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TNJPHMR

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Letter from the Editor's Desk

Dear all,

We are happy to release our 5th edition of TNJPHMR Today and reaching you in time again. We're getting stronger and growing with release of every issue. It is all because of the effort of each and everyone of you including the contributors.

TNJPHMR has truly become a multidisciplinary journal where in the entire spectrum of subjects right from communicable diseases including TB and Rabies, Air pollution in non-communicable diseases, special areas like Fire Safety and Quality improvement have been covered in the current issue of TNJPHMR. The value of HR and their motivation is also discussed, the challenges in MCCD which give us the updated numbers for all our planning and implementation.

TNJPHMR is now provisionally indexed with Science Citation Index which is National Medical Commission approved indexing agency.

An International Public Health Conference is commemorated to celebrate 100 years of the Directorate of Public Health and Preventive Medicine of Tamil Nadu in the month of December 2022. The theme of the Conference is "Excellence in Public Health".

We are planning to release a special edition of TNJPHMR in view of the DPHI-CON2022 conference and request each and every one of to support this by sharing your scientific thoughts as a article to the special addition. Looking forward for a long-term association with you all.

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

Director of Public Health & Preventive Medicine

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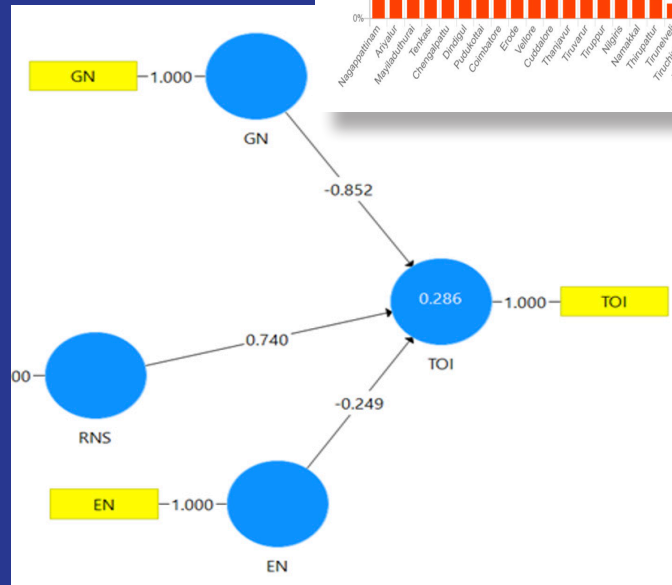
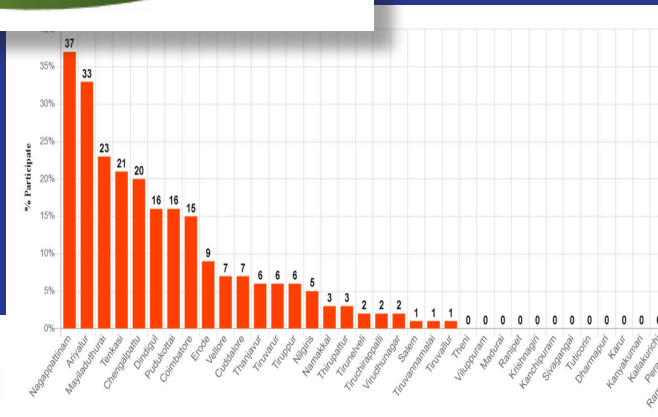
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A 3D pie chart with two segments. The larger segment is green and labeled '57%'. The smaller segment is orange and labeled '43%'. The chart is shown from an isometric perspective, giving it a three-dimensional appearance.



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ORIGINAL ARTICLE - PUBLIC HEALTH

TUBERCULOSIS CASE FINDING IN THE PUBLIC SECTOR IN TAMIL NADU – TRENDS AND EXPERIENCES FROM 2015 TO 2022

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Abstract

Background : Tuberculosis continues to be an important cause of mortality and morbidity in Tamil Nadu. The Government of Tamil Nadu has been implementing the National Tuberculosis Elimination Programme with the aim of achieving the End TB targets by 2025.

Objectives : The present article aims to describe the case finding activities undertaken in Tamil Nadu and the resultant changes. In addition, it explores the impact of the COVID-19 pandemic on TB case finding.

Methods : Secondary data available in the various registers and reports (paper-based and digital) within the NTEP were consolidated for the calculation of indicators relevant to case finding. The trends in such indicators over the period of 2015-2022 were mapped and represented.

Results : The presumptive TB examination rate has increased by 69% from 2015 to 2022. Annual case notification rate in the public sector has declined by 19% overall for the state. The NNT (number needed to test to diagnose one case of TB) for smear microscopy has nearly doubled and NNT for NAAT has increased by 80%. Presumptive TB examinations which were severely impacted by the COVID-19 pandemic have significantly improved in 2022

Conclusions : The stagnation or decline in TB notifications despite increased presumptive TB examinations suggests an overall declining trend of the tuberculosis epidemic in Tamil Nadu. The gains need to be consolidated and built upon in the coming years leading up to 2025 to push for TB elimination.

Key words : Tuberculosis, case finding, COVID-19, NTEP, notification, number needed to test (NNT)

INTRODUCTION

The state of Tamil Nadu has one of the highest epidemiological transition levels (0.26) in India.¹ Despite this, tuberculosis continued to be one of the top 10 causes of years of life lost (7th in males and 11th in females) and among the top 15 causes of disability-adjusted life years in 2019.²

Early detection of the disease and prompt initiation of effective treatment continue to be the strongly recommended mainstay for TB infection prevention and control.³ The National Strategic Plan for TB elimination in India aims to achieve the Sustainable Development Goals (80% reduction in tuberculosis incidence, 90% reduction in tuberculosis mortality, and zero households incurring catastrophic health expenses due to tuberculosis) for 2030⁴ by the year 2025. Keeping in line with this, the Government of Tamil Nadu has been implementing the National TB Elimination Programme (erstwhile Revised National TB Control Programme – RNTCP) with the aim of a TB-free Tamil Nadu.

Tuberculosis is diagnosed primarily through 3 modalities – sputum smear microscopy, chest X-ray, and WHO-recommended molecular diagnostics (WRMDs; CBNAAT and Truenat). According to the Technical and Operational

Guidelines, all presumptive TB should be offered at least sputum smear microscopy and chest X-ray. WRMDs should be offered upfront to key populations such as PLHIV, children, presumptive EP-TB, etc. for diagnosis of TB. However, in line with the priority target of diagnosing 90% of all TB using WRMDs by 2030,⁵ there is a push to offer WRMDs universally to all presumptive TB. Providing chest X-rays to all presumptive TB is essential to complete the diagnostic cascade.

The current paper aims to characterize the landscape of TB case finding in Tamil Nadu state from 2015 to 2022.⁶ The objectives are to describe the progress of TB case finding in the public sector in Tamil Nadu and the effect of the COVID-19 pandemic on case finding along with recovery in the aftermath. In addition, it maps the programmatic developments which contributed to the changes.



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METHODOLOGY

STUDY DESIGN : We conducted an analysis of tuberculosis surveillance data reported in Tamil Nadu state from 2015 to July/August 2022.

STUDY AREA : Tamil Nadu state is in the southernmost part of mainland India, covering an area of 130,058 square kilometers and having a projected population of 813.8 lakhs. The population density was 555 persons per square kilometer and the population sex ratio (defined as the number of females per 1000 males) was 995 in 2011. The literacy rate stands at 80.3%. Nearly half the population is urban (48.5%), out of which 8% (2.8 million) live in slums.

The state consists of 38 administrative districts and 42 health unit districts (HUDs).

TB care services are delivered in Tamil Nadu through a 3-tier health directorate system – Directorate of Public Health and Preventive Medicine, Directorate of Medical and Rural Health Services and Directorate of Medical Education providing primary, secondary and tertiary care respectively. There are 35 NTEP districts, each of which is subdivided into TB units (which typically correspond to health blocks). Five of these 35 districts are located within Chennai. Each TB unit has public sector peripheral health institutions (PHIs) and private sector hospitals/clinics/labs/pharmacies under its purview. In the public sector, there are medical colleges, district headquarters hospitals, sub-district hospitals, block primary health centers, primary health centers and health sub-centers – these public sector facilities are termed as peripheral health institutions (PHIs). Out of these, some PHIs are equipped as designated microscopy centers. In addition, there are a total of 140 Truenat machines and 75 CBNAAT machines. The vast infrastructure of the NTEP is manned and supported at the district level by a team of DTO, DPC, TO, DPPMC, DRTB & TB-HIV coordinator and at the field level by STS, STLS, TB-HV and LTs.

STUDY POPULATION : All identified presumptive TB and diagnosed TB cases reported to the government system during the study period constituted the study population.

CASE DEFINITIONS

1. Presumptive TB: a person with any of the symptoms and signs suggestive of TB, such as cough for 2 weeks or more, fever for 2 weeks or more, significant weight loss, hemoptysis, etc.

2. TB case: may either be –

a. Microbiologically confirmed TB: a presumptive TB case from whom a biological specimen is positive for acid-fast bacilli, or positive for *Mycobacterium tuberculosis*

on culture, or positive for tuberculosis through a rapid diagnostic molecular test,

b. Clinically diagnosed TB: a presumptive TB case that is not microbiologically confirmed but has been diagnosed with active TB by a clinician based on X-ray abnormalities, histopathology, or clinical signs with a decision to treat the patient with a full course of anti-TB treatment.

3. Notification/Notified TB case: a TB case that has been diagnosed and reported to the public NTEP system.

SOURCE OF DATA : 1) Annexure-M: monthly report regarding the performance of sputum microscopy prepared at the level of peripheral health institutions and consolidated at levels of TB unit, district, and state for a month, quarter, and year. This report contains the number of new adult out-patients, presumptive TB tested, presumptive TB who test positive, etc.

2) CBNAAT indicator report: monthly report regarding the performance of CBNAAT machines submitted by each CBNAAT site for each machine. This report is also consolidated at the level of district and state for a month, quarter, and year. It contains details on total tests conducted on CBNAAT, presumptive TB tested on CBNAAT, presumptive TB who test positive, etc.

3) Truenat indicator report: monthly report regarding the performance of Truenat machines submitted by each Truenat site for each machine. This report is also consolidated at the level of district and state for a month, quarter, and year. It contains details on total tests conducted on Truenat, presumptive TB tested on Truenat, presumptive TB who test positive, etc.

4) Nikshay: Nikshay is the digital case-based reporting system of the National Tuberculosis Elimination Programme. Notification registers containing detailed line lists of all TB patients diagnosed within the state and reported to the government NTEP system were downloaded for the period from 2017 to August 2022. For the number of patients diagnosed in the public sector in 2015, data was downloaded from archived Epicenter reports.

5) India TB reports: Numbers of notified TB (public, private and total) for the year 2016 were obtained district-wise from the India TB report 2017.

ANALYSIS

All the data sources except the India TB reports were available as Microsoft Excel files. Analysis of the data was done in Microsoft Excel 365. The following indicators were calculated:

1) Annual case notification rate (ACNR): number of TB

cases notified per lakh (100,000) population,

2) Presumptive TB examination rate (PTBER): number of individuals with presumptive TB who were examined for diagnosis of TB per lakh (100,000) population,

3) Number needed to test to diagnose a case of TB (NNT): number of presumptive TB that need to be tested to diagnose a case of TB,

4) Proportion of presumptive TB offered a molecular test for diagnosis: proportion of presumptive TB tested on NAAT (CBNAAT/Truenat) out of total presumptive TB

The above indicators were calculated for each district and for Tamil Nadu state from 2015/2016 (NAAT for diagnosis of TB was introduced in 2016 – therefore presumptive TB includes those tested on NAAT from 2016 only) to 2022. For 2022, data from January to July/August were taken and annualized to give the indicator for the whole of 2022.

Estimates of the population done by the Central TB Division were taken for calculations. The five NTEP districts of Chennai were counted as a single district for the purpose of this study. Hence, 31 districts will be represented instead of 35.

A four-quadrant graph with PTBER (x-axis) and ACNR (y-axis) was prepared, depicting the performance of the state for the 8 years (2015 to 2022) with PTBER ranging from 0 to 2400 per lakh population and ACNR ranging from 0 to 160 per lakh population. The four-quadrant graph compares the PTBER and the ACNR for each year and places the state in any of the following 4 quadrants: bottom left (low PTBER and low ACNR), top left (low PTBER and high ACNR), top right (high PTBER and high ACNR) and bottom right (high PTBER and low ACNR).

RESULTS

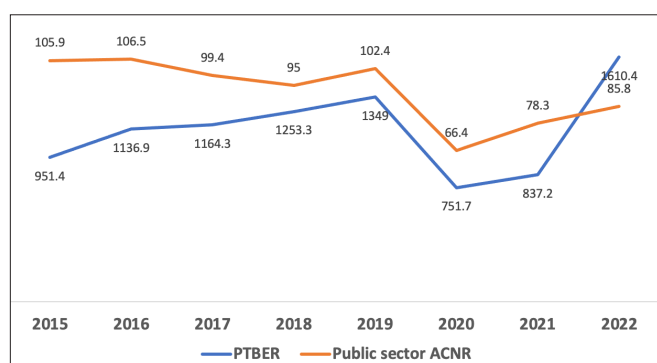


Figure 1: Trend of PTBER and public sector ACNR - 2015 to 2022

The PTBER has increased by 69% from 2015 to 2022. Out of the 31 districts, 29 districts show an increase in the PTBER, ranging from 10% to 207%. This increase in testing

was accompanied by a decline in public sector ACNR in 26 out of the 29 districts over the same period. ACNR in the public sector has declined by 19% overall for the state - the decline in ACNR was as high as 34-40% in some districts.

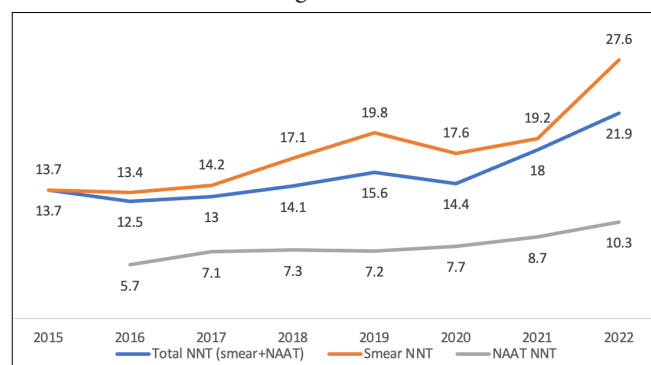


Figure 2: Trend in NNT (number needed to test to diagnose a case of TB) by technology

Total NNT (both NAAT and smear microscopy) increased in 29 districts from 2015 to 2022, leading to a nearly 60% increase for the state. Similarly, the NNT for smear microscopy nearly doubled and NNT for NAAT increased by 80%.

Impact of and recovery from the COVID-19 pandemic and mitigation measures

From 2019 to 2020, the PTBER decreased in all the districts of Tamil Nadu (a decline ranging from 18% to 67%). The overall decline at the state level was 44.3%. This was accompanied by a decline in the public sector ACNR in all the districts (ranging from 25% to 50%) with a 35% decline for the state.

In 2021, 7 out of the 31 districts reported a further decline in PTBER while the remaining districts showed an increase. In 2022, nearly all districts show an increase in PTBER - one district which doubled its PTBER from 2020 to 2021 reported a decline. The state showed an increase in PTBER of 19% overall in 2022 compared to pre-pandemic levels. A return to or an increase over the pre-pandemic PTBER levels was reported in 19 out of 31 districts, with an overall increase in PTBER of 19% in the state over 2019 levels.

The public sector ACNR concomitantly increased by up to 37% in all but 2 districts from 2020 to 2021 while it further increased by up to 24% in all but 4 districts from 2021 to 2022. The public sector ACNR for Tamil Nadu state increased by 18% and 10% respectively over the same periods. However, a return to 2019 levels is yet to be noticed – public sector ACNR remains 16% lower.

Figure 3 shows that Tamil Nadu moved from the top left quadrant (low PTBER and high ACNR) in 2015-17 to top right (high PTBER and high ACNR) in 2018-19 followed by a

major drop to the bottom left quadrant (low PTBER and low ACNR) in 2020 and 2021. This was followed by a recovery in 2022 to place the state in the top right quadrant.

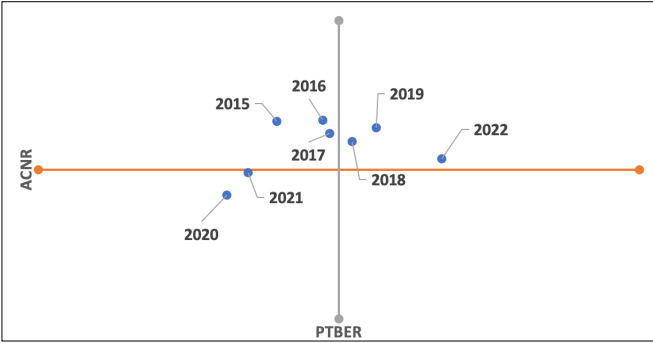


Figure 3: PTBER vs ACNR - 4-quadrant graph showing progress from 2015 to 2022

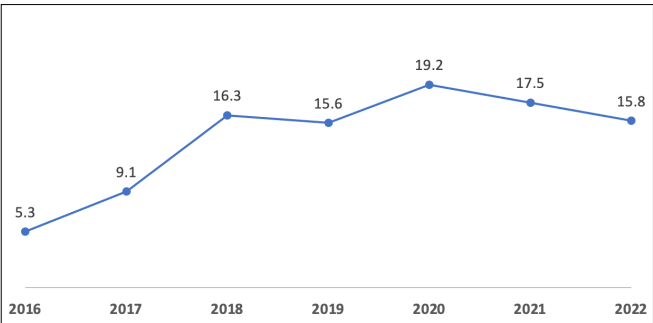


Figure 4: Proportion of presumptive TB offered upfront NAAT for diagnosis of TB

DISCUSSION

TB case finding in Tamil Nadu has undergone a paradigm shift in the last 7 years. To decentralize the availability of TB diagnostic services, a 137% increase in the number of DMCs was completed in 2018 – the number was increased from 837 to 1984. Currently, nearly 75% of the public sector health facilities (1984 out of 2678) in the state are DMCs. With the introduction of WHO-recommended molecular diagnostics (WRMDs) for the diagnosis of TB since 2016, the laboratory system for high-quality TB diagnosis and drug resistance testing has expanded rapidly. This expansion of molecular diagnostics occurred in 3 rounds from 2016 to 2019 with supply of GeneXpert CBNAAT machines by the Central TB Division. Subsequently, Truenat MTB/MTB-Rif machines were supplied from the third quarter of 2020 onwards. Initially, the eligibility for presumptive TB using molecular diagnostics was limited to PLHIV. Subsequently, in 2017, it was decided to expand the eligibility to key populations such as extra-pulmonary TB and children. This has led to the increase in provision of NAAT upfront for diagnosis of TB from 5.3% of all presumptive TB in 2016 to around 16.3% in 2018 and a peak of 19.2% in 2020, as seen

in figure 4. For the period 2018-2022, this proportion has stagnated between 15% and 20%.

For culture and drug susceptibility testing, in addition to the two existing Intermediate Reference Laboratories (IRLs) in Chennai and Madurai, 3 more culture and drug susceptibility (C&DST) laboratories are being established in Tiruchirapalli, Coimbatore and Kancheepuram.

Table 1 : Active case finding in Tamil Nadu

Year	Total screened for TB symptoms	Total presumptive TB identified	Total diagnosed TB
2017	3014361	90722	3184
2019	1125471	39233	1657
2020	655610	22994	1308
2021	308147	21028	1215

Systematic active case finding among vulnerable populations and in the community was started in 2017. Nearly 175000 presumptive TB have been identified from 2017 to 2021 because of active case-finding efforts and nearly 7500 TB patients have been diagnosed. In July 2020, a targeted case finding campaign was launched with a focus on contacts of TB patients, PLHIV, line-listed NCD patients (especially uncontrolled diabetics and chronic kidney disease patients) and line-listed ILI/SARI patients who have been prescribed home/institutional quarantine. This targeted case finding campaign aided the recovery of TB case finding post the first COVID-19 lockdown.

The introduction of mobile diagnostic units equipped with digital X-ray machines in 2022 has been a shot in the arm for the completion of TB diagnostic cascade, especially during active case finding.

The stagnation or decline in TB notifications despite increased presumptive TB examinations suggests a strong recovery from the disastrous impact of the COVID-19 pandemic. Thus, through augmented case finding activities supported by political and administrative commitment, the gains made till 2022 need to be consolidated and built upon in the coming years leading up to 2025 to push for focused TB elimination processes.

Way Forward

- 1) Re-orientation of strategies based on findings of the Tamil Nadu TB prevalence survey,
- 2) Inter-sectoral collaboration for TB case finding,
 - a. TB-free workplace policy,
 - b. TB-free Panchayats,
 - c. School health,
 - d. Tribal health.
- 3) Health systems approach for TB elimination:
 - a. Integration of TB services within Makkalai Thedi

Maruthuvam and TB surveillance within TN-Population Health Registry

b. Decentralization of TB service delivery to Health and Wellness Centers (HWCs)

HWCs may be designated as TB diagnostic centers (TDCs) and may act as sputum collection spokes in a structured hub-and-spoke model with DMCs and NAAT labs serving as hubs.

c. Planned and systematic expansion of Programmatic Management of TB Preventive Therapy (PMTPT) services to the entire state

4) Systematic active case finding in mapped vulnerable populations using highly sensitive screening and diagnostic algorithms with assistance of computer-aided diagnostics (CAD) and artificial intelligence,

5) Re-invigoration of private sector engagement with adoption of FAST (Find, Assess, Support, Treat) and/or similar tailor-made models in all districts.

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Abbreviations used :

- ACNR – Annual Case Notification Rate
 CBNAAT – Cartridge Based Nucleic Acid Amplification Test
 COVID 19 – Corona Virus Disease – 19
 DPC – District Programme Coordinator
 DPPMC – District Public Private Mix Coordinator
 DRTB – Drug Resistant Tuberculosis
 DTO – District Tuberculosis Officer
 EP -TB – Extra Pulmonary Tuberculosis
 HUD – Health Unit District
 LT – Lab Technician
 MTB – Mycobacterium Tuberculosis
 MTB Rif – Mycobacterium Tuberculosis Rifampicin gene
 NAAT- Nucleic Acid Amplification Test
 NNT – Number Needed to Test
 NTEP – National Tuberculosis Elimination Program
 PHI – Peripheral Health Institution
 PLHIV – People Living with Human Immunodeficiency Virus
 PTBER – Presumptive Tuberculosis Examination Rate
 STS – Senior Treatment Supervisor
 STLS – Senior Treatment Laboratory Supervisor
 TB – Tuberculosis
 TB HIV – Tuberculosis – Human Immunodeficiency Virus
 TB HV – Tuberculosis Health Visitor
 TO – Treatment Organizer
 WHO – World Health Organization
 WRMD – WHO Recommended Molecular Diagnostics

APPLYING HEALTH BELIEF MODEL TO STUDY THE ADHERENCE TO COVID-19 PRECAUTIONARY MEASURES AMONG BASIC LEVEL HEALTHCARE WORKERS IN A TERTIARY CARE HOSPITAL, CHENNAI.

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Abstract

BACKGROUND : Following precautionary measures will be the best way of containing COVID-19 even after vaccine invention or treatment innovation as the latter may not reach remote population. However, differences have been observed in behavioral adherence to precautionary measures among people, especially the basic level healthcare workers who involve in patient care and supportive services, getting constantly exposed to infectious diseases. Here, we aim to explore how the intra-personal factors influence adherence to precautionary measures using Health belief model to plan for an effective behavior change intervention.

OBJECTIVES : 1.To assess the adherence to precautionary measures among basic level healthcare workers in a tertiary care hospital, Chennai.

2.To evaluate health beliefs with respect to COVID-19 and its precautionary measures.

METHODS : A cross-sectional study was conducted among 110 Basic level healthcare workers, chosen by simple random sampling at a tertiary care hospital in Chennai, during the months of November and December 2020. An Interviewer administered semi-structured, pretested questionnaire was used to collect data. The data was entered in MS Excel and analyzed by SPSS 16.

RESULTS : Despite working in a covid care hospital, where exposure is very high, Face mask was properly worn by only 35.5% of the workers. Only 33.6% of the workers ensured safe patient care, maintaining adequate physical distancing of 3 feet. Hand hygiene was followed least following activities like pushing trolley, using lifts. Perceived barrier was very high with mean score of 16.55, while perceived severity was low with mean of 11.78. High correlation was seen between, Hand-wash-Perceived benefits; safe patient care-perceived barrier; touching face-perceived susceptibility; Wearing mask-perceived barrier.

CONCLUSION : This study cast spotlight over the insubstantial health behavior of basic level workers in health care. Effort must be taken to educate them in order to prevent infectious hazardous diseases, as they are the vulnerable exposed group. This will ensure that the health system is strengthened as a whole.

KEY MESSAGES : COVID-19, Precautionary measures, Health belief, Healthcare workers

INTRODUCTION

Due to its exponential growth, there is widespread transmission COVID 19 across nations, the specific treatment of which remains unknown.¹ Though various vaccines have been put into use for its prevention, there is overarching cases of Break through infection. New, highly infectious strains such as Delta, Omicron have emerged and the epidemiology of COVID 19 stays unpredictable. Hence, adherence to personal safety measures will be the exemplary way of containing the disease as they are easily affordable, accessible, and applicable to all population. Individual differences have been observed in behavioral adherence to personal safety measures among people, including health care workers.² Due to the rapid spread of the virus and a dearth of verified research, current knowledge on the influence of intrapersonal factors on alleviating the COVID-19 pandemic is sparse. These include perceived susceptibility to acquiring COVID 19 disease, awareness about the severity and consequences of the illness, perceived benefits of following precautionary measures,

conceived barriers to following the precautionary measures such as hindrance to speech/breathing while wearing face mask, use of public transport and cues to action including provision of hand washing facility, awareness made through IEC Programmes, mass media. In this study, we aim to explore how the intrapersonal factors influence the adherence to personal safety measures using Health belief model, for designing an effective behavior change intervention on a community level.

Chennai among other districts in Tamil Nadu has received bountiful COVID 19 cases due to multiple reasons such as high population density, industrialization, large population movement. Health care facilities were flooded



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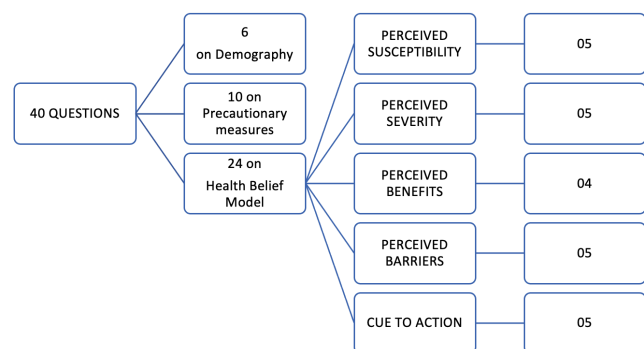
with patients, seeking inpatient care owing to the severity of illness. Tertiary care hospitals had intake of self-reported as well as referred patients, making the patient load heavy. Along with doctors and staff nurses, there are basic level health care workers like sanitary workers, food distributors, lift operators, ward workers, security staffs, who involve in care of COVID 19 patients and other supportive services with unstained hearts. They provide preliminary level of care such as bathing the patient, helping the patient while defecation, setting up the bed, laundering, mopping floors, transferring drugs and other materials to wards. They support the treatment of all kind of patients, right from stable to severely ill patients on cardiorespiratory support. In doing so, they get highly exposed to infectious diseases like COVID 19. It is essential to prevent and protect them from such harmful diseases. The first step is to enlighten them about their nature of work and the risk involved and hardly are there any studies to assess their knowledge about disease transmission, risk perception, attitude towards diseases and practice of personal safety measures. Hence, this study was done to assess the beliefs prevailing among the basic level health care workers pertaining to health, which will provide adequate information to plan an effective preventive intervention

METHODOLOGY

A cross-sectional study was done among Basic level healthcare workers in a tertiary care hospital, Chennai, after getting ethical approval from the Institutional Ethics Committee of Madras Medical College, and permission from the Dean of the institution. The study was conducted during the months of November and December 2020. Sample size was calculated using the formula $N = Z^2sd^2/d^2$, with α being at 5% significance level, 20% absolute precision, $SD=0.51$ based on a previous study¹, 10% non-response rate as 110. Basic level health care workers encompassing sanitary workers, lift operators, ward workers, security staff were included. List of all basic level workers working in the hospital was obtained from the administration and study participants were chosen by simple random sampling by computer generated random number table. The workers selected were informed about the study and asked for their convenient time and place for administering the questionnaire. They were then approached individually. Informed consent was obtained from the study participants, after explaining about the study. An Interviewer administered semi-structured, pretested questionnaire, in Tamil language, adopted from a previous study (Adherence to COVID-19 Precautionary Measures: Applying the Health

Belief Model and Generalised Social Beliefs to a Probability Community Sample by Tong et al 3) was used to collect data. This included 40 questions including assessment of face mask worn.

- Demographic data included age, sex, job description, monthly income, education etc.
- Precautionary measures included: Handwashing, face mask wearing, Physical distancing, avoiding touching face without sanitizing, Wearing gloves.
- Health Belief Model items were in the form of Likert and yes/no (for perceived susceptibility, perceived severity, perceived barriers, perceived benefits on a scale of 5: 0- Strongly Disagree; 5- Strongly Agree and for Cues to action 1- yes; 0- No)



OPERATIONAL DEFINITION :

• Basic level health care workers :

Sanitary workers, Lift operators, Ward workers, Security staff working in Rajiv Gandhi Government General Hospital for a duration of at least 6 months.

• Precautionary measures :

Personal protective measures advised for the prevention of COVID 19 disease including Handwashing, face mask wearing, Physical distancing, avoiding touching face without sanitizing, Wearing gloves.

• Hand washing :

Washing hands with or without soap (using plain water) on various occasions (Before eating, after toilet use, after handling patient things, after pushing trolley, after exiting covid ward, after using lifts, after sanitary works)

• Hand washing using soap :

Washing hands using soap, following all the six steps on various occasions (Before eating, after toilet use, after handling patient things, after pushing trolley, after exiting covid ward, after using lifts, after sanitary works)

• Safe patient care :

Ensuring physical distancing of at least 3 feet from patients while working in covid ward.

• **Avoiding touching face without sanitizing :**

Not touching eyes, nose, or mouth without sanitizing the hands by washing with soaps or using hand sanitizers while inside the hospital campus.

• **Wearing gloves :**

Wearing disposable gloves while entering covid wards, using lifts in covid ward, pushing trolley, handling patient things and while doing sanitary works.

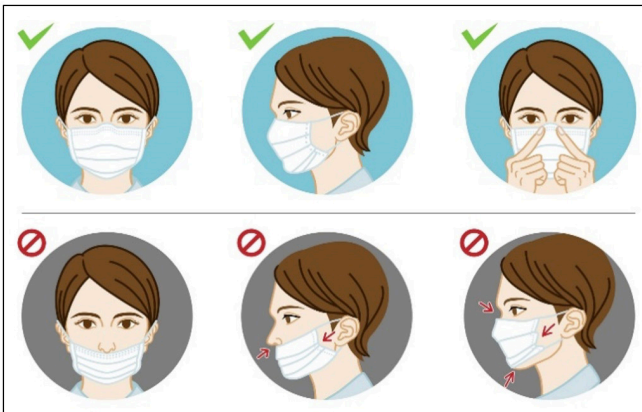
• **Face mask :**

Wearing face mask inside the hospital campus and removing it only while eating or drinking water, after ensuring seclusion.

• **Appropriate use of face mask:**

Face mask properly worn, covering nose and mouth completely during the time the study participant was interviewed, not removing it or pulling it towards the neck exposing nose and mouth.

FACEMASK ASSESSMENT



RESULTS :

Table 1 shows the descriptive data of the study participants. In this study, the mean age of the participants was 44.3 years. Females were slightly higher in number, with a proportion of 54.5%. Close to half of the study participants had completed primary schooling and about 27.3% were illiterate. Diabetes mellitus was the most predominant comorbid disease, with a prevalence of 24.5%. The next major comorbid disease was Hypertension, prevalent among 18.2% of study participants. The other conditions included IHD, Bronchial Asthma, Thyroid disorders and stroke.

Adherence to various precautionary measures is shown in the figure 1. All the study participants reported wearing of face mask, However, only 35.5% were wearing the face mask correctly (covering nose and mouth) during the time of interview.

About 94.5 % of the study participants had the habit of washing hands, among whom, only 82.7% used soap

for washing hands during various occasions. Only 58.2 % reported not touching face, without sanitizing their hands.

Only 51.8% of the workers used gloves. Safe patient care, by maintaining adequate social distancing was practiced only by 33.6% of the basic level healthcare workers in this study.

Table 1 : Descriptive Data of Study Participants

Variables	Frequency [n (%)]
Sex	
Male	50 (45.5%)
Female	60 (54.5%)
Age in years (Mean SD)	
	44.32 (6.9)
Job description	
Ward Worker	37(33.6%)
Security Staff	31(28.2%)
Sanitary Worker	29(26.4%)
Lift Operator	13(11.8%)
Education	
Illiterate	30 (27.3%)
Middle school	26 (23.6%)
Primary school	53 (48.2%)
High school	1 (0.9%)
Comorbidities	
Diabetes Mellitus	27(24.5%)
Hypertension	20(18.2%)
IHD	8(7.3%)
BA	6(5%)
Thyroid Disorder	4(3.6%)
Stroke	1(0.9%)

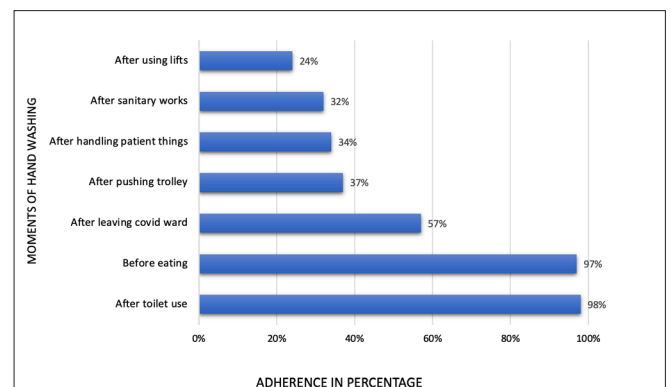


Table 1 : Descriptive Data of Study Participants

In the present study, Adherence to washing hands, as a whole with plain water or using soap, was maximum after toilet use and before eating. It was least following potentially infection prone activities like handling patient things, sanitary works and after using lift.

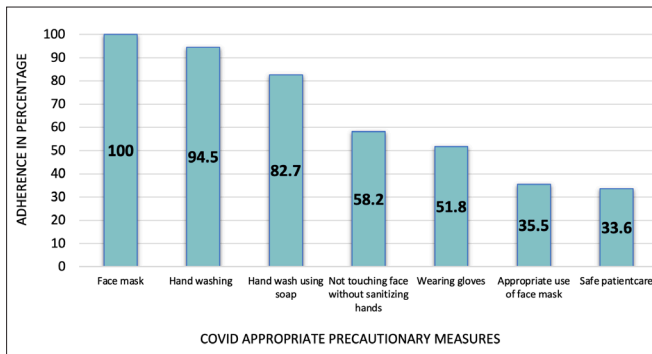


Figure 2 : Analysis of Hand Washing on Various Occasions

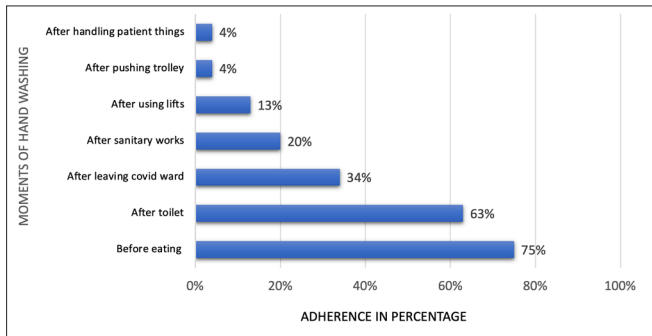


Figure 3 : Analysis of Hand Washing using Soap on Various Occasions

The present study showed, among the participants who washed hands, only 82.7% had used soap for doing the same. Figure 3 depicts the adherence to washing hands using soap on different occasions. It can be seen, this was maximum before eating, followed by toilet use (75% and 63% respectively). However, proper hand washing was not adhered after handling patient things, pushing trolley, after using lifts etc.

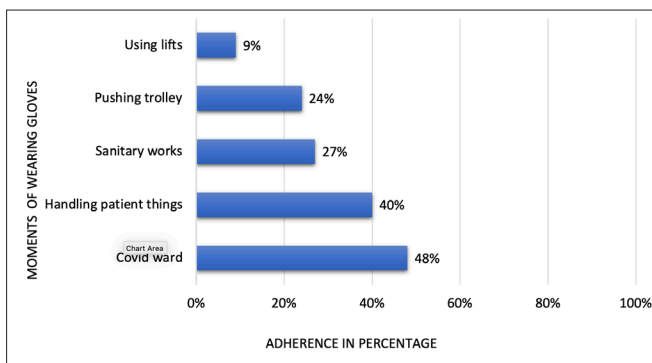


Figure 4 : Analysis of Wearing Gloves on Various Occasions

In the present study only 51.8% of the basic level health care workers wore gloves on one or the other occasion, of which wearing gloves while working in covid ward contributed to the major (48%). Wearing gloves was adhered least while using lifts of covid ward, pushing trolley and sanitary works.

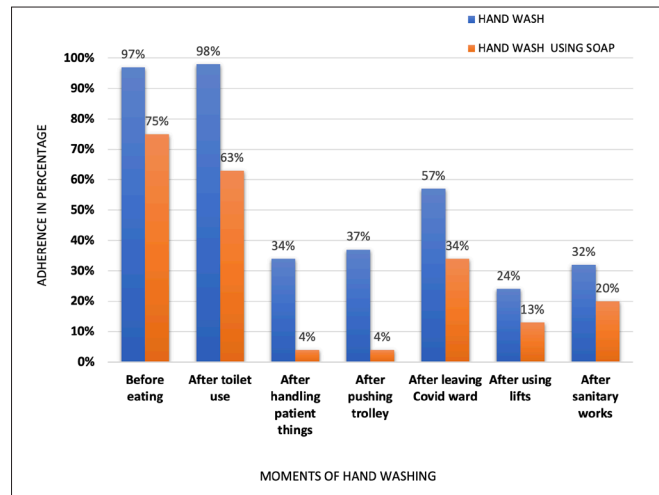


Figure 5 : Comparative Analysis of Hand Hygiene

Figure 5 shows the comparative analysis of hand hygiene practices during various occasions. There was less adherence to washing hands using soap in all the situations assessed. The difference was high in activities like handling patient things and pushing trolley.

Table 2 : Constructs of Health Belief Model

CONSTRUCT	MEAN SCORE	STANDARD DEVIATION	MINIMUM	MAXIMUM
PERCEIVED SUSCEPTIBILITY	12.60	5.88	5	25
PERCEIVED SEVERITY	11.78	6.14	5	25
PERCEIVED BENEFITS	12.62	5.23	4	20
PERCEIVED BARRIERS	16.55	6.52	5	25
CUES TO ACTION	2.73	1.18	1	5

Table 2 shows the mean score of various constructs of Health Belief Model, as reported by the study participants. Perceived Barrier was high with a mean score of 16.5 (out of 25).

This was followed by perceived benefits with mean score around 12.6 out of 20. Cues to action and perceived susceptibility followed these, with a mean score of 2.73 out of 5 and 12.6 out of 25 respectively.

The HBM construct with least score was Perceived Severity with a mean score of 11.78.

Precautionary measures replicate the intrapersonal health risk beliefs of an individual. In this study we could see that the perception of barrier to adherence to personal safety measures is high and perception of severity of diseases to be low. This correspondingly represents the lower adherence of precautionary measures among the basic level health

care workers who participated in this study.

Table 3: Correlation Between Precautionary Measures & HBM Constructs

HBM PRECAUTION	PERCEIVED SUSCEPTIBILITY	PERCEIVED SEVERITY	PERCEIVED BENEFITS	PERCEIVED BARRIERS	CUES TO ACTION
HAND WASH	0.185	0.169	0.450**	-0.233*	0.392**
SAFE PATIENT CARE	0.224*	0.258**	0.127	-0.538**	0.315
TOUCHING FACE WITHOUT WASHING HANDS	-0.412**	-0.378*	-0.002	0.370	-0.031
WEARING MASK	0.041	0.224*	0.233*	-0.718**	0.236*

** Correlation is significant at 0.01 level

* Correlation is significant at 0.05 level

Table 3 shows the correlation between precautionary measures & HBM constructs.

washing hands, safe patient care and washing hands showed positive correlation with all constructs of HBM except perceived barrier. Correlation between washing hands and perceived benefits was maximum with $r=0.45$. Moderately high negative correlation was seen between perceived barrier and safe patient care with $r=-0.54$. Strong inverse correlation was seen between wearing mask and perceived barrier, with $r=-0.72$.

Touching face without proper hand sanitization showed negative correlation between all constructs of HBM except perceived barrier. Moderately high negative correlation was seen with perceived susceptibility with correlation coefficient -0.41 .

DISCUSSION

The study results showed that Face mask was worn by 100% of the study participants. In a study by Tong et al.,³ among general population face mask was worn by 96.4% of the study participants often or always. This reflects the comparatively higher adherence to this precautionary measure among health care workers. However, only 35.5% of them were wearing it appropriately and perceived barrier which had high negative correlation with appropriate face mask wearing was playing a significant role.

In the present study, Hand washing was done by 94.5% of the study participants at one or other occasion and 82.7% of them used soap for washing hands. Hand washing showed moderately high positive correlation with perceived benefits. This could be compared with a study by Bhagavathula et al.,⁴ in which 85.4% of healthcare workers reported hand hygiene to be a preventive strategy for covid 19 transmission.

In the present study safe patient care, maintaining adequate

physical distance was practiced only by 33.6% of basic level health care workers and this was negatively correlated with perceived barrier. This can be related to a study by Sesagiri et al.,⁵ which examined the public perceptions of physical distancing using HBM. In the latter study, physical distancing was negatively correlated with perceived barrier and positively with perceived severity, thus implying, perceived barrier to be an obstacle to physical distancing in both hospital set up and at community level.

In the present study nearly 58.2 % of the study participants reported touching face, without sanitizing their hands and this was negatively correlated with perceived susceptibility. However, a study by Tong et al.,³ reported lower prevalence of touching face without sanitizing, as 36.4% and negatively correlated to perceived barrier. This could be attributed to lower health risk behaviour among the study participants in this group.

DISCUSSION

This study shows that the adherence to precautionary measures among basic level health care workers is exiguous, which in turn increases their susceptibility to contagious diseases such as COVID 19, with the perception of severity of the latter being low and perception of barrier to follow the personal safety measures being high in this study group. Significant correlation was seen between various constructs of HBM and level of adherence to precautionary measures, thus establishing the need for emphasis on corrective measures accordingly.

RECOMMENDATIONS

- This study can be replicated in general public for designing an effective behavior change intervention on a community level.
- IEC aiming on intervening the concerned health believes will help in improving adherence to precautionary measures, thereby preventing unnecessary turmoil in relation with health.

LIMITATIONS

The present study assessed adherence to COVID 19 precautionary measures using self-reporting questions, which may have Social desirability bias.

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ORIGINAL ARTICLE - PUBLIC HEALTH

KAP RELATED TO MEDICALLY CERTIFIED CAUSE OF DEATH FOR DOMICILIARY DEATHS IN RURAL AREAS OF VILLUPURAM DISTRICT, TAMIL NADU, 2022

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(1) Directorate of Public Health & Preventive Medicine

Abstract

BACKGROUND : Globally two thirds of annual deaths are not registered and 53.4% deaths occur at home with no properly assigned cause of death. In India, there is almost 53% home deaths and 45% of total registered deaths have no medical attention in 2020. In Tamil Nadu 74 % are home deaths of which 62% contribution is from Village panchayat where the MCCD coverage is 5% in 2020 .In Villupuram district 81% are home deaths of which 85% contribution with 0.2% MCCD coverage noted in Village Panchayat during March-May 2022 .

OBJECTIVES : To understand the knowledge, attitude and practices from the family members of the deceased, related to non-availability of medically certified cause of death of those who died at home (non-institutional), from 1st March 2022 to 31st May 2022 in the rural areas Villupuram district.

METHODOLOGY : It was a descriptive cross-sectional study in two Taluks (Vikravandi & Vanur) in Villupuram district among any one family member of those who died at home between 1st March 2022 to 31st May 2022. Data collected through semi-structured questionnaire using Health Care Workers (HCW). Proportions would be calculated regarding the knowledge, attitude and practices as responded by the family members of the deceased

RESULTS : We interviewed 525(88%) relatives of the deceased, of which 93 % personnel died at home. Among home deaths 32% have received medical attention 30 days prior to death in which 6% received MCCD. Among the home deaths, it was noted 22% among those died in home was brought to home by against medical advice from hospitals of which 3% received MCCD. Among home deaths 5% received MCCD. The reasons for not attempting death certificate among home deaths were they didn't know about MCCD (72%), the cause of death of the deceased were assumed by the relatives (22%), none of the officials asked MCCD (4%) Others (2%).

CONCLUSION : This study's findings call for community-based awareness programmes to provide a simple, clear and understandable message to reinforce knowledge about MCCD through Health Care Providers to create awareness on importance of population level cause-specific mortality statistics. Targeted training for doctors and Registrars on proper capture of MCCD should be recommended.

KEY WORDS : MCCD non-availability, Home deaths

INTRODUCTION

Every country needs a Cause of Death data for age and sex specific mortality which can be reliable and reproducible to decrease its mortality and to derive policies which can lower the burden (1-5). Globally, two-thirds 38 million of 56 million annual deaths are still not registered (6) and the global deaths occurring at home is around 53.4%(7). The United Nations estimates that the deaths in the Low and Middle Income countries accounts to around 48 million deaths which represents more than 4/5th of the global deaths which is around 56 million, contributes around 59.7% home deaths and do not mostly have a proper diagnosis of Cause of Death (3,7-10). In India the death reporting is 96% and around 53.4% are home deaths (7,11). The Medically certified deaths is 22% to total registered deaths while the coverage of medical certification among home deaths is not known, the known factor is that 45% had no medical attention during death in India in 2020. In Tamil Nadu there is 100% registration of

deaths of which home deaths contributes to 74% in 2020. Among home deaths the Village Panchayat contribute the highest number of deaths 62%, in contrast to which it has the lowest MCCD coverage of 5%. 19 districts had nil MCCD coverage in Village Panchayat in 2020 in which Villupuram is one of the district. In Villupuram district 81% were home deaths of which 85% contribution with 0.2% MCCD coverage noted in Village Panchayat during March-May 2022 (12).

OBJECTIVE

To understand the knowledge, attitude and practices from the family members of the deceased, related to non-



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availability of medically certified cause of death of those who died at home (non-institutional), from 1st March 2022 to 31st May 2022 in the rural areas Villupuram district.

METHODOLOGY

STUDY DESIGN : Descriptive cross-sectional study

STUDY DURATION : 1st March 2022 to 31st May 2022

STUDY AREA : Two taluks (Vanur & Vikravandi) with highest number of deaths per lakh population of Villupuram district were selected.

STUDY POPULATION : Any relative of the deceased in two taluks from the study area during the study period was taken (Vanur & Vikravandi) of Villupuram district.

SAMPLE SIZE : All the deceased from the Village Panchayat of two taluks (Vanur & Vikravandi) registered in CRS were taken for the study. The sample taken was 591.

DATA COLLECTION : The data was collected using a pre tested semi-structured questionnaire. The HCWs are given a half day training on data collection using the questionnaire and also trained on the basics of CRVS. The line list of the deceased is taken and randomly each HCW is assigned for administration of the questionnaire to the family members of the deceased. The responses are recorded as hard copy.

DATA ANALYSIS : Data was entered in MS EXCEL by the Data Entry Operator (SBHI), Villupuram district and analysed by calculating proportions regarding the knowledge, attitude and practices as responded by the family members of the deceased.

RESULTS

We interviewed 525(89%) relatives of the deceased, remaining 66(11%) were not available in their residence. Of the interviewed personnel we came to know that deceased were 309 (59%) male and 216 (41%) female. 417 (79%) deceased personnel were above 55 years. 490 (93 %) personnel died at home & 13 (2.5%) died at hospital.

Among the 490 persons died at home 155 (32%) have received medical attention in which 113(73%) had received medical attention in government facility, 41(26%) had received medical attention in private facility prior and 1(1%) person had received medical attention in a pharmacy prior to death in the last 30 days. Only 9 (6%) received MCCD among persons died at home who have received medical attention 30 days prior to death.

Among home deaths, it was noted 109 (22%) was brought to home by against medical advice from hospitals of which 81(74%) were from government hospitals and 28(26%) were from private hospitals. Only 3 (3%) received

MCCD among persons died at home who have been brought against medical advice.

Table 1 : Frequency of socio-demographic characters

Variable		Frequency
Demography	Vanur	235(45.3%)
	Vikravandi	287(54.7%)
Age distribution (In Years)	0-15	6(1.1%)
	16-35	19(3.6%)
	36-54	83(15.8%)
	Above 55	417(79.4%)
Gender of Deceased	Male	309(58.9%)
	Female	216(41.1%)
Deceased - Place of Death	Home	490(93.3%)
	Hospital	13(2.5%)
	Others	22(4.2%)

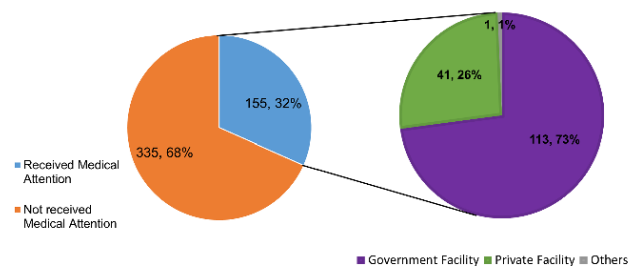


Figure 1 : Personnel received Medical Attention prior to death in last 30 days n=490

Figure.2: Personnel died after being brought against medical advice n=490

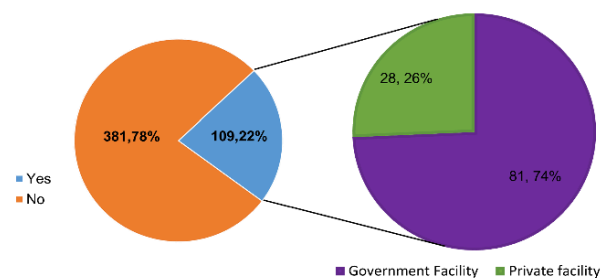


Figure 2 : Personnel died after being brought against medical advice n=490

Among home deaths 22(5%) were seeking MCCD, and succeeded in receiving the certificate. It was noted that 15 (68%) got MCCD because they were requested by VAO. The reasons for not attempting death certificate among home deaths (n=468) were they didn't know about MCCD 339(72%), the cause of death of the deceased were assumed

by the relatives 105(22%), none of the officials asked MCCD 17 (4%) Others 7 (2%).

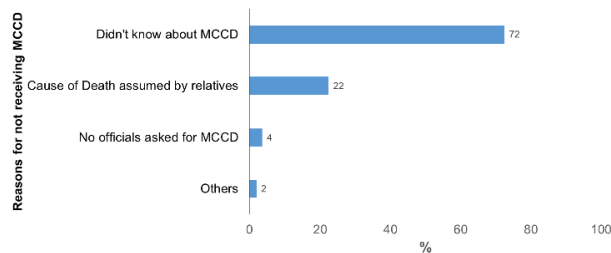


Figure 3 : Reasons for not receiving MCCD certificate

DISCUSSION

In India 28.0% of the total registered deaths alone have received medical attention in institutions (11). The non-institutional deaths being the highest contributor has low MCCD coverage. In Tamil Nadu Village Panchayat has the highest number of deaths and least MCCD coverage (12). In view of the lower frequency of reporting of MCCD among home deaths in Village panchayats which contributes a major part in Tamil Nadu, we did a study and assessed the Knowledge, attitude and practices related to non-availability of medically certified cause of death of those who died at home (non-institutional), from the family members of the deceased. It was noted in the study that 93 % died at home in Village Panchayats. The deaths as per records were non-institutional deaths, but during study it was noted that 13 deaths were from hospital and it has been captured as non-institutional deaths.

Among home deaths 155(32%) have received medical attention prior to thirty days while most of it is from government institutions 113(73%), but 94 % did not receive MCCD. Those who have received medical attention within 30 days from any institution would have been assessed by a physician and the methods to capture cause of death from the physician records may be a source of data for MCCD. 109(22%) deaths which occurred at home were brought against medical advice again in most of which is from government institutions 84(71%) and only 2% received MCCD among them. The inference requires a separate study on the reasons for increased number of discharges on against medical advice in government institutions and the ways on which MCCD be provided for these cases if needed.

Among the home deaths 22(5%), relatives of deceased were seeking MCCD in which 15(68%) was requested by VAO for providing death certificate. The relatives or bystanders of the deceased did get the MCCD when they tried to get the MCCD certificate. The major reason for not attempting death certificate among home deaths was that they didn't

know about MCCD 339(72%) followed by the reason that the deceased cause of death were assumed by the relatives themselves 105(22%).

It has been noted that the awareness on MCCD is totally lacking among the community based on the results. The practice on assuming the Cause of death by the relatives themselves in the elderly is another major reason for the non-availability of MCCD. The importance of MCCD has to be stressed upon starting from Health Care worker and then taken to the community level.

CONCLUSION

The study findings call for community-based awareness programmes to provide a simple, clear and understandable message to reinforce knowledge about MCCD through Health Care Providers to create awareness on importance of population level cause-specific mortality statistics, which will translate into good practice. The Targeted training for all doctors especially from government institutions and Registrars on MCCD and its importance should be recommended.

RECOMMENDATIONS

Notifiers (VHN/SHN/CHN/Anganwadi Workers and ASHAs to be informed to create awareness among the public in Villages on the importance of the Medical Certification of Cause of Death and from whom it should be collected and provided to the Birth and Death Registrar concerned for Registration of the Death.

Block Health Supervisors (Block Level Registrar) should visit the village Panchayats for scrutiny of the Birth and Death Registration and ensure whether the MCCD is collected for Domiciliary Deaths attended by Medical Practitioners during last illness and the recording of Cause of Death is properly made by the Birth and Death Registrar.

It is to be identified whether any huge fee is collected for Form 4A by the Medical Practitioners in Village Panchayats. IMA to be informed to issue circular to all Medical Practitioners to provide MCCD in Form 4/4A at free of cost. In respect of against medical advice it is to be ascertained to identify the causes for Against Medical Advice and methods to capture Cause of Death from these persons. The Doctors and Registrars must be trained and made aware on the procedures of providing MCCD to the deceased by the attending physician.

CONFLICT OF INTEREST: None

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A CROSS SECTIONAL STUDY TO ASSESS THE KNOWLEDGE, ATTITUDE & PRACTICE ABOUT AIR POLLUTION, AND RELATED HEALTH HAZARDS AMONG RESIDENTS NEAR A LANDFILL IN VANIYAMBADI, TAMIL NADU, 2020

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Abstract

BACKGROUND : Air pollution is a cause of morbidity and mortality with open landfills also being major sources of air pollutants. People living near exposed landfills are at more risk of health hazards. This study aims to assess the knowledge, attitude and practice about air pollution, related health hazards and prevention among residents living near an open landfill in Vaniyambadi town. A cross sectional study from September to October 2020 among 93 residents living near an open landfill was conducted. The study revealed that the residents had good knowledge about air pollution and its health hazards and with good prevention practices. Personal Protective Equipment usage was found to reflect the positive impact of the pandemic related Information Education Communication activities with everyone using face masks. The results showed that 26% had below average knowledge about air pollution, sources and causes, which warrants the need to emphasize on addressing the gap in knowledge and practice among residents near landfill.

KEYWORDS : Residents, landfill, air pollution, health hazards.

INTRODUCTION

The interaction between man and environment has been studied extensively with ultimately depicting that all activities related to human survival as well as evolution has had a negative impact on his surrounding environment. Among the environmental pollutions, air pollution is a very major cause for concern especially in times like Pandemic where those already suffering from air pollution related morbidities have a poorer outcome if infected ^{1,2}.

Air pollution has various effects on the health with short term being COPD (Chronic Obstructive Pulmonary Disease) and other minor symptoms like cough, wheezing, breathlessness etc., while the long term effects are mostly related to cardiovascular and cerebrovascular pathologies in addition to various malignancies.(Manisalidis et al. 2020) ³.

There are many pollutants that are major factors in disease in humans. Among them, Particulate Matter (PM), particles of variable but very small diameter, penetrate the respiratory system via inhalation, causing respiratory and cardiovascular diseases, reproductive and central nervous system dysfunctions, and cancer ^{6,7}.

A landfill is one of the major methods used for waste disposal. It is defined as the deposition of waste in a specially designated area, which consists of a pre-constructed 'cell' lined with an impermeable, it has been found out that Landfill operation is usually associated with contamination of surface and groundwater by leachate from the landfill (mostly if the landfill lacks adequate liners), pungent odour,

loud disturbing noise from landfill bulldozers, bio-aerosol emissions; volatile organic compound⁸.

Some other pollutants associated with deposition of waste on landfills include litter, dust, excess rodents, unexpected landfill fires. Complex chemical and microbiological reactions within the landfill often lead to the formation of several gaseous pollutants, persistent organic pollutants (such as dioxins, polycyclic aromatic hydrocarbons), heavy metals and particulate matter. Studies have shown that when nitrogen dioxide and sulphur dioxide are inhaled or ingested by humans, symptoms such as nose and throat irritations, bronchoconstriction, dyspnea and respiratory infections are prevalent, especially in asthmatic patients¹⁴.

These effects can trigger asthma attacks in asthmatic patients when in contact in high proportions, heavy metals affect the nervous system which causes neurotoxicity leading to neuropathies with symptoms like memory disturbances, sleep disorders, anger, fatigue, head tremors, blurred vision and slurred speech. It can also cause kidney damage like initial tubular dysfunction, risk of stone formation or nephrocalcinosis, and renal cancer¹⁴.

When waste such as used tires, construction debris,



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old appliances and furniture, as well as general household, commercial and industrial waste, is disposed in places without permitted and controlled facilities can provide a ready source of nutrition and shelter for rodents and consequently for their ecto-parasites¹⁵.

In addition Industrial revolution as well as frequent change in habitat of humans such as urbanization has had an even more deleterious effect.(Manisalidis et al. 2020)³ Global air pollution has been noted to be a major public health issue with very little change despite an array of social, legislative and economic measures undertaken by all governments¹. In addition to health-related effects these activities leading to air as well as environmental pollutions can also cause climate changes which in turn affect the ecological balance as well as pave way for newer and worse scenarios with the current pandemic being an eye-opener.

WHO estimates that in 2016, some 58% of outdoor air pollution-related premature deaths were due to ischemic heart disease and strokes, while 18% of deaths were due to chronic obstructive pulmonary disease and acute lower respiratory infections respectively, and 6% of deaths from lung cancer in 2016, 91% of the world population was living in places where the WHO air quality guidelines levels were not met. 9 Ambient (outdoor air) pollution in both cities and rural areas was estimated to cause 4.2 million premature deaths worldwide in 2016. (Ambient (outdoor) air pollution n.d.)¹¹

PM stands for Particulate Matter, it is the major pollutant among others. The major components of PM are sulfate, nitrates, ammonia, sodium chloride, black carbon, mineral dust and water. It consists of a complex mixture of solid and liquid particles of organic and inorganic substances suspended in the air¹¹. While particles with a diameter of 10 microns or less, (\leq PM10) can penetrate and lodge deep inside the lungs, the most damaging are those with a diameter of 2.5 microns or less, (\leq PM2.5). PM2.5 can penetrate the lung barrier and enter the blood system.(Ambient (outdoor) air pollution n.d.)¹⁰

The concentrations of PM are often highest especially in the urban areas of India. Ozone is a major factor in asthma morbidity and mortality, while nitrogen dioxide and sulfur dioxide also can play a role in asthma, bronchial symptoms, lung inflammation and reduced lung function.(Ambient (outdoor) air pollution n.d.).¹¹

JUSTIFICATION

Landfills emit landfill gas that consists mostly of methane and carbon dioxide, with small amounts of volatile

organic compounds from the bacterial decomposition of organic materials. Methane and carbon dioxide are both greenhouse gases, and methane is toxic and explosive in large concentrations. Other anaerobic chemical reactions also release volatile organic products. Methane and carbon dioxide are the two principal gases associated with landfill emissions, however, there is also a small amount of other volatile organic compounds (VOCs) among which are frequently substances such as arsenic and lead from various electronics disposed in the landfill. Mercury represents yet another noxious substance that usually leaks through the waste due to haphazardly discarded fluorescent light bulbs.

WHO reports have suggested that any potential exposure is likely to be limited to 1 km from landfill sites by the air pathway, and 2 km by the water pathway Paigen et al., 1987. (Swaroopanand, Mahavidyalya, and Bhilai 2015) Municipal drinking water of contaminated wells due to waste disposal site has adverse effect on spontaneous abortions, birth defects and children health concern leukemia.¹³ Cancer risks in the population which was living 2 km. from landfill sites in Great Britain and found leukemia in children and adult. Brain & bladder cancer and hepatobiliary cancer in people were also reported.(Swaroopanand, Mahavidyalya, and Bhilai 2015)

To understand the risks of hazardous waste disposal within health-care establishments, one should be responsive about hygiene methods of solid waste (trash and garbage deposits) disposal. For this most important thing is creating awareness in public to improve the quality control in healthcare Local health board should play main role in awareness programs. They must also know the role of municipalities and their approach towards such landfill sites(Swaroopanand, Mahavidyalya, and Bhilai 2015)

This study aims to assess the knowledge as well as attitude among general public living near an open landfill situated in a rural area of Tamil Nadu. Also, to assess the practice of these people regarding preventive measures against air pollution as well as regarding solid waste disposal. Thereby enabling them to take up an active role in the effective self-management of preventive measures against health hazards related to air pollution.

OBJECTIVE

To assess the knowledge, attitude and practice about air pollution, related health hazards and prevention practices among residents living near an open landfill in Vaniyambadi town, Tirupattur district.

METHODOLOGY

A cross sectional study was conducted over a period of 2 months from September 2020 to October 2020 among the residents living in the vicinity of a landfill and Solid waste management facility near Vaniyambadi town.

$$N = \frac{Z\alpha^2 * p * q}{d^2}$$

N = Sample size

$Z\alpha/2 = 1.96$ (0.05/2, upper tail probability for 0.025)

p = 30.8 prevalence of respiratory symptoms among residents near a dump- yard16

q = 1-p

d = 10, absolute precision

Substituting the values,

$$N = \frac{1.96 * 1.96 * 30.8 * 69.2}{10 * 10}$$

$$N = \frac{3.8416 * 2131.36}{100}$$

$$N = \frac{8187.83}{100}$$

$$N = 81$$

Adding 10% (81*10/100) as attrition rate,

$$81 + 8 = 93$$

$$N = 93$$

For this study purposive sampling was used and residents, near the municipality operated solid waste management facility which also had an open landfill in Vaniyambadi taluka, were selected. One adult resident per household was randomly selected, provided their houses were situated within a radius of 3 km from the landfill and those who gave consent were included in this study. Out of 101 households, 4 were locked and 2 families were not willing for this study and data was collected from adults in remaining households.

A pretested, semi-structured, interviewer administered questionnaire was used for data collection. Two male adults working as volunteers under the Vaniyambadi town panchayat, were recruited for establishing rapport among the local people for explaining the study's purpose. Questionnaire was explained to participants in local language as well in English and then information and consent sheet was distributed by volunteers to the participants with emphasis on getting an informed signed consent.

Participants were approached on the basis of about 10

to 15 households per day, and data collection was done only on weekends and during the daytime to ensure the presence of all family members. Difficult terms were first explained and then the participants were told to give their response independently and in an unbiased way without any undue pressure, maintaining the confidentiality of their identity. A total of 93 responses were obtained.

The questionnaire comprised of 4 sections.

Section I: Includes information on socio-demographic profile of the participants.

Section II, III and IV: includes questions regarding the knowledge about air pollution, attitude towards air pollution and various preventive practices adopted by residents as well as their take on the practices aimed at solid waste segregation.

i. 21 knowledge-related questions- Every right answer was awarded one mark and every wrong answer was awarded zero. Multiple option answers were awarded more than one mark for each correct answer. The total score of knowledge-related questions were 61. 0 to 24 was considered bad knowledge, 25 to 31 were considered average knowledge and more than 32 was considered as good knowledge.

ii. 10 attitude related questions- Maximum score was 44 and minimum score was 22. The median score was taken as cut off. The ranking of respondents was done as follows: Positive (score $\geq 50\%$) and Negative (score $< 50\%$).

iii. 5 questions regarding self-reported practice against air pollution another 5 related to practices on solid waste segregation and self-reported practices on hand hygiene as well as mask usage. The total score was 24 for air pollution preventing practices. The median score was taken as cut off. The ranking of respondents was done as follows: Good (score $\geq 50\%$) and Bad (score $< 50\%$).

The data was entered in MS Excel and was analyzed using SPSS version 16. Descriptive statistics such as proportions, mean, and standard deviation (SD) were used and inferential statistics such as Fischer's exact test and Chi square test were used. P value < 0.05 was considered significant. Data were expressed in graphs, tables and charts wherever necessary.

RESULTS

Out of the 93 participants, the Mean age of the study participants was found to be 42 ± 11.22 Years. 73 (81.7%) were male and 20 were female. 91.4% were Hindu and 6.3% were Christians. Majority were married (88%). Regarding education, only 1% were illiterate and 28.3% had attended college. The mean duration of staying in current residence was 31 ± 13.7 years. The mean distance from the landfill was 1.2 kilometers. (Table 1).

Table 1: Socio demographic details of participants (n= 93)

Sociodemographic details		Frequency (%)
Age (in years)	11-19	2(2.1)
	20-29	12(12.8)
	30-39	22(23.4)
	40-49	34(36.4)
	50-59	17(18.1)
	60-69	6(6.4)
	70-79	1(1.1)
Gender	Male	73(77.7)
	Female	20(21.3)
Marital Status	Married	84(89.4)
	Unmarried	09(9.6)
Education	Illiterate	1(1.1)
	Primary	8(8.5)
	Middle	23(24.5)
	High	21(22.3)
	Higher Secondary	16(17)
	Undergraduate	7(7.4)
	Postgraduate	17(18.1)
Occupation	Private Company	39(41.5)
	Coolie	21(22.3)
	Business	7(7.4)
	Farmer	10(10.6)
	Tailor	3(3.2)
	Teacher	3(3.2)
Fuel for Cooking	LPG	89(94.7)
	Firewood	2(2.1)
	Both	2(2.1)

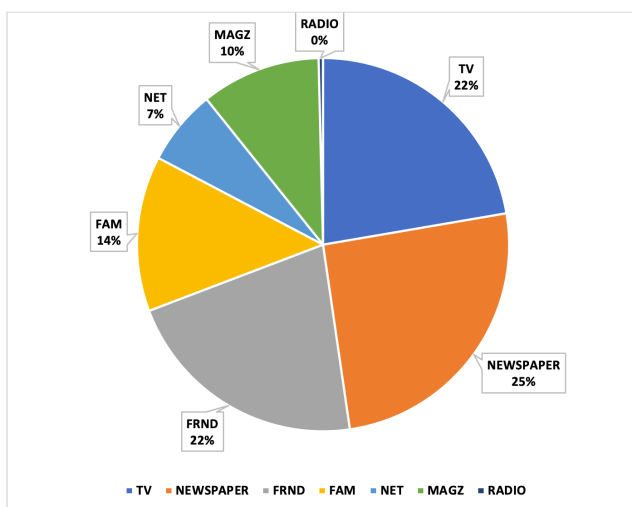


Figure 1: Sources of information on Air pollution (Multiple responses)

Sources of Air Pollution

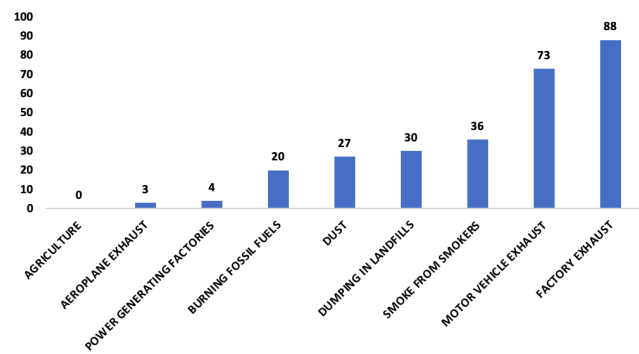


Figure 2: Sources of Air pollution (Multiple responses)

Among respiratory problems due to air pollution 39% stated bronchial asthma as the major respiratory health hazard due to air pollution followed by lung cancer while involvement of eyes (redness) was (91%). Only 37% were aware that air pollution was hazardous to fetus. About 82% knew about other system involvement. While 35% reported mask usage to enable reduce effects of air pollution and 47% reported that proper waste management can protect from the effects of air pollution in their area. (Table 2). Newspapers were the major source (67%) to provide knowledge about air pollution followed by television (52%) and internet (43%).

Table 2: Knowledge regarding air pollution and its health hazards

Variables	Frequency (%)
Health hazards of air pollution	
Asthma	79 (39%)
Lung Cancer	46 (22.6%)
Pneumonia	38 (18.7%)
Chronic Obstructive Pulmonary Disease	22 (10.8%)
Mother to child transmission	34 (36.1%)
Chronic cough	69 (43.1%)
Skin conditions	64 (68%)
Gastrointestinal conditions	60 (63.8%)
Hypertension	62 (37.3%)
Myocardial infarction	83 (50%)
Diabetes mellitus	15 (9%)
Stroke	6 (3.6%)
Eye Irritation	85 (90.4%)
Knowledge about prevention	
Wearing masks	60 (35.5%)
Routine health checkups	8 (4.7%)
Less work in polluted areas	22 (13.8%)
Proper waste management	79 (46.7%)

Knowledge :

In knowledge regarding air pollution and its health hazards, 25.8% (24) of the participants had good knowledge. 96% (225) were aware about air pollution. 57% had recognized vehicle smoke and factory exhaust as the major sources of air pollution, followed by smokers and landfill (24%) (Figure 1). 34% had reported carbon dioxide as the major constituent of air pollution followed by Sulphur dioxide (27.7%).

Table 3: Attitude about air pollution and its preventive measures

Attitude based questions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Air in Vaniyambadi is better now compared to 5 years before	17 18.2%	1 1%	30 32.2%	36 38.7%	9 9.6%
Individual is responsible for preventing against air pollution	0	6 6.4%	14	57 61.2%	20 21.5%
Routine health checkups prevent against air pollution	4 4.3%	17 18.8%	44 15.1%	42 45.1%	16 17.2%
Personal protective equipment can prevent against air pollution	0	3 3.2%	22 23.6%	54 58%	14 15.1%
Strict legislations regarding factories can reduce air pollution	0	3 3.2%	16 17.2%	47 50.5%	27 29.1%
Strict legislations regarding landfill operation can reduce air pollution	2 2%	1 1%	25 26.2%	44 47.3%	21 22.5%
Open landfill is the major cause of air pollution in their area	0	1 1%	25 26.8%	38 40.8%	29 31.1%

Attitude :

53% (49) of participants had positive attitude towards air pollution and its prevention. While 29.1% stressed that strict legislations by Government towards factories and vehicles can reduce air pollution, 22.5% agreed that legislations regarding operation of open landfills can reduce air pollution. 72% felt that the major cause for pollution in their area was due to the landfill and lax regulations regarding solid waste management.

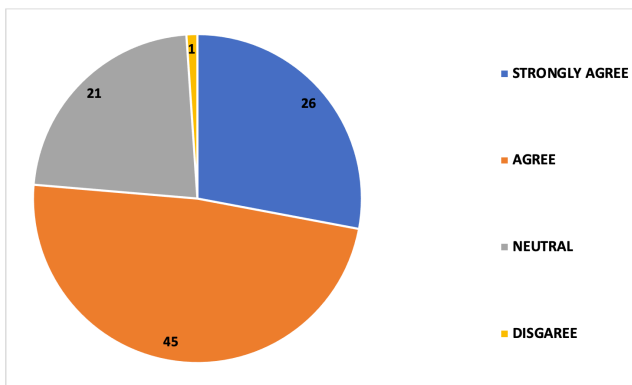


Figure 3: More stringent measures on solid waste management as well as land fill operation

Practice :

Regarding self-reported practice for protection against air pollution related health hazards 62.3% (58) of the participants had good practice. Although the residents were not much inclined to usage of caps (20%). Only 70% used masks always (Table 4) which actually reflects the positive outcome of the Pandemic related IEC activities even among rural population.

About 48% had health checkups only when they develop symptoms while 22.3% reported availing health checkup regularly at least once in 6 months (Figure 4). Among the residents 41.4% reported self-medication almost always when they developed any symptoms while 57.4% opted this strategy only sometimes.

Table 4. Use of personal protective equipment

	Always	Sometimes	Rarely	Never
Cap	12(12.9%)	8(8.6%)	0	73(78.4%)
Mask	70 (75.2%)	21 (22.5%)	1 (1%)	1 (1%)
Helmet without Visor	54 (58.1%)	23 (24.74%)	2 (2.1%)	14(15.1%)
Helmet with Visor	73 (78.4%)	16 (17.2%)	1(1%)	3(3.2%)

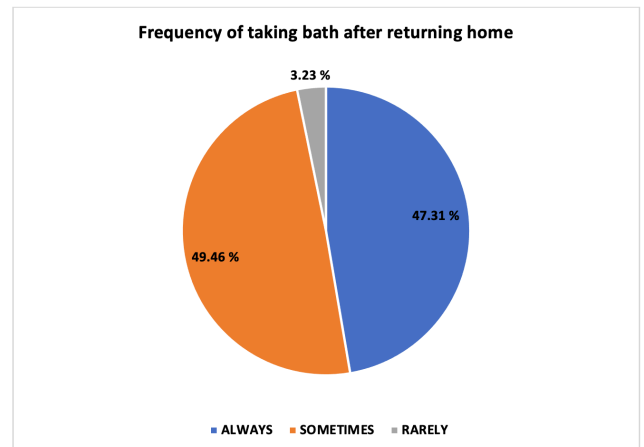


Figure 4: Practices of residents regarding self-hygiene

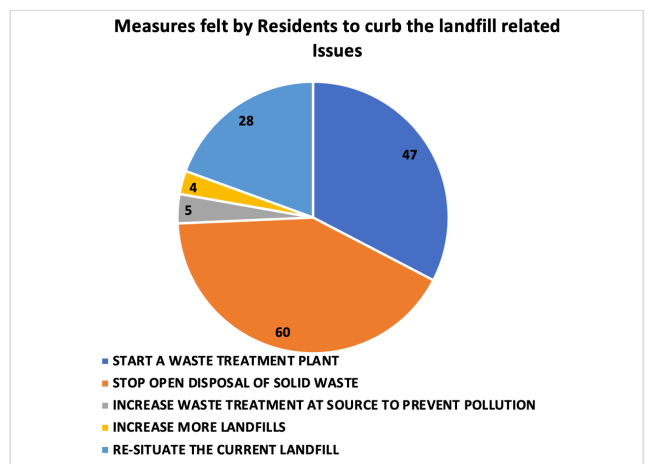


Figure 5: Self-realized measures against landfill to curb related

Table 5: Association between Knowledge and Practice

	Good Practice	Bad Practice	P value
Good knowledge	11 78.6%	3 21.4%	0.349
Average knowledge	32 58.2%	23 41.8%	

There was no significant association between knowledge and Practice.

Table 6: Association between Attitude and Practice against air pollution

	Good Practice	Bad Practice	P value
Positive Attitude	36 73.5%	13 26.5%	0.031
Negative Attitude	22 50%	22 50%	

There was a significant association between Attitude and Practice.

Table 7: Association between Attitude and Practice on solid waste segregation

	Good Practice	Bad Practice	P value
Positive Attitude	39 79.6%	10 20.4%	0.001
Negative Attitude	19 43.2%	25 56.8%	

There was a very significant association between Attitude and Practice on solid waste segregation.

DISCUSSION

Ambient air pollution accounts for an estimated 4.2 million deaths per year due to stroke, heart disease, lung cancer, acute and chronic respiratory diseases^{3,4}. Around 91% of the world's population lives in places where air quality levels exceed WHO limits¹. While ambient air pollution affects developed and developing countries alike, low- and middle-income countries experience the highest-burden, with the greatest toll in the WHO Western Pacific and South-East Asia regions¹¹.

Vaniyambadi of Tirupattur district is a rural area with

the major occupation of residents as laborer in nearby leather industries although the residences are not clustered around the landfill but about 101 residences were found to be situated within a 3 km radius around the landfill. Provided these residents live in a highly potentially polluted environment given the existing leather factories as well as near-by factories they are prone to a variety of health hazards. In our study we were able to assess the knowledge of such residents since their role is most important to prevent all landfill related health hazards not including those from air pollution due to the nearby factories.

In this study we found that 25.8% (n=24) residents had good knowledge related to causes as well as sources and potential health hazards related to air pollution in spite of them not having formal higher education. Among the residents about 55% had average knowledge only regarding which reflected the need to establish a more intensely individual oriented approach towards IEC as well as BCC to further improve the resident's knowledge regarding air pollution as well as the role of landfills as a cause for air pollution.

In this study we found the residents' perception that ambient air pollution can be an important cause for asthma as well as lung cancer. Surprisingly 82% of the residents had a very strong knowledge that air pollution can also cause cardiovascular disease, especially Myocardial Infarction (50%) followed by Hypertension (37%). They also had the knowledge that air pollution can cause skin diseases (70%) with majority believing mostly-dermatitis (57%) followed by rashes (38%). Above 85% residents had the knowledge that air pollution caused eye irritation as well as nose and throat irritations. Among these residents 80% knew that landfills and living or working in proximity to landfills can be a major cause of air pollution and related health hazards in addition to other hazards due to the waste from landfills. On a similar note this study reflects the findings of a similar study done among residents near a landfill in Chennai (Effects of ambient air pollution on respiratory and eye illness in population living in Kodungaiyur, Chennai - ScienceDirect n.d.) .

Only 35% of residents believed in usage of masks as a useful measure for preventing air pollution related health hazards while less than 10% believed that regular health checkups could help in avoiding major issues related to health hazards whatever may be the cause. Hence this highlights the crucial role of Government as well as local bodies in emphasizing on regular health checkups by way of free camps or organizing specialty clinics in nearby primary health centers.

As per the study 52.6% of residents showed positive

attitude towards their responsibility in curbing air pollution causing activities as well as usage of PPEs (73%). While 79% of them felt that stricter legislations on motor vehicles as well as factories could help in reducing air pollution. 69% (n=65) of the residents felt that legislations needed to be tightened related to operation of a landfill, with 72% of them feeling that landfills are a major source of air pollution in their area.

In the present study regarding practices to prevent air pollution related health hazards our residents showed that 62.3% had good practices on the whole. 99% of the residents used masks while 97% used helmets with visors in our study. Above 90% of residents proved their better sense of personal hygiene regarding taking baths almost always after returning home. While the concept of regular health check-ups was downplayed with less than 50% undergoing regular health check-ups to avoid missing any diseases in their early stages. In addition, we were able to gauge their practice of self-medication that almost all had the idea that self-medication (41.4%- always) is justified in case they develop symptoms related to respiratory complaints. But on an alarming note it was observed that 47.8% of the residents also reported that a check-up is felt warranted by them only if they develop any symptoms rather than regularly.

To ensure the better health of such vulnerable at-risk population living in such polluted areas it is better if they are targeted for IEC activities more intensely as well as involving them in legislation purposes regarding operation of a solid waste management facility in residential areas, especially in rural areas.

There was no significant association between knowledge and either attitude or practice related to air pollution prevention practices or solid waste disposal related practices. But there was a very significant association between attitude of residents and their practices on solid waste segregation at the source(homes).

LIMITATIONS

As the study was done in a single landfill related setting it cannot be extrapolated to similar residencies near landfills elsewhere. Due to the current Pandemic we were unable to obtain clinical measurements as well as laboratory evaluation in terms of any (minimally invasive or otherwise) investigations to further broaden the assessment of status of the residents' respiratory system physiology or deviations therein.

In view of the ongoing Pandemic, we were unable to include a more extensive sample population. So further studies can be

undertaken with a larger sample under the same topic in the future.

CONCLUSION

The attitude as well as practice among residents near a landfill of Vaniyambadi rural town is positive in spite of their formal educational deficiency, they also displayed better practices towards prevention against air pollution as well as regarding solid waste segregation at source and reduction of solid waste generation.

Although there was no significant association between education and knowledge, attitude or practice it is to be noted that the various sources of information (70% -TV, newspapers and friends) regarding air pollution among the residents had played a major role in affecting their practices towards it. This also proves that the lacuna in the knowledge can be bridged using the most common tools such as television as well as newspapers while interpersonal communication as always also remains the cornerstone in information dissemination in rural areas.

RECOMMENDATIONS

- Health education to all residents living near such highly polluted areas need to be advised on adopting better preventive practices to safeguard themselves from air pollution as well as from other ill-effects of landfill vicinity.
- Administrative measures could be in place to check and prohibit establishment of water and related products manufacturing companies within the radius of 2 kilometers of an open landfill.
- Government as well as local bodies in collaboration with the factories can ensure the proper supply as well as usage of Personal Protective Equipment to at risk residents as well as those employed under risk prone areas.
- Regular health checkups to especially these at-risk populations can be made a compulsory function of local primary health centers in addition to their routine activities with help from the local governing bodies.
- The concept of Bio parks could be emphasized which might greatly help in reducing the air pollutants being generated from such densely polluted geographical sites.
- Regular annual master health checkups for such residents at nearby Medical colleges.
- Combined efforts of local public as well as local governing bodies towards amicably feasible closure of the continuous open landfills being operated and to promote environmentally positive waste management processes as

well as try to adopt other methods including waste reduction at source in addition to solid waste generation among all residents of that nearby residential locality.

CONFLICT OF INTERESTS : Nil

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ORIGINAL ARTICLE - PUBLIC HEALTH

THE ROLE OF SOCIO-DEMOGRAPHICS ON DOCTOR MOTIVATION AND TURNOVER IN TAMIL NADU CHCS: SMART PLS ANALYSIS.

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Abstract

BACKGROUND : Tamil Nādu is the one of the states having more number of doctors than WHO ratio 1: 1000, yet specialists and GDMOs shortage in community health centers is a continuous pattern of rural health statistics from the year 2015 despite many policies.

OBJECTIVES : The study efforts to analyze the ERG (Existential, Relatedness and Growth) needs of doctors in relation with the turnover intention and to investigate the moderating effect of socio-demographic variables on the relationship between ERG dimensions and turnover intention.

METHODS : Structured questionnaire representing Existential, Relatedness and Growth needs was designed based on the review of the literature. Hypotheses have been set for the investigation to test the relationship and investigate the moderating effects of age, gender, years spent in a rural area, marital status, years of service and future location choice.

RESULTS : A negative association was discovered between ERG needs and turnover intention. Absence of 'Growth needs' was shown to be the most crucial predictor of rural CHC doctors' turnover intention. The relationship between ERG motivation and turnover intention is influenced by doctors' marital status, childhood years spent in rural areas, and future location choices.

CONCLUSION : Identifying these aspects will enable policymakers, academics, and public health practitioners to devise rural retention strategies for doctors.

KEYWORDS : Rural CHC doctors, ERG dimensions, Turnover intention, Moderation, demographic variables.

INTRODUCTION

Tamil Nadu is one of the largest states in India, having 97.35 per cent of the rural land with a rural population of 37229590 as of the 2011 census ¹. The objective of Health Sector 2023 is for Tamil Nadu to become India's number one state in terms of societal health indicators by delivering universal access to health services ². Rural Health Statistics, 2020 shows that there are now 179 GDMO vacancies in rural CHCs ³. Moreover, CHCs have a massive shortage of specialists as of 2015. Currently, there is a shortage of 1312 specialists. Despite the need for 1540, just 228 have been filled ⁴. Keeping rural doctors is a constant battle, so that NHP 2015 underlined the need for more rural medical students to return to their communities and enhance access to health care for the poor ⁵. Also, the government took some compulsory measures for retention like mandatory rural postings and mandatory rotational postings ⁶. However, the applicability of the standards is a big challenge. Tamil Nadu is one of six states with more physicians than the WHO's 1: 1000 ratio. It has four physicians per 1000 people, but abundance in urban areas, producing rural shortages. It reflects doctors' disdain towards rural Tamil Nadu. Following the alarming facts, the study sought to find out the motivational demands, reasons for turnover intention and the moderating impacts of socio-demographic characteristics.

MATERIALS AND METHODS

A. OBJECTIVES OF THE STUDY

- To find out the relationship between ERG needs and turnover intention as perceived by rural CHC doctors in Tamil Nadu.
- To investigate the moderating effect of socio-demographic variables on the relationship between ERG dimensions and turnover intention.

This study employs a cross-sectional analytical approach and stratified sampling technique under the probability method. Ethical approval was taken from IRB, IIHMR University.

B. QUESTIONNAIRE DESIGN

Structured questionnaire representing Existential, Relatedness and Growth needs was designed based on the review of the literature. The items relevant to ERG needs taken from 7 validated scales. In addition, three qualitative studies' themes were itemized to form the questionnaire. The



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validated turnover intention scale – TIS-6 by Roodt used in this study to measure the turnover intention of rural doctors⁷. On the basis the objectives, hypotheses have been set for the investigation to test the relationship and investigate the moderating effects of age, gender, years spent in a rural area, marital status, years of service and future location choice.

RESULTS

A. OBJECTIVE NO.1

Find out the relationship between ERG dimensions and turnover intention:

The reliability of questionnaires was verified to determine the Dimensions of ERG and turnover intention, tested by the Cronbach α test through SPSS software. Overall reliability of the questionnaire, i.e., 0.933 for 43 items, is highly reliable⁸. Next the dimensions of ERG were extracted through the Exploratory Factor Analysis technique.

The results of Exploratory Factor Analysis (EFA):

KMO = 0.942 > 0.5 indicated adequate sampling size to access factor structure. The data acquired for the dimensions of ERG were eligible for factor analysis since Barlett's test of sphericity was significant at 0.000 < 0.05⁹. Through EFA, four components were extracted with a variance of 63.909%, and all the items were forced to form a single factor¹⁰. **The new extracted factors were Factor 1 (Existential needs: EN)** comprising of 8 items, **Factor 2 (Societal relatedness needs: RN_S)** entailing of 5 items, **Factor 3 (Family relatedness needs: RN_F)** involving of 5 items and **Factor 4 (Growth needs: GN)** residing of 6 items describing the variances of 19.078, 15.819%, 14.517% and 14.495% respectively. Further to check the validity and causal relationships, the dimensions of ERG need and Turnover intention were further subjected to CFA and Structural Equation Modelling (SEM) analysis¹¹. It comprises of two parts; one is measurement model and next is structural model.

a. Measurement Model:

Before constituting the structural model, the path of the framework to be utilized for constructing the model was checked through the measurement model. The confirmatory factor analysis technique was used to determine the constructs' reliability and validity as derived after exploratory factor analysis.¹² (Fig.2, Table.1) The square root of average variance extracted values and discriminant validity values were verified with the Fornell and Larcker criteria and the Heterotrait and Monotrait ratio (HT-MT ratio)^{13,14}. HTMT ratio indicated the correlation values between the latent constructs to show the extent of the uniqueness of the measure. (Table 2).

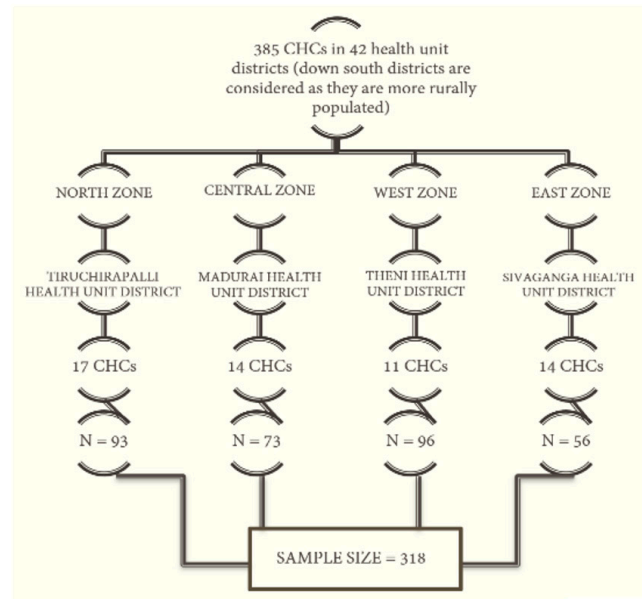


Figure 1: Sampling method and respondents of study

Table 1: Convergent Validity

	Constructs and associated items	Loading	Cronbach's Alpha	Composite reliability	Average variance extracted
	Existential needs		0.911	0.93	0.653
EN1	Housing services	0.76			
RN2	Appreciation from patients	0.805			
RN3	Pleasant working climate	0.824			
EN2	Working conditions with light, heat, and ventilation	0.821			
EN3	Safe and attractive working environment	0.849			
EN4	Social benefits	0.802			
EN5	Satisfactory physical surroundings	0.796			
GN3	Initial training for my learning	0.633			
	Growth needs		0.86	0.895	0.588
GN2	Sense of value what I do	0.728			
GN4	Personal growth in my work	0.804			
GN5	Opportunities for advancements in my career	0.758			
GN6	Equal opportunities for promotion	0.788			
GN8	Promotion opportunities	0.736			
RN6	Status in the community as health care professional	0.784			
	Family relatedness needs		0.833	0.883	0.602
GN9	Opportunity to expand the scope of practice	0.709			
RN11	Spousal fulfillments	0.844			
RN12	Finding spouse job	0.75			
EN12	Undisrupted family life	0.762			
EN13	School for children	0.806			
	Societal relatedness needs		0.884	0.915	0.684
RN9	Interpersonal relationship	0.803			
GN11	Chance to paying back for public concern	0.796			
GN12	Chance to work for the poorest segments	0.844			
GN7	Chance to work for other people	0.829			
RN10	Social contact at work	0.86			

b. Structural model:

Hair et al. advocated, SEM to analyze the cause-and-effect relationship between the dependent and independent variables¹⁵. Dimensions of ERG needs as obtained after the Confirmatory Factor Analysis was used further in envisaging the proposed conceptual relationship of ERG dimension with turnover intention. After removing the insignificant dimension, i.e. "Family relatedness needs", the final structural model comes up with three significant dimensions and were

tested with turnover intention and checked for model fit.

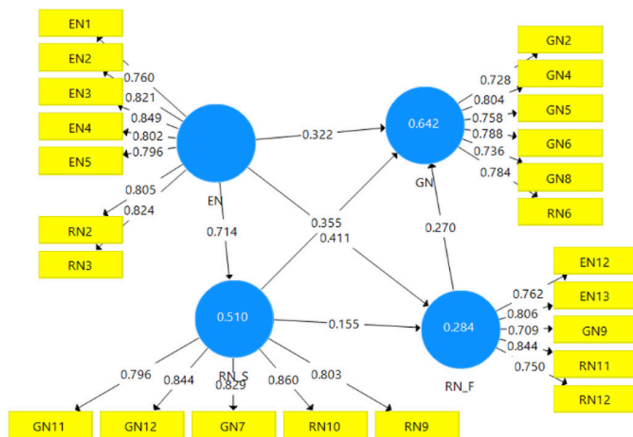


Figure 2: Measurement model

Table 2: Discriminant Validity

	EN	GN	RN_F	RN_S
Fornell-Larcker criterion				
EN	0.808			
GN	0.716	0.767		
RN_F	0.522	0.597	0.776	
RN_S	0.714	0.706	0.448	0.827
Heterotrait – Monotrait ratio				
EN	1.000			
GN	0.803	1.000		
RN_F	0.594	0.7	1.000	
RN_S	0.789	0.807	0.514	1.000

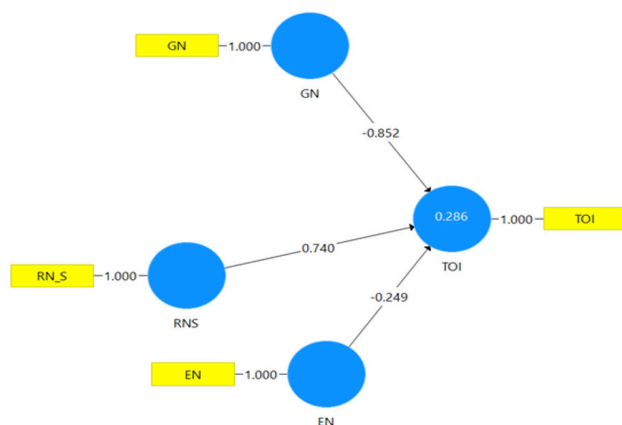


Figure 3: Final structural model

The key standards for the internal structural model evaluation are the determination coefficient R^2 and the path coefficient (β -value) and the T-statistic value, the impact size f^2 and the model's predictive significance Q^2 . Path coefficient and total effect were used to test the hypothesis. It is the most

reliable source for examining multi-correlational variables¹⁶. Furthermore, the t-value must be larger than 1.69, and the p-value must be less than .05¹⁷. R^2 levels of 0.04 to 0.16 are moderately poor in social sciences, according to Cohen and Ritchey, whereas R^2 values of 0.25 to 0.49 are moderately high^{18,19}. The R^2 score in this study is 28.6 per cent, indicating that the model generated has a moderately strong effect. Hair recommends the f-values 0.35 (strong effect), 0.15 (moderate effect), and 0.02 (weak effect)¹⁵. GN and RNS considerably influence TOI, whereas EN has a minor impact. (Table.3) Q^2 values greater than 0, 0.25, and 0.50, respectively, indicate the PLS-path model's small, medium, and significant predictive significance¹⁶. The Q^2 value is 0.271. (Table.3) Hence the model has medium predictive power. Furthermore, the SRMR was lower than the initially recommended criterion of 0.080, suggesting that the model fit was acceptable²⁰. The normed fit index developed by Bentler is one of the fit metrics suggested in the SEM literature; the closer the NFI to 1, the better the fit²¹. NFI values greater than 0.9 generally indicate an acceptable fit²². In this study, The SRMR, i.e., 0.000 and NFI = 1, indicated the acceptable fit of the model.

Table 3: Model Fit Indices for Final Model

	Beta coefficients	T Statistics	P Values	f^2	Q^2	R^2	NFI	SRMR
GN → TOI	-0.852	7.875	0.000	0.186	0.271	28.6	1	0.000
RNS → TOI	0.740	5.979	0.000	0.155				
EN → TOI	-0.249	2.611	0.009	0.019				

Table 4: Beta Coefficients for the Final Model

			Estimate
Turnover	<---	GN	-.852
Turnover	<---	RN_S	.740
Turnover	<---	EN	-.249

Table 4 shows that with every unit increase in growth needs, societal relatedness needs and existential needs, Turnover intention increased by -.852, .740, and -.249 units and growth need were found to have maximum impact on the turnover intention of rural CHC doctors. (Table.4) On the other hand, growth and existential requirements were found to have an inverse connection with doctors' turnover intention. Hence, it can be deduced that there is a significant relationship between ERG dimensions with elements

turnover intention. So, the alternative hypothesis H1: There is a significant relationship between Dimensions of ERG (Existential, relatedness and growth) and Turnover intention is accepted.

Table 5: Moderation Effects

Moderation	Beta coefficients	Standard Deviation	T Statistics	P Values	Significance
Age*ERG -> TOI	0.039	0.06	0.653	0.514	Insignificant
Gender*ERG -> TOI	0.092	0.063	1.448	0.148	Insignificant
Marital Status*ERG -> TOI	-0.127	0.059	2.149	0.032	Significant
ERG*years rural -> TOI	0.105	0.05	2.111	0.035	Significant
ERG*Years of service -> TOI	-0.078	0.059	1.257	0.209	Insignificant
ERG*Location choice -> TOI	-0.166	0.049	3.379	0.001	Significant

B. OBJECTIVE NO.2

Moderating Effect of Socio-Demographic Variables on the Dependent Variables

A moderator variable can be visualized as a third variable that changes the relationship between the independent and dependent variables[23]. Thus, a moderator specifies the conditions under which a given effect occurs and the conditions under which the direction (nature) or strength of an effect vary [24]. Once the relationship found between ERG dimensions and turnover intention, the final model was analyzed with moderators i.e., age, gender, marital status, years spent in rural areas, years of service, and future location choice for their tapping effects in relationship of ERG needs and turnover intention.

The results of moderation show that the p value for age, gender and years of service are 0.514, 0.148 and 0.209; since the values are more than 0.05, hence there is no significant moderating impact of variables age, gender, and years of service of rural doctors in influencing the dimensions of ERG concerning turnover Intention. However, for the other demographic variables i.e., Marital status, Years spent in the rural area, and future location choice, the p values are 0.032, 0.035 and 0.001. Since the value is less than 0.05, these variables have a significant moderating effect. Further to identify which group is having a significant effect, simple slope analysis results have been checked with Smart PLS.

The focal predictors represent the negative relationship between ERG Dimensions and turnover intention for higher for married doctors and lower for unmarried doctors. The gradient slope values assess the same. Likewise, a negative relationship is strengthened for doctors who spent fewer years in rural areas and lowered for the doctors who spent more years. In addition, the negative relationship intensified for doctors having the rural choice of location in future and

decreased for the doctors having the urban choice of location.

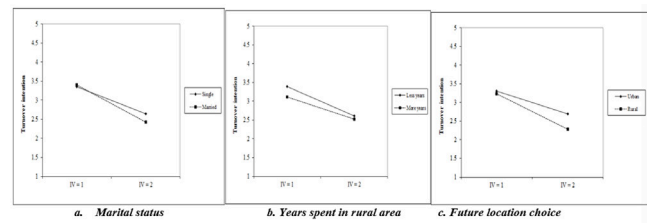


Figure 4: Graphical comparison of moderating variables – Slope analysis

Table 6: Slope Analysis Results for Significant Moderators

Marital status		Years spent in rural area		Future location choice	
Gradient of slope for Single doctors	-0.359	Gradient of slope for Less years spent in rural area	-0.396	Gradient of slope for Urban choice in future	-0.305
t-value	-8.027	t-value	-8.855	t-value	-6.820
p-value	0.000	p-value	0.000	p-value	0.000
Gradient of slope for Married doctors	-0.486	Gradient of slope for More years	-0.291	Gradient of slope for Rural choice in future	-0.471
t-value	-4.437	t-value	-2.656	t-value	-4.300
p-value	0.000	p-value	0.009	p-value	0.000

C. TESTING OF STUDY HYPOTHESES

Inferences were found from the results, and the study proved the following hypotheses :

1. There is a relationship between Dimensions of ERG and Turnover intention.
2. The interactive relationship between ERG dimensions and turnover intention is not affected by age.
3. The interactive relationship between ERG dimensions and turnover intention not affected by gender.
4. The interactive relationship between ERG dimensions and turnover intention affected by marital status.
5. The interactive relationship between ERG dimensions and turnover intention affected by years spent in rural area.
6. The interactive relationship between ERG dimensions and turnover intention not affected by 'years of service'.
7. The interactive relationship between ERG dimensions and turnover intention affected by 'future location choice'.

DISCUSSION

The study indicated a negative association between ERG motivation and doctor turnover intention, with 'Growth needs' having the most significant influence.

Age, gender, and years of service did not alter the aspects of ERG demands in influencing rural CHC doctors' turnover intentions. However, marital status, years spent in a rural area,

and future location choices alter interaction connections. Based on the study's findings, the Tamil Nadu public health department must expand human resources, especially physicians, to assist the poor, thereby strengthening the health system's infrastructure and workforce quality. This study has various implications for health care providers and policymakers in Tamil Nadu.

To meet the growth needs of doctors, accurate and rapid scholarship awarding systems without time-bound forced rural deployments are required. NHM should design more detailed training modules and refocus medical education on rural health to increase training quality. Achieving procedural justice in setting promotion requirements would improve doctor motivation. From the start of their course, rural students must be encouraged, not only admired but mentally prepared to serve their community. This rural pipeline approach should be reinforced based on the study's conclusions. Doctors' marital status is an essential element in rural retention. Due to their jobs or lack of recreation amenities, most married doctors and wives do not want to move to rural locations.

On the other hand, they do not wish to stay in rural areas if they work elsewhere, especially in cities. Getting the exact location for doctor couples is difficult because the counselling process determines priorities. So, for married doctors, the government should consider creating rural posts with adequate counselling and without delays. The study found that basic rural amenities influenced their future placement choices; however, many existential demands are regarded adversely by rural doctors and specialists, such as COVID safety, social instability, isolation, communication, transportation, and water facilities. Upgrading basic facilities in rural regions is a cooperative endeavour of public health, public welfare, and rural administrative agencies.

CONCLUSION

From the perspective of the practical contribution of this study, it is anticipated that the conclusions will provide management implications to boost the motivation of Rural CHC doctors. Moreover, this study can be applied to the rural public health care setting in significant states of India where the problem is rural doctors' retention. Nevertheless, the sampling frame identified should be the same as this study to obtain reliable results.

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A STUDY ON FIRE SAFETY KNOWLEDGE AND PRACTICES AMONG RESIDENTS OF AN APARTMENT COMPLEX IN CHENNAI CITY

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Abstract

BACKGROUND : Fire is one of the essential elements, which provides us heat and light. It serves various purposes in both domestic and industrial settings. High rise apartments are the norm in metropolitan cities, knowledge, attitude and practices of fire safety in apartments play a huge role in preventing accidental fires.

OBJECTIVES : 1. To assess the knowledge, attitude and practices of fire safety among apartment residents of Chennai. 2. To determine the factors influencing the knowledge, attitude and practices regarding fire safety among apartment residents of Chennai.

METHODS : A community based cross sectional study was conducted from September to November 2021, among 200 residents belonging to an apartment complex in Chennai city. Data was collected using a semi-structured, self-administered questionnaire. Data were entered in Microsoft excel and analysed using SPSS version 16.

RESULTS : In this study, males (48%) and females (52%) were almost equally represented. The mean age of the participants were 43.27 ± 16.62 years. Majority of the participants were degree graduates (51%). Majority of the households had 4 members. 61.5% had a dependent (person aged below 15 years or above 60 years) living with them. More than three-fourths (76.5%) of the participants belonged to upper middle (II) socio-economic class, as per modified kuppasamy socio-economic scale updated for 2020. In this study, 25% of the participants were from a rural background and 34.5% of the study participants were tenants and the remainder were owners. The mean duration of staying in this apartment was found to be 9.78 ± 6.504 years. No fire safety mock drill had been conducted in this apartment complex. None of the participants had done a fire risk assessment of their home. Majority of the residents had fair knowledge (53%), attitude (89%) and practice (77.5%) regarding fire safety. Significant association was found between presence of dependents, urban back ground, ownership status and knowledge regarding fire safety. Significant association was found between socio-economic status, knowledge and attitude regarding fire safety. Significant association was found between attitude, knowledge and practices regarding fire safety. No significant associations were found between age, gender, education qualification, socio-economic class and knowledge regarding fire safety.

CONCLUSION : The majority of the participants had a fair knowledge, attitude and practice. Fire safety mock drills and fire risk assessment had never been conducted in this apartment, hence one such mock drill can be conducted to improve the individual perceptions regarding fire safety in residences.

KEYWORDS : Apartment residents, fire, safety, knowledge, attitude, practice.

INTRODUCTION

Fire is produced by burning combustible material with evolution of light, heat and is accompanied by flame.¹ In domestic settings, fire is mainly used to cook food and heat water.

Currently, over half of the world's population live in urban areas, which is expected to rise to two-thirds by 2050. This global trend signals an increasing number of urban disasters. Sustained growth in urban areas is leading to higher concentrations of high-rise residential and commercial buildings, and an amplified risk to people living and working in these buildings in the event of an emergency.² Fire in such buildings either commercial or residential often involves more than one unit. Many building occupants may be affected.³

An accidental fire is a mishap that could be either man

made or natural. It can incur physical and economical losses.

Most people spend at least one quarter of their lives in their residence, practicing several kinds of activities that carries potential risk for accidental fires. The most common cause of residential fires is cooking fire. In most cooking fires, the ignition occurred due to the presence of flammable cooking oil, which could contribute rapidly to fire propagation. Electrical equipment and installations can

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also cause residential fires due to malfunctions, failures and lack of maintenance of electrical systems.⁴

Apart from these causes fire can also be caused by certain behaviours like indoor smoking, storage of combustibles and flammables near heat sources and poor housekeeping practices.

As per data from Tamil Nadu Fire and Rescue Services, during the year 2018, there were 22,601 fire accidents in Tamil Nadu. This accounted for loss of 36 lives and property loss amounting to 58.83 crore rupees.⁵

Fire safety can be defined as the set of practices to prevent or avert occurrence of fire and manage growth and effects of accidental or intentional fires while keeping resulting losses to an acceptable level.⁶ By practicing simple fire safety tips, one can reduce the chances of experiencing a fire and subsequent injury or death.⁷

In this study, the knowledge, attitude and practices of apartment residents with respect to fire safety was assessed.

JUSTIFICATION

Fire is always unexpected. The dense nature of apartment buildings allows for the increased spread of smoke, heat, and fire. Responding to a fire needs fast decisions and actions in an environment that can be loud, smoky, dark, and hot. Lives and property can be saved by being prepared before fire strikes. Most of the studies conducted in different settings are on infrastructure preparedness. However, there is no study on the level of awareness and knowledge regarding fire safety among apartment residents in Chennai. Hence, in this study an attempt was made to gain an idea about the existing knowledge, attitude and practices of fire safety among apartment residents in Chennai.

OBJECTIVES

1. To assess the knowledge, attitude and practices of fire safety among apartment residents of Chennai.
2. To determine the factors influencing the knowledge, attitude and practices regarding fire safety among apartment residents of Chennai.

METHODOLOGY

A community based cross-sectional study was carried out during the period from September to November 2021 among residents of an apartment complex in Chennai city. This study was carried out after getting ethical clearance from the Institutional Ethics Committee of Madras Medical College, Chennai. The sample size was calculated from a previous study, with 87.13% having correct fire safety practices.⁸ The

sample size was calculated using the formula ($N = 3.84PQ/d^2$) with α being at 5% significance level, 5% absolute precision, which gives sample size of 172, considering a non-response rate of 10% the sample size was calculated to be 189 and rounded off to 200.

Out of the cities in Tamilnadu, Chennai was selected by simple random sampling method. Of the 15 zones in Chennai, Zone 7 (Ambattur) was selected by simple random sampling. Of the wards 79 to 93 under Zone 7 (Division 93) was selected. From the list of residential apartments in Division 93, DABC Sahithyam apartment was chosen. The residents who were above 18 years of age and staying in the apartment for 1 year or longer were included in the study. Residents less than 18 years of age were not included in the study.

Pretested, semi-structured, self-administered questionnaire was used for data collection. The residents were visited at their doorstep and explained in detail about the study and rapport was established. Informed consent was obtained and questionnaire form was distributed. Participants were assured of the confidentiality of their data. Participants were asked to fill their responses in the form and a contact number was provided to them to clarify their doubts. The filled questionnaires were collected the next day. Those participants who did not find time to fill the forms by the first day were given one more day and were requested to fill the questionnaire.

Data was collected using a pretested, semi-structured, self-administered questionnaire, which had five parts.

- Part I – Comprises of questions related to the socio-demographic profile of the participants.
- Part II – Comprises of questions related to the basic details of the participants.
- Part III - Comprises of 11 questions related to knowledge. Every correct answer was awarded with one mark and wrong answer was awarded with zero mark. The total score of knowledge related questions were 11.
- Part IV - Comprises of 9 questions related to attitude. One mark was awarded to each response agreeing with the statement and zero mark was awarded for response disagreeing with or having no idea related to the statement. The total score of the attitude related questions were 9.
- Part V - Comprises of 10 questions related to fire safety practice. One mark was awarded for each response of positive practice and zero mark was awarded for each negative practice. Total score of the practice related questions were 10.

The knowledge, attitude and practice scores were assessed as good ($>\text{mean}+\text{SD}$), fair ($\text{mean}-\text{SD}$ to $\text{mean}+\text{SD}$) and poor

(<mean-SD).

The collected data was entered in Microsoft Excel and analysed using SPSS version 16. Descriptive statistics such as proportions, mean and standard deviation were used. Inferential statistics such as chi-square test was used. P-value <0.005 was considered significant. Pie-chart and tables were used to express data where necessary.

RESULTS

200 apartment residents participated in this community based cross sectional study. Males (52%) and females (48%) were almost equally represented (Figure 1). Majority of the participants (30.5%) were below 30 years of age. (Table 1) The mean age of the participants were 43.27 ± 16.62 years, the eldest participant was 80 years old. Majority of the participants were degree graduates (51%) followed by post graduates (25%) and higher secondary school graduates (21%). Majority of the households had 4 occupants. 61.5% had a dependent (person aged below 15 years or above 60 years) living with them. More than three-fourths (76.5%) of the participants belonged to upper middle (II) socio-economic class, as per modified kuppusamy socio-economic scale updated for 2020. 25% of the participants were from a rural background. None of the participants were physically challenged. 34.5% of the study participants were tenants and the remainder were owners. The mean duration of staying in this apartment was found to be 9.78 ± 6.504 years. No fire safety mock drill had been conducted in this apartment complex. 39 (19.5%) of the study participants had participated in a fire safety mock drill elsewhere, of which 71.79% had participated in such drills at their work place (Table 2). None of the participants had done a fire risk assessment of their home. 45% of the study participants were of the opinion that owner, tenant, flat owners association and government regulatory body were responsible for the fire safety of the apartment.

Table 1. Age wise distribution of the study participants

S. No.	Age category	Frequency	Percentage
1	18 to 30 years	61	30.5%
2	31 to 40 years	30	15%
3	41 to 50 years	36	18%
4	51 to 60 years	38	19%
5	61 to 70 years	25	12.5%
6	71 to 80 years	10	5%
7	Total	200	100%

Gender wise distribution (n=200)

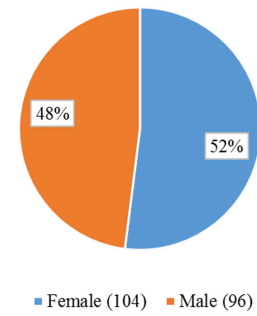


Figure 1. Gender wise distribution of the study participants

Table 2. Demographic characteristics and basic details

S. No.	Demographic Characteristic and basic details		Frequency (n=200)	Percentage
1	Educational status	Degree	102	51%
		Diploma	3	1.5%
		High School	3	1.5%
		Higher Secondary School	42	21%
		Post graduate	50	25%
2	Dependents	Present	123	61.5%
		Absent	77	38.5%
3	Socio-economic class	Upper class (I)	45	22.5%
		Upper middle class (II)	153	76.5%
		Lower middle class (III)	2	1%
4	Background/Nativity	Urban	150	75%
		Rural	50	25%
5	Ownership	Owner	131	65.5%
		Tenant	69	34.5%
6	Participated in a fire mock drill elsewhere	Participated	39	19.5%
		Not participated	161	80.5%

There were 11 questions regarding knowledge on fire safety. 79.5% were aware of the fire service emergency contact number. 84.5% had knowledge that pouring water on electrical or oil fires will be dangerous. Three-fourths (75%) of the participants were aware that different types of fire extinguishers are needed for fires from different sources. 79.5% had knowledge that fire produces gases which can causes drowsiness. 94% were aware that staircase is best means to evacuate in case of a fire accident. 85% had knowledge that an accidental fire can affect multiple units in an apartment. 71.5% answered that if an accidental fire originates in a room, the room must be closed after evacuating all the occupants. 71.5% answered that its necessary to crawl low to avoid smoke. 60% felt that rapid evacuation is a limitation in high rise buildings. 99% answered correctly that windows and doors must be opened to ventilate the room in case of a gas leak. 93.5% were aware about the presence of a fire station in the neighbourhood. (Table 3) The mean score obtained by the study participants was found to be 8.93 ± 1.817 . Among the study participants 53% had a fair knowledge regarding fire safety (Table 4).

Table 3. Knowledge regarding fire safety

S. No.	Knowledge based questions	Yes	No	Do not know
1	101 is the fire department emergency contact number.	159 (79.5%)	7 (3.5%)	34 (17%)
2	Pouring water on electrical or oil fires will be dangerous.	169 (84.5%)	22 (11%)	9 (4.5%)
3	Fires originating from different sources need different types of fire extinguishers?	150 (75%)	31 (15.5%)	19 (9.5%)
4	Fire produces gases that can make you drowsy.	159 (79.5%)	7 (3.5%)	34 (17%)
5	In case of a fire accident in high rise buildings, using staircase is the best means to escape.	188 (94%)	8 (4%)	4 (2%)
6	Accidental fire in an apartment can affect more than one unit.	170 (85%)	30 (15%)	0
7	If a fire starts in your room, after all the people in the room had been evacuated, the door must be closed to prevent rapid spread of fire.	143 (71.5%)	20 (10%)	37 (18.5%)
8	In case of an accidental fire, one must crawl low when escaping to avoid smoke.	143 (71.5%)	24 (12%)	33 (16.5%)
9	In case of fire accidents, total evacuation is a limitation in high rise buildings.	120 (60%)	26 (13%)	54 (27%)
10	In case you suspect gas leak, the room must be ventilated by opening all the windows and doors and not by turning on the Fan/Exhaust fan.	198 (99%)	0	2 (1%)
11	Is there a fire station in Mogappair?	187 (93.5%)	2 (1%)	11 (5.5%)

Table 4. Knowledge score category

S. No.	Knowledge score category	Frequency	Percentage
1	Good	48	(24%)
2	Fair	106	(53%)
3	Poor	46	(23%)
4	Total	200	100%

Table 5. Attitude related to fire safety

S. No.	Attitude related questions	Agree	No idea	Disagree
1	A fire accident can occur in a residential building.	184 (92%)	12 (6%)	4 (2%)
2	Every resident should know about do's and don'ts in case of fire emergency.	196 (98%)	4 (2%)	0
3	Every resident should be trained in fire prevention control.	195 (97.5%)	5 (2.5%)	0
4	Investing in fire prevention and control equipment, is definitely NOT a waste of money.	180 (90%)	13 (6.5%)	7 (3.5%)
5	Everyone should respond to fire alarm.	196 (98%)	4 (2%)	0
6	Everyone should know emergency telephone numbers.	194 (97%)	4 (2%)	2 (1%)
7	Everyone should actively participate in mock fire drills.	184 (92%)	15 (7.5%)	1 (0.5%)
8	In case of an accidental fire in the apartment, able residents should volunteer in rescue operations until professional help arrives?	199 (99.5%)	1 (0.5%)	0
9	Smoking indoors can be a potential hazard for accidental fires.	183 (91.5%)	17 (8.5%)	0

Table 6. Attitude score category

S. No.	Attitude score category	Frequency	Percentage
1	Good	0	(0%)
2	Fair	178	(89%)
3	Poor	22	(11%)
4	Total	200	100%

More than 90% of the participants agreed to all the questions regarding fire safety. (Table 5) The mean score obtained by the study participants was found to be 8.56 ± 0.878 . Majority (89%) of the study participants had a fair attitude regarding fire safety practices. (Table 6)

Table 7. Practice related to fire safety

S. No.	Practice related questions	Yes	No
1	Do you have any fire safety inventory available?	23 (11.5%)	177 (88.5%)
2	Do you keep walkways, stairs and exits free from obstructions at all times?	167 (83.5%)	33 (16.5%)
3	Do you turn OFF the LPG cylinder regulator knob when not in use?	172 (86%)	28 (14%)
4	Do you regularly inspect the tubing connecting your LPG cylinder with your stove?	177 (88.5%)	23 (11.5%)
5	Do you keep things that can catch fire, such as dishtowels, paper or plastic bags, potholders, and curtains at least 3 feet away from the stove top?	184 (92%)	16 (8%)
6	Do you check the plugs and cables of your electrical appliances for fraying or other damage regularly?	178 (89%)	22 (11%)
7	Do you use splitters and plug more than one extension cord into a single wall outlet?	98 (49%)	102 (51%)
8	Do you make sure electrical appliances in house such as water heater, clothing irons, mixers, grinders etc. are turned off when not in use?	198 (99%)	2 (1%)
9	Do you regularly service or maintain the electrical appliances in your house?	171 (85.5%)	29 (14.5%)
10	Have you ever discussed with your family members about a fire escape plan?	43 (21.5%)	157 (78.5%)

Table 8. Practice score category

S. No.	Practice score category	Frequency	Percentage
1	Good	25	(12.5%)
2	Fair	155	(77.5%)
3	Poor	20	(10%)
4	Total	200	100%

Practice

88.5% of the participants did not have any fire safety inventory. 83.5% of them keep walkways, staircase and exits free from obstructions. 86% of the participants had a good practice of turning off the LPG cylinder regulator knob when not in use. 88.5% regularly inspected LPG tubing for damages. 92% do not keep any flammable things for 3 feet from the stove. 89% regularly check plugs and cables of electrical appliances for damages. 51% had a bad practice of using splitters to plug more than one extension cord in a single wall outlet. 99% make sure electrical appliances are switched off when not in use. 85.5% regularly service electrical appliances in their homes. 78.5% had not discussed with their family members regarding a fire escape plan (Table 7). The mean score obtained by the study participants was found to be 7.06 ± 1.334 . Majority (77.5%) of the study participants had a fair attitude regarding fire safety practices. (Table 8)

Associations

Knowledge

Significant association was found between presence of dependents, urban back ground, ownership status and knowledge regarding fire safety (p-value < 0.05). (Table 9)

Table 9. Association between Socio-economic status and Attitude regarding fire safety practices.

		Knowledge			Total	p-value
		Good knowledge	Fair knowledge	Poor knowledge		
Presence of dependents	Yes	35 (28.5%)	67 (54.5%)	21 (17.1%)	123	0.022
	No	13 (16.9%)	39 (50.6%)	25 (32.5%)	77	
Back ground	Rural	22 (44%)	20 (40%)	8 (16%)	50	0.001
	Urban	26 (17.3%)	86 (57.3%)	38 (25.3%)	150	
Ownership status	Owner	35 (26.7%)	73 (55.7%)	23 (17.6%)	131	0.037
	Tenant	13 (18.8%)	33 (47.8%)	23 (33.3%)	69	

Attitude

Significant association was found between socio-economic status, knowledge and attitude regarding fire safety (p-value < 0.05). (Table 10)

Table 10. Association between Socio-economic status and Attitude regarding fire safety practices.

		Attitude		Total	p-value
		Fair attitude	Poor attitude		
Socio-economic status	Upper class (I)	45 (100%)	0	45	0.022
	Upper middle class (II)	131 (85.6%)	22 (14.4%)	153	
	Lower middle class (III)	2 (100%)	0	2	
Knowledge	Good knowledge	48 (100%)	0	48	0.008
	Fair knowledge	93 (87.7%)	13 (12.3%)	106	
	Poor knowledge	37 (80.4%)	9 (19.6%)	46	

Practice

Significant association was found between attitude, knowledge and practices regarding fire safety (p-value <

0.05). (Table 11)

Table 11. Association between attitude, knowledge and practices regarding fire safety practices.

		Practice			Total	p-value
		Good practice	Fair practice	Poor practice		
Attitude	Fair attitude	25 (14%)	133 (74.7%)	20 (11.2%)	178	0.028
	Poor attitude	0	22 (100%)	0	22	
Knowledge	Good knowledge	8 (16.7%)	34 (70.8%)	6 (12.5%)	48	0.008
	Fair knowledge	17 (16%)	82 (77.4%)	7 (6.6%)	106	
	Poor knowledge	0	39 (84.8%)	7 (15.2%)	46	

DISCUSSION

Fire has varied uses in residential and industrial settings. Fire is ubiquitously used by almost all households in cooking, during religious pooja, celebrations, as a source of light during electrical power failure, etc. Fire is an essential element, but it can become a danger when it occurs where it is not needed. An accidental fire can cause destructive and expensive damage to personnel and property. The knowledge, attitude and practices on fire safety, plays a major role in preventing and/or reducing these damages and losses.

In this study conducted among 200 apartment residents it was found that, majority of the residents had fair knowledge (53%), attitude (89%) and practice (77.5%) regarding fire safety, this was similar to a finding by Musigapong P et al. who found that most students in Thailand had fair knowledge (57.8%), attitude (64.8%) and practices (57%) towards fire safety and prevention. 9 Conversely, Kumara KAT et al. who conducted a study among government office workers reported that 7.4% had average knowledge on fire safety. ¹⁴ Mkharem M et al. reported that 80% had average knowledge regarding fire safety awareness. ¹⁵

No fire safety mock drills were conducted, and only 19.5% had participated in a fire drill conducted elsewhere, this was almost similar to the finding by Musigapong P et al. who found that 18.8% students in Thailand had attended a fire mock drill and Kihila JM et al. where only 4.4 % had participated in a fire drill. ^{9, 10}

In this study, the level of knowledge was significantly associated with attitude (p-value <0.05) and the level of knowledge and attitude was significantly associated with practices (p-value <0.05), whereas Musigapong P et al. observed that only the level of knowledge was statistically significant association with attitude.⁹ 71.5% of the participants in this study, answered correctly that one must crawl when escaping an accidental fire to avoid smoke, this finding was similar to a finding by Jaslow D where 72%

gave a similar answer.¹¹ In this study, 94% had the correct knowledge to avoid using elevator in case of an accidental fire, but, Zmud M et al. found that 73% of residential building occupants also gave a similar response.¹²

In this current study 79.5% knew the fire emergency number, as compared to Kulkarni RS et al. who conducted a study among healthcare workers who reported that only 27.72% knew the emergency fire number. 8 Kihila JM et al, reported that 81.5% were not aware of the fire emergency contact number. 10 Sravan Kumar Yeteru et al. who conducted study undergraduates, post graduates, teaching faculty in a dental college reported that only 50.4% knew the emergency contact number.¹³ In the current study 98% participants agreed that everyone should know about the do's and don'ts in case of a fire emergency, similarly, Sravan Kumar Yeteru et al. found that 98.6% agreed to the same.¹³

The current study found that 97.5% participants agreed that everyone should be trained in fire prevention and control, similarly, Sravan Kumar Yeteru et al. found that 97% agreed to the same.¹³ Kumara KAT et al. found that 97% agreed that fire safety and prevention should be taught to everyone.¹⁴

In this study, 90% agreed that it is not a waste of finances to invest in fire safety and prevention, similarly, Sravan Kumar Yeteru et al. reported that 83% answered that it was not a waste of finances to invest in fire safety and prevention.¹³ No significant association was found between education level and knowledge of fire safety, in the current study, Sravan Kumar Yeteru et al. also reported a similar finding. 13 Kumara KAT et al. also reported that no significant associations were found between level of education, age and knowledge regarding fire safety. 14 In this study, 98% should respond to fire alarm, similarly, Kumara KAT et al reported that 95.8% should respond to fire alarm.¹⁴ In this study, 97% agreed that they should know emergency contact number, similarly Kumara et al 95.7% reported that everyone should know emergency contact number.¹⁴ In the current study 49% participants reported that they use splitters to plug more than one extension cord into a single wall outlet, whereas, Kumara et al reported that 19.3% respondents had a similar practice.¹⁴

In this study, 99.5% agreed that in case of a fire accident, all occupants should be involved in rescue till emergency services arrives. Mkharem M reported that 43.33% agreed to the same.¹⁵ In this study, 84.5% participants knew that, water should not be used to put out an electrical fire, in a study conducted among health care professionals by Holla R et al., it was found that 61% gave a similar response.¹⁶

LIMITATIONS

Since, this study relied on self-reported responses, some participants could have given socially acceptable responses. Moreover, since there was time duration of more than 1 day between giving the questionnaire and collecting the forms, they had ample time to modify their answers. This study only covered a single apartment complex in the city and so the findings may not be generalised.

CONCLUSION

In this study conducted among 200 residents of an apartment complex in Chennai. Both the genders were almost equally represented. The majority of the participants had a fair knowledge, attitude and practice. Significant association was found between presence of dependents, urban back ground, ownership status and knowledge regarding fire safety. Significant association was found between socio-economic status, knowledge and attitude regarding fire safety. Significant association was found between attitude, knowledge and practices regarding fire safety. Nearly half of the participants had a bad practice of using splitters to plug multiple devices into a single wall outlet. Moreover majority felt that owners, tenants, flat owners association and government regulatory body all are responsible for fire safety and prevention in residential buildings.

RECOMMENDATIONS

Fire safety mock drills should be conducted at least once a year. Each individuals can do a fire risk assessment of their own homes to know where they are lacking and rectify the same. Fire safety inventory should be maintained by each family. Practice of using splitters to plug more than one extension cord into a single wall outlet should be avoided. Each family should discuss among their family members about a fire emergency preparedness and escape plan.

CONFLICT OF INTERESTS - Nil

ACKNOWLEDGEMENT

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IMPLEMENTATION OF EXTERNAL QUALITY ASSURANCE SCHEME (EQAS)-IMPACT ON RELIABILITY AND REPRODUCIBILITY IN PHC LABORATORY SERVICES

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Abstract

BACKGROUND: Assessment is a critical aspect of laboratory quality management, and it can be conducted in several ways. EQA is defined as a system for objectively checking the laboratory's performance using an external agency or facility. Directorate of Public Health and Preventive Medicine, Tamil Nadu has registered all its 2127 Primary Health Centre Laboratories to participate in the CMC-Biochemistry-External Quality Assurance Scheme (EQAS) from 2021 to ensure reliable and reproducible results.

AIM : To assess the impact of participation in Proficiency Testing (PT) to deliver quality laboratory services in a primary health care setting.

OBJECTIVES : To analyse the consistency in participation by PHC laboratories and the performance of laboratory investigations for Glucose Analyte from Jan – Sep 2022

METHODOLOGY : All the 2127 PHC laboratories in Tamil Nadu were registered under CMC-Biochemistry EQAS Program for the Year 2022 followed by adequate Quality Management Training to the Laboratory Technicians of PHCs by the State Public Health Laboratory and also through the District Public Health Laboratories. A Dashboard was created to analyse the participation and performance analytics of all the 2127 PHC labs individually and district wise.

RESULTS : In 2020, a total of 876 labs (41.2%) only were participated consistently. The participation has gradually increased to a total of 1398 labs (65.7%) in 2021 followed by 1637 labs (77%) in 2022. Excellent score was obtained by 1655 labs (77.8%) in 2021 followed by 1640 labs (77.1%) in 2022.

CONCLUSION : Quality of laboratory investigations are paramount important to deliver reliable and reproducible test results in the primary health care centres to serve the rural community. Participation in EQAS will ensure and assure the

INTRODUCTION

Laboratory Quality Assurance encompasses a range of activities that enable laboratories to achieve and maintain high levels of accuracy and proficiency despite changes in test methods and the volume of specimens tested. Assessment is a critical aspect of laboratory quality management, and it can be conducted in several ways. One of the commonly employed assessment methods is that of External Quality Assessment.¹

Assessment is a critical aspect of laboratory quality management, and it can be conducted in several ways. EQA is defined as a system for objectively checking the laboratory's performance using an external agency or facility. Several EQA methods or processes are commonly used. These include Proficiency Testing (PT), Rechecking or Retesting and On-site Evaluation.¹

In Proficiency Testing, an external provider sends unknown samples for testing to a set of laboratories, and the results of all laboratories are analyzed, compared, and reported to the laboratories. The basic purpose of proficiency testing is to assess the performance of laboratories for their conduct of specific test.²

Participation in an EQAS programme provides valuable data and information, which allows comparison of performance and results among different test sites, provides early warning for systematic problems associated with kits or operations, provides objective evidence of testing quality, indicates areas that need improvement, Identifies training needs. EQAS helps to ensure Physicians, Patients and Health administration, that the laboratory can produce reliable results. Successful performance in an EQAS programme reflects the effectiveness of the laboratory's quality management, and allows for recognition of laboratory quality by external groups.

OBJECTIVE

To assess the impact of participation in Proficiency



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Testing (PT) to deliver quality laboratory services in a primary health care setting.

ABOUT CMC-CLINICAL BIOCHEMISTRY EQAS:

The Department of Clinical Biochemistry, Christian Medical College, Vellore under the banner of The Association of Clinical Biochemists of India (ACBI) is conducting an External Quality Assessment Scheme (EQAS) since 1978. The Participants represents all the states of India and also Andaman and Nepal. The participating laboratories include teaching and non-teaching hospital laboratories, government as well as private, small hospitals, private clinics and diagnostic centres.

It is a twelve-month program starting from January to December every year. Those labs who report results for at least six months alone are eligible for the participation certificates at the end of the cycle. Each laboratory is assigned a lab number and they are requested to secure the password.

There are two basic Biochemistry programs viz, Chemistry – I and Chemistry – II for the small and medium laboratories. Chemistry – II is ideal for small laboratories like PHCs labs catering to the need of rural community. This cover 9 analytes like Glucose, Urea, Creatinine, T. Bilirubin, T protein, Albumin, Uric acid, Cholesterol and Triglyceride.

MATERIALS AND METHODS

All the 2127 PHC laboratories under CMC-Clinical Biochemistry EQAS program from 2020 were included in this study, with necessary Hands-on-training to the PHC Laboratory Technicians, Provide Standard Operating Procedures (SOP) and uniformly implement the program across the state of Tamil Nadu and analyse the consistency in participation and the performance of laboratory investigations for Glucose Analyte from 2021 and 2022 (up to Sep 2022) through a Dash Board analytics.

The basic preparation of PT panel involves preparation of a master pool of human serum as per WHO recommended procedure, dispensing the correct volume into the vials and lyophilization. Homogeneity and stability checks are done as per the ISO 13528:2015 standards³. The lyophilised vials are sealed, well packed in thick envelops and distributed through courier service or postal service to all the participating laboratories.

The laboratories are requested to reconstitute the correct sample, analyse and enter the results in the web site before the 20th of every month. Any amendments can be made only till the 25th of the month and it should be sent through an

e-mail only clearly mentioning the lab number and reason for amendment. Once the report is published on the net, no amendment can be made. Evaluation of the report is based on WHO and ISO 13528:2015 recommended expressions such as Robust mean for the assigned value and SDI (Z score) for individual parameters. Details on monthly report and the statistical tools are available on the monthly summary page. Evaluated monthly report is uploaded into the net by 2nd working day of the succeeding month.

After the completion of the cycle, the yearly summary is updated into the web site for individual labs and certificates are sent to the eligible laboratories. The CMC-Biochemistry EQAS providers maintain confidentiality of the participants demographics, results, reports or any other information provided by them. A Dashboard analytics was created exclusively for the 2127 PHCs under the Directorate of Public Health and Preventive Medicine by CMC, Vellore through which the participation and performance analytes of the PHC labs can be assessed and ascertained by using the super admin username and password for the DPH&PM. DPH&PM Scientific Committee Permission was obtained.

RESULTS

A total of 2127 PHC laboratories were registered with CMC-Clinical Biochemistry EQAS Program for the year 2021,2021 and 2022. In 2020, a total of 876 labs (41.2%) only were participated consistently in all months. In 2021, the participation has gradually increased to a total of 1398 labs (65.7%) followed by 1637 labs (77%) in 2022 indicating a 36% improvement in consistency in participation over a period of 3 years.

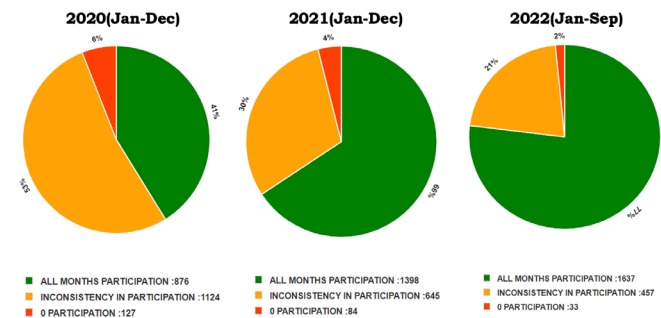


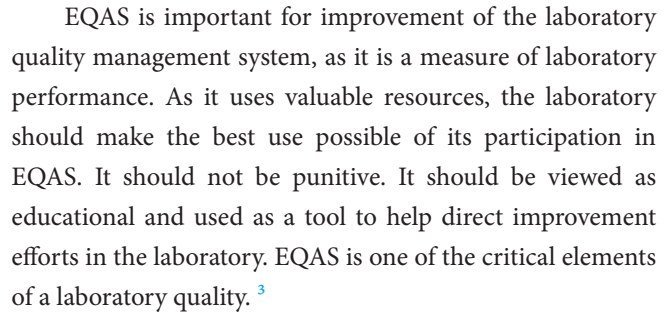
Figure 1 : Consistency in Participation from 2020-2022 (up to September)

Similarly, inconsistency in participation has also gradually reduced from 1124 labs (52.8%) in 2020 to 645 labs (30.3%) in 2021 followed by 457 labs (21.5%) in 2022 with a substantial reduction of 31.5%.

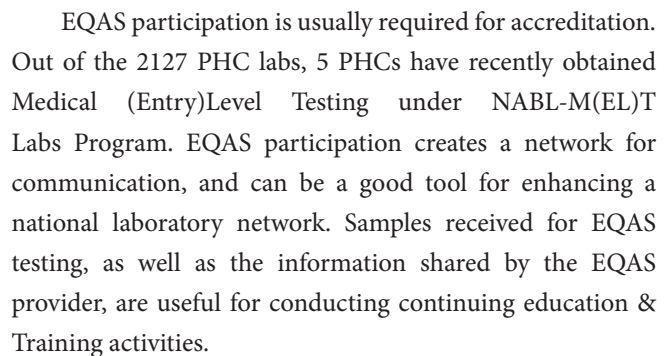
In the year 2020, a total of 127 labs (6%) did not participate in the EQAS Program followed by a total of 84 labs (3.94%)

Excellent score was obtained by 1655 labs (77.8%) in 2021 followed by 1640 labs (77.1%) in 2022. Overall, only 0.14% of labs in 2021 and 0.04% of labs in 2022 have failed in the Glucose analyte.

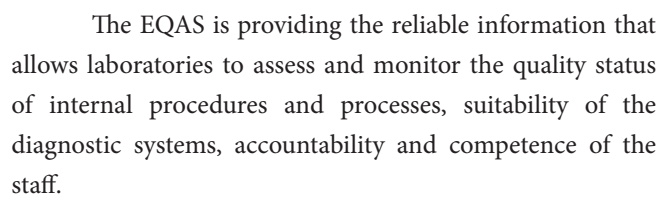
DISCUSSION



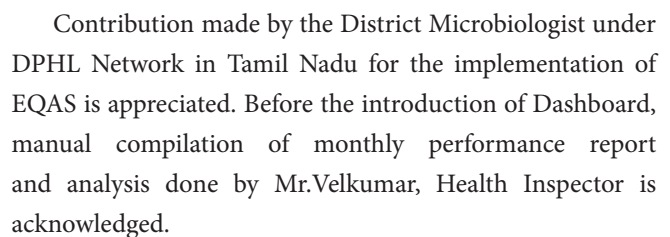
There has been a substantial improvement in the participation of EQAS in 2127 PHC labs from 2020 onwards. Sensitizing the laboratory technicians on the importance of consistent participation in EQAS is very important. On the other hand, the laboratorian should always aim to achieve excellent score in each cycle thereby ensuring their skills, calibrated equipment, quality reagents and commitment to deliver reliable and reproducible results.



CONCLUSION



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acknowledged.

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COMPLIANCE TOWARDS ANTI RABIES VACCINE AND ITS DETERMINANTS AMONG PEOPLE EXPOSED TO ANIMAL BITE IN SULUR BLOCK OF COIMBATORE DISTRICT: A CROSS SECTIONAL STUDY

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Abstract

BACKGROUND: Globally Rabies accounts for 59000 deaths per year with Africa and Asia contributing to 95% of the deaths. Sulur block of Coimbatore District reports an average of 5-10 animal bites per day which seem to be higher in the district. This study focuses on understanding the compliance to Anti Rabies Vaccination (ARV) regimen and the determining factors among people exposed to animal bite approaching the PHC's or GH of this block.

METHODS: A cross sectional study was done among people exposed to animal bite who visited the government facilities in Sulur block during October -2021 to March-2022. Using simple random sampling method, a sample of 155 participants was selected from the sampling frame. Data collection was done by trained health care staff through face-to-face interviews using semi-structured questionnaire after obtaining consent. People exposed to animal bites who completed the recommended anti-rabies vaccination course (0,3,7,28) irrespective of date appropriateness were considered compliant.

RESULTS: Most of the study participants were men, and dog bite was the most common animal exposure. Only 54.5% had received their 1st dose of ARV on the same day of animal exposure. Only 60% had completed all 4 doses of vaccination irrespective of date appropriateness. The most common reason cited for delay in 1st dose was low risk perception (25%) followed by unavailability of ARV in the hospital (19.4%). The most common reasons for noncompliance to completion of schedule was low risk perception (14.2%).

CONCLUSION: This study signifies the need for increasing awareness about the disease and post-exposure prophylaxis to rabies, to improve compliance.

KEYWORDS: Anti-Rabies Vaccination, Compliance, Animal Bite.

INTRODUCTION

Globally Rabies accounts for 59000 deaths per year with Africa and Asia contributing to 95% of the deaths.¹ The frequent people exposed to animal bites are reported to be in the age group of 5-14 years globally. India accounts for 36% of the world's rabies deaths, causing approximately around 18,000-20 000 deaths every year.² Tamil Nadu, the southern state of India had reported 31 deaths due to Rabies in the state-run medical colleges for the year 2018.³ Rabies is a fatal but Vaccine preventable disease. In India 97 percentage of the Rabies transmission happens through dog bites.² India is a signatory to the WHO's drive towards zero deaths from dog-mediated rabies by 2030.⁴ To achieve this target, India has formulated 'National guidelines for Rabies prophylaxis', to ensure uniform practices in post exposure prophylaxis (PEP) across the country. As per the guidelines every animal bite is considered as a potential rabid animal bite and prophylaxis should be started immediately. PEP includes wound toileting, active immunization with Anti Rabies vaccine (ARV) and passive immunization with Rabies Immunoglobulin. ARV should be administered for all animal bite people exposed to animal bites with Category 2 and Category 3 bites. Category 2 includes any wound in

skin without bleeding & Category 3 includes all wounds with bleeding and any mucous membrane involvement. ARV schedule is a multidose schedule requiring multiple visits to be made by the patients.⁵

Under National Rabies Control Programme, the regimen approved by Drug Controller General of India is the updated Thai Red cross regimen which involves injecting reconstituted vaccine on two sites with 0.1ml per site intradermally over the deltoid region on days 0,3,7 and 28. PEP should be instituted immediately, and the complete course of the ARV schedule should be adhered to ensure complete protection against Rabies. However, there are studies which have shown non-adherence to the regimen for various reasons.⁶⁻¹²

Coimbatore district which is the 2nd largest district in Tamil Nadu with literacy rate of 89.2% which is



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higher than the national average as per 2011 census of India. Sular block of Coimbatore district is in the eastern end of the district consisting of 41 revenue villages.

The block is catered by 4 Primary Health Centres and 1 Taluk headquarters hospital (referred to as Sular GH). Sular block of Coimbatore District reports an average of 5-10 animal bites per day which seem to be higher in the district. This study focuses on understanding the compliance to ARV regimen among people exposed to animal bite approaching the PHC's or GH of this block. This study also focusses on the factors determining the compliance to ARV regimen among the study participants. This study will give an insight on the actual compliance and help policy makers in designing strategies to address the non-compliance. The literature reviewed found that there is lack of information on compliance to ARV coming from rural Tamil Nadu. Hence this necessitates the need for understanding the situation in Rural Tamil Nadu.

OBJECTIVES

Primary objective

- To estimate the proportion of people exposed to animal bite who are compliant to anti-rabies vaccine regimen in Sular block of Coimbatore district.
- To find the factors determining the compliance to anti-rabies vaccine among study participants.

METHODOLOGY

STUDY DESIGN : Cross sectional study

STUDY POPULATION : All people exposed to animal bite who visited the four PHC's and GH of Sular block in the last 6 months (October -2021 to March-2022).

INCLUSION CRITERIA : All people exposed to animal bite who visited the four PHC's and GH of Sular block in the last 6 months (October -2021 to March-2022).

EXCLUSION CRITERIA :

- Patients who do not give consent to participate in the study
- Patients who could not be contacted even after 3 attempts in different period
- Participants whose contact details are incorrect or not available
- Participants who are not residents of Sular block

STUDY AREA : Public health institutions in Sular block of Coimbatore district include 4 PHCs and 1 secondary level hospital which provides anti rabies vaccine services 24*7 free of cost. Rabies immunoglobulin is available in Sular GH. Hence all Category 3 patients requiring rabies immunoglobulin will be referred to GH. In the reference

period mentioned (October 2021 – March 2022), there were 2527 patients who were exposed to animal bite and availed services in either the PHCs or GH of Sular Block.

SAMPLE SIZE AND SAMPLING METHOD : Assuming 50% variability, 95% confidence level and 7.5% absolute precision, and a finite population correction (2527 population size) the required sample size, is 160. Accounting for 10% non-response rate, the corrected sample size is 176.

The list of all patients who were exposed to animal bite in the last 6 months (October 2021 – March 2022) from PHCs and GH of Sular block of Coimbatore district was used as the sampling frame from which the required samples were selected. Using computer generated random number table, the required sample size was selected using simple random method. If the contact details of the selected participants were not available or incorrect, it was replaced by another random number.

DATA COLLECTION : Data collection was done by trained health care staff through face-to-face interviews. The selected Health staff were trained adequately on the study protocol, obtaining consent, interviewing using the semi-structured questionnaire.

The selected participants were visited by the trained health staff using the contact details available in the ARV registers and they were explained regarding the purpose of the study. They were invited to participate in the study after giving them details regarding the study and addressing the queries raised by them. Participants who were willing to participate were included in the study after getting informed written consent.

A total of 31 participants were below 18 years, the adult member in the household of these participants (Parents, Elder sibling or other identified guardian) were approached for informed written consent and assent was obtained from the participants.

The participants were interviewed using a semi-structured questionnaire by the health care staff and responses recorded in the format provided. The following information were included in the questionnaire:

- Socio-demographic characteristics of patients,
- Awareness about rabies (including knowledge about susceptible animals, Routes of transmission, Signs of rabies in animal and rabies prevention and control measures),
- Details on the nature of exposure and PEP administration
- Vaccination status of biting dog/cats if known.

STATISTICAL ANALYSIS : Data was entered in excel and double verified for ensuring data quality. Data analysis was done using SPSS version 16. Descriptive analysis was done by calculating percentage and frequencies for discrete data.

Mean and standard deviation was calculated for continuous data following normal distribution. For skewed data, median and interquartile range is presented. Inferential statistics was done for finding the association between determinants and compliance. Regression analysis was done for those determinant factors which are found statistically significant in univariate analysis

OPERATIONAL DEFINITION

All animal bite people exposed to animal bites who completed the recommended course of anti-rabies vaccination (0,3,7,28) irrespective of date appropriateness was considered as compliant; whereas those people exposed to animal bites who discontinue the vaccination at any point during the recommended course were considered as noncompliant or drop-outs. All the noncompliant cases were recorded and the reasons for incomplete vaccination course was found out by interviewing the noncompliant bite people exposed to animal bites or their guardians.

Date appropriateness for the 1st dose is calculated. It was considered as a delay if the ARV was not received on the same day of animal exposure

ETHICAL CONSIDERATIONS

The study was initiated after ethical approval from the Institutional Ethics Committee of Directorate of Public Health and Preventive Medicine. All the participants were explained about the purpose of the study and informed written consent was obtained. It was ensured that the participants were interviewed at their convenient time. Privacy and confidentiality of information was maintained. Patients who had not taken vaccination as per recommended schedule, were referred for testing neutralizing antibodies. If it is less than 0.5IU/ml, a booster dose was given.¹³

RESULTS

A total of 155 participants were included in the study. The mean age of the study participants was 37 years (SD -20 years), with participants ranging from 2 years to 82 years.

- includes the data pertaining to the study participants (i.e. those with animal bite exposure)

\$ - includes data of those who were respondents to the interview

The demographic profile of the study participants showed that almost 25% of those with animal bite exposure were below 19 years of age and more than 2/3rd of the study participants were males. Only 15% belonged to lower or lower middle class as per B G Prasad Classification.

Table 1 .Demographic profile of the study participants

Variable		Frequency	Percentage
Age group #	<5 years	5	3.2%
	6-10 years	15	9.7%
	11-19 years	18	11.7%
	20-59 years	93	60.4%
	>60 years	24	15.6%
Gender#	Male	102	65.8%
	Female	53	34.2%
Respondents in case of minor (< 18 years of age) (n-31 years)	Father	20	64.5%
	Mother	9	29%
	Sister	2	6%
Type of settlement	Rural	102	65.8%
	Semi-Urban	37	23.9%
	Urban	16	10.3%
Educational Qualification of the respondents ⁵	No education	22	14%
	Non -formal school education	6	4%
	Primary	38	25%
	Secondary education	9	6%
	Higher Secondary	47	30%
	Graduate	30	19%
	Postgraduate	3	2%
Socioeconomic classification based on B G Prasad classification	Upper class	23	14.8%
	Upper middle class	49	31.6%
	Middle class	60	38.7%
	Lower middle class	13	8.4%
	Lower class	10	6.5%

Table 2. Knowledge regarding rabies among respondents

Knowledge variable		Frequency	Percentage
Ever heard of rabies		89	57.4%
Animals transmitting rabies (n-89)	Dogs	89	100%
	Cats	53.9	53.9%
	Domestic livestock	23.6	23.6%
	Wild animals	21.3	21.3%
	Rats/Rodents	28.1	28.1%
Route of transmission of rabies from animals (n-89)	Dog bites	97.8	97.8%
	Other animal bites	39.3	39.3%
	Animal scratches	58.4	58.4%
	Contact with saliva over an intact skin	39.3	39.3%
	Contact with saliva over broken skin	53.9	53.9%
	Contact with urine/faeces	14.6	14.6%
	Touching rabid animal	14.6	14.6%
Signs and symptoms of rabies (n-89)		76	85.4%
Serious nature of rabies (n-89)		71	79.8%
Prevention and control of rabies (n-89)		77	86.5%

Knowledge regarding route of transmission, signs and symptoms, prevention and control of rabies was assessed only among those who have ever heard of rabies(n-89). It was considered to have adequate knowledge on clinical signs and symptoms, if the respondent had given answers like aggressive behaviour, excessive salivation, barking, biting. If the respondent answers that rabies is 100% fatal, it was considered to have adequate knowledge on serious nature of the disease. If the respondent answers wound washing, visit to hospital for PEP and vaccination, then it was recorded as adequate knowledge on prevention and control.

Table 3. Animal Exposure among the study participants

Variable		Number	Frequency
Type of Exposure	Bite wound with bleeding	72	46.5
	Minor scratches or abrasions without bleeding	44	28.4
	Licks on the mucus membrane or broken skin	1	0.6
	contacts on the intact skin	14	9
	Nibbling on skin	24	15.5
Type of animal	Dogs	142	91.6
	Cats	9	5.8
	Rats	3	1.9
	Others	1	0.6
Ownership of the animal	Pet	122	78.7%
	Stray	33	21.2%
Vaccination status of the animal	Vaccinated	45	29%
	Not Vaccinated	49	31.6%
	Status not known	61	39.4%
Bite provocation	Provoked	57	36.8%
	Non provoked	98	63.2%
Anatomical site of bite	Head/neck/face	10	6.5%
	Upper limbs	60	38.7%
	Trunks/genitalia	2	1.3%
	Lower limbs	83	53.5%
No of bite wounds	Single bite wound	93	60%
	Multiple bite wound	20	12.9%
	Scratches only without bleeding	42	27.1%
Category of exposure (extract from ARV register)	Category I	32	20.6%
	Category II	108	69.7%
	Category III	15	9.7%
Clinical signs of biting animal	Apparently normal	145	93.5%
	Abnormal	10	6.5%

Table 4. Details regarding Post exposure prophylaxis

Variable		Frequency	Percentage
Immediate action	Wound washing with soap and water	48	31%
	Wound washing with water only	37	23.9%
	Applied local herbs/medicine	13	8.4%
	Applied antiseptics after wound washing	15	9.7%
	Did nothing	42	27.1%
Wound wash at hospital	Yes	86	55.5%
	No	63	40.6%
	Don't remember	6	3.9%
Delay in receiving 1 st dose of vaccination		72	46.5%
Reasons for delay in receiving 1 st dose(n-72)	Not aware of the need to get PEP	13	18.1%
	ARV was not available at the hospital during the visit	14	19.4%
	Hospital far away and didn't get time to visit the hospital	8	11.1%
	Animal was normal	4	5.6%
	Waited for 10 days observation	2	2.8%
	Considered the exposure to be minor and no risk	18	25%
	No money for transportation for immediate visit	3	4.2%
	The exposure day was government holiday	4	5.6%
	The clinician in the hospital asked me to come on the other day	1	1.4%
Compliance to all doses of ARV	Yes	93	60%
	No	62	40%
Dosage missed (n-62)	Day 3	7	11.2%
	Day 7	20	32.2%
	Day 28	35	56.4%
		16	25.8%
Reasons for non-compliance to ARV	Lack of time	2	3.2%
	Not advised by HCP to come for follow up	8	12.9%
	Forgot the schedule	22	35.5%
	Did not care	1	1.6%
	Lack of means of transportation	13	21.0%
	Others	15	100%
Rabies immunoglobulin for Category 3 bite		15	100%

Table 5. Factors determining compliance to ARV among study participants

Variable		Compliance (n-93)	Non-Compliance (n-62)	Chi-square test value	P value
Gender	Male	61 (59.8%)	41(40.2%)	0.005	0.945
	Female	32(60.4%)	21(39.6%)		
Age group	<5 years	2(40%)	3(60%)	2.848	0.590
	6-10 years	11(73.3%)	4(26.7%)		
	11-19 years	9(50%)	9(50%)		
	20-59 years	37(61.3%)	36(38.7%)		
	>60 years	14(58.3%)	10(41.7%)		
Type of locality	Rural	32(51%)	50(49%)	11.094	0.003*
	Semi-urban	27(73%)	10(27%)		
	Urban	14(87.5%)	2(12.5%)		
Educational status of respondents	No education	11(500%)	11(50%)	2.589 ^a	0.7631
	Non -formal education	3(50%)	3(50%)		
	Primary	26(68.4%)	12(31.5%)		
	Secondary education	6(66.6%)	3(33.3%)		
	Higher Secondary	27(57.4%)	20(42.5%)		
Socioeconomic status	Graduate/ postgraduate	20(60.6%)	13(39.3%)	5.827 ^a	0.208
	Upper class	12(52.2%)	11(47.8%)		
	Upper middle class	26(53.1%)	23(46.9%)		
	Middle class	37(61.7%)	23(38.3%)		
	Lower middle class	9(69.2%)	4(30.8%)		
Ever heard of rabies	Yes	40(60.6%)	26(39.4%)	0.018	0.894
	No	53(59.6%)	36(40.4%)		
Ownership of animals	Pet	70(57.4%)	52(42.6%)	1.643	0.200
	Stray	23(69.7%)	10(30.3%)		
Vaccination status of the animal	Vaccinated	26(57.8%)	19(42.2%)	1.372	0.514
	Non-Vaccinated	27(55.1%)	22(44.9%)		
	Status unknown	40(65.6%)	21(34.4%)		
Provocation	Provoked	33(57.9%)	24(42.1%)	0.166	0.683
	Non provoked	60(61.2%)	38(38.8%)		
Type of bite wound	Single bite wound	55(59.1%)	38(40.9%)	4.378	0.112
	Multiple bite wound	16(80%)	4(20%)		
	Only scratches without bleeding	22(52.4%)	20(47.6%)		
Anatomical site of exposure	Head/neck/face	5(50%)	5(50%)	5.939 ^a	0.133
	Upper limb	30(50%)	30(50%)		
	Trunk/ genitalia	1(50%)	1(50%)		
	Lower limb	57(68.7%)	26(41.9%)		
Category of Exposure	Category 1	12(37.5%)	20(62.5%)	9.614 ^a	0.007*
	Category 2	69(63.9%)	39(36.1%)		
	Category 3	12(80%)	3(20%)		

- Fisher Exact Test, * - p value significant at <0.005

Among the various factors analysed for finding association with compliance to completion of ARV, type of locality and category of exposure had a significant association (Table 5)

DISCUSSION

This study builds evidence on the current practice regarding post exposure to animal bites from rural part of Tamil Nadu. The study was done among those people who had an exposure and have approached any of the public health facility in the Sular Block of Coimbatore district. The study showed 40% non-compliance to completion of ARV.

The demographic profile of the study participants showed that almost 25% of those with animal bite exposure were below 19 years of age and 15.6% were elderly. The age distribu-

tion of the exposed is very similar as studied in other states of India.⁷ More than 2/3rd of the study participants were males. Only 15% belonged to lower or lower middle class as per B G Prasad Classification.

Most of the bite victims had bite wound with bleeding (46.5%) and abrasions without bleeding (28.4%). Most common anatomical site was on lower limbs (53.5%) followed by upper limbs (38.7%). Majority of the biting animals were dog (91.6%) followed by cats (5.8%); More than 3/4th of the animals were pet animals. Only 29% of the biting animals were known to be vaccinated against rabies.

Based on the data extracted from the ARV registers in the public health facilities, it was found that only 9.7% were identified as Category III. This is in non-alignment with the self-reported information given by the individuals during interview which states that 46.5% had an exposure which led to bleeding. Ideally as per the guidelines any wound with bleeding should be considered as Category III and immunoglobulin should be offered. This is also evident on comparing with other literature, wherein category 3 bites varied from 50- 80%.^{7,8} This discrepancy highlights the need for training of HCPs on the anti-rabies guidelines. However unlike other studies, all those individuals who were identified as Category III exposure received RIG. Whereas in other studies it was found that only less than half of those identified as Category III received RIG.^{7,10}

The awareness of the respondents on rabies was inadequate. Only 57.4% had heard about rabies; of which only 79.8% knew about the severity of the disease. This level of awareness among this population is lower than those reported in other studies. In the multicentre study conducted across different states of India reported 76% of the participants to have heard about rabies.⁷ The perceived risk of transmission of rabies from different animals in the present study was inadequate; the high risk of rabies transmission from cat was perceived only by 53.1%.

The practice followed after the exposure was insufficient with regard to wound wash. In this study only 31% had washed their wound with soap and water and 8.6% had applied some herbal applications which are not recommended. This is very similar to other studies which also reported low levels of wound toileting done after exposure.^{7,10}

Delay in getting the 1st dose of ARV was reported among 46.5% and the most common reason quoted for such delay was perceived the severity of the exposure to be less. The second most reason quoted was non availability of ARV during the visit to health facility. The probable reason while probing further revealed that patients were asked to visit the facility

on a daytime for ensuring minimal wastage of ARV. However, this is non-conforming to the guidelines which states that ARV should be given 24/7 at all public health facility irrespective of the wastage incurred.

The compliance to complete course of anti-rabies vaccination for PEP was only 60%. This is very similar to other studies which have reported compliance to be ranging from 55-80%.^{7,10-12,14} The highest dropouts was seen for day 28 dose. The reasons quoted for non-compliance was perceived less severity and lack of time. Among the factors assessed for determining the association with compliance, it was found that there was no difference based on gender, education or socio-economic class. However, it was found that non-compliance was high among rural population compared to others. This necessitates targeted health education approach for rural population. Similarly, among the exposure related factors, only category of exposure had a significant association with compliance. A study conducted in Davangere district, a rural part of Karantaka district in the year 2014, found that 82.6% completed the ARV schedule. Lack of time (50%) was the most common reason for non-compliance. It was also found in the study, that wound toileting was followed only by 12.5% of the study participants.⁶ In a longitudinal study conducted in a tertiary care centre of Mumbai in the year 2015, it was found that the compliance rate was only 55.2%.⁹ In a study conducted by Shanakarajah et al in Bangalore in the year 2015 it was found that the compliance rate for intradermal rabies vaccination (Updated Thai Regimen) to be 77.0%. The major constraints were loss of wages, forgotten dates, cost incurred and distance from the hospital.¹¹ In another study done in Karnataka in 2017-18, it was found that 50.3% had completed all 4 doses as per the Updated Thai Regimen. The reasons for non-compliance were found as transportation problems, loss of wages, non-availability of rabies biologicals in Peripheral centres, negligence of the participants and forgotten dates.⁸

In a multicentric study, health facility-based survey conducted during May 2017 to January 2018 in six regional-representative states involving 18 health facilities found that the compliance rate for the full course of intra-dermal rabies vaccination was 85.1%.⁷ In a study conducted in the urban slums of Chennai found that 55.1 % as the compliance rate to the full course of the ARV regimen.¹² In a prospective study done in rural Odisha in the year 2019, found that only 52.3% of the patients were compliant with ARV, and 49.4% were compliant with Rabies Immunoglobulin.¹⁰

This study has included only those who had approached public health facilities. Hence it cannot be generalised to

those who had never approached a health facility post exposure or those who had approached a private facility, as the estimates derived from this study could be an underestimate.

CONCLUSION

This study highlights the need for creating more awareness on the need for compliance to completion of all doses of ARV especially among rural population as well as refresher training for the health care providers to ensure compliance to the national rabies prophylaxis guidelines and to ensure avoiding missed opportunity of protecting the exposed from rabies as early as possible.

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PREVALENCE OF LATENT TUBERCULOSIS INFECTION (LTBI) DETECTED BY IGRA AMONG THE HOUSEHOLD CONTACTS OF ACTIVE TUBERCULOSIS CASES IN TIRUVALLORE DISTRICT

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Abstract

BACKGROUND: Tuberculosis (TB) is a major public health problem and a leading cause of death worldwide. Latent tuberculosis infection (LTBI) is a condition of persistent immune response to infection by *Mycobacterium tuberculosis*. Household contacts of active TB cases need to be investigated for the presence of LTBI for detection and management.

OBJECTIVE: Detection of Latent TB Infection (LTBI) by Interferon Gamma Release Assay (IGRA) from close contacts of TB cases in Tiruvallur District.

METHODS: Blood samples of 1200 Household contacts of Pulmonary TB Patients from Tiruvallur District were collected and referred to State Public Health Laboratory for diagnosis of LTBI by Interferon Gamma Release Assay (IGRA).

RESULTS: Among the 1200 Household contacts of TB cases tested for IGRA, a total 520 (43%) were positive for LTBI and female was predominantly positive (62.3%) than male (37.7%). 59% of the LTBI was observed between 15-44 Age Group.

CONCLUSION: Early Diagnosis and treatment of Latent TB infection among the household contacts of TB patients are very important to reduce the TB disease burden in the community.

KEYWORDS: Tuberculosis, LTBI, Interferon Gamma.

INTRODUCTION

Tuberculosis (TB) is a major public health problem and a leading cause of death worldwide. Over 10 million people are estimated to have developed TB in 2020; the majority were from high TB burden, resource-constrained, low and middle-income countries including India ¹. In 2014, the World Health Assembly adopted End TB Strategy which aims to eliminate the global TB epidemic by the year 2035 ².

Latent tuberculosis infection (LTBI) is a condition of persistent immune response to infection by *Mycobacterium tuberculosis* (M.tb) in people without any evidence of active TB disease ^{3,4}. It is estimated that approximately 1.7 billion individuals were infected with LTBI in 2014, with a 5%–10% lifetime risk of developing active TB. Over 50% of the household contacts of pulmonary TB patients in resource constrained countries have LTBI ^{5,6}.

Hence, WHO recommends that those with LTBI should be treated with tuberculosis preventive therapy (TPT) to realise the goals of the End TB Strategy ⁷. Contact investigation is an essential component of the WHO's TB management protocol to detect those with LTBI among high-risk groups, and to initiate TPT ⁸. WHO recommends the tuberculin skin test (TST) or interferon-gamma release assays (IGRA) to detect LTBI. TST is a reasonably low-cost

tool; however, its production is limited. IGRA results in fewer false-positive results than with TST, but has higher cost and supply chain issues that challenge its routine induction in National TB programmes ⁸.

Both the tests are based on stimulating the cell-mediated immune response to detect whether it recognizes the antigens of Mtb. However, both TST and IGRA have reduced sensitivity in immunocompromised patients and cannot determine between active TB and LTBI.

The QuantiFERON®-TB Gold Plus (QFTPlus), a new version of IGRAs, have been recently evaluated in the field of latent TB diagnosis. The QFT-Plus exploit both CD4+ and CD8+ T cells immune response to Mtb, having an important clinical value in conditions of immune depression due to CD4 T-cell impairments as in HIV-infection. In addition, a number of studies suggest that the CD8+ response is present at the onset of the infection and RD1-specific CD8 T-cells



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are more frequently detected during active TB compared to LTBI and, within LTBI, in recent infection compared with remote infection. ^{9,10}

OBJECTIVES

To detect Latent Tuberculosis infection (LTBI) among the household contacts of bacteriologically confirmed TB patients by Interferon Gamma Release Assay (IGRA) in Tiruvallur District and also to assess the age and sex wise preponderance of LTBI in the community.

METHODOLOGY

STUDY DESIGN : Cross sectional study

STUDY PLACE AND TIME : Tiruvallur District during March to October 2022.

STUDY POPULATION : Household contacts of bacteriologically confirmed TB patients.

INCLUSION CRITERIA : Household contacts of active TB Patients.

EXCLUSION CRITERIA :

- Non contacts of Active TB patients.
- Children <5 years & HIV patients.

SAMPLE COLLECTION:

- Blood samples (5 mL) were collected in Lithium Heparin blood collection tube.
- 1 ml of blood is drawn from the sample and transferred to each of the QFT-Gold Plus tubes and gently shaken well. Incubated for 16-24 hrs followed by centrifugation to separate the plasma.

SAMPLE SIZE :

- Total Number of TB Cases enumerated in Tiruvallur District was 829.
- Samples for IGRA from Close Contacts 1200.

IMMUNE ASSAYS

The Interferon-Gamma (IFN-γ) Release Assays (IGRAs) provide an alternative to the century-old tuberculin skin test (TST) for diagnosing latent tuberculosis infection (LTBI). The QuantiFERON®-TB Gold(QFT) assay, is an enzyme-linked immunosorbent assay (ELISA) that measures the amount of IFN-γ produced by T-cells stimulated by Mycobacterium tuberculosis-specific antigens namely Early Secreted Antigenic Target 6 (ESAT-6), Culture Filtrate Protein 10 (CFP-10) and TB 7.7. Many studies in adults have shown IGRAs to be more specific than the TST for detecting LTBI and at least as sensitive as the TST for detecting tuberculosis (TB) disease.

RESULTS

A total of 1200 household contacts of Active TB Patients in Tiruvallur District were subjected to IGRA using QuantiFERON®-TB Gold (QFT) Assay, out of which 520 household contacts (43%) were detected with LTBI (Fig-1).

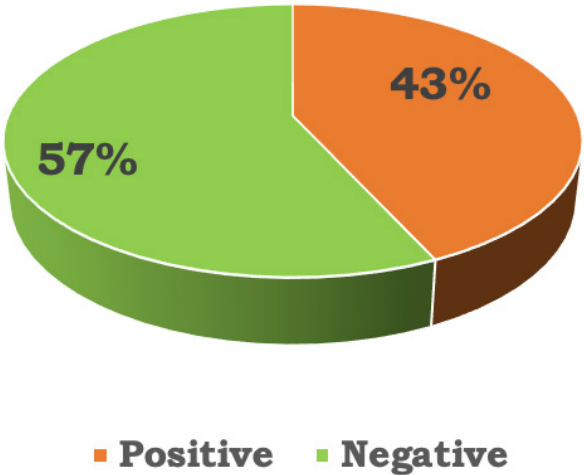


Figure 1 : Prevalence of LTBI among Household contacts

Out of the 1200 samples tested, only 22 samples (2%) became indeterminate.

Among the 520 LTBI cases detected in Tiruvallur District, there is a clear preponderance of infection in Female (62.3%) than Male (37.7%) (Fig-2).

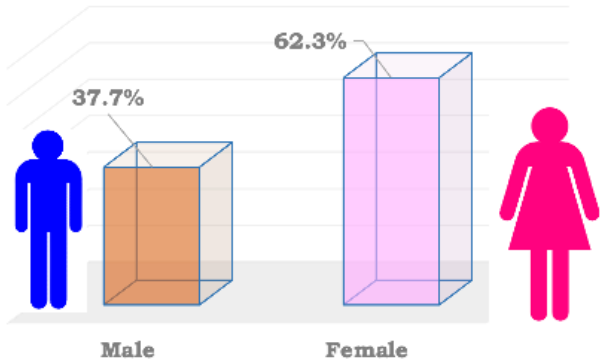


Figure 2 : Sex wise distribution of LTBI among household contacts

Among the LTBI positive household contacts detected in Tiruvallur District, age wise distribution of cases is shown in Fig-3. In children between 5-14 years age group (13%) and in elderly persons above 55 Years of age (12%), the LTBI prevalence was found to be less when compared to the other age groups. The age group between 15-44 years has almost 59% of the total of LTBI cases detected in this study.

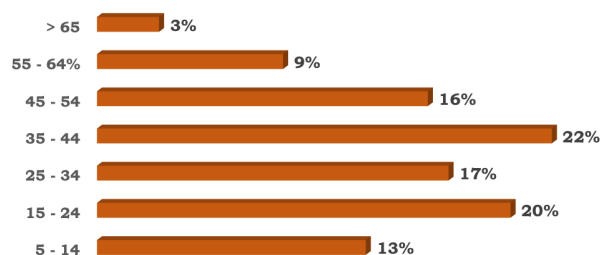


Figure 3 : Age wise distribution of LTBI among household contacts

DISCUSSION

The global prevalence of LTBI is estimated to be nearly 33%.¹² In India, there are no estimates regarding the prevalence of LTBI in the general population; however, the WHO data indicate that roughly 3.5 lakh children below the age of 5 years were eligible for LTBI treatment¹³. Although most of the infected persons do not manifest the disease. They are at high risk of developing active infection and hence represent a reservoir of bacteria. The lifetime risk of reactivation of TB is estimated to be around 5-10%¹⁴. The risk is much higher in those with HIV, with a 10% annual risk of activation, and in young children. If untreated, 40% of the LTBI children under 1 year of age develop active disease, whereas it is 24% in children of 1-10 years and 16% in those between 11 and 15 years.^{15,16}

It has been proposed that the infected persons accumulate in the pool of LTBI from which individuals having latent TB exit with active TB. To control the active infection, reducing the magnitude of the pool of latent infection is required¹⁷. Hence, screening and treatment of LTBI should be an important part of global TB control activities if we want to achieve End TB strategy¹⁸. WHO recommends systematic screening, identification and treatment of LTBI especially in groups at high risk for developing active TB like people living with HIV, child contacts of pulmonary TB cases, patients with silicosis and other forms of immunosuppression.¹⁹ After ruling out active TB cases by a symptom screen, individuals should be tested for LTBI by either interferon-gamma release assays (IGRA) or tuberculin skin test (TST). Hence, detection of LTBI is of paramount importance in the course of achieving elimination of TB by 2025 in India.

Both TST and IGRA, the two currently available tests for diagnosis of LTBI, work on the principle of cell-mediated immunity. The TST detects M.tb sensitization via a delayed-type hypersensitivity response to M.tb antigens from purified protein derivatives (PPD) while IGRAs measure interferon-gamma (IFN- γ) release in response to specific M.tb antigens.

Limitations of TST is cross-reaction with environmental non-tuberculous mycobacteria and the BCG vaccine. IGRA claims to overcome these limitations and be more specific than TST.

This study has a sizable population of household contacts of active tuberculosis patients screened for the presence of LTBI by IGRA and the results reveals the prevalence of 43% of LTBI in Tiruvallur District. WHO estimates that approximately 40% of the Indians are infected with Mycobacterium tuberculosis, the vast majority of who have LTBI. Similar study conducted in Chennai, the LTBI prevalence was 74% detected by either a positive TST or positive QFT-GIT.¹¹

More men than women develop and die of tuberculosis (TB) but fewer data exist on sex differences in Latent TB infection (LTBI). Compared to numerous reports on active TB, disparities between sexes in LTBI are less frequently analyzed and have inconsistent findings. Male sex has been identified as an independent risk factor associated with LTBI in some studies.²⁰⁻²²

Limited evidence is available in Tamil Nadu to indicate the proportion of LTBI between males and females. In our study, the proportion of LTBI was significantly higher in females than in males (62.3% Vs 37.7%) similar to the one reported from Brazil.²³ Behavioural factors that affect sex differences in active TB disease may play a role in LTBI. Women spend more time performing indoor household tasks which could affect exposure dynamics for domestic close contacts.

Limited studies are available to report the age-specific prevalence of LTBI among household contacts, including adolescents and young adults exposed to an active index case in a TB endemic setting. In the present study, we have shown an increased prevalence of LTBI between 15-44 years (59%). South African investigators also found an increasing prevalence of LTBI among a younger age group^{24,25,26}.

CONCLUSION

Our study showed a high prevalence of LTBI (43%) among household contacts of pulmonary TB patients in a high burden setting in Tiruvallur district. It also revealed an interesting finding on the higher prevalence of LTBI in females than males, suggesting the need to confirm the pattern in other districts of Tamil Nadu. Higher prevalence LTBI observed in young adult is also a cause of concern and need to be counter checked with other districts of Tamil Nadu.

ACKNOWLEDGEMENT

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FINANCIAL SUPPORT

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ORIGINAL ARTICLE - PUBLIC HEALTH

IODOMETRIC TITRATION OF EDIBLE SALT SAMPLES TO ASSESS THE AVAILABILITY OF IODINE IN TAMIL NADU FROM 2017-2022

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Abstract

BACKGROUND: Globally Iodine deficiency disorders (IDDs) is one of the important public health problem. Iodine deficiency disorders leads to various diseases including cretinism, goitre, hypothyroidism, mental retardation, loss of hearing, intellectual disabilities, abortion, still birth. Iodine deficiency is the one of the preventable public health problems. Due to the implement of IDD control programme in India, 94% of people taking iodised salt. IDD Monitoring Laboratories in States are useful in measuring amount of iodine in production and consumer level.

OBJECTIVE: To test the availability of iodine in edible salt at households and retailers both in rural and urban areas from Jan 2017- June 2022 by iodometric titration method.

METHODS: Iodine Content of edible salt sample was estimated by a process called Iodometric Titration which involve the titration of iodine liberated by addition of sulphuric acid (H₂SO₄) from a solution of iodated salt. Iodine liberated is then titrated with Sodium Thiosulphate.

RESULTS: A total of 31805 edible salt samples were tested at State IDD Monitoring laboratory from Jan 2017 to June 2022 and overall, 75% of the salt samples tested were found to have >15PPM iodine. There has been a consistent increase in iodine adequacy from 66% in 2017 to 83% in 2022.

CONCLUSION: NFHS 2019-21 survey conducted among the households in which salt was tested, 92% in Tamil Nadu had iodized salt against the national average of 94% suggesting the importance of State IDD Monitoring Laboratory to provide scientific evidence to ensure availability of iodized salt in the community.

KEYWORDS: Iodine Deficiency Disorder, Iodized Salt, IDD Monitoring Lab.

INTRODUCTION

Iodine is a element required for human body for normal mental and physical development. It is the one of the important element for thyroid hormone synthesis.¹ Iodine deficiency disorders leads to various diseases including cretinism, goitre, hypothyroidism, mental retardation, loss of hearing, intellectual disabilities, abortion, still birth. Iodine deficiency is the one of the preventable public health problems.² Iodine deficiency was thought to associated only with goitre and cretinism.³ But now a days due to advancement in Biomedical research has shown that iodine deficiency has a significantly associated with many disease and also independent risk factor for certain disease affecting peoples in all age group from fetus to adults.⁴⁻⁶

The iodine deficiency in pregnancy is a preventable conditions and prevention of iodine deficiency in pregnant mothers prevent neurodevelopmental disorder in new born. The children born in iodine-deficient regions have intelligence quotient (IQ) 13.5 points lesser than children born in iodine sufficient regions. IDD with its direct association with brain development, cognition development.

Globally, 1.8 billion people are at risk of developing iodine deficiency due to insufficient iodine intake in diet. The Indian population is more prone for IDD due to insufficient amount of iodine in the soil.⁷

Globally, Universal Salt Iodization (USI) is the one of the key strategy for control of IDD. In 1994, It was introduced by the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) Joint Committee. It is a safe, cost-effective and sustainable strategy to ensure sufficient intake of iodine by all individuals.⁸ Salt iodization, which costs less than ₹0.2 per person per year⁹ and has been rated as one of the most cost-effective development interventions (ratio of 1:81) by Copenhagen Consensus Statement 2008¹⁰ and subsequently again in 2012.¹¹



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In India IDD has declined due successful adoption and scaling up of USI in the country. IDD control programme in India has been a public health success story. India has achieved >90 per cent household level coverage of adequately iodized salt of USI as per NFHS 2019-21.¹²

OBJECTIVES

- To establish the State IDD Monitoring Laboratory at State Public Health Laboratory (SPHL), Directorate of Public Health and Preventive Medicine.
- To train the field staff for collection of edible salt samples collected from households and retailers, both rural and urban areas and shipment to State IDD Monitoring Laboratory @ SPHL, Chennai.
- To test the availability of iodine in edible salt by iodometric titration method from 2017-2022.
- To initiate appropriate preventive and corrective measures to ensure consumption of 100% iodized salt in households.

METHODS

SAMPLING PROCEDURE :

- 50 salt samples were collected per District for a 3 months cycle.
- Out of 50 samples, 25 samples from rural households, 15 samples from urban households, 7 samples from rural retailers and 3 samples from urban retailers were collected with Proper label (Fig-1).
- The amount of an iodated salt samples should be about 100 gms for loose iodated salt kept in polythene pouch and a whole packet for packed iodated salt.
- These samples were sent to State IDD Monitoring Laboratory for testing by iodometric titration method (Based on IS: 7224 – 1985).
- A compiled report (Monthly Report) of Iodated salt analysis have been furnished to State and District Programme officers every month for necessary corrective measures.

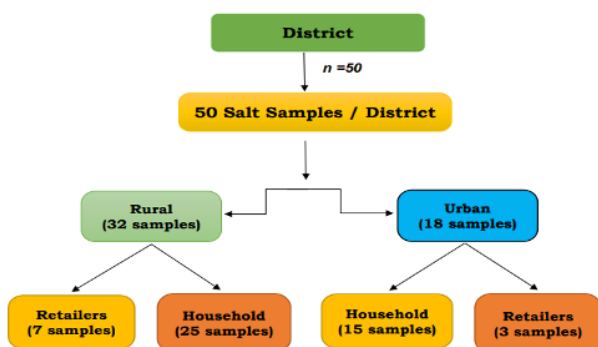


Figure 1 : Sampling procedure

RESULTS

A total of 31805 salt samples were received from the districts from Jan 2017 to June 2022 were tested for the Iodine content by Iodometric Titration Method at State IDD Monitoring Laboratory. Overall, 75% of salt samples were found to have >15PPM iodine.

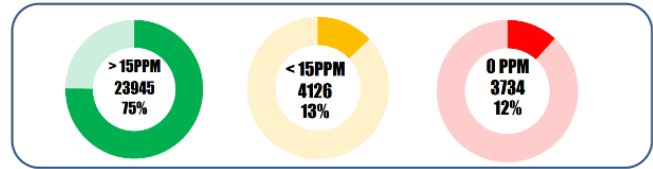


Figure 2 : Iodine content in salt samples

There has been a consistent increase in iodine adequacy from 66% in 2017 to 83% in 2022 (Table-1).

Table 1 : Overall analysis of Iodine in salt sample

Over all Analysis - 2017 - 2022						
Year wise	> 15PPM	%	< 15PPM	%	0 PPM	%
2017	3120	66%	753	16%	820	17%
2018	10708	73%	1972	13%	1968	13%
2019	4054	76%	621	12%	642	12%
2020	1453	81%	133	7%	197	11%
2021	2968	88%	330	10%	92	3%
Jan 2022 - June 2022	1642	83%	317	16%	15	1%
Total	23945	75%	4126	13%	3734	12%

District wise analysis indicate few districts viz., Virudhunagar, Villupuram, Theni, Krishnagiri, Madurai and Ramanathapuram has less than 70% of the salt samples having >15PPM of iodine (Table-2).

Table 2 : District wise analysis of Iodine in salt sample

District wise Analysis of Iodine in Salt Sample, during (Jan 2017- June 2022)

S.No	Districts	> 15PPM %	< 15PPM %	0 PPM %
1	Chengalpattu	100%	0%	0%
2	Ranipet	90%	10%	0%
3	Salem	90%	10%	0%
4	The Nilgiris	89%	10%	1%
5	Tenkasi	86%	14%	0%
6	Kanchipuram	85%	6%	9%
7	Nagapattinam	84%	10%	6%
8	Ariyalur	83%	8%	9%
9	Namakkal	83%	12%	5%
10	Kanyakumari	81%	10%	9%
11	Coimbatore	79%	10%	11%
12	Karur	79%	11%	10%
13	Tiruppur	78%	13%	9%
14	Trichy	76%	12%	11%
15	Tiruvallur	76%	14%	10%
16	Sivaganga	76%	12%	11%
17	Tiruvannamalai	76%	12%	12%
18	Thiruvallur	75%	10%	15%
19	Tuticorin	75%	17%	9%
20	Dharmapuri	74%	13%	13%
21	Tirupathur	74%	11%	15%
22	Erode	74%	18%	10%
Tamil Nadu		75%	13%	12%
23	Cuddalore	73%	13%	14%
24	Vellore	72%	11%	17%
25	Tirunelveli	71%	12%	17%
26	Dindigul	71%	17%	13%
27	Pudukottai	70%	14%	16%
28	Perambalur	70%	23%	7%
29	Thanjavur	70%	16%	15%
30	Ramanathapuram	69%	14%	17%
31	Madurai	67%	15%	18%
32	Krishnagiri	67%	13%	20%
33	Theni	66%	10%	25%
34	Villupuram	65%	15%	20%
35	Chennai	62%	23%	15%
36	Virudhunagar	59%	17%	23%

DISCUSSION

In order to eliminate IDD in the country, there is a need to invigorate the efforts at national and State level from production to consumer level. There is a need to reposition the NIDDCP by linking elimination of IDD to HRD of the country. The Country should follow social process model based on four main components. The four main components are Demand for Iodized Salt (Pull), Supply of Iodized Salt

(Push), Regular Reliable Representative State Level Scientific Data and Data for Decision Makers and Sustained Political Commitment .

Even though, 92% of iodized salt consumption among households in Tamil Nadu (Based on NFHS-5 survey findings), still there are few districts in Tamil Nadu with less than 70% salt samples found to have >15PPM of the required iodine content needs to be addressed.

There is a need for renewed focus and vigour to achieve USI in the country by developing strategy to target and engage small-scale producer/difficult to reach areas/marginalized population and strengthen monitoring of iodine content of salt from production to consumer level. There is also a need to establish national and State level coalitions for sustained optimal iodine intake comprising key stakeholders which include government policymakers, salt industry representatives, civil society, consumer organizations and national and international development agencies working for IDD elimination in India.

CONCLUSION

The elimination of IDD is eminently possible. We are at a turning point in our battle against the ancient and pervasive scourge of iodine deficiency. IDD control programme is one of the success public health programme. The result from State IDD Laboratories providing the evidence-based report for 100% elimination. The current 94% household level coverage of iodized salt in India, of which 78% is using adequately iodized salt. It is a huge achievement. In future with accelerated and coordinated efforts it would be possible to achieve the IDD control in our country.

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REVIEW ARTICLE - PUBLIC HEALTH

HEALTH DEPARTMENT PREPAREDNESS IN SITUATIONAL ANALYSIS FOR 44TH CHESS OLYMPIAD HELD AT MAMALLAPURAM 28TH JULY- 10TH AUGUST, 2022

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BACKGROUND : The Chess Olympiad held at Mamallapuram from 28th July- 10th August was the very first time such an international event was organized and conducted in our country. This event indeed comprised of teams from 186 countries in open section and teams from 162 teams in the women section. The Directorate of Public Health and Preventive Medicine took care of the entire event in various aspects namely arranging specialist team, screening medical team, ensuring Covid appropriate behavior, digital health platform, vector control, disinfection, protected water supply, general sanitation and also preparedness for mass casualties

KEYWORDS : Sanitation, Triage, Food Safety, Pandemic

INTRODUCTION

Mass gatherings where people accumulated at large for a particular purpose in a short duration, gain importance by demanding health and medical arrangements apart from which the people gathered.

The Chess Olympiad was a biennial chess tournament conducted where teams representing various nations of the world competed. FIDE organized the tournament and hence selected the host nation. FIDE was formed in the year 1924. First Olympiad was organized in 1927, which took place in London. The Olympiads were occasionally held annually and at irregular intervals until World War II but since 1950 they are held regularly every two years

The 44th Chess Olympiad organized by the FIDE was held in Chennai, Tamil Nadu from 28 July to 10 August 2022. This was the very first chess Olympiad to take place in India. The event was initially supposed to take place in Khanty – Mansiysk; along with the chess world cup 2019, but was moved to Moscow and scheduled for the period from 5 to 17 August 2020. However, it was postponed as a result of the growing concerns about the Covid 19 pandemic and finally relocated to Chennai following Russia's invasion of Ukraine. Totally 188 teams were registered from 186 countries in open section and 162 teams from 160 countries in the women section.

The Tamil Nadu Health department made arrangements for medical teams and ambulances in order to cover covid – 19 screening at airports, hotels and venues. The Department identified 13 hospitals in and around Old Mahabalipuram Road and East Coast Road. The Directorate of Public Health

and Preventive Medicine monitored the compliance with the covid 19 protocols, real – time PCR testing and following the Monkey pox guidelines. The Directorate also deployed static medical teams in identified Hotels for treatment of minor ailments; screening medical teams were deployed in all 21 hotels and at the tournament venue. Continuous fogging and spraying measures to prevent mosquito breeding and fly control measures were implemented by the Directorate in coordination with the local bodies. More than 250 persons including medical personnel, paramedical personnel and field workers were deployed from the Directorate.

PLANNING

1.State level organising committee : State level organizing committee health and medical services was formed under the chairmanship of Principal Secretary, Health and Family welfare department. The committee comprised of Commissioner Greater Chennai Corporation, Commissioner of Food Safety department, Mission Director NHM, Director of Indian Medicine and Homeopathy, Project Director, Managing Director of Tamil Nadu Medical Service Corporation, Director of Medical Education, Director of Medical and Rural Health Services, Director



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of Public Health and Preventive Medicine, District Revenue Officer of Tamil Nadu Health System Program and District Collector of Chengalpattu.

2. District level organising committee : District level organising committee was formed under the chairmanship of District Collector of Chengalpattu District. The committee comprised of Deputy Director of Health Services, Joint Director of Health Services, Dean Chengalpattu Medical College and Designated Officer Department of Food safety and Drug administration. The committee in coordination with the state level organizing committee.

3. Working group : At state level, working group was formed under the chairmanship of District Revenue Officer, Tamil Nadu Health Service Program and Additional Director of Tamil Nadu Health Service Program. The working group was formed for Covid screening at airport and tournament venue, covid treatment and isolation, fogging and disinfection, medical teams at opening and closing ceremony, Yoga and Naturopathy teams, Anti doping coordination, specialist team at tournament venue, mass casualty team, static medical team, emergency operation and ambulance assistance, 104 control room, insurance cards and inpatient care, food safety, child health, maternal health, TNMSC supplies and distribution ID cards and passes for the vehicles.

4. Screening at airport : A team was arranged at the airport for screening of players, coaches, support staff and visitors. 2% of total flight passengers were tested randomly on arrival at the airport.

5. Medical arrangements at Hotels

5.1. Static Medical team : Health teams had a prompt display at all hotels and strategically stationed near the reception for easy access to players and team members. Totally 8 static medical team was formed. Each team consisted of Doctor, Nurse, Pharmacist, lab Technician and a Driver. The 8 static medical team were stationed in the identified hotels namely ITC Welcome, Taj Fisherman Cove, Grande Bay Resorts, Park Plaza, Hotel Leela Palace, Esthell Village Resort, Novotel Sholinganallur and Siruseri. The teams were posted in three shifts round the clock in the hotel.

The team did screening for all the chess players, coaches, support staffs and other team members in the stationed hotel. They were screened for temperature using contactless thermal scanners. If anybody was found symptomatic, they were isolated and tested in the same hotel based on existing covid protocols. Any one from the team (MO/SN/Pharmacist/Lab Technician) did the screening. The particulars of the screening were recorded in the given format daily before they leave the hotels for the tournament.

The static medical team also treated minor ailments as per the SOPs. If anyone required institutional care, they were shifted after informing the 104-control room. The patient was shifted through 108 stationed in the hotel.

The static medical team was equipped with drugs for treatment of minor ailments, emergency drugs, dressing materials, examination kits, Td vaccine, ECG, Oxygen Concentrator, Nebulizer, wheel chair and covid sample collection kit.

5.2. Screening Medical team : Screening Medical team comprising MLHP/ Village Health Nurse, Health Inspector, Hospital worker was deployed in the hotels where static medical team was not there. They were in the hotel from 9 am to 4 pm.

5.3. Lab : Lab technician in the static medical team collected the covid samples for those who were found symptomatic. The lab technicians were equipped with adequate VTM kits, PPE kits, RTPCR testing request forms. Any players, coaches, support staff or visitors found symptomatic, samples for covid was collected. The collected samples were transported using reverse cold chain mechanism by the Health Inspector deployed for the Hotel to the State Public Health Laboratory, DMS campus, Chennai. Standard RT – PCR testing done at State Public Health Laboratory, DMS campus, Chennai. Turn Around Time (TAT) for release of results was 3 hours from the time of sample receipt at State Public Health Laboratory. Once the results were received, it was communicated to the concerned.

6. Arrangements at Tournament venue :

6.1. Specialist team : Totally 7 specialist team was deployed in the Tournament site from Chettinad Hospital and Research institute, Shri Sathyasai Institute of Medical Sciences, Tagore Medical College Hospital, Karpaga Vinayaga Institute of Medical Sciences, Melmaruvathur Adhiparasakthi Institute of Medical Sciences, SRM Medical College and Hospital, Shree Balaji Medical College and Hospital.

Specialist team comprises of Physician, Surgeon, Anesthetist, Staff Nurse, Hospital worker. The team was equipped with drugs for treatment of minor ailments, emergency drugs, dressing materials, examination kits, Td vaccine, ECG, Oxygen Concentrator, Nebulizer and wheel chair.

The static medical team also treated minor ailments as per the SOPs. If anyone needed institutional care, they were shifted after informing the 104 control room. The patient were shifted through 108 stationed in the hotel.

6.2 Screening Medical Team : In the Tournament venue 5 screening medical teams were deployed in VIP entrance, Players bay and Spectators entrance. The screening medical

team was equipped with contactless thermal scanner, Pulse Oximeter, hand sanitizer, masks, BP apparatus, Glucometer and covid sample collection kits. The screening medical team did screening for all the participants like chess players, coaches, support staffs, other team members and the spectators. They were screened while entering the tournament venue for temperature using contactless thermal scanners. Anybody found symptomatic should not be allowed to enter the venue until found negative. If anyone found symptomatic samples for covid was collected at the venue itself.

6.3 Ensuring Covid Appropriate Behavior : Totally 6 teams were deployed in players bay, Hall 1 entry, Hall 2 entry, VIP entrance, Cloak room and spectators' entry. The team consisted of Health Inspectors, Hospital workers, DBCs and Mazdoors. The team ensured whether all wore mask covering nose and mouth, social distancing as far as practicable.

6.4 Digital Health Platform : At the tournament venue a digital health care platform was organized. Through this platform health related services and information were given through electronic and telecommunication technologies. It helped the players to contact their doctors for care and treatments.

6.5 Vector control & Fly control : Vector control and fly control were carried over by local bodies, public health department and hotel authorities at the tournament site, 21 hotels and surrounding areas of Mahabalipuram. Inside the hotel premises vector and fly control were carried out by the hotel authorities. Public health department started vector and fly control activities 2 weeks before the commencement of the tournament. The solid waste management, fly control measures taken at compost yard, outdoor fogging in the areas surrounding the hotels were supervised by the local bodies.

6.6 Disinfection : Disinfection activities in tournament areas and inside the hotels were carried out by the hotel authorities as per the protocols laid on by the Health Department.

6.7 Protected water supply : Protected water supply in the hotel was provided by the hotel authorities in the hotel itself. The local bodies and the public health department supervised the supply of protected water supply.

6.8 General sanitation : To ensure proper sanitation adequate arrangements were made before the tournament itself. Sanitation inside the hotel were taken care by the hotel authorities. Sanitation in the surroundings were taken care by the local bodies under the supervision of Public Health department. Mahabalipuram Town Panchayath, Greater Chennai corporation, Kelambakkam Panchayath areas were thoroughly cleaned in and around before the commencement of the tournament. Adequate arrangement was made for

the proper collection and removal of all refuse throughout the tournament and adequate number of conservancy workers were supervised by the masthries under the control of Health Inspectors/ Sanitary Inspectors. Provision of sufficient number of carts for prompt removal of all refuse were collected and dumped in dumping yard. Provision of temporary toilets separate for each sex were provided at the tournament sites in adequate number for use of the general public and all workers involved in the tournament site.

7. Preparedness for mass casualty :

In case of Mass Casualty Incidence (MCI) Health sector provides assistance to the ill and injured.

The role of health sector is

1. Assessment and Triage
2. Stabilization of the sick
3. Transportation of the sick to the nearby health facility.

7.1 MCI : Mass Casualty Incidence: when the no. of fatalities exceeds the local city resource capabilities; causing them to request assistance or aid from outside.

7.2 Preparedness for MCI :

1. ACLS Ambulance to be kept always ready and will stay 2 to 3 km from actual event area so that in case of any MCI.
2. MCI – A triage team and emergency management team with adequate equipment must be stationed at closed by
3. 104 exclusive help line for the event.
4. Evacuation plan assembly point outside the event area to be designated and the ambulances with the patients will be sent to nearby Hospitals as per the list given below.
5. All ambulance pilots and health assistants must be instructed and given clear instructions the mode of operation during declaration of MCI.
6. Govt and private hospitals of Mahabalipuram to be sensitized for emergency management.
7. Additional Medical officers and nurses from Primary health centers and Govt Hospitals to be mobilized on declaration of MCI.
8. All medicines and equipment and kits are provided by DMS.

7.3 Types of Medical Teams Required :

S.No	Teams*	Description	Position
1	Medical Team	3 doctors, 3 nurses and 3 paramedics for each venue with medicine kits	At the venue
2	Triage / Assessment Team	Teams with 1 doctor, 1 nurse and 2 paramedics <ul style="list-style-type: none"> • medical teams of near by 5 hotels • 1 team for 250 persons in 1-2 hour TRIAGE 	Nearby facility
3	Emergency Management	2 teams with complete resuscitation kits	

7.5 Simple Triage and Rapid Treatment (START) :

1. **Green** - Able to move aside – managed by first aid team
2. **Black** - Not able to move / no respiration even after opening the airway. (Dead – to be cleared with respect)
3. **Red** -not able to move and -

RR > 30	-	need emergency
CRT > 2 sec	-	management

Not obeying simple commands.

4. **Yellow** - Rest of the immobile patients.
- managed by medical team

7.6 On declaration of Mass Casualty Incident by the overall nodal officer :

1. 104 to activate all medical teams, local hospitals, DDHS, JDHS, Deans & MS of all hospitals concerned immediately.
2. All Medical teams nearby (5 teams) must rush to the declared spot in less than 5 minutes (5 minutes to 40 minutes; ITC welcome, Grand bay, Esthel village, Taj fishermen cove and Novotl Siruseri)
3. All ambulances (22) should reach the spot in 5 – 30 minutes
4. Emergency medical team to rush in 2 minutes
5. In house medical team and other teams to start triage
6. Volunteers help to remove the dead
7. Red tagged patients to be shifted in less than 30 minutes to those hospitals given above
8. Additional man power and ambulances to be assigned by JDHS & DDHS as required
9. One coordinator to monitor bed availability and ambulance movement.

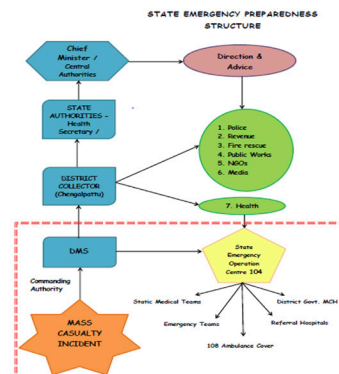
7.7 Preparedness for Red tagged patients of Chengalpattu Medical College Hospital, Chengalpattu

1. 2 ICU Beds in IMCU- TAEI block and 2 ICU beds in TAEI ward with all monitoring facilities, O2 outlets and Suction outlets have been allotted with 2 emergency drug cart trays with all resuscitative drugs and consumables.
2. In case of more number of inpatients expected, the allotted beds may be extended up to 10 to 15 beds.
3. Duty Asst. surgeons of General medicine, General surgery, Anesthesiologists, Orthopaedician departments were posted for 24 hours duty apart from the routine duty team, along with two senior ICU trained staffs and 4 paramedical workers were exclusively allotted. Duty MO and other staffs were relieved only after the next duty persons arrival
4. Appropriate Sign boards at appropriate places for easy access to TAEI block were kept.
5. One ALS ambulance was exclusively allotted and kept ready with all amenities including blood storage facilities.

7.8. District Field Operation Team: 12 District field

operation teams were formed. These teams were stationed in tournament venue, Mahabalipuram, OMR, Sholinganallur and Kovalam. The team would be activated in any MCI arises.

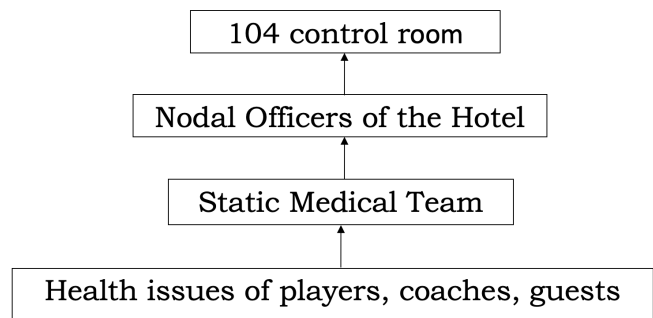
7.9 Flow of command



8. Empanelled in Government of Tamilnadu decided to deliver health insurance card to all players under Chief Minister Comprehensive Health Insurance Scheme. Under this scheme the players can bear the medical expenses upto ₹2 lakhs (€ 2,500) in case any players admitted in the hospital.

9. Emergency operations and Ambulance Assistance:

9.1. 104 control room : A state control room for health department was formed in 104 call centre for addressing the health related grievances and for daily report collection. State control room coordination committee was formed.



in the prescribed format through online. The reports were collected for the period of 8 pm to 8 pm. The nodal officer of the concerned hotel entered the report through online with username and password given to them. The nodal officer from the hotel where static medical teams were deployed submitted the report on the line list of the outpatient.

9.2. 108 Ambulance deployment : Totally 28 ambulance deployed exclusive for the 44th Chess Olympiad. 108 ambulances were stationed one in each hotel. In Tournament venue 5 ambulance was deployed in the following site. 1 ALS ambulance at the entry of the tournament venue, 1 ALS ambulance near specialist team, 2 BLS ambulances in VIP parking area, 1 BLS ambulance at spectators frisking area.

Apart from regular 108 ambulances 5 neonatal ambulance were deployed.

10. Anti dope team : Anti dope team was deployed in the tournament site. WADA gave instructions to all India chess federation AICF to collect urine samples from players chosen randomly on 3 different days, 28.07.22, 03.08.22 and 09.08.22. On 28.07.22 being the inauguration day samples were not collected.

A team from NADA of 2 doctors and 2 nurses came and took charge of the doping control station on 28.07.22.

On 3rd and 9th of August 2022, 10 urine samples were collected each day from different players. Players were chosen randomly by WADA representative Dr Morape. A total of 20 Samples were collected, stored properly in the ILR and packed to maintain the temperature. Samples were sent through the courier on the same day to the designated laboratory at Delhi.

11. Food safety team : Food safety team was deployed in all 21 hotels accommodating the players. The team inspected the food served to the players every day. Additional hygiene training and inspection for food safety team was given. Staffs from other district were deployed to monitor food safety measures in all hotels.

12. Blood bank : Blood was arranged in all blood banks of Chengalpattu Medical College Hospital and RGGH. E – Rakthakosh app training was given to all Health Personnel who were involved in the medical team. The contact directory of the donors was made available, which will help the health personnel to arrange without any delay.

13. Yoga and Naturopathy : Yoga and Naturopathy team was deployed in all hotels accommodating players. The team conducted yoga sessions every day in the morning which helped the players to ease out from stress. Staffs from other district were deployed to have team in all the 21 hotels.

14. Training : Training for health personnel involved in the 44th Chess Olympiad was conducted at RGGH and Chengalpattu Medical College and Hospital from 12.07.2022 to 20.07.2022. At Chengalpattu Medical College training was conducted in 4 batches and in RGGH training was conducted in 6 batches. Training module was prepared and the training was given on treatment of minor ailments, drug reporting format, SOP on mass casualty, Google Translation app, e-Rakthakosh app, Triaging and mock drill. Totally 433 health personnel were trained; 242 health personnel at Chengalpattu medical college and 191 health personnel at RGGH.

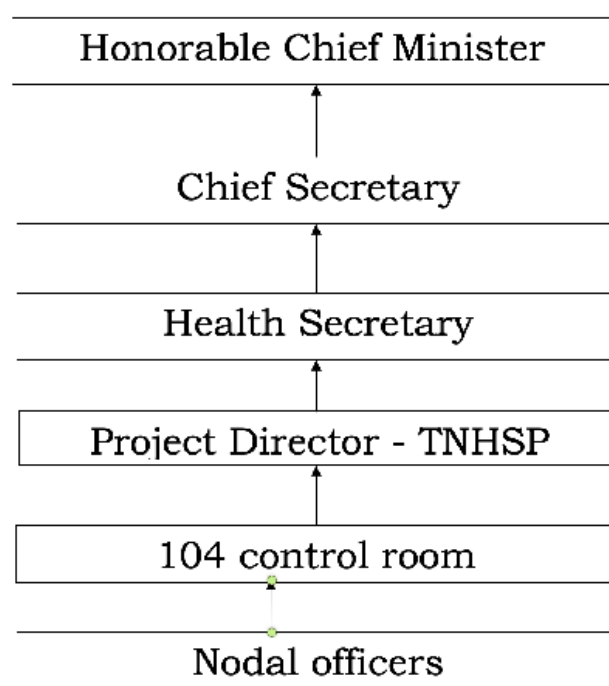
15. Review and progress meeting : Periodic review meeting was conducted at state level and district level to monitor the progress of the arrangements by the health department. State level coordination meeting and District level coordination

meetings were conducted to identify the progress, challenges and the gaps for the effective implementation of the health services.

16. Communication strategies : For effective communication with the team members at the state level control room number was established 044 27440100. Apart from landline number whatsapp number for control was established 7550032333. Also whatsapp groups were created for exchange of information and communication.

17. IEC : SOPs were formed for treatment of minor ailments and management of mass casualty by the experts. Detailed training was given for the health personnel on the SOPs. A contact directory was prepared at the state level for department of health and family welfare. The contact directory included details of all team involve from health and family welfare department.

20. Data collection : Reports for health department were collected through online by the 104 call centre. Online daily reports from the nodal officer were collected.



It was really a great experience to work in Chess Olympiad especially during covid pandemic with nearly 3000 participants including players, coaches, support staffs from more than 180 countries. We were prepared for managing covid positive individuals and some food poisoning cases as players with varied food habits assembled here. But to our surprise we managed from preterm labour to fractures, 44th chess Olympiad saw it all. We managed effectively all kind of illnesses/ symptomatic with highest satisfaction for those who availed medical treatment/services. We managed heart

attack, prostate enlargement, denture replacement , newer spectacles, sudden blackout during a game of chess at playing arena. We managed illness/ symptoms right from head to foot effectively to the fulfillment of all participant of chess Olympiad.

With the time technology, human interactions, economics as well as lifestyle including civilization has undergone rapid changes, due to this mass gatherings though reduce in numbers has increased in the way mass gather in unthinkable proportion. For the state this is naïve experience , hence with capacity building, this was tackled. The circumstance where we had to tackle pandemic especially recent pandemic has thrown unforeseen solution in anticipation of possible re emergence.

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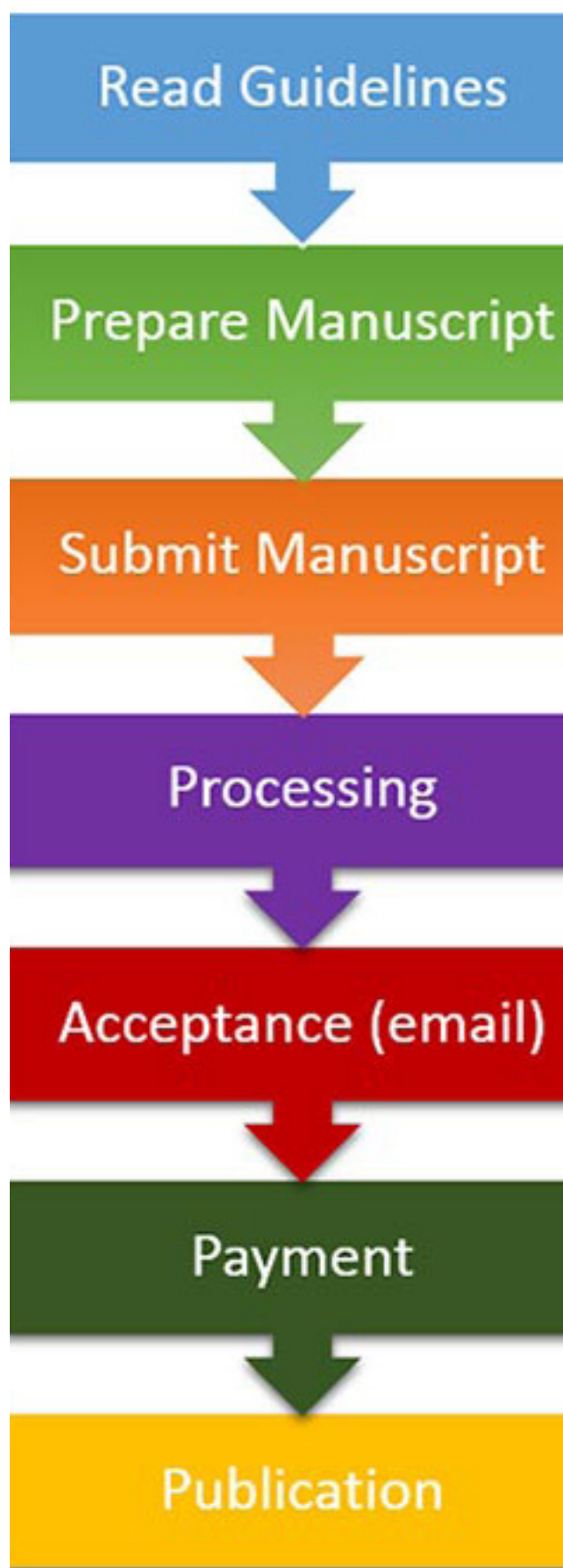
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