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TNJPHMR

TAMILNADU JOURNAL OF PUBLIC HEALTH AND MEDICAL RESEARCH

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Letter from the Editor's Desk

Dear readers

We are happy to share yet another edition of TN Journal of Public health and medical research and in this particular edition we like to share our experience in preventing and emergence of on epidemic following an unprecedented rain in Chennai and in Southern districts. The practical knowledge of how we coordinated the multiple activities with various departments and special teams is an learning experience in management of any disaster. Sharing an experience of managing and moving towards eliminating some of the neglected tropical diseases like filariasis over the period of years following the WHO guidelines is much needed of academic learning.

A simple situational and operational research using the existing CRS data gives useful information for our future planning.

Improving the quality aspects of ongoing immunization program is stressed using the importance of AEFI monitoring which will bring confidence in the public health system.

Finally, handling emerging noncommunicable diseases needs not only medicines but the need for managing their mental health is well documented and this will ensure policy change to provide integrated physical and mental health care at primary care level soon.

Thank you all for your support and guidance.

Dr. T.S.Selvavinayagam MD., DPH., DNB.,

Director of Public Health & Preventive Medicine

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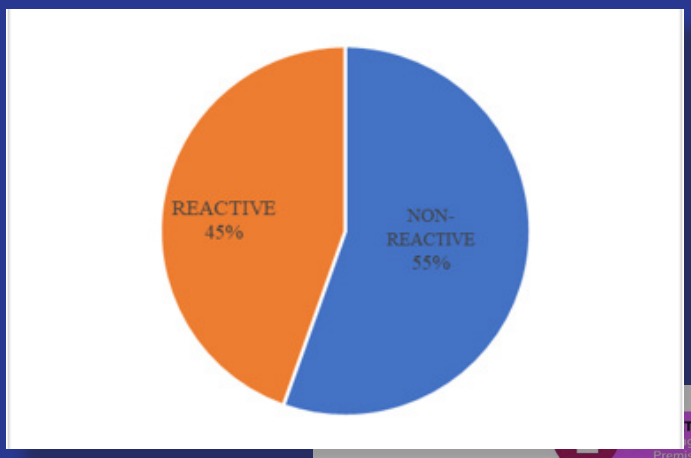

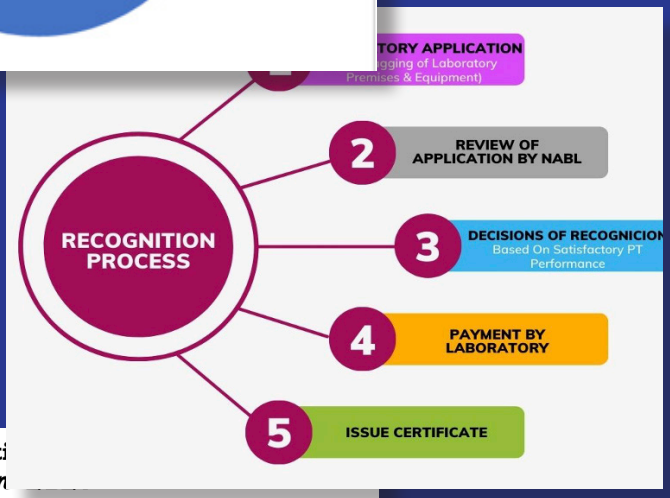

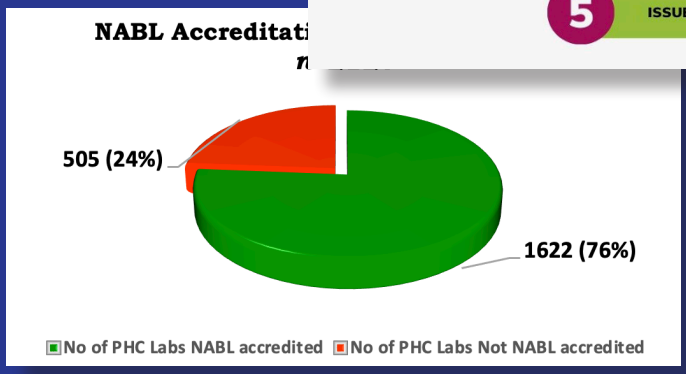

RESEARCH IS TO SEE WHAT EVERYBODY ELSE HAS SEEN, AND TO THINK WHAT NOBODY ELSE HAS

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ORIGINAL ARTICLE - PUBLIC HEALTH

SEROPREVALENCE OF SARS-COV-2 SPECIFIC IGG ANTIBODIES AMONG BLOOD DONORS

Nivetha Manoharan [(1)], Niranj Rathan Radhakrishnan [(1)], Ashwin Anandan [(1)], Ravindra Prasad Thokala [(1)], Krishnamoorthy Radhakrishnan [(1)]

(1) Department of Transfusion Medicine, Sri Ramachandra Medical college and research institute, Porur, Chennai.

Abstract

INTRODUCTION : The Severe Acute Respiratory syndrome (SARS-CoV-2) manifests as asymptomatic to mildly symptomatic illness but at times becomes so severe to the extent of leading to death. The study on seroprevalence of SARS-CoV-2 among the voluntary blood donors, who represent the hale and healthy individuals in the community will be a useful indicator of community prevalence of the infection. As the disease significantly impairs blood supply, understanding the prevalence helps in implementing necessary safety measures in places like blood bank.

METHODOLOGY : This cross-sectional study was carried out between January 2021 and December 2021 during which 100 donors who were not vaccinated and without any prior Covid-19 infection were included. After obtaining informed consent from the blood donors willing to participate in the study, SARS-CoV-2 IgG antibody screening was done using chemiluminescence immunoassay.

RESULTS : The prevalence of SARS-CoV-2 IgG antibodies among the blood donors were 45%. 55.4% of the donors from the age group of 21-30 years and 29% of the donors in the age group of 31-40 years were reactive. 59.5% of the first-time donors, 51.3% of the infrequent donors and 12.5% of the regular donors were found to be reactive. There was a statistically significant relationship between the age and the frequency of donation with the seropositivity rate.

CONCLUSION : Study on seroprevalence among the asymptomatic individuals serves as an indicator for the transmission of virus across the community, to implement measures to prevent the spread of virus among the population and to implement vaccination programmes.

KEYWORDS : Severe acute respiratory syndrome, SARS-Cov-2, antibodies, Seropositive

INTRODUCTION

The pandemic of Severe Acute Respiratory Syndrome (SARS-CoV-2) is reported to have originated at Wuhan in China in November 2019 and have been spread across the globe. The symptoms range from mild fever, cough, sore throat to severe respiratory illness and manifests as asymptomatic to mildly symptomatic illness in many affected individuals but at times becomes severe to an extent of leading to death in some individuals. There is no report of SARS-CoV-2 to be transmitted through blood or blood products.[1] Yet, the study of seroprevalence of SARS-CoV-2 among voluntary blood donors who represent the hale and healthy individuals in the community will be a useful indicator of community prevalence of SARS-CoV-2 infection.[2] As the disease significantly impacts blood supply through reduced blood donation and by affecting health care workers, understanding the prevalence of SARS-CoV-2 in the local community helps in implementing data driven precautionary and safety measures in places like blood banks, while ensuring effective supply of highly essential blood and blood components. Screening helps in assessing the spread of the virus and the level of antibody protection against the virus at the population level. As individuals with asymptomatic and mild infections may be missed, it could be obtained by screening the population for specific antibodies by using validated serological assays.[3] The screening of blood donors for SARS-CoV-2 is not mandatory as per National blood transfusion guidelines.[4] But the screening helps in assessing the spread of the virus and the level of antibody protection against the virus at the population level.

The SARS-CoV-2 IgG antibodies were measured by using Chemiluminescence immunoassay method after obtaining informed consent from the participants.

SUBJECTS AND METHODS

AIM AND OBJECTIVE : To estimate the seroprevalence of antibodies to SARS-CoV-2 (IgG) among blood donors.

METHODOLOGY : This was a cross sectional study carried out between January 2021 and December 2021 in a tertiary care hospital in South India, in which all eligible donors from 18 to 65 years, who were not vaccinated and without any prior infection of covid were included in the study. The study

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Corresponding Author: Nivetha Manoharan
e-mail : nivisasi28@gmail.com

is approved by Institutional Ethics committee in December 2020. As per the Institutional Ethics committee guidance, this study is registered in Clinical Trial Registry prospectively with CTRI Number CTRI/2021/01/030455.

The eligibility criteria for the selection of blood donors were as per Drug and cosmetic rules, 1945 (amended March 2020). Additionally, those with prior Covid infection and those who have been vaccinated were excluded from the study. After obtaining the informed consent, all eligible blood donors were screened for SARS-CoV-2 IgG antibodies using Chemiluminescence immunoassay using VITROS immunodiagnostic ANTI-SARS-CoV IgG immunoassay, which is intended for the qualitative detection of IgG antibodies to SARS-CoV-2 in the human serum. A 5ml of donor whole blood sample was collected in an EDTA vacutainer, which was centrifuged and separated and the test was performed with 3 ml of donor plasma sample. 2 VITROS Anti SARS-CoV-2 IgG controls were used namely anti SARS-CoV-2 IgG non-reactive and anti-SARS-CoV-2 IgG reactive. Results were based on the E ratio (S/Co), with values <1 as non-reactive and >1 as reactive as per the manufacturer guide. The test is intended for use as an aid in identifying individuals with an adoptive immune response to SARS-CoV-2 infection. Individuals may have detectable virus present for several weeks following seroconversion. Participants age, gender, frequency of donation and ABO blood groups were noted. Data were presented as mean, standard deviation, frequency and percentage. Categorical variables were compared using Pearson chi-square test. Significance was defined by P values less than 0.05 using a two-tailed test. Data analysis was performed using IBM-SPSS version 21.0 (IBM-SPSS Science Inc., Chicago, IL).

RESULTS

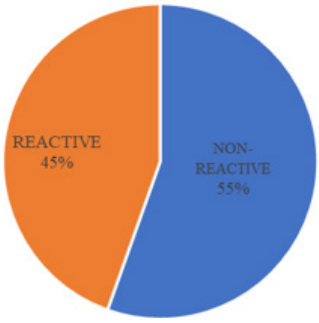

Figure 1 : Seroprevalence of SARS-CoV-2 IgG antibodies among the study participants

Among 100 donors, 45% (95% CI is 35% to 55%) of the donors were reactive for SARS-CoV-2 IgG antibodies (Fig 1). The age group distribution, gender, frequency of donation and blood group of the donors participated in the study stratified by SARS-CoV-2 IgG antibodies is illustrated in the table 1 and 2.

Table 1 : Cross tabulation of seroprevalence of SARS-CoV-2 IgG antibody with gender, age group and frequency OD blood donation

GENDER		SARS-CoV-2 IgG ANTIBODY				TOTAL
		NON - REACTIVE (<1)	**REACTIVE (>1)**			
	MALE	54 (55.7%)	43 (44.3%)			97
	FEMALE	1 (33.3%)	2 (66.7%)			3
AGE GROUP		**NON - REACTIVE**	**S/Co 1-5**	**S/Co 5.1-10**	**S/Co >10.1**	
	18-30	29 (48.3%)	22 (71%)	7 (22.6%)	2 (6.5%)	60
	31-40	22 (70%)	5 (55.6%)	2 (22.2%)	2 (22.2%)	31
	41-65	4 (44.4%)	2 (40%)	2 (40%)	1(20%)	9
	TOTAL		**29 (64.4%)**	**11 (24.4%)**	**5 (11.1%)**	**45**
FREQUENCY OF DONATION		**NON-REACTIVE**	**S/Co 1-5**	**S/Co 5.1-10**	**S/C >10.1**	
	FIRST TIME DONORS	15 (40.5%)	13 (59.1%)	6(27.3%)	3 (13.6%)	37
	INFREQUENT DONORS	19 (48.7%)	14 (70%)	4 (20%)	2 (10%)	39
	REGULAR DONORS	21 (87.5%)	2 (66.7%)	1 (33.3%)	0	24
	TOTAL		**29 (64.4%)**	**11 (24.4%)**	**5 (11.1%)**	**45**

There was no statistically significant corelation between the gender and the seropositivity rate (p value- 0.444). There was a statistically significant corelation between the seropositivity rate and the age (p value- 0.026) and the frequency of donation (p value- 0.001)

Table 1 : Cross tabulation of seroprevalence of SARS-CoV-2 IgG antibody with blood group of the donors.

		NON-REACTIVE	**REACTIVE**	**TOTAL**	p-value
Blood group	**A Positive**	11 (57.9%)	8 (42.1%)	19	0.204
	AB Positive	1 (20%)	4 (80%)	5	
	B Negative	0	1 (100%)	1	
	B Positive	12 (46.2%)	14 (53.8%)	26	
	O Positive	31 (63.3%)	18(36.7%)	49	
Total		55 (55%)	45 (45%)	100	

DISCUSSION

Hundred donors were included in the study, where 97% were male and 3% were female. The maximum participants were observed in the age group of 21 to 30 years (56%). This may be explained by the fact that these group of population were able to travel and be eligible for blood donation despite all the restrictions implemented during the pandemic compared to the elderly age group. Among the study participants,24% of the donors were regular blood

donors, 37% and 39% of the blood donors were first time and infrequent blood donors respectively. None of the donors in our study reported to have any comorbidities. Around 49% of the participating donors were 'O' blood group. Considering the 'Rh' status 99% of the donors were Rh positive.The seropositivity rate for the SARS-CoV-2 IgG antibodies was found to be 45% (Fig 1). A study by Ram Jaiswal et al., had a seropositivity rate of 43% which is similar to the reports in our study.[5] A similar study by Srinivasa Rao Chunchu et al., reported a seroprevalence of 49.4% with a sample size of 1034 donors.[6] A study by Sahar Saeed et al., which was conducted during the first wave of Covid 19 reported a seroprevalence less than 1%, which signifies that proportion of population exposed to the virus without any symptoms were less during the spread of the first wave.[7]Among the study participants, 44.3% of the male donors among the 97 male donors and 66.7% of the female donors among the 3 female donors were reactive for SARS-CoV-2 IgG antibodies. A similar study by Srinivasa Rao Chunchu et al., reported 49.2% of the male donors to be seropositive and 71.4% of the female donors to be seropositive.[6] Tulika Chandra et al., in their study reported none of the female participants were seropositive.[8] In our study, the percentage of female donors becoming seropositive is high when compared to the male donors inspite of the smaller number of female participants included in the study which is similar to other studies. But there was no statistical significance between the gender and the seropositivity rate in our study. In the present study, none of the donors less than 20 years of age were found to be seropositive. 55.4% of the donors within the age group of 21-30 years and 55.6% of the donors above 40 years of age were found to be seropositive. 29% of the donors in the age group 31-40 years were found to be seropositive. A similar study by Pratibha Kale et al., reported that 46.6% of the donors in the age group of 26-35 years were found to seropositive followed by 28.2% of the donors in the age group of 18-25 years, 19.4% of the donors in the age group of 36-45 years and 5.8% of the donors who were more than 45 years were found to be seropositive.[9] Cruz S. Sebastiao et al., in their study found that maximum seropositivity rate was found in the age group less than 20 years and they have stated that seroprevalence rate was found to be increased over time.[10] Srinivasa Rao Chunchu et al., in their study found that higher antibody responses were found between the age group of 30-45 years in comparison to 18-29 years.[6] A similar study by May Raouf et al., reported 48.6% of the donors in the age group of 17-35 years were found to be seropositive.[11] In our study, 31 among the 56 donors in the age group 21-30 years were found be reactive and 5 among the 9 donors in the age group more than 40 years were found to be reactive which shows that donors within the age group of 21-30 years have had some asymptomatic exposure and had shown high immunological response. There was a statistically significant relationship between the age of the donors and seropositivity rate from our study. In comparing the seroprevalence with the frequency of blood donation in our study, 59.5% of the first-time donors were found to be seropositive followed by 51.3% of the infrequent donors and 12.5% of the regular donors were found to be seropositive. In a similar study by Pratibha Kale et al., 26.1% of the repeat donors were found to be reactive.[9] Srinivasa Rao Chunchu et al., in his study reported that 50.6% of the replacement donors were found to be seropositive followed by 47.6 % of the voluntary donors to be seropositive.[6] May Raouf et al., in his study reported 10.7% of the regular donor were found to be seropositive and 16.7% of the first-time donors were found to be seropositive. He also stated that regular donors would be highly aware of the blood donation criteria and the precautionary measures to be taken before donating the blood.[11] Similarly in our study the first-time donors and infrequent donors were found to have more seropositivity rate compared to the regular donors which shows that first time donors and infrequent donors had some asymptomatic exposure compared to the regular donor who would be well aware of the covid protocols implemented in the blood center. There was a statistical significance between the seropositivity rate and the frequency of donation from our study. When comparing the seroprevalence with the blood group of the donors, 80% of the 'AB' blood group donors were found to be seropositive, 57.6% of the 'B' blood group donors were reactive followed by 42.1% of the 'A' group donors followed by 36.7% of the 'O' blood group donors. One donor was found to be Rh negative and was reactive for SARS-CoV-2 IgG antibodies. In our study 4 among the 5 'AB' positive donors were found to be seropositive. But there was no statistical significance between the blood group of the donors and the seropositivity rate from our study.Among the 45 reactive donors in our study, around 29 (64.4%) donors were observed to have a S/Co value ranging from 1 to 5. Around 11 donors (24.4%) were found to have a S/Co value between 5.1 to 10 and 5 (11.1%) donors with the S/Co value more than 10. A similar study by Pratibha Kale et al., categorized the antibody S/Co value from 1 to 5 as category 1 and around 41.8% of the donors were observed to have a S/Co of ranging from 1 to 5. The S/Co value more than 5 was considered as category 2. Around 58.1% of the donors were found to be with the S/Co value more than 5.[9] In a similar study by Srinivasa Rao

Chunchu et al., categorized the IgG antibody positivity rate as less than 3.5, 3.5-6, 6-12 and more than 12 and reported that donors with S/Co greater than 9.5 have significantly higher neutralizing capacity.[6] SARS-CoV-2 IgG antibody S/Co value does not have any statistical significance with age group (p value- 0.509), frequency of donation (p value- 0.909) and the blood group (p value – 0.997) among the reactive blood donors.

CONCLUSION

SARS-CoV-2 IgG antibody testing, has a potential to identify the asymptomatic spread of the virus among the healthy population in the community. It also helps the donors and the blood center to have an idea about implementing measures to prevent the spread of infection while blood donation and to implement strategies to provide safe blood components inspite of the pandemic. Studies on seroprevalence among the asymptomatic individual is very much essential as it serves as an indicator for the transmission of virus across the community. Herd immunity is associated with the extent of spread of virus among the community.[6] Though this study shows a higher seroprevalence of SARS-CoV-2 IgG antibodies, the seropositivity rate necessary to acquire the herd immunity is much higher. But the seropositivity rate helps us to implement measures to prevent the spread of virus among the population in the community by knowing the transmission, immunity levels among the population in a community, to develop therapeutic options and to implement vaccination programmes. Further, seroprevalence in blood donors assists us in implementing measures to arrest the spread of virus among the donors and to the blood center staffs and helps us in monitoring the risks and benefits, if at all that blood unit is transfused to the recipient.

ACKNOWLEDGEMENT: NIL

REFERENCES

1. World Health Organization. Maintaining a safe and adequate blood supply during the pandemic outbreak of coronavirus disease (COVID-19): interim guidance, 20 March 2020. World Health Organization; 2020.

2. Amorim Filho L, Szwarcwald CL, Mateos SD, Leon AC, Medronho RD, Veloso VG, Lopes JI, Porto LC, Chieppe A, Werneck GL. Seroprevalence of anti-SARS-CoV-2 among blood donors in Rio de Janeiro, Brazil. Revista de saude publica. 2020 Jul 6;54:69.

3. Kevadiya BD, Machhi J, Herskovitz J, Oleynikov MD, Blomberg WR, Bajwa N, Soni D, Das S, Hasan M, Patel M, Senan AM. Diagnostics for SARS-CoV-2 infections. Nature materials. 2021 May;20(5):593-605.

4. Interim S. National guidance to Blood Transfusion services in India in light of COVID-19 Pandemic. India NBTCMoHaFWGo. 2020:12.

5. Jaiswal R, Sharma S, Singla A, Devpura N, Vohra R, Kakkar M, Rijhwani P, Sureka R. Seroprevalence of SARS-CoV-2 IgG antibody among healthy blood donors: a single centre study. Transfusion and Apheresis Science. 2022 Jun 1;61(3):103338.

6. Chunchu SR, Ravula U, Gente VK, Bacchu S, Pandu Ranga Rao S, Mooli S. SARS-CoV-2 seroprevalence among whole blood donors during first wave of covid-19 pandemic in India. Indian Journal of Hematology and Blood Transfusion. 2022 Jul;38(3):546-55.

7. Saeed S, Drews SJ, Pambrun C, Yi QL, Osmond L, O'Brien SF. SARS-CoV-2 seroprevalence among blood donors after the first COVID-19 wave in Canada. Transfusion. 2021 Mar;61(3):862-72.

8. Chandra T, Agarwal D, Himanshu D, Agarwal M, Puri B. SARS-CoV-2 IgG Surveillance in Asymptomatic Blood Donors and Health Workers. Advances in Medicine. 2021 Dec 29;2021

9. Kale P, Patel N, Gupta E, Bajpai M. SARS-Coronavirus-2 seroprevalence in asymptomatic healthy blood donors: indicator of community spread. Transfusion and Apheresis Science. 2022 Feb 1;61(1):103293.

10. Sebastião CS, Galangue M, Gaston C, Van-Dunen R, Quivinja J, Lunbungululo E, Alfredo D, Sozinho A, Teixeira A, Manico E, Machado D. Seroprevalence of anti-SARS-CoV-2 antibodies and risk factors among healthy blood donors in Luanda, Angola. BMC Infectious Diseases. 2021 Dec;21(1):1-0.

11. Raouf M, Rabeh M, Kaur S, Sharma R, Thottumkal N, Mohammed R. Seroprevalence of IgG Anti-SARS-CoV-2 among Voluntary Blood Donors in Dubai: Demographic and Risk Factors. Dubai Medical Journal. 2021;4(3):204-11.

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ORIGINAL ARTICLE - PUBLIC HEALTH

CLINICO-EPIDEMIOLOGICAL PROFILE OF INFLUENZA A H1N1 CASES IN TAMIL NADU FROM 2022 TO 2023.

Sankarmani Ramasamy Mathivanan [(1)], Senthilkumar Masilamani [(1)], Palani Sampath [(1)], Selvavinayagam T S [(1)]

(1) The Directorate of Public Health and Preventive Medicine, Chennai, Tamil Nadu.

Abstract

INTRODUCTION: The swine flu or Influenza A H1N1 virus infection was first observed in Mexico and later spread quickly worldwide as a pandemic including India in 2009. It has emerged as a virulent pathogen leading to a considerable burden worldwide. The present study aims to analyze the clinic-epidemiological profile of the cases that tested positive in Tamil Nadu.

METHODS: During this retrospective study from 2022 to 2023, 6462 cases tested positive in Tamil Nadu, and the clinical-epidemiological profile was available for 6303 cases. The data was collected after approval from the Director of Public Health and Preventive Medicine of Tamil Nadu and the data was entered in Microsoft Excel and analysed using SPSS software version 21.

RESULTS: : In Tamil Nadu, the case positivity rate was 11.2% with a case fatality rate of 0.68%. The highest case positivity rate was in children <10 years(20%) followed by adults between 50-60 years of age(15.9%). Highest mortality rate was seen between 51-60 years (41.9%). The incidence was highest in Chennai followed by Coimbatore. The cumulative incidence was highest in September (46.5%) during monsoon. The highest mortality was observed in Category C patients (p-value <0.05) and in those who were initiated on treatment >2 days after the onset of symptoms (p-value <0.05).

CONCLUSION : Based on the findings of our study, we can hypothesize that the incidence of the Influenza A H1N1 case has a bimodal distribution with the highest fatality among the elderly. Stringent surveillance and preventive measures are needed during monsoon season and early initiation of treatment is necessary to reduce the mortality and morbidity.

KEYWORDS : Influenza A H1N1, Swine flu, Epidemiology, Tamil Nadu, Seasonality.

INTRODUCTION

The influenza virus, also referred to as the flu virus, is known to primarily attack the respiratory system. It is a member of the Orthomyxoviridae family of RNA viruses, which has three subtypes.[1] They are Influenza A, B, and C, with Influenza A and B being the subtypes that are more frequently circulating. Numerous influenza viruses, including AH1N1, AH3N2, Influenza B, and others, are circulating and can cause seasonal influenza.[2,3] There is a great chance that influenza will frequently spark pandemics and outbreaks. Four of the five worldwide pandemics that occurred in the 20th and 21st centuries have been caused by it.[4]

Swine flu virus Influenza A(H1N1) first appeared in Mexico in March 2009, then moved to the USA and, by May, India. The World Health Organisation (WHO) proclaimed a pandemic in June that persisted in India and claimed the lives of nearly 40% of cases until it was contained in August 2010. The infected cells break down and cytokines are released, causing fever, malaise, damage to the pulmonary parenchyma and respiratory epithelium, and pneumonia. It addition it leads to secondary bacterial infections because of tissue damage and exacerbation of preexisting comorbidities.[2,5]

India witnessed its first swine flu (Influenza A H1N1) outbreak in 2009 which infected 27,236 cases leading to mortality among 981 cases across the country. The outbreak continued until 2010 infecting 20,604 cases and mortality among 1763 cases. The outbreak was contained in 2010 but cases keep reported in all states of India making it endemic in India. In 2015 an outbreak was declared due to a mutant strain of Influenza A H1N1 which infected 10,000 cases leading to mortality in 774 cases. Later in 2017, the virus spread rapidly throughout the country which showed variance in the period of occurrence. The periods of peaks corresponded between January to March and between July to September.[6]

In Tamil Nadu, the incidence of Influenza A H1N1 has been noticed ever since the first outbreak in 2009. The incidence rates have been reduced since 2010 with peaks once in every 3 to 5 years. The peaks in new cases corresponded to the rise and fall in the monsoon rains.[7] There was a drastic fall

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Corresponding Author: Sankarmani R M
e-mail : drsankarmani@gmail.com

in the number of cases during the COVID-19 pandemic and shown a slight increase in the cases since 2022.[8] This study is planned to elicit the clinical and epidemiological profile of the laboratory-confirmed Influenza A H1N1 cases and the factors that lead to the mortality of the cases.

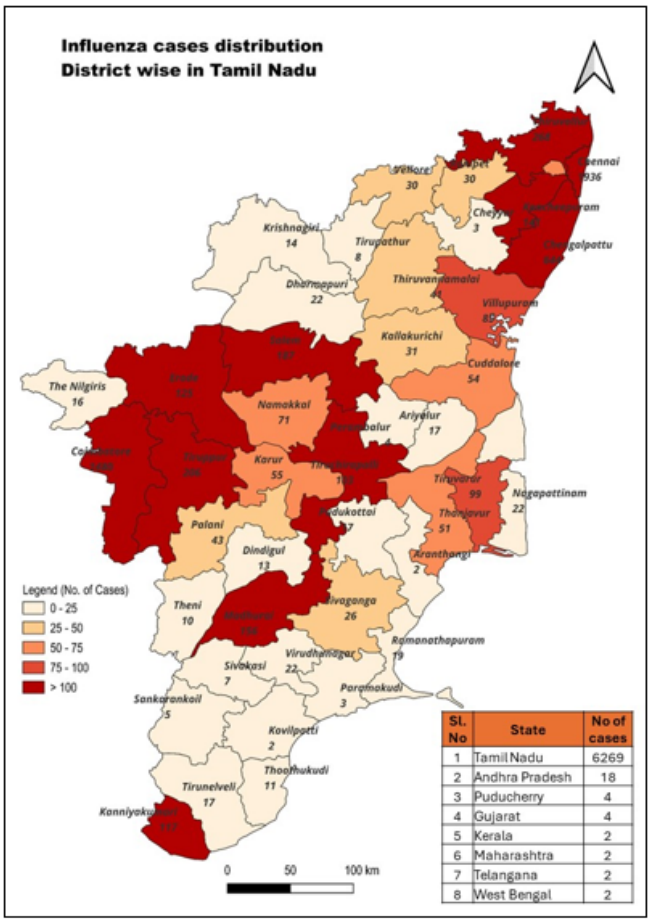
METHODOLOGY

This is a retrospective cross-sectional study that was conducted in Tamil Nadu. Data of all the laboratory-confirmed Influenza A H1N1 cases in Tamil Nadu between the period January 2022 to December 2023 from both private and government institutions in Tamil Nadu were used for the study. The epidemiological factors of the cases like demographic characteristics, clinical profile, and outcome was represented and compared. Official permission to conduct the study was obtained from the Director of Public Health and Preventive Medicine, Tamil Nadu. All the suspected and confirmed Influenza A H1N1 cases were categorized into either of the three categories A, B or C based on the guidelines issued by the National Centre for Disease Control (NCDC) of the Ministry of Health and Family Welfare (MoHFW) India. The patients' treatment protocol and procedure were as per the categorization of cases from the MoHFW. Patients in Category-A included those with a low fever, cough, or sore throat, along with headache, diarrhoea, vomiting, and/or body aches. Patients in category B included individuals with high-grade fever, sore throat, and other high-risk conditions in addition to those exhibiting the signs and symptoms of category A. In addition to the signs and symptoms of Categories A and B, individuals in Category C also had bluish discoloration of the nails, sputum mixed with blood, sleepiness, chest pain, and dyspnea.[9] Influenza A H1N1 screening is done in both private and government institutions in Tamil Nadu. There are 60 laboratories throughout the state of Tamil Nadu where screening is done with 13 institutions from the Government sector and 47 institutions from the Private sector. It is mandatory to report the total number of samples screened and the total screened samples resulted in positive.[10] During the study period, 57,764 samples were screened in Tamil Nadu with 24,333 samples in 2022 and 33,431 in 2023. A total of 6462 cases (Year 2022- 2852 cases, Year 2023 - 3510 cases) were reported in Tamil Nadu during the study period. Among them, complete details were not available for 59 cases. Hence the final study population was 6303 (Year 2022- 2851 cases, Year 2023 - 3452 cases).

The line list contained the details of patients' demographic profiles like age, gender, and place. Clinical profile like date of onset of symptoms, date of sampling, date of result published, and the outcome of the disease. The secondary data was entered in the Microsoft Excel software and the data was checked for duplication and any typing errors. The final data was analysed using IBM-SPSS software version 21.0. Categorical variables were represented as frequency and proportion and significance was tested using the Chi-square test. Continuous variables were represented as mean and standard deviation and significance was tested using the t-test.

RESULTS

Figure 1 describes the distribution of Influenza A H1N1 cases in Tamil Nadu during the study period. Among the 6303 cases reported positive, 6269 cases were natives of Tamil Nadu, and 34 cases were from different states. Half of the cases from other states were from Andra Pradesh (n=18). Within Tamil Nadu, the major proportion of cases was from Chennai (n=1936, 30.7%) followed by Coimbatore (n=1480, 23.5%). A total of 43 deaths occurred in Tamil Nadu among the cases during the study period with a case fatality rate of 0.68%.



Sl. No	State	No of cases
1	Tamil Nadu	6269
2	Andhra Pradesh	18
3	Puducherry	4
4	Gujarat	4
5	Kerala	2
6	Maharashtra	2
7	Telangana	2
8	West Bengal	2

Figure 1 : District-wise distribution of Influenza A H1N1 cases in Tamil Nadu from 2022 to December 2023.

The mean age of the cases was 42.47 ± 25.45 years ranging from less than 1 to 97 years. Table 1 explains the age distribution of cases and mortality rates in each age group.

All the cases were stratified into 10 groups with a 10-year class interval. The majority of positive cases occurred in children less than 10 years of age (n=1261, 20%) followed by 51-60 years (n=1019, 16.2%). The case fatality rate was highest in adults between the ages 51 to 60 years with 1.77% and least with nil deaths above 80 years of age.

Table 1 : Morbidity and Mortality due to Influenza A H1N1 cases in Tamil Nadu from 2022 to December 2023 among various age groups (n=6303).

Age group in years	No. of cases	Percentage of cases	No of deaths	Percentage of deaths	Case fatality rate
< 10 years	1261	20	1	2.3	0.08
11 - 20 years	316	5	1	2.3	0.32
21 - 30 years	460	7.3	2	4.7	0.43
31 - 40 years	686	10.9	2	4.7	0.29
41 - 50 years	701	11.1	4	9.3	0.57
51 - 60 years	1019	16.2	18	41.9	1.77
61 - 70 years	978	15.5	9	20.9	0.92
71 - 80 years	648	10.3	6	14.0	0.93
81 - 90 years	214	3.4	0	0.0	0.00
> 90 years	20	0.3	0	0.0	0.00
Total	6303	100	43	100.0	0.68

Figure 2 depicts the comparison trend of Influenza cases in Tamil Nadu from 2022 to 2023. There has been a surge in cases in August, September and October and November in 2022 and 2023 but the number of cases was lesser in 2023 compared to 2022 and the fall in cases occurred at the end of November.

Figure 2 : Comparison between the trend of Influenza A H1N1 cases in Tamil Nadu from 2022 to December 2023 (n=6303).

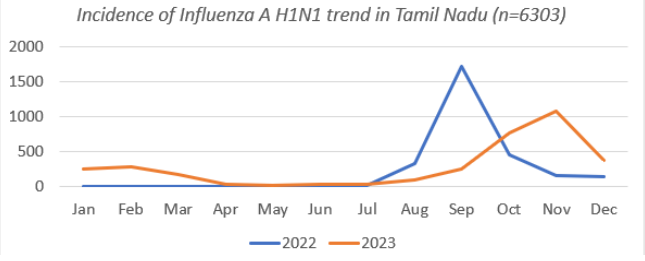


Table 2 describes the month-wise distribution of cases and mortality rates in Tamil Nadu. Maximum number of cases were reported in September (n=1966, 31.2%) followed by November (n=1255, 19.9%) and October (n=1233, 19.6%). The case fatality rates were higher in August (2.6%) followed by July (1.5%) and September (1.0%).

Table 2: Month-wise Morbidity and Mortality due to Influenza A H1N1 cases in Tamil Nadu from 2022 to December 2023 (n=6303).

Month	No. of cases	Percentage of cases	No of deaths	Percentage of deaths	Case fatality rate
Jan	255	4.00%	1	2.30%	0.39
Feb	285	4.50%	1	2.30%	0.35
Mar	178	2.80%	0	0.00%	0.00
Apr	37	0.60%	0	0.00%	0.00
May	29	0.50%	0	0.00%	0.00
Jun	45	0.70%	0	0.00%	0.00
Jul	65	1.00%	1	2.30%	1.54
Aug	422	6.70%	11	25.60%	2.61
Sep	1966	31.20%	20	46.50%	1.02
Oct	1233	19.60%	0	0.00%	0.00
Nov	1255	19.90%	6	14.00%	0.48
Dec	533	8.50%	3	7.00%	0.56
Total	6303	100.00%	43	100.00%	0.68

Table 3 describes the distribution of cases and mortality rates with various influencing factors. For comparison of susceptibility of age with case fatality rate and to find association of age leading to mortality, the age was classified as ≤41 years and >41 years based on the mean age of the cases. Factors like the age of the patients more than 42 years (Case fatality rate-1.02%), those admitted in government institutions (Case fatality rate-1.26%), and those patients in Category C (Case fatality rate-1.14%) had higher case fatality rates. The higher case fatality rates in the above findings were statistically significant with p-value <0.05. The case fatality rates were higher in those who were treated as inpatients (Case fatality rate-0.71%), but the finding was not statistically significant. The number of cases and case fatality rate was higher in males which was not statistically significant. There wasn't much difference between gender of the cases and the year diagnosed positive with the deaths among cases.

Table 3: Morbidity and Mortality due to Influenza A H1N1 cases with influencing factors in Tamil Nadu from 2022 to December 2023 among various age groups (n=6303).

Factors		No. of cases	% of cases	No of deaths	% of deaths	Case fatality rate	p value
Gender	Male	3415	54.20	25	58.10	0.73	0.601
	Female	2888	45.80	18	41.90	0.62	
Age	≤41 years	2777	44.10	7	16.30	0.25	<0.001*
	>42 years	3526	55.90	36	83.70	1.02	
Year	2022	2851	45.20	25	58.10	0.87	0.121
	2023	3452	54.80	18	41.90	0.52	
Type of Institution	Government	553	8.80	7	16.30	1.26	0.081
	Private	5750	91.20	36	83.70	0.62	
Patient testing condition	In-patient	6022	95.50	43	100.00	0.71	N/A
	Out-patient	281	4.50	0	0.00	0.00	
Category of Patient	A	901	14.30	1	2.30	0.11	0.001*
	B	2774	44.00	12	27.90	0.43	
	C	2628	41.70	30	69.80	1.14	

A H1N1 cases and the factors leading to mortality including duration for symptoms, RT-PCR testing and treatment initiation. The factors were converted to categorical variables for analysis. The case fatality rate was higher when the sampling was done after 2 days of onset of symptoms (Case fatality rate -0.91%), when the samples were tested more than 24 hours later (Case fatality rate -1.39%) and when the treatment was initiated more than 2 days after onset of symptoms (Case fatality rate -0.95%). This difference was statistically significant only when the initiation of treatment was more than 2 days following onset of symptoms with a p value <0.05.

Table 4: Morbidity and Mortality due to Influenza A H1N1 cases due to clinical and laboratory diagnosis to initiation of treatment in Tamil Nadu from 2022 to December 2023 among various age groups (n=4064).

Factors		No. of cases	% of cases	No of deaths	% of deaths	Case fatality rate	p value
Onset of Symptoms to sampling	≤2 days	4121	65.40	23	53.50	0.55	0.100
	>2 days	2182	34.60	20	46.50	0.91	
Onset of Symptom to Treatment	≤2 days	3257	51.70	14	32.60	0.42	0.012*
	>2 days	3046	48.30	29	67.40	0.95	
Publication of results to Treatment	≤24 hours	6144	97.50	42	97.70	0.68	0.934
	>24 hours	159	2.50	1	2.30	0.62	

DISCUSSION

Influenza A H1N1 cases clinical and epidemiological factors may exhibit a wide variety of presentations in relation to geographical distribution. Several studies have mentioned that the incidence and positivity rates of Influenza A H1N1 cases are high in temperate zones compared to tropical zones.[11,12] The distribution of cases in Tamil Nadu varied widely, and maximum clustering of cases was seen in Chennai, Coimbatore, and the districts surrounding Chennai. The varied distribution of cases probably could be due to the high volume of migration between people in those industrialized districts with higher cases. Similar findings were observed in the study by Pandita AK et al, and Singhal et al, where urban areas had the maximum burden of cases.[13,14] Tamil Nadu is a state of India with a wide diversity like the sub-continent and the findings of this study can be compared with studies from other Indian states. During the study period in Tamil Nadu, the case positivity rate of Influenza A H1N1 was 11.19% and the case fatality rate was 0.68%. A similar case positivity rate and fatality rate was observed in the study by Kiruba R et al in Chennai which could reflect the influence of geographical location.[15] Whereas the findings from other studies in India were not similar. In studies by Pandita AK et al in Uttarakhand, Singhal YK et al in Rajasthan, Siddharth V et al in Chandigarh, and Gaikwad LL et al in Solapur, the case positivity ranged from 25.4% to 63%, which is much higher than the finding in our study.[13,14,16,17] This difference in positivity could be influenced by the socio-demographic profile of the study area. Despite the lesser case positivity rate in our study and studies conducted in Tamil Nadu compared to other studies in different parts of India like Uttarakhand, Rajasthan, Chandigarh, and Solapur the case fatality rate is similar.[13,14,16,17] This probably could be due to the spontaneous recovery due to the innate immunity and herd immunity following exposure to Influenza A H1N1 over the years and also the advancement in the healthcare system with early diagnostic techniques and treatment modalities compared to the scenario a decade back. The age of the cases varied from less than a year to 97 years and the majority of the positive cases were from the age group lesser than 10 years followed by those from the age group 51-60 years and above with high case fatality rates in those from the age group 51-60 years and above. The findings of the bimodal distribution of case positivity were identical to the findings from Abdulkader R et al where higher rates were seen in cases lesser than 20 years and above 50 years.[12] However, the case fatality rate increased with increasing age and more among those ages >42 years. The higher case positivity with mortality, similar to our study was noted in ages above 50 years in the study by Sidhu SK et al in Amritsar.[6]. The finding of higher positivity in less than 10 years and above 50 years highlights the fact that children and the elderly are more susceptible and hence categorized as B cases as they are more vulnerable.[5,18-20] Monsoon has a higher influence in the case positivity and fatality ratio. In our study there was a high positivity rate in September followed by August, October, and November. Similar to our study findings were observed in the study by Siddharth V et al in Chandigarh, Gaikwad LL et al in Maharashtra, and Kiruba R et al in Tamil Nadu where higher cases were reported from August to December.[15-17] In studies at Telangana by Sujatha K et al, Uttarakhand by Pandita AK et al, and in Amritsar by Sidhu et al the incidence of cases varied from December to April.[6,14,21] In a systemic review by Ratre YK et al, the incidence of Influenza A H1N1 cases varied from each country depending on the monsoon. Likewise, the case fatality rate had a drastic increase when compared to the case positivity rate by July which could be due to the number of suspected cases tested was less before the mortality increased due to influenza. This brings strong evidence of the influence of monsoons on the incidence of Influenza A H1N1 cases.[20]

The onset of symptoms to the initiation of treatment influenced the outcome of the patient in our study. The earlier the initiation of treatment with Oseltamivir following

the onset of symptoms reduced the mortality and early recovery of the patients. However, the duration between the onset of symptoms with time of testing, publication of result, and publication of result to initiation of treatment did not influence the mortality and outcome of the patients. Similar to our study findings were found in the studies by Fjelltveit EP et al, Lee BY et al, and Deshpande A et al, where the outcome was better with earlier initiation of treatment following the onset of symptoms.[8,22,23] Hence earlier initiation of treatment is better to achieve a better outcome. The findings from our study shows that majority of the cases were tested positive in private hospitals compared to government hospitals. Similarly, another finding from our study showed that there was nil mortality among those who tested positive as outpatient sampling for Influenza A. But studies on these findings were not available as most studies were institution-based study where the cases were admitted and on treatment. The possibilities of these findings could be due to the fact that the mortality rates are higher among those in Category C. As per the NCDC guidelines sampling is required for only those who are hospitalised and category C which is strictly followed by Government institutions which could be the reason for the variations in the findings.[9,10]

CONCLUSION

Our study involved cases from the entire state of Tamil Nadu. Epidemiological information of Influenza A H1N1 was provided in our study. The positivity rate following testing the symptomatic patients was lesser in Tamil Nadu and the Case fatality rate was also lesser than that of other states in India. Based on the findings of our study, it was hypothesized that the incidence of H1N1 cases was higher during the winter and monsoon season starting from August to December affecting Children less than 10 years of age and between 51 to 70 years with bimodal distribution. Highest mortality was seen between ages 50 to 70 years. Our study also highlighted the fact that early initiation of treatment following the onset of symptoms is essential to mitigate mortality and morbidity among the cases. Timely initiation of treatment can reduce mortality and morbidity of cases of Influenza A H1N1. Hence treatment with Oseltamivir can be initiated in symptomatic patients even before testing and availability of test results during winter and monsoon seasons to achieve a better outcome.

RECOMMENDATION

Based on the findings from our study it can be recommended that children aged less than 10 years and adults more than 50 years of age has to be more cautious during monsoon and winter season with appropriate respiratory etiquette like wearing masks and avoiding social gatherings. Symptomatic patients can be initiated with tablet Oseltamivir prior to the availability of the laboratory reports as it significantly decreases the mortality due to Influenza A H1N1 and adequate stocks to be kept available in private and public sectors. Vaccination against Influenza can be initiated before monsoon and should be advised for elderly and children less than 10 years of age which should be promoted in private and public institutions.

LIMITATIONS

This is a secondary data analysis of the laboratory confirmed cases. There was no control group available to compare the findings. Presenting signs and symptoms of the cases were not available and could not be used for the analysis. However the details that were available are consistent with the findings from other studies.

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CONFLICTS OF INTEREST: There are no conflicts of interest.

REFERENCE

1. Types of Influenza Viruses | CDC [Internet]. [cited 2024 Jan 24]. Available from: https://www.cdc.gov/flu/about/viruses/types.htm

2. Li HJ, Li L, Ren M, Dai J. Influenza A (H1N1). Radiol Infect Dis Vol 1 [Internet]. 2015 Aug 28 [cited 2024 Jan 24];1:465. Available from: /pmc/articles/PMC7122523/

3. Influenza [Internet]. [cited 2024 Jan 24]. Available from: https://www.who.int/teams/health-product-policy-and-standards/standards-and-specifications/vaccine-standardization/influenza

4. Larussa P. Pandemic novel 2009 H1N1 influenza: What have we learned? Semin Respir Crit Care Med. 2011;32(4):393–9.

5. Freitas ARR, Donalisio MR. Excess of Mortality in Adults and Elderly and Circulation of Subtypes of Influenza Virus in Southern Brazil. Front Immunol [Internet]. 2018 Jan 8 [cited 2023 Nov 6];8(JAN). Available from: https://pubmed.ncbi.nlm.nih.gov/29375560/

6. Sidhu SK, Singh K, Devi P, Kaur M, Singh N, Kaur M, et al. Clinical - epidemiological profile and diagnosis of Influenza A H1N1 cases by real time RTPCR at a tertiary care institute of India: the war is not over yet. Asian Pacific J Heal Sci [Internet]. 2016 Sep 30 [cited 2023 Nov 29];3(3):120–5. Available from: https://apjhs.com/index.php/apjhs/article/view/374

7. Indhumathi E, Krishna Makkena V, Mamidi V, Jayaprakash V, Jayakumar M. Influenza A (H1N1) Virus Infection Associated Acute Kidney Injury - A Study from a Tertiary Care Center in South India. Saudi J Kidney Dis Transpl [Internet]. 2020 Jul 1 [cited 2023 Nov 7];31(4):759–66. Available from: https://pubmed.ncbi.nlm.nih.gov/32801236/

8. Deshpande A, Klompas M, Yu PC, Imrey PB, Pallotta AM, Higgins T, et al. Influenza Testing and Treatment Among Patients Hospitalized With Community-Acquired Pneumonia. Chest [Internet]. 2022 Sep 1 [cited 2024 Jan 23];162(3):543–55. Available from: http://journal.chestnet.org/article/S0012369222002215/fulltext

9. Technical Guidelines for H1N1 :: National Centre for Disease Control (NCDC) [Internet]. [cited 2024 Jan 24]. Available from: https://www.ncdc.mohfw.gov.in/index1.php?lang=1&level=1&sublinkid=409&lid=359

10. Health & Family Welfare Department, Government of Tamil Nadu [Internet]. [cited 2024 Jan 24]. Available from: https://tnhealth.tn.gov.in/tngovin/ah1n1.php

11. Balaganesakumar SR, Murhekar M V., Swamy KK, Kumar MR, Manickam P, Pandian PRT. Risk factors associated with death among influenza A (H1N1) patients, Tamil Nadu, India, 2010. J Postgrad Med [Internet]. 2013 Jan [cited 2023 Nov 7];59(1):9–14. Available from: https://pubmed.ncbi.nlm.nih.gov/23525052/

12. Abdulkader RS, Potdar V, Mohd G, Chadwick J, Raju MK, Devika S, et al. Protocol for establishing a model for integrated influenza surveillance in Tamil Nadu, India. Front public Heal [Internet]. 2023 [cited 2023 Nov 7];11. Available from: https://pubmed.ncbi.nlm.nih.gov/37663861/

13. Singhal YK, Kothari N. A clinico-epidemiological profile of patients with influenza A H1N1 attending a tertiary care hospital in southern Rajasthan region of India. Int J Res Med Sci [Internet]. 2019 Apr 26 [cited 2024 Jan 23];7(5):1877. Available from: https://www.researchgate.net/publication/332699144_A_clinico-epidemiological_profile_of_patients_with_influenza_A_H1N1_attending_a_tertiary_care_hospital_in_southern_Rajasthan_region_of_India

14. Pandita AK, Raina D, Arora T, Ohri P. Clinico-epidemiological profile of Influenza A H1N1 cases at a tertiary care institute of Uttarakhand. J Fam Med Prim Care [Internet]. 2021 [cited 2023 Nov 6];10(3):1258. Available from: /pmc/articles/PMC8140227/

15. Kiruba R, Suresh Babu B V., Sheriff AK, Gunasekaran P, Anupama CP, Saran N, et al. Dynamics of the occurrence of influenza in relation to seasonal variation in Chennai, Tamil Nadu: A 7 -year cumulative study. Indian J Med Microbiol [Internet]. 2019 [cited 2023 Nov 7];37(3):401–5. Available from: https://pubmed.ncbi.nlm.nih.gov/32003340/

16. Gaikwad LL, Haralkar S. Clinico-epidemiological profile of Influenza A H1N1 cases admitted at a tertiary care institute of western India. Int J Med Sci Public Heal [Internet]. 2014 Jul 4 [cited 2023 Nov 28];3(10):1258–1258. Available from: https://www.ijmsph.com/?mno=162860

17. Siddharth V, Goyal V, Koushal V. Clinical-Epidemiological Profile of Influenza A H1N1 Cases at a Tertiary Care Institute of India. Indian J Community Med [Internet]. 2012 Oct [cited 2023 Nov 20];37(4):232. Available from: /pmc/articles/PMC3531016/

18. Ghosh U, Bharathy RVN, Prasad DJH, Moorthy M, Verghese VP. An Eight-Year Profile of Children with Influenza A(H1N1) in a Large Hospital in India. J Trop Pediatr [Internet]. 2021 Aug 1 [cited 2023 Nov 6];67(4). Available from: https://pubmed.ncbi.nlm.nih.gov/34580718/

19. Reyes S, Montull B, Martínez R, Córdoba J, Molina JM, Martí V, et al. Risk factors of A/H1N1 etiology in pneumonia and its impact on mortality. Respir Med [Internet]. 2011 Sep [cited 2023 Nov 6];105(9):1404–11. Available from: https://pubmed.ncbi.nlm.nih.gov/21561754/

20. Ratre YK, Vishvakarma NK, Bhaskar LVKS, Verma HK. Dynamic Propagation and Impact of Pandemic Influenza A (2009 H1N1) in Children: A Detailed Review. Curr Microbiol [Internet]. 2020 Dec 1 [cited 2023 Nov 6];77(12):3809–20. Available from: https://pubmed.ncbi.nlm.nih.gov/32959089/

21. Sujatha K, Murali V, Rao BB, Kathi A. A Clinical and Epidemiological Study of H1N1 Cases at A Tertiary Care Hospital in Hyderabad, Telangana. [cited 2023 Nov 30]; Available from: www.ijcmr.com

22. Fjelltveit EB, Cox RJ, Østensjø J, Blomberg B, Ebbesen MH, Langeland N, et al. Point-of-Care Influenza Testing Impacts Clinical Decision, Patient Flow, and Length of Stay in Hospitalized Adults. J Infect Dis [Internet]. 2022 Jul 7 [cited 2024 Jan 23];226(1):97. Available from: /pmc/articles/PMC9373161/

23. Lee BY, McGlone SM, Bailey RR, Wiringa AE, Zimmer SM, Smith KJ, et al. To Test or to Treat? An Analysis of Influenza Testing and Antiviral Treatment Strategies Using Economic Computer Modeling. PLoS One [Internet]. 2010 [cited 2024 Jan 24];5(6). Available from: /pmc/articles/PMC2890406/

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ORIGINAL ARTICLE - PUBLIC HEALTH

PLACE OF DEATH IN TAMIL NADU CIVIL REGISTRATION SYSTEM: TIME SERIES ANALYSIS 2018-2022

Abishek Stanislaus [(1)], Selvavinayagam T S [(1)], Somasundaram A [(1)], Sumathi Veerappan Rajamanikkam [(1)], Sangeetha Ramanujam [(1)]

(1) The Directorate of Public Health and Preventive Medicine, Chennai, Tamil Nadu.

Abstract

INTRODUCTION: The place of death trend is very important to the policy makers and changes in pattern is observed in developed world. There is no adequate literature analysing the trends in place of death in Tamil Nadu. Hence we will study the trends in place of death by age and gender in Tamil Nadu and its ditricts.

METHODOLOGY: The study design was a descriptive cross-sectional study from Civil Registration System (CRS) data in Tamil Nadu State for the period 1st January 2018 to 31st December 2022. We included all the deceased who were registered in CRS and was resident of Tamil Nadu for the study. We collected the data in excel and calculated proportions regarding the place of death in Tamil Nadu by state, districts, age groups and gender.

RESULTS: : Home deaths were higher in the state ranging 70 – 76%. Deaths occurring by gender at institutions in the state was higher for males (23.7% - 29.9%) from 2018 to 2022. Deaths occurring in places other than Institution and Home was in males. Institutional death was higher in age group less than 1 year (95.9% -97.7%) and least in age group 65 years and above (13.5% -18%). Among those less than 1 year in the state, the home deaths was increased in 11 districts and the percentage of home deaths among females higher in 30 districts in 2022. In the age group 65 years and above, Home deaths was observed to have increased in 16 districts in 2022 in which percentage among females was higher in all districts. The percentage of deaths occurring in places other than institution and home has increased in all age groups especially in age group 5-14 years and has increased in 26 districts in 2022.

CONCLUSION : Home deaths are higher in the state and Institutional Deaths are increasing but at a very slower pace. There was a notable difference among the district when the deaths are compared by place of death with age and gender.

KEYWORDS : Place of Death, Age, Gender, Tamil Nadu

INTRODUCTION

Globally 67 million people died around the world in 2022.[1] The place of death of an individual is very essential indicator quality of end of life care[2] as it influences immensely the type and manner of care provided to an individual during their death. The deaths occurring at home mostly doesn't involve trained healthcare professionals and technologies which can prolong life as compared to deaths happening in health institutions.[3] In the low income and middle income countries (LMIC) most of the deaths occur at home[4] while on the contrast it has been noticed that only minority of deaths occur at home in high income countries.[5-7] The home deaths occurring in LMIC has a notable variation being highest in countries in South, East and South East Asia and sub Saharan Africa.[8] In India around 28% of deaths occurred in Institution in 2020.[9] The status of Tamil Nadu is that 30 % deaths has occurred in Institution as per data available in Civil registration System in the state.[10] The place of death trend is very important as they provide insight into changing societal, family, and personal more and they help to direct health policymaking and health services planning.[11] The trend is noted to be changing patterns regarding the place and type of care during death in developed world.[12] In India the institutional deaths trend has started to decline from 34.5% to 30 % when compared from 2017 to 2020.[13,14,15,16] There is no adequate literature analysing the trends in place of death in Tamil Nadu. Hence we will study the trends in place of death in Tamil Nadu and its districts.

OBJECTIVE

- To study the overall trends in place of death in Tamil Nadu and its districts from 1st January 2018 to 31st December 2022.
- To study the trends in place of death in Tamil Nadu and its districts by age and gender from 1st January 2018 to 31st December 2022 .

METHODOLOGY

STUDY DESIGN : The study design was a descriptive cross-sectional study of the place of death in Tamil Nadu State and

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Corresponding Author: Abishek Stanislaus
e-mail : abishek299300@gmail.com

its districts for the period 1st January 2018 to 31st December 2022. The study population taken for this study is all deaths registered in Civil Registration System during the study period. We included all the deceased who were registered in CRS and was the resident of Tamil Nadu for the study.

SAMPLE SIZE : We considered all deceased registered in CRS excluding the records which were not a resident of Tamil Nadu during the study period.

DATA COLLECTION : We extracted and collected the data for each year from Civil Registration System software from State Bureau of Health intelligence in excel

DATA ANALYSIS : Data was analysed by calculating proportions regarding the place of death in Tamil Nadu and its districts, place of death for both gender.

HUMAN SUBJECT PROTECTION : The study was approved by Institutional Ethics Committee of Tamil Nadu Public Health department; privacy and confidentiality were maintained in such a way that no personal data was used or revealed during analysis or report preparation & presentation. The institution or the district name was not revealed for privacy and confidentiality purposes.

RESULTS

Overall in the state, the home deaths were higher in the state ranging 70 – 76% from 2018 to 2022 compared to deaths occurring at Institutions (21.8% - 27.4%) and other places like on transit deaths and deaths occurring in orphanages etc (2.4%- 3.5%). The deaths occurring at Institution was increased by 0.9% in 2022 compared to 2018 in the state, although there was a decline of deaths percentage in 2022 by 4.7% as compared to 2021. The institutional deaths recorded was higher in 2021(27.4%), compared to 2022(22.7%). Chennai reported highest percentage (38%) of deaths occurring at Institution in 2022 but when same district compared to 2018 there was a notable decrease of 7.4% in 2022. The institutional deaths coverage was decreased for the year 2022 in Chennai, Sivaganga, The Nilgris, Ramanathapuram, Theni, Pudukottai, Coimbatore, Kanniyakumari, Madurai, Tiruchirapalli, Cuddalore, Virudhunagar when compared to 2018.

Among 5 Years, 2018 to 2022 the percentage of home deaths was higher in 2018 (75.4%). Deaths occurring at home was highest in Ariyalur(82.4%) followed by Kallakurichi(81.8%) and Cuddalore(81.7%). A notable decrease of 9.3 % for home deaths was noted in Thiruvallur district in 2022, compared to 2018. The deaths occurring in places other than institution and home, was increasing in the state from 2.8% in 2018 to 3.5% in 2022, and it was higher in Kancheepuram(8.7%) followed by Tiruppur(6.1%) and Ranipe t(5.6%) for the year 2022 and the pattern was in increasing trend when those districts were compared to 2018 (Table 1).

Table 1: Distribution of Deaths by Place of occurrence in Tamil Nadu and its districts 2018- 2022

S. No.	District	Institutional %					Home %					Others %				
		2018	2019	2020	2021	2022	2018	2019	2020	2021	2022	2018	2019	2020	2021	2022
1	Ariyalur	13.6	14.7	14.3	17.3	15.0	84.8	83.5	84.1	81.0	82.4	1.6	1.7	1.6	1.7	2.6
2	Chennai	45.6	44.0	44.4	47.4	38.2	50.4	52.7	53.0	50.0	57.7	4.0	3.3	2.6	2.6	4.1
3	Coimbatore	29.8	29.0	27.8	34.4	28.5	67.6	68.1	69.9	63.7	69.0	2.6	2.8	2.3	1.9	2.5
4	Cuddalore	16.7	16.0	16.3	20.1	15.9	81.8	82.1	82.3	78.2	81.7	1.5	1.9	1.4	1.7	2.4
5	Dharmapuri	20.0	19.5	19.7	25.3	20.3	76.3	77.7	77.9	73.0	77.3	3.7	2.8	2.4	1.7	2.5
6	Dindigul	16.5	16.6	16.9	21.0	18.0	79.6	79.4	80.1	76.0	77.9	4.0	3.9	3.0	3.0	4.1
7	Erode	18.5	18.8	18.8	25.2	19.3	78.3	78.2	78.1	72.1	77.2	3.2	3.0	3.1	2.7	3.5
8	Kancheepuram	24.4	27.7	28.4	33.5	34.8	71.5	67.8	68.2	62.5	56.5	4.2	4.5	3.4	4.0	8.7
9	Chengalpattu					21.3					75.3					5.4
10	Kanyakumari	25.1	26.6	24.9	27.3	24.2	70.6	70.1	72.3	69.7	72.1	4.3	3.4	2.8	3.0	3.7
11	Karur	17.2	17.6	18.8	23.9	18.6	79.4	79.1	79.0	73.8	77.6	3.4	3.3	2.2	2.3	3.9
12	Krishnagiri	16.7	18.1	19.0	24.1	17.9	81.2	79.1	79.0	74.0	78.5	2.1	2.8	2.0	1.9	3.6
13	Madurai	23.5	22.9	22.7	26.4	22.7	73.0	73.9	74.5	70.8	73.4	3.5	3.2	2.8	2.8	3.9
14	Nagapattinam	24.8	21.5	20.2	24.1	27.6	73.6	76.7	78.4	74.6	70.4	1.6	1.8	1.4	1.2	2.0
15	Mayiladuthurai					18.5					79.5					2.0
16	Namakkal	15.6	16.1	17.8	23.6	18.1	81.6	80.6	79.6	73.8	78.1	2.8	3.3	2.6	2.6	3.8
17	Perambalur	17.0	17.3	15.7	22.1	17.8	79.7	79.7	81.5	74.9	78.0	3.3	3.0	2.9	3.0	4.2
18	Pudukottai	19.8	21.3	20.4	22.8	18.3	78.8	77.2	78.4	76.0	79.4	1.4	1.5	1.2	1.2	2.2
19	Ramanathapuram	22.5	21.2	20.0	21.9	20.7	75.3	77.0	78.5	76.4	77.4	2.2	1.7	1.5	1.7	1.9
20	Salem	20.1	19.2	21.1	26.9	20.8	76.8	78.1	76.7	71.4	76.8	3.0	2.7	2.2	1.7	2.5
21	Sivaganga	19.6	17.2	17.1	20.3	16.4	78.5	80.5	81.1	76.9	80.2	1.9	2.3	1.8	2.8	3.4
22	Thanjavur	22.6	22.7	22.2	27.5	23.5	75.4	75.3	76.1	70.8	74.3	2.0	2.0	1.7	1.7	2.2
23	The Nilgris	25.5	24.6	23.5	26.7	22.7	71.9	72.4	74.0	71.3	74.5	2.6	3.0	2.5	2.0	2.8
24	Theni	21.4	20.3	20.1	23.1	19.9	76.1	77.0	77.4	74.1	76.3	2.4	2.7	2.5	2.9	3.8
25	Thiruvallur	17.7	23.8	22.1	27.4	25.7	79.8	73.2	75.6	70.1	70.5	2.5	3.0	2.4	2.5	3.8
26	Thiruvarur	21.8	22.4	22.9	27.2	24.7	76.9	75.8	76.0	71.4	73.8	1.3	1.8	1.0	1.4	1.5
27	Thoothukudi	24.9	24.4	23.4	28.1	25.2	71.5	71.6	73.1	68.3	70.2	3.6	4.0	3.5	3.6	4.6
28	Tiruchirapalli	22.6	21.9	21.8	26.3	21.9	74.8	75.5	75.6	71.6	75.2	2.5	2.5	2.6	2.2	3.0
29	Tirunelveli	22.3	21.1	21.4	24.3	25.0	75.2	76.1	76.2	73.2	71.5	2.6	2.8	2.4	2.5	3.4
30	Tenkasi					18.3					78.7					2.9
31	Tiruppur	21.3	21.6	21.5	27.4	21.7	74.8	74.0	74.5	68.5	72.2	3.9	4.4	4.0	4.1	6.1
32	Tiruvannamalai	15.9	18.2	17.8	21.8	18.7	82.5	80.1	80.8	76.8	78.8	1.6	1.7	1.4	1.4	2.4
33	Vellore	24.7	25.4	23.6	27.7	29.2	71.8	70.8	73.7	69.6	65.9	3.5	3.8	2.7	2.6	4.9
34	Ranipet					19.1					75.4					5.6
35	Tirupathur					23.7					75.1					1.3
36	Villupuram	11.6	14.3	15.7	19.1	17.7	86.4	83.9	82.6	79.2	80.0	2.0	1.9	1.7	1.7	2.2
37	Kallakurichi					16.2					81.8					2.0
38	Virudhunagar	16.1	16.1	16.0	18.7	15.9	81.2	81.3	81.8	79.1	80.3	2.7	2.6	2.2	2.2	3.8
Tamil Nadu State		21.8	22.9	23.0	27.4	22.7	75.4	74.2	74.6	70.2	73.8	2.8	2.9	2.4	2.4	3.5

Overall in Tamil Nadu Deaths occurring by gender at institutions was higher for males (23.7% - 29.9%) compared to females (19.0% - 23.9%) from 2018 to 2022. Deaths occurring at institution was higher in Chennai for both gender ((male: 40.8% -50.5%), (female: 34.8 -43.3%)).

The institutional deaths coverage was decreased in males for the year 2022 in Chennai, Sivaganga, Ramanathapuram, The Nilgris, Theni, Pudukottai, Madurai, Kanniyakumari & Coimbatore when compared to 2018. The institutional deaths coverage was decreased in females for the year 2022, in Chennai, The Nilgris, Sivaganga, Dharmapuri, Tiruchirapalli, Coimbatore, Pudukottai, Theni, Kanniyakumari, Madurai, Tiruppur, Thoothukudi Ramanathapuram, Virudhunagar, Cuddalore, Dindigul, Salem and Ariyalur when compared to 2018. The deaths occurring at home was higher in Ariyalur for both gender ((male: 78.6% -83.7%), (female: 84.4 – 87.8%)). The deaths occurring at home among females was not decreased much over the five years in the study period except 2021(74.8%). The deaths occurring in places other than Institution and Home was higher in males (3.2% – 4.6%) double the time compared to females (1.3% -1.8%) in 2022. The deaths occurring in places other than Institution and Home was remarkably higher in males compared to females in Tiruppur, Karur, Chengalpattu & Kanniyakumari in 2022 (Table 2).

The number of deaths percentage was increasing when the age increases and the pattern was same for both gender

except for deaths in less than 1 year, which was higher than the deaths compared to the age group 1-14 years in the state. The institutional death was higher in age group less than 1 year (95.9% -97.7%), and least in age group 65 years and above (13.5% -18%) where the percentage of deaths are very high in the state. Overall, the institutional deaths have improved in all age groups in 2022 when compared to 2018 in the state. The institutional deaths were decreased in females, in the age group 5 – 44 years, in 2022 compared to 2018. The institutional deaths were higher in female gender when compared to male gender in age groups 5-44 years in all the five years 2018 to 2022. The least percentage of deaths happened at institution was for female gender in the age group 65 years and above in the year 2020.The percentage of deaths happening in places other than institution and home was higher in age groups 5-44 compared to all other age groups, in all the years 2018 to 2022. The percentage of deaths occurring in places other than institution and home was increased in all age groups in 2022 compared to 2018 and while comparing by gender it is much higher in age group 5-14 years in both gender and when compared between gender it was higher in male in age group 15-44 years by 8.5% and lower in male in age group less than 1 year by 0.3% (Table 3).

Table 2: Distribution of Deaths in Tamil Nadu and its districts by Place of Death and Gender 2018- 2022

S. No.	District	% Male										% Female									
		Institutional					Home					Institutional					Home				
		2018	2019	2020	2021	2022	2018	2019	2020	2021	2022	2018	2019	2020	2021	2022	2018	2019	2020	2021	2022
1	Ariyalur	14.2	16.2	16.1	19.1	16.7	83.7	81.4	81.5	78.6	78.8	2.1	2.5	2.3	2.3	3.5	12.7	12.5	11.5	14.7	12.5
2	Chennai	48.4	47.5	46.0	50.5	40.8	46.0	46.0	48.7	46.1	53.5	5.6	4.6	3.4	3.5	5.7	41.6	39.3	39.5	43.3	34.8
3	Coimbatore	32.2	31.7	30.8	37.3	31.8	64.5	64.7	66.2	60.1	66.0	3.3	3.7	3.0	2.6	3.3	26.0	25.0	23.2	30.1	23.7
4	Cuddalore	18.5	17.7	18.9	22.3	17.8	79.6	79.7	79.4	75.4	79.0	1.9	2.6	1.8	2.3	3.3	13.7	13.4	12.4	17.0	13.3
5	Dharmapuri	20.8	21.2	21.9	28.3	23.0	74.4	75.1	74.9	69.6	73.6	4.8	3.7	3.2	2.2	3.4	18.7	17.0	16.4	21.1	16.2
6	Dindigul	17.8	18.7	19.5	23.4	20.8	77.1	78.4	78.7	72.8	73.7	5.1	4.9	3.7	3.8	5.5	14.4	13.6	13.2	17.7	14.2
7	Erode	21.0	20.9	21.5	27.5	21.8	74.7	74.8	74.3	68.8	73.5	4.3	4.2	4.2	3.7	4.8	14.8	15.6	14.9	21.8	15.6
8	Kancheepuram	26.0	29.7	31.0	36.3	31.2	66.8	64.7	64.9	59.3	62.9	5.1	5.6	4.1	4.4	5.9	21.9	24.7	24.7	29.5	25.3
9	Chengalpattu				23.3	19.7					69.7					7.0					18.5
10	Kanyakumari	27.8	28.9	27.9	30.4	27.4	66.9	66.1	68.0	65.2	67.2	6.3	4.9	4.1	4.4	5.4	21.5	23.4	20.8	23.5	20.3
11	Karur	19.6	20.2	21.9	27.0	21.1	75.6	74.9	74.9	69.7	73.3	4.8	4.9	3.2	3.2	5.6	13.9	14.0	14.5	19.7	15.2
12	Krishnagiri	19.0	19.7	21.1	26.0	20.1	79.0	78.5	76.2	71.3	75.1	3.0	3.8	2.7	2.7	4.8	14.5	15.7	15.6	21.1	14.6
13	Madurai	26.3	24.9	24.8	28.4	24.8	70.1	70.9	71.7	67.9	70.0	4.6	4.2	3.5	3.7	5.2	20.9	20.0	19.6	23.6	19.8
14	Nagapattinam	26.6	23.2	22.6	26.5	30.9	71.1	74.4	75.4	71.8	66.4	2.3	2.5	2.0	1.7	2.7	21.8	18.9	16.7	20.8	22.6
15	Mayiladuthurai					26.4					76.9					16.7					16.0
16	Namakkal	17.3	18.1	21.1	26.2	20.9	79.7	77.5	75.4	70.2	73.7	3.9	4.4	3.5	3.6	5.3	13.0	13.4	13.1	20.1	14.2
17	Perambalur	18.9	19.2	17.9	24.8	19.7	78.6	76.5	78.4	71.4	74.6	4.6	4.3	3.7	3.8	5.7	14.2	14.7	12.3	18.1	15.0
18	Pudukottai	21.7	23.6	23.1	24.9	20.6	76.4	74.4	75.3	73.5	76.1	1.9	2.1	1.6	1.6	3.3	16.7	17.7	16.1	19.7	14.8
19	Ramanathapuram	25.4	23.7	22.1	23.7	22.7	72.0	74.0	75.8	73.9	74.6	2.7	2.3	2.1	2.4	2.7	18.1	17.4	16.6	19.2	17.5
20	Salem	21.6	20.7	23.4	29.6	22.9	74.5	75.6	73.8	68.3	73.7	3.9	3.7	2.9	2.2	3.4	18.0	16.9	17.7	23.1	17.8
21	Sivaganga	21.5	19.2	20.0	22.4	18.6	76.9	77.6	77.4	74.0	77.0	2.5	3.1	2.5	3.6	4.4	16.6	14.2	12.7	17.4	13.1
22	Thanjavur	24.4	24.8	24.9	30.2	26.1	72.9	72.7	72.9	67.5	70.8	2.7	2.6	2.1	2.2	3.0	19.8	19.6	18.1	23.7	20.0
23	The Nilgiris	26.1	26.0	26.0	29.8	24.2	70.5	70.1	70.8	67.6	72.2	3.4	4.0	3.2	2.7	3.5	24.5	22.5	19.9	22.6	20.5
24	Theni	24.0	22.4	23.0	25.5	22.7	72.8	73.9	73.5	70.8	72.3	3.3	3.7	3.5	3.7	4.9	17.5	17.3	15.7	19.6	15.8
25	Thiruvallur	19.4	20.1	24.9	29.8	27.7	77.2	76.0	71.8	66.8	67.1	3.4	4.0	3.3	3.4	5.2	15.2	20.4	18.0	24.1	23.0
26	Thiruvarur	24.6	24.7	26.5	30.0	26.0	73.5	73.0	72.2	68.1	69.9	1.8	2.3	1.3	1.9	2.1	17.3	19.2	17.7	23.3	19.9
27	Thoothukudi	27.9	27.7	26.6	31.6	28.9	66.9	66.8	68.6	63.6	66.1	5.2	5.5	4.8	4.9	6.0	20.8	20.1	19.2	23.4	20.3
28	Tiruchirapalli	23.8	24.0	24.3	28.7	24.3	72.7	72.6	72.2	68.4	71.7	3.4	3.4	3.5	2.9	4.0	20.9	19.1	18.2	23.1	18.6
29	Tirunelveli					28.7					68.3					5.0					20.4
30	Tenkasi	25.0	24.0	24.8	27.5	22.1	71.3	71.9	71.8	68.9	73.7	3.7	4.1	3.6	3.6	4.2	18.7	17.2	17.2	20.2	13.6
31	Tiruppur	23.1	24.4	24.4	30.0	24.3	71.7	69.9	70.3	64.8	67.6	5.2	5.8	5.3	5.3	8.1	18.3	17.3	17.0	23.5	17.7
32	Tiruvannamalai	17.6	19.9	20.3	24.3	21.3	80.2	77.7	77.7	73.9	75.6	2.2	2.3	2.0	1.8	3.1	13.3	15.6	14.1	18.4	15.1
33	Vellore					31.3					62.2					6.6					25.6
34	Ranipet	26.6	27.6	26.1	30.4	21.2	69.2	67.6	70.6	66.3	71.6	4.3	4.7	3.4	3.3	7.2	22.0	22.4	20.1	24.3	16.3
35	Tirupathur					26.7					71.5					1.8					19.7
36	Villupuram	12.3	15.7	17.9	20.8	20.1	85.1	81.7	79.8	76.9	76.8	2.6	2.6	2.3	2.3	3.1	10.6	12.1	12.2	16.6	14.3
37	Kallakurichi					17.6					79.7					2.7					13.5
38	Virudhunagar	17.9	18.0	18.4	21.2	18.1	78.4	78.5	78.6	75.8	78.6	3.7	3.5	3.0	3.0	5.1	13.4	13.4	12.4	15.2	13.0
Tamil Nadu State		23.7	25.1	25.7	29.9	25.2	72.6	71.0	71.1	66.9	70.2	3.8	3.9	3.2	3.2	4.6	19.0	19.8	19.1	23.9	19.2

Table 3: Distribution of deaths by place of death among specific age group and gender

Gender	Age group (Years)	Deaths % by age group					Institution %					Home %					Others %				
		2018	2019	2020	2021	2022	2018	2019	2020	2021	2022	2018	2019	2020	2021	2022	2018	2019	2020	2021	2022
Overall deaths %	less than 1	1.6	1.7	1.4	1.1	1.5	95.9	96.9	97.7	97.3	96.6	3.6	2.8	2.1	2.2	2.4	0.4	0.3	0.2	0.6	1.0
	1 to 4	0.3	0.3	0.2	0.2	0.2	64.7	69.8	66.8	72.8	66.9	28.4	24.9	28.6	21.5	24.9	6.8	5.3	4.6	5.8	8.2
	5 to 14	0.6	0.6	0.5	0.4	0.5	42.2	48.1	45.4	44.4	44.7	46.4	40.5	42.5	43.2	40.2	11.4	11.4	12.1	12.4	15.1
	15 to 44	12.6	12.5	11.1	10.6	11.4	35.8	37.4	37.7	42.4	36.4	53.7	52.1	53.1	48.6	50.9	10.5	10.4	9.2	9.0	12.7
	45 to 64	31.2	31.0	31.2	31.6	30.5	25.9	27.2	28.9	36.0	28.6	71.2	69.7	68.5	61.4	67.5	2.9	3.0	2.6	2.6	3.9
	65 & above	53.8	54.1	55.7	56.0	55.9	13.5	14.3	14.6	18.0	14.3	85.6	84.6	84.6	81.0	84.4	0.9	1.1	0.9	1.0	1.3
Male %	less than 1	1.4	1.6	1.3	1.3	1.5	96.6	97.2	98.0	97.5	97.3	3.1	2.5	1.8	1.9	1.8	0.3	0.3	0.2	0.5	0.9
	1 to 4	0.2	0.2	0.2	0.2	0.2	64.6	69.7	67.9	71.8	67.4	28.1	25.0	27.7	21.8	23.4	7.3	5.3	4.4	6.4	9.2
	5 to 14	0.5	0.5	0.4	0.5	0.5	39.6	45.6	42.3	41.7	44.2	46.3	40.5	43.3	43.6	38.4	14.1	13.9	14.4	14.7	17.4
	15 to 44	13.3	13.9	11.5	14.2	14.0	34.3	36.4	36.5	41.5	35.6	52.8	50.9	52.2	47.5	49.2	12.9	12.8	11.3	11.0	15.2
	45 to 64	31.0	31.8	30.1	37.9	33.5	27.3	28.8	30.7	37.1	30.0	69.1	67.4	66.0	59.6	65.1	3.6	3.8	3.3	3.3	4.9
	65 & above	44.7	46.3	45.6	58.5	50.3	15.3	16.3	17.3	20.7	16.5	83.6	82.4	81.6	78.1	81.9	1.1	1.3	1.0	1.1	1.5
Female %	less than 1	1.7	1.7	1.5	1.1	1.5	95.1	96.4	97.2	96.9	95.6	4.4	3.2	2.6	2.5	3.3	0.5	0.4	0.2	0.6	1.1
	1 to 4	0.3	0.3	0.2	0.2	0.3	64.8	69.9	65.6	73.9	66.5	28.8	24.9	29.7	21.1	26.4	6.3	5.2	4.8	5.1	7.1
	5 to 14	0.6	0.6	0.5	0.4	0.5	45.8	51.3	49.1	47.8	45.3	46.6	40.6	41.6	42.7	42.6	7.6	8.1	9.3	9.5	12.2
	15 to 44	9.5	9.2	8.3	7.8	7.9	39.2	39.9	40.2	44.5	38.2	55.8	55.0	55.3	51.0	55.1	5.0	5.0	4.5	4.5	6.7
	45 to 64	27.0	26.8	27.3	28.7	26.2	23.3	24.4	25.6	34.2	26.1	75.1	74.0	73.0	64.4	71.8	1.6	1.6	1.4	1.4	2.1
	65 & above	60.9	61.3	62.1	61.7	63.7	11.3	12.0	11.2	14.8	11.9	87.9	87.2	88.1	84.4	87.1	0.7	0.8	0.7	0.8	1.0

HOME DEATHS IN AGE GROUP LESS THAN 1 YEAR : Overall in the state, the deaths was highest in Namakkal (15.3%) followed by Kanyakumari (12.5%) in 2022. The percentage of home deaths have increased in 11 districts and found highest in Mayiladuthurai followed by Namakkal and Karur in 2022 compared to 2018. The percentage of deaths among male was highest in Namakkal(16.1%) followed by Kanyakumari(12.3%) in 2022. The percentage of deaths among males was increased in 9 districts and found highest in Namakkal followed by Mayiladuthurai and Perambalur in 2022 compared to 2018. The percentage of deaths among among female was highest in Namakkal (14.8%), followed by Kanyakumari(12.8%) in 2022. The percentage of deaths was increased in 14 districts and found highest in Tenkasi, followed by Thiruvarur and Erode in 2022 compared to 2018. The percentage of deaths of females was higher in 30 districts when compared to males in 2022(Table 4).

HOME DEATHS IN AGE GROUP 65 YEARS AND ABOVE: Overall in the age group, the deaths were highest in Ariyalur (92.9%) followed by Kakkalurichi (91.8%) in 2022. The percentage of deaths was increased in 16 districts and found highest in Chennai followed by Mayiladuthurai and Tirupathur in 2022 compared to 2018. The percentage of deaths among male was highest in Ariyalur (91.3%) followed by Kallakurichi (91.1%) in 2022. The percentage of deaths among males was high in 15 districts and highest among them was Chennai followed by Mayiladuthurai and Ramanathapuram in 2022 compared to 2018. The percentage of deaths among female was highest in Ariyalur (94.8%) followed by Krishnagiri(92.9%) in 2022. The percentage of deaths among females was high in 17 districts and highest among them was Tirupathur followed by Mayiladuthurai and Chennai in 2022 compared to 2018. The percentage of deaths of females was higher in all districts when compared to the opposite gender in 2022 (Table 4).

DEATHS IN PLACES OTHER THAN INSTITUTION AND HOME IN AGE GROUP 5-14 YEARS : The deaths were higher in Tiruppur (28.9%) followed by Dindigul(26.2%) and Chengalpattu (26.0%) in 2022 in the state. The percentage of deaths was increased in 26 districts and found highest in Chengalpattu followed by Thiruvallur and Cuddalore in 2022 compared to 2018. The percentage of deaths among male was highest in Thiruvallur (35.1%) followed by Dindigul (32.1%) in 2022. The percentage of deaths among males was high in 24 districts and highest among them is Thiruvallur followed by Cuddalore and Chengalpattu in 2022 compared to 2018. The percentage of deaths among female was highest in Chengalpattu (25%) and Tiruppur (25%) in 2022.

The percentage of deaths among females was high in 26 districts and highest among them was Tiruchirapalli followed by Chengalpattu and Namakkal in 2022 compared to 2018. The percentage of deaths of females was higher in 12 districts when compared to the opposite gender in 2022(Table 4).

Table 4: Distribution of deaths by place of death among specific places in specific age groups.

S. No.	Districts	Home Deaths												Deaths in other places					
		Less than 1 year						65 years and above						5-14 years					
		Total		Male		Female		Total		Male		Female		Total		Male		Female	
		2018	2022	2018	2022	2018	2022	2018	2022	2018	2022	2018	2022	2018	2022	2018	2022	2018	2022
1	Ariyalur	7.7	1.4	8.7	1.2	9.7	1.8	94.4	92.9	95.3	91.3	96.1	94.8	9.3	9.3	16.0	11.5	0.0	7.1
2	Chennai	5.4	2.5	3.6	2.6	8.2	2.4	63.5	68.2	58.7	63.8	68.6	72.5	5.8	17.2	9.8	18.9	3.8	15.2
3	Coimbatore	2.7	0.6	1.9	0.4	3.8	0.8	78.4	79.3	75.6	76.5	81.8	82.4	10.9	10.3	12.6	13.4	8.7	6.3
4	Cuddalore	4.3	3.6	3.5	2.2	5.6	5.6	89.7	90.1	88.3	88.6	91.6	92.0	4.2	16.2	3.3	18.5	5.7	11.8
5	Dharmapuri	1.9	0.6	2.1	0.0	1.6	1.5	88.5	90.2	87.6	88.0	89.6	92.8	6.5	5.2	4.9	7.7	9.5	3.8
6	Dindigul	3.1	3.6	1.5	2.8	5.6	4.5	89.5	89.0	88.3	86.3	90.9	92.0	18.8	26.2	20.0	32.1	16.7	19.6
7	Erode	6.3	3.4	8.9	2.0	1.6	5.1	87.6	86.4	88.3	83.6	90.3	89.5	13.2	19.4	11.1	23.6	16.1	13.2
8	Kancheepuram	4.0	0.0	3.8	0.0	4.4	0.0	80.8	67.2	78.5	63.4	83.4	71.3	10.7	20.5	11.8	26.3	9.3	14.3
9	Chengalpattu		1.4		0.0		3.3		81.6		78.8		84.7		26.0		26.5		25.0
10	Kanyakumari	15.3	12.5	18.2	12.3	11.5	12.8	79.6	81.2	76.5	77.8	83.1	84.6	26.1	9.8	34.6	14.8	15.0	4.2
11	Karur	3.3	5.2	2.8	6.5	4.2	2.9	89.3	88.8	87.2	86.5	91.6	91.3	17.9	20.8	17.6	20.8	18.2	20.8
12	Krishnagiri	0.4	0.6	0.0	0.5	1.0	0.8	91.6	90.8	90.7	89.0	93.0	92.9	8.2	9.2	10.2	11.3	5.6	6.7
13	Madurai	0.6	1.8	0.7	1.5	0.5	2.3	84.8	84.9	83.1	82.7	86.9	87.3	13.8	20.2	20.0	22.6	5.8	17.3
14	Nagapattinam	1.5	0.0	0.0	0.0	3.5	0.0	84.5	84.0	82.7	81.9	86.8	86.3	4.8	5.0	0.0	4.2	10.0	6.3
15	Mayiladuthurai		5.4		5.7		5.1		88.8		86.9		91.0		7.9		5.3		10.5
16	Namakkal	12.1	15.3	9.5	16.1	15.4	14.8	90.0	87.9	88.0	85.3	92.4	90.7	9.9	16.4	15.4	15.6	3.1	17.9
17	Perambalur	5.9	4.4	0.0	5.5	10.8	2.8	90.8	90.0	88.7	87.7	93.3	92.6	22.7	16.1	25.8	11.8	15.4	21.4
18	Pudukottai	1.6	0.8	2.5	0.0	0.0	2.0	89.1	89.7	87.5	88.0	91.2	91.9	4.2	9.2	2.6	13.9	6.1	3.4
19	Ramanathapuram	4.1	2.7	1.9	1.0	6.6	4.7	87.4	89.5	85.2	88.2	90.1	91.1	13.3	6.1	19.4	6.9	6.9	5.4
20	Salem	1.9	1.6	1.8	0.9	2.0	2.5	87.8	87.5	86.7	85.7	89.3	89.5	17.2	13.5	18.6	15.5	14.6	10.9
21	Sivaganga	3.2	2.4	2.0	0.0	4.7	4.8	89.9	90.0	88.3	88.6	91.8	91.6	3.6	12.9	3.1	12.5	4.3	13.3
22	Thanjavur	4.1	0.6	2.5	0.4	6.1	0.9	85.8	85.9	84.0	84.1	88.1	88.1	10.0	12.5	17.9	16.4	0.0	5.7
23	The Nilgris	2.0	2.0	0.0	0.0	5.9	5.0	81.2	83.4	80.8	82.1	81.7	84.6	13.0	10.5	20.0	16.7	0.0	0.0
24	Theni	1.9	2.6	1.2	1.0	2.9	4.7	88.8	88.0	86.2	85.2	91.9	91.0	9.1	12.5	13.9	13.8	3.3	11.4
25	Thiruvallur	7.9	1.6	7.4	1.2	8.5	2.0	88.3	81.1	86.4	77.9	90.3	84.5	9.2	23.4	14.9	35.1	2.5	7.4
26	Thiruvarur	0.5	2.3	0.9	1.2	0.0	4.0	87.2	86.0	84.3	83.5	91.2	89.2	3.7	10.4	2.6	6.1	6.3	20.0
27	Thoothukudi	1.2	1.7	2.0	1.3	0.0	2.3	83.2	82.9	80.0	79.8	86.7	86.1	17.0	15.2	22.9	11.1	10.0	20.6
28	Tiruchirapalli	2.2	2.5	2.4	0.4	1.9	5.2	84.7	84.3	83.3	81.3	86.2	87.4	7.9	17.1	13.0	16.9	0.0	17.3
29	Tirunelveli	3.9	3.8	4.1	5.1	3.6	1.3	85.8	82.6	82.8	79.0	89.2	86.2	15.9	12.0	24.7	17.0	6.9	5.6
30	Tenkasi		4.4		2.2		8.0		89.0		85.6		92.5		12.8		16.1		6.7
31	Tiruppur	6.9	3.4	5.5	2.4	8.7	5.1	86.5	85.2	84.5	82.3	89.0	88.5	22.9	28.9	25.8	31.8	18.6	25.0
32	Tiruvannamalai	5.4	2.7	4.2	2.0	7.0	3.9	90.2	88.6	88.3	86.5	92.4	91.1	6.4	9.6	6.7	8.6	5.8	10.9
33	Vellore	2.6	1.7	2.8	0.0	2.2	4.2	82.9	77.6	80.8	74.2	85.5	81.1	7.6	11.0	7.7	16.3	7.4	5.1
34	Ranipet		1.4		1.5		1.2		86.0		83.1		89.1		13.6		12.9		14.3
35	Tirupathur		1.4		1.7		1.0		86.5		83.5		90.0		6.1		9.4		2.9
36	Villupuram	5.9	1.5	4.6	0.9	7.5	2.3	93.6	89.6	92.6	87.5	95.0	92.0	10.9	11.4	12.4	11.3	7.8	11.4
37	Kallakurichi		0.8		0.0		2.3		91.8		91.1		92.7		11.6		11.4		12.0
38	Virudhunagar	3.1	2.1	3.6	0.6	2.5	4.0	90.8	90.6	88.8	88.7	93.2	92.6	15.1	18.6	22.9	21.7	6.7	14.3

DISCUSSION

Learning the fraction of deaths occurring at home varies across countries and within the country which can significantly support in tracking the implementation of health system.[8] It was noted in a comparative study by Joanna B Broad it was noted 54 % or more of all deaths occurred in hospitals, ranging from Japan (78 %) to China (20 %)[17] In our study, overall the home deaths are higher in the state ranging 70 – 76% from 2018 to 2022 compared to deaths occurring at Institutions (21.8% - 27.4%) and other places (2.4%- 3.5%). The deaths occurring at Institution has increased by 0.9% in 2022 compared to 2018, although there was a decline of deaths percentage in 2022 by 4.7% when compared to 2021. The deaths occurring at home was highest in Ariyalur(82.4%) followed by Kallakurichi(81.8%) and Cuddalore(81.7%). A notable decrease of 9.3 % was noted for home deaths in Thiruvallur district in 2022 compared to 2018. In a study done with data on deaths from British Columbia it was noted that institutional deaths were higher for male gender compared to female gender.[18] In our study, Overall, in Tamil Nadu the Deaths occurring by gender at institutions was higher for males (23.7% - 29.9%) compared to females (19.0% - 23.9%) from 2018 to 2022. The deaths occurring at home among females has not decreased much over the five years in the study period except 2021(74.8%). In a study from Andalusia, the percentage of deaths at home were increasing as age increases.[19] In our study, the number of deaths percentage is increasing when the age increases and the pattern was same for both gender except for deaths happening less than 1 year which was higher than the deaths compared to the age group 1-14 years. In a retrospective study done using the Mongolian National Death Registry, the proportion of out of hospital deaths was increasing as the age increases and on comparison by gender it was noted that the out of hospital deaths for age group less than 5 years is higher in female compared to opposite gender and vice versa for other age groups.[20] The institutional death was higher in age group less than 1 year (95.9% -97.7%) and least in age group 65 years and above (13.5% -18%). Overall in the age group less than 1 year, the home deaths are highest in Namakkal (15.3%) followed by Kanyakumari (12.5%) in 2022. The percentage of home deaths less than 1 year was increased in 11 districts and found highest in Mayiladuthurai followed by Namakkal and Karur in 2022 compared to 2018. The percentage of home deaths of females less than 1 year was higher in 30 districts when compared to the opposite gender in 2022. The institutional deaths have decreased among female gender in the age group 5 – 44 years in 2022 compared to 2018 although the deaths are higher in female gender when compared to male gender in all the five years 2018 to 2022. Overall in the age group 65 years and above, the home deaths are highest in Ariyalur (92.9%) followed by Kakkalurichi (91.8%) in 2022. In a study by Joanna B Broad it was noted that a higher percentage of deaths was among women when compared with men in residential aged care.[17] The percentage of home deaths for the age group 65 years and above was increased in 16 districts and found highest in Chennai followed by Mayiladuthurai and Tirupathur in 2022 compared to 2018. The percentage of home deaths of females for the age group 65 years and above was higher in all districts when compared to the opposite gender in 2022. The place of death demarcated as others in a study by Joanna B Broad, it was noted nearly 80% deaths occurred there but it also included private clinics along with places like public places.[17] In our study the deaths occurring in places other than institution and home was increasing in the state from 2.8% in 2018 to 3.5% in 2022 and it is higher in Kancheepuram(8.7%) followed by Tiruppur(6.1%) and Ranipet(5.6%) for the year 2022 and the pattern is in increasing trend when those districts were compared to 2018. The deaths occurring in places other than Institution and Home was higher in males (3.2% – 4.6%) double the time compared to females (1.3% -1.8%). The deaths occurring

in places other than Institution and Home is remarkably higher in males compared to females in Tiruppur, Karur, Chengalpattu & Kanniyakumari. The percentage of deaths occurring in places other than institution and home has increased in all age groups in 2022 compared to 2018 and while comparing by gender it was much higher in age group 5-14 years in both gender. The deaths occurring in places other than institution and home in age group 5-14 years are higher in Tiruppur (28.9%) followed by Dindigul(26.2%) and Chengalpattu(26.0%) in 2022. The percentage of deaths has increased in 26 districts and found highest in Chengalpattu followed by Thiruvallur and Cuddalore in 2022 compared to 2018.

CONCLUSIONS

Overall, the home deaths are higher in the state from 2018 to 2022 and there is slight increase of in institutional deaths in 2022 compared to 2018 which is on a good note. The number of deaths percentage was increasing when the age increases except for deaths happening less than 1 year which was higher than the deaths compared to the age group 1-14 years. Overall in the age group less than 1 year, the home deaths has increased in 11 districts in 2022 compared to 2018. The percentage of home deaths of females less than 1 year is higher in 30 districts when compared to the opposite gender in 2022. The percentage of home deaths for the age group 65 years and above has increased in 16 districts in 2022 compared to 2018. The percentage of home deaths of females for the age group 65 years and above was higher in all districts when compared to the opposite gender in 2022. The deaths occurring in places other than institution and home has increased, when compared by age group it was higher in age group 5-14 years in which it has increased in 26 districts in 2022 compared to 2018.

RECOMMENDATIONS

The home deaths with higher percentage in districts must be addressed. The home deaths among less than 1 year age group have to be addressed in 11 districts where it was in increasing trend and especially among females. The other vulnerable age group is above 65 years where the home deaths are in increasing trend in 16 districts especially among females as the deaths among female are higher in all districts when compared to male in 2022. The deaths occurring in places other than institution and home among the age group 5- 14 years must be studied to reduce the deaths happening in other places.

CONFLICT OF INTEREST: Nil

REFERENCE

1. "How Many People Die and How Many Are Born Each Year?" Our World in Data. "How Many People Die and How Many Are Born Each Year?" Accessed December 8, 2023. https://ourworldindata.org/births-and-deaths.

2. Houttekier et al.: Study of recent and future trends in place of death in Belgium using death certificate data: a shift from hospitals to care homes. BMC Public Health 2011 11:228.

3. Wilson, D. (1997). A report of an investigation of end-of-life patient care practices in health care facilities, and the influences for those practices. Journal of Palliative Care, 13(3), 34–40.

4. Gomes M, Begum R, Sati P, et al. Nationwide mortality studies to quantify causes of death: relevant lessons from India's million death study. Health Aff 2017;36:1887–95

5. Broad JB, Gott M, Kim H, et al. Where do people die? An international comparison of the percentage of deaths occurring in hospital and residential aged care settings in 45 populations, using published and available statistics. Int J Public Health 2013;58:257–67

6. Cohen J, Bilsen J, Miccinesi G, et al. Using death certificate data to study place of death in 9 European countries: opportunities and weaknesses. BMC Public Health 2007;7:283

7. Cohen J, Pivodic L, Miccinesi G, et al. International study of the place of death of people with cancer: a population-level comparison of 14 countries across 4 continents using death certificate data. Br J Cancer 2015;113:1397–404

8. Adair T. Who dies where? Estimating the percentage of deaths that occur at home. BMJ Global Health 2021; 6:e006766. doi:10.1136/ bmjgh-2021-006766

9. "India - Annual Report on MCCD-2020." Accessed December 8, 2023. https://censusindia.gov.in/nada/index.php/catalog/42681.

10. CRS data 2022 from SBHI Section, O/o DPH&PM, Tamil Nadu, India

11. Wilson DM, Truman CD, Thomas R, Fainsinger R,

Kovacs-Burns K, Froggatt K, Justice C. The rapidly changing location of death in Canada, 1994-2004. Soc Sci Med. 2009 May;68(10):1752-8. doi: 10.1016/j.socscimed.2009.03.006. Epub 2009 Apr 1. PMID: 19342137.

12. Murray, S. A., & Kok, J. Y. (2008). Internationally, it is time to bridge the gap between primary and secondary healthcare services for the dying. Annals of the Academy of Medicine, 37(2), 176–184.

13. "India - Annual Report on CRS-2017." Accessed December 8, 2023. https://crsorgi.gov.in/web/uploads/download/CRS_report_2017_20192020.pdf

14. "India - Annual Report on CRS-2018." Accessed December 8, 2023. https://crsorgi.gov.in/web/uploads/download/crs2018_20072020_approved.pdf

15. "India - Annual Report on CRS-2019." Accessed December 8, 2023. https://crsorgi.gov.in/web/uploads/download/CRS%202019%20report.pdf

16. "India - Annual Report on CRS-2020." Accessed December 8, 2023. https://crsorgi.gov.in/web/uploads/download/CRS_report_2020.pdf

17. Broad JB, Gott M, Kim H, Boyd M, Chen H, Connolly MJ. Where do people die? An international comparison of the percentage of deaths occurring in hospital and residential aged care settings in 45 populations, using published and available statistics. Int J Public Health. 2013 Apr;58(2):257-67. doi: 10.1007/s00038-012-0394-5. Epub 2012 Aug 15. Erratum in: Int J Public Health. Int J Public Health. 2013 Apr;58(2):327. PMID: 22892713.

18. Jayaraman J, Joseph K. Determinants of place of death: a population-based retrospective cohort study. BMC Palliat Care. 2013 May 1;12:19. doi: 10.1186/1472-684X-12-19. PMID: 23634892; PMCID: PMC3645954.

19. Ruiz-Ramos M, Javier García-León F, Méndez-Martínez C. El lugar de la muerte en Andalucía: influencia de la edad, sexo y causa de defunción [Place of death in Andalusia: influence of age, gender and cause of death]. Rev Clin Esp. 2011 Mar;211(3):127-32. Spanish. doi: 10.1016/j.rce.2010.10.006. PMID: 21392741.

20. Sainbayar A, Gombojav D, Lundeg G, Byambaa B, Meier J, Dünser MW, Mendsaikhan N. Out-of-hospital deaths in Mongolia: a nationwide cohort study on the proportion, causes, and potential impact of emergency and critical care services. Lancet Reg Health West Pac. 2023 Aug 7;39:100867. doi: 10.1016/j.lanwpc.2023.100867. PMID: 37927992; PMCID: PMC10625029.

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ORIGINAL ARTICLE - PUBLIC HEALTH

8KM HEALTH WALK PROGRAM IN THE DISTRICTS OF TAMIL NADU: AN OVERVIEW OF THE WALKERS NCD

Pravin T [(1)], Prathapkumar P [(1)], Krishnaraj K [(1)] , Selvavinayagam T S [(1)]

(1) The Directorate of Public Health and Preventive Medicine, Chennai, Tamil Nadu.

Abstract

ABSTRACT: The Government of Tamil Nadu is proactively addressing the rise of Non-Communicable Diseases (NCDs) by introducing measures such as establishing "health walk pathways" across the state. Physical activity is recognized as a significant risk factor for NCDs, and the World Health Organization recommends individuals aged 18 years and above engage in 150 to 300 minutes of moderate-intensity physical activity per week. This secondary data analysis aims to profile the NCD status of participants in health walks. Among the 19,910 individuals screened for Hypertension and Diabetes, 66% were found to be normal, while 26% were known to have either Hypertension or Diabetes. Moreover, 8% of participants were newly diagnosed with either Hypertension, Diabetes, or both. These findings underscore the importance of proactive measures in NCD prevention and highlight the potential role of novel community-based initiatives that help in modifying the risk factors of non communicable diseases

KEYWORDS : Non-communicable diseases, health walk, risk factor modification

INTRODUCTION

The Government of Tamil Nadu is taking proactive measures to combat the growing instances of Non-Communicable Diseases (NCDs). As part of this initiative, the state has introduced a home-based drug delivery component called the 'Makkalai Thedi Maruthuvam' scheme. This program is designed to enhance the detection, treatment, and follow-up of NCDs to achieve better compliance and control rates across the whole state.

Physical inactivity constitutes a pivotal risk factor for non-communicable diseases and ranks fourth among the leading contributors to premature mortality worldwide. The World Health Organization (WHO) recommends that individuals aged 18 years and above engage in a minimum of 150-300 minutes of moderate-intensity aerobic physical activity, such as brisk walking, or 75-150 minutes of vigorous-intensity aerobic physical activity, such as running, every week, as a means of promoting healthy living. Physical activity contributes to a 27% reduction in complications associated with hypertension and diabetes and a 30% reduction in complications associated with heart disease. Regular physical activity, such as brisk walking, confer benefits such as the maintenance of optimal body weight, the management of chronic diseases, such as hypertension and diabetes, and the attenuation of mental stress.[1]

Considering the above facts, the Department of Health and Family Welfare, Government of Tamil Nadu has made an announcement in the Assembly 2023-24, to bring in the habit of regular walking named “Health Walking (Nadappom Nalam Peruvom)” focussing on motivation and encouragement of the public to have a physically active lifestyle to avoid and manage chronic non-communicable diseases. The initiative was launched in a bid to promote a healthy lifestyle among people, and thus named 'Nadappom Nalam Peruvom (Health Walk)'.

The Department of Public Health and Preventive Medicine, in collaboration with local bodies and municipal administration, has identified one walkway in each of the 38 revenue districts. The identified walkway should be an 8 km stretch walkway, either circular or linear, with the same start and end points. This walkway should already be established and in use by the general public and should have all necessary amenities such as resting areas, green shades, directional signs, milestone markings, drinking water and toilet facilities. Additionally, there will be various IEC boards to raise awareness about the importance of health walks and non-communicable diseases. The guidelines and checklist for the selection of the health walk area and the conduct of the health walk program are framed and communicated for uniform implementation across the State. The Government has sanctioned Rs.57 lakhs as per the proposal submitted by the Tamil Nadu Health Systems Reform Program (TNHSRP) for establishing and maintenance of the health walk pathway. The program was launched on November 4, 2023, in all districts. According

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Corresponding Author: Pravin T
e-mail : docpravins@gmail.com

to the program guidelines, all Deputy Directors of Health Services are required to conduct a Health Walk campaign and medical camp on the first Sunday of every month. The report on these activities should be maintained in registers in the prescribed format and monitored by the state. This study aims to analyse the health walkers' profile and their status of non-communicable diseases based on State data collected in the last three months since the program's launch.

METHODOLOGY

STUDY DESIGN : Secondary data analysis of the State Data on Health Walk Program

STUDY DESIGN : December 2023 to March 2024

STUDY AREA : All Districts of Tamil Nadu

STUDY PARTICIPANTS : Health walkers who used the 8 km Health walk pathway on the 1st Sunday of every month.

STATISTICAL ANALYSIS : Microsoft Excel

FINDINGS

The secondary data analysis of the four months (Dec 23 to Mar 24) State report shows an average of 6000 participants per month in the '8 km Health Walk Program'. Out of the total walkers, 19910 who reported voluntarily to the medical camp organized on the 1st Sunday were screened for Hypertension and Diabetes of which 13063 (66%) are found to be normal and 5289 (26%) are known to have Hypertension and/or Diabetes. Among the screened, 1558 (8%) are newly diagnosed to have either Hypertension, Diabetes or both Hypertension and Diabetes. The findings are shown in table 1 and figure 1.

Table 1: Walkers Health Profile in 8km Health Walk Program

Month	No. of Participants in Health Walk on 1st Sunday	No. Screened for HT and DM	No. Normal out of Screened	Newly Diagnosed among Screened	Known among the Screened
Dec-23	6522	5221	3476	478	1267
Jan-24	6648	5578	3723	348	1507
Feb-24	6296	5187	3215	459	1513
Mar-24	4844	3924	2649	273	1002
Total	**24310**	**19910**	**13063**	**1558**	**5289**

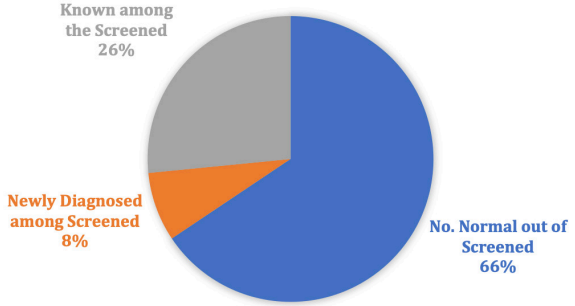

Figure 1 : Walkers Health Profile in 8km Health Walk Programme

DISCUSSION

This analysis shows the Walkers NCD profile under the 8 km health walk program launched by the Health and Family Welfare Department, Government of Tamil Nadu through the Department of Public Health and Preventive Medicine in coordination with the local bodies and municipal administration.

According to the secondary data analysis, 66% of the walkers were found to be normal after being screened for hypertension and diabetes. Another 26% of them were already known to have either hypertension, diabetes, or both. The remaining 8% were newly diagnosed with hypertension, diabetes or both and were put on treatment.

It is worth noting that the majority of the walkers consisted of normal people, which could be attributed to the general public's awareness of health walks and non-communicable diseases (NCDs). Although these program reports are from the early months, the trend is quite promising.

The NCD screening details of the walkers on 1st Sunday of every month are recorded in the prescribed format issued by the State NCD section of the Directorate of Public Health and Preventive Medicine.

CONCLUSION

The 8km health walk program is a recently launched initiative that encourages people to walk for better health. After just four months, a secondary data analysis was conducted to study the NCD (non-communicable diseases) health profile of the walkers. However, to fully understand the impact of the program and how walkers perceive it, further research is necessary. This additional research can play a vital role in informing policymakers, healthcare professionals, and other stakeholders involved in designing and implementing health programs. Moreover, the study's results can also contribute to developing evidence-based health interventions that promote healthy lifestyles and prevent NCDs.

REFERENCE

1. WHO guidelines on physical activity and sedentary behaviour: at a glance 2020

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ORIGINAL ARTICLE - PUBLIC HEALTH

MORTALITY TRENDS OF GENDER AND AGE SPECIFIC GROUPS IN DISTRICTS OF TAMIL NADU 2018-2022

Abishek Stanislaus [(1)], Selvavinayagam T S [(1)], Somasundaram A [(1)]
Sumathi Veerappan Rajamanikkam [(1)]

(1) Directorate of Public Health & Preventive Medicine

Abstract

INTRODUCTION : Mortality statistics provide valuable insights for assessing community health status. The mortality of Tamil Nadu was studied and it was noted that there is higher mortality in males compared to female and mortality is higher in 60 + age group for the year 2019- 2022. (3) This study is done to describe the mortality trends noted by districts, age and gender in Tamil Nadu from 2018-2022.

OBJECTIVES : The objective is to analyse whether there is any difference by describing the mortality trends among different age groups, genders in the districts of Tamil Nadu by age groups and gender for the years 2018-2022

METHODOLOGY : The study design was a cross sectional retrospective study of the mortality in Tamil Nadu State for the period 1st January 2018 -31st December 2022. The study population taken for this study is all registered deaths in Civil Registration System (CRS) of Tamil Nadu. We included all deaths reported in Civil Registration System during the 2018-2022.

RESULTS : Overall there was an increase in male mortality of Vellore district in 2022 while comparing to other districts with 2021. In less than 1 years age group crude mortality rate is still in increasing trend except 8 districts in 2022. In the age group 1 to 4 years the overall mortality rate is decreasing only in 4 districts while increasing in other districts. Female mortality is high in 12 districts in the age 1 to 4 years group while compared to male mortality in 2022. It was noted that from age group 15 years and above the male mortality is higher compared to female in all districts. There is higher mortality in the age group 55 years and above and the mortality difference between both genders has reduced in 2022 since 2018.

CONCLUSION : The mortality rates have started to decrease in all the districts of Tamil Nadu in 2022 except Vellore. Male mortality is higher in age group 15 years and above in all districts. Female mortality is high in 12 districts in age group 1 to 4 years. There is diversity in mortality within districts when compared with age and gender.

KEYWORDS : Tamil Nadu, Mortality, Age group, Gender

INTRODUCTION

Mortality statistics provide valuable insights for assessing community health status. It helps to understand the health status of the population and its differentials among the different population sub groups.[1] Mortality statistics is used to formulate health plans and policies. The data of mortality for different age groups and gender is an important cornerstone for public policy action. [2] The mortality data is taken from Civil Registration System (CRS). The CRS in India began in the middle of 19th century which enables the continuous and permanent recording of births and deaths under a statutory regime. The registration of birth and death was unified and made compulsory in 1969 through an act known as Registration of Birth and Death Act.[3] In Tamil Nadu the CRS is digitized since 2018. The data is collected in manual forms and then digitized in an online portal by the birth and death registrars. The mortality data from CRS is compiled in the state through State Bureau of Health Intelligence (SBHI) section under Directorate of Public Health and Preventive Medicine. The mortality data of Tamil Nadu from CRS was studied and it was noted that there is higher mortality in males compared to female and mortality is higher in 60 + age group for the year 2019- 2022.[4] The mortality data is to be compared geographically by districts to learn whether there is difference in mortality by age group and gender to identify issues and create geographic specific health plans. The study is done to describe the mortality trends noted by districts, age and gender in Tamil Nadu from 2018-2022. Analysing the mortality trends by age groups, gender and district may give valuable insights for public health interventions. This approach may help to decide the requirement of services at the right place and for the right group of population.

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Corresponding Author: Abishek Stanislaus
e-mail : abishek299300@gmail.com

OBJECTIVES

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METHODOLOGY

The study design was a cross sectional retrospective study of the mortality in Tamil Nadu State for the period 1st January 2018 - 31st December 2022. The study population taken for this study is all registered deaths in Civil Registration System (CRS) of Tamil Nadu. We included all deaths reported in Civil Registration System during the years 2018-2022.

Operational Definitions :

We defined gender specific crude mortality rate as deaths during data period (2018-2022) due to all causes of the particular gender divided by enumerated population of the same gender multiplied by 1000 (5)

We defined age group specific crude mortality rate as deaths during data period (2018-2022) due to all causes of the particular age group by total enumerated population of the same age multiplied by 1000 (5)

SAMPLE SIZE :

We considered all deaths from the year 2018 to 2022 reported in CRS software and were taken for the study.

INCLUSION CRITERIA :

The deaths which had their residence as Tamil Nadu State were taken for the study.

EXCLUSION CRITERIA :

The deaths which were not a resident of Tamil Nadu and not properly mapped to any of the districts of Tamil Nadu were not taken for the study.

DATA COLLECTION PROCEDURE :

We collected the mortality data for the deaths registered in the year 2018 to 2022 by place of residence from CRS software from State Bureau of Health intelligence & population data maintained at statistical division of Public Health Department as enumerated from Census 2011. The enumerated population for age and gender was calculated using the data from the report of the technical group on population projections. All data collected and compiled using excel sheets.

DATA ANALYSIS :

We calculated gender specific mortality, Age group wise mortality & district wise mortality using proportions for each category of mortality. We used Excel Software for analysis.

HUMAN SUBJECT PROTECTION :

The study got approved by Institutional Ethics Committee of Tamil Nadu Public Health department; the privacy and confidentiality was maintained in such a way that no personal data was used or revealed during analysis or report preparation & presentation.

RESULTS

The gender specific Crude mortality rate is gradually increasing from the year 2018 and significantly peaking for all the districts for both male and female gender in the year 2021 and gradually decreasing in the year 2022. Among the 5 years the gender specific Crude mortality rate of males in Virudhunagar (28.9) is the highest in 2021 and among females it is highest in Kancheepuram (11.6) in 2022. When comparing among districts, all districts had higher male mortality and the mortality was decreased in 2022 compared to 2021 except Vellore where the male mortality is increasing. The gender specific Crude mortality rate among males and females is significantly higher in 2022 compared to 2018 in Kancheepuram. When comparing the gender specific Crude mortality rate of male and female mortality within the districts the difference is highest in Virudhunagar in 2021 and 2020 (Table 1).

Table 1: Crude mortality rate in districts of Tamil Nadu by Gender 2018- 2022

District	Male					Female					All deaths				
	2018	2019	2020	2021	2022	2018	2019	2020	2021	2022	2018	2019	2020	2021	2022
Ariyalur	10.3	11.4	11.9	14.7	11.7	6.6	7.4	8.1	10.1	8.1	8.5	9.4	10.0	12.4	9.9
Chengalpattu	7.5	9.8	11.0	14.0	8.9	5.2	6.5	7.6	9.8	6.4	6.4	8.1	9.3	11.9	7.6
Kancheepuram					16.5					11.6					14.0
Chennai	4.1	8.4	9.8	12.0	8.3	2.8	6.1	7.0	9.0	6.3	3.4	7.2	8.4	10.5	7.3
Coimbatore	10.7	10.8	11.5	15.0	11.9	6.8	7.1	7.5	10.2	8.2	8.8	8.9	9.5	12.6	10.1
Cuddalore	8.2	8.4	9.6	11.9	9.6	5.0	5.4	6.4	8.3	6.7	6.6	6.9	8.0	10.1	8.1
Dharmapuri	7.4	8.9	8.8	11.7	9.5	4.8	5.6	5.9	8.2	6.3	6.1	7.3	7.3	9.9	7.9
Dindigul	10.1	11.1	11.4	14.6	11.0	6.7	7.7	7.9	10.1	7.9	8.4	9.4	9.6	12.4	9.4
Erode	10.6	11.4	11.7	15.1	12.4	7.1	7.6	8.0	10.3	8.7	8.8	9.5	9.8	12.7	10.5
Villupuram	8.6	9.2	9.6	11.6	9.1	5.4	5.9	6.3	8.0	6.1	7.0	7.6	8.0	9.8	7.6
Kallakurichi					9.1					5.8					7.5
Kanniyakumari	8.9	9.2	10.0	11.4	10.0	6.7	6.8	7.5	9.1	8.0	7.8	8.0	8.7	10.3	9.0
Karur	10.4	10.9	11.3	14.1	11.4	7.4	7.8	8.1	10.5	8.6	8.9	9.3	9.7	12.3	10.0
Krishnagiri	8.1	8.6	9.3	12.0	9.3	4.9	5.4	6.0	7.9	6.3	6.5	7.0	7.7	9.9	7.8
Madurai	9.2	10.1	11.4	13.7	10.7	6.3	6.9	7.5	9.7	7.7	7.7	8.5	9.5	11.7	9.2
Mayiladuthurai	7.4	9.0	10.2	12.5	10.1	4.6	5.9	6.8	9.1	7.6	6.0	7.5	8.5	10.8	8.9
Nagapattinam					10.9					7.5					9.2
Namakkal	9.8	10.5	10.9	13.6	11.1	6.8	7.5	7.8	10.1	8.0	8.3	9.0	9.4	11.9	9.5
Perambalur	10.2	11.2	12.4	15.3	11.4	7.0	8.0	8.2	10.4	8.1	8.6	9.6	10.3	12.8	9.8
Pudukottai	9.1	10.5	11.2	14.0	11.3	5.6	6.6	6.8	8.9	7.2	7.4	8.6	9.0	11.4	9.3
Ramanathapuram	8.4	9.7	10.8	13.1	10.8	5.4	6.4	6.8	8.9	7.0	6.9	8.1	8.8	11.0	8.9
Salem	8.4	9.6	10.4	14.3	10.4	5.5	6.4	6.8	9.8	7.2	7.0	8.0	8.6	12.0	8.8
Sivaganga	9.1	11.5	11.9	14.9	12.1	5.8	7.7	8.1	10.3	8.4	7.5	9.6	10.0	12.6	10.3
Tirunelveli	9.9	10.6	11.1	12.9	11.1	7.5	8.1	8.6	10.0	8.7	8.7	9.4	9.9	11.4	9.9
Tenkasi					11.2					8.9					10.0
Thanjavur	9.5	10.4	11.1	13.5	11.0	6.1	6.8	7.4	9.7	8.0	7.8	8.6	9.3	11.6	9.5
The Nilgris	7.2	8.7	9.1	10.6	9.5	4.7	5.7	6.4	7.7	6.8	6.0	7.2	7.7	9.1	8.1
Theni	10.3	10.5	11.8	13.9	11.3	6.8	7.0	8.0	9.7	7.9	8.6	8.7	9.9	11.8	9.6
Thiruvallur	8.1	10.6	11.0	13.3	11.1	5.5	7.3	7.6	9.6	8.0	6.8	8.9	9.3	11.4	9.5
Thiruvarur	10.6	10.2	10.7	13.8	11.0	6.8	7.0	7.3	9.6	7.5	8.7	8.6	9.0	11.7	9.3
Thoothukudi	9.3	10.2	10.8	13.1	10.4	6.9	7.8	7.9	9.8	7.6	8.1	9.0	9.4	11.5	9.0
Tiruchirapalli	9.3	10.4	11.2	13.4	10.5	6.6	7.4	7.8	10.0	7.8	8.0	8.9	9.5	11.7	9.2
Tiruppur	10.0	10.2	10.8	14.1	11.4	6.2	6.6	7.1	9.3	7.5	8.1	8.4	9.0	11.7	9.5
Tiruvannamalai	8.9	10.0	10.5	13.0	10.5	6.2	7.0	7.3	9.4	7.4	7.5	8.5	8.9	11.2	9.0
Vellore	7.6	9.0	8.9	5.5	10.1	5.3	6.4	7.0	9.6	7.4	6.5	7.7	8.0	7.6	8.8
Ranipet					9.8					7.5					8.6
Tirupathur					9.5					7.0					8.3
Virudhunagar	10.1	11.5	14.0	28.9	12.0	6.9	8.1	8.5	10.2	8.8	8.5	9.8	11.2	19.6	10.4
Tamil Nadu	9.0	10.1	10.8	13.6	10.7	6.0	6.9	7.4	9.5	7.6	7.5	8.5	9.1	11.5	9.2

Table 2 : Crude mortality rate in districts of Tamil Nadu by Age group less than 1 year and by gender 2018- 2022

District	Age Group <1 year														
	Male					Female					All Deaths				
	2018	2019	2020	2021	2022	2018	2019	2020	2021	2022	2018	2019	2020	2021	2022
Ariyalur	12	16	10	15	15	14.0	14.3	11.2	14.1	11.8	12.8	15.3	10.6	14.4	13.7
Chengalpattu	6	9	9	10	8	5.3	8.2	7.1	7.3	6.2	5.8	8.5	8.1	8.8	7.2
Kancheepuram					22					15.8					19.0
Chennai	7	13	13	10	12	5.3	11.3	11.1	8.7	9.4	6.1	12.3	12.2	9.2	10.6
Coimbatore	8	8	7	10	10	6.6	5.8	5.2	5.3	6.0	7.4	7.1	6.3	7.6	7.9
Cuddalore	7	8	7	8	10	5.0	5.9	6.0	7.7	7.5	6.1	6.9	6.4	8.1	8.8
Dharmapuri	16	18	16	22	18	12.6	16.7	15.5	14.5	14.1	14.4	17.5	16.0	18.2	15.9
Dindigul	12	11	10	13	12	8.5	9.2	8.9	9.8	11.2	10.2	10.2	9.6	11.4	11.7
Erode	6	7	6	8	6	4.2	5.8	3.7	4.3	5.4	5.3	6.2	5.0	6.2	6.0
Villupuram	6	9	10	11	8	6.2	6.5	6.6	8.7	6.5	6.3	8.1	8.2	9.8	7.1
Kallakurichi					16					9.9					13.1
Kanniyakumari	4	4	5	5	5	4.1	3.3	3.9	3.3	3.9	4.3	3.9	4.3	3.9	4.5
Karur	9	13	10	16	17	6.6	8.0	7.8	10.3	10.1	7.7	10.5	8.9	13.1	13.6
Krishnagiri	11	13	14	16	15	7.6	12.5	10.5	10.8	11.1	9.4	12.6	12.1	13.3	13.2
Madurai	12	13	12	15	16	10.0	11.6	9.1	12.0	13.6	11.2	12.2	10.9	13.5	14.8
Mayiladuthurai	9	9	8	10	11	7.8	8.3	5.8	7.9	10.1	8.2	8.5	6.9	8.7	10.6
Nagapattinam					15					9.2					12.4
Namakkal	7	7	7	9	10	6.7	7.0	5.5	7.9	8.0	6.9	7.3	6.2	8.3	9.0
Perambalur	7	15	11	14	14	9.7	12.0	7.3	9.8	10.0	8.3	13.4	9.5	12.1	12.2
Pudukottai	13	14	15	14	13	8.9	10.9	11.3	10.4	9.6	10.9	12.5	13.4	12.4	11.6
Ramanathapuram	10	11	8	10	11	9.9	8.9	7.9	5.7	10.0	9.9	9.9	7.9	7.7	10.4
Salem	10	12	11	14	14	8.5	11.1	8.0	10.0	10.8	9.3	11.8	9.7	11.9	12.3
Sivaganga	10	11	9	11	12	9.4	8.2	7.7	6.7	12.1	9.5	9.9	8.4	8.8	11.9
Tirunelveli	11	10	10	12	14	10.6	7.1	8.7	8.9	7.6	10.8	8.9	9.2	10.3	10.8
Tenkasi					14					9.6					12.0
Thanjavur	11	13	12	17	17	10.1	9.5	9.8	13.6	14.5	10.4	11.3	11.0	15.3	15.8
The Nilgris	6	6	8	10	6	3.4	4.4	7.3	3.4	4.3	4.5	5.1	7.6	7.1	5.1
Theni	17	14	13	12	12	12.4	11.3	8.4	13.2	10.7	14.7	12.5	11.1	12.8	11.5
Thiruvallur	4	8	5	10	11	4.4	7.1	6.2	7.8	9.8	4.4	7.5	5.7	9.1	10.2
Thiruvarur	12	12	10	13	19	8.5	11.3	9.7	9.5	12.3	10.2	11.5	10.1	11.3	15.6
Thoothukudi	11	11	9	11	13	9.2	8.9	8.2	7.3	7.8	10.0	9.9	8.8	9.2	10.3
Tiruchirapalli	10	12	10	13	12	8.8	8.5	8.2	9.4	9.9	9.3	10.4	9.3	11.1	11.2
Tiruppur	7	9	7	9	10	6.1	6.8	5.5	4.7	6.2	6.4	7.8	6.1	7.0	8.0
Tiruvannamalai	9	14	13	16	15	7.7	11.0	8.3	11.2	9.9	8.2	12.5	10.6	13.5	12.4
Vellore	12	14	14	14	17	8.4	10.3	11.3	11.4	11.9	10.1	12.4	12.6	12.7	14.4
Ranipet					16					10.7					13.4
Tirupathur					14					13.4					13.9
Virudhunagar	11	11	10	12	12	9.2	9.0	8.6	8.3	10.2	10.1	10.1	9.2	10.3	11.3
Tamil Nadu	**9**	**11**	**10**	**12**	**13**	**8**	**9**	**8**	**9**	**10**	**9**	**10**	**9**	**11**	**11**

Table 3: Crude mortality rate in districts of Tamil Nadu by Age group 1- 4 years and by gender 2018- 2022

District	Age group : 1 to 4 years														
	Male					Female					All Deaths				
	2018	2019	2020	2021	2022	2018	2019	2020	2021	2022	2018	2019	2020	2021	2022
Ariyalur	0.6	0.5	0.3	0.7	0.5	0.4	0.2	0.2	0.6	0.6	0.5	0.4	0.2	0.7	0.6
Chengalpattu	0.4	0.4	0.3	0.5	0.4	0.4	0.4	0.3	0.5	0.3	0.4	0.4	0.3	0.5	0.3
Kancheepuram					1.0					1.0					1.0
Chennai	0.2	0.6	0.5	0.5	0.5	0.3	0.5	0.4	0.4	0.4	0.3	0.6	0.4	0.4	0.4
Coimbatore	0.3	0.3	0.2	0.4	0.4	0.3	0.4	0.2	0.3	0.3	0.3	0.3	0.2	0.4	0.4
Cuddalore	0.5	0.3	0.3	0.4	0.3	0.3	0.4	0.3	0.2	0.3	0.4	0.4	0.3	0.3	0.3
Dharmapuri	0.5	0.7	0.3	0.5	0.5	0.4	0.5	0.2	0.4	0.6	0.5	0.6	0.3	0.5	0.6
Dindigul	0.5	0.4	0.3	0.4	0.3	0.3	0.4	0.3	0.4	0.6	0.4	0.4	0.3	0.4	0.5
Erode	0.3	0.4	0.1	0.1	0.4	0.3	0.2	0.2	0.1	0.3	0.3	0.3	0.2	0.1	0.3
Villupuram	0.3	0.4	0.3	0.6	0.6	0.3	0.4	0.4	0.3	0.3	0.3	0.4	0.4	0.5	0.4
Kallakurichi					0.6					0.4					0.5
Kanniyakumari	0.3	0.2	0.1	0.2	0.3	0.3	0.1	0.1	0.3	0.3	0.3	0.2	0.1	0.2	0.3
Karur	0.5	0.5	0.3	0.8	0.6	0.2	0.3	0.2	0.5	0.5	0.4	0.4	0.3	0.6	0.5
Krishnagiri	0.4	0.7	0.6	0.5	0.6	0.5	0.5	0.3	0.4	0.6	0.4	0.6	0.4	0.5	0.6
Madurai	0.5	0.4	0.5	0.4	0.6	0.4	0.4	0.3	0.5	0.4	0.4	0.4	0.4	0.5	0.5
Mayiladuthurai	0.3	0.3	0.3	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.4
Nagapattinam					0.7					0.3					0.5
Namakkal	0.2	0.4	0.2	0.3	0.5	0.3	0.1	0.2	0.3	0.4	0.2	0.3	0.2	0.3	0.4
Perambalur	0.5	0.5	0.6	0.6	1.3	0.3	0.6	0.7	0.5	0.5	0.4	0.5	0.6	0.5	0.9
Pudukottai	0.5	0.7	0.4	0.5	0.5	0.5	0.6	0.4	0.5	0.5	0.5	0.7	0.4	0.5	0.5
Ramanathapuram	0.5	0.3	0.6	0.4	0.5	0.4	0.5	0.3	0.4	0.6	0.4	0.4	0.4	0.4	0.5
Salem	0.5	0.4	0.3	0.4	0.4	0.3	0.3	0.4	0.3	0.5	0.4	0.3	0.4	0.4	0.5
Sivaganga	0.5	0.3	0.5	0.4	0.4	0.5	0.6	0.2	0.6	0.4	0.5	0.4	0.3	0.5	0.4
Tirunelveli	0.5	0.5	0.4	0.5	0.6	0.4	0.4	0.3	0.4	0.4	0.4	0.4	0.3	0.5	0.5
Tenkasi					0.4					0.4					0.4
Thanjavur	0.4	0.5	0.4	0.6	0.4	0.3	0.4	0.4	0.5	0.5	0.4	0.4	0.4	0.6	0.5
The Nilgris	0.1	0.4	0.1	0.2	0.1	0.1	0.2	0.1	0.2	0.2	0.1	0.3	0.1	0.2	0.2
Theni	0.6	0.4	0.1	0.5	0.4	0.5	0.3	0.4	0.5	0.5	0.5	0.4	0.3	0.5	0.4
Thiruvallur	0.3	0.7	0.3	0.3	0.4	0.3	0.6	0.2	0.3	0.3	0.3	0.6	0.3	0.3	0.3
Thiruvarur	0.2	0.5	0.5	0.5	0.5	0.4	0.2	0.3	0.4	0.5	0.3	0.3	0.4	0.4	0.5
Thoothukudi	0.4	0.4	0.3	0.5	0.3	0.5	0.4	0.3	0.5	0.4	0.5	0.4	0.3	0.5	0.3
Tiruchirapalli	0.3	0.5	0.4	0.5	0.5	0.5	0.4	0.3	0.4	0.4	0.4	0.5	0.3	0.5	0.4
Tiruppur	0.3	0.5	0.3	0.4	0.4	0.3	0.3	0.3	0.4	0.3	0.3	0.4	0.3	0.4	0.3
Tiruvannamalai	0.6	0.6	0.6	0.6	0.7	0.4	0.6	0.4	0.6	0.6	0.5	0.6	0.5	0.6	0.6
Vellore	0.6	0.6	0.3	0.7	0.5	0.5	0.4	0.4	0.6	0.6	0.5	0.5	0.4	0.6	0.6
Ranipet					0.4					0.6					0.5
Tirupathur					0.7					0.9					0.8
Virudhunagar	0.4	0.4	0.2	0.4	0.4	0.2	0.3	0.4	0.4	0.6	0.3	0.4	0.3	0.4	0.5
Tamil Nadu	**0.4**	**0.5**	**0.3**	**0.5**	**0.5**	**0.3**	**0.4**	**0.3**	**0.4**	**0.5**	**0.4**	**0.4**	**0.3**	**0.4**	**0.5**

Age group less than 5 years:

The age group specific Crude mortality rate in this age group is gradually increasing from the year 2018 and significantly peaking for all the districts in the year 2021 and mortality rate is increasing further in 2022 for age group less than 1 year in districts except Ariyalur, Chengalpattu, Dharmapuri, Erode, Villupuram, Krishnagiri, Pudukottai, The Nilgris, Theni & Tiruvannamalai while compared to 2021. In the age group less than 1 year while comparing with gender within the districts it was noted that the male mortality is higher in all districts (except Sivaganga), while compared with female mortality in 2022. In age group 1 to 4 years Higher male mortality in 2022 is noted when comparing with 2018. Female mortality is high in 12 districts(Ariyalur, Dharmapuri, Dindigul, Ramanathapuram, Thanjavur, Nilgris, The Theni, Thoothukudi, Vellore, Ranipet, Tirupathur and Virudhunagar) in this age group while compared to male mortality in 2022. (Table 2 & 3).

Table 4 : Crude mortality rate in districts of Tamil Nadu by Age group 5- 14 years and by gender 2018- 2022

District	Age group 5 to 14 years														
	Male					Female					All Deaths				
	2018	2019	2020	2021	2022	2018	2019	2020	2021	2022	2018	2019	2020	2021	2022
Ariyalur	0.4	0.5	0.3	0.4	0.5	0.3	0.3	0.3	0.4	0.5	0.4	0.4	0.3	0.4	0.5
Chengalpattu	0.3	0.3	0.3	0.4	0.3	0.2	0.2	0.3	0.3	0.2	0.2	0.3	0.3	0.4	0.2
Kancheepuram					0.6					0.6					0.6
Chennai	0.2	0.3	0.3	0.3	0.3	0.2	0.3	0.2	0.3	0.3	0.2	0.3	0.2	0.3	0.3
Coimbatore	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.3	0.3	0.3	0.3	0.2	0.3	0.3
Cuddalore	0.3	0.3	0.4	0.3	0.3	0.2	0.2	0.3	0.2	0.2	0.2	0.3	0.3	0.3	0.3
Dharmapuri	0.3	0.4	0.3	0.4	0.3	0.2	0.4	0.2	0.5	0.2	0.3	0.4	0.2	0.4	0.3
Dindigul	0.4	0.5	0.4	0.4	0.3	0.3	0.4	0.2	0.3	0.3	0.4	0.4	0.3	0.4	0.3
Erode	0.3	0.2	0.3	0.3	0.3	0.2	0.1	0.2	0.3	0.2	0.2	0.2	0.2	0.3	0.3
Villupuram	0.5	0.4	0.3	0.5	0.3	0.2	0.3	0.3	0.4	0.2	0.4	0.4	0.3	0.4	0.3
Kallakurichi					0.4					0.3					0.3
Kanniyakumari	0.2	0.2	0.2	0.3	0.2	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Karur	0.2	0.2	0.3	0.3	0.3	0.3	0.2	0.3	0.4	0.3	0.2	0.2	0.3	0.3	0.3
Krishnagiri	0.3	0.3	0.3	0.4	0.4	0.3	0.3	0.3	0.4	0.3	0.3	0.3	0.3	0.4	0.4
Madurai	0.4	0.3	0.3	0.4	0.4	0.3	0.3	0.3	0.3	0.4	0.3	0.3	0.3	0.4	0.4
Mayiladuthurai	0.3	0.3	0.2	0.3	0.3	0.3	0.2	0.2	0.4	0.3	0.3	0.3	0.2	0.3	0.3
Nagapattinam					0.5					0.3					0.4
Namakkal	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.3	0.2	0.3	0.3	0.3	0.3	0.3
Perambalur	0.7	0.4	0.4	0.7	0.4	0.3	0.4	0.3	0.4	0.4	0.5	0.4	0.3	0.5	0.4
Pudukottai	0.3	0.4	0.3	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.3	0.4	0.3
Ramanathapuram	0.3	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.3	0.3	0.3	0.3	0.3
Salem	0.4	0.3	0.3	0.3	0.3	0.2	0.3	0.2	0.4	0.2	0.3	0.3	0.3	0.4	0.2
Sivaganga	0.3	0.3	0.3	0.5	0.3	0.2	0.3	0.2	0.3	0.3	0.3	0.3	0.3	0.4	0.3
Tirunelveli	0.3	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.3	0.4	0.3
Tenkasi					0.5					0.3					0.4
Thanjavur	0.3	0.3	0.2	0.3	0.3	0.2	0.3	0.2	0.3	0.2	0.3	0.3	0.2	0.3	0.3
The Nilgris	0.3	0.3	0.1	0.3	0.2	0.1	0.3	0.2	0.2	0.1	0.2	0.3	0.2	0.2	0.2
Theni	0.4	0.5	0.3	0.5	0.3	0.3	0.3	0.4	0.3	0.4	0.3	0.4	0.3	0.4	0.4
Thiruvallur	0.3	0.4	0.3	0.4	0.4	0.2	0.3	0.2	0.3	0.3	0.2	0.3	0.3	0.4	0.4
Thiruvarur	0.4	0.2	0.2	0.2	0.3	0.2	0.2	0.2	0.4	0.2	0.3	0.2	0.2	0.3	0.3
Thoothukudi	0.3	0.3	0.4	0.4	0.3	0.3	0.4	0.3	0.3	0.3	0.3	0.4	0.3	0.4	0.3
Tiruchirapalli	0.4	0.4	0.3	0.4	0.4	0.2	0.3	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Tiruppur	0.3	0.3	0.2	0.3	0.4	0.2	0.2	0.3	0.3	0.3	0.3	0.2	0.3	0.3	0.3
Tiruvannamalai	0.5	0.5	0.4	0.6	0.4	0.3	0.3	0.4	0.4	0.3	0.4	0.4	0.4	0.5	0.4
Vellore	0.3	0.4	0.3	0.4	0.4	0.3	0.3	0.3	0.3	0.4	0.3	0.3	0.3	0.4	0.4
Ranipet					0.3					0.4					0.4
Tirupathur					0.4					0.4					0.4
Virudhunagar	0.3	0.5	0.4	0.5	0.5	0.3	0.3	0.3	0.3	0.4	0.3	0.4	0.4	0.4	0.4
Tamil Nadu	**0.3**	**0.3**	**0.3**	**0.4**	**0.4**	**0.2**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.4**	**0.3**

Age group 5 to 44 years:

The age group specific Crude mortality rate is almost static from the year 2018 with slight increase and decrease in all the districts with no significantly peaking for all the districts in the year 2021. In this age group overall mortality is increasing in districts (5-14 years – 15 districts, 15-24 years- 28 districts, 25-34 years- 29 districts, 35-44 years – 32 districts) as age group increases. The male mortality is increased (5-14 years – 14 districts, 15-24 years- 34 districts, 25-34 years- 35 districts, 35-44 years – 34 districts) and female mortality is increased (5-14 years – 17 districts, 15-24 years- 20 districts, 25-34 years- 19 districts, 35-44 years

– 23 districts) in 2022 when compared within gender in 2018 . In this age group while comparing with gender within the districts it was noted the male mortality is higher while compared to female mortality (Table 4, 5, 6 & 7).

Table 5 : Crude mortality rate in districts of Tamil Nadu by Age group 15- 24 years and by gender 2018- 2022

District	Age group 15 to 24 years														
	Male					Female					All Deaths				
	2018	2019	2020	2021	2022	2018	2019	2020	2021	2022	2018	2019	2020	2021	2022
Ariyalur	1.8	1.9	1.6	1.7	1.9	1.5	1.5	1.2	1.3	1.2	1.6	1.7	1.4	1.5	1.5
Chengalpattu	1.2	1.7	1.3	1.7	1.4	0.7	0.8	0.8	0.9	0.7	1.0	1.2	1.1	1.3	1.0
Kancheepuram					2.7					1.6					2.1
Chennai	0.7	1.3	1.0	1.2	1.1	0.4	0.7	0.6	0.7	0.5	0.6	1.0	0.8	0.9	0.8
Coimbatore	1.4	1.5	1.2	1.4	1.6	0.6	0.7	0.6	0.7	0.7	1.0	1.1	0.9	1.0	1.1
Cuddalore	1.3	1.4	1.2	1.4	1.4	0.8	0.9	0.9	0.9	0.9	1.1	1.1	1.0	1.2	1.1
Dharmapuri	1.4	1.4	1.4	1.7	1.8	0.8	0.9	0.9	1.1	0.9	1.1	1.1	1.2	1.4	1.4
Dindigul	1.5	1.6	1.3	1.7	1.7	0.7	1.0	0.9	1.0	0.8	1.1	1.3	1.1	1.4	1.2
Erode	1.2	1.4	1.2	1.2	1.4	0.5	0.7	0.7	0.8	0.7	0.9	1.1	1.0	1.0	1.0
Villupuram	1.2	1.3	1.2	1.4	1.4	0.9	0.9	0.9	0.9	0.8	1.1	1.1	1.0	1.2	1.1
Kallakurichi					1.4					1.1					1.3
Kanniyakumari	1.3	1.2	0.8	1.0	1.0	0.4	0.4	0.3	0.4	0.4	0.9	0.8	0.6	0.7	0.7
Karur	1.3	1.4	1.2	1.5	1.5	0.9	0.8	0.7	0.8	0.8	1.1	1.1	1.0	1.2	1.2
Krishnagiri	1.5	1.6	1.7	1.9	2.1	1.1	0.9	1.0	1.1	1.0	1.3	1.3	1.3	1.5	1.5
Madurai	1.5	1.4	1.3	1.8	1.6	0.8	0.9	0.8	1.1	1.0	1.2	1.2	1.1	1.4	1.3
Mayiladuthurai	1.2	1.2	1.2	1.4	1.5	0.7	0.9	0.8	1.0	0.8	0.9	1.1	1.0	1.2	1.2
Nagapattinam					1.7					0.7					1.2
Namakkal	1.1	1.2	1.1	1.5	1.5	0.6	0.7	0.8	0.8	0.8	0.9	0.9	0.9	1.2	1.2
Perambalur	1.4	1.6	1.8	1.7	1.6	1.6	1.3	1.1	1.3	1.1	1.5	1.5	1.5	1.5	1.4
Pudukottai	1.2	1.5	1.3	1.6	1.7	0.9	1.1	1.0	0.9	0.8	1.0	1.3	1.1	1.3	1.3
Ramanathapuram	1.3	1.4	1.2	1.4	1.6	0.8	0.9	1.1	0.9	0.9	1.1	1.1	1.2	1.2	1.3
Salem	1.2	1.3	1.3	1.4	1.3	0.7	0.8	0.7	0.9	0.7	1.0	1.0	1.0	1.1	1.0
Sivaganga	1.1	1.3	1.2	1.9	1.7	0.9	1.0	0.8	1.0	0.9	1.0	1.2	1.0	1.4	1.3
Tirunelveli	1.2	1.4	1.3	1.6	1.5	0.8	0.8	0.8	0.9	1.1	1.0	1.1	1.0	1.3	1.3
Tenkasi					2.0					1.1					1.5
Thanjavur	1.4	1.5	1.3	1.5	1.7	0.9	1.1	0.9	1.1	1.0	1.1	1.3	1.1	1.3	1.3
The Nilgris	1.0	1.3	1.1	1.0	1.4	0.6	0.7	0.7	0.6	0.6	0.8	1.0	0.9	0.8	1.0
Theni	1.5	1.5	1.5	1.7	1.5	0.8	0.8	0.7	1.1	0.9	1.2	1.2	1.1	1.4	1.2
Thiruvallur	1.4	1.7	1.4	1.7	1.9	0.8	0.9	0.8	1.0	0.9	1.1	1.3	1.1	1.4	1.4
Thiruvarur	1.5	1.3	1.2	1.6	1.7	0.9	1.0	0.9	1.1	0.8	1.2	1.1	1.1	1.4	1.2
Thoothukudi	1.3	1.5	1.3	1.6	1.5	0.8	0.8	0.7	1.0	0.7	1.0	1.2	1.0	1.3	1.1
Tiruchirapalli	1.2	1.5	1.3	1.4	1.5	0.9	1.0	0.9	0.9	0.8	1.1	1.2	1.1	1.2	1.2
Tiruppur	1.4	1.5	1.2	1.4	1.6	0.7	0.7	0.7	0.7	0.7	1.1	1.1	1.0	1.1	1.2
Tiruvannamalai	1.4	1.4	1.3	1.7	1.4	1.0	0.9	0.9	1.2	0.9	1.2	1.2	1.1	1.5	1.2
Vellore	1.2	1.5	1.2	1.5	1.5	0.7	0.9	0.8	1.1	0.7	0.9	1.2	1.0	1.3	1.1
Ranipet					1.2					0.9					1.1
Tirupathur					1.6					1.1					1.4
Virudhunagar	1.4	1.5	1.3	1.7	1.8	0.9	1.1	0.9	1.1	1.2	1.1	1.3	1.1	1.4	1.5
Tamil Nadu	**1.3**	**1.4**	**1.3**	**1.5**	**1.6**	**0.8**	**0.9**	**0.8**	**0.9**	**0.9**	**1.1**	**1.2**	**1.1**	**1.2**	**1.2**

Table 6 : Crude mortality rate in districts of Tamil Nadu by Age group 25- 34 years and by gender 2018- 2022

District	Age group 25 to 34 years														
	Male					Female					All Deaths				
	2018	2019	2020	2021	2022	2018	2019	2020	2021	2022	2018	2019	2020	2021	2022
Ariyalur	3.1	3.0	3.5	3.2	3.4	1.5	1.6	1.4	1.4	1.2	2.3	2.3	2.4	2.3	2.2
Chengalpattu	2.5	2.9	2.7	3.5	2.6	0.8	1.1	1.1	1.3	0.8	1.7	2.0	1.9	2.4	1.7
Kancheepuram					5.1					1.9					3.4
Chennai	1.3	2.4	2.1	2.8	2.1	0.5	0.9	1.0	1.1	0.7	0.9	1.6	1.5	1.9	1.4
Coimbatore	2.6	2.4	2.4	3.0	2.9	1.0	0.8	0.9	1.0	0.9	1.8	1.6	1.6	2.0	1.9
Cuddalore	2.4	2.3	2.2	2.6	2.5	1.0	1.0	0.8	1.0	0.9	1.7	1.6	1.5	1.8	1.7
Dharmapuri	2.0	2.4	2.5	3.0	2.5	1.0	1.1	0.8	1.1	1.0	1.5	1.7	1.6	2.1	1.8
Dindigul	2.4	2.8	2.5	3.1	2.6	1.1	1.1	1.1	1.2	1.0	1.7	1.9	1.8	2.1	1.8
Erode	2.4	2.4	2.1	2.6	2.5	0.9	0.9	0.9	1.0	0.8	1.6	1.7	1.5	1.8	1.7
Villupuram	2.5	2.6	2.5	3.0	2.6	1.1	1.1	1.0	1.1	0.8	1.8	1.8	1.8	2.0	1.7
Kallakurichi					2.6					1.2					1.9
Kanniyakumari	1.9	1.6	1.7	1.7	1.8	0.5	0.5	0.5	0.6	0.5	1.2	1.1	1.1	1.1	1.1
Karur	2.4	2.1	2.1	2.7	2.4	1.0	1.0	0.8	1.1	0.9	1.7	1.5	1.5	1.9	1.6
Krishnagiri	2.5	2.5	2.6	3.6	3.1	0.8	1.2	1.2	1.4	1.1	1.7	1.8	1.9	2.5	2.1
Madurai	2.5	2.9	2.7	3.0	2.6	1.0	1.1	1.0	1.2	1.1	1.8	2.0	1.9	2.1	1.8
Mayiladuthurai	1.8	2.5	2.2	2.8	2.4	0.9	1.1	1.1	1.2	1.0	1.3	1.8	1.7	2.0	1.7
Nagapattinam					3.1					1.2					2.1
Namakkal	2.1	2.4	1.9	2.5	2.5	0.9	0.8	0.8	1.0	1.0	1.5	1.6	1.4	1.7	1.7
Perambalur	2.6	3.0	3.3	3.9	3.2	1.2	1.4	1.3	1.7	1.3	1.9	2.2	2.3	2.7	2.2
Pudukottai	2.1	3.1	2.5	2.9	2.6	1.1	1.0	1.1	1.4	1.0	1.6	2.0	1.8	2.1	1.8
Ramanathapuram	2.2	2.5	2.3	2.9	2.5	0.9	0.9	1.0	1.3	1.0	1.5	1.7	1.6	2.1	1.7
Salem	2.2	2.3	2.2	3.1	2.5	0.9	1.0	0.9	1.2	1.0	1.5	1.6	1.6	2.2	1.7
Sivaganga	2.2	2.5	2.2	2.6	2.7	0.9	1.2	0.9	1.2	1.1	1.6	1.8	1.6	1.9	1.9
Tirunelveli	2.3	2.4	2.5	2.7	2.7	1.1	1.3	1.1	1.3	1.2	1.7	1.8	1.8	2.0	1.9
Tenkasi					2.5					1.3					1.9
Thanjavur	2.6	2.8	2.5	2.7	2.9	1.2	1.1	1.1	1.2	1.1	1.9	1.9	1.8	2.0	2.0
The Nilgris	2.1	2.1	2.3	2.5	2.2	0.9	0.8	0.7	0.8	0.7	1.5	1.4	1.5	1.6	1.5
Theni	3.0	2.9	2.7	3.4	3.2	1.2	1.2	1.3	1.3	1.0	2.1	2.0	2.0	2.4	2.1
Thiruvallur	2.5	3.3	2.8	3.5	3.1	0.9	1.1	1.1	1.2	1.1	1.7	2.2	2.0	2.3	2.1
Thiruvarur	2.4	2.3	2.3	2.9	2.6	1.2	1.2	1.1	1.2	1.2	1.8	1.8	1.7	2.1	1.9
Thoothukudi	2.3	2.6	2.5	3.0	2.5	1.0	1.0	0.9	1.3	0.9	1.6	1.8	1.7	2.1	1.7
Tiruchirapalli	2.4	2.5	2.3	2.6	2.6	1.1	1.1	1.0	1.2	1.0	1.7	1.8	1.6	1.9	1.8
Tiruppur	2.5	2.9	2.4	3.2	2.9	0.8	0.9	0.8	1.2	1.0	1.7	1.9	1.6	2.2	1.9
Tiruvannamalai	2.4	3.0	2.6	3.1	2.6	1.1	1.3	1.2	1.4	1.0	1.7	2.1	1.9	2.2	1.8
Vellore	2.1	2.5	2.3	3.0	2.8	1.0	1.2	1.0	1.3	1.1	1.5	1.9	1.6	2.1	1.9
Ranipet					2.4					1.0					1.7
Tirupathur					2.9					1.2					2.1
Virudhunagar	2.8	3.1	2.9	3.3	3.3	1.0	1.3	1.2	1.5	1.4	1.9	2.2	2.0	2.4	2.3
Tamil Nadu	**2.3**	**2.6**	**2.5**	**3.0**	**2.7**	**1.0**	**1.1**	**1.0**	**1.2**	**1.0**	**1.7**	**1.8**	**1.7**	**2.1**	**1.9**

Table 7 : Crude mortality rate in districts of Tamil Nadu by Age group 35- 44 years and by gender 2018- 2022

District	Age group 35 to 44														
	Male					Female					All Deaths				
	2018	2019	2020	2021	2022	2018	2019	2020	2021	2022	2018	2019	2020	2021	2022
Ariyalur	5.4	6.0	6.1	6.7	6.4	2.0	2.3	2.0	2.7	2.2	3.7	4.1	4.0	4.7	4.2
Chengalpattu	4.1	5.6	5.5	7.2	4.6	1.4	2.0	2.1	2.8	1.6	2.7	3.7	3.8	4.9	3.1
Kancheepuram					9.1					3.4					6.2
Chennai	2.3	4.8	4.7	6.2	4.3	0.8	1.7	1.9	2.5	1.5	1.5	3.2	3.3	4.3	2.8
Coimbatore	5.4	5.4	5.5	6.5	5.6	1.9	1.8	1.7	2.4	1.8	3.6	3.6	3.6	4.4	3.7
Cuddalore	4.6	4.6	4.7	5.7	4.9	1.6	1.8	1.9	2.3	1.9	3.1	3.2	3.3	4.0	3.4
Dharmapuri	3.5	4.8	4.1	5.7	4.5	1.6	1.6	1.6	2.4	1.7	2.6	3.2	2.8	4.0	3.0
Dindigul	5.2	5.9	5.3	6.7	5.2	2.0	2.5	2.2	2.6	1.9	3.6	4.2	3.7	4.6	3.5
Erode	5.3	5.3	5.3	6.5	5.5	1.7	1.9	1.7	2.4	1.9	3.5	3.6	3.5	4.4	3.6
Villupuram	4.5	5.0	5.1	5.9	4.9	1.7	1.7	1.6	2.1	1.4	3.1	3.3	3.3	3.9	3.1
Kallakurichi					4.8					1.7					3.2
Kanniyakumari	3.3	3.6	3.7	3.9	3.5	1.1	1.2	1.1	1.5	1.0	2.2	2.3	2.4	2.7	2.2
Karur	4.8	4.6	4.6	6.0	4.3	2.1	2.1	1.8	2.2	1.8	3.4	3.3	3.1	4.0	3.0
Krishnagiri	4.3	5.3	5.3	7.0	5.5	1.5	1.8	1.9	2.6	2.1	2.9	3.5	3.6	4.8	3.8
Madurai	4.8	5.5	5.6	6.5	5.6	2.0	2.3	2.1	2.7	2.0	3.4	3.9	3.8	4.6	3.8
Mayiladuthurai	3.8	5.0	4.9	5.3	4.6	1.5	2.1	2.0	2.3	2.1	2.6	3.5	3.4	3.8	3.3
Nagapattinam					5.5					1.9					3.7
Namakkal	4.3	4.5	4.5	5.1	4.6	1.7	1.9	1.7	2.1	1.4	2.9	3.2	3.1	3.6	3.0
Perambalur	5.5	6.2	6.2	6.6	6.0	1.9	2.7	2.0	2.7	2.2	3.7	4.4	4.1	4.6	4.0
Pudukottai	4.6	5.4	5.5	6.4	5.5	1.7	2.0	1.9	2.2	1.8	3.2	3.7	3.6	4.2	3.6
Ramanathapuram	4.1	4.6	4.4	5.7	5.1	1.5	2.0	1.6	2.3	1.8	2.8	3.3	3.0	3.9	3.4
Salem	4.3	4.5	4.7	6.7	4.7	1.7	1.8	1.9	2.7	1.7	2.9	3.1	3.2	4.6	3.2
Sivaganga	4.3	5.2	4.9	5.9	5.3	1.4	2.0	1.9	2.3	1.7	2.9	3.5	3.3	4.0	3.5
Tirunelveli	4.3	4.9	4.8	5.7	5.2	2.1	2.2	2.2	2.4	2.0	3.1	3.5	3.5	4.0	3.5
Tenkasi					5.1					2.3					3.7
Thanjavur	5.2	5.5	4.9	5.9	5.2	1.8	2.0	2.2	2.5	2.1	3.4	3.7	3.5	4.2	3.6
The Nilgris	4.5	4.8	4.8	5.2	5.8	1.2	1.5	1.6	1.8	1.6	2.8	3.1	3.2	3.4	3.7
Theni	5.5	5.6	5.8	7.1	6.1	2.3	2.2	2.5	3.0	2.3	3.8	3.9	4.1	5.0	4.1
Thiruvallur	4.8	6.3	6.0	6.9	6.1	1.6	2.2	2.3	2.7	2.2	3.2	4.2	4.1	4.7	4.1
Thiruvarur	4.6	5.6	5.2	5.7	4.8	2.1	2.1	1.8	2.7	1.9	3.3	3.8	3.4	4.1	3.3
Thoothukudi	4.4	4.7	5.3	5.7	4.9	1.8	1.9	2.1	2.5	1.9	3.1	3.3	3.7	4.1	3.4
Tiruchirapalli	4.8	5.4	5.2	5.7	4.8	1.9	2.1	2.1	2.3	1.8	3.3	3.7	3.6	4.0	3.3
Tiruppur	5.2	5.3	5.5	6.7	5.8	1.7	1.8	1.9	2.6	1.6	3.4	3.5	3.6	4.5	3.7
Tiruvannamalai	4.7	5.2	5.2	6.2	5.7	1.8	1.9	2.1	2.5	1.8	3.2	3.5	3.6	4.3	3.7
Vellore	4.1	5.1	4.7	6.5	5.4	1.9	2.2	2.3	3.0	2.0	3.0	3.6	3.4	4.7	3.7
Ranipet					4.6					2.0					3.3
Tirupathur					5.3					2.2					3.7
Virudhunagar	5.3	6.0	6.1	7.3	6.2	2.0	2.5	2.4	3.1	2.4	3.6	4.2	4.2	5.1	4.3
Tamil Nadu	**4.6**	**5.2**	**5.1**	**6.1**	**5.3**	**1.7**	**2.0**	**1.9**	**2.5**	**1.9**	**3.1**	**3.6**	**3.5**	**4.3**	**3.6**

Table 8 : Crude mortality rate in districts of Tamil Nadu by Age group 45- 54 years and by gender 2018- 2022

District	Age group 45 to 54 years														
	Male					Female					All Deaths				
	2018	2019	2020	2021	2022	2018	2019	2020	2021	2022	2018	2019	2020	2021	2022
Ariyalur	10.7	11.8	12.6	13.5	10.5	5.3	6.3	6.8	7.4	6.4	8.0	9.0	9.7	10.4	8.4
Chengalpattu	8.4	10.8	12.3	14.2	8.7	3.8	4.4	5.6	7.1	3.8	6.1	7.6	8.9	10.6	6.2
Kancheepuram					18.0					8.4					13.0
Chennai	5.0	10.4	10.7	12.9	8.9	2.1	4.3	5.1	6.5	4.1	3.5	7.3	7.9	9.6	6.5
Coimbatore	12.0	11.9	13.0	15.6	12.2	4.6	5.0	5.0	7.1	4.9	8.2	8.4	9.0	11.3	8.5
Cuddalore	9.3	9.5	10.6	12.4	10.5	4.2	4.7	5.4	6.7	4.8	6.7	7.1	8.0	9.5	7.6
Dharmapuri	7.8	9.8	9.6	11.5	9.7	3.4	4.2	3.9	5.5	3.8	5.6	7.0	6.7	8.4	6.7
Dindigul	10.8	12.1	12.2	13.9	11.7	5.5	5.6	5.8	7.0	5.4	8.2	8.8	9.0	10.4	8.5
Erode	10.7	11.6	11.6	13.5	11.8	4.3	5.0	5.5	6.7	4.7	7.5	8.3	8.5	10.0	8.1
Villupuram	9.2	9.8	9.7	10.7	8.4	4.0	4.5	4.6	5.8	3.6	6.6	7.2	7.1	8.2	5.9
Kallakurichi					9.0					4.2					6.5
Kanniyakumari	7.2	8.1	8.1	9.0	7.8	3.4	3.4	3.8	4.3	3.9	5.3	5.7	6.0	6.6	5.8
Karur	10.6	11.1	10.9	13.5	10.3	4.9	4.5	5.5	6.5	4.9	7.7	7.8	8.2	9.9	7.6
Krishnagiri	8.1	9.5	10.1	12.7	9.8	3.7	4.3	4.8	6.5	4.1	5.9	6.9	7.4	9.5	6.9
Madurai	10.2	11.6	12.8	15.0	11.5	4.9	5.3	6.0	7.2	5.3	7.5	8.4	9.4	11.0	8.3
Mayiladuthurai	8.5	10.5	10.6	11.9	9.5	3.9	5.0	5.7	7.2	6.4	6.2	7.8	8.1	9.5	7.9
Nagapattinam					11.6					5.6					8.5
Namakkal	9.4	10.5	10.3	13.3	9.8	4.1	4.9	4.5	6.3	4.2	6.7	7.7	7.4	9.7	6.9
Perambalur	11.5	12.3	11.9	15.4	11.9	5.2	6.3	6.6	7.3	5.9	8.3	9.2	9.2	11.3	8.8
Pudukottai	10.1	12.3	12.5	14.5	12.1	4.3	4.8	5.0	6.5	4.9	7.2	8.5	8.7	10.4	8.4
Ramanathapuram	8.9	10.3	11.5	12.9	10.7	3.8	4.6	4.7	6.3	4.8	6.4	7.4	8.1	9.5	7.7
Salem	9.1	10.0	10.8	14.7	10.2	3.9	4.8	5.1	7.2	4.5	6.5	7.4	7.9	10.9	7.3
Sivaganga	10.0	11.6	11.2	13.9	11.9	4.0	5.0	5.2	6.3	4.9	7.0	8.3	8.2	10.0	8.3
Tirunelveli	9.5	10.5	10.5	11.6	10.8	4.8	5.0	5.7	6.2	4.4	7.2	7.7	8.1	8.8	7.5
Tenkasi					10.4					4.7					7.5
Thanjavur	10.6	11.9	12.4	14.2	11.6	5.1	5.6	6.0	7.4	5.6	7.8	8.7	9.2	10.7	8.5
The Nilgris	9.0	10.2	9.6	11.6	10.4	3.5	4.2	4.5	5.0	4.4	6.2	7.2	7.0	8.2	7.3
Theni	12.1	12.1	12.4	14.1	12.9	5.4	5.8	6.5	7.7	5.4	8.7	8.9	9.4	10.8	9.0
Thiruvallur	10.0	13.2	12.8	15.2	12.2	4.3	5.6	6.2	7.6	5.7	7.2	9.4	9.5	11.3	8.9
Thiruvarur	12.2	11.3	11.5	14.1	11.3	6.4	6.2	6.3	7.9	5.7	9.2	8.7	8.9	10.9	8.4
Thoothukudi	9.4	10.1	10.4	12.3	10.4	4.4	5.2	5.4	6.2	4.5	6.9	7.7	7.9	9.2	7.4
Tiruchirapalli	10.3	11.2	11.3	12.5	10.8	4.8	5.5	5.7	6.5	4.7	7.5	8.3	8.5	9.4	7.7
Tiruppur	10.9	11.4	12.4	15.1	12.6	4.1	4.5	5.0	6.3	4.5	7.5	7.9	8.6	10.6	8.4
Tiruvannamalai	8.6	10.0	10.4	12.5	10.2	4.2	5.1	5.2	6.3	4.4	6.4	7.5	7.8	9.3	7.2
Vellore	8.6	10.4	10.7	13.5	11.5	4.6	5.3	6.1	8.0	5.5	6.6	7.8	8.3	10.7	8.4
Ranipet					9.9					4.8					7.3
Tirupathur					9.7					5.3					7.4
Virudhunagar	11.3	12.8	13.7	15.2	12.5	5.3	5.9	6.9	7.4	6.2	8.3	9.3	10.3	11.2	9.3
Tamil Nadu	**9.7**	**11.0**	**11.3**	**13.3**	**10.9**	**4.4**	**5.0**	**5.4**	**6.7**	**5.0**	**7.0**	**8.0**	**8.3**	**9.9**	**7.9**

Table 9 : Crude mortality rate in districts of Tamil Nadu by Age group 55- 69 years and by gender 2018- 2022

District	Age group 55 to 69 years														
	Male					Female					All Deaths				
	2018	2019	2020	2021	2022	2018	2019	2020	2021	2022	2018	2019	2020	2021	2022
Ariyalur	24.3	28.7	29.6	33.1	25.0	16.7	19.7	20.3	21.4	16.3	20.4	24.1	24.9	27.1	20.6
Chengalpattu	19.9	25.5	30.0	33.7	19.7	12.5	15.5	18.6	22.4	13.2	16.2	20.4	24.2	27.9	16.4
Kancheepuram					39.2					25.6					32.3
Chennai	10.3	21.2	26.2	29.2	18.8	6.4	13.4	16.6	20.1	12.6	8.3	17.2	21.3	24.5	15.7
Coimbatore	28.0	29.0	31.2	37.1	28.1	15.0	16.1	16.9	22.4	16.0	21.4	22.4	23.9	29.6	21.9
Cuddalore	23.0	23.8	27.4	29.5	23.1	14.0	14.7	17.3	20.4	15.5	18.4	19.2	22.3	24.9	19.3
Dharmapuri	19.9	23.8	22.8	28.0	22.0	12.2	13.9	14.5	19.1	13.1	16.0	18.8	18.6	23.5	17.5
Dindigul	28.1	29.9	30.2	35.0	26.0	17.7	19.9	19.2	22.1	16.3	22.8	24.8	24.6	28.4	21.1
Erode	27.2	30.2	30.6	35.5	28.5	16.8	17.4	17.5	21.6	17.0	21.9	23.7	24.0	28.4	22.6
Villupuram	24.3	25.5	26.3	27.5	20.3	15.9	17.2	17.4	18.7	13.0	20.1	21.3	21.7	23.0	16.6
Kallakurichi					21.3					14.3					17.7
Kanniyakumari	22.8	23.0	25.8	25.7	22.5	14.7	15.7	17.7	19.3	15.6	18.7	19.3	21.7	22.4	19.0
Karur	27.2	28.4	29.3	32.6	25.5	18.1	19.6	19.2	22.7	17.4	22.6	23.9	24.1	27.5	21.3
Krishnagiri	20.7	22.5	24.6	28.0	20.4	11.9	13.1	14.0	18.0	13.6	16.2	17.7	19.2	22.9	16.9
Madurai	26.0	28.3	30.9	33.9	26.3	16.2	18.0	19.5	23.0	17.0	21.0	23.1	25.1	28.3	21.5
Mayiladuthurai	21.8	25.1	28.5	30.3	24.9	12.2	15.9	17.2	21.5	17.7	16.9	20.4	22.7	25.8	21.2
Nagapattinam					24.5					16.8					20.6
Namakkal	27.0	27.8	29.5	32.4	25.5	15.8	18.0	17.1	21.8	15.4	21.3	22.8	23.2	27.0	20.3
Perambalur	26.6	29.8	31.4	36.2	25.3	18.9	22.3	20.8	24.4	17.6	22.7	26.0	26.0	30.2	21.4
Pudukottai	25.5	28.0	30.0	32.4	26.4	15.5	18.5	17.7	20.8	16.8	20.4	23.2	23.8	26.5	21.5
Ramanathapuram	24.8	27.8	30.5	32.6	26.0	14.5	17.6	18.2	22.0	16.0	19.6	22.6	24.3	27.2	20.9
Salem	22.2	25.0	28.0	34.5	24.1	13.4	15.0	16.4	22.9	14.6	17.7	19.9	22.1	28.5	19.2
Sivaganga	24.0	30.8	32.1	34.4	27.9	14.7	21.0	21.6	23.5	18.1	19.3	25.8	26.8	28.8	22.9
Tirunelveli	26.8	28.2	29.1	30.4	24.9	17.5	19.4	20.1	20.8	16.9	22.1	23.8	24.5	25.5	20.8
Tenkasi					26.7					18.3					22.4
Thanjavur	26.5	29.1	31.4	33.2	26.1	16.5	18.4	19.3	23.0	18.3	21.4	23.7	25.3	28.0	22.1
The Nilgris	22.0	27.3	28.5	27.4	24.4	12.9	15.5	16.2	17.8	15.6	17.3	21.3	22.3	22.5	19.9
Theni	28.2	29.5	33.7	34.4	27.1	17.1	17.7	19.4	21.2	16.9	22.5	23.5	26.4	27.7	21.9
Thiruvallur	23.5	30.0	32.2	34.5	27.9	14.5	19.3	20.4	24.2	18.5	18.9	24.6	26.2	29.2	23.1
Thiruvarur	32.0	30.5	30.6	35.3	27.1	19.5	20.7	19.5	23.6	18.2	25.7	25.5	25.0	29.3	22.5
Thoothukudi	23.2	25.7	27.8	30.3	23.1	15.9	17.6	18.0	20.7	14.7	19.5	21.6	22.9	25.4	18.8
Tiruchirapalli	25.4	27.7	30.1	32.0	23.9	16.9	18.6	19.4	22.7	16.2	21.1	23.1	24.7	27.3	19.9
Tiruppur	25.2	25.4	28.4	33.4	26.1	14.1	14.8	15.8	20.0	15.0	19.6	20.0	22.0	26.6	20.4
Tiruvannamalai	24.2	26.1	27.3	30.8	23.8	15.5	17.6	18.5	21.0	16.3	19.8	21.8	22.8	25.8	19.9
Vellore	21.5	25.5	26.5	31.9	24.1	13.7	16.6	17.7	23.1	16.2	17.5	21.0	22.0	27.4	20.1
Ranipet					24.0					16.4					20.1
Tirupathur					24.2					16.8					20.4
Virudhunagar	27.2	31.4	34.9	34.8	28.9	17.6	20.2	20.4	22.5	18.6	22.3	25.7	27.5	28.5	23.6
Tamil Nadu	**24.4**	**27.2**	**29.2**	**32.2**	**25.1**	**15.1**	**17.5**	**18.2**	**21.5**	**16.4**	**19.7**	**22.3**	**23.6**	**26.7**	**20.6**

Table 10 : Crude mortality rate in districts of Tamil Nadu by Age group 70 years and above by gender 2018- 2022

District	Age group 70 years and above														
	Male					Female					All Deaths				
	2018	2019	2020	2021	2022	2018	2019	2020	2021	2022	2018	2019	2020	2021	2022
Ariyalur	92.2	96.4	105.8	119.9	91.0	57.5	62.9	75.9	82.8	64.9	74.1	79.0	90.3	100.2	77.1
Chengalpattu	59.7	78.4	92.8	101.7	67.1	52.0	65.2	75.8	79.1	56.1	55.7	71.6	83.9	89.7	61.3
Kancheepuram					109.6					90.0					99.2
Chennai	30.7	64.1	84.8	86.4	60.7	28.0	63.2	72.4	73.5	56.3	29.3	63.7	78.3	79.5	58.4
Coimbatore	92.9	91.7	99.7	113.8	89.3	73.4	76.5	83.5	88.9	76.7	82.8	83.8	91.3	100.6	82.6
Cuddalore	61.2	64.2	79.0	86.7	66.8	41.6	45.6	58.3	61.9	51.5	51.0	54.5	68.2	73.6	58.7
Dharmapuri	57.5	69.5	72.4	82.5	66.5	42.6	50.1	56.7	61.8	52.4	49.7	59.4	64.3	71.5	59.0
Dindigul	81.4	90.9	100.5	112.9	79.6	60.8	72.8	79.4	84.3	67.1	70.7	81.5	89.5	97.7	73.0
Erode	97.0	104.7	112.5	127.1	101.7	78.0	84.2	89.8	93.1	82.6	87.1	94.1	100.7	109.0	91.6
Villupuram	66.9	72.2	81.6	87.9	69.7	45.5	50.1	57.7	62.0	53.5	55.8	60.7	69.2	74.2	61.1
Kallakurichi					63.3					41.0					51.5
Kanniyakumari	91.4	94.3	104.5	105.9	91.3	81.0	81.5	89.8	88.9	80.4	86.0	87.7	96.9	96.9	85.5
Karur	93.5	100.2	110.4	114.0	94.6	76.9	81.5	88.7	92.4	78.1	84.9	90.5	99.1	102.5	85.9
Krishnagiri	67.0	65.0	73.9	81.1	61.6	45.7	47.9	56.0	57.1	49.4	55.9	56.1	64.6	68.3	55.1
Madurai	69.0	76.5	95.0	96.1	71.2	56.9	63.7	72.1	75.2	61.0	62.7	69.9	83.1	85.0	65.8
Mayiladuthurai	54.0	70.1	87.9	96.7	74.8	39.7	50.0	64.8	70.4	57.6	46.6	59.6	75.9	82.7	65.7
Nagapattinam					77.8					60.3					68.5
Namakkal	88.5	96.3	105.5	111.0	89.5	73.2	80.9	89.4	90.2	76.0	80.5	88.3	97.1	100.0	82.3
Perambalur	84.7	90.9	112.4	115.0	83.2	61.2	67.4	79.3	81.0	64.9	72.5	78.6	95.2	97.0	73.5
Pudukottai	72.7	83.1	93.8	107.1	81.9	48.8	58.4	64.1	70.1	56.9	60.2	70.2	78.3	87.4	68.6
Ramanathapuram	64.4	78.6	93.1	98.9	79.3	48.0	56.7	65.2	67.8	55.0	55.8	67.2	78.6	82.4	66.4
Salem	69.9	83.9	93.2	107.0	79.1	54.0	63.9	69.6	77.6	63.9	61.6	73.5	80.9	91.4	71.0
Sivaganga	77.7	103.2	112.6	123.1	94.2	57.0	72.9	80.5	87.2	73.2	66.9	87.4	95.9	104.0	83.1
Tirunelveli	89.6	96.1	105.4	102.5	86.2	78.3	84.7	91.9	88.3	80.7	83.7	90.2	98.4	95.0	83.2
Tenkasi					83.9					78.2					80.9
Thanjavur	72.8	79.7	93.8	99.8	78.3	53.1	59.5	68.6	73.9	62.4	62.5	69.2	80.7	86.0	69.9
The Nilgris	48.0	59.4	67.0	72.5	62.1	43.2	53.1	64.1	65.1	56.5	45.5	56.1	65.5	68.6	59.1
Theni	78.5	79.1	97.8	98.2	76.6	61.5	63.9	78.4	75.4	64.6	69.6	71.2	87.7	86.1	70.3
Thiruvallur	56.9	74.2	83.1	85.1	71.2	51.7	67.5	71.0	70.6	62.5	54.2	70.7	76.8	77.4	66.6
Thiruvarur	79.8	76.6	87.9	101.4	78.5	54.8	55.4	67.0	70.5	55.4	66.8	65.6	77.0	85.0	66.3
Thoothukudi	85.0	93.3	98.8	105.3	79.9	72.8	84.6	86.1	85.5	69.5	78.7	88.7	92.2	94.8	74.4
Tiruchirapalli	76.2	87.5	100.8	105.4	79.0	62.6	72.7	78.5	83.5	68.9	69.1	79.8	89.2	93.8	73.7
Tiruppur	88.8	88.3	94.7	106.2	83.6	66.6	70.3	77.0	79.5	68.7	77.3	79.0	85.5	92.0	75.7
Tiruvannamalai	73.9	84.5	92.3	97.8	78.5	59.2	66.4	71.2	75.4	61.7	66.3	75.1	81.4	85.9	69.6
Vellore	56.8	65.4	78.5	87.1	67.0	46.1	57.0	64.1	69.8	59.0	51.2	61.0	71.0	77.9	62.7
Ranipet					69.8					61.1					65.2
Tirupathur					59.6					49.3					54.1
Virudhunagar	81.7	93.3	107.6	103.4	83.4	66.1	78.0	84.5	82.4	72.6	73.6	85.3	95.6	92.3	77.6
Tamil Nadu	**73.8**	**82.9**	**94.4**	**101.2**	**78.5**	**57.4**	**65.9**	**74.1**	**77.0**	**64.2**	**65.3**	**74.0**	**83.8**	**88.4**	**70.9**

– 34 districts, 55-69 years- 27 districts, 70 years and above - 29 districts). The male mortality is increased (45-54 years – 33 districts, 55-69 years- 20 districts, 70 years and above - 25 districts) and female mortality is increased (45-54 years – 29 districts, 55-69 years- 26 districts, 70 years and above -34districts) in 2022 when compared within gender in 2018 .In this age group while comparing with gender within the districts it was noted the male mortality is higher while compared to female mortality and certain districts in each age group had mortality way more higher among males when compared with opposite gender (Table 8, 9 & 10).

DISCUSSION

The mortality in Tamil Nadu has increased during Covid -19 overall and by all age groups and gender and later started to decrease in 2022. The mortality pattern is high in male compared to female for the state of Tamil Nadu (4). Age-specific death rates in USA were lower for most age groups, except for infants and the very old for which death rates were higher. Age-specific death rates were lower for most age groups, except infants and those 75 years and over among males (7). In a study from Scotland there was increase in the diversity of mortality (8). Increased mortality is noted in age group less than 5 years compared to age group 5- 44 years and increased mortality in males in a study done in Tamil Nadu(6). Overall, the districts when compared, all districts had higher male mortality and the mortality decreased in 2022 compared to 2021 except Vellore where the male mortality is still increasing. This mortality increase in Vellore district must be studied as the pattern is not noted in any of the other districts. The gender specific crude mortality rate for males is highest in Virudhunagar during 2021, in females it is highest in Kancheepuram in 2022 on comparison for the years 2018-2022.The mortality in less than 1 year age group is still increasing compared to 2021 except 8 districts (Ariyalur, Dharmapuri, Erode, Krishnagiri, Pudukottai, The Nilgris, Theni & Tiruvannamalai. Sivaganga has higher female mortality in less than 1 age group compared to male mortality. In the age group 1 to 4 years the overall mortality rate is decreasing only in Cuddalore, Sivaganga, Theni and Thoothukudi while increasing in other districts with higher male mortality in 2022 when comparing with 2018.Female mortality is high in 12 districts in the age group 1 to 4 while compared to male mortality in 2022 in this age group. It was noted that from age group 15 and above the male mortality is higher compared to female in all districts. There is higher mortality in the age group 55 and above and the mortality difference between both genders has reduced in 2022 since

2018. The pattern of mortality is almost same as found in developed countries as mortality is higher in elderly age group and diversity of mortality is noted compared to districts.

CONCLUSION

Overall Vellore alone had male mortality still increasing while other districts started decreasing their mortality rate during 2022 when compared with 2021. The gender specific crude mortality rate for males and female is highest during Covid 19 and lowest in Chennai during 2018, on comparison for the years 2018-2022. In less than 1 age group crude mortality rate is still in increasing trend except 8 districts in 2022, Sivaganga district has less male mortality compared to female in this age group in 2022. In the age group 1 to 4 the overall mortality rate is decreasing only in Cuddalore, Sivaganga, Theni and Thoothukudi while increasing in other districts. Higher male mortality in 2022 is noted when comparing with 2018 and Female mortality is high in 12 districts in this age group while compared to male mortality in 2022. There is no significant peaking of mortality during Covid-19 in the age group 5 to 44. It was noted that from age group 15 and above the male mortality is higher compared to female in all districts. There is higher mortality in the age group 55 and above and the mortality difference between both genders has reduced in 2022 since 2018.

RECOMMENDATIONS

The districts with increased mortality in particular age group 0-5 has to be studied. The reasons for the increased mortality in particular gender in comparison with the other gender has to be studied. Cause wise mortality of all the deaths may give a clear picture in pinpointing the reason for higher mortality.

LIMITATIONS

The numbers taken into consideration are the deaths registered in the CRVS. The deaths of the resident of Tamil Nadu occurred in other state or country has not been considered due to lack of data.

CONFLICT OF INTEREST None

REFERENCES

1. Population Analysis for Policies & Programmes [Internet]. [cited 2022 Oct 8]. Available from: https://papp.iussp.org/ sessions/papp101_s06/PAPP101_s06_030_010.html

2. Wang H, Dwyer-Lindgren L, Lofgren KT, et al. Age-specific and sex-specific mortality in 187 countries, 1970-2010: a systematic analysis for the Global Burden of Disease Study 2010. Lancet. 2012;380(9859):2071-2094. doi:10.1016/S0140-6736(12)61719-X

3. TRAINING MANUAL for Civil Registration Functionaries in India (1st ed.). (2012). Office of the RegistrarGeneral,India. https://crsorgi.gov.in/web/uploads/download/CRS_mannual_Hindi_English.pdf

4. Stanislaus, "IMPACT OF PANDEMIC ON MORTALITY TRENDS IN TAMIL NADU 2019-2022."Volume 3 Issue 2 TNJPHMR

5."Indicator Metadata Registry Details." Accessed March 14, 2024. https://www.who.int/data/gho/indicator-metadata-registry/imr-details/5668.

6. Venkata Raghava Mohan , J. Muliyil, Mortality patterns and the effect of socioeconomic factors on mortality in rural Tamil Nadu, south India: a community-based cohort study, Transactions of The Royal Society of Tropical Medicine and Hygiene, Volume 103, Issue 8, August 2009, Pages 801–806, https://doi.org/10.1016/j.trstmh.2009.04.014

7. Anderson, Robert N. "The Effect of Revised Populations on Mortality Statistics for the United States, 2000," n.d.

8. McMonagle C, Brown D, Reeve R, Mancy R. Trends in the diversity of mortality causes and age-standardised mortality rates among subpopulations within Scotland, 2001-2019. SSM Popul Health. 2022 Aug 13;19:101192. doi: 10.1016/j.ssmph.2022.101192. PMID: 36039349; PMCID: PMC9418986.

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ORIGINAL ARTICLE - PUBLIC HEALTH

TRENDS IN MORTALITY FOR HYPERTENSIVE DISEASES AND DIABETES MELLITUS IN TAMIL NADU 2000 - 2021

Abishek Stanislaus [(1)], Selvavinayagam T S [(1)], Dr.Somasundaram A [(1)]
Sumathi Veerappan Rajamanikkam [(1)], Sangeetha Ramanujam [(1)]

(1) Directorate of Public Health & Preventive Medicine

Abstract

INTRODUCTION : The global burden of hypertension was estimated to be around 1.4 billion in 2010, likely to surpass 1.6 billion by 2025. Diabetes Mellitus has quadrupled in the last three decades and ranks as the ninth major cause of death. The objective of the study is to analyze the trends in mortality for Hypertensive Heart Disease and Diabetes Mellitus in Tamil Nadu from 2000 to 2021.

METHODOLOGY : The study design was a descriptive analysis of the Medical Certification of Cause of Death (MCCD) annual reports of Tamil Nadu State for the period 2000 to 2021. The MCCD annual reports from 2000 to 2021 and the required data were collected as soft copy from the Department of SBHI for Tamil Nadu and from 2008 to 2020 for India. The data for 2013 was not available. Data were analyzed by calculating proportions by subgroups for each year overall, by age, and by gender from 2000 to 2021.

RESULTS : The percentage of deaths due to Hypertensive Diseases decreased in Tamil Nadu during 2021 overall by 2.2%, and in both genders (Male: 2.1%, Female: 2.4%). The trend was not stable, with continuous increases and decreases through the years. Female mortality due to Hypertensive Diseases has been high since 2002 till 2021, except for 2014 & 2016. The percentage of cases due to Hypertensive Diseases in the age group 15 to 44 years was higher in males from 2000 to 2021 in Tamil Nadu. The percentage of deaths due to diabetes mellitus started to decline by 1.8% in 2021 compared to the previous year. Overall, female mortality due to diabetes mellitus has been high since 2000 till 2021 in Tamil Nadu. The percentage of cases in the age group 15 to 44 years was higher in males from 2000 to 2021 in Tamil Nadu.

CONCLUSION : The percentage of deaths due to Hypertensive Diseases and Diabetes Mellitus has started to decrease in Tamil Nadu during 2021, in both genders compared to previous years, although the percentage was higher for Diabetes Mellitus compared to 2000. Female mortality was higher due to Hypertensive Diseases and Diabetes Mellitus overall and in the age group 45 years and above.

KEYWORDS : Hypertensive Diseases, Diabetes Mellitus, Tamil Nadu, Mortality

INTRODUCTION

Non-communicable diseases result from a combination of genetic, physiological, environmental, and behavioral factors.[1] Hypertension and Diabetes Mellitus are major non-communicable diseases worldwide. Hypertension causes 7.5 million deaths worldwide, accounting for around 12.8% of total deaths.[2] Hypertensive diseases encompass a constellation of cardiac modifications induced by hypertension.[3] The high prevalence of hypertension leads to the rise of hypertensive diseases.[4] The global burden of hypertension was estimated to be around 1.4 billion in 2010 and is likely to surpass 1.6 billion by 2025.[5] Worldwide, 1.5 million deaths are directly attributed to diabetes each year, and the prevalence and cases are steadily increasing over the past few decades.[6] It has been noted that the number of people with Diabetes Mellitus has quadrupled in the last three decades, ranking it as the ninth major cause of death.[7]

The current epidemiological characteristics of Hypertensive Diseases and Diabetes Mellitus need to be studied in the state for a successful response to them, in comparison with past years. Studies comparing the mortality trends of Hypertensive Diseases and Diabetes Mellitus by overall, gender, and specific age groups for the state of Tamil Nadu are not available. This study can help policymakers and decision-makers by providing an idea of the current status and assisting them in making informed, evidence-based decisions to allocate resources for preventing and managing Hypertensive diseases and Diabetes Mellitus.

OBJECTIVE

The objective of the study is to study the trends in mortality for Hypertensive Diseases and Diabetes Mellitus in Tamil Nadu from 2000 to 2021.

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Corresponding Author: Abishek Stanislaus
e-mail : abishek299300@gmail.com

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METHODOLOGY

STUDY DESIGN :

The deaths considered for the study are those medically certified by doctors. These deaths represent only a proportion of the total deaths in the state, as only a specific percentage of deaths are reported as medically certified. Most of the reported deaths come from urban areas, with coverage percentages ranging from 19% to 45%. The number of medically certified deaths decreases as age increases.

The study design was a descriptive analysis of the Medical Certification of Cause of Death (MCCD) annual reports of Tamil Nadu State for the period 2000 to 2021. The MCCD data received from doctors was coded according to the International Classification of Diseases (ICD) – 10 version. The MCCD data is collated by collecting it in a specific format from the districts by the State Bureau of Health Intelligence (SBHI) in the annual report format provided by the Registrar General of India and submitted to them annually.

DATA COLLECTION :

The MCCD annual reports were collected as soft copies from the Department of SBHI for Tamil Nadu from 2000 to 2021 and for India from 2008 to 2020 from the CRS website. The data for India was taken to compare the trend of Tamil Nadu with the country. The MCCD data was available for India only from 2008. The mortality data for Hypertensive Diseases and Diabetes Mellitus was collected based on subchapters available from ICD-10 codes (Hypertensive Diseases [I10-I15], Diabetes Mellitus [E-10 –E14]) for all 21 years by age and gender from the MCCD reports available, which was collated into a single Excel sheet by the principal investigator. The data for India was available from 2008 to 2020, except for the overall status for Diabetes Mellitus, which was available from 2000. The data for the year 2013 was not available as it could not be extracted from the available source for Tamil Nadu and hence was not considered for analysis.

DATA ANALYSIS :

Data was analyzed by calculating percentage for Hypertensive Diseases & Diabetes Mellitus each year by overall, gender and specific age groups for Tamil Nadu from 2000 to 2021.

HUMAN SUBJECT PROTECTION :

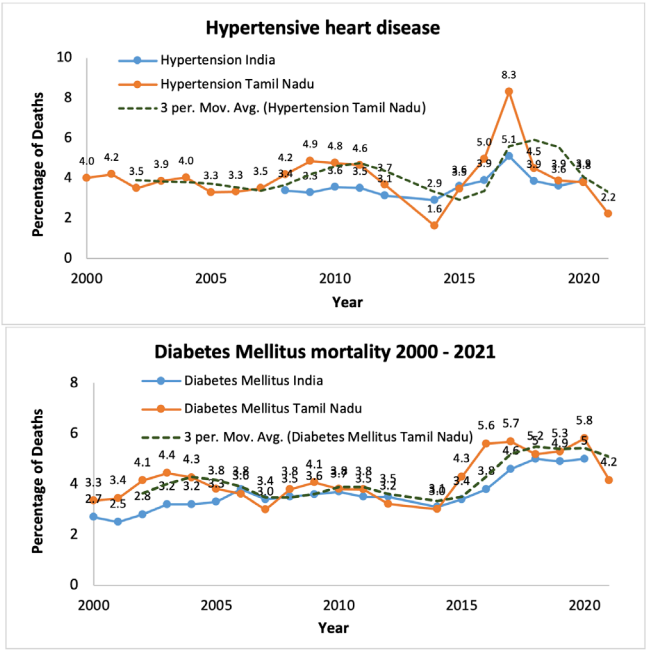
The study was approved by the Institutional Ethics Committee of Tamil Nadu Public Health Department. Privacy and confidentiality were maintained so that no personal data was used or revealed during analysis, report preparation, or presentation. The institution or district names were not revealed for privacy and confidentiality purposes.

RESULTS

The percentage of mortality due to Hypertensive Diseases in the state was 4% in 2000, which slightly increased and decreased within the range of 3.3% to 4.9% until 2012. Following this, there was a decrease in the state (1.6%) and in the country (2.9%) in 2014, which was the lowest mortality recorded in the available dataset. The percentage of mortality then started to rise from 2015 to 2017, from 3.5% to 8.3%, which was the highest percentage recorded in all 21 years of data, and then started to decrease to 2.2% in 2021. The percentage of mortality in the state, compared with the country, has been decreasing currently as of the 2020 data, which was higher in all years since 2008 except for 2014 and 2015.

The percentage of deaths due to diabetes mellitus in the state was 3.3% in 2000, which rose to 4.4% until 2003 and then started to decrease to 3% in 2007. The percentage again increased for two years to 4.1% and then started to decline to 3.0% by 2014. The percentage of deaths gradually increased until 2017 to 5.7% and then declined in the following year, after which it again started to increase to 5.8% in 2020. The percentage started to decline by 1.7% in 2021 compared to the previous year. The percentage of deaths, when compared with the country, has been higher in all years from 2000 to 2020 except for 2006-2007, 2012, and 2014. (Chart 1).

Chart 1: Trend of mortality of Hypertensive Diseases & Diabetes Mellitus 2000 – 2021

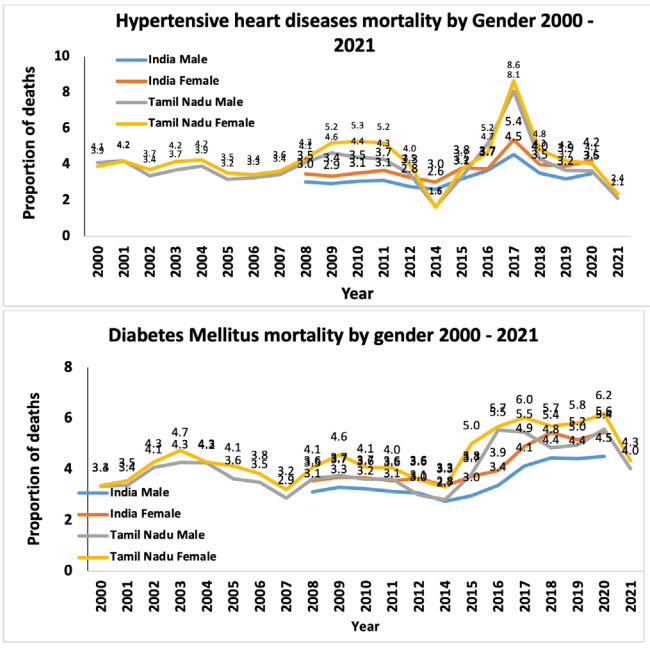


Overall, male mortality due to hypertension has been lower compared to females since 2002 until 2021, except for 2014 where it was equal and 2016 where it was higher than

females by 0.5%. When comparing male mortality with the country's data, it was noted that the percentage was higher in the state compared to the country from 2008 to 2020, except for 2014 where the country's percentage was higher than the state's proportion by 1%. Female mortality, when compared with the country's data, was higher in the state compared to the country from 2008 to 2020, except for 2014, 2015, and 2020 where the country's percentage was higher than the state's percentage by 1.4%, 0.1%, and 0.1%, respectively.

Overall, female mortality due to diabetes mellitus has been higher compared to males since 2000 until 2021. The highest difference between both genders was higher during 2015 (1.2% higher among females). When comparing male mortality with the country's data, it was noted that the percentage was higher in the state compared to the country from 2008 to 2020, except for 2012 where the country's percentage was higher than the state's proportion by 0.1%. Female mortality, when compared with the country's data, was higher in the state compared to the country from 2008 to 2020, except for 2012 and 2014 where the country's percentage was equal to the state's percentage. (Chart 2)

Chart 2 : Trend of mortality of Hypertensive Diseases & Diabetes Mellitus by gender 2000 – 2021



The percentage of mortality due to Hypertensive Diseases in the age group 0-14 years was lower in Tamil Nadu from 2008 to 2020 compared to India, except for 2012, 2014, and 2015, where it was the same in 2014 and 2015 (0.2%) and higher in Tamil Nadu by 1.7% in 2012, with the male gender having the higher percentage (1.9%) in 2012. The percentage of cases in the age group 15 to 44 years was lower overall and by gender when compared to the overall state percentage from 2000. The percentage of cases in the age group 15 to 44 years was higher in males compared to females from 2000 to 2021, except for 2014, 2019, and 2021 where it was equal in 2014 and 2019 in both genders while it was higher in females in 2021 with a difference of 0.2%. The percentage of cases in the age group 15 to 44 years was higher during 2017 in the entire 21 years of data (2000 – 2021) with 5.1% and less than 2% from 2002-2007, 2014-2015, and 2021. The percentage of cases was higher in Tamil Nadu when compared with India from 2008 to 2020 except in 2019 where it was equal overall and 0.1% higher in the country compared to the state percentage. The percentage of cases in the age group 45 years & above was higher in Tamil Nadu when compared with India from 2008 to 2020 except in 2014, 2015, and 2020 where it was higher in the country compared to the state percentage overall and by gender and only in females in 2019 by 0.3%. The percentage of cases in the age group 45 years & above was lower in 2021 (Overall: 2.4%, Male: 2.3%, Female: 2.5%) compared with 2000 (Overall: 5.5%, Male: 5.3%, Female: 5.8%) in Tamil Nadu. The percentage of cases in the age group 45 years & above was higher in females compared to males except in 2014 and 2016 where it was higher in males by 0.1% and 0.5%, respectively, in Tamil Nadu from 2000 to 2021. The percentage of cases in the age group 45 years & above was higher during 2017 in the entire 21 years with 9.3% and least in 2014 with 1.9% followed by 2.4% in 2021. (Table 1).

Table1 : Mortality proportion of Hypertensive Diseases by age group and gender 2000 – 2021

Mortality % of Hypertensive heart diseases by age group																		
Year	Tamil Nadu									India								
	0-14 years			15 to 44 years			45 years and above			0-14 years			15 to 44 years			45 years and above		
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
2000	0.0	0.0	0.0	3.1	2.4	2.8	5.3	5.8	5.5	NA	NA	NA	NA	NA	NA	NA	NA	NA
2001	0.0	0.0	0.0	3.6	2.2	3.0	5.1	6.3	5.5	NA	NA	NA	NA	NA	NA	NA	NA	NA
2002	0.0	0.0	0.0	1.6	1.2	1.5	4.5	5.6	4.9	NA	NA	NA	NA	NA	NA	NA	NA	NA
2003	0.0	0.0	0.0	1.6	1.2	1.4	4.8	6.1	5.3	NA	NA	NA	NA	NA	NA	NA	NA	NA
2004	0.0	0.0	0.0	1.7	1.3	1.5	5.1	6.1	5.4	NA	NA	NA	NA	NA	NA	NA	NA	NA
2005	0.0	0.0	0.0	1.4	1.2	1.3	4.0	4.8	4.3	NA	NA	NA	NA	NA	NA	NA	NA	NA
2006	0.0	0.0	0.0	1.4	1.1	1.3	4.1	4.7	4.3	NA	NA	NA	NA	NA	NA	NA	NA	NA
2007	0.0	0.0	0.0	1.5	1.4	1.4	4.4	5.1	4.7	NA	NA	NA	NA	NA	NA	NA	NA	NA
2008	0.0	0.0	0.0	2.3	1.6	2.1	5.0	5.7	5.3	0.2	0.2	0.2	1.2	1.0	1.1	4.5	5.6	4.9
2009	0.0	0.0	0.0	2.9	2.4	2.7	5.4	6.4	5.8	0.1	0.1	0.1	1.1	1.1	1.1	4.4	5.3	4.7
2010	0.0	0.0	0.0	2.3	2.1	2.2	5.3	6.6	5.8	0.1	0.1	0.1	1.4	1.1	1.3	4.4	5.5	4.8
2011	0.0	0.1	0.0	2.2	2.0	2.1	5.2	6.5	5.8	0.1	0.1	0.1	1.2	1.1	1.1	4.6	5.7	5.0
2012	1.9	1.5	1.7	2.2	2.0	2.1	4.0	4.8	4.3	0.2	0.2	0.2	1.1	1.0	1.1	3.9	4.9	4.3
2014	0.1	0.1	0.1	1.2	1.2	1.2	1.9	1.8	1.9	0.1	0.1	0.1	1.0	1.1	1.1	3.7	4.4	4.0
2015	0.2	0.2	0.2	2.0	1.8	1.9	3.7	4.2	4.0	0.2	0.2	0.2	1.5	1.5	1.5	4.3	5.2	4.7
2016	0.0	0.0	0.0	2.9	1.9	2.6	5.9	5.4	5.7	0.3	0.3	0.3	1.7	1.5	1.7	5.0	5.2	5.1
2017	0.0	0.0	0.0	5.5	4.4	5.1	9.0	9.7	9.3	0.1	0.1	0.1	2.6	2.9	2.7	5.9	7.0	6.3
2018	0.0	0.0	0.0	2.6	2.4	2.5	4.8	5.4	5.0	0.1	0.1	0.1	2.3	2.1	2.2	4.4	5.2	4.7
2019	0.0	0.0	0.0	2.1	2.1	2.1	4.1	4.6	4.3	0.1	0.1	0.1	2.0	2.2	2.1	3.9	4.9	4.3
2020	0.0	0.0	0.0	2.4	2.2	2.3	3.9	4.4	4.1	0.2	0.2	0.2	2.1	1.7	2.0	4.2	5.3	4.6
2021	0.0	0.0	0.0	1.3	1.5	1.4	2.3	2.5	2.4	NA	NA	NA	NA	NA	NA	NA	NA	NA

NA -Not Available

The percentage of mortality due to diabetes mellitus in the age group 0-14 years, both overall and by gender, was lower in Tamil Nadu from 2008 to 2011 and in 2017, and higher for the remaining years compared to India when compared from 2008 to 2020. The percentage of cases in the age group 15 to 44 years is lower overall and by gender when compared to the state average overall from 2000 to 2021 and the country average for the age group from 2008 to 2020.

The percentage of cases in the age group 15 to 44 years was higher in males compared to females from 2000 to 2021 in Tamil Nadu. The percentage of cases in the age group 15 to 44 years was higher during 2020 in the entire 21 years of data (2000 – 2021) with 3.2% and least during 2006 with 0.9%. The percentage of cases was lower in Tamil Nadu when compared with India from 2008 to 2020, except for five years in which it was equal in 2008 and higher in Tamil Nadu in the remaining four years (2015-2017 & 2020). The percentage of cases in the age group 45 years & above was higher overall and by gender when compared to the state average from 2000 to 2021. The percentage of cases in the age group 45 years & above was higher in females compared to males in Tamil Nadu during 2000 to 2021. The percentage of cases in the age group 45 years & above was higher during 2016 & 2017 in the entire 21 years with 6.4% and least in 2014 with 3.5%. The percentage of cases was higher in Tamil Nadu when compared with India from 2008 to 2020, was equal in 2008, and higher overall and by gender in Tamil Nadu during 2015 -2017, while it was higher by overall and male gender during 2020 and higher in the female gender in 2009 by 0.1% when compared to the country's percentage. (Table 2).

Table 2 : Mortality percentage of Diabetes Mellitus by age group and gender 2000 – 2021

Mortality % of Diabetes Mellitus by age group																			
Year	Tamil Nadu									India									
	0-14 years			15 to 44 years			45 years and above			0-14 years			15 to 44 years			45 years and above		
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
2000	0.0	0.0	0.0	1.8	1.3	1.6	4.6	5.5	4.9	NA	NA	NA	NA	NA	NA	NA	NA	NA
2001	0.0	0.0	0.0	1.2	0.9	1.1	4.7	5.8	5.1	NA	NA	NA	NA	NA	NA	NA	NA	NA
2002	0.0	0.0	0.0	1.2	1.0	1.1	5.7	6.6	6.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
2003	0.0	0.0	0.0	1.5	1.3	1.4	5.7	7.0	6.1	NA	NA	NA	NA	NA	NA	NA	NA	NA
2004	0.0	0.0	0.0	1.3	1.2	1.3	5.7	6.2	5.9	NA	NA	NA	NA	NA	NA	NA	NA	NA
2005	0.0	0.0	0.0	1.0	1.2	1.1	4.8	5.7	5.1	NA	NA	NA	NA	NA	NA	NA	NA	NA
2006	0.0	0.0	0.0	1.2	0.9	1.1	4.5	5.3	4.8	NA	NA	NA	NA	NA	NA	NA	NA	NA
2007	0.0	0.0	0.0	1.0	0.8	0.9	3.8	4.6	4.1	NA	NA	NA	NA	NA	NA	NA	NA	NA
2008	0.0	0.0	0.0	1.3	1.2	1.3	4.6	5.4	4.9	0.4	0.5	0.5	1.2	1.3	1.2	4.6	5.4	4.9
2009	0.0	0.0	0.0	1.6	1.4	1.5	4.6	5.8	5.1	0.4	0.4	0.4	1.3	1.3	1.3	4.8	5.6	5.1
2010	0.0	0.0	0.0	1.6	1.5	1.6	4.4	5.2	4.7	0.3	0.3	0.3	1.0	1.1	1.0	4.8	5.7	5.1
2011	0.0	0.1	0.1	1.7	1.6	1.7	4.5	5.1	4.7	0.1	0.1	0.1	1.0	1.0	1.0	4.6	5.5	4.9
2012	1.0	1.3	1.2	1.5	1.3	1.4	3.6	4.5	3.9	0.2	0.3	0.2	1.1	1.1	1.1	4.4	5.4	4.8
2014	0.2	0.2	0.2	2.1	2.2	2.1	3.2	3.9	3.5	0.1	0.1	0.1	1.2	1.3	1.2	3.8	4.8	4.2
2015	0.1	0.2	0.2	1.8	2.7	2.1	4.4	5.7	4.9	0.1	0.2	0.1	1.2	1.5	1.3	4.1	5.1	4.5
2016	0.0	0.0	0.0	3.0	2.9	3.0	6.3	6.4	6.4	0.1	0.2	0.1	1.4	1.5	1.5	4.6	5.5	5.0
2017	0.6	0.6	0.6	3.2	3.0	3.1	6.1	6.7	6.4	0.2	0.3	0.2	1.7	1.9	1.7	5.5	6.6	6.0
2018	0.3	0.5	0.3	2.6	3.0	2.7	5.4	6.3	5.8	0.2	0.3	0.2	1.7	1.9	1.7	5.9	7.2	6.4
2019	0.2	0.2	0.2	2.7	3.1	2.8	5.6	6.4	5.9	0.1	0.2	0.2	1.7	1.9	1.8	5.8	6.8	6.2
2020	0.4	0.3	0.4	3.1	3.4	3.2	6.0	6.7	6.3	0.2	0.2	0.2	2.1	1.9	2.0	5.6	6.9	6.1
2021	0.0	0.0	0.0	2.9	3.1	3.0	4.3	4.6	4.4	NA	NA	NA	NA	NA	NA	NA	NA	NA

NA -Not Available

DISCUSSION

A study conducted by Dai et al. revealed that deaths due to Hypertensive Diseases globally have increased drastically when compared from 1990 to 2017. It was noted that the deaths due to Hypertensive Diseases were higher in males younger than 70 years than in females in the same age group, whereas the numbers were lower among males than among females in age groups of ≥70 years (8). In our study, we compared the mortality of Hypertensive Diseases and Diabetes Mellitus using percentages for 21 years from 2000 to 2021 for the state with the country by overall mortality, gender, and age group. It was noted that the percentage of deaths due to Hypertensive Diseases has started to decrease in Tamil Nadu during 2021 (2.2%) when compared to 2000 (4.0%). The current decrease in Hypertension and Diabetes Mellitus may be due to the MTM (Makkalai Thedi Maruthuvam) scheme implemented in Tamil Nadu. The MTM scheme involves screening and delivering medications for NCDs at people's doorsteps. The percentage of mortality due to Hypertensive Diseases in Tamil Nadu, when compared to India, was consistently higher from 2008 to 2019 except in 2012 and started to decrease since 2020. Female mortality is high due to Hypertensive Diseases when compared to male mortality since 2002 till 2021, except for two particular years, 2014 & 2016. Female mortality of the state has also been high when compared with the country in almost all the years from 2008 to 2020. The percentage in both genders has decreased notably in 2021 to almost half of the percentage in 2000 (Male: 2.1%, Female: 2.4%) when compared with 2000 (Male: 4.1%, Female: 3.9%) in Tamil Nadu. The mortality of Hypertensive Diseases by age group was higher from age group 15 years and above in almost all the years in Tamil Nadu compared to country mortality, but there is a decrease since 2020 in the age group 45 years and above. The percentage of cases in the age group 15 to 44 years was higher in males compared to females, and vice versa in the age group 45 years and above in almost all the years from 2000 to 2021 in Tamil Nadu.It was noted in a study that by 2016, diabetes-related mortality declined by 7% in 49 countries. In High-Income Countries, it declined by 12%, while in Middle-Income Countries, it increased by 11%, which could be due to a higher prevalence (9). In another study, it was noted that the global mean mortality rate due to Diabetes Mellitus followed an upward trend in developing countries until 2005, and then a downward trend (10). In another study, it was noted that the age effect on the mortality of diabetes has increased with advancing age for both males and females (11).The percentage of deaths due to diabetes mellitus in the state was 3.3% in 2000 and had ups and downs fluctuating till 2021, but the percentage started to decline by 1.8% in 2021 compared to the previous year but was almost higher in all the years when compared to the country's percentage from 2000 to 2020. Overall, female mortality due to diabetes mellitus has been high compared to males since 2000 till 2021 in Tamil Nadu, and the same pattern is noted for the country. The percentage of mortality of diabetes mellitus in the age group 0-14 years by overall and gender was lower in Tamil Nadu from 2008 to 2011 and in 2017 and higher for the remaining years compared to India when compared from 2008 to 2020. The percentage of cases in the age group 15 to 44 years was lower when compared to the country's percentage from 2008 to 2020. The percentage

of cases was higher in Tamil Nadu when compared with India from 2008 to 2020, was higher overall and by gender in Tamil Nadu during 2015 -2017, while it was higher by overall and male gender during 2020 and higher in the female gender in 2009 by 0.1% when the country compared to the state percentage. The percentage of cases in the age group 15 to 44 years was higher in males when compared to females, and vice versa in the age group 45 years and above from 2000 to 2021 in Tamil Nadu.

CONCLUSION

The percentage of deaths due to Hypertensive Diseases has started to decrease in Tamil Nadu during 2021 and in both gender and the trend was fluctuating with continuous increase and decrease through the years. The mortality percentage among female gender was high due to Hypertensive Diseases since 2002 till 2021 except 2014 & 2016. The mortality percentage due to Hypertensive Diseases in the age group 15 to 44 years was higher in males and vice versa in age group 45 years and above in almost all the years from 2000 to 2021 in Tamil Nadu. The percentage of cases seen the age group 45 years and above for both Hypertensive Diseases and Diabetes Mellitus. The percentage of deaths by diabetes mellitus in the state started decreasing compared to previous year. Overall the female mortality due to diabetes mellitus has been high compared to males since 2000 till 2021 in Tamil Nadu. The percentage of cases in the age group 15 to 44 years was higher in males when compared to females and vice versa in age group 45 years and above from 2000 to 2021 in Tamil Nadu.

RECOMMENDATIONS

The high mortality percentage among females overall and in specific age group 45 years and above for Hypertensive Diseases and Diabetes Mellitus must be studied. The higher mortality among males for Hypertensive Diseases and Diabetes Mellitus in the age group 15 – 44 years also must be studied.

LIMITATIONS

The entire picture of the state is not presented as only a part of deaths are medically certified.

CONFLICT OF INTEREST None

REFERFENCES

1. World Health Organization. (2023). World health statistics 2023: monitoring health for the SDGs, sustainable development goals. World Health Organization https://iris.who.int/handle/10665/367912 . License: CC BY-NC-SA 3.0 IGO

2. Indicator Metadata Registry Details. (n.d.). https://www.who.int/data/ gho/indicator-metadata-registry/imr-details/3155

3. Drazner, Mark H. "The Progression of Hypertensive Heart Disease." Circulation123,no.3(2011):327–34.https://doi.org/10.1161/ CIRCULATIONAHA . 108.845792.

4. Cuspidi C, Sala C, Negri F, Mancia G, Morganti A; Italian Society of Hypertension. Prevalence of left-ventricular hypertrophy in hypertension: an updated review of echocardiographic studies.J Hum Hypertens. 2012; 26:343–349. doi: 10.1038/jhh.2011.104

5. Mills KT, Bundy JD, Kelly TN, Reed JE, Kearney PM, Reynolds K, Chen J, He J. Global disparities of hypertension prevalence and control: a systematic analysis of population-based studies from 90 countries. Circulation. 2016; 134:441–450. doi: 10.1161/ CIRCULATIONAHA .115.018912

6. Diabetes. (2019, May 13). https://www.who.int/health topics/diabetes?gclid=Cj0KCQiAh8OtBhCQARIsAIkWb6_unY7_Oit5_jrpo3wk0QaqmxRHRYG0oji-Cc7s2Xw_clVVf7TwUJIaAjCLEALw_wcB#tab=tab_1

7. GBD 2019 Stroke Collaborators Global, regional, and national burden of stroke and its risk factors, 1990-2019: a systematic analysis for the Global Burden of Disease Study 2019. Lancet Neurol. 2021 Oct;20(10):795–820. doi:10.1016/S1474-4422(21)00252-https://air.unimi.it/handle/2434/866438 .S1474-4422(21)00252-0

8. Dai H, Bragazzi NL, Younis A, Zhong W, Liu X, Wu J, Grossman E. Worldwide Trends in Prevalence, Mortality, and Disability-Adjusted Life Years for Hypertensive Heart Disease From 1990 to 2017. Hypertension. 2021 Apr;77(4):1223-1233. doi: 10.1161/HYPERTENSIONAHA.120.16483. Epub 2021 Feb 15. PMID: 33583201.

9. Khaltaev N, Axelrod S. Global trends in diabetes-related mortality with regard to lifestyle modifications, risk factors, and affordable management: A preliminary analysis.

Chronic Dis Transl Med. 2021 Apr 15;7(3):182-189. doi: 10.1016/j.cdtm.2021.03.003. PMID: 34505018; PMCID: PMC8413119.

11. Balooch Hasankhani, M., Mirzaei, H. & Karamoozian, A. Global trend analysis of diabetes mellitus incidence, mortality, and mortality-to-incidence ratio from 1990 to 2019. Sci Rep 13, 21908 (2023). https://doi.org/10.1038/s41598-023-49249-0

12. Jha RP, Shri N, Patel P, Dhamnetiya D, Bhattacharyya K, Singh M. Trends in the diabetes incidence and mortality in India from 1990 to 2019: a joinpoint and age-period-cohort analysis. J Diabetes Metab Disord. 2021 Jul 5;20(2):1725-1740. doi: 10.1007/s40200-021-00834-y. Erratum in: J Diabetes Metab Disord. 2021 Aug 12;20(2):1741. PMID: 34900822; PMCID: PMC8630265.

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ORIGINAL ARTICLE - PUBLIC HEALTH

DEPRESSION AND ANXIETY AMONG DIABETIC AND HYPERTENSIVE PRIMARY HEALTH CARE PATIENTS IN KANNIYAKUMARI DISTRICT

Eberlein George [(1)], *Prathap Kumar P* [(2)], *Pravin T* [(2)]
Krishnaraj K [(2)], *Selvavinayagam T S* [(2)]

(1) District Programme Officer, Non-Communicable Diseases, O/o Deputy Director of Health Services, Nagercoil.
(2) Directorate of Public Health & Preventive Medicine

Abstract

INTRODUCTION : To determine if depression or anxiety among the patient of non communicable diseases play a role in control of their diseases.
METHODOLOGY : Secondary data analysis of the study conducted by J-PAL. All the data collected by the primary study has been included without any inclusion or exclusion criteria.
RESULTS : Data of 1097 participants enrolled in the primary study was analysed. Out of the 1097 participants, 672 were females and 425 were males. The median age of the participants was 57 years with an IQR of 16. Out of the participants who were suggestive to have anxiety on the PHQ4 questionnaire, 15% and 20% had uncontrolled hypertension and uncontrolled diabetes respectively. Out of the participants who were suggestive to have depression, 20% had uncontrolled hypertension and 8% had uncontrolled diabetes.
CONCLUSION : This secondary analysis reinforces the idea that mental health plays a vital role in the control of non communicable diseases. Further comprehensive studies are warranted to cement the findings of this analysis.
KEYWORDS : Mental health, hypertension, diabetes

INTRODUCTION

Depression and anxiety are now being recognized as emerging non-communicable disease states across entire populations.[1] This heightened awareness has come to the forefront following the COVID-19 outbreak. The disaster has illuminated the often overlooked issue of mental health, particularly among the elderly and working-class populations. Shortly after the onset of the COVID-19 pandemic, reports began to surface emphasizing the significance of mental health disorders, particularly depression.[2]

The COVID-19 pandemic acted as a catalyst, bringing mental health into sharper focus as individuals grappled with unprecedented challenges such as isolation, fear of illness, economic instability, and grief. These stressors exacerbated pre-existing mental health conditions and triggered new cases of depression and anxiety. Moreover, the pandemic highlighted disparities in access to mental health resources, further underscoring the urgent need for comprehensive mental health support systems.

Among the most affected demographics were the elderly, who faced heightened vulnerability due to increased social isolation and greater susceptibility to severe illness from the virus.[3] Additionally, the working-class population bore the brunt of economic hardships, job insecurity, and the pressure to adapt to remote work environments, all of which contributed to heightened levels of stress and anxiety. In response to these challenges, governments, healthcare organizations, and advocacy groups have intensified efforts to raise awareness about mental health issues and expand access to mental health services.

Telemedicine and online support groups have emerged as crucial resources for individuals seeking assistance during periods of social distancing and lockdowns. Moving forward, it is imperative to prioritize mental health as an integral component of public health initiatives.

Long-term strategies should focus on destigmatizing mental illness, integrating mental health services into primary healthcare systems, and fostering resilience and coping mechanisms within communities.[4] By addressing mental health concerns holistically, societies can better support individuals in navigating the complex challenges of the modern world, pandemic or otherwise.

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Corresponding Author: Prathap Kumar P
e-mail : georgeeberlein@gmail.com

The Sustainable Development Goal (SDG) target 3.4 sets a clear agenda: "By 2030, reduce by one third premature mortality from non-communicable diseases through prevention, treatment, and promotion of mental health and well-being."[5] This objective underscores the recognition among policymakers of the integral link between mental well-being and overall physical health within the population.

There's a growing acknowledgment that addressing mental health issues isn't just about improving individual lives; it's also about bolstering public health outcomes and reducing healthcare costs in the long term. By integrating mental health considerations into existing policies and programs, policymakers can effect significant savings on healthcare expenditures by preventing the escalation of mental health conditions and their associated physical health complications.

Small adjustments to existing policies and programs can yield substantial benefits.[6] For instance, incorporating mental health screenings into routine healthcare check-ups can facilitate early detection and intervention for individuals at risk of developing mental health disorders. Additionally, ensuring access to affordable mental health services and promoting mental health literacy within communities can help destigmatize seeking treatment and encourage proactive management of mental well-being.

Investing in preventive measures and early intervention not only improves individual outcomes but also alleviates the strain on healthcare systems and reduces the economic burden associated with treating advanced stages of mental illness. Moreover, prioritizing mental health promotion aligns with broader public health goals, fostering resilient and thriving communities.

By aligning policy decisions with the objectives outlined in SDG target 3.4, governments can cultivate a more holistic approach to healthcare that recognizes the interconnectedness of mental and physical well-being. Through strategic investments in mental health promotion and early intervention, policymakers can pave the way for healthier, happier populations while simultaneously achieving significant cost savings in healthcare expenditures.

Non-communicable diseases (NCDs) present a unique challenge due to their requirement for long-term drug therapy and strict adherence to treatment regimens. However, the prolonged use of medications, coupled with the frequency of dosing, can have detrimental effects on the mental well-being of patients.[7] This negative impact on mental health often translates into decreased medication compliance, exacerbating the control of the underlying NCD.

As adherence to treatment dwindles, the management of the NCD becomes increasingly challenging, necessitating escalation of treatment strategies. This escalation not only intensifies the burden of managing the disease but also contributes to heightened levels of stress and depression among patients. Consequently, a vicious cycle ensues, wherein depression further compromises treatment adherence and disease control, leading to a downward spiral of deteriorating health outcomes.

This study endeavors to illuminate the effects of mental health on the control rates of hypertension and diabetes. By understanding the interplay between mental health and disease management, healthcare providers can develop targeted interventions aimed at improving medication adherence and enhancing the overall quality of life for patients with chronic diseases.

Exploring avenues for intervention within this cycle offers an opportunity to implement holistic approaches to patient care that address both the physical and psychological dimensions of chronic disease management. By breaking the cycle of depression and poor disease control, healthcare professionals can empower patients to regain control over their health and well-being, ultimately fostering improved health outcomes and enhanced quality of life.

Type 2 Diabetes Mellitus and Hypertension remain at the forefront of non-communicable diseases, as evidenced by data from the National Family Health Survey – 5. In Tamil Nadu, 20.7% of women and 22.1% of men exhibit elevated blood sugar levels or require medication for control. Similarly, 24.8% of females and 30.2% of males struggle with poorly managed blood pressure or rely on medication.[8]

A study titled 'Depression Increases the Risk for Uncontrolled Hypertension' reveals a striking relative risk of 15.5 for uncontrolled hypertension among depressed individuals.[9] The research also uncovers a significant correlation between depression and both systolic and diastolic blood pressure values. The authors advocate for the screening of depression in hypertensive patients, citing its simplicity and cost-effectiveness as potential tools for improving outcomes.

METHODS

This secondary study analyzes data derived from a larger primary investigation, which was conducted with after ethical clearance. The primary study (JAPL-ML) employed random sampling techniques across various blocks within the Kanniyakumari district from 19 July 2023 to 23 September 2023, selecting four blocks at random. Subsequently, one

primary health center per block was chosen randomly, and patients attending routine outpatient clinics were recruited as study participants after providing informed consent in the local vernacular language. All consecutive patients attending the general outpatient department were included in the primary study. This secondary data analysis utilizes the entirety of the data collected during the primary study, without any additional inclusions or exclusions.

RESULTS

Table 1 : Sex distribution of the study participants

Parameter	Frequency	Percentage
Females	672	61
Males	425	39
Total	1097	100

The median age of the study participants was 57 years with an interquartile range of 16 years. There was a total of 798 hypertensive patients and 510 diabetic patients. 14 new hypertensive patients and 7 new diabetic patients were diagnosed at the time of the study.

Out of the 798 hypertensive patients 450 (56.4%) had uncontrolled blood pressure values (systolic more than or equal to 130 or diastolic more than or equal to 90). Out of the 510 diabetic patient 288 (56.5%) had uncontrolled glycosylated hemoglobin values (>7). 15% of the participants who were suggestive of having anxiety on the PHQ4 questionnaire had poorer control of hypertension and 20% of participatns who were suggestive of having anxiety on the PHQ4 questionnaire had poorer control of their blood sugar values. Of the participants with uncontrolled glycosylated hemoglobin values, 8% were suggestive of having depression on the PHQ4 questionnaire. Among participants with uncontrolled blood pressure values, 11% were suggestive of having depression on the PHQ4 questionnaire.

Table 1 : Sex distribution of the study participants

	Anxiety	Depression
Uncontrolled Hypertension	15% (66/450)	11% (51/450)
Uncontrolled Diabetes	20% (59/288)	8% (22/288)

The number of participants who had either uncontrolled hypertension or uncontrolled diabetes who were suspected of having either anxiety or depression was 23%.

DISCUSSION

In Kanniyakumari district, primary health centers witness an average daily attendance of approximately 20 non-communicable disease patients, with 13 being females and 7 males. Conversely, mental health clinics register a significantly lower average daily attendance of around 3 patients, underscoring the prevalent stigma surrounding mental health disorders, particularly in rural areas.

The correlation between depression or anxiety and the management of hypertension and diabetes mellitus has been well-documented in prior studies(10, 11, 12, 13). This secondary data analysis reinforces the notion that the presence of anxiety or depression can affect the control rates of non-communicable diseases within communities. It underscores the need for further research in this area, which could delve deeper into the tangible effects of mental health interventions on the management of non-communicable diseases. Exploring the interplay between mental health and the control of chronic conditions such as hypertension and diabetes opens avenues for more targeted interventions aimed at improving overall health outcomes. By elucidating the mechanisms through which anxiety and depression affect disease management, future research can inform the development of tailored interventions that address both the physical and psychological aspects of patient care. Moreover, investigating the effectiveness of mental health interventions in enhancing disease control can provide valuable insights into potential strategies for integrated healthcare delivery. By integrating mental health screening and intervention into primary care settings, healthcare providers can offer comprehensive support to individuals managing chronic conditions, thereby improving both their physical and mental well-being.

CONCLUSION

In conclusion, while existing research highlights the association between mental health and the control of non-communicable diseases, further exploration is needed to elucidate the specific pathways and potential interventions. By prioritizing research in this area, healthcare professionals can advance our understanding of how mental health influences disease management and develop innovative approaches to improve health outcomes for individuals with chronic conditions.

CONFLICT OF INTEREST No conflict of interest

CORRESPONDING AUTHOR

Eberlein George

REFERENCES :

1. Pearce M, Garcia L, Abbas A, Strain T, Schuch FB, Golubic R, Kelly P, Khan S, Utukuri M, Laird Y, Mok A, Smith A, Tainio M, Brage S, Woodcock J. Association Between Physical Activity and Risk of Depression: A Systematic Review and Meta-analysis. JAMA Psychiatry. 2022 Jun 1;79(6):550-559. doi: 10.1001/jamapsychiatry.2022.0609. PMID: 35416941; PMCID: PMC9008579.

2. COVID-19 Mental Disorders Collaborators. Global prevalence and burden of depressive and anxiety disorders in 204 countries and territories in 2020 due to the COVID-19 pandemic. Lancet. 2021 Nov 6;398(10312):1700-1712. doi: 10.1016/S0140-6736(21)02143-7. Epub 2021 Oct 8. PMID: 34634250; PMCID: PMC8500697.

3. Liang J, Huang S, Jiang N, Kakaer A, Chen Y, Liu M, Pu Y, Huang S, Pu X, Zhao Y, Chen Y. Association Between Joint Physical Activity and Dietary Quality and Lower Risk of Depression Symptoms in US Adults: Cross-sectional NHANES Study. JMIR Public Health Surveill. 2023 May 10;9:e45776. doi: 10.2196/45776. PMID: 37163324; PMCID: PMC10209797.

4. Penninx BWJH, Benros ME, Klein RS, Vinkers CH. How COVID-19 shaped mental health: from infection to pandemic effects. Nat Med. 2022 Oct;28(10):2027-2037. doi: 10.1038/s41591-022-02028-2. Epub 2022 Oct 3. PMID: 36192553; PMCID: PMC9711928.

5. WHO global meeting to accelerate progress on SDG target 3.4 on noncommunicable diseases and mental health. East Mediterr Health J. 2021 May 27;27(5):524-525. doi: 10.26719/2021.27.5.524. PMID: 34080682.

6. Le LK, Esturas AC, Mihalopoulos C, Chiotelis O, Bucholc J, Chatterton ML, Engel L. Cost-effectiveness evidence of mental health prevention and promotion interventions: A systematic review of economic evaluations. PLoS Med. 2021 May 11;18(5):e1003606. doi: 10.1371/journal.pmed.1003606. PMID: 33974641; PMCID: PMC8148329.

7. Namisango E, Powell RA, Taylor S, Radbruch L, Freeman R, Haufiku D, Mwagomba BM Dr, Acuda W, Thambo L, Kambiya I, Luyirika EBK, Mwangi-Powell FN, Harding R. Depressive Symptoms and Palliative Care Concerns Among Patients With Non-communicable Diseases in Two Southern African Countries. J Pain Symptom Manage. 2023 Jan;65(1):26-37. doi: 10.1016/j.jpainsymman.2022.09.008. Epub 2022 Sep 24. PMID: 36162705.

8. National Family Health Survey - 5: 2019 - 2021. (n.d.). http://rchiips.org/nfhs/NFHS-5_FCTS/Tamil_Nadu.pdf. http://rchiips.org/nfhs/NFHS-5_FCTS/Tamil_Nadu.pdf

9. Rubio-Guerra AF, Rodriguez-Lopez L, Vargas-Ayala G, Huerta-Ramirez S, Serna DC, Lozano-Nuevo JJ. Depression increases the risk for uncontrolled hypertension. Exp Clin Cardiol. 2013 Winter;18(1):10-2. PMID: 24294029; PMCID: PMC3716493.

10. Mohammed A, Putnis N, Kakunze A, Riches SP, Humphreys E, Eaton J, Bhatia T, Dar O, Raji T, Walker IF, Ogwell A. Non-communicable diseases, injuries, and mental ill-health in Africa: the role of the Africa Centres for Disease Control and Prevention. Lancet Glob Health. 2023 Apr;11(4):e495-e496. doi: 10.1016/S2214-109X(23)00054-2. PMID: 36925164.

11. Math SB, Thippaiah SM, Nanjappa MS. Lessons learnt from the National Mental Health Programme (NMHP): A guide to success for the National Health Programme for Non-Communicable Diseases. Indian J Med Res. 2021 Mar;154(3):416-421. doi: 10.4103/ijmr.IJMR_2518_19. PMID: 34854429; PMCID: PMC9131796.

12. Gyawali B, Harasym MC, Hassan S, Cooper K, Boschma A, Bird M, Konradsen F, Raju E, Tellier S. Not an 'either/or': Integrating mental health and psychosocial support within non-communicable disease prevention and care in humanitarian response. J Glob Health. 2021 Nov 13;11:03119. doi: 10.7189/jogh.11.03119. PMID: 34804510; PMCID: PMC8590828.

13. Obas KA, Bytyci-Katanolli A, Kwiatkowski M, Ramadani Q, Fota N, Jerliu N, Statovci S, Gerold J, Zahorka M, Probst-Hensch N. Strengthening Primary Healthcare in Kosovo Requires Tailoring Primary, Secondary and Tertiary Prevention Interventions and Consideration of Mental Health. Front Public Health. 2022 Apr 5;10:794309. doi: 10.3389/fpubh.2022.794309. PMID: 35480592; PMCID: PMC9037373.

14. PHQ 4 questionnaire. (2011, November). Obas KA, Bytyci-Katanolli a, Kwiatkowski M, Ramadani Q, Fota N, Jerliu N, Statovci S, Gerold J, Zahorka M, Probst-Hensch N. Strengthening Primary Healthcare in Kosovo Requires Tailoring Primary, Secondary and Tertiary Prevention Interventions and Consideration of Mental Health. Front Public Health. 2022 Apr 5;10:794309. Doi: 10.3389/fpubh.2022.794309. PMID: 35480592; PMCID: PMC9037373. Retrieved March 20, 2024, from https://www.oregonpainguidance.org/app/content/uploads/2016/05/PHQ-4.pdf

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ORIGINAL ARTICLE - PUBLIC HEALTH

SURVEILLANCE OF ADVERSE EVENTS FOLLOWING IMMUNIZATION (AEFI) FOLLOWING ROUTINE IMMUNIZATION (RI) IN TAMIL NADU

Vinay Kumar Krishnamurthy [(1)], Vidhya Viswanathan [(1)], Naveen Paul Pugal Mani [(1)], Ramani Satyanidhi Rao [(1)], Srimantha Sriramalu [(1)], Manjunatha Swamy Anandan [(1)], Sathish Kumar Ramalingam [(1)], Selvavinayagam T S [(1)]

(1) Directorate of Public Health and Preventive Medicine, Chennai-6

Abstract

INTRODUCTION : Globally, 3.5- 5 million childhood deaths are averted every year and more than 15 million future deaths have been halved with increasing access to immunisation services. Vaccines are safe, but it's a fact that no vaccination is risk-free, and after vaccination, side effects may occur in some instances. A vaccine may naturally result in fever, erythema, localized discomfort, etc. during the immunity-building process. There is a remote chance that the vaccine's ingredients will cause a foreign body reaction, which may raise some concerns to parents and caregivers. Monitoring of Adverse Events Following Immunization (AEFI) is an essential strategy for ensuring the safety of vaccines and its administration. This article describes status of implementation, key aspects and challenges of AEFI Surveillance in Tamil Nadu.

METHODS : The program documents from 2008, minutes of AEFI committee meetings and all cases discussed in each of the meetings were analysed.

RESULTS : Minor AEFI reported in the state HMIS portal is 2,671 in 2011-12 and is 46,369 in 2023-24. The approximate vaccine doses administered is 95.56 and 146.42 Lakhs in in 2011-12 and 2023-24 respectively. The number of reported serious and severe AEFI cases increased from 92 in 2015 to 457 AEFIs in 2023. However, there was a slight reduction in AEFI reporting seen in 2020, 2021 which may be due to COVID-19 pandemic. Annual reporting ratio of AEFI per 100,000 surviving infants, designated as a performance indicator is 0.71 in 2015-16 and 4.71 in 2023-24. Of total 1,887 serious and severe AEFI cases reported from the year 2015, 1,684(89.3%) has been discussed and of those, 47.8% of AEFIs were classified as 'A1'- Vaccine product related reactions, 39.3% as 'C'- Coincidental events and there were Zero% of AEFIs due to "A2"- Vaccine quality defect related reactions.

CONCLUSION : Trainings, increasing awareness among field level staff, and monitoring should be done consistently to further improve AEFI surveillance in the State. Embracing future research opportunities in AEFI including descriptive analysis, and qualitative study among field workers can indeed help stakeholders enhance the effectiveness and transparency of AEFI surveillance systems. This in turn contribute significantly to maintain public confidence in vaccination programs and ensuring vaccine safety for all populations.

KEYWORDS : Passive surveillance, vaccine safety, Routine Immunization

INTRODUCTION

Vaccines are known to protect against Vaccine Preventable Diseases (VPDs), which lowers the frequency and severity of VPDs and saves lives of the children. By guaranteeing that every person receives all necessary vaccinations at the proper age and in time, Immunization per se offers protection not only for the individual against the VPDs but also to the community. Vaccines are safe, but it's a fact that no vaccination is risk-free, and after vaccination, side effects may occur in some instances. It is also critical to remember that the benefits of vaccinations have far more outweighed the risks related to or perceived to be due to the vaccines.[1] Vaccines have brought a significant reduction in deaths and morbidity associated with VPDs.[2–4] Globally, 3.5 - 5million childhood deaths are averted every year and more than 15 million future deaths have been halved with increasing access to immunisation services.[5] Vaccines administered to the healthy new-borns and youngsters are alien substances to human bodies.[10] A vaccine may naturally result in fever, erythema, localized discomfort, etc. during the immunity-building process. In addition, there is a remote chance that the vaccine's ingredients will cause a foreign body reaction, which may raise some concerns to the parents and caregivers. With more number of vaccines being introduced in the Expanded Programme on Immunisation in many Low- and Middle-income Countries (LMICs) it is necessary to establish a functional Surveillance systems for Adverse Events Following Immunization(AEFI).[6–8] Each vaccine has their own related minor, serious and severe reactions at a particular expected incidence.[1,14] The World Health Organization

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Corresponding Author: Vidhya Viswanathan
e-mail : vidhyaviswanathan5210@gmail.com

(WHO) defines Adverse Event Following Immunization (AEFI) as "any untoward medical occurrence which follows immunization and which does not necessarily have a causal relationship with the usage of the vaccine".[9] Regardless of the reasons, an AEFI has the potential to deeply distress individuals to the point that they decide not to vaccinate their children and also inform their peer group about the same. This could result in vaccine denial/ hesitancy and the kids far more likely to contract a disease that can be prevented by vaccination, get gravely sick, become handicapped, and possibly even die. Thus, AEFI Surveillance contributes a lot to maintain a public trust about the immunization program being implemented in the country. However, the majority of AEFIs are moderate, resolve on their own, and don't require long-term care, extremely uncommon cases might result in substantial adverse reactions. Every time a vaccine is administered, the risk of AEFI is balanced against the danger of not immunizing a kid. A vaccination is only deemed safe when the advantages outweigh the disadvantages. However, even at a comparatively low incidence, there is a chance that the children who received the vaccination will experience a few major adverse effects due to the large absolute number of beneficiaries.

The way vaccination programs being implemented creates a "paradox," which means that the focus of attention changes with the implementation of immunization program when the vaccination coverage increases and disease burden reduces drastically, more cases of AEFI attract the attention of the people than the disease in the community.[11] The major objective of AEFI surveillance is early detection and analysis of adverse events and appropriate and quick response in order to decrease the negative impact on the health of individuals and the immunization programme. At least 10 AEFI per 100,000 surviving infants were reported in 2015 in 60% of the countries in the WHO Region of the Americas, 55% of the countries in Europe, 43% of the countries in the Eastern Mediterranean, 33% of the countries in the Western Pacific, and 27% of the countries in South-East Asia.[12] When novel vaccinations or vaccine combination products are introduced, monitoring AEFI is particularly crucial. AEFIs must be properly identified, reported, and handled. The vaccinators, healthcare specialists, and partners must collaborate well on this complicated activity that involves numerous interconnected and cross-disciplinary duties. Field-based healthcare personnel must identify and report all cases of AEFI occurring in their setting and expert AEFI causation evaluation and high-calibre AEFI field investigations should follow then. Sustaining the public's and healthcare professionals' faith in the vaccination program depends on timely and efficient internal and external communications. The program may be in jeopardy when AEFI reporting, investigation, causation evaluation, and communication are done poorly. This could have an impact on vaccination acceptance and uptake and expose communities to diseases that could be prevented by vaccination.[13] Assuring vaccine safety begins with efficient spontaneous AEFI reporting.[5]

Universal Immunization Program (UIP) under the Ministry of Health and Family Welfare, Government of India has been providing life-saving vaccines to approximately 27.4 million children and 30 million pregnant women, which benefits the largest cohort of beneficiaries in the world from Vaccine Preventable Diseases (VPDs).[14] In India, vaccinations administered as part of the Universal Immunization Programme (UIP) are voluntary.

With the introduction of the Universal Immunization Program (UIP) in 1985, AEFI surveillance was initiated in India in 1988. The World Health Organization, National Polio Surveillance Project India and other development partners provided technical help to Government of India in 2005–2006 to draft the National AEFI Surveillance and Response Operational Guidelines. The guidelines were revised in 2010, 2015 and latest by 2024. These guidelines, which were developed through consultation with a variety of stakeholders, including State Government program managers, academic institutions, independent subject experts, officials from the Drug Controller General of India (DCGI), development partners, and various government departments involved in the immunization program, are based on a framework suggested by the World Health Organization.[11]

In 2012, the Immunization Technical Support Unit (ITSU) established the AEFI Secretariat with the aim of establishing a team of committed staff at the national level, concentrating solely on vaccination safety surveillance. Any adverse event that occurs after receiving a vaccination—whether it is administered under the Universal Immunization Programme (UIP) or in the private sector, for adults or children, for travel abroad, etc. should be reported to the AEFI surveillance system.[15]

This article describes the status of implementation, key aspects and challenges of AEFI Surveillance in Tamil Nadu State.

METHODS

The AEFI Surveillance program documents from 2008 to till date were reviewed. All the AEFI meetings and the cases discussed in each of the meetings were compiled

and analysed. The Causality Assessment Report (CAR) of all cases were reviewed for the AEFI classification as per National AEFI Surveillance and Response Operational Guidelines. The approximate number of vaccine doses administered every year is calculated from the percentage of Fully Immunized (FI%) from the State HMIS data and the estimated infant target for the respective years were obtained from the program reports.

In Tamil Nadu, Routine Immunization (RI) sessions are planned on all Wednesdays of the month where the field staff who are the Village Health Nurses (VHNs) in rural areas and Urban Health Nurses (UHNs) in Urban areas vaccinate all their eligible beneficiaries both at the institutional (Facility) and field level (Outreach). Birth dose vaccinations are being given at all days in all Primary Health Centres, in all Secondary care hospitals such as District Hospitals, Sub district Hospitals and in all Tertiary care hospitals such as Medical College Hospitals. All the health field staff, identified vaccinators in secondary care and tertiary care centres have been trained in Immunization practises, picking up an AEFI and reporting. The reports from the Secondary and Tertiary care centres are being complied at their nearby Primary Health Centres by the designated surveillance health inspectors.

Government of India had developed an electronic web-based portal called SAFE-VAC (Surveillance and Action For Events following Vaccination) for AEFI database which serves as a dedicated Signal management system for vaccines, where all Serious and Severe AEFIs are reported from all over the nation and Tamil Nadu is updating the portal regularly.

RESULTS

AEFI cases reporting and Causality Assessment in Tamil Nadu is done according to AEFI Surveillance and Response Operational Guidelines by Government of India (1) . Once the field staff – Village Health Nurses (VHNs) in rural areas or Urban Health Nurses (UHNs) in Urban areas are informed about an AEFI, she immediately reports it to the Medical Officer who in turn classifies the type of AEFI reported. The minor AEFI are reported in the state Health Management Information System (HMIS). The serious/ severe type AEFI are reported to the District Health Officer (DHO) of the Public Health department who is the District Immunization Officer (DIO), in a Case Reporting Form (CRF) within 24 hours of reporting of AEFI, and the DHO in turn reports it to the State and national level authorities via the SAFE-VAC portal.

The Medical Officer then investigates the Serious and Severe event and collects the relevant records such as hospital case sheets, discharge summaries or preliminary post mortem reports in case of death and submit the documents along with the Case Investigation Form (CIF) within ten days of the reporting of the event. The final post mortem report wherever required should be submitted at the earliest. The Case Investigation Form (CIF) will be sent to the State only after thorough investigation by the District Health Officer (DHO) and the District AEFI committee via SAFE-VAC portal. The flow of reporting and processing of an AEFI till Causality Assessment Report (CAR) in Tamil Nadu is depicted in Figure 1. The AEFI surveillance for Serious and Severe AEFIs thus has five major steps such as Notification, Verification and Reporting, Investigation, Causality Assessment and Feedback.

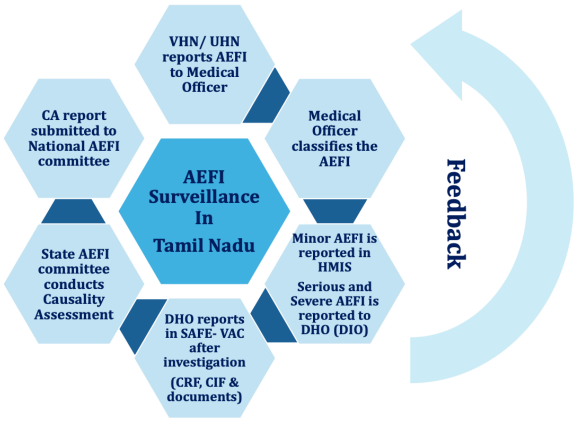

Figure 1: Flow chart depicting AEFI surveillance from reporting to Causality Assessment in Tamil Nadu.

The Minor AEFI cases reported in the state HMIS portal is 2,671 in 2011-12 and is 46,369 in 2023-24 (up to Feb). The approximate no. of vaccine doses administered is 95.56 Lakhs in 2011-12 and 146.42 Lakhs in 2023-24 (up to Feb). The year wise Minor AEFI cases reported and the approximate vaccine doses administered from 2010 to 2024 is shown in Figure 2.

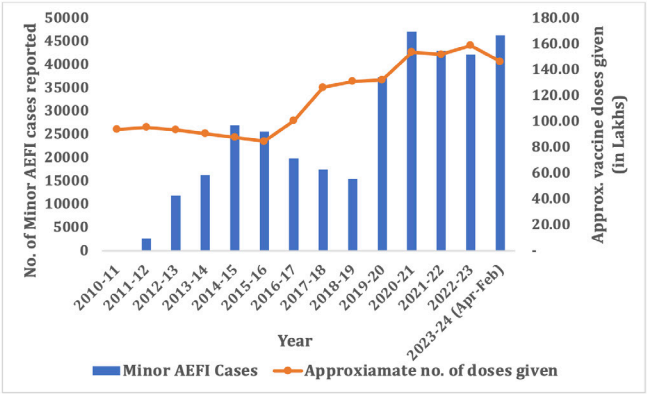

Figure 2: Trend of reported Minor AEFI in the state of Tamil Nadu from 2010 to 2023, (Source: tnhmis.org)

Global Advisory Committee on Vaccine Safety (GACVS) considered a number of principles in deriving a set of indicators for AEFI surveillance. Three types of indicators are proposed: (i) to monitor the volume of AEFI reports; (ii) to monitor the quality of those reports; and (iii) to monitor the quality of the response to serious AEFI. The proposed general indicator is the ratio of AEFI reports per 100,000 surviving infants per year and is designated as a performance indicator for tracking and monitoring progress in AEFI reporting by Global Vaccine Action Plan (GVAP).[16] The Annual AEFI reporting ratio of serious and severe AEFI per 1,00,000 surviving infants in the year 2015-16 is 0.71 and is 4.71 in 2023-24 (up to Feb). The year wise AEFI annual reporting ratio is shown in Table 1.

Table 1: Annual AEFI reporting ratio per 100,000 surviving infants from the year 2015 to 2024

Reporting year	Annual Infant target (in Lakhs)	Approx. vaccine doses given (in Lakhs)	AEFI reported (in Nos.)	Annual AEFI ratio per 100,000 surviving infants
2015-2016	10.22	84.63	73	0.71
2016-2017	9.95	100.7	75	0.75
2017-2018	9.70	126.35	164	1.69
2018-2019	9.44	130.82	90	0.95
2019-2020	9.54	132.16	228	2.39
2020-2021	9.32	153.61	186	2.00
2021-2022	9.21	151.85	190	2.06
2022-2023	9.15	158.7	296	3.23
2023-2024	9.16	146.41	432	4.71

AEFI Committees were established at the State and the district level in 2007 and at the National level in 2008. The Director of Public Health and Preventive Medicine (DPH&PM) is the Chairman of the AEFI Committee and Joint Director (Immunization) who is the State Immunization Officer (SEPIO/SIO) act as the convenor for the State AEFI Committee. District Health Officer in the districts who is the District Immunization Officer (DIO) heads the AEFI committee at the district levels.

The Committee also includes physicians, paediatricians, obstetricians-gynaecologists, neurologists and cardiologists, in collaboration with Indian Academy of Paediatrics (IAP) and Indian Medical Association (IMA).[17,18] The State AEFI committee also includes a National Consultant as a member. The State AEFI committee convenes at regular intervals discussing every AEFI reported in a hybrid mode of meeting including both in person and also a virtual mode so as to include all its members including the Government of India member (National consultant). The Causality Assessment is based on a detailed discussion of the cases reported followed by a Causality Assessment algorithm.

The State AEFI committee has convened 60 Causality Assessment meetings since 2014 till March 2024 (33 meetings from 2014 to 2020 & 27 meetings from 2021 to 2024). Totally, 1,887 serious and severe AEFI cases were reported from the year 2015. Of which, 1,684(89.3%) has been discussed in the State AEFI meetings and classification done and shared to the National AEFI Secretariat. The number of reported serious and severe AEFI cases increased from 92 in 2015 to 457 AEFIs in 2023 as shown in Figure 4., and the number of vaccine doses given also increased from 2015 to 2023. However, there was a slight reduction in AEFI reporting seen in 2020, 2021.

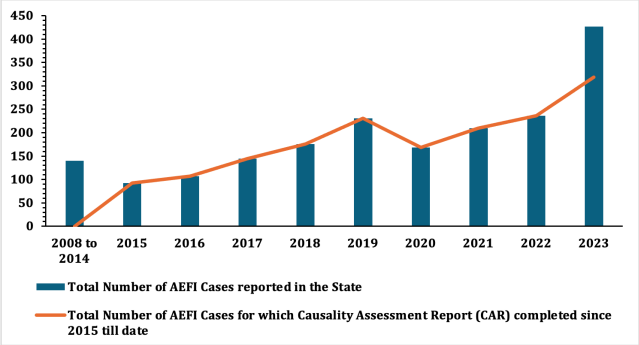

Figure 4 : Characteristics of AEFI reported and Causality assessment details done by State and submitted to National AEFI committee in Tamil Nadu, 2015 to 2024
(Source: O/o DPH&PM, Immunization Department)

The final classification has been adapted from definition and application of terms for vaccine pharmacovigilance Report of the CIOMS/WHO Working Group on Vaccine Pharmacovigilance.[19] The classification of "A. Consistent causal association to immunizatiown" and "C. Inconsistent causal association to immunization" (coincidental) are made clearer by the cause-specific definitions. When there is sufficient data on the AEFI but it cannot be placed into one of the aforementioned categories, the association is classified as "B. indeterminate." When there is a case without adequate information for causality conclusion, it is categorized as "D- Unclassifiable" and requires additional information for further review of causality. Of all the 1684 AEFIs discussed in the State AEFI meetings and classified, 47.8% of AEFIs were classified as 'A1'- Vaccine product related reactions, 39.3% as 'C'- Coincidental events which were emerging or emerged at the time of vaccination and there were Zero% of AEFIs due to "A2"- Vaccine quality defect related reactions.

The State Committee provides suggestions based on the discussions of the Causality Assessment in every meeting. These recommendations are then promptly communicated to all districts, aiding in raising awareness of the nature of the AEFI cases that occurred. The AEFI Secretariat in addition, does Causality Assessments at the National level. The

findings of the National Causality Assessment are regarded as final. The national level is using model 2, (1) in which all reported cases in the nation are categorized into serious and severe categories by a National sub-committee. The National AEFI Committee is presented with an overview of these situations as well as specifics of cases that require additional consideration. It should be mentioned that the National AEFI Committee meets every quarter, whereas sub-committee meetings occur more regularly at the national level.

Table 2 : Cause-specific categorization of AEFIs

Cause-specific type of AEFI	Definition
A. Consistent with causal association to immunization	
A1	Vaccine product-related reaction (An AEFI that is caused or precipitated by a vaccine due to one or more of the inherent properties of the vaccine product)
A2	Vaccine quality defect-related reaction (An AEFI that is caused or precipitated by a vaccine due to one or more quality defects of the vaccine product, including its administration device as provided by the manufacturer)
A3	Immunization error-related reaction (formerly "programme error") (An AEFI that is caused by inappropriate vaccine handling, prescribing or administration and thus by its nature is preventable)
A4	Immunization anxiety-related reaction (An AEFI arising from anxiety about the immunization)
B. Indeterminate	
B1	Temporal relationship is consistent but there is insufficient definitive evidence for vaccine causing events.
B2	Reviewing factors result in conflicting trends of consistency and inconsistency with causal association to immunization
C. Inconsistent casual association to immunization	
C	Coincidental event (An AEFI that is caused by something other than the vaccine product, immunization error or immunization anxiety)
D. Unclassifiable	

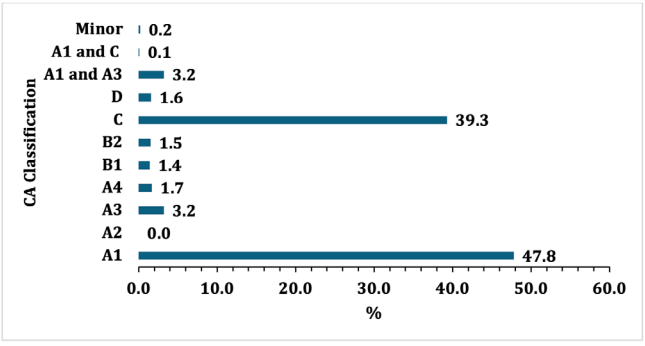

Figure 5 : Classification of AEFI following Causality assessment by State AEFI Committee in Tamil Nadu, 2015 to 2024 (Source: O/o DPH&PM, Immunization Division)

The State Committee provides suggestions based on the discussions of the Causality Assessment in every meeting. These recommendations are then promptly communicated to all districts, aiding in raising awareness of the nature of the AEFI cases that occurred. The AEFI Secretariat in addition, does Causality Assessments at the National level. The findings of the National Causality Assessment are regarded as final. The national level is using model 2,[1] in which all reported cases in the nation are categorized into serious and severe categories by a National sub-committee. The National AEFI Committee is presented with an overview of these situations as well as specifics of cases that require additional consideration. It should be mentioned that the National AEFI Committee meets every quarter, whereas sub-committee meetings occur more regularly at the national level.

Though AEFI reporting and management are in better progress in the state, there are also few challenges such as there are silent districts which report zero AEFI for the year. Those districts need to be focussed and ensured of adequate capacity building, refresher trainings and review of the processes of the surveillance system. Some of the districts were given with refresher trainings and once in a month, review of district level reporting. Apart from reporting, there are some challenges in obtaining the few documents for causality assessment like final post mortem report with chemical and visceral analysis which are usually delayed since all AEFI deaths are not necessarily being labelled as Medico Legal Cases. Another major challenge observed based on the minutes of the State AEFI Committee meetings is the poor quality of CIF and CRFs from the investigating officials in the districts which impedes / delays the Causality Assessment activities.

DISCUSSION

The state's reporting of AEFI cases including Minor cases in the state HMIS portal had improved over period of time. AEFI reporting ratio suggested as the performance indicator by GVAP criteria, also showed consistent increase and this may be due to better reporting of AEFI, in addition to increase in the number of doses administered to the children over period of time. The increasing trend in reporting reflects persistent efforts at state and district level including training and monitoring. Although COVID-19 pandemic had caused a hindrance in the reporting of AEFI cases, the state has rebounded with better performance in subsequent years.

At the District and State levels, the State has its own AEFI committees that were established in compliance with GOI guidelines. The Causality Assessment of each AEFI in the State is carried out by the State AEFI committee and the National AEFI committee. In order to improve communication between the National and State committees and to provide an outside perspective to the Causality Assessment, the National Consultant's involvement in the State AEFI committee is also beneficial. Most AEFIs occurred were due to innate nature of the vaccine itself or due to other coincidental events following Immunization.

It is strongly felt that still there is a lot of scope for

improvement in silent districts. It is a known fact that human resource-related issues are crucial to the reporting process of any programs / activities. All health staff should be reoriented at regular intervals on the importance of reporting of AEFI at the field level and on newer guidelines. Regular trainings and refresher trainings, increasing awareness among field level staff, and monitoring should be done in order to improve AEFI surveillance in the State.

Embracing future research opportunities in AEFI including descriptive analysis, detailed surveillance evaluation, and qualitative KAP method study among field workers can indeed help stakeholders enhance the effectiveness, efficiency and transparency of AEFI surveillance systems. This in turn contribute significantly to maintain public confidence in vaccination programs and ensuring vaccine safety for all populations.

REFERENCES

1. AEFI Surveillance and Response Operational Guidelines 2024.pdf.

2. Ajibola O, Omoleke SA, Omisakin OA. Current status of cerebrospinal meningitis and impact of the 2015 meningococcal C vaccination in Kebbi, Northwest Nigeria. Vaccine. 2018 Mar 7;36(11):1423–8.

3. Andre F, Booy R, Bock H, Clemens J, Datta S, John T, et al. Vaccination greatly reduces disease, disability, death and inequity worldwide. Bull World Health Organ. 2008 Feb;86(2):140–6.

4. Lindstrand A, Cherian T, Chang-Blanc D, Feikin D, O'Brien KL. The World of Immunization: Achievements, Challenges, and Strategic Vision for the Next Decade. J Infect Dis. 2021 Sep 30;224(Suppl 4):S452–67.

5. Omoleke SA, Bamidele M, de Kiev LC. Barriers to optimal AEFI surveillance and documentation in Nigeria: Findings from a qualitative survey. PLOS Glob Public Health. 2023 Sep 8;3(9):e0001658.

6. Mpabalwani EM, Mwenda JM, Akanmori BD. Exploring the feasibility of integration of surveillance for intussusception into the routine monitoring of adverse events following immunization by countries of the WHO African Region for Africa. Pan Afr Med J [Internet]. 2022 [cited 2024 Mar 21];41. Available from: https://www.panafrican-med-journal.com/content/article/41/157/full

7. Akanmori BD, Traore T, Balakrishnan M, Maure C, Zuber P, Mihigo R. Vaccine Safety and Pharmacovigilance in the African Region: Recent updates. J Immunol Sci [Internet]. 2018 Jul 3 [cited 2024 Mar 21];specialissue(1). Available from: https://www.immunologyresearchjournal.com/articles/vaccine-safety-and-pharmacovigilance-in-the-african-region-recent-updates.html

8. Joshi J, Das MK, Polpakara D, Aneja S, Agarwal M, Arora NK. Vaccine Safety and Surveillance for Adverse Events Following Immunization (AEFI) in India. Indian J Pediatr. 2018 Feb 1;85(2):139–48.

9. 9789241507769_eng.pdf [Internet]. [cited 2024 Mar 21]. Available from: https://iris.who.int/bitstream/handle/10665/206144/9789241507769_eng.pdf;jsessionid=85AE9E78C0CE847143548D6A4456F4AB?sequence=1

10. Sebastian J, Gurumurthy P, Ravi MD, Ramesh M. Active surveillance of adverse events following immunization (AEFI): a prospective 3-year vaccine safety study. Ther Adv Vaccines Immunother. 2019 Nov 21;7:2515135519889000.

11. Chitkara AJ, Thacker N, Vashishtha VM, Bansal CP, Gupta SG. Adverse event following immunization (AEFI) surveillance in India: Position paper of Indian Academy of Pediatrics, 2013. Indian Pediatr. 2013 Aug;50(8):739–41.

12. Omoleke SA, Getachew B, Isyaku A, Aliyu AB, Mustapha AM, Dansanda SM, et al. Understanding and experience of adverse event following immunization (AEFI) and its consequences among healthcare providers in Kebbi State, Nigeria: a qualitative study. BMC Health Serv Res. 2022 Jun 3;22(1):741.

13. MacDonald NE, Guichard S, Arora N, Menning L, Wilhelm E. Lessons on causality assessment and communications from the 2019 South-East Asia Regional (SEAR) workshop on inter-country expert review of selected Adverse Events Following Immunization (AEFI) cases. Vaccine. 2020 Jul;38(32):4924–32.

14. Revised AEFI Guidelines Execute Summary.pdf [Internet]. [cited 2024 Mar 21]. Available from: https://main.mohfw.gov.in/sites/default/files/Revised%20AEFI%20Guidelines%20Execute%20Summary.pdf

15. Adverse Events Following Immunization (AEFI) Secretariat [Internet]. ITSU. [cited 2024 Mar 21]. Available from:https://itsu.org.in/adverse-events-following-immunization-aefi-secretariat/

16. Lei J, Balakrishnan MR, Gidudu JF, Zuber PLF. Use of a new global indicator for vaccine safety surveillance and trends in adverse events following immunization reporting 2000–2015. Vaccine. 2018 Mar 14;36(12):1577–82.

17. AEFI G.O. (Ms) NO. 317 .pdf.

18. G.O. 1573 AEFI state and district committee g.o. issued. pdf.

19. CIOMS/WHO Working Group on Vaccine Pharmacovigilance, editor. Definition and application of terms for vaccine pharmacovigilance: report of CIOMS/WHO Working Group on Vaccine Pharmacovigilance. Geneva: World Health Organization; 2012. 193 p.

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ORIGINAL ARTICLE - PUBLIC HEALTH

ADAPTING TO ADVERSITY: PUBLIC HEALTH FLOOD RESPONSE STRATEGIES FOLLOWING TWIN DISASTERS

Selvavinayagam T S [(1)], Vadivelan P [(1)], Senthil Kumar M [(1)] , Parthipan Kumarasamy [(1)], Sudharshini Subramaniam [(3)], Mohan A [(1)], Sankarmani Ramasamy Mathivanan [(1)], Kensheya Regina [(2)]

(1) Directorate of Public Health and Preventive Medicine, Tamil Nadu

(2) SRM Medical College, Kattankulathur

(3) Institute of Community Medicine, Madras Medical College, Chennai -03

Abstract

INTRODUCTION : Floods represent the most prevalent natural calamities globally, with their impact expected to amplify due to the influences of climate change and population displacement. In December 2023, Tamil Nadu faced substantial rainfall, notably in Chennai and its suburbs and in the southern districts of Tamil Nadu namely Thoothukudi, Tirunelveli, Tenkasi and Kanniyakumari, triggering extensive flooding. This paper endeavours to document the lessons learned from Tamil Nadu's flood response in 2023 and the subsequent measures being undertaken by the public health system to enhance preparedness. The various Public Health interventions implemented to address potential outbreaks following a disaster, included establishment of incident command system at the State and District level; establishment of a helpline number for immediate assistance; continuous Disease Surveillance; risk stratification of areas; formation of task-specific teams to address different aspects of the emergency and continuous monitoring of activities. The flood response activity in Tamil Nadu has demonstrated remarkable effectiveness, as evidenced by the absence of any outbreaks in both Chennai and the southern districts, which were affected by flood.

KEYWORDS : Flood response activities

INTRODUCTION

Floods represent the most prevalent natural calamities globally, with their impact expected to amplify due to the influences of climate change and population displacement. In recent years, Tamil Nadu has confronted numerous flooding incidents, posing immediate peril to human well-being along with enduring repercussions such as displacement and deteriorating living conditions. Consequently, it's imperative that the initial response to flood emergencies encompasses provisions for shelter, clean water, nutrition, sanitation, and hygiene to mitigate health risks. Adequate Public Health preparedness plays a pivotal role in averting morbidity and mortality associated with flood disasters.[1]

In the beginning of December 2023, Tamil Nadu faced substantial rainfall, notably in Chennai and its environs with a downfall of 46 centimeters of rainfall over two days (December 3 and 4, 2023) , triggering extensive flooding due to Cyclone Michaung. The Indian Meteorological Department (MET) predicted further heavy precipitation over southern Tamil Nadu (Tenkasi, Tirunelveli, Thoothukudi, Kanyakumari) on December 17, 2023.[2] The southern districts faced a downpour of maximum 93 cm in Kayalpattinam of Thoothukudi districts over two days (December 17 and 18, 2023). The aftermath of this unprecedented deluge was immediate and catastrophic, resulting in localized road inundation, hampering transportation and mobility, and inundating low-lying areas, causing severe damage to both public and private property. Buildings were breached by water, leaving inhabitants stranded without essential provisions such as food, water, and electricity, while causing complete destruction to household assets and vehicles, rendering homes uninhabitable for an extended period. Displaced individuals were relocated to temporary shelters established by the State Government. According to disaster management data, the floods on December 17 and 18 damaged over 7,417 dwellings, claimed the lives of 1.07 lakh livestock, and ravaged 2.24 lakh acres of crops. The Tamil Nadu State Government spearheaded relief and rescue operations in response.

These floods have significant implications for Public Health. Immediate and medium-term health impacts are primarily associated with communicable diseases, with disruptions in basic preventive and curative health services exacerbating the challenge of accessing appropriate healthcare. The

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Corresponding Author: Parthipan Kumarasamy
e-mail : partheeee@gmail.com

displaced population faced an imminent risk of waterborne and foodborne disease outbreaks, such as Acute Diarrheal Diseases, Dysentery, etc., due to interruptions in safe water supply and sanitation.

Additionally, overcrowding resulting from population displacement increases the transmission of airborne diseases like measles and pneumonia. Moreover, increased vector breeding heightens the risk of vector-borne diseases.

Thus, the role of the Public Health system during and after floods is monumental, aiming to prevent and manage any ensuing illnesses.

This paper endeavours to document the lessons learned from Tamil Nadu's flood response in 2023 and the subsequent measures being undertaken by the Public Health system to enhance preparedness.

Public Health Interventions :

Several Public Health Interventions were implemented to address potential outbreaks following a disaster, including:

1. Establishment of incident command system at the state and district level.
2. Establishment of a Helpline number for immediate assistance
3. Disease Surveillance
4. Risk stratification of areas
5. Formation of task-specific teams to address different aspects of the emergency.
6. Monitoring of activities.

1. Establishment of incident command system at State and District level

The Directorate of Public Health and Preventive Medicine quickly implemented epidemic prevention and disease control strategies.

The State Emergency Operation Centre and Public Health Control Room were immediately established by the Directorate, along with 104 medical helpline services.

On December 18, 2023, District Control Rooms were established at the offices of the District Health Officers in Thoothukudi, Tirunelveli, Tenkasi and Kanyakumari.

These served as hubs for outbreak detection and epidemic prevention, functioning as daily reporting and monitoring centers for cases of fever, diarrhea, etc., in flood affected areas.

They also coordinated field epidemic control activities, including the collection of reports from mobile medical units, static camps, and the Integrated Health Information Platform (IHIP).

2. Establishment of a Helpline number for immediate assistance

In the State Public Health Control Room, the flood helpline number 9444340496/8754445477 was established as a crucial component of the public health emergency response and epidemic surveillance system for flood-affected communities.

The helpline was widely publicized through television, newspapers, and other media platforms.

Health Inspectors stationed in the State Public Health Control Room managed the helpline, serving as the primary point of contact for the general public.

They provided information and advice on epidemic control measures during floods, including safe drinking water practices and mosquito management, to ensure the well-being of the affected population.

3. Disease surveillance and prevention :

Numerous measures were implemented to monitor disease occurrence and mitigate epidemics. Disease Surveillance involved utilizing data from medical camps and the Integrated Health Information Platform (IHIP).

The geographical localization and reporting of Acute Febrile Illness (AFI) and Acute Diarrheal Disease (ADD) were achieved through Choropleth Mapping. Trend analysis of each reported disease served as a valuable tool for monitoring disease trends.

These analyses aided in prioritizing vulnerable populations, carrying out risk stratification of areas and consequently planning activities for the following day, including providing healthcare services to high-risk focus areas.

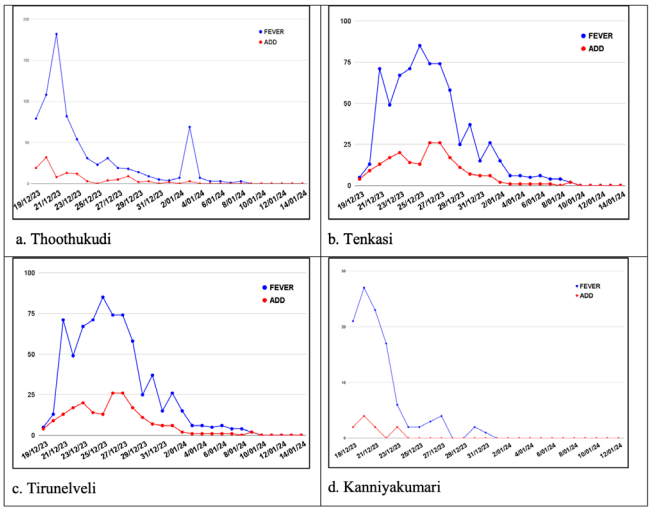

Figure 1 : Trend analysis of fever and diarrhoeal diseases in the Southern Districts of Tamil Nadu.

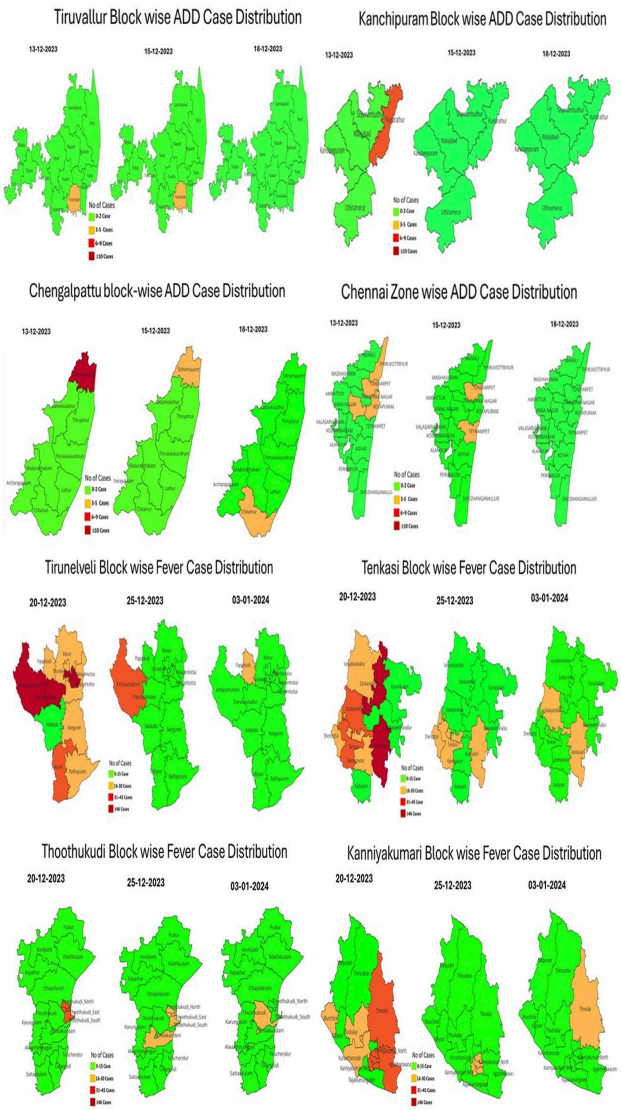

Figure 2 : Choropleth mapping of the Fever case distribution in the flood affected districts of Tamil Nadu.

4. Risk stratification of areas :

Based on the number of illness reported, the areas were stratified as high-risk areas and control measures were undertaken. An area is classified as high risk, if there were >15 acute febrile illness (AFI) reported per day or five or more cases of acute diarrhoeal diseases(ADD).

Once the high-risk area is identified and epidemiological linkage for ADD/AFI cases are confirmed, medical teams were sent to these areas. They were engaged in active surveillance to detect additional cases, treat both cases and contacts, ensure chlorination at household and community levels, and conduct disinfection in and around the households of affected individuals. Source reduction for vector control, along with fogging and anti-larval measures were implemented in necessary areas. Comprehensive details were reported to the control room for follow-up.

5. Formation of task-specific teams to address different aspects of the emergency

The Directorate of Public Health and Preventive Medicine appointed personnel from the cadre of Joint Directors of Public Health and Preventive Medicine to oversee the incident command system in the districts and supervise the monitoring of medical camps, vector control, and chlorination activities. They took command roles, providing directives for essential actions, such as scheduling mobile medical camps, addressing inadequate chlorination sites, prioritizing high-risk areas for vector control, and ensuring disinfection of drinking water supplies and mobile medical camps to curb epidemics.

Additionally, officials in the cadre of District Health Officers were tasked with monitoring field activities. Their responsibilities encompassed overseeing all medical camps, vector control efforts, and chlorination activities. This team contributed insights for planning activities in the subsequent days and prioritizing high-risk areas based on reports. Furthermore, the field monitoring team ensured the administration of chemoprophylaxis to vulnerable populations in flood-affected regions and distribution of Non-Communicable Disease (NCD) drugs to beneficiaries through medical teams.

To address specific needs, task-specific teams were formed, including flood response teams, vector control teams, and water analytics teams. These teams were allocated specific functions, and based on their reported data, the district and state command systems promptly initiated epidemic prevention and disease control measures.

Table 1 : Deployment of various teams to flood affected districts

DISTRICT	Vector control - Regional Entomologist Teams	Vector control- Senior /Junior Entomologist Teams	Water Analyst Teams	External Mobile Medical Teams
Chennai	3	6	6	159
Chengalpattu	1	1	1	60
Tiruvallur	1	1	1	51
Kancheepuram	1	1	1	30
Thoothukudi	1	2	2	30
Tirunelveli	1	2	2	30
Tenkasi	1	1	1	5
Kanyakumari	1	1	1	5

5.1 Flood Response teams :

The flood response team comprised a Medical Mobile Unit consisting of one Medical Officer, one Staff Nurse/ Pharmacist, one Health Inspector, and a dedicated driver, each equipped with their own Medical Mobile Unit vehicle. These teams were instructed to carry essential medications

for disease control and prevention. In addition to the existing Medical Mobile Teams, more teams were mobilized from districts all over Tamil Nadu and deployed in the flood-affected districts as follows :

Table 2 : Deployment of Mobile Medical Teams in flood affected districts of Tamil Nadu

District	Number of additional external medical teams	Total medical camps Conducted	Total beneficiaries
Chennai	159	7834	4,85,109
Chengalpattu	60	2953	1,68,526
Tiruvallur	51	2308	1,22,806
Kancheepuram	30	1270	69,328
Thoothukudi	30	3885	2,75,346
Tirunelveli	30	2945	1,02,458
Tenkasi	05	2055	59,280
Kanyakumari	05	1569	50,358
TOTAL	**370**	**10,454**	**13,33,211**

At the medical camp, several measures were implemented :

• Socio-demographic details of patients were documented.

• Patients presenting with fever had their blood samples collected for serologic tests to detect diseases such as Leptospirosis, Dengue, and Malaria.

• Cases of Acute Diarrheal Diseases (ADD) requiring stool sample collection for Cholera investigation was done.

• Food handlers were provided with chemoprophylaxis, including Doxycycline 200 mg, Metronidazole 400 mg, and Albendazole 400 mg. Additionally, individuals in high-risk areas received Doxycycline 100 mg / Azithromycin 500mg tablets as Chemoprophylaxis

• A Measles-Rubella vaccination campaign was successfully carried out administering 52,516 doses.

Furthermore, initiatives were undertaken to reach out to Antenatal mothers, facilitate safe deliveries for expectant mothers, monitor the health status of those in need of palliative care, and ensure compliance with medication refills for patients with non-communicable diseases including Injection Insulin. They were given even for persons taking treatment in private sector.

Follow-up calls were conducted for patients seen at the medical camps, with specific attention given to monitoring and mapping cases of fever, acute diarrheal disease (ADD), acute respiratory infections, skin diseases, and injuries to identify any clustering trends. Overall, a total of 14,365 medical camps provided medical assistance to 845,769 individuals from December 6th to December 20th, 2023 in flood affected Northern Districts and 10,454 medical camps provided medical assistance to 4,87,442 individuals in flood affected Southern Districts.

5.2 Vector control teams were deputed with Regional Entomological teams along with Senior and Junior Entomologists to oversee vector control activities in the flood affected areas. Vector control activities included:

- Source reduction involving the elimination or disposal of open containers and elimination of artificial water stagnation found both indoors and outdoors.
- Anti-larval measures consisted of applying Temephos to water containers containing larvae that could not be drained.
- Additionally, indoor fogging with Pyrethrum and outdoor fogging with Technical Malathion was employed as an anti-adult vector control measure.

5.3 Water Analysis team :

Water Analyst teams were dispatched to the districts affected by the flood. Each team consisted of 1 Assistant Water Analyst, 1 Junior Water Analyst, and a health inspector. Water teams analysed water distribution system along with local body officials and TWAD board team in order to identify the waterline leakages and ensured cleaning of OHTs before regular drinking water supply started. Temporary water supply through tanker lorries and tractor water tankers were done to ensure chlorination at source itself and also before distribution to the public in order to ensure provision of safe drinking water. The activities of the Water Analytical teams included:

- Reporting drinking water pipe leakages and unsanitary drinking water supply to the district command system, followed by subsequent follow-ups the following day.
- Monitoring the chlorination level of drinking water sources and devising action plan for chlorination activities in these areas.
- Testing the quality of drinking water in water-supplying tanks and private drinking water sources for any contamination and ensuring adequate chlorination.
- Collecting water samples from taps, hand pumps, overhead tanks, and portable water sources at houses for testing residual chlorine levels.
- Prioritizing flood-affected areas with reported cases of acute diarrheal diseases or fever for water sampling the following day.
- Sending collected samples for bacteriological analysis to detect any contamination, while residual chlorine levels are measured in the nearest Chief Water Analysis Laboratory.
- Chlorinating water sources found unfit for drinking in the

presence of a team member from the Water Analytical team. - Inspecting water-supplying lorries for rust, debris, or dirt, and ensuring adequate chlorination of the drinking water.

A total of 4,549 sources were inspected by the team for adequate chlorination during the control measure activities, and 4,465 sources were found to be adequately chlorinated in Thoothukudi district. Spot tests for residual chlorine were conducted on 1,251 water samples in the flood-affected areas of Tirunelveli, with 1,099 samples testing positive for residual chlorine. Additionally, approximately 56 water samples were collected from the flood-affected areas of Tirunelveli district, of which 47 samples underwent bacteriological testing and 9 underwent chemical testing.

Supply of Chlorine tablets

Due to extensive damage to drinking water supplies caused by flood inundation in Thoothukudi and Tirunelveli, there was an urgent and dire need for super chlorination in these areas. Approximately 40 lakh chlorine tablets were swiftly procured and supplied within 24 hours. The procurement of chlorine tablets was facilitated through the Tamil Nadu Medical Service Corporation. These tablets were airlifted from Bhopal to Chennai and subsequently to Tuticorin Port after undergoing thorough quality checks. The delivery of chlorine tablets to local residents was accomplished within 48 hours, despite the urgency, without compromising on quality.

Quality control

Quality checks for the chlorine tablets were conducted in both drinking Reverse Osmosis (RO) water and tap water for residual chlorine levels at the Directorate of Public Health and Preventive Medicine. The residual chlorine effect was found to be there both in RO water as well as Tap Water. In RO water it lasted for 8 hours and 30 minutes, while it lasted for 7 hours in tap water. This disparity may be attributed to the higher total dissolved solids (TDS) content in normal water. The quality check process was approved by the Chief Water Analyst.

A total of 40 lakh chlorine tablets were distributed in these areas through mobile medical units, static medical camps, and door-to-door visits. Each household received 10 tablets, with each tablet being sufficient to chlorinate 20 litres of water.

6. Monitoring of activities

A daily review meeting was held at the end of each day, chaired by the Health Secretary and the Director of Public Health and Preventive Medicine. This meeting was attended by City Health Officers, Additional City Health Officers, Zonal Health Officers, and Zonal Medical Officers of Greater Chennai Corporation and District Health Officers of concerned districts as well as monitoring District Health Officers and Joint Directors via video conferencing calls.

The purpose of these meetings was to review the current situation, coordinate with assigned officials, and plan forthcoming activities. This meeting served as a nodal point where specialized teams for each task presented their reports, leading to comprehensive action. Each report was interconnected, resulting in appropriate actions being taken. The teams were intricately intertwined, operating in a cause-and-effect manner. State monitoring provided an overarching view of the entire action.

Impact of flood response activities

Based on the data reported through P form in Integrated Health Information Platform(IHIP) ,which is part of a monitoring mechanism, we try to compare the reporting of acute febrile illness and acute diarrhoeal disease for the year 2022-23 with year 2023-24 for Weeks 48-52 &Week 1-4.

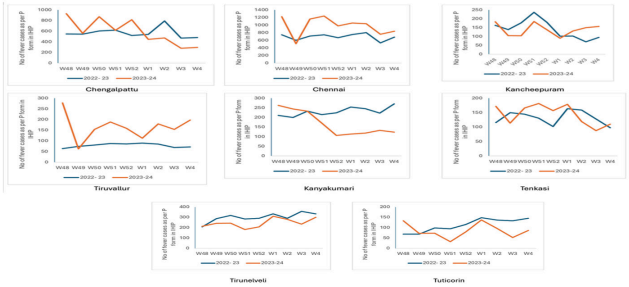

Figure 3 : Distribution of fever cases reported in IHIP in the flood affected districts comparing data for the year 2022-23 with year 2023-24 for Weeks 48-52 &Week 1-4.

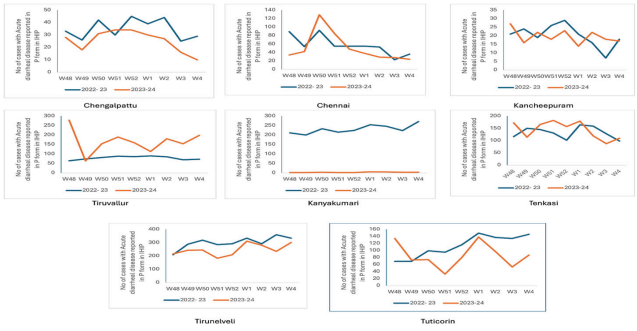

Figure 4 : Distribution of acute diarrheal diseases reported in IHIP in the flood affected districts comparing data for the year 2022-23 with year 2023-24 for Weeks 48-52 &Week 1-4.

Figure 3 &4 shows the distribution of the acute fever cases and acute diarrheal diseases reported in the IHIP over

the year 2022-23 and 2023-24. The data shows that there is no significant increase in the cases reported especially in the southern districts compared to Chennai and its neighbouring districts.

Chennai experienced floods in early December, causing significant disruption and damage. The establishment of the state incident command system was delayed due to the headquarters being directly affected by the floods. However, once operational, the system swiftly implemented Standard Operating Procedures (SOPs) for team formation and functions. Despite the initial challenges, necessary logistics and SOPs were efficiently organized.

Subsequently, when floods hit the southern districts a few weeks later, the state incident command system was already equipped with established SOPs and guidelines for flood response activities. This proactive preparedness likely contributed to the relatively low number of reported cases in these districts, as evidenced by Figures 3 and 4. This underscores the critical importance of having comprehensive guidelines and SOPs in place and the Disaster Response Teams ready particularly in disaster situations, to effectively mitigate impacts and prevent outbreaks.

DISCUSSION

The flood response activity in Tamil Nadu has demonstrated remarkable effectiveness, as evidenced by the absence of major outbreaks in both Chennai and the Southern Districts, which were affected by flood.

This success can be attributed to a series of well-coordinated efforts, including proper delegation of tasks, specific assignment of responsibilities, pooling of resources from neighbouring districts, establishment of a command system at both state and district levels, and the utilization of technology for informed decision-making.

These measures facilitated the development and execution of appropriate plans to mitigate the impact of the floods on health. The response efforts extended beyond mere prevention and management of outbreaks and encompassed the provision of regular health services to those most in need. Tamil Nadu has faced similar floods in the past.

Chennai floods, which happened during November – December 2015 was feared to result in major epidemic outbreaks considering the amount of damage it caused. However, the floods ended with no major outbreaks due to the various outbreak control measures undertaken which includes, formation of 24*7 control room, organizing screening camps, vector control, monitoring of water supply, sanitation and surveillance mechanism, etc. 3The previous experience of handling such disasters paved way for a swift action during a disaster.

A comprehensive review conducted by Mohajervatan et al highlighted the importance of flood emergency response plans in safeguarding public health.

The review delineated two main phases of response plans: initial and specific. Each phase plays a crucial role in mitigating the adverse effects of flooding.

The initial phase involves early warning dissemination, establishment of a command system, information management, coordination, development of incident action plans, establishment of safety/security/relief camps, and management of logistics.[4]

All these actions were diligently undertaken by Tamil Nadu, as part of its flood response activities. Since most of the activities were carried out by mobilizing the available Human Resources and Mobile Medical Unit vehicles from unaffected districts, the entire Public Health measures were done in a cost-effective manner costing only around Rs. 5.35 Cr except for repair of building damages.

Majority of funds (more than Rs. 4 Crore) was spent on Drugs, Disinfectants and Insecticides, with only a meagre amount utilized for Contingency measures to accommodate the medical teams and for food and fuel. This was possible because of the structured Public Health System available in the State.

CONCLUSION

Documenting the flood response activities is vital for informing future guidelines aimed at incorporating the health effects of floods into comprehensive response plans. By understanding and analysing past successes and challenges, authorities can enhance preparedness and response strategies, thereby minimizing the impact of future flood events on public health and safety.

As climate change is expected to cause more such floods in the future, the health problems caused by floods will increase. Hence, it's crucial to quickly evaluate how well different public health actions work to reduce the health impact of floods.

The public health actions that have been documented in this paper can be helpful for other states and countries dealing with similar disasters.

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We would like to give special thanks to the Additional Chief Secretary to Government, Health & Family Welfare Department for his support in swift mobilization of

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REFERENCES

1. Paterson, D.L., Wright, H. and Harris, P.N. (2018) 'Health Risks of Flood disasters', Clinical Infectious Diseases, 67(9), pp. 1450–1454. doi:10.1093/cid/ciy227.

2. Government of India Ministry of Earth Sciences India meteorological ... Available at: https://internal.imd.gov.in/press_release/20231217_pr_2695.pdf (Accessed: 11 January 2024).

3. Selvavinayagam T S. Learning from Chennai floods to mitigate epidemic. Int J Health Syst Disaster Manage [serial online] 2016 [cited 2024 Mar 31];4:114-9. Available from: https://www.ijhsdm.org/text.asp?2016/4/4/114/196767

4. Mohajervatan A, Tavakoli N, Khankeh H, Raeisi AR, Atighechian G. Health sector's flood response plan: A comprehensive review. Environmental Health Engineering and Management Journal. 2021 Aug 10;8(3):169-78.

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PREVENTION AND CONTROL STRATEGIES TO COUNTER THE DENGUE CYCLICAL TREND IN TAMIL NADU

Selvavinayagam T S [(1)], Vadivelan P [(1)], Senthil kumar M [(1)] , Parthiban Kumarasamy [(1)]
Sankaramani Ramasamy Mathivanan [(1)], Anuradha L [(1)], Shanthi D [(1)], Bharani Kumar [(1)]

(1) Directorate of Public Health and Preventive Medicine, Tamil Nadu

Abstract

INTRODUCTION : The most common vector-borne disease that is most prevalent is Dengue, which in its severe form can be fatal. Tamil Nadu has witnessed multiple epidemics in the past, with a cyclical trend occurring every five years. There are multivarious efforts to mitigate the dengue outbreak, which is endemic, by using a variety of preventive and control measures, which results in positive results and outcomes.

OBJECTIVE : The current study aims to assess the preventive and control methods used to combat Dengue and prevent the cyclical trend of outbreaks in Tamil Nadu.

METHODOLOGY : This retrospective study analyzed Dengue cases reported in Tamil Nadu from 2012 to 2023 and the control measures adopted to prevent and control the spread of Dengue infection. The data includes all the Dengue cases reported in the Sentinel Surveillance Hospitals (SSH) of Tamil Nadu under the National Vector Borne Disease Control (NVBDC) Program.

RESULTS : In Tamil Nadu, Dengue cases were identified throughout the year with an increase in incidence during monsoon (August). Since 2012, there are 2 peaks, one in 2012 with 13,204 cases and the other in 2017 with 23,294 cases. The commonly used anti-larval and anti-adult chemicals were Temephos 50% EC, Technical Malathion and Pyrethrum extract 2%. The number of positive mosquito pool for viral markers by RT PCR was highest in 2019 which was brought down in 2021 by preventive measures.

CONCLUSION : As the outbreak of the Dengue virus continues to prevail in today's world, the development of safe, cost-effective, and potential preventive and control measures, the development of new and improved techniques against dengue plays an important role in outbreak prevention. These multivarious efforts adopted by us prevented the expected outbreak and should be adopted by others to reduce the burden of Dengue.

KEYWORDS : Dengue, surveillance, outbreak, integrated vector control measures.

INTRODUCTION

In India, the first epidemic of clinical Dengue-like illness was recorded in Madras (now Chennai) in 1780. The epidemiology of Dengue in the Indian subcontinent has been very complex and has substantially changed over almost the past six decades in terms of prevalent strains, affected geographical locations, and severity of disease.[1] Dengue virus was isolated in India during 1945 for the first time. The first evidence of the occurrence of Dengue fever in the country was reported in 1956 from the Vellore district in Tamil Nadu.[2]

Dengue was once considered to be an arboviral disease of the urban environment infecting populations from municipalities, corporations, and cities. With rapidly increasing in urbanization, expanding travel patterns and climatic changes Dengue infection has spread to all geographical regions including both rural and urban areas. Dengue has been classified as the major re-emerging arboviral disease of public health importance by the World Health Organization (WHO) in the past decade affecting more than 100 tropical and sub-tropical countries.[3]

Dengue epidemics tend to have seasonal patterns, with transmission often peaking during and after rainy seasons. Under optimal conditions, the life cycle of the aquatic stage of the Aedes Aegypti (the time taken from hatching to adult emergence) can be as short as seven days. At low temperatures, however, it may take several weeks for adults to emerge. During the rainy season, when survival is longer, the risk of virus transmission is greater. There are several factors contributing to this increase, and they include high mosquito population levels, susceptibility to circulating serotypes, favourable air temperatures, precipitation and humidity, all of which affect the reproduction and feeding patterns of mosquito populations as well as the Dengue virus incubation period.[4]

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Corresponding Author: Sankaramani Ramasamy
e-mail : drsankarmani@gmail.com

Aedes aegypti is the main vector species of Dengue in India and is common in most of the urban areas on account of deficient water management, presence of non-degradable tyres and long-lasting plastic containers as well as increasing urban agglomerations and the inability of the public health community to mobilize the population to respond to the need to eliminate mosquito breeding sites.[5] In India, every States experience outbreak of Dengue infection periodically. Some States encounter Dengue outbreaks once in every 3 years to 10 years. With stringent preventive and control measures the outbreak can be prevented.

Tamil Nadu has witnessed outbreaks of Dengue infection once in every 5 years in the past decades with the last outbreak occurring in 2017. With the expectation of an impending outbreak in 2022 - 23, The Directorate of Public Health and Preventive Medicine (DPH&PM) took several initiatives to prevent the spread of Dengue infection and other vector-borne diseases. With this knowledge, the above study was planned with the objectives of highlighting the comprehensive approaches of DPH&PM to prevent and control outbreaks of Dengue and to analyze the Dengue disease trend in Tamil Nadu.

METHODOLOGY

This descriptive retrospective study was conducted in Tamil Nadu with the data on Dengue cases reported in Tamil Nadu and the control measures adopted to prevent and control the spread of Dengue infection from 2012 to 2023. The data includes all the Dengue cases reported in the Sentinel Surveillance Hospitals (SSH) of Tamil Nadu under the National Vector Borne Disease Control (NVBDC) Program. Official permission to conduct the study was obtained from the Scientific Advisory Committee (SAC) of DPH&PM, Tamil Nadu.

The data was collected using Microsoft Excel and checked for validity and data cleaning done. The data was further analysed using IBM Statistical Package for the Social Sciences (SPSS) Version 19.

OPERATIONAL DEFINITION

Dengue case :

Probable case:

An acute febrile illness of 2-7 days duration with two or more of the following manifestations – headache, retro-orbital pain, myalgia, arthralgia, rash, haemorrhagic manifestation.[6]

Confirmed Dengue case:

A probable case of Dengue fever with IgM - ELISA positive with test done using National Institute of Virology (NIV) testing kit or NS1 Ag – ELISA from Panbio Dengue Early ELISA kit from the SSH of the districts.[6,7]

Dengue Surveillance :

Disease surveillance :

In order to take action to prevent or control a disease, epidemiological surveillance is vital. It is the continuous, systematic collection, recording, analysis, interpretation, and distribution of data representing the current health state of a community or population to stakeholders and public health specialists. Any dengue prevention and control program must include surveillance because it offers the data required for risk assessment, epidemic response, and program evaluation. [4,8]

Entomological surveillance :

In order to ascertain shifts in the geographic distribution of vectors, to monitor and assess control programs, to acquire relative measurements of the vector population over time, and to enable pertinent and timely decisions regarding interventions, entomological surveillance is employed for both operational and research purposes. Identification of high-density infestation locations or times when the number of mosquitoes is rising may be accomplished through surveillance. The House index, Container index, Breteae index, and Mosquito pool are the commonly used entomological surveillance techniques.[8,9]

Environmental surveillance :

There are a number of elements that have been shown to affect how susceptible a community is to dengue epidemics. When it comes to planning and determining the risk of dengue, factors such as population density and distribution, settlement features, land tenure, housing types, socioeconomic position, and education are all interconnected and crucial. Particularly pertinent information includes understanding how home water storage methods and solid waste disposal services have changed over time, as well as how the quality and dependability of water supply services have changed across time. This kind of data aids in the creation of ecological profiles, which are useful for organizing epidemic intervention strategies and planning focused source reduction or management initiatives.[10]

Dengue Prevention and Control measures :

Dengue preventive and control measures are multidimensional involving several stages of vector dynamics and activities. They are broadly classified as Integrated Vector Control measures (IVC).[11–13]

a. Methods for Environmental Management and Source Reduction

Destruction of unused water storage containers or vessels,

detection and elimination of mosquito breeding grounds, proper management of sunshades, porticos, and roof tops, proper covering of stored water, keeping track of the weekly dry day once in a week.

b. Biological Control

Use of larvivores fishes (Gambusia / Mosquito fish) in ornamental tanks, fountains, etc., Use of biocides (Bacillus thuringiensis).

c. Chemical Control

Use of chemical larvicidal agents like abate (50% EC Temephos) in big breeding containers, indoor aerosol space spray during daytime using 2% Pyrethrum Extract, and outdoor aerosol air spray using Technical Malathion.

d. Personal Prophylactic Measures

Use of topical applicant mosquito repellent creams on exposed parts of the body, liquids, coils, mats etc., wearing of full sleeve shirts and full pants with socks to cover all the possible exposed parts of the body, Use of bed nets for sleeping infants and young children during daytime to prevent mosquito bite.

e. Health Education

To impart knowledge to the public regarding the disease and its presentation, transmission methods and vector dynamics through commonly used media sources like Television, Radio, Cinema slides, social gplatforms, etc. Information Education and Communication (IEC) and Behavioural Change Communication (BCC) about Aedes mosquito breeding sites are illustrated, and there are various audio Jingles as well as celebrity videos promoting Dos and Don'ts. All resources are provided in Tamil, and the public can get toll-free assistance via the 104, and 24 x 7 Public Health Control Room.

f. Community Participation

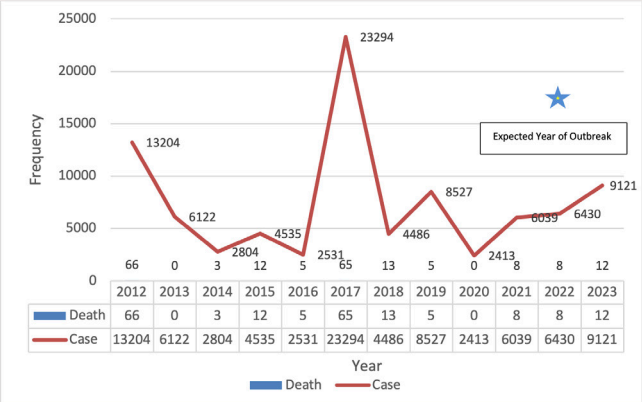
Organising rallies and marches for the community to sensitize them and involving the community for detection of mosquito breeding places and their elimination. Promoting a community representative or a leader to be a moderator of preventive and control measures actively.

RESULTS :

The Dengue infection is prevalent in Tamil Nadu for a while with frequent outbreaks once in every 5 years since the past two decades. With every outbreak the prevalence has increased since 2008.

First ever outbreak was noted in the year 2008 followed by 2012 and 2017.

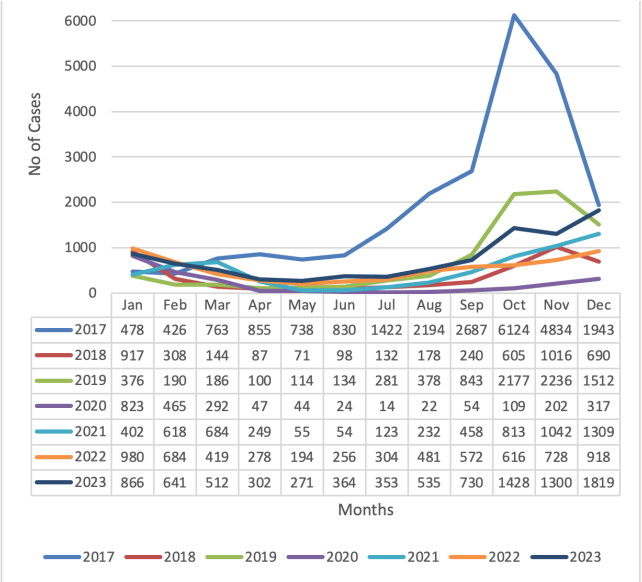
Figure 1 explains the Dengue infection trend in Tamil Nadu since 2012 where there are 2 peaks, one in 2012 and the other in 2017 corresponding to the out breaks.



	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Death	66	0	3	12	5	65	13	5	0	8	8	12
Case	13204	6122	2804	4535	2531	23294	4486	8527	2413	6039	6430	9121

Figure 1: Dengue infection trend in Tamil Nadu from 2012 to 2023.

Figure 2 explains the month-wise distribution trend of Dengue cases in Tamil Nadu from 2017 to 2023. The incidence of Dengue cases increases with onset of monsoon in August. In the year 2017 witnessing the last outbreak in Tamil Nadu, the incidence of cases increased from June and peaked at October reporting 6,124 cases.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2017	478	426	763	855	738	830	1422	2194	2687	6124	4834	1943
2018	917	308	144	87	71	98	132	178	240	605	1016	690
2019	376	190	186	100	114	134	281	378	843	2177	2236	1512
2020	823	465	292	47	44	24	14	22	54	109	202	317
2021	402	618	684	249	55	54	123	232	458	813	1042	1309
2022	980	684	419	278	194	256	304	481	572	616	728	918
2023	866	641	512	302	271	364	353	535	730	1428	1300	1819

Figure 2 : Month-wise distribution of Dengue cases in Tamil Nadu from 2017 to 2023.

Table 1 illustrates the chemical control agents used in Tamil Nadu from 2019 to 2023. Temephos 50% EC and Pyrethrum extract 2% is commonly used for anti-larval measures and anti-adult measures. The procurement has been constant over the years.

Table 1 : Chemical control agents used in Tamil Nadu between 2019 and 2023.

MONTH	2019		2020		2021		2022		2023	
	Temephos 50% EC	Pyrethrum Extract 2%	Temephos 50% EC	Pyrethrum Extract 2%	Temephos 50% EC	Pyrethrum Extract 2%	Temephos 50% EC	Pyrethrum Extract 2%	Temephos 50% EC	Pyrethrum Extract 2%
Jan	2923	1622	2582	1458	1514	1010	1786	1476	2082	1444
Feb	2615	1886	2207	1265	1871	1288	1446	818	1702	1181
Mar	3026	974	1761	1154	2272	2175	1548	596	1949	1357
Apr	2296	1790	1358	448	2401	1126	1083	449	1494	1275
May	1178	1054	1167	403	1137	1264	1160	587	2341	1003
Jun	1974	1481	1347	906	2113	1264	1906	938	1219	1217
Jul	1936	1738	1245	416	1985	1106	1596	983	1621	1256
Aug	2009	1875	1327	662	1835	785	1754	1065	1413	1013
Sep	2300	3374	2022	1248	2279	1351	1601	1156	1500	1175
Oct	3292	3292	1805	1364	1794	1151	1553	1444	1777	1440
Nov	2691	3362	2109	1496	2378	1746	1842	1600	1364	1208
Dec	3358	2623	2018	1402	2430	1963	1774	1394	1487	1312
TOTAL	29598	25071	20948	12222	24009	16229	19049	12506	19949	14881

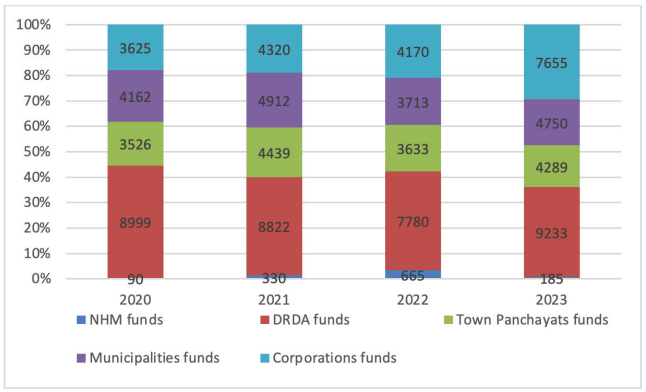


Figure 3 : Domestic breeding checkers deployed in Tamil Nadu from 2020 to 2023

Table 2: HUD wise Mosquito pool tested for Viral markers in Mosquito using RT-PCR test.

S. No	Name of the Health Unit District	2018		2019		2020		2021		2022		2023	
		Samples Tested	Positive	Samples Tested	Positive	Samples Tested	Positive	Samples Tested	Positive	Samples Tested	Positive	Samples Tested	Positive
1	Kancheepuram	27	1	39	15	160	5	223	8	262	13	241	10
2	Chengalpattu	14	0	25	11	103	11	456	16	530	17	348	15
3	Tiruvallur	33	1	49	17	182	6	287	9	320	14	319	6
4	Poonamallee	25	1	17	8	49	6	210	7	151	10	180	20
5	Vellore	93	4	101	30	209	11	342	24	405	8	285	3
6	Ranipet							174	5	290	8	234	11
7	Thirupathur	50	4	73	22	318	9	302	10	301	7	315	10
8	Tiruvannamalai	11	0	27	12	113	7	170	5	242	7	313	5
9	Cheyyar	60	3	53	21	129	9	265	11	289	7	318	9
10	Cuddalore	78	1	140	39	229	14	527	27	574	17	416	11
11	Villupuram	37	3	109	40	135	9	297	10	318	11	303	7
12	Kallakurichi	32	0	62	19	154	11	162	8	239	9	200	3
13	Thanjavur	67	2	154	29	191	5	471	8	395	20	394	10
14	Tiruvarur	32	0	63	16	96	1	159	4	237	10	283	12
15	Nagapattinam	29	0	51	14	125	2	211	1	170	8	168	6
16	Mayiladuthurai									161	8	156	2
17	Trichy	67	0	134	21	237	5	497	14	553	41	544	42
18	Karur	28	1	97	33	167	4	265	6	349	17	316	13
19	Ariyalur	12	1	34	8	57	1	131	1	131	4	146	3
20	Perambalur	18	2	48	5	80	1	122	2	120	7	196	3
21	Pudukottai	75	0	135	14	215	3	338	8	385	9	281	16
22	Aranthangi	20	1	50	9	65	0	118	1	84	1	76	3
23	Madurai	69	1	61	23	218	15	607	28	575	23	637	17
24	Theni	28	0	30	10	49	3	195	5	240	4	251	6
25	Dindigal	69	2	108	34	118	6	281	7	331	10	250	7
26	Palani	17	0	55	17	95	5	190	2	213	5	180	2
27	Ramnad	50	3	71	14	124	4	214	3	206	11	191	7
28	Paramakudi	18	0	89	15	124	2	264	7	260	11	274	17
29	Sivagangai	74	3	94	12	94	2	252	6	297	11	332	11
30	Virudhunagar	73	2	107	17	128	3	257	3	328	16	277	13
31	Sivakasi	56	2	95	22	93	2	254	4	269	13	177	6
32	Tirunelveli	43	1	56	10	64	1	228	13	271	17	340	14
33	Tenkasi	22	7	31	12	73	6	297	22	309	14	287	11
34	Thoothukudi	24	4	34	9	58	0	120	0	438	27	414	18
35	Kovilpatti	22	1	42	10	45	1	128	5	114	11	135	4
36	Kanyakumari	39	1	50	20	86	3	280	7	262	10	233	9
37	Salem	135	8	183	35	265	3	790	18	603	25	591	35
38	Attur									236	9	237	8
39	Namakkal	39	1	75	6	79	0	362	11	465	18	411	16
40	Dharmapuri	28	2	110	23	101	1	203	9	204	7	221	11
41	Krishnagiri	59	9	54	11	152	1	401	4	346	13	206	3
42	Coimbatore	56	1	102	36	91	7	232	15	504	18	287	22
43	Tirupur	77	8	88	28	95	7	509	19	540	22	558	9
44	Erode	15	0	54	15	142	9	309	16	408	16	412	26
45	Nilgiris	2	1	0	0	14	0	6	0	21	1	32	1
46	Chennai Corp	64	5	301	116	27	8	128	6	266	14	253	21
	TOTAL	3905	87	5370	878	7369	209	14255	395	14212	579	13220	514

Table 2 explains the mosquito pool testing done to identify the presence of Dengue virus in the Aedes mosquito. Mosquito pooling has been effectively implemented in all districts and the testing has increased gradually since 2018 following the outbreak in 2017 when the guideline was framed.

Figure 3 explains the number of Domestic breeding checkers (DBC) deployed in Tamil Nadu from 2020 to 2023. Major contribution to the DBC deployment was from the Department of Rural development and the Panchayat Raj through DRDA at District level. DBC workers play a pivotal role in prevention and control of Dengue infection.

DISCUSSION

Dengue is an arboviral disease caused by Dengue virus through the bites of infected Aedes mosquito.

Dengue has become a major public health problem from being an urban disease to pan-geographic disease involving all terrains.

It has a potential to cause outbreaks at constant intervals. Tamil Nadu has experienced outbreaks at an interval of 5 years. With expected outbreak by 2022 the DPH&PM took several initiatives to prevent and control activities. The prevention and control activities involve various strategies.

Disease Surveillance :

Surveillance plays a major role in identifying the Dengue disease trend in the State of Tamil Nadu. It is carried out by the Integrated Disease Surveillance Program of the Integrated Health Information Platform (IHIP-IDSP) and through the NVBDC program. Daily samples tested and positives from the SSH are collected and assessed by the VBDC section of Communicable disease and appropriate field activities are planned with the team of Programme officers at the State level, District Health officers, District Entomologists / Regional entomologist team, various public health staffs and official in the field level and DBC workers with the help of mapping when the trend of disease increases. Similarly, the IHIP-IDSP section of the Communicable disease monitors the real-time reporting through the platform and initiates appropriate control measures with the help of State and District Surveillance officer, Epidemiologist and Rapid Response Team when the trend increases. The dual monitoring is an effective method of surveillance in prevention and control of Dengue outbreaks.[14–16]

Entomological Surveillance :

Entomological surveillance is carried out by the team of Regional Entomologists (RE), District Entomologists (DE), Health Inspectors (HI) and DBC workers in the field to study the vector dynamics and the presence of Dengue virus in the Aedes mosquito. The team periodically performs mosquito pooling which collects samples of the mosquito and larva from the field, and they are tested for the presence of virus by RT-PCR testing in the Apex laboratory at State Public Health Laboratory (SPHL), Chennai, and Institute of Vector Control and Zoonoses (IVCZ), Hosur. When the samples are found positive for Dengue virus field activities to reduce the vector density is initiated with fogging, source reduction, and indoor and outdoor spraying of insecticides.[17,18]

In addition to the mosquito pool, the major step in entomological surveillance is calculation of House Index, Container Index and Breteau Index. They are monitored by the HI and DBC workers on every week by house to house visit and recorded in the register. Analysis of these data helps to predict and impending outbreak when there is rise in the index. Efficient and timely deployment of the HI and DBC workers has helped to monitor the vector density and kept the Dengue disease under control preventing outbreaks.[9,13]

Environmental Surveillance :

Environmental surveillance is carried out by the team of DE, HI and DBC workers in the field. They look for the possible sites for breeding which involves water collection sites, temporary and permanent water collection bodies in houses, farmlands, abandoned buildings, Government and private institutions, and other possible environmental sites which could pose a possible risk factor. The unplanned urbanisation has led to increased burden of Dengue disease which is checked and controlled by the environmental surveillance which targets the root cause for the disease by controlling the vectors.

Integrated vector control measures :

Integrated vector control measures are multi-dimensional and is highly effective in prevention and control of dengue. These measures are closely monitored in Tamil Nadu at the highest levels to prevent any outbreaks of Dengue disease.

a. Source reduction: It is performed by the HI and DBC workers in the field. They destroy or provide alternate measures to all the possible sites which could potentially contain the vectors in breeding. Several activities are involved in it. One such activity is the tyre removal campaign which is conducted on a fixed day in a week to remove all the unused tyres stored in shops and abandoned in the field. Similarly, during regular visits unused and abandoned tanks are destroyed with a chisel and hammer which is available in the kit which they carry. Household empty flowerpot and accessories are stored upside down to prevent water collection which could help vectors breed. Coconut shells, bottles, etc are collected and destroyed.[9,11,18]

b. Biological control: Biological control is by introducing larvivores fish Gambusia in large water bodies in which Aedes larvae could not be destroyed or by chemical control measures. The DPH&PM has introduced Gambusia fish in several waterbodies in the State with the help of HI and DBC workers. These fishes have a strong appetite for mosquito larva leading to control of the vector density and prevention of Dengue disease.[11,18]

c. Chemical control: Chemical control is done by using chemical agents like Pyrethrum extract 2%, Technical Malathion and Temephos EC 50% through the HI and DBC workers monitored by the entomological team. Temephos EC 50% is used in small to medium water storage units in the households which is a larvicidal agent. DBC workers and HI carry it with them during their daily field visit and use them. Similarly, Pyrethrum extract 2% is used for indoor fogging and Technical Malathion for outdoor fogging which acts on adult mosquito and kills them. Fogging is done during 8 to 11 am and by 3 to 5 pm.[5,18]

d. Personal prophylaxis: Every household in the high vector

density area are advised to use mosquito nets. People are advised to wear full sleeves to prevent the public being susceptible to the mosquito bites.[18]

e. Health education and Community participation: The DPH&PM has initiated several measures to provide awareness to the public in prevention and control of Dengue. Several IEC materials have been prepared in the form of pamphlets, short videos involving celebrities and political leaders for dissemination to the public to provide awareness. The DPH&PM has designated multimedia links (Nalam Youtube channel, X handle, TNDPHPM website) where information is shared to the general population to adopt preventive measures. Similarly, guidelines for prevention, control and management are shared to all levels of health care providers including private practitioners through IMA and IAP. These initiatives have had a major impact on the reduction of cases and prevention of outbreaks.[3,19]

Best practices and innovations in Dengue controls :

In Tamil Nadu various best practices from past experiences and innovations are being followed up to prevent and control Dengue. They involve multilevel approach and multisectoral coordination like reporting of clustering of any fever cases to the relevant authorities, Timely referral of Dengue cases through 108 Ambulances, State & District level epidemic co-ordination committee meeting, Nomination of Block Nodal Officers by the District administration during outbreaks/ monsoon season, Special Fever camps / MMU & RBSK teams deployment for medical camps, ORS Corners in all Health facilities to hydrate the patients, 24 Hours Fever Clinic in Community health centers, Government Hospitals and Medical college Hospitals. All Block PHCs and UGPHC having Cell counters to screen the patients haematological status (CBC, Platelet, Haematocrit, etc.) and exclusive fever wards with mosquito proofing and adequate beds, drugs and laboratory logistics and availability of blood components.[18]

Capacity building for Govt and Private Medical practitioners, Involvement of AYUSH Department for distribution of Nila Vembu Kudineer, provision under The Tamil Nadu Public Health Act 1939, Madras Municipal Corporation act, Involvement of resident welfare associations, Raid on Quack practitioners, Effective inter-departmental coordination with Municipal administration and water supply department, Rural development and Panchayat Raj institutions, Education department, Revenue department, and Department of ICDS. Certification of Aedes Free campus activities on every Thursday in Government offices and educational institutions, Detection of Dengue virus from the Aedes mosquito by RT-PCR method, Genomic surveillance – whole genomic sequencing (WGS) of Dengue virus to identify the mutation and emergence of new variants and types of mosquitoes (under process), GIS mapping of Dengue hotspots and Xeno mapping.[11,18]

The above activities have been followed by the DPH&PM ever since Dengue was notified. Adopting the best practices from the experience gained during previous outbreaks these activities are implemented with strict monitoring and evaluation at all levels. These have helped the State of Tamil Nadu to prevent the outbreak of Dengue disease in 2022 - 23 which was expected based on the previous cyclical trend of outbreak once in every 5 years. Continuation of these activities/ best practices/ innovations to prevent outbreak in the future which should be adopted in other States where outbreaks are highly prevalent are recommended.[11,18]

CONCLUSION

Dengue must be viewed as an emerging and serious public health concern that calls for coordinated, multifaceted, and all-encompassing responses. As the Dengue infection outbreak persists in the modern world, the creation of secure, affordable, and effective preventive and control strategies promises a decrease in Dengue viral infection. Advanced combinations have also anticipated attenuation of vector population as tactics expand and are employed in conjunction with other approaches. The above-multifaceted approach followed in Tamil Nadu to the anticipated epidemic prevented the major events and burden of the disease. The mosquito pool is to be strengthened to identify the presence of Dengue virus in Mosquito in all states where Dengue is a major burden to identify the hotspots and initiate Integrated vector control measures to prevent impending outbreaks. Future generations may benefit from improved control and protective immunity if new approaches and techniques are further investigated and tested.

REFERENCES

1. Dengue in India : Indian Journal of Medical Research [Internet]. [cited 2024 Mar 21]. Available from: https://journals.lww.com/ijmr/pages/articleviewer.aspx?year=2012&issue=36030&article=00006&type=Fulltext

2. National Guideline for Clinical Management of Dengue 2022 [Internet]. [cited 2024 Mar 21]. Available from: https://www.who.int/timorleste/publications/national-guideline-for-clinical-management-of-dengue-2022

3. Pilot E, Nittas V, Murthy GVS. The Organization, Implementation, and Functioning of Dengue Surveillance in India—A Systematic Scoping Review. Int J Environ Res Public Health [Internet]. 2019 Feb 2 [cited 2024 Mar 21];16(4). Available from: /pmc/articles/PMC6407027/

4. Guidelines :: National Center for Vector Borne Diseases Control (NCVBDC) [Internet]. [cited 2024 Mar 21]. Available from: https://ncvbdc.mohfw.gov.in/index1.php?lang=1&level=1&sublinkid=5899&lid=3686

5. Kularatne SA, Dalugama C. Dengue infection: Global importance, immunopathology and management. Clin Med (Northfield Il) [Internet]. 2022 Jan 1 [cited 2024 Mar 21];22(1):9. Available from: /pmc/articles/PMC8813012/

6. SIGNS & SYMPTOMS OF DENGUE FEVER :: National Center for Vector Borne Diseases Control (NCVBDC) [Internet]. [cited 2024 Mar 22]. Available from: https://ncvbdc.mohfw.gov.in/index4.php?lang=1&level=0&linkid=436&lid=3711

7. LABORATORY DIAGNOSIS :: National Center for Vector Borne Diseases Control (NCVBDC) [Internet]. [cited 2024 Mar 22]. Available from: https://ncvbdc.mohfw.gov.in/index4.php?lang=1&level=0&linkid=445&lid=3725

8. GOI INITIATIVES FOR DENGUE AND CHIKUNGUNYA :: National Center for Vector Borne Diseases Control (NCVBDC) [Internet]. [cited 2024 Mar 22]. Available from: https://ncvbdc.mohfw.gov.in/index4.php?lang=1&level=0&linkid=444&lid=3726

9. Chin J, American Public Health Association. SURVEILLANCE, EMERGENCY PREPAREDNESS AND RESPONSE. 2009 [cited 2024 Mar 21];624. Available from: https://www.ncbi.nlm.nih.gov/books/NBK143158/

10. Rather IA, Parray HA, Lone JB, Paek WK, Lim J, Bajpai VK, et al. Prevention and Control Strategies to Counter Dengue Virus Infection. Front Cell Infect Microbiol [Internet]. 2017 Jul 25 [cited 2024 Mar 21];7(JUL):336. Available from: /pmc/articles/PMC5524668/

11. Health & Family Welfare Department, Government of Tamil Nadu [Internet]. [cited 2024 Mar 22]. Available from: https://tnhealth.tn.gov.in/tngovin/dph/dphdbdengue.php

12. DENGUE SITUATION IN INDIA :: National Center for Vector Borne Diseases Control (NCVBDC) [Internet]. [cited 2024 Mar 22]. Available from: https://ncvbdc.mohfw.gov.in/index4.php?lang=1&level=0&linkid=431&lid=3715

13. VECTOR CONTROL MEASURES :: National Center for Vector Borne Diseases Control (NCVBDC) [Internet]. [cited 2024 Mar 22]. Available from: https://ncvbdc.mohfw.gov.in/index4.php?lang=1&level=0&linkid=448&lid=3722

14. Chandy S, Ramanathan K, Manoharan A, Mathai D, Baruah K. Assessing effect of climate on the incidence of dengue in Tamil Nadu. Indian J Med Microbiol. 2013 Jul 1;31(3):283–6.

15. Over 3,000 DBC Workers May be Engaged as Multi-Tasking Staff in Delhi - Oneindia News [Internet]. [cited 2024 Mar 28]. Available from: https://www.oneindia.com/india/over-3000-dbc-workers-may-be-engaged-as-multi-tasking-staff-in-delhi-gen-3667093.html

16. Goel K, Chaudhuri S, Saxena A. India's strategy on surveillance system- A paradigm shift from an Integrated Disease Surveillance Programme (IDSP) to an Integrated Health Information Platform (IHIP). Clin Epidemiol Glob Heal [Internet]. 2022 May 1 [cited 2023 Oct 12];15:101030. Available from: http://www.ceghonline.com/article/S2213398422000720/fulltext

17. TNDPHPM [Internet]. [cited 2024 Mar 28]. Available from: https://www.tndphpm.com/#/IVCZ

18. TNDPHPM [Internet]. [cited 2024 Mar 28]. Available from: https://www.tndphpm.com/#/Dengue

19. Mone FH, Hossain S, Hasan MT, Tajkia G, Ahmed F. Sustainable actions needed to mitigate dengue outbreak in Bangladesh. Lancet Infect Dis [Internet]. 2019 Nov 1 [cited 2024 Mar 21];19(11):1166–7. Available from: http://www.thelancet.com/article/S1473309919305419/fulltext

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ORIGINAL ARTICLE - PUBLIC HEALTH

NABL CERTIFICATION FOR THE LABORATORIES IN PRIMARY HEALTH CENTRES UNDER MELT PROGRAM: PROCESS AND PERFORMANCE TO ENSURE QUALITY ASSURANCE

Raju S [(1)], Selvavinayagam T S [(2)], Rajesh Kumar M [(1)] , Kumaresan A [(1)], Arthy Devi P [(1)], Dinesh R [(1)] , Velkumar S [(3)] , Senthilkumar M [(2)], Jemini [(2)] , Somasundaram A [(2)]

(1) State Public Health Laboratory, O/o the DPH&PM, Chennai-6

(2) Directorate of Public Health and Preventive Medicine, Chennai-6

(3) Office of the District Health Office, DPH&PM, Nagercoil

Abstract

INTRODUCTION : NABL provides certification under MELT Program for the peripheral labs based on the quality standards adopted to ensure Quality Assurance (QA). The laboratories in PHCs in Tamil Nadu have been consistently involved in the QA Program and are eligible to apply for NABL Certification. By taking part in this program, laboratories can improve their performance and ensure that they meet the highest standards of quality. This, in turn, helps to improve the quality of healthcare services provided to the community.

AIM : To obtain NABL certification under the MELT Program to ensure the laboratory's commitment to deliver reliable and reproducible diagnostic test results ensuring appropriate treatment in a primary health care setting.

OBJECTIVE : To obtain NABL Certification under MELT Program for the Laboratories in PHCs in Tamil Nadu

METHODOLOGY : NABL certification process involves a series of assessments and evaluations to determine the laboratory's compliance with the NABL standards. State Public Health Laboratory (SPHL) of DPH&PM has facilitated this process by conducting online training to District Microbiologists and Laboratory Technicians of PHCs to understand the essential component required for NABL Certification. All the 2127 PHC laboratories in Tamil Nadu were registered under Medical Entry Level Testing (MELT) during Sep 2023 and uploaded all the vital documents. NABL assessors evaluated the laboratory's infrastructure, equipment, personnel, procedures, and performance in EQAS and proceed further for issue or denial of certification process.

RESULTS : Out of 2127 PHCs in Tamil Nadu, a total of 1622 Laboratories in Primary Health Centre (76%) have received the NABL certification under MELT program in Oct 2023. Five districts have also achieved 100% of their PHC labs obtaining NABL Certification.

CONCLUSION : Quality of laboratory investigations are paramount importance to deliver reliable and reproducible test results in the primary health care centres to serve the community. Participation in NABL certification program ensures credibility of the laboratory system in PHCs and also contributes to the overall development and improvement of primary healthcare systems in Tamil Nadu.

KEYWORDS : NABL, MELT, PHC Lab, EQAS, Certification

INTRODUCTION

Primary Health Care Centers (PHC) play a crucial role in providing essential healthcare services to the community. Laboratory services is an integral part of the primary health care services covering both communicable and non-communicable diseases. Accurate testing is necessary to diagnose, treat and prevent illnesses effectively. It is essential to maintain the highest standards of accuracy in laboratory testing to ensure that the patients receive the best possible care.

PHC laboratories are responsible for conducting a wide range of tests including hematology, biochemistry, clinical pathology and serological investigations. Integrated Essential Laboratory System (IELS) being implemented in Tamil Nadu has assured Test Menu to cover 29 tests in Addl. PHCs and 35 tests in Block PHCs. In addition, 62 tests can be referred out from primary health care institutions to the higher centers like Govt. Hospitals and Medical College Hospitals through an effective Hub and Spoke Model of sample transportation. Laboratory Information Management System (LIMS) provides barcoding of each and every sample registered in a PHC laboratory. These test facilities provide valuable information to healthcare providers, enabling them to diagnose and treat health conditions.

National Accreditation Board for Testing and Calibrating Laboratories (NABL), being the apex institution in the

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Corresponding Author: Raju S
e-mail : sivraju@gmail.com

country is implementing the ISO 15189:2021 standards for the Medical Laboratories fulfilling the requirements for quality and competence. NABL has recently launched a voluntary program namely "Medical Entry Level Testing (MELT) Labs Program" for the medical testing laboratories functioning in villages and small towns, performing basic testing. In order to encourage these labs for their quality practices, NABL provide Certifications under MELT Program. This program is based on the satisfactory External Quality Assurance Scheme (EQAS) or Proficiency Testing (PT) performance participated by the lab from an NABL accredited PT provider.

The NABL certification program is designed to evaluate the quality of laboratory services provided by primary healthcare laboratories and ensure that they meet the required standards.

The certification process involves a series of assessments and evaluations to determine the laboratory's compliance with the NABL standards. The process begins with an online application submitted by the laboratory seeking certification along with uploading of necessary documents including the recent EQAS performance. Upon receiving the application, the NABL team conducts an initial review of the laboratory's documents and procedures to determine if they meet the requirements.

If the laboratory meets the stipulated requirements, the reviewer recommends for certification for a period of three years. During this period, an assessor is assigned to conduct an on-site assessment who evaluates the laboratory facilities, equipment, personnel, procedures, and implementation of quality management system. The assessors also conduct sample testing to ensure that the laboratory's testing methods meet the NABL standards.

About NABL Medical Entry Level Testing (MELT) Labs Program :

The program is offered by the National Accreditation Board for Testing and Calibration Laboratories (NABL), which is an autonomous body under the Department of Science and Technology, Government of India. NABL is responsible for providing accreditation to testing and calibration laboratories in India as per ISO standards.

The NABL MELT Labs Program is designed to help laboratories to establish a quality management system that meets international standards. The program covers all aspects of laboratory testing, including pre-analytical, analytical, and post-analytical phases. It also provides guidance on the selection and use of equipment, as well as the calibration and maintenance of instruments.

It is a comprehensive program that includes both on-site and off-site assessments. On-site assessments are conducted by a team of assessors who visit the laboratory and evaluate its facilities, equipment, personnel, and procedures. Off-site assessments are conducted through a review of the laboratory's documentation and quality management system.

It is a valuable resource for laboratories with limited experience in medical testing. It provides a framework for quality management system implementation and offers guidance on testing procedures, equipment, and personnel training. The program also provides a level of credibility and recognition for laboratories that have successfully completed the certification process.

The program provides a comprehensive initiative designed to help labs establish their proficiency in conducting medical tests. It is an investment in a lab's future and provides them with a competitive edge.

OBJECTIVES

- To register all the 2127 PHC laboratories under NABL certification under MELT
- To sensitize the District Microbiologists and Laboratory Technicians about the MELT Program and submit the documents for verification.
- To follow-up each and every PHC laboratory to submit necessary documents and comply the requirements.
- To ensure completion of application process to obtain NABL certification.

METHODOLOGY

The NABL accreditation procedure is a rigorous process that ensures that laboratories meet the highest standards of quality and accuracy. The first step in the process is to submit an application to NABL through online. This application should include a detailed description of the laboratory, including its scope of work, equipment, and staff qualifications. Once the application is received, NABL will conduct a preliminary assessment to determine if the laboratory is eligible for accreditation. If the laboratory meets the stipulated requirements, certificate will be issued.

For NABL accreditation, Proficiency Testing (PT) plays a vital role. In Tamil Nadu, all the 2127 PHC laboratories were registered with CMC-Clinical Biochemistry EQAS Program for the year 2021,2022 and 2023. A total of 9 biochemistry analytes have been included under the Chemistry III program, Glucose, one of the basic investigations done in a PHC was taken for the performance assessment. The program is based on satisfactory proficiency testing (PT) performance and

valid for one cycle of three years.

The Laboratory application will be reviewed by NABL and decision on recognition will be taken based on performance in proficiency testing (PT). During the recognition period (within three years), on-site assessment (surveillance) will be conducted.

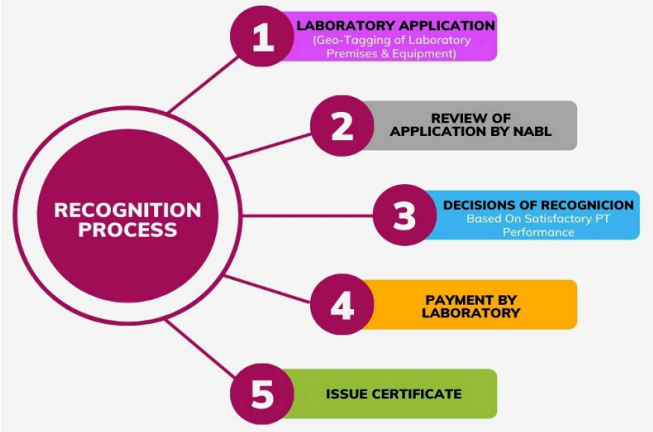

Figure 1 : Flow Diagram for NABL Accreditation Process

The Assessment was based on the following parameters.

- Legal Identity Certificate issued by the PHC Medical Officer.
- EQAS or Proficiency Testing (PT) by a third-party service provider

accredited by NABL-Minimum 6 months participation and satisfactory

performance in all 6 months.

- Calibration of essential equipments like Semiautoanalyzer, Centrifuge

and Micropipettes.

- Availability of facilities like patient waiting area, sample collection area, testing area, washing area and segregation of BMW.
- BMW Authorization issued by Tamil Nadu Pollution Control Board.

The investment and participation in EQAS/IQC and the NABL Certification will ensure the credibility of the PHC labs to deliver quality laboratory investigations for the poor and needy rural community.

RESULTS :

A total of 2127 PHC laboratories were registered with NABL Medical Entry Level Testing (MELT) Labs Program during Sep 2023. A total of 1622 PHC Labs under the Directorate of Public Health and Preventive Medicine have obtained the NABL Certification under the MELT Program (Fig-2).

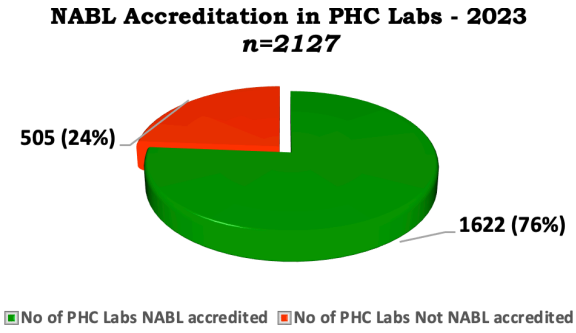

Figure 2 : Percentage NABL Registration and certification in 2023

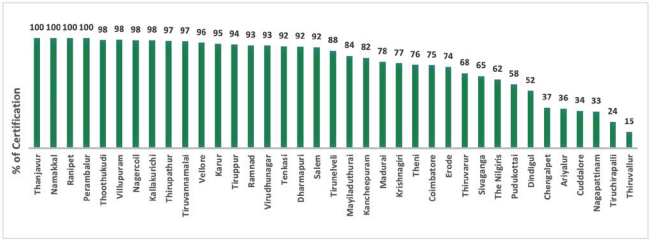

Figure 3 : Overall District wise status-Percentage of NABL Certification

Due to the sustained efforts and constant follow-up, Thanjavur, Namakkal, Ranipet and Perambalur districts have obtained NABL Certification for all their PHC laboratories (Fig-3).

NABL charges a certification fee of Rs 17,718 per laboratory and out of 1622 PHCs in Tamil Nadu 45 PHCs have obtained the certificate by paying the recommended fee from NHM funds. In commemoration of the Silver Jubilee Celebration of Quality Council of India (QCI) in 2023, certification fee for the remaining 1577 PHC laboratories were paid from QCI funds to a sum of Rs 2,79,41,286 (Rs 2.79 crores) which is a saving to Govt.of Tamil Nadu.

DISCUSSION :

Laboratory services in PHCs are very essential for the prevention and control of communicable and non-communicable diseases and also to provide better Maternal and Child Care services. Laboratory strengthening required a sustained efforts to improve infrastructure, necessary human resources, provide essential and quality equipment and consumables and implementation of quality assurance.

Introduction of Semiautoanalyzers in 2006 in PHC laboratories has changed the perception of basic Microscopic Centers into a clinical laboratory. Human resources being one of the critical components of laboratory strengthening, the qualification criteria changed by the Government, allowed recruitment of qualified laboratory technicians in PHCs with CMLT qualification. During the Dengue outbreak in

2017, hematology analyzers were supplied to all Block PHCs and Upgraded PHCs, which has further strengthened and redefined the role and importance of laboratory support in PHCs to the community.

In order to deliver reliable and reproducible test results in PHCs, all the 2127 PHC labs have been registered under CMC-Biochemistry EQAS Program since 2021 onwards and Tamil Nadu is the only state in the country in which all the PHC laboratories are taking part in the QA program organized by a NABL accredited 3rd party.

There was a vision to get NABL certification in all the 2127 PHC labs in a Phased manner covering all block PHCs and UG-PHCs first to obtain the NABL Certification followed by the remaining Additional PHCs. In continuation of the quality initiatives in PHC laboratories, five PHC laboratories representing 5 Districts in Tamil Nadu have obtained the NABL Certification under MELT program viz.,Thalavaipattinam PHC in Tiruppur, Venkitankuruchi PHC in Ramanathapuram, Mapillaiurani PHC in Thoothukudi and Thovalai PHC in Kanyakumari and Patchur in Tirupattur. All these 5 PHCs have fulfilled the requirements without any Non-Conformities (NC) and got the NABL Certificates at the National Conclave in Bangalore in Aug 2022.

NABL certification drive in PHC laboratories was initiated in Sep 2023 with financial support from QCI funds. This was the first time in the country that 1622 PHC labs have obtained the NABL certification.

The NABL certification under MELT Program is an essential resource for medical laboratories that are just starting out or have limited experience in medical testing. The program provides a framework for quality management system implementation and offers guidance on testing procedures, equipment, and personnel training. By participating in the program, laboratories can establish their credibility and ensure the accuracy and reliability of their test results. Accreditation provides formal recognition of competency, thus providing a ready means for the beneficiaries to find a reliable testing laboratory services to meet their needs.

CONCLUSION :

NABL Certification gives quality recognition to the institution at the Primary Health Care level so that it encourages more and more patients form the community to reach and avail health services. It is very important that the out of the pocket expenditure for the laboratory investigations spent by the poor and needy community is very high and a quality certification in PHC labs will drastically reduce the individual expenditure on laboratory investigations in the community.

REFERENCES :

1.https://nabl-india.org/wp-content/uploads/2020/05/Announcement-for-NABL-MELT-Labs- Program.pdf

2. https://nablmelt.qci.org.in/Laboratory/login.php

3. https://certificationinindia.com/nabl-medical-entry-level-testing/

4.Quality-assurance-in-rural-phc-laboratories-by-obtaining-medical-entry-level-testing-labs-melt-under-nabl.html

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ORIGINAL ARTICLE - PUBLIC HEALTH

TREND OF SCRUB TYPHUS IN TAMIL NADU – 2021-2023 (BASED ON IHIP DATA)

AvudaiSelvi Rathinasamy [(1)], Amudha [(1)], SankarmaniRamasamy [(1)] , Mathivanan [(1)], Sudhakar Thangarasu [(1)], Vimalkumar Elangovan [(1)], Krishnaveni P [(1)], Srinivasan K [(1)] Gurunathan V [(1)], Balamurugan M [(1)], Senthil Kumar M [(1)] , SomasundaramA [(1)],Vadivelan P [(1)], Selvavinayagam T S [(1)]

(1) Directorate of Public Health and Preventive Medicine, Tamil Nadu

Abstract

INTRODUCTION : Scrub typhus is a well-known zoonotic disease and it is also a neglected tropical disease. It was once thought to be a disease of rural origin but widely distributed in the recent past which has become a major public health problem.

OBJECTIVE : To analyse the epidemiological profile of Scrub typhus in Tamil Nadu.

METHODS : It's a descriptive cross-sectional study using secondary data of 35662 samples from IHIP-IDSP portal between 2021 and 2023. The collected data was analysed using SPSS-16 and QGIS-3.34.Data were expressed as tables, charts and maps.

RESULTS : Among the sample tested, 1746 were positive for Scrub typhus with positivity rate of 4.8% and equal distribution between genders. The prevalence was similar between 1 and 60 age group but maximum hospitalisation was observed in children less than 10 years. The prevalence of cases was found throughout the year in most districts with peaks between July and March.

CONCLUSION : Scrub typhus has become a re-emerging disease of public health importance. From being a disease of monsoon and post monsoon trend it has become endemic in most districts with sporadic outbreaks. More field studies and holistic approach involving intersectoral coordination and implementation of One Health is crucial to prevent any

INTRODUCTION

Scrub typhus is an acute febrile illness that affects multiple organ systems and results in significant morbidity and mortality. It is a zoonotic infection caused by an obligate intracellular bacteria Orientia tsutsugamushi, transmitted to humans by the bite of mite (Chiggers) belongs to the family Trombiculidae , species Leptotrombidium deliense.[1] It is responsible for fatal tropical infection and is a disease of public health importance in India.[2] The agents causing this infection belong to the Order Rickettsiales, that comprises of the family Anaplasmataceae and Rickettsiaceae. Of these rickettsioses are caused by bacteria belonging to the genus Rickettsia, while scrub typhus is due to Orientia spp.[3]

The Incidence of Scrub typhus is commonly reported in Asia-Pacific region. It is endemic in India, Korea, China, Taiwan, Japan, Pakistan, Thailand, Laos, Malaysia, Vietnam, Sri Lanka, and Australia. In 1999, the World Health Organization listed scrub typhus as one of the most underdiagnosed and underreported causes of febrile illness in the Asian region. The majority of cases of scrub typhus occur in rural areas where mite-harbouring vegetation is common. Most of the studies have described focal areas of scrub vegetation as small as a few square meters that are infested with these mites becomes hot spots, their risk of disease increases dramatically.[4]

In recent years there has been a resurgence of scrub typhus across India. Scrub typhus has re-emerged as a major cause of acute undifferentiated febrile illnesses (AUFI) with high morbidity and mortality.[5,6] It is known to occur in diverse ecological settings in India with more numbers of cases being reported from Tamil Nadu, Andhra Pradesh, Karnataka, and Kerala in the South, Himachal Pradesh, Uttaranchal, Jammu, and Kashmir in the North, Meghalaya, Assam, and Nagaland in the North-East, West Bengal and Bihar in the East, and Maharashtra and Rajasthan in the West.[7]

In the temperate zones transmission is seasonal, whereas in tropical areas transmission occurs throughout the year and it is influenced by rainfall which may be the reason

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Corresponding Author: AvudaiSelvi Rathinasamy
e-mail : skyblue4616@gmail.com

for clustering of cases during the rainy season(8) But the outbreaks have been reported during the winter season in southern parts of India.[9]

The clinical manifestation begins few days after chigger bite. A necrotic eschar may be noted at the inoculating site of the mite. This finding is pathognomonic of the disease in endemic settings. It begins as a papule and later ulcerates to form a black crust like a skin burn from a cigarette.[7] Eschars can be missed in dark skinned individuals. They are mostly found in covered locations such as groins, axilla etc[10] In absence of characteristic eschar, it is difficult to clinically suspect scrub typhus. Similar to many other febrile illnesses, this disease is characterized by non-specific features like fever, rash, headache, dyspnea, lymphadenopathy and organomegaly which pose a significant challenge to the treating physicians. Therefore, high index of suspicion and early use of appropriate diagnostic test is very important to prevent fatalities.[11] With the above knowledge this study was planned to estimate the prevalence of Scrub typhus in Tamil Nadu and analyse the epidemiological factors of the disease in the state.

METHODOLOGY

This is a retrospective study with secondary data analysis of the scrub typhus cases. The Scrub typhus reported data was collected from Integrated Disease Surveillance Programme under Integrated Health Information Portal. The data included in this study was the samples tested at District Public Health Laboratories of Tamil Nadu from June 2021 – December 2023. Official permission to conduct this study was obtained from the Director of Public Health and Preventive Medicine (DPH&PM), Tamil Nadu. The line listing format includes information on name, age, sex, address, date of diagnosis, and the patient care (in-patient or out- patient). The IDSP IHIP data were collected from all Government Primary health centers (PHCs), Community health centers (CHCs) and District hospitals (DHs). The details of the patients were not disclosed in this study.

Diagnosis was by standard IgM ELISA for Scrub typhus, which uses recombinant p56kD type specific antigens of Orientia tsutsugamushi Karp, Kato, Gilliam, and TA716 strains.

Based on the line listing data of Rickettsial infections during the study period, a preliminary analysis was carried out by SPSS software (version 16.0). Age was grouped into 10 categories with class interval of 10. District wise prevalence of Scrub typhus was analysed and interpreted using mapping by QGIS software (version 3.34).

RESULTS

In Tamil Nadu currently there are 38 DPHLs functioning one in each of the 38 districts. A total of 35,761 patient'ssamples were tested during the study period out of which 99 samples were invalid, they were either haemolysed or insufficient sample.

Finally,35662 samples were included in this study and the positivity rate was 4.8% (1746). Further analysis was carried out for 1746 positive samples. The mean age of patient was 34.5 ± 20.2 years and the positivity rate was equally distributed in both the genders. (Table 1)

Table 1: Gender wise prevalence of Scrub typhus in Tamil Nadu (2021-2023)

Gender	Negative	Positive	Total	Prevalence (%)	95% CI
Female	18443	948	19391	4.8%	4.59 to 5.20
Male	15462	798	16260	4.9%	4.58 to 5.25
Transgender	11	0	11	0%	0
Total	**33916**	**1746**	**35662**	**4.8%**	**4.67 to 5.12**

Among the 1,746 patients reported positive, 577 patients were hospitalised. Among those hospitalized, about 19% (115) belongs to the age group of 1 -10 years.

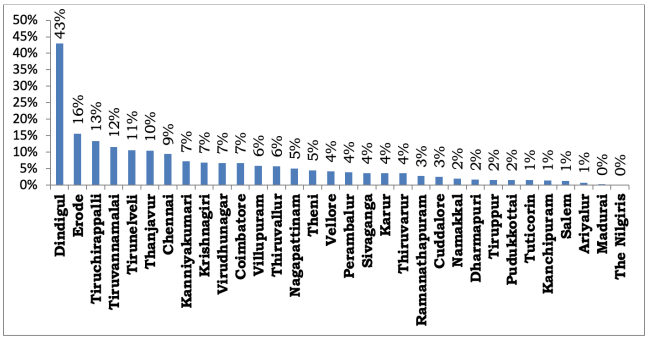

Figure 1: District-wise positivity rate for Scrub typhus in Tamil Nadu.

The positivity rate of the samples tested is presented in the Figure 1. Highest positivity rate was observed in Dindigul district with 43% and least was observed in Madurai and The Nilgiris with 0%.

Table 2 : Age-sex distribution of Scrub typhus cases in Tamil Nadu (2021- 2023)

Age Grouping	IPD			OPD			Grand Total
	Female	Male	Total	Female	Male	Total	
<10 years	52	63	**115**	74	54	**128**	**243**
11-20 years	30	58	**88**	98	106	**204**	**292**
21- 30 years	53	26	**79**	117	65	**182**	**261**
31-40 years	28	32	**60**	111	79	**190**	**250**
41-50 years	51	34	**85**	94	74	**168**	**253**
51-60 years	38	28	**66**	83	66	**149**	**215**
61-70 years	26	33	**59**	61	48	**109**	**168**
71-80 years	10	9	**19**	16	17	**33**	**52**
81-90 years	3	3	**6**	2	3	**5**	**11**
> 90 years	0	0	**0**	1	0	**1**	**1**
Grand Total	**291**	**286**	**577**	**657**	**512**	**1169**	**1746**

Seasonal clustering of cases was observed. The incidence of cases started to increase from September to December of the study period and falling back to normal by February. (Figure:2)

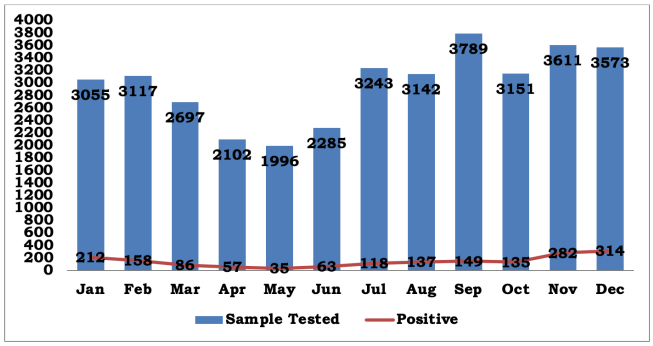

Figure 2 : Graph representing Cumulative test done to positives Month-wise for Scrub typhus cases in Tamil Nadu

Figure 3 demonstrates the mont-wise distribution of Scrub typhus in Tamil Nadu for three years. There was 7 reported outbreaks of Scrub typhus. Most outbreaks were reported during the surge of cases or when there was a fall in cases. In 2021 outbreaks were reported in Dindigul and Thanjavur districts. In 2022 outbreaks were reported in Thanjavur, Krishnagiri, Virudhunagar.

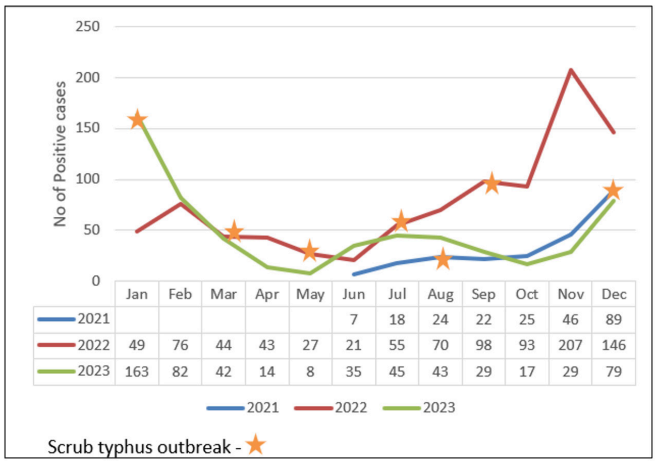

Figure 3 : Year and Month wise incidence of Scrub typhus cases in Tamil Nadu – 2021 – 2023 with outbreaks reported

The distribution of Scrub typhus cases in all districts for 3 years were represented in the Figure 4. Scrub typhus is endemic in following districts such as Chennai , Kanchipuram, Ranipet , Krishnagiri and Kanniyakumari reported Scrub typhus throughout the study period (2021 -2023). Recently incidence was higher in the Nilgiris , Chengalpattu, Thoothukudi and Tirunelveli.

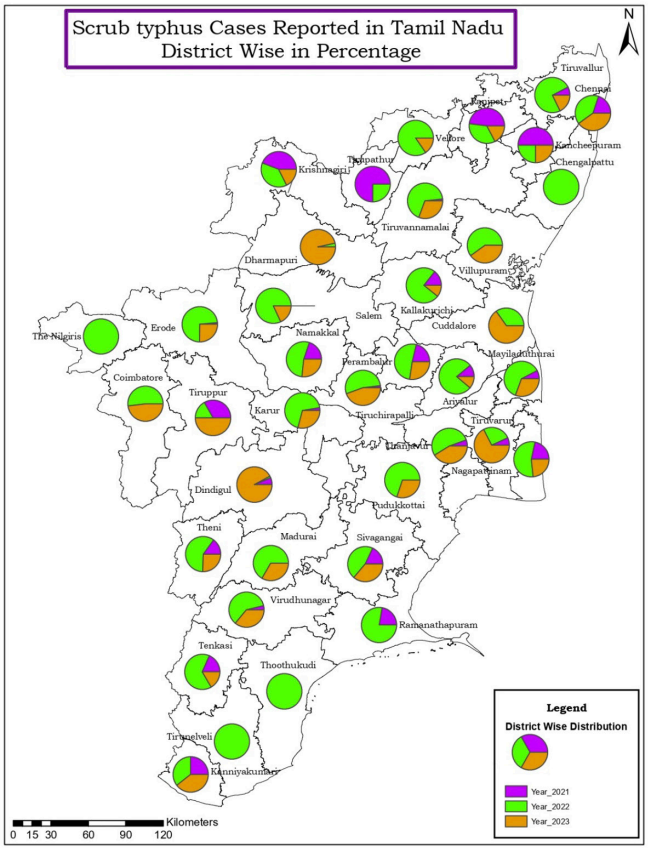

Figure 4 : District wise Distribution of Scrub typhus cases in Tamil Nadu – 2021 -2023.

DISCUSSION

Scrub typhus has been prevalent in India for quite a while and due to recent advances it was not a major public health burden for over decades. In several discussions and forums it has been in lime light as an important neglected tropical disease. Recently the incidence of Scrub typhus has been in increasing trend. The major burden was seen in rural areas with increased vegetation with domestic and wild animal habitations. But our study has come up with finding of cases throughout the state both in urban and rural which could be due to rapid urbanisation and climate change.

Our study involved 35622 cases who were suspected to be suffering Scrub typhus and the test positivity rate was 4.8% which is much less when compared to study conducted in Delhi by C.K.Thakur et al, in south India by Chrispal A.et al and in Goa by Narvencar KPS et al. The difference in test positivity in our study could be due to a community based study rather than hospital based study in other studies.

The incidence of Scrub typhus was similar in proportion in both genders in our study. Similar findings were also observed in studies conducted by Soloman D' Cruz et al in Northern Tamil Nadu, George M et al in Andhra Pradesh and in Delhi by C.K.Thakur et al. In contrast the

study in China conducted by Pei-Ying Peng et al showed increased prevalence was observed in female. This difference in the finding could be due to geography of the location and nature of the job by the individual. In India agriculture work including cattle rearing is equally shared among the gender, which could influence the finding of equal distribution.

The prevalence of cases was evenly distributed between ages from 1-60 years and the prevalence decreased in elderly more than 60 years of age. The above finding was inconsistence with finding from other studies conducted by Pei-Ying Peng et al where the incidence in higher above 40 years of age. Taking into consideration, the severity of the disease, majority of IP admission was sought for cases less than 10 years of age. The above finding could be due to the highest health seeking behaviour of parents towards the children rather than for the adults which is similar to the study conducted in South Odisha by Akash Panigrahi et al.

Seasonal trend had an influence in the prevalence of Scrub typhus in our study. It was observed that the cases started to increase from the month of July and peaked at November and December, followed by decline in cases by February. Similar findings of seasonal trend was observed in study by C.K.Thakur et al, George M et al and Soloman D' Cruz et al. These findings could be due to the monsoon and post monsoon effect leading to migration of animals and vectors to favourable environment. Climate change due to global warming has led to prevalence of cases throughout the year which was not common a decade ago.

Outbreaks due to Scrub typhus occurred sporadically in different districts through the year. Outbreak did not follow any seasonal trend and it occurred even when the case load was minimal. In contrast to our findings, several studies highlighted that outbreaks were more common during monsoon and post monsoon in study conducted by Meghnath D et al and Pei-Ying Peng et al . This change could be due to climate change and environmental modification which leads to human animal conflicts due to migration and geographical variation.

The number of cases reported in 2021 was less compared to 2022 and 2023 and only in selected pockets of Tamil Nadu. This could be due to the effect of COVID -19 pandemic which imposed lockdown and restricted movements of people. Following which in 2022 Scrub typhus cases were reported through the state with maximum number of outbreaks during the study period. This probably could be due to the sudden exposure and triggering between the epidemiological triad of agent host and vector. Since 2023 Scrub typhus has become endemic to all districts throughout the year. The Only exception in the findings was in The Nilgiris and Madurai district. The probable reason for very low positivity at Nilgiris district could be due to low temperature which does not favour the growth of ticks while Madurai district probably could be free from agent or less agent and vector.

CONCLUSION

In conclusion our study has provided valuable insights on district wise epidemiological data of Scrub typhus in Tamil Nadu, which can help in public health decisions at the district and state level. The seasonal variations can be used with data's from the Meteorological department to study the impact of climate change on vector borne diseases. These valuable inputs can be incorporated with data's obtained during intersectoral coordination for development of a One Health Directorate to combat the future events and outbreaks.

REFERENCES

1. Watt G. Parola P. Scrub typhus and tropical Rickettsioses. Curr Opin Infect Dis 2003; 16 : 429-36.

2. Behera B, Biswal M, Das RR, Dey A, Jena J, Dhal S, et al. Clinico-epidemiological analysis of scrub typhus in hospitalised patients presenting with acute undifferentiated febrile illness: A hospital-based study from Eastern India. Indian J Med Microbiol. 2019 Apr-Jun; 37(2):278–280. https://doi.org/10. 4103/ijmm.IJMM_19_147 PMID: 31745031.

3. Luce-Fedrow, A. et al. Strategies for detecting rickettsiae and diagnosing rickettsial diseases. Future Microbiol. 10(4), 537–564 (2015).

4. https://www.cdc.gov/typhus/healthcare-providers/index.html.

5. Kispotta R, Kasinathan A, Kumar Kommu PP, Manikandan M. Analysis of 262 Children with Scrub
Typhus Infection: A Single-Center Experience. Am J Trop Med Hyg. 2020 Nov 9. https://doi.org/10.
4269/ajtmh.20-1019 Epub ahead of print. PMID: 33219642.

6.Varghese GM, Trowbridge P, Janardhanan J, Thomas K, Peter JV, Mathews P, Abrahamet al. Clinical
profile and improving mortality trend of scrub typhus in South India. Int J Infect Dis. 2014 Jun; 23:39–
43. https://doi.org/10.1016/j.ijid.2014.02.009 Epub 2014 Mar

21. PMID: 24661931.

7. Xu G, Walker DH, Jupiter D, Melby PC, Arcari CM. A review of the global epidemiology of scrub typhus.
PLoS Negl Trop Dis. 2017 Nov 3; 11(11):e0006062. https://doi.org/10.1371/journal.pntd.0006062
PMID: 29099844; PMCID: PMC5687757.

8. Gurung S, Pradhan J, Bhutia PY. Outbreak of scrub typhus in the North East Himalayan region-Sikkim: An emergingthreat. Indian J Med Microbiol. 2013;31:72–4. [PubMed] [Google Scholar]

9. Liu YX, Feng D, Suo JJ, Xing YB, Liu G, Liu LH, et al. Clinical characteristics of the autumn-winter type scrub typhuscases in South of Shandong province, Northern China. BMC Infect Dis. 2009;9:82. [PMC free article] [PubMed] [GoogleScholar]

10. Kim DM, Won KJ, Park CY, Yu KD, Kim HS, Yang TY, et al. Distribution of eschars on the body of scrub typhus patients: a prospective study. Am J Trop Med Hyg 2007; 76:806–9.

11. Peter JV, Sudarsan TI, Prakash JAJ, Varghese GM. Severe scrub typhus infection: Clinical features, diagnostic challenges and management. World J Crit care Med [Internet]. 2015 [cited 2024 Feb 28];4(3):244. Available from: https://pubmed.ncbi.nlm.nih.gov/26261776/

12. Kala D, Gupta S, Nagraik R, Verma V, Thakur A, Kaushal A. Diagnosis of scrub typhus: recent advancements and challenges. 3 Biotech [Internet]. 2020 Sep 1 [cited 2024 Mar 21];10(9). Available from: /pmc/articles/PMC7431554/

13. Vanramliana, Pautu L, Lalmalsawma P, Rosangkima G, Sarma DK, Chinzah H, et al. Epidemiology of scrub typhus and other rickettsial infections (2018–22) in the hyper-endemic setting of Mizoram, North-East India. PLoS Negl Trop Dis [Internet]. 2023 Nov 1 [cited 2024 Feb 28];17(11):e0011688. Available from: https://journals.plos.org/plosntds/article?id=10.1371/journal.pntd.0011688

14. Devasagayam E, Dayanand D, Kundu D, Kamath MS, Kirubakaran R, Varghese GM. The burden of scrub typhus in india: A systematic review. PLoS Negl Trop Dis [Internet]. 2021;15(7):1–15. Available from: http://dx.doi.org/10.1371/journal.pntd.0009619

15. Thakur CK, Chaudhry R, Gupta N, Vinayaraj E V., Singh V, Das BK, et al. Scrub typhus in patients with acute febrile illness: A 5-year study from India. Qjm. 2020;113(6):404–10.

16. Chrispal A, Boorugu H, Gopinath KG, Prakash JAJ, Chandy S, Abraham OC, et al. Scrub typhus: an unrecognized threat in South India - clinical profile and predictors of mortality. Trop Doct [Internet]. 2010 Jul [cited 2024 Mar 21];40(3):129–33. Available from: https://pubmed.ncbi.nlm.nih.gov/20360426/

17. Narvencar KPS, Rodrigue S, Nevrekar RP, Dias L, Dias A, Vaz M, et al. Scrub typhus in patients reporting with acute febrile illness at a tertiary health care institution in Goa. Indian J Med Res [Internet]. 2012 Dec [cited 2024 Mar 20];136(6):1020. Available from: /pmc/articles/PMC3612306/

18. D'Cruz S, Perumalla SK, Yuvaraj J, Prakash JAJ. Geography and prevalence of rickettsial infections in Northern Tamil Nadu, India: a cross-sectional study. Sci Rep [Internet]. 2022;12(1):1–9. Available from: https://doi.org/10.1038/s41598-022-21191-7

19. Peng PY, Duan HY, Xu L, Zhang LT, Sun JQ, Zu Y, et al. Epidemiologic changes of a longitudinal surveillance study spanning 51 years of scrub typhus in mainland China. Sci Rep [Internet]. 2024 Dec 1 [cited 2024 Mar 20];14(1):3138. Available from: https://pubmed.ncbi.nlm.nih.gov/38326459/

20. Panigrahi A, Narasimham M V., Biswal M, Bisht K, Mishra B, Parida B. Epidemiology of scrub typhus in a tertiary care hospital of Southern Odisha: a cross sectional study. Indian J Med Microbiol [Internet]. 2023 Mar 1 [cited 2024 Mar 20];42:92–6. Available from: https://pubmed.ncbi.nlm.nih.gov/36192256/

21. Dhimal M, Dumre SP, Sharma GN, Khanal P, Ranabhat K, Shah LP, et al. An outbreak investigation of scrub typhus in Nepal: confirmation of local transmission. BMC Infect Dis [Internet]. 2021 Dec 1 [cited 2024 Mar 20];21(1). Available from: /pmc/articles/PMC7893900/

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ORIGINAL ARTICLE - PUBLIC HEALTH

ASSESSMENT OF CARDIOVASCULAR RISK EVENT USING WHO/ISH RISK PREDICTION CHARTS AMONG OUTPATIENTS ATTENDING PRIMARY CARE FACILITY IN TAMIL NADU

Kothandaraman S [(1)], Subramani A [(2)], Prathap Kumar P [(2)] , Pravin T [(2)], Krishnaraj K [(2)], Selvavinayagam T S [(2)]

(1) District Programme Officer, Non-Communicable Diseases, O/o Deputy Director of Health Services, Thiruchirapalli.
(2) Directorate of Public Health and Preventive Medicine, Chennai-6

Abstract

INTRODUCTION : The 2030 Agenda for Sustainable Development recognizes NCDs as a major challenge for sustainable development. Non-communicable diseases (NCDs), also known as chronic diseases, tend to be of long duration and are the result of a combination of genetic, physiological, environmental and behavioral factors. The non-communicable diseases commonly include cardiovascular disease (CVD), various types of cancers, chronic respiratory illnesses, diabetes, and so on which are estimated to account for around 60% of all deaths.
OBJECTIVE : To assess the ten-year risk cardiovascular events using WHO/ISH charts among outpatients in primary care facility.
METHODOLOGY : Secondary data analysis of the study conducted by J-PAL. All the data collected by the primary study has been included without any inclusion or exclusion criteria. 1260 Outpatient Department (OPD) attendees of four Primary health centers were assessed for risk of encountering a major cardiovascular event such as myocardial infarction or stroke ten years later using the WHO/ISH risk prediction charts.
RESULTS : Cardiovascular risk factors like smoking and abdominal obesity was found to be 5% and 60%, lipid parameters like total cholesterol, low and High-Density Lipoprotein values were found to be abnormal in 53%, 29.6% and 10% respectively. Among the study population, patients already diagnosed with diabetes was 246 (19.6%) and based on JNC 8 classification 219(17%) had stage 1 and 65(5%) had stage 2 hypertension. Out of 1260 study participants 76% had lower risk and 24% had moderate risk for the occurrence of cardiovascular events by using WHO/ISH risk prediction charts in the next ten years.
CONCLUSION : WHO-ISH risk predication chart can be used as a tool to predict cardiovascular diseases risk in a low-cost resource settings among asymptomatic individuals.
KEYWORDS : Cardiovascular diseases, Risk prediction charts, WHO/ISH.

INTRODUCTION

The 2030 Agenda for Sustainable Development recognizes NCDs as a major challenge for sustainable development. As part of the agenda, heads of state and government committed to develop ambitious national responses and to reduce premature mortality from NCDs by one third through prevention and treatment.

Non-communicable diseases (NCDs), also known as chronic diseases, tend to be of long duration and are the result of a combination of genetic, physiological, environmental and behavioral factors. The non-communicable diseases commonly include cardiovascular disease (CVD), various types of cancers, chronic respiratory illnesses, diabetes, and so on which are estimated to account for around 60% of all deaths.[1] Cardiovascular diseases (CVDs) are a group of disorders of the heart and blood vessels. An estimated 17.9 million people died from cardiovascular diseases in 2019, representing 32% of all global deaths. Of these deaths, 85% were due to heart attack and stroke. Over 75% of cardiovascular diseases deaths take place in low- and middle-income countries.[2]

The most important behavioral risk factors of heart disease and stroke are unhealthy diet, poor physical activity, tobacco and harmful use of alcohol. The effects of behavioral risk factors may show up in individuals as raised blood pressure, blood glucose and blood lipids as well it can lead to overweight and obesity. These risks factors can be measured in primary care facilities and most cardiovascular diseases can be prevented by addressing behavioral risk factors at early stages. Identifying those at highest risk of cardiovascular diseases and ensuring they receive appropriate treatment can prevent premature deaths.[2]

WHO/ISH charts are designed to aid the clinicians in implementing timely preventive measures to improve the life expectancy, quality of life of the risk groups and reduction in the burdening of the health system. These charts indicate

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Corresponding Author: Kothandaraman S
e-mail : dr.ktgsram@gmail.com

10-year risk of a fatal or non-fatal major cardiovascular event (myocardial infarction or stroke), according to age, sex, blood pressure, smoking status, total blood cholesterol and presence or absence of diabetes mellitus.[3] This study was conducted to assess the ten-year risk of fatal or non-fatal cardiovascular event using WHO-ISH risk prediction chart among patients attending Outpatient Department (OPD) in a primary care center.

METHODS

This secondary study analyzes data derived from a larger primary investigation, which was conducted with after ethical clearance. The primary study (DPH-JPAL-ML STUDY) employed random sampling techniques across various blocks within the Tiruchirapalli district from 19 July 2023 to 23 September 2023, selecting four blocks at random and the study was conducted among 1260 study participants aged above 40 years. Subsequently, one primary health center per block was chosen randomly, and patients attending routine outpatient clinics were recruited as study participants after providing informed consent in the local vernacular language. All consecutive patients attending the general outpatient department were included in the primary study. This secondary data analysis utilizes the entirety of the data collected during the primary study, without any additional inclusions or exclusions.

WHO/ISH risk prediction charts are a series of color-coded charts recommended by the WHO guidelines for CVD prevention. Different charts are available for the 14 WHO epidemiological sub regions around the world. In our study to estimate the ten year CVD risk, WHO/ISH (laboratory- based) chart of SEAR D (Asian region) has been used with the parameters of age, diabetic status, smoking status total cholesterol and Systolic blood pressure.[3]

After obtaining the informed consent, study participants were interviewed face-to-face using the questionnaire adopted from WHO-STEPS survey.[4] Also, each of the participants were subjected to anthropometric measurement (waist circumference); assessment of blood pressure, and laboratory investigations (lipid profile). Lipid profile was measured using fasting blood samples of the study subjects using an Olympus AU400 auto analyzer. The set cut-off values for lipid profile were adopted as per WHO guidelines. The data collected was entered in MS excel and was analyzed using SPSS version 20.0. Descriptive statistics using frequencies and percentages were calculated for categorical data.

OPERATIONAL DEFINITIONS

Smoking was defined as the use of any smoke form of tobacco product in the last six months.[4] Diabetic status was defined by individuals who were under treatment with oral hypoglycemic agents/ insulin was labeled as diabetic irrespective of their blood glucose status.

Blood pressure was measured using a digital blood pressure monitor (Omron) by using the Oscillo metric technique as recommended by NCD surveillance of Integrated Disease Surveillance Project (IDSP), Government of India. It was measured in right upper limb in supine position or sitting on a chair with back straight and with arm resting on a table at the level of the heart with appropriate size cuff.

The first reading of blood pressure was taken after 5 minutes of rest and subjects were diagnosed to be hypertensive (if systolic blood pressure ≥140 mm Hg and/or diastolic blood pressure ≥90 mm Hg or taking antihypertensive medication).

Waist circumference was measured at a level midway between the lowest rib and the iliac crest using microcopies tape with sensitivity of 0.1 cm. Subjects with a waist circumference of ≥102 cm (male) and ≥88 cm (females) was said to have abdominal or truncal obesity.[12]

The ten-year risk of a fatal or non-fatal cardiovascular event was classified based on the scores obtaining by plotting the collected data in the WHO/ISH risk prediction chart. The risk was classified as low, moderate or high when the score was below 10, 10 to 20 or above 20 respectively.[4]

RESULTS

A total of 1260 study subjects were assessed for the cardiovascular risk factor using WHO-ISH charts. Majority of study participants were females 795 (63%) (Fig 1) and most of participants (235) were between 40 to 44 years of age.

CVD risk factors like smoking and abdominal obesity was found to be 5% and 60% (Table 1) among the study participants, lipid parameters like total cholesterol, low and High-Density Lipoprotein values were found to abnormal in 53%, 29.6% and 10% respectively in the study (Table 2). Among the study population, patients already diagnosed with diabetics was 246 (19.6) and based on JNC-8 classification, 492 (39%) had pre-hypertension,219(17%) had stage 1 and 65(5%) had stage 2 hypertension (Fig 2). Among the participants, 76% had lower risk, 23% had moderate risk and 1% had high risk for the occurrence of cardiovascular events by using WHO/ISH risk prediction charts in the next ten years. (Table 3)

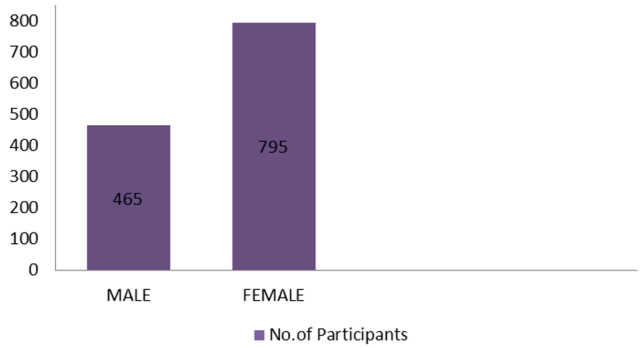

Figure 1 : Distribution of study participants based on Gender (n=1260)

Table 1 : Distribution of waist hip ratio among participants (n=1260)

Waist –hip ratio	Frequencies (%)
HIGH	756(60%)
LOW	504 (40%)

Table 2 : Baseline characteristics of study participants (n=1260)

Variables	Present (%)	Absent (%)
Diabetes mellitus	**246(19.7)**	**1013(80.3)**
Hypertension	**284(22.5)**	**976(77.5)**
High HDL	**126(10)**	**1134(90)**
High LDL	**371(29.6)**	**889(70.4)**
High cholesterol	**668(53)**	**592(47)**

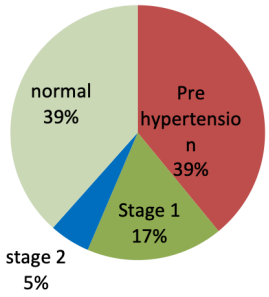

Figure 2 : Distribution of study participants based on JNC 8 classification (n=1260)

Table 3: Ten-year risk of a fatal or non-fatal cardiovascular event according to WHO/ISH risk prediction chart (n=1260).

CVD risk	Frequency	Percentage
Low	954	76%
Moderate	294	23%
High	12	1%

DISCUSSION

The present study observed that 76% of the individuals had low risk, 23 % had moderate risk and 1.0% of them had high risk of developing a fatal or non-fatal cardiovascular event in ten years, as per the risk prediction charts. Similar findings were observed by application of the WHO/ISH risk prediction charts in various studies. Almost 17% of the study subjects had moderate or high risk for a cardiovascular event in a study done by shrivatsav et al in a rural population of Puducherry[5] Savitharani et al, in their study done among support staff of a tertiary hospital in Mysuru reported that 1.7% had ten-year risk of CVD which was contradictory to our study findings.[6]

The risk factors of CVD like diabetes and hypertension were 19.7% and 36% among study subjects which was similar to a study conducted by deori et al in a rural population of Lucknow were prevalence of diabetes and hypertension was 15.6% and 34% respectively.[7] Similar study done by otgontuya in Mongolia had diagnosed 44% to be hypertensive among study population.[8]

Of the lipid parameters in our study, 10% of subjects had abnormal HDL level and high total cholesterol, high LDL was present in 53% & 29.6% subjects respectively which was contradictory to the study done by Ghorpade et al were high cholesterol and LDL was 25.6% and 22.7 % respectively.[9] The present study identified that age, abdominal obesity, raised systolic blood pressure, known case of diabetes and raised cholesterol values as significant factors associated with CVD risk which was similar study done by Norhayati et al in Malaysia showed that diabetes and hypertension plays a vital role in occurrence of CVD.[10]

CONCLUSION

WHO-ISH risk predication chart can be used as a tool to predict the risk for occurrence of cardiovascular diseases risk in low-cost resources settings among asymptomatic individuals. This helps in planning preventive measures at primary levels to reduce the burden of non-communicable disease in the future.

RECOMMENDATIONS

As the WHO-ISH charts yield useful information in predicting cardio vascular disease, this tool can be utilized at primary care level utilising data from MTM –line list portal by addition of missing factors like total cholesterol. This will help in categorizing the risk of the individual to mitigate the magnitude of fatal or non-fatal cardiovascular event.

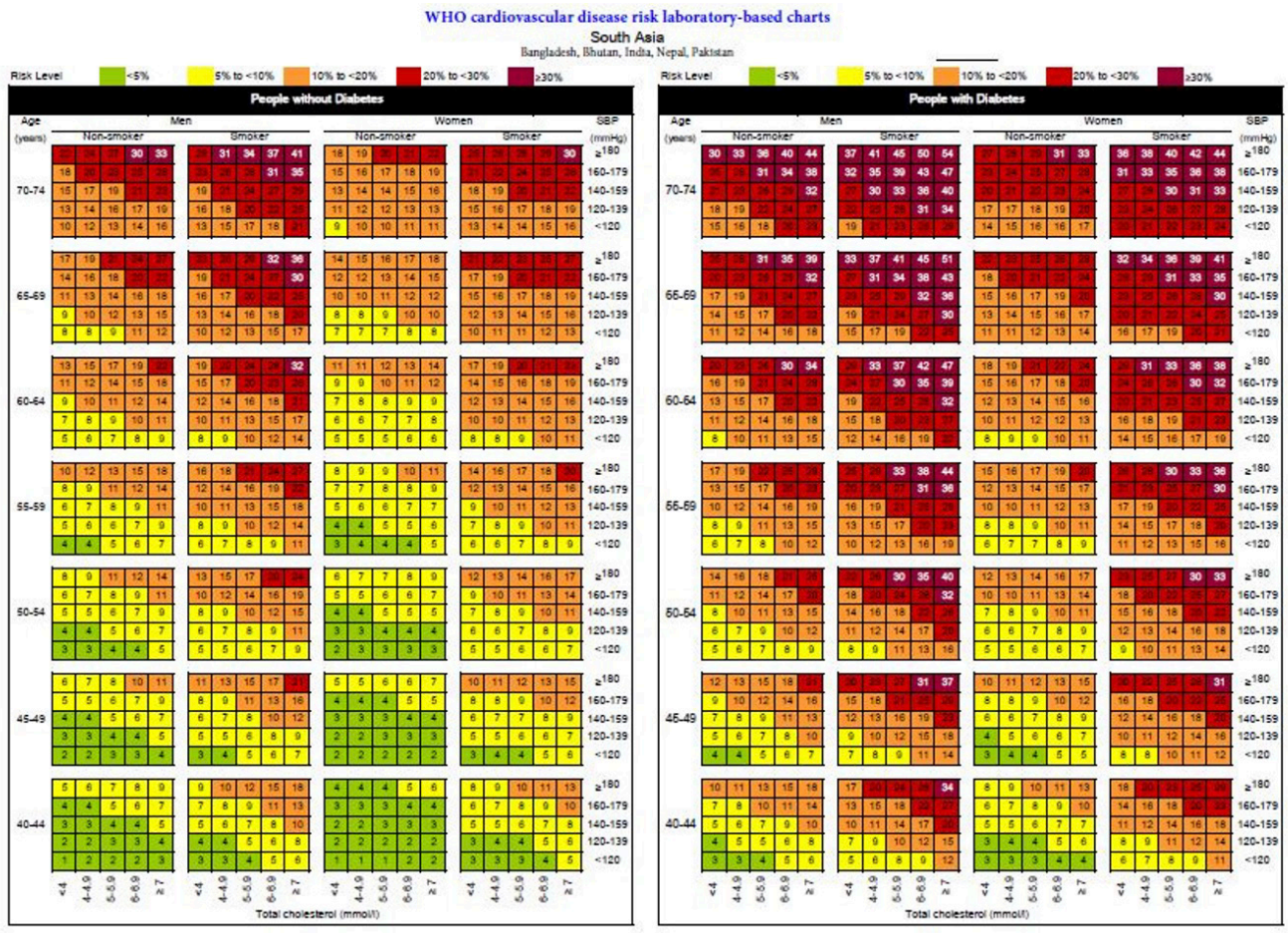

Figure 3 : DWHO –Cardiovascular risk chart (laboratory based)

REFERENCES

1. Non communicable diseases [Internet]. [cited 2024 Mar 14]. Available from: https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases.

2. Cardiovascular diseases [Internet]. [cited 2024 Feb 29]. Available from: https://www.who.int/health-topics/cardiovascular-diseases

3. WHO updates Cardiovascular Risk Charts [Internet]. [cited 2024 Mar 19]. Available from: https://www.who.int/news/item/02-09-2019-who-updates-cardiovascular-risk-charts.

4. STEP wise approach to NCD risk factor surveillance (STEPS) [Internet]. [cited 2024 Mar 18].Available from:https://www.who.int/teams/noncommunicablediseases/surveillance/systems-tools/steps.

5. Mohamed SM, Anandaraj r,Sivasubramanian v.Assessment of ten-year risk of cardiovascular event using WHO/ISH risk prediction chart among adults in a tertiary care hospital in puducherry,India J Med sci Res 2021; 9(2);96-100.

6. Shrivastava SR, Ghorpade AG, Shrivastava PS. A community-based cross-sectional study of cardiovascular risk in a rural community of Puducherry. Heart Views. 2015 Oct 1;16(4):131-6.

7. Savitharani B, Madhu B, Manjunath R, Sridevi, Ashok N. Utilization of who-ish 10-year cvd risk prediction chart as a screening tool among supporting staff of a tertiary care hospital, Mysuru, India. Heart India. 2016 Jan 1;4:13.

8. Deori TJ, Agarwal M, Masood J, Sharma S, Ansari A. Estimation of cardiovascular risk in a rural population of Lucknow district using WHO/ISH risk prediction charts. Journal of Family Medicine and Primary Care. 2020 Sep;9(9):4853.

9. Otgontuya D, Oum S, Buckley BS, Bonita R. Assessment of total cardiovascular risk using WHO/ISH risk prediction charts in three low and middle income countries in Asia. BMC Public Health. 2013 Jun 5;13:539.

10. Ghorpade AG, Shrivastava SR, Kar SS, Sarkar S, Majgi SM, Roy G. Estimation of the cardiovascular risk using World Health Organization/International Society of Hypertension (WHO/ISH) risk prediction charts in a rural population of South India. Int J Health Policy Manag. 2015 Apr 21;4(8):531–6.

11. Norhayati M, Amirah SS, Husniati Y. Cardiovascular risk: associated factors, assessment andagreement between WHO/ISH risk prediction chart andFramingham Scoring System among Primary Care Patientsin Kelantan, Malaysia. International journal of collaborative research on internal medicine and public health [Internet]. 2013 [cited 2024 Mar 19].

12. Ministry of Health & Family Welfare, Government of India, Non-communicable disease risk factors survey - Integrated disease surveillance project, 2007- 2008.New Delhi;2009.

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ORIGINAL ARTICLE - PUBLIC HEALTH

PREVALENCE OF DENGUE VIRUS ANTIGEN IN AEDES MOSQUITOES AND LINKING OF DENGUE CASE INCIDENCE IN GIS MAPPING OF TAMILNADU STATE.

Selvavinayagam T S [1], Vadivelan P [1], Bharani Kumar D [1], Senthil Kumar M [1], Anuradha L [1]

(1) Directorate of Public Health and Preventive Medicine, Tamil Nadu

Abstract

INTRODUCTION : Dengue is a Vector borne Disease which is caused by a virus and transmitted by Aedes mosquitoes. A Geographic Information System (GIS) was used as an analytical tool to study the spatial distribution of dengue virus-infection among Aedes mosquitos in Tamilnadu. Databases are available with village wise code. The dengue infection among field caught Aedes female mosquito were subjected through reverse transcriptase - polymerase chain reaction (RT-PCR) assay and its description in GIS mapping of Tamilnadu was the main motto of this study. In laboratory experiments, all assays showed sufficient sensitively to detect viraemia among the infected mosquito through RT-PCR. The mosquito pools for this study were collected from all the Health unit districts including urban areas and segregated into positive and negative pools affected villages respectively and the same has been depicted in GIS mapping so as to study the area or village with positive case incidence as well as positive in mosquito pools. Thus, the geographic distribution of the virus infected Aedes mosquitos, village wise locations were depicted in GIS linked with the human cases. Test results out of 13220 Aedes mosquito pools collected, 514 places found positive along with dengue cases incidence are depicted and linked in GIS mapping and there is a linkage with positive correlation between dengue positive and mosquito pool positive (r = 0.3443,) The development of a village wise RT-PCR laboratory-based dengue virus infection among Aedes mosquitoes with the reporting of dengue cases can successfully serve as an epidemiological tools in an early warning signal for dengue epidemics and simultaneously to initiate the control measures in anticipation.

INTRODUCTION

Dengue is a major public health concern for many tropical and sub-tropical regions of the world, causing periodic or annual outbreaks which eventually results in high mortality esp., in children. Dengue is endemic in Tamil Nadu also. Dengue is reported in all the districts of Tamil Nadu every year. The reporting of cases varies year to year depending upon the environmental situation, climatic condition of rain fall, humidity & temperature which increases the breeding potentiality of the Aedes mosquitoes. The Department of Public health & Preventive Medicine has been taken all necessary prevention & control measures under the guidance of Govt., of Tamil Nadu such as strengthening the fever surveillance and vector control activities. Dengue viruses are transmitted to humans through the bite of infective Aedes mosquitos, which breeds in stagnant water in all forms of receptacles in both urban and rural areas. The present study mainly envisaged to detect dengue viral antigen in Aedes vector mosquitoes throughout Tamil Nadu state. Detection of dengue viral antigen in vector mosquitoes will be helpful in finding out the vector infection rate in an area that determine the transmission potential of dengue virus. This will be useful in mapping positive areas and thereby preventing dengue epidemics. Forecasting dengue epidemics will pave a way to prevent possible outbreaks and dengue deaths.

METHODOLOGY

Geographic Information System (GIS) databases have been recently used to monitor the presence of vireamia among vector mosquitoes plays a vital role in disease transmission. This could be an important tool to assess the field situation of dengue cases epidemic. (Sithiprasasna et al, 1997, 2003) therefore it is noteworthy to identify the hot spot or vulnerable area or villages prone to epidemic and the same to be mapped in GIS so as to curtail the epidemic well in advance in the district as a precautionary measures.

i. Field collection of mosquitos :

Adult Aedes mosquitos were collected at weekly intervals from Jan to December 2023 from both indoors and outdoors in dengue-endemic areas both in urban & rural pockets from all 46 Health Unit Districts. At each indoor station, Aedes mosquitos were captured by suction tubes by district level Entomologist, Junior Entomologist, Field Assistant or insect collectors. At each outdoor station, Aedes mosquitos were collected by an aspirators for 10-15 minutes.

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Corresponding Author: Bharani kumar D
e-mail : tbharani79@gmail.com

ii.Mosquito collection from the following area

- Clustering of fever cases
- Dengue - Other Viral fever cases reported area
- Suspected fever death
- High vector Indices
- Dengue free blocks

iii. Frequency of Collection and Dispatch for Analysis

Collection were made on weekly basis and sent to State Public Health Lab (SPHL) and Institute of Vector Control & Zoonoses of this Directorate of Public Health for analysis.

iv. Procedure for the Collection

1. Dengue vector mosquitoes resting indoor such as dark corners, under tables etc. near breeding sources were collected between 8 am to 11 am and 3 pm to 5 pm and then transported to laboratory for identification and further processing.
2. In the laboratory, mosquitoes were segregated into males and females and the species identified and separated.
3. Only fed and gravid mosquitoes are needed to carry out antigen detection test. These mosquitoes were packed into pools of 25 each for testing the dengue antigen.
4. The desiccated mosquito pools were packed in individual Eppendroff tubes, wrapped in cotton to avoid breakage during transportation and packed in small cartoon boxes. Relevant details such as Date of Collection, Area of Collection including Name of Villages, Primary Health Centre and Block etc were enclosed.
5. Immature were also collected and kept for adult emergence. Hatched out adults were also used for detecting viral antigen. Hence the vector mosquitoes collected from the emergence were also sent for analysis by Reverse Transcriptase-Polymerase Chain Reaction (RTPCR) a standard testing for DENV detection described by Morita et al (1991).

v. Dengue hotspot

A hotspot can be defined as an area that has higher concentration of events compared to the expected number given a random distribution of events. In Dengue the hotspot is a place where there is a repetition of cases occurring for successive years.

RESULTS

In this study, we report the results of dengue virus detected in Aedes mosquitoes collected during 2023 with the help of RT-PCR .

The presence of dengue viraemia among the Aedes mosquitoes has provided important information on vector infection with dengue virus that helps in precise estimation of vector infection rate within a particular geographical area. An extensive study on virus detection in field collected Aedes mosquitoes was hence undertaken to measure the village-wise infection rate and to identify the potential risk areas of dengue infection in the respective HUDs of Tamilnadu. In the present study , a total of 13,220 Aedes mosquitoes pools were collected from all 46 health unit districts in Tamilnadu and subjected the mosquito pools to RT-PCR against DENV virus. Out of these 514 mosquitoes pools were found positive for dengue. The data were entered in MS Excel-2010 and statistical analysis was done to see if any Pearson's correlation (r) is calculated between mosquito pool positivity and dengue case incidence. Since r = 0.3443, (table -1 &2) there is a positive correlation between dengue positive and mosquito pool positive. i.e., if mosquito pool positivity increases dengue positivity will also increases. Vice-versa.

Table 1 : Dengue & mosquito pools Sample Taken & Positive (Man Vs Vector) Comparison Report - 2023

S. No	Name of the Health Unit District	Dengue cases		Mosquito Pool		
		Sample Taken	Positive	Mosquito pool Collected	Positive	Negative
1	Chennai Corp	63880	3121	253	21	232
2	Coimbatore	18330	2810	287	22	265
3	Tiruvallur	7145	2135	319	6	313
4	Madurai	19606	2119	637	17	620
5	Chengalpattu	27436	1851	348	15	333
6	Cuddalore	11185	1697	416	11	405
7	Kancheepuram	8172	1369	241	10	231
8	Tenkasi	3489	1074	287	11	276
9	Thanjavur	9243	1071	394	10	384
10	Poonamallee	3741	1042	180	20	160
11	Tirunelveli	2072	1034	340	14	326
12	Trichy	5577	1010	544	42	502
13	Tirupur	6041	871	558	9	549
14	Sivagangai	3825	855	332	11	321
15	Kanyakumari	13608	788	233	9	224
16	Vellore	73005	779	285	3	282
17	Tiruvannamalai	9876	759	313	5	308
18	Ramnad	5418	738	191	7	184
19	Aranthangi	6464	711	76	3	73
20	Namakkal	3794	634	411	16	395
21	Ranipet	6025	606	234	11	223
22	Perambalur	4225	581	196	3	193
23	Thoothukudi	2089	564	414	18	396
24	Salem	14918	560	591	35	556
25	Pudukottai	5171	556	281	16	265
26	Erode	3231	542	412	26	386
27	Paramakudi	2913	529	274	17	257
28	Dindigal	9904	523	250	7	243
29	Cheyyar	1962	491	318	9	309
30	Theni	3231	489	251	6	245
31	Krishnagiri	5235	481	206	3	203
32	Villupuram	6717	457	303	7	296
33	Ariyalur	6958	456	146	3	143
34	Tiruvarur	6925	394	283	12	271
35	Virudhunagar	2463	382	277	13	264
36	Kallakurichi	4708	362	200	3	197
37	Dharmapuri	3996	329	221	11	210
38	Mayiladuthurai	1518	324	156	2	154
39	Thirupathur	2672	316	315	10	305
40	Karur	5327	298	316	13	303
41	Sivakasi	1261	287	177	6	171
42	Palani	4955	215	180	2	178
43	Attur	1039	213	237	8	229
44	Kovilpatti	472	202	135	4	131
45	Nagapattinam	2487	169	168	6	162
46	Nilgiris	4709	116	32	1	31
	TOTAL	**417018**	**36910**	**13220**	**514**	**12706**

*36910 suspected cases from various sources.

Correlation coefficient, $r = \frac{\sum XY - \sum X \sum Y}{\sqrt{\sum X^2 - (\sum X)^2}\sqrt{\sum Y^2 - (\sum Y)^2}}$

$= \frac{(18971740) - (36910)(514)}{\sqrt{(1362348100) - (\sum 36910)^2}\sqrt{(264196) - (514)^2}}$

r = 0.344

Correlation coefficient between Mosquito pool positive and Dengue case positive,

Table-2 : Dengue Positive and Mosquito pool positive Report -2023

Sl. No	Name of the Health Unit District	Dengue Positive (X)	Mosquito Pool Positive (Y)	X^2	Y^2	XY
1	Chennai Corp	3121	21	9740641	441	65541
2	Coimbatore	2810	22	7896100	484	61820
3	Tiruvallur	2135	6	4558225	36	12810
4	Madurai	2119	17	4490161	289	36023
5	Chengalpattu	1851	15	3426201	225	27765
6	Cuddalore	1697	11	2879809	121	18667
7	Kancheepuram	1369	10	1874161	100	13690
8	Tenkasi	1074	11	1153476	121	11814
9	Thanjavur	1071	10	1147041	100	10710
10	Poonamallee	1042	20	1085764	400	20840
11	Tirunelveli	1034	14	1069156	196	14476
12	Trichy	1010	42	1020100	1764	42420
13	Tirupur	871	9	758641	81	7839
14	Sivagangai	855	11	731025	121	9405
15	Kanyakumari	788	9	620944	81	7092
16	Vellore	779	3	606841	9	2337
17	Tiruvannamalai	759	5	576081	25	3795
18	Ramnad	738	7	544644	49	5166
19	Aranthangi	711	3	505521	9	2133
20	Namakkal	634	16	401956	256	10144
21	Ranipet	606	11	367236	121	6666
22	Perambalur	581	3	337561	9	1743
23	Thoothukudi	564	18	318096	324	10152
24	Salem	560	35	313600	1225	19600
25	Pudukottai	556	16	309136	256	8896
26	Erode	542	26	293764	676	14092
27	Paramakudi	529	17	279841	289	8993
28	Dindigal	523	7	273529	49	3661
29	Cheyyar	491	9	241081	81	4419
30	Theni	489	6	239121	36	2934
31	Krishnagiri	481	3	231361	9	1443
32	Villupuram	457	7	208849	49	3199
33	Ariyalur	456	3	207936	9	1368
34	Tiruvarur	394	12	155236	144	4728
35	Virudhunagar	382	13	145924	169	4966
36	Kallakurichi	362	3	131044	9	1086
37	Dharmapuri	329	11	108241	121	3619
38	Mayiladuthurai	324	2	104976	4	648
39	Thirupathur	316	10	99856	100	3160
40	Karur	298	13	88804	169	3874
41	Sivakasi	287	6	82369	36	1722
42	Palani	215	2	46225	4	430
43	Attur	213	8	45369	64	1704
44	Kovilpatti	202	4	40804	16	808
45	Nagapattinam	169	6	28561	36	1014
46	Nilgiris	116	1	13456	1	116
	TOTAL	**36910**	**514**	**1362348100**	**264196**	**18971740**

r = 0.3443,

*36910 suspected cases from various sources.

DISCUSSIONS

Tamilnadu is the only state in conducting Aedes mosquito pool analysis against dengue control which is unique nowhere found in India. Dengue cases occurring every year in all the districts. Previously only few districts reported dengue, perhaps currently all the districts are reporting dengue cases every year and the infection has become a perennial problem. Tamilnadu lies with subtropical climatic conditions , partial south-west monsoon rain shower during June to August towards the southern districts and fully north-east rainfall every year starting in the month of Sep to December and occasionally with unusual rain during summer. The dengue cases incidence from 2012 to 2023 is given below in table-3. During 2017, a massive outbreak occurred 23,294 cases with 65 death reported in Tamilnadu. The present control strategy includes fever surveillance and mosquito control. These control activities are mainly carried out only after reporting of cases or epidemic in an area. In the absence of a safe and effective mass vaccination, the prevention and control of dengue outbreaks depends on the surveillance of cases and mosquito vectors (WHO, 1986; Khundsen and Sloff, 1992; Gubler and Clarke, 1994). Vector surveillance allows timely implementation of emergency mosquito control measures, such as insecticidal fogging of adult mosquitos and destruction of breeding places, to limit an impending outbreak. There is a need for a proper scientific tool to forecast dengue incidence. Hence, there is a need to opt for a new innovative tool to predict such incidence in future so as to prevent the occurrence of epidemic. So, detecting dengue virus in the field caught mosquitoes and initiating preventive measures in anticipation was required.

Tamil Nadu State –Map-1

Figure 1 : Tamil Nadu State –Map-1

Table 1 : Dengue case incidence in Tamil Nadu from 2012-2023

Year	Cases	Deaths
2012	13204	66
2013	6122	0
2014	2804	3
2015	4535	12
2016	2531	5
2017	**23294**	**65**
2018	4486	13
2019	8527	5
2020	2410	0
2021	6039	8
2022	6430	8
2023	9121	12

*9121 confirmed dengue cases

In this study, epidemiological parameters such as the dengue human cases incidence have been linked with spatial distribution of mosquito pools positive and negative status assay by RT-PCR depicted in GIS-Mapping of these positives, linked with the dengue cases incidence hamlet wise were done for the effective control and prevention activities against dengue. The positive villages comes under the districts which includes Coimbatore, Tiruppur, Erode, salem, Tenkasi, Tiruvellore, Madurai, Chengalpattu, Kancheepuram where mosquito positive pools as well as incidence of more number of human dengue cases reported during 2023 which clearly indicate that there is a linkage between mosquito pool and the occurrence of human dengue cases, even the mosquito pool positive as well as the reporting of human cases are more in the southern pockets as clearly shown in the GIS mapping as well the reporting of cases in table-2. If the mosquito pools positive shown more in an area in a district or in a hamlet villages, there is a need to tighten the control measures effectively in controlling the reporting of human cases and thus it becomes the effective forecasting mechanism in preventing the epidemic origin of cases in a particular period of time at a particular geographical locations as actually reported during the year 2017 in Tamilnadu.

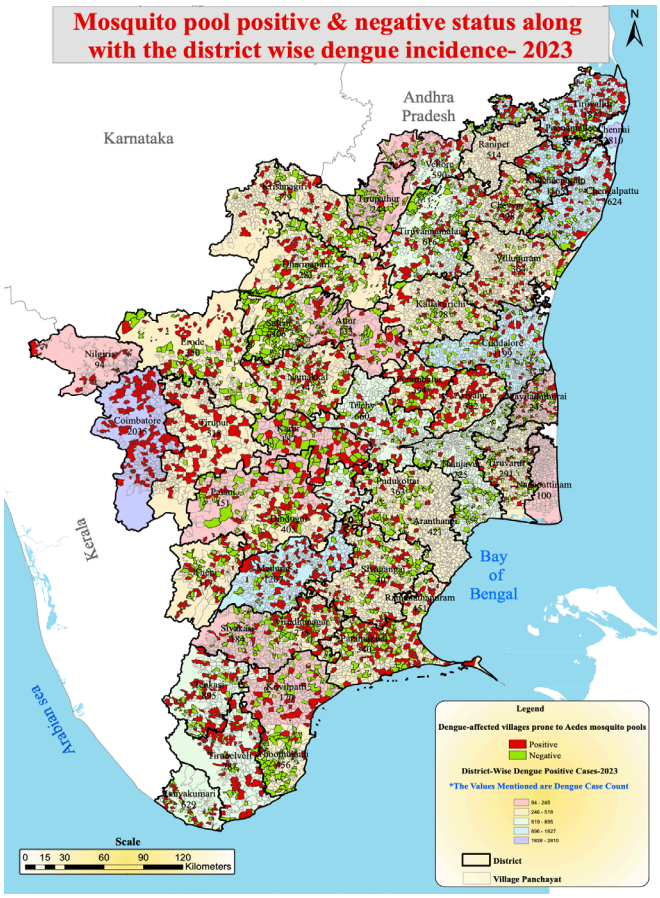

Figure 1 : Linking of Aedes Mosquito pool with case incidence in GIS

CONCLUSION

Based on the above field study and with the help of statistical analysis it seems that there is a linkage between mosquito pool positive with dengue case incidence as shown in the GIS map (1) It is clearly visible in high definition map with matching colours of case incidence range district wise for the year 2023 as shown in table-1 & Map 2.

CONFLICT OF INTEREST

There is no conflict of interest for this study.

RECOMMENDATIONS

Xenodiagnosis among Aedes mosquitoes with positive area-wise linking in GIS mapping should be taken into consideration for initiating vector control measures. The above measures can identify the impending outbreak at the earliest to initiate the Dengue prevention and control activities. It will significantly reduce the mortality and morbidity due to Dengue thereby reducing the burden of disease. Hence, it is highly suggested to adopt Xenodiagnosis and GIS mapping combinedly in all endemic states to prevent major outbreaks of Dengue in the future.

ACKNOWLEDGEMENTS

Special thanks to the Team of TNeGA who has taken a staunch effort with much care in providing all technical support in plotting the data in GIS mapping.

REFERENCES

1.Chow VTK, Seah CLK, Chan YC. Use of NS3 consensus primers for the polymerase chain reaction amplication and sequencing of dengue viruses and other flaviviruses. Arch Virol 1993; 133: 157-70.

2.Chow VTK, Chan YC, Yong R, et al. Monitoring of dengue viruses in field-caught Aedes aegypti and Aedes albopictus mosquitos by a type-specific polymerase chain reaction and cycle sequencing.Am J Trop Med Hyg 1998; 58: 578-86.

3.Chungue E, Roche C, Lefever MF, Barbazan P, Chanteau S. Ultra-rapid, simple, sensitive, and economical silica method for extraction of dengue viral RNA from clinical specimens and mosquitos by reverse transcriptase-polymerase chain reaction. J Med Virol 1993; 40: 142-5.

4. Gubler DJ. Surveillance for dengue and dengue haemorrhagic fever. Bull Pan Am Health Organ 1989; 23:

397-404. Comprehensive guidelines for prevention and control of dengue fever-WHO(SEARO)2015

5. Rosen L, Gubler DJ. The use of mosquitos to detect and propagate dengue viruses. Am J Trop Med Hyg 1974; 23: 51153-60.

6. Sithiprasasna R, Linthicum KJ, Liu GJ, Jones JW, Singhasivanon P. Some entomological observations on temporal and spatial distribution on malaria vectors in three villages in north-western Thailand using a Geographic Information System (GIS). Southeast Asian J Trop Med Public Health. 2003a; 34: 505-16.

7. Pankhong P, Siriprasertkul W, Patpoparn S, et al. Molecular serotyping of dengue viruses in fieldcaught Aedes osquitos by in-house RNA extraction/ RT-PCR reagent kits. Southeast Asian J Trop Med Public Health 2002; 33 (suppl 3): 139-44.

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CASE REPORT - PUBLIC HEALTH

NON-VITAL TOOTH BLEACHING: A REPORT OF TWO CASES

Kapilesh Singh [(1)], Moitri Ojha [(2)], Anik Banerjee [(3)], Chetan D. Ahire [(4)], Amit Bolival [(5)]

(1) Department of Conservative Dentistry and Endodontics, SMBT Dental College, Sangamner, Maharashtra, India
(2) Department of Periodontology, SMBT Dental College, Sangamner, Maharashtra, India.
(3) Kothiwal Dental College and Research Centre, Moradabad, Uttar Pradesh 244001
(4) MGV,s KBH Dental College & Hospital, Nashik
(5) PMNM dental college, Bagalkot

Abstract

ABSTRACT: Intrinsic discoloration of the anterior teeth may have a considerable influence on the cosmetic aspect and the personality of an individual. The prime reason for this is the alteration in structure and composition of the dental hard tissues. Factors such as tooth injury, ageing, systemic or metabolic diseases play an important role in intrinsic discolouration. The amount of tooth structure destroyed, location of the fracture and the severities of discolorations are considered while selecting a type of treatment, a type of restorative material and kind of tooth preparation. There are numerous treatment options for tooth discoloration like placement of veneers, crowns and bleaching. The advantages of selecting bleaching technique for non-vital tooth over veneers or crowns are that it is minimally invasive, more esthetically appealing and less expensive. Nevertheless, it relies on the clinician's skill and knowledge to progress ahead with a good case selection and to prevent any post procedural glitches that may befall. This present article emphasizes on two cases of non-vital discoloured teeth that were treated by walking bleach method using a mixture of hydrogen peroxide and sodium perborate.

KEYWORDS : Non vital tooth, walking bleach, esthetic, hydrogen peroxide, sodium perborate

INTRODUCTION

Tooth discoloration can significantly affect the esthetic appeal and the self-confidence of an individual in society; hence its treatment is suggestive. Discoloration of tooth can be broadly classified into extrinsic and intrinsic (Dayan et al 1983, Hayes et al 1989). Extrinsic discolouration is due to accumulation of stains on the external surface of the tooth or within the acquired pellicle.[1] Several factors like drugs, intake of food and beverages, tobacco or cigarettes, amalgam or poly-antibiotic paste and chromogenic bacteria influence this form of pigmentation. Intrinsic stains can be caused due to hereditary disorders (amelogenesis imperfecta, Dentinogenesis imperfect, dental dysplasia), infections (maternal rubella or cytomegalovirus) and excess fluoride intake. Internalized discolouration is a new term that has been introduced to define stains that are extrinsic in nature but enter into enamel or dentin via developmental defects.[2,3]

Non-vital tooth discolouration can be amended via tooth bleaching or masking by placement of crowns or veneers. Tooth bleaching is a considerable cost-effective, less invasive and simple approach where agents like carbamide peroxide, hydrogen peroxide and sodium perborate are employed.[4] Walking bleach technique involves placing of active bleaching agents into the pulp chamber that leads to oxidization of organic pigments.[5] The area is then enclosed by placement of calcium hydroxide dressing. The present article describes two cases of non-vital teeth that were treated by walking bleach technique.

CASE HISTORY

CASE REPORT 1 : A 21-year-old female presented to our department with the chief complaint of discolored tooth in the upper front tooth region. The patient presented with the history of trauma by fall 3 years back. On intra-oral examination, tooth discoloration was observed with respect to 21. The tooth was non-mobile and did not exhibit any fracture. (Figure: 1) However, it did not show any response to cold test or electric pulp test demonstrating a necrotic pulp. Radiographic investigation revealed no periapical changes. Hence, it was decided to perform root canal therapy followed by bleaching therapy. The patient was detailed about the procedure and written consent was obtained.

Access cavity preparation was performed on the lingual aspect of 21 with the help of round bur and endo-Z bur. Working length was established using third generation apex locator. After accomplishing biomechanical preparation,

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Corresponding Author: Moitri Ojha
e-mail : moitriojha@yahoo.in

obturation was done by lateral condensation technique. Subsequent to this step, 2 mm of gutta percha was eliminated beyond the gingival margin. A layer of Glass ionomer cement (GIC) (approximately 2 mm in thickness) was placed to prevent the internal resorption. A thick paste of bleaching agent (comprising 35% hydrogen peroxide + sodium perborate mixed with saline) (Figure: 2) was placed in the pulp chamber which was removed after 10-15 minutes with the help of suction and water. The procedure was repeated for four times (once in every consecutive week for a month) and after the desired result was obtained, the tooth was restored with composite resin. (Figure: 3)

Figure 1 : Non vital tooth w.r.t. 21

Figure 2 : Placement of bleaching agents (comprising 35% hydrogen peroxide + sodium perborate mixed with saline)

Figure 3 : Effective aesthetic results after 1 month

CASE REPORT 2 : A 33-year-old female patient reported with the chief complaint of tooth discoloration in the upper front tooth region. On intra-oral examination dark yellowish discoloration was noted on the 11 tooth. (Figure: 4) The non-vitality of the tooth was confirmed by electric pulp test and cold test. There were no peri-apical changes demonstrated in the radiograph. Conventional endodontic therapy was planned followed by non-vital tooth bleaching. (Figure: 5) Following obturation, 2mm of gutta percha was removed near the orifice and 2mm of GIC was placed as a barrier between the bleaching agent and the sealed canal. The bleaching technique was performed with the help of bleaching agent (comprising 35% hydrogen peroxide + sodium perborate mixed with saline). The procedure was repeated for four times at a one-week interval. The desired result was noted after the fourth visit (Figure: 6) and consequently composite restoration was performed.

Figure 4 : Non vital tooth w.r.t. 11

Figure 5 : Root canal therapy w.r.t 11

Figure 6 : Effective esthetic results after 1 month

DISCUSSION

Diffusion of blood components into the dentinal tubules induced due to trauma might lead to discolouration of the tooth. The iron released during the disintegration process can be converted to black ferric sulfide. Further, the hydrogen sulfide further released by bacteria can produce grayish stain on the teeth.[6] Brown (1965) stated that trauma or necrosis induced discolouration can be effectively treated in about 95% of cases teeth discoloured as a result of drug interactions or restoration. The bleaching agent containing hydrogen peroxide releases reactive oxygen species that helps to disrupt conjugated bonds into single bonds which can be easily washed off.[7]

The benefit of this therapy is that it aids in good cosmetic results and is economical. Further, the procedure is much less invasive than conventional ceramic crown placement or veneers. On the other hand, for laminate or crowns the tooth may have to undergo destructive changes and irreversible alterations. Also, there can be chances of debonding, marginal leakage or fracture of the restoration in the future. Several factors determine the success of the therapy like the extent of tooth destruction, the degree of tooth fracture, the severity of discolouration, the choice of restorative material and the kind of tooth preparation.[8] Lado et at. hypothesized that this peroxide may lead to denaturation of the dentin at the cervical area. Disintegration of the organic matter is chiefly due to the oxidizing behaviour of hydrogen peroxide, while the inorganic portion is destroyed due to acidity.[9]

Numerous problems have been related to non-vital teeth bleaching such as infiltration of hydrogen peroxide into the tubules, alterations in the dentin framework and permeability, wearying of the hard tissues, dental fracture during the procedure, over-bleaching and possibility of relapse. However, both the patients were followed up for a period of one month and no such complications were noted. A concerning complication of tooth bleaching is external cervical resorption. It is typically symptomless and perceived through routine radiographic inspection. It has been proposed that thirty percent of hydrogen peroxide when used alone or in combination with sodium perborate induces more cytotoxic effect on periodontal cells than perborate-water mixture.[10,11]

CLINICAL SIGNIFICANCE

In the recent times of esthetic treatment that targets for a beautiful smile and concurrently at less invasive therapy for better clinical result, adopting walking bleach technique for whitening of discolored teeth can be opined as a comparatively easy, rapid and convenient tactic for favourable outcome.[12]

ACKNOWLEDGEMENT : Nil

CONCLUSION

A non-vital, discoloured tooth with minimal structural damage is best suited for non-vital tooth bleaching. It is crucial for dental practitioner to select appropriate case for the procedure and also to schedular regular check-ups.

REFERENCES

1. Watts A, Addy M. Tooth discolouration and staining: A review of the literature. Br Dent J. 2001;190: 309–16.

2. Nathoo SA. The chemistry and mechanisms of extrinsic and intrinsic discoloration. J Am Dent Assoc. 1997;128(Suppl):6–10.

3. MacIsaac AM, Hoen CM. Intracoronal bleaching: concerns and considerations. J Can Dent Assoc 1994 Jan;60(1):57-64.

4. Nixon PJ, Gahan M, Robinson S, Chan MF. Conservative aesthetic techniques for discoloured teeth: 1. The use of bleaching. SADJ. 2008;63(332):334–7.

5. Fasanaro TS. Bleaching teeth: history, chemicals and methods used for common tooth discolorations. J Esthet Dent 1992 May-Jun;4(3):71-78.

6. Yui KC, Rodrigues JR, Mancini MN, Balducci I, Gonçalves SE. Ex vivo evaluation of the effectiveness of bleaching agents on the shade alteration of blood-stained teeth. Int Endod J. 2008;41: 485–492.

7. Leith R, Moore A, O'Connell AC. An effective bleaching technique for non-vital, discoloured teeth in children and adolescents. J Ir Dent Assoc. 2009;55: 184–9.

8. Ambalia SV, Ramgadhia HS. Nonvital tooth bleaching, non-invasive technique: a case report. IOSR J Dent Med Sci 2017 Mar;16(3):80-82

9. Lado EA, Stanley HR, Weisman MI. Cervical resorption in bleached teeth. Oral Surg Oral Med Oral Pathol. 1983;55(1):78–80.

10. Jiang T, Ma X, Wang Y, Zhu Z, Tong H, Hu J. Effects of hydrogen peroxide on human dentin structure. J Dent Res. 2007;86(11):1040–1045.

11. Rotstein I, Torek Y, Lewinstein I. Effect of bleaching time and temperature on the radicular penetration of hydrogen peroxide. Endod Dent Traumatol. 1991;7(5):196–198.

12. Shilpi Awadhiya, Anu Narang, Manish Agarwal, Mahendra Jain. Nonvital Bleaching: A Case Series on whitening Procedure for Discolored Endodontically Treated Teeth. International Journal of Prosthodontics and Restorative Dentistry, 2018;8(1):28-31

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MISCELLANEOUS ARTICLE - PUBLIC HEALTH

TAMIL NADU AT THE BRINK OF ELIMINATING LYMPHATIC FILARIASIS

Selvavinayagam T S [(1)], Vadivelan P [(1)], Barani Kumar D [(1)] , Sudharshini Subramaniam [(2)]

(1) Directorate of Public Health and Preventive Medicine, Tamil Nadu

(2) Institute of Community Medicine, Madras Medical College, Chennai - 03

Abstract

INTRODUCTION : Tamil Nadu was one among the nine states which contributed to 95% of total burden of filariasis in India. Tamil Nadu is the pioneer state in the country to launch the MDA program during 1996 as pilot project even before the declaration by WHO Assembly for Elimination of Lymphatic Filariasis. Based on the successful results, the program has been extended to the other 26 endemic districts of Tamil Nadu from 1998. Mass Drug Administration with Diethyl carbamazine was implemented in all 26 districts from 2007 -12 (4 rounds). The state achieved coverage of >65% in all these rounds. The state completed 3 rounds of Transmission Assessment Survey in 2014, 2016 and 2018 with microfilaria rate of 0.18%, 0.21% and 0.10% respectively. The mass drug administration with DEC was stopped since 2015. Morbidity management and disability prevention strategies includes morbidity survey and line listing of patients with morbidity related to filariasis, promotion of Hydrocele operation in camp approach and all operable hydrocele cases were operated and all lymphoedema cases were trained by doctors on limb oedema management and morbidity management kits are distributed. The state is currently in the stage of dossier preparation and submission for verification process, following which the state will be certified for achieving lymphatic filariasis elimination status.

KEYWORDS : Lymphatic filariasis, Elimination, Elephantiasis

INTRODUCTION

Lymphatic filariasis, one of the ancient parasitic diseases was ranked by World Health Organization (WHO) as the 2nd leading cause of long-term chronic disability worldwide in 1995.1Wuchereria bancrofti is responsible for 90% of the infection throughout the world, with the rest 10% due to Brugia malayi and a small proportion by Brugia timori. The adult form of these worms live inside human lymphatic system, causing the dilation of lymphatic vessels and damage them. The microfilaria which are produced in millions by the female worm circulate in the human blood, which are suck by the adult female Culex mosquitoes. Within the mosquitoes, the microfilariae develop into infectious larvae. The infection is passed on to other human beings when these mosquitoes with infected larvae have their next blood meal in humans. This life cycle determines the potential areas of breaking the cycle of infection. There are various strategies that can be used to interrupt the transmission of the parasite; various countries have adopted specific strategies to eliminate LF. For example, Japan adopted mass screening and selective treatment approach,[2] China used a combination of selective treatment and mass treatment using medicated salt approach,[3] Solomon Islands achieved elimination by adopting only mosquito control.[4] However, improvement in the predisposing conditions like sanitation was the major reason for elimination in major countries across the world.

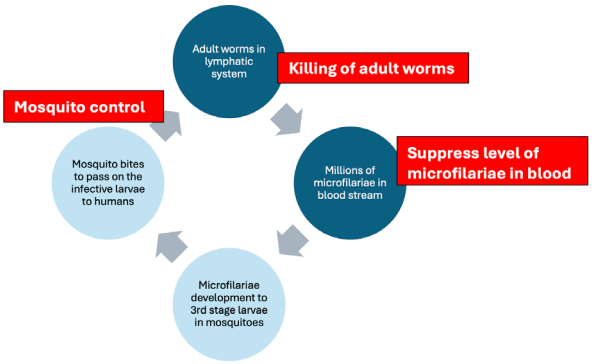

Figure 1 : Life cycle of filariasis and potential intervention strategies

Global Program to Eliminate Lymphatic Filariasis

In 1994, the international task force for disease eradication, listed LF as one of the 6 diseases that could be potentially eradicated. WHO became optimistic and announced the Global Program to Eliminate Lymphatic Filariasis (GPELF) in 1998 and was under implementation since 2000. One goal of the NTD road map towards achievement of SDG 3.3.5 is a 90% reduction in the population that requires interventions

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Corresponding Author: Sudharshini Subramaniam
e-mail : sudharshini.subramaniam90@gmail.com

for NTDs by 2030.6 For LF, this is measured as the population of endemic Implementation Units (IU) that no longer require mass drug administration (MDA).

GPELF endorses two pillar strategy wherein it includes both interruption of transmission and providing care to those who currently suffer the disease.[5]

- **Interruption of transmission** focuses on selective screening to detect high risk areas followed by mass drug administration.

- **Morbidity Management and Disability prevention** - providing clinical intervention to alleviate morbidity and prevent disability.

Interruption of transmission

In order to interrupt transmission, districts in which lymphatic filariasis is endemic should be mapped and a strategy of preventive chemotherapy called mass drug administration (MDA) implemented to treat the entire at-risk population. The following drug regimens are recommended for use in annual MDA for at least 5 years with a coverage of at least 65% of the total at-risk population:

• 6 mg/kg of body weight diethylcarbamazine citrate (DEC) + 400 mg albendazole; or

• 150 µg/kg of body weight ivermectin + 400 mg albendazole (in areas that are also endemic for onchocerciasis);

• 400 mg albendazole preferably twice per year (in areas that are also endemic for Loa loa).

• Since 2017, WHO recommended Triple drug therapy called IDA (Ivermectin, DEC, Albendazole) except in areas which are endemic for onchocerciasis.[7]

An alternative regimen in endemic regions is the use of cooking salt fortified with DEC. DEC fortified salt has been used in only a few settings.[8]

This intervention should be repeated annually with effective coverage of ≥65% of the total population to ensure the prevalence of infection has been reduced to low level that transmission of infection is no longer sustainable. After at least 5 rounds of MDA with adequate coverage, a transmission assessment survey (TAS) is conducted in the implementation units to demonstrate reduction in infection rate in the community[5]

Milestones towards validation[5]

1. Stop the spread of infection through MDA

1. Implement MDA in all endemic areas (100% geographical coverage)

2. Reduce infection below a threshold at which transmission is not sustainable in all endemic areas and stop MDA

3. Demonstrate sustained reduction of infection below the threshold for atleast 4 years after stopping MDA.

2. Alleviate suffering by managing morbidity and preventing disability (MMDP)

1. Define burden of disease (estimates of the number of patients)

2. Recommended minimum package of care available in all areas of known patients (100% geographical coverage)

Validation process[9]

A programme area (Implementation Unit (IU) or multiple IUs) is considered eligible for TAS when all of the following criteria are met:

(i) at least five rounds of MDA have been implemented,

(ii) coverage exceeds 65% of the total population in the IU for each of five rounds of MDA, and

(iii) the prevalence of infection in sentinel and spot-check sites is below 1% (assessing microfilaremia) or below 2% (assessing antigenemia, usually by a rapid card test; ICT).

Once an area passes the TAS, it can stop MDA and transition to post-MDA surveillance. Additional rounds of MDA are implemented in areas failing the TAS. Once MDA has ceased, surveillance is necessary in order to provide evidence that recrudescence has not occurred, and that transmission can be considered as interrupted. Currently, the TAS also serves as the method for post-MDA surveillance. Based on present recommendations, post-MDA TAS should be repeated at least twice at an interval of 2–3 years before beginning the final phase of "verification of the absence of transmission"

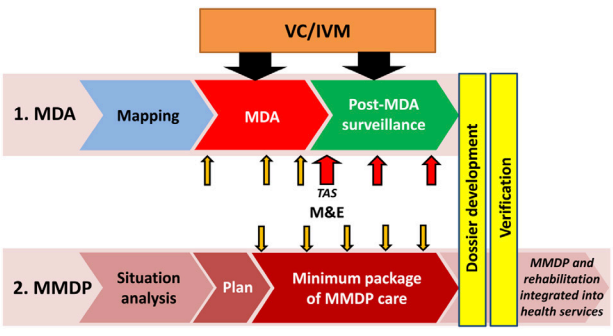

Figure 2 : Two pillar strategy for lymphatic filariasis elimination

Source : Ichimori K, King JD, Engels D, Yajima A, Mikhailov A, Lammie P, et al. (2014) Global Programme to Eliminate Lymphatic Filariasis: The Processes Underlying Programme Success. PLoS Negl Trop Dis 8(12): e3328. https://doi.org/10.1371/journal.pntd.0003328[10]

VC – vector control, IVM – integrated vector control

management, TAS – Transmission Assessment Survey, MDA – Mass Drug Administration, MMDP – Morbidity Management and Disability Prevention, M&E – Monitoring and Evaluation

As per the 2022 WHO progress report, 760 million people have passed TAS and doesn't require MDA, representing a 53.3% reduction. Of the 72 countries listed by WHO as being endemic for LF, 19 countries have achieved the elimination status, and 10 are in post MDA surveillance. India is one among the 36 countries which had scaled up MDA in all endemic areas.

MDA not started	MDA started but not at scale	MDA scaled to all endemic districts	Post MDA surveillance	Elimination as a public health problem
• 1	• 6	• 36	• 10	• 19

Figure 3 : Country progress against Lymphatic Filariasis : MDA status of countries 2022.

MDA- Mass Drug Administration

Source :Weekly Epidemiological Record - Global programme to eliminate lymphatic filariasis: progress report, 2022.[11]

Elimination of Lymphatic Filariasis in Tamil Nadu

Tamil Nadu was one among the nine states (Andhra Pradesh, Bihar, Gujarat, Kerala, Maharashtra, Orissa, Tamil Nadu, Utter Pradesh and West Bengal) which contributed to 95% of total burden of filariasis in India.

Tamil Nadu is the pioneer state in the country to launch the MDA program in Cuddalore district during 1996 as pilot project even before the declaration by WHO Assembly for Elimination of Lymphatic Filariasis.

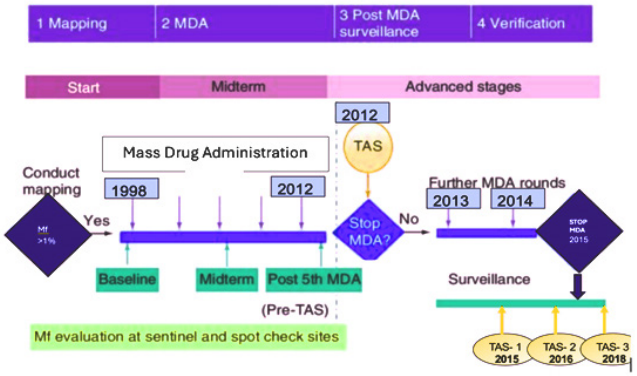

Figure 4 : Timeline of events towards filariasis elimination in Tamil Nadu

Based on the successful results, the program has been extended to the other 25 endemic districts of Tamil Nadu from 1998.

The state has an unique administrative set up with regards to filariasis, in the form of 42 filaria clinics and 21 control units run in the State. The timeline of events with regards to efforts towards filariasis elimination is given in Figure 4.

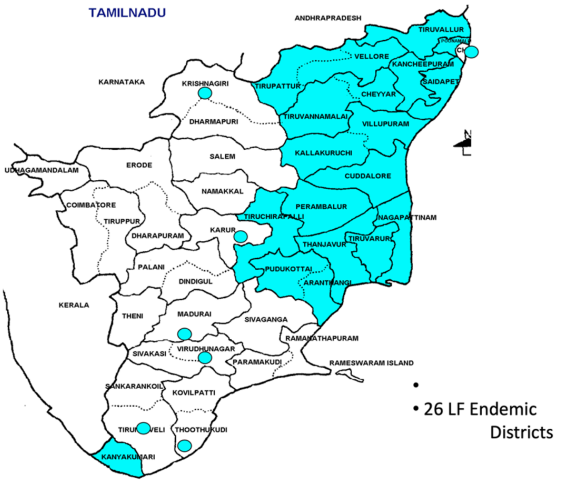

Figure 5 : Endemic districts for lymphatic filariasis in Tamil Nadu

Interruption of transmission of filariasis

In Tamil Nadu, there are 26 endemic districts for LF. In 1994, a rapid assessment survey was done to confirm mapping of endemic districts. The drug regimen that was adopted for MDA in Tamil Nadu was 6 mg/kg of body weight diethylcarbamazine citrate (DEC) alone to begin with. Later since 2001, the regimen that was adopted was 6 mg/kg of body weight diethylcarbamazine citrate (DEC) + 400 mg albendazole. MDA was implemented in all 26 districts from 2007 -12 (4 rounds) (Figure 5). The coverage evaluation survey was done for each round. Coverage rate and microfilaremia rate proceeding each MDA round is given in table 1.

Table.1 : MDA and its coverage rate in the endemic districts of Tamil Nadu

Round	Year	Drug	% of Coverage	Mf rate
I	1996	DEC (One District)	93	
II	1998	DEC (11 Districts)	94	0.83
III	1999	DEC (11 Districts)	95	0.3
IV	2000	DEC (12 Districts	94	0.18
V	2001	DEC (6 Districts) DEC+ALB (6 Districts)	96	0.15
VI	2002		94	0.1
VII	2003		95	0.08
VIII	2004		95	0.04
IX	2007	DEC+ALB (26 Districts)	93	0.29
X	2008		94	0.14
XI	2009		94	0.11
XII	2012		95	0.09
XIII	2013	DEC+ALB (6 Districts)	95.3	0.17
XIV	2014	DEC+ALB (3 Districts)	97.3	0.11

The characteristics required of a sentinel site are as follows :

- a population of at least 500 people (in order to collect samples from at least 300 people);
- chosen from an area of known high transmission (high disease or parasite prevalence or vector abundance) or from an area where difficulty in achieving high drug coverage is anticipated.

These are the areas within the districts likely to require the longest period of time for interruption of transmission. Once chosen, the same site should act as the sentinel site throughout the course of the programme.

Characteristics of spot-check sites

Spot-check sites have the same characteristics as sentinel sites but, unlike the sentinel sites, which remain the same over the course of the programme, different spot-check sites are hosen for every assessment. Spot-check sites provide additional information on the prevalence of microfilaremia in the districts. They should be in an area considered at high risk for continued transmission.

After successful completion of 5 rounds, TAS was conducted to take a decision on whether to continue MDA or not in the year 2015.

Transmission assessment survey (TAS)

Tamil Nadu conducted TAS as we achieved the following conditions:

- Five rounds of MDA completed.
- Prevalence of Mf is <1% in sentinel and spot- check sites after fifth MDA.
-At least 65% coverage of total population in each MDA.

(TAS)

Since the net primary-school enrolment ratio is ≥75%, cluster survey with Lot Quality Assurance Sampling analysis was done among children in first and second years of primary schools. Immunochromatographic test to detect W. bancrofti antigen was used. The cut off that was used to declare TAS pass was Ag <2%. The first TAS was conducted in July 2014, followed by November 2016 and Septemeber 2018. The survey was done among 36,833 children in TAS-I, 38,954 in TAS-II, and 39,754 children in TAS-III. After the first TAS was passed, decision to stop MDA was taken. Microfilaremia rate in the three TAS were 0.18%, 0.21% and 0.10% respectively. The state has now passed all three TAS and is in process of preparing dossier for verification.

Post-MDA surveillance

After MDA has stopped, the following activities are undertaken in Tamil Nadu as surveillance measures. One time confirmatory mapping was done in all TAS confirmed blocks of previously endemic districts, and in non-endemic districts. Among a total of 2,80,305 night blood samples collected in 45 HUDS in the year 2022, 3 were tested positive for Microfilaria as shown in Table 2.

Table 2 : One time confirmatory mapping in Tamil Nadu -2022

S.No	Name of the HUDs	No of the Sentinel Site	No of the Random Site	Total NBS Collected	No. of Mf Positives			
					<5 years	5-14 Years	15 & +years	Total
1	Kancheepuram	6	6	3604	**0**	**0**	**0**	**0**
2	Chengalpattu	9	9	5554	0	0	1	1
3	Thiruvallur	13	13	7842	0	0	0	0
4	Poonamallee	2	2	1200	0	0	0	0
5	Vellore	14	14	8400	0	0	0	0
6	Thirupathur	6	6	3600	0	0	0	0
7	Ranipet	11	11	6602	0	0	0	0
8	T.V.Malai	11	11	6600	0	0	0	0
9	Cheyyar	11	11	6600	0	0	1	1
10	Cuddalore	22	22	13261	0	0	0	0
11	Villupuram	16	16	9214	0	0	0	0
12	Kallakurichi	9	9	5400	0	0	0	0
13	Thanjavur	16	16	9600	0	0	0	0
14	Thiruvarur	10	10	6034	0	0	0	0
15	Nagapattinam	8	8	4800	0	0	0	0
16	Mayiladuthurai	7	7	4212	0	0	0	0
17	Tiruchirappalli	15	15	9007	0	0	0	0
18	Karur	10	10	6014	0	0	0	0
19	Ariyalur	8	8	4800	0	0	0	0
20	Perambalur	4	4	2400	0	0	0	0
21	Pudukottai	8	8	4806	0	0	0	0
22	Aranthangi	7	7	4200	0	0	0	0
23	Madurai	13	13	7988	0	0	0	0
24	Theni	8	8	4800	0	0	0	0
25	Dindugal	7	7	4286	0	0	0	0
26	Palani	10	10	6035	0	0	0	0
27	Ramnad	8	8	4829	0	0	0	0
28	Paramakudi	7	7	4213	0	0	0	0
29	Sivagangai	16	16	9641	0	0	0	0
30	Virudhunagar	5	5	3025	0	0	0	0
31	Sivakasi	6	6	3432	0	0	0	0
32	Thirunelveli	10	10	6062	0	0	0	0
33	Tenkasi	10	10	6084	0	0	0	0
34	Thoothukudi	10	10	6043	0	0	0	0
35	Kovilpatti	5	5	3000	0	0	0	0
36	Kanyakumari	13	13	7885	0	0	0	0
37	Salem	16	16	9632	0	0	0	0
38	Attur	10	10	6115	0	0	0	0
39	Namakkal	20	20	12097	0	0	0	0
40	Dharmapuri	8	8	5424	0	0	0	0
41	Krishnagiri	12	12	7230	0	0	0	0
42	Coimbatore	16	16	9688	0	0	0	0
43	Thirupur	13	13	7873	0	0	0	0
44	Erode	15	15	8723	0	0	1	1
45	Nilgiris	4	4	2450	0	0	0	0
	Total	**465**	**465**	280305	**0**	**0**	**3**	**3**

Testing and Treating" strategy was implemented among high-risk populations such as migrants. Under this strategy, migrant population are surveyed using night blood smear test. The positive cases are treated with a single dose of DEC and albendazole. For the year 2023, around 44,208 migrants were tested with night blood smear and 152 (0.3%) tested positive for Mf. All those who tested positive were treated with 12 days of DEC.

Entomological data collection

For such data collection, four "Sentinel Sites" (3 from rural & 1 from urban areas) were identified on the basis of past Mf survey data. Besides, four random (spot) sites (3 from rural & 1 from urban areas) were selected each year afresh by multi-stage random sampling method.

From each of such sentinel and random (spot) site,

entomological data collection should be made from 10 catching stations spending 15 minutes in each catching station using flash light and aspirator tube in the early morning between 6 a.m. and 10 a.m. All the female Culex quinquefasciatus mosquitoes shall be dissected to find out the filarial infection (Filarial larvae).

A minimum of three collections at an interval of 10 days used to be carried out in each site once a year during October-November each year and four indices are to be calculated.

Table 3 : Entomological data collection in Tamil Nadu for 2022-23

	S1	S2	S3	S4	R1	R2	R3	R4
10 MHVD	150	183	204	136	149	200	170	152
Infection Rate	0	0	0	0	0	0	0	0
Infectivity Rate	0	0	0	0	0	0	0	0
Mean mosquito infectivity	0	0	0	0	0	0	0	0

MHVD – Man Hour Vector Density S- Spot check sites, R-random sites; Infection rate is presence of filarial larvae in any stage; Infectivity rate – presence of stage 3 filarial larva in the mosquito.

With respect to the 1st pillar, Tamil Nadu has satisfied all the requisite criteria for entering into the validation stage.

Morbidity Management and Disability Prevention

Morbidity management is aimed at giving relief to the LF patients who have been suffering from Lymphoedema and Hydrocele. The following activities are done for MMDP :

1. Morbidity survey and line listing of patients with morbidity related to filariasis.
2. Promotion of Hydrocele operation in “Camp Approach" and all operable hydrocele cases were operated.
3. All lymphoedema cases were trained by doctors at PHC, CHC and government hospitals on to how to take care of the affected body part(s). Such training are given twice a year. Following training each patient were is a “morbidity management kit" containing a plastic mug, soft towel, soft soap and antifungal/antibacterial cream.
4. Financial assistance of Rs 1000/ per month is given by the Government for patients with Grade-4 lymphedema.

Dossier preparation

The state has successfully completed all the essential rounds of MDA and passed the TAS. The state is now in the stage of verification process for which dossier is being prepared. A state level committee and district level committee is formed for collecting and collating all the necessary documents for dossier preparation.

The state has completed all the necessary requirements for achieving the elimination status and sustained efforts are continued to ensure the elimination status. The compilation and collation of all the details taken towards elimination is underway and the complete document will be submitted to appropriate authority for certification of elimination status.

Table.1 : MDA and its coverage rate in the endemic districts of Tamil Nadu

		(Cumulative)*	2022	2023	(in 2022)
1	Ariyalur	288	0	0	332
2	Chengalpet	554	0	0	616
3	Chennai	83	0	0	83
4	Coimbatore	2	0	0	3
5	Cuddalore	811	1	0	1154
6	Dharmapuri	80	1	0	88
7	Dindigul + Palani	35	0	0	36
8	Erode	17	0	0	18
9	Kallakurichi	994	10	11	994
10	Kancheepuram	611	6	0	606
11	Kanyakumari	2614	0	0	2601
12	Karur	81	0	0	78
13	Krishnagiri	76	2	0	79
14	Madurai	70	0	0	74
15	Mayiladuthurai	909	20	22	1065
16	Nagapattinam	214	2	3	284
17	Namakkal	12	0	0	15
18	Nilgiris	0	0	0	0
19	Perambalur	394	0	0	399
20	Pudukottai+ Aranthangi	63	0	0	67
21	Ramanathapuram + Paramakudi	57	0	0	58
22	Ranipet	1362	0	0	1385
23	Salem + Attur	128	1	1	132
24	Sivagangai	19	0	0	21
25	Thanjavur	1961	0	0	1972
26	Theni	19	0	0	21
27	Thenkasi	39	0	0	45
28	Thirunelveli	118	0	0	119
29	Thirupathur	898	0	0	1380
30	Thirupur	28	0	0	33
31	Thiruvallur + Poonamallee	1682	0	0	1682
32	Thiruvannamalai+Cheyyar	3510	70	3	3725
33	Thiruvarur	405	1	2	444
34	Thoothukudi + Kovilpatti	114	0	4	125
35	Trichy	417	3	0	444
36	Vellore	1522	0	0	1535
37	Villupuram	1459	12	14	1423
38	Virudhunagar + Sivakasi	112	2	3	115

Challenges

- Migration from endemic regions increases the likelihood of new cases emerging.
- Enhancing morbidity management, particularly through the expansion of Acute dermato-lymphangitis prevention activities, is essential.
- Development of guidelines, tools/diagnostics, and strategies for post-MDA and post-validation surveillance is crucial.
- Collaborative networks between vector-borne disease control programs and surgical societies have been lacking, or at most, minimal.
- In urogenital health, while hydrocele holds significant importance, other conditions such as scrotal elephantiasis, chyluria, and chylocele receive less attention.

CONCLUSION

Tamil Nadu stands as the only state in the country to successfully accomplish all requisite MDA rounds and attain a MF rate below 1%. This achievement owes itself to persistent endeavours and diligent surveillance of the disease by committed teams. The documented progress towards elimination serves as a potential benchmark for other states and offers valuable insights for addressing various diseases.

REFERENCES

1. The World Health Report 1995--bridging the gaps. World Health Forum 16, 377–85 (1995).

2. Sasa, M. Human filariasis : a global survey of epidemiology and control. 819 (1976).

3. World Health Organization. Regional Office for the Western Pacific. Control of lymphatic filariasis in China. 203 (2003).

4. Webber, R. H. The natural decline of Wuchereria bancrofti infection in a vector control situation in the Solomon Islands. Trans R Soc Trop Med Hyg 71, 396–400 (1977).

5. Control of Neglected Tropical Diseases. https://www.who.int/teams/control-of-neglected-tropical-diseases/lymphatic-filariasis/global-programme-to-eliminate-lymphatic-filariasis.

6. SDG Target 3.3 | Communicable diseases: By 2030, end the epidemics of AIDS, tuberculosis, malaria and neglected tropical diseases and combat hepatitis, water-borne diseases and other communicable diseases. https://www.who.int/data/gho/data/themes/topics/indicator-groups/indicator-group-details/GHO/sdg-target-3.3-communicable-diseases.

7. Triple Drug Therapy (IDA) for Lymphatic Filariasis Background.

8. DEC-fortified salt for the elimination of lymphatic filariasis: A manual for program managers.

9. Validation of elimination of lymphatic filariasis as a public health problem. https://www.who.int/publications/i/item/9789241511957.

10. Ichimori, K. et al. Global Programme to Eliminate Lymphatic Filariasis: The Processes Underlying Programme Success. PLoS Negl Trop Dis 8, e3328 (2014).

11. Global programme to eliminate lymphatic filariasis: progress report, 2022. https://www.who.int/publications/i/item/who-wer9841-489-502.

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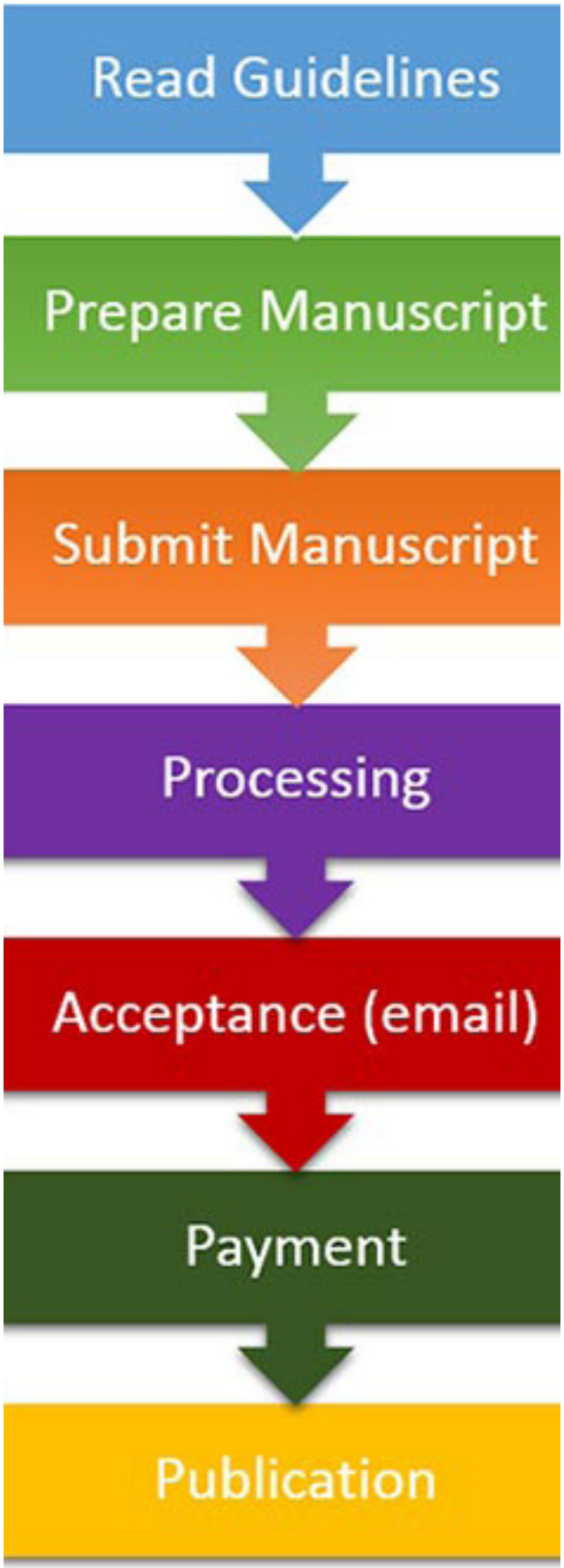

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