

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

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Abstract

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

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

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

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

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

INTRODUCTION

Globally 67 million people died around the world in 2022.¹ The place of death of an individual is very essential indicator quality of end of life care² as it influences immensely the type and manner of care provided to an individual during their death. The deaths occurring at home mostly doesn't involve trained healthcare professionals and technologies which can prolong life as compared to deaths happening in health institutions.³ In the low income and middle income countries (LMIC) most of the deaths occur at home⁴ while on the contrast it has been noticed that only minority of deaths occur at home in high income countries.⁵⁻⁷ The home deaths occurring in LMIC has a notable variation being highest in countries in South, East and South East Asia and sub Saharan Africa.⁸ In India around 28% of deaths occurred in Institution in 2020.⁹ The status of Tamil Nadu is that 30 % deaths has occurred in Institution as per data available in Civil registration System in the state.¹⁰ The place of death trend is very important as they provide insight into changing societal, family, and personal more and they help to direct health policymaking and health services planning.¹¹ The trend is noted to be changing patterns regarding the place and type of care during death in developed world.¹² In India

the institutional deaths trend has started to decline from 34.5% to 30 % when compared from 2017 to 2020.^{13,14,15,16} There is no adequate literature analysing the trends in place of death in Tamil Nadu. Hence we will study the trends in place of death in Tamil Nadu and its districts.

OBJECTIVE

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

METHODOLOGY

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



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

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

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

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

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

RESULTS

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

Among 5 Years, 2018 to 2022 the percentage of home deaths was higher in 2018 (75.4%). Deaths occurring at home was highest in Ariyalur(82.4%) followed by Kallakurichi(81.8%) and Cuddalore(81.7%). A notable decrease of 9.3 % for home deaths was noted in Thiruvallur district in 2022, compared to 2018. The deaths occurring in places other than institution and home, was increasing in the state from 2.8% in 2018 to 3.5% in 2022, and it was higher in Kancheepuram(8.7%)

followed by Tiruppur(6.1%) and Ranipe t(5.6%) for the year 2022 and the pattern was in increasing trend when those districts were compared to 2018 (Table 1).

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

S. No.	District	Institutional %					Home %					Others %				
		2018	2019	2020	2021	2022	2018	2019	2020	2021	2022	2018	2019	2020	2021	2022
1	Ariyalur	15.6	14.7	14.3	17.3	15.0	84.8	83.5	84.1	81.0	82.4	1.6	1.7	1.6	1.7	2.6
2	Chennai	45.6	44.0	44.4	47.4	38.2	50.4	52.7	53.0	50.0	57.7	4.0	3.3	2.6	2.6	4.1
3	Coimbatore	29.8	29.0	27.8	34.4	28.8	67.6	68.1	69.9	63.7	69.0	2.6	2.8	2.3	1.9	2.5
4	Cuddalore	16.7	16.0	16.3	20.1	15.9	81.8	82.1	82.3	78.2	81.7	1.9	1.9	1.4	1.7	2.4
5	Dharmapuri	20.0	19.5	19.7	23.3	20.3	76.3	77.7	77.9	73.0	77.3	3.7	2.8	2.4	1.7	2.5
6	Dindigul	18.5	16.6	16.9	21.0	18.0	79.6	79.4	80.1	76.0	77.9	4.0	3.9	3.0	3.0	4.1
7	Erode	18.5	18.8	18.8	25.2	19.3	78.3	78.2	78.1	72.1	77.2	3.2	3.0	3.1	2.7	3.5
8	Kancheepuram	24.4	27.7	28.4	33.5	34.8	71.5	67.8	68.2	62.5	56.5	4.2	4.5	3.4	4.0	8.7
9	Chengalpattu					21.3					73.3				6.4	
10	Kanniyakumari	25.1	26.6	24.9	27.3	24.2	70.8	70.1	72.3	69.7	72.1	4.3	3.4	2.8	3.0	3.7
11	Karur	17.2	17.6	18.3	23.9	18.6	79.4	79.1	79.0	73.9	77.6	3.4	3.3	2.2	2.3	3.9
12	Krishnagiri	16.7	18.1	19.0	24.1	17.9	81.2	79.1	79.0	74.0	78.5	2.1	2.8	2.0	1.9	3.5
13	Madurai	23.5	22.9	22.7	26.4	22.7	73.0	73.9	74.5	70.8	73.4	3.5	3.2	2.8	2.8	3.9
14	Nagapattinam	24.8	21.6	20.2	24.1	27.6	73.6	76.7	78.4	74.6	70.4	1.6	1.8	1.4	1.2	2.0
15	Maviladuthurai					18.6					79.5				7.0	
16	Namakkal	15.6	16.1	17.8	23.6	19.1	81.6	80.6	79.6	73.8	78.1	2.8	3.3	2.6	2.6	3.8
17	Perambalur	17.0	17.3	18.3	22.1	17.8	79.7	79.7	81.5	74.9	78.0	3.3	3.0	2.2	2.3	4.2
18	Pudukottai	19.8	21.3	20.4	22.8	18.3	78.8	77.2	78.4	76.0	79.4	1.4	1.5	1.2	1.2	2.2
19	Ramanathapuram	22.5	21.2	20.0	21.9	20.7	75.3	77.0	78.5	76.4	77.4	2.2	1.7	1.5	1.7	1.9
20	Salem	20.1	19.2	21.1	26.9	20.8	76.8	78.1	76.7	71.4	76.8	3.0	2.7	2.2	1.7	2.5
21	Sivaganga	19.6	17.2	17.1	20.3	16.4	78.6	80.6	81.1	76.9	80.2	1.9	2.3	1.8	2.8	3.4
22	Thanjavur	22.6	22.7	22.2	27.5	23.5	75.4	75.3	76.1	70.8	74.3	2.0	2.0	1.7	1.7	2.2
23	The Nilgris	23.8	24.6	23.6	26.7	22.7	71.9	72.4	74.0	71.3	74.5	2.6	3.0	2.5	2.0	2.8
24	Theni	21.4	20.3	20.1	23.1	19.9	76.1	77.0	77.4	74.1	76.3	2.4	2.7	2.5	2.9	3.8
25	Thiruvallur	17.7	23.8	22.1	27.4	25.7	79.8	73.2	75.6	70.1	70.5	2.5	3.0	2.4	2.5	3.8
26	Thiruvannamalai	21.8	22.4	22.9	27.2	24.7	76.9	75.8	76.0	71.4	73.8	1.3	1.8	1.0	1.4	1.5
27	Thoothukudi	24.9	24.4	23.4	28.1	25.2	71.5	71.6	73.1	68.3	70.2	3.6	4.0	3.5	3.6	4.6
28	Tiruchirapalli	22.6	21.9	21.8	26.3	21.9	74.8	75.8	75.6	71.6	75.2	2.5	2.5	2.6	2.2	3.0
29	Tirunelveli	22.3	21.1	21.4	24.3	25.0	75.2	76.1	76.2	73.2	71.5	2.6	2.8	2.4	2.8	3.4
30	Tenkasi					18.3					78.7				3.4	
31	Tiruppur	21.3	21.6	21.5	27.4	21.7	74.8	74.0	74.5	68.5	72.2	3.9	4.4	4.0	4.1	6.1
32	Tiruvannamalai	15.9	18.2	17.8	21.8	18.7	82.5	80.1	80.8	76.8	78.8	1.6	1.7	1.4	1.4	2.4
33	Vellore					29.2					65.9				4.9	
34	Ramapattinam	24.7	25.4	23.6	27.7	19.1	71.8	70.8	73.7	69.6	75.4	3.5	3.8	2.7	2.6	5.6
35	Tirupattur					23.7					75.1				1.3	
36	Vilupuram					17.2					80.0				2.2	
37	Kallakurichi	11.6	14.3	15.7	19.1	16.2	86.4	83.9	82.6	79.2	81.8	2.0	1.9	1.7	1.7	2.0
38	Virudhunagar	16.1	16.1	16.0	18.7	15.9	81.2	81.3	81.8	79.1	80.3	2.7	2.6	2.2	2.2	3.8
	Tamil Nadu State	21.8	22.9	23.0	27.4	22.7	75.4	74.2	74.6	70.2	73.8	2.8	2.9	2.4	2.4	3.5

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

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

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

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

HOME DEATHS IN AGE GROUP LESS THAN 1 YEAR :

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

HOME DEATHS IN AGE GROUP 65 YEARS AND ABOVE:

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

DEATHS IN PLACES OTHER THAN INSTITUTION AND HOME IN AGE GROUP 5-14 YEARS :

The deaths were higher in Tiruppur (28.9%) followed by Dindigul(26.2%) and Chengalpattu (26.0%) in 2022 in the state. The percentage of deaths was increased in 26 districts and found highest in Tiruppur followed by Thiruvallur and Cuddalore in 2022 compared to 2018. The percentage of deaths among male was highest in Thiruvallur (35.1%) followed by Dindigul (32.1%) in 2022. The percentage of deaths among males was higher in 24 districts and highest among them is Thiruvallur followed by Cuddalore and Chengalpattu in 2022 compared to 2018. The percentage of deaths among female was highest in Chengalpattu (25%) and Tiruppur (25%) in 2022.

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

Sl. No.	District	% Male					% Female				
		Institutional	Home	Others	Institutional	Home	Others				
1	Ariyalur	143	162	151	118	105	83	51	41	51	61
2	Chennai	484	472	460	500	460	467	481	505	500	440
3	Cuddalore	185	177	189	223	173	190	197	174	179	138
4	Cuddalore	185	177	189	223	173	190	197	174	179	138
5	Dharmapuri	109	112	109	120	104	110	108	115	110	105
6	Dindigul	171	181	185	234	205	171	184	187	228	181
7	Erode	210	208	215	275	211	247	248	213	268	215
8	Kanyakumari	200	287	310	363	372	383	408	467	549	603
9	Karur	189	202	210	272	214	289	296	352	408	467
10	Kanniyakumari	274	288	279	304	274	289	281	280	282	273
11	Karur	189	202	210	272	214	289	296	352	408	467
12	Krishnagiri	180	187	211	280	261	190	185	192	173	175
13	Madurai	265	243	248	284	244	262	259	277	289	260
14	Nagapattinam	24	24	24	24	24	24	24	24	24	24
15	Mayiladuthurai	20	24	24	24	24	24	24	24	24	24
16	Namakkal	173	181	201	282	269	173	174	174	174	174
17	Perambalur	183	182	179	248	197	186	185	184	174	144
18	Puducherry	211	216	211	243	240	243	243	243	243	243
19	Ramanathapuram	24	24	24	24	24	24	24	24	24	24
20	Salem	216	207	204	284	259	245	245	245	245	245
21	Srinagar	218	182	180	224	180	178	178	178	178	178
22	Thiruvallur	24	24	24	24	24	24	24	24	24	24
23	The Nilgiris	20	20	20	20	20	20	20	20	20	20
24	Thiruvallur	24	24	24	24	24	24	24	24	24	24
25	Thiruvallur	24	24	24	24	24	24	24	24	24	24
26	Thiruvallur	24	24	24	24	24	24	24	24	24	24
27	Thiruvallur	24	24	24	24	24	24	24	24	24	24
28	Thiruvallur	24	24	24	24	24	24	24	24	24	24
29	Tirunelveli	20	20	20	20	20	20	20	20	20	20
30	Tendlooi	20	20	20	20	20	20	20	20	20	20
31	Tiruppur	25	24	24	24	24	24	24	24	24	24
32	Tiruppur	25	24	24	24	24	24	24	24	24	24
33	Tiruppur	25	24	24	24	24	24	24	24	24	24
34	Vellore	14	16	17	13	13	15	16	13	13	13
35	Vellore	14	16	17	13	13	15	16	13	13	13
36	Vellore	14	16	17	13	13	15	16	13	13	13
37	Vellore	14	16	17	13	13	15	16	13	13	13
38	Vellore	14	16	17	13	13	15	16	13	13	13
39	Vellore	14	16	17	13	13	15	16	13	13	13
40	Vellore	14	16	17	13	13	15	16	13	13	13
41	Vellore	14	16	17	13	13	15	16	13	13	13
42	Vellore	14	16	17	13	13	15	16	13	13	13
43	Vellore	14	16	17	13	13	15	16	13	13	13
44	Vellore	14	16	17	13	13	15	16	13	13	13
45	Vellore	14	16	17	13	13	15	16	13	13	13
46	Vellore	14	16	17	13	13	15	16	13	13	13
47	Vellore	14	16	17	13	13	15	16	13	13	13
48	Vellore	14	16	17	13	13	15	16	13	13	13
49	Vellore	14	16	17	13	13	15	16	13	13	13
50	Vellore	14	16	17	13	13	15	16	13	13	13

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

Gender	Age group (Years)	Deaths % by age group				Institution %				Home %				Others %					
		2018	2019	2020	2021	2018	2019	2020	2021	2018	2019	2020	2021	2018	2019	2020	2021		
Overall deaths %	1 to 4	1.6	1.7	1.4	1.1	1.5	96.9	97.7	97.3	96.6	3.6	2.8	2.1	2.2	0.4	0.3	0.2	0.6	
	5 to 14	0.3	0.3	0.2	0.2	0.2	64.7	69.8	66.8	72.8	66.9	28.4	24.9	28.6	21.5	24.9	6.8	5.3	4.6
	15 to 44	0.6	0.6	0.5	0.4	0.5	42.2	48.1	45.4	44.4	44.7	46.4	40.5	42.5	43.2	40.2	11.4	11.4	12.1
	45 to 64	12.6	12.5	11.1	10.6	11.4	35.8	37.4	37.7	42.4	36.4	53.7	52.1	53.1	48.6	50.9	10.5	10.4	9.2
	65 & above	31.2	31.0	31.2	31.6	30.5	25.9	27.2	28.9	36.0	28.6	71.2	69.7	68.5	61.4	67.5	2.9	3.0	2.6
Male %	1 to 4	1.4	1.6	1.3	1.3	1.5	96.6	97.2	98.0	97.5	3.1	2.5	1.8	1.9	1.8	0.3	0.2	0.5	
	5 to 14	0.2	0.2	0.2	0.2	0.2	64.6	69.7	67.9	71.8	67.4	46.1	25.0	27.7	21.8	23.4	7.3	5.3	4.4
	15 to 44	0.5	0.5	0.4	0.5	0.5	39.6	45.6	42.3	41.7	44.2	46.3	40.5	43.3	43.6	38.4	14.1	13.9	14.7
	45 to 64	13.3	13.9	11.5	14.2	14.0	34.3	36.4	36.5	41.5	36.6	52.8	50.9	52.2	47.5	49.2	12.9	12.8	
	65 & above	31.0	31.8	30.1	37.9	33.5	27.3	28.8	30.7	37.1	30.0	69.1	67.4	66.0	59.6	65.1	3.6	3.8	
Female %	1 to 4	1.7	1.7	1.5	1.1	1.5	95.1	96.4	97.2	96.9	4.4	3.2	2.6	2.5	3.3	0.5	0.4	0.2	
	5 to 14	0.3	0.3	0.2	0.2	0.3	64.6	69.9	66.6	73.9	66.5	28.8	24.9	29.7	21.1	26.4	6.3	5.2	
	15 to 44	0.6	0.6	0.5	0.4	0.5	45.8	51.3	49.1	47.8	45.3	46.6	40.6	41.6	42.7	42.6	7.6	8.1	
	45 to 64	9.5	9.2	8.3	7.8	7.9	39.2	39.9	40.2	44.5	38.2	55.8	55.0	53.1	50.0	5.1	5.0		
	65 & above	27.0	26.8	27.3	28.7	26.2	23.3	24.4	25.6	34.2	26.1	75.1	74.0	73.0	64.4	71.8	1.6	1.4	

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

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

S. No.	Districts	Home Deaths												Deaths in other places					
		Less than 1 year						65 years and above						5-14 years			15-64 years		
		Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female			
1	Ariyalur	7.7	1.4	5.7	1.2	9.7	1.8	94.4	92.9	93.3	91.3	96.1	94.8	9.3	9.3	16.0	11.5	0.0	7.1
2	Chennai	5.4	2.5	2.6	2.6	8.2	2.4	63.5	58.2	58.7	63.8	68.4	72.5	6.8	17.2	9.8	18.9	3.8	15.2
3	Coimbatore	2.7	0.6	1.9	0.4	3.8	0.8	73.4	79.3	75.6	75.8	81.8	82.4	10.9	10.3	12.6	15.4	8.7	6.5
4	Cuddalore	4.3	3.6	3.5	2.2	5.8	5.9	89.7	90.1	88.3	88.9	91.8	92.0	4.2	16.2	3.3	18.5	5.7	11.9
5	Dharmapuri	1.9	0.6	2.1	0.0	1.6	1.5	83.5	90.2	87.6	88.0	89.5	92.8	6.5	6.2	4.9	7.7	9.5	3.8
6	Dindigul	3.1	3.6	1.8	2.8	5.6	4.5	89.5	89.0	88.3	86.3	90.9	92.0	18.8	25.2	20.0	32.1	16.7	19.9
7	Erode	6.3	3.4	8.9	2.0	1.6	5.1	87.6	86.4	85.3	83.6	90.3	89.5	13.2	19.4	11.1	23.6	16.1	13.2
8	Kancheepuram	4.0	0.0	3.8	0.0	4.4	0.0	80.8	87.2	78.5	83.4	71.3	10.7	20.8	11.8	26.3	9.3	14.3	
9	Chengalpattu	1.4	0.0	1.4	0.0	3.3	0.0	81.8	78.8	83.4	84.7	10.7	25.0	11.8	26.3	25.0	25.0	25.0	
10	Kanyakumari	15.3	12.5	18.2	12.3	11.8	12.8	79.6	81.2	76.5	77.8	83.1	84.6	26.1	9.8	34.6	14.8	18.0	4.2
11	Karur	3.3	5.2	2.8	6.5	4.2	2.9	89.3	88.8	87.2	86.5	91.6	91.3	17.9	20.8	17.8	20.8	18.2	20.8
12	Krishnagiri	0.4	0.6	0.0	0.5	1.0	0.8	91.6	90.8	90.7	89.0	93.0	92.9	8.2	9.2	10.2	11.4	5.6	6.7
13	Madurai	0.6	1.8	0.7	1.5	0.5	2.3	84.8	84.0	83.1	82.7	85.8	87.3	13.8	20.2	20.0	22.0	5.8	17.3
14	Nagapattinam	1.5	0.0	0.0	0.0	0.0	84.5	84.0	82.7	81.9	86.8	86.3	4.0	5.0	0.0	4.2	10.0	6.3	
15	Mayiladuthurai	5.4	5.4	5.7	5.7	5.1	88.8	88.8	86.9	86.9	91.0	4.8	7.9	0.0	5.3	10.0	10.5	10.5	
16	Namakkal	12.1	15.8	9.5	15.1	15.4	14.8	90.0	87.9	88.0	85.3	92.4	90.7	9.9	15.4	15.4	15.6	3.1	17.9
17	Perambalur	5.9	4.4	0.0	5.8	10.8	2.8	90.8	90.0	88.7	87.7	93.3	92.6	22.7	15.1	25.8	11.8	15.4	21.4
18	Puducherry	1.6	0.8	2.5	0.0	0.0	2.0	89.1	89.7	87.5	88.0	91.2	91.9	4.2	9.2	2.6	15.9	6.1	3.4
19	Ramanathapuram	4.1	2.7	1.9	1.0	6.6	4.7	87.4	89.5	85.2	88.2	90.1	91.1	13.2	6.1	19.4	6.9	8.9	5.4
20	Salem	1.9	1.6	1.8	0.9	2.6	2.5	87.3	87.3	86.7	85.7	89.3	89.2	17.2	13.5	18.9	15.5	14.6	10.9
21	Sivaganga	3.2	2.4	3.0	0.0	4.7	4.8	89.9	90.0	88.3	88.6	91.8	91.5	3.6	12.9	3.1	12.8	4.3	13.3
22	Thangamir	4.1	0.6	2.5	0.4	6.1	0.9	85.8	85.9	84.0	84.1	88.1	88.1	10.0	12.5	17.9	16.4	0.0	5.7
23	The Nilgiris	2.0	2.0	0.0	0.0	5.9	5.0	81.2	83.4	80.8	82.1	81.7	84.5	13.0	10.5	20.0	16.7	0.0	0.0
24	Thiruv	1.9	2.6	1.2	1.0	2.9	4.7	88.8	88.0	86.2	85.2	91.9	91.0	9.1	12.5	15.9	13.8	3.3	11.4
25	Thiruvallur	7.9	1.6	7.4	1.2	8.5	2.0	83.3	81.1	86.4	77.9	90.3	84.5	9.2	23.4	14.9	35.1	2.5	7.4
26	Tiruvannamalai	0.5	2.3	0.9	1.2	0.0	4.0	87.2	86.0	84.3	83.5	91.2	89.2	3.7	10.4	4.8	6.1	5.3	20.0
27	Tiruchendur	1.2	1.7	2.0	1.3	0.0	2.3	82.2	82.9	80.7	79.3	85.1	85.1	17.9	15.2	22.9	11.1	10.0	20.6
28	Tiruchirapalli	2.2	2.5	2.4	0.4	1.9	5.2	84.7	84.3	83.3	81.3	86.2	87.4	7.9	17.1	15.0	16.9	0.0	17.3
29	Tiruvallur	3.9	3.8	4.1	3.1	3.6	1.3	85.8	82.6	82.0	82.0	89.2	86.2	79.0	12.0	24.7	17.0	6.9	5.8
30	Tiruvallur	0.9	2.4	3.5	2.4	8.7	5.1	86.5	85.2	84.5	82.3	89.0	88.5	22.9	23.9	25.8	21.8	18.6	25.0
31	Tiruppur	5.4	2.7	4.2	2.0	7.0	3.9	90.2	88.6	88.3	86.5	92.4	91.1	6.4	9.6	6.7	8.6	5.8	10.9
32	Tiruvannamalai	1.7	0.0	0.0	0.0	4.2	77.6	74.2	81.1	81.1	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0
33	Vellore	2.6	1.4	2.8	1.5	2.2	1.2	82.9	86.0	80.8	83.1	85.8	86.1	7.8	13.6	7.7	12.9	7.4	14.3
34	Ramanpet	1.7	1.7	1.7	1.7	1.0	85.5	83.5	83.5	83.5	90.0	90.0	6.1	9.4	9.4	9.4	9.4	9.4	
35	Tirupattur	3.9	1.5	4.8	0.9	7.2	2.3	93.0	89.6	92.6	87.5	90.0	92.0	11.4	12.4	11.3	7.8	11.4	
36	Viluppuram	5.9	0.8	4.8	0.0	7.2	2.3	93.0	91.8	92.6	91.1	90.0	92.7	10.9	11.0	11.0	11.0	11.0	
37	Kallakurichi	3.1	2.1	3.0	0.6	2.8	4.0	90.8	90.6	88.8	88.7	93.2	92.6	15.1	18.0	22.9	21.7	6.7	14.3

DISCUSSION

Learning the fraction of deaths occurring at home varies across countries and within the country which can significantly support in tracking the implementation of health system.⁸ It was noted in a comparative study by Joanna B Broad it was noted 54 % or more of all deaths occurred in hospitals, ranging from Japan (78 %) to China (20 %)¹⁷ In our study, overall the home deaths are higher in the state ranging 70 – 76% from 2018 to 2022 compared to deaths occurring at Institutions (21.8% - 27.4%) and other places (2.4%- 3.5%). The deaths occurring at Institution has increased by 0.9% in 2022 compared to 2018, although there was a decline of deaths percentage in 2022 by 4.7% when compared to 2021. The deaths occurring at home was highest in Ariyalur(82.4%) followed by Kallakurichi(81.8%) and Cuddalore(81.7%). A notable decrease of 9.3 % was noted for home deaths in Thiruvallur district in 2022 compared to 2018. In a study done with data on deaths from British Columbia it was noted that institutional deaths were higher for male gender compared to female gender.¹⁸ In our study, Overall, in Tamil Nadu the Deaths occurring by gender at institutions was higher for males (23.7% - 29.9%) compared to females (19.0% - 23.9%) from 2018 to 2022. The deaths occurring at home among females has not decreased much over the five years in the

study period except 2021(74.8%). In a study from Andalusia, the percentage of deaths at home were increasing as age increases.¹⁹ In our study, the number of deaths percentage is increasing when the age increases and the pattern was same for both gender except for deaths happening less than 1 year which was higher than the deaths compared to the age group 1-14 years. In a retrospective study done using the Mongolian National Death Registry, the proportion of out of hospital deaths was increasing as the age increases and on comparison by gender it was noted that the out of hospital deaths for age group less than 5 years is higher in female compared to opposite gender and vice versa for other age groups.²⁰ The institutional death was higher in age group less than 1 year (95.9% -97.7%) and least in age group 65 years and above (13.5% -18%). Overall in the age group less than 1 year, the home deaths are highest in Namakkal (15.3%) followed by Kanyakumari (12.5%) in 2022. The percentage of home deaths less than 1 year was increased in 11 districts and found highest in Mayiladuthurai followed by Namakkal and Karur in 2022 compared to 2018. The percentage of home deaths of females less than 1 year was higher in 30 districts when compared to the opposite gender in 2022. The institutional deaths have decreased among female gender in the age group 5 – 44 years in 2022 compared to 2018 although the deaths are higher in female gender when compared to male gender in all the five years 2018 to 2022. Overall in the age group 65 years and above, the home deaths are highest in Ariyalur (92.9%) followed by Kallakurichi (91.8%) in 2022. In a study by Joanna B Broad it was noted that a higher percentage of deaths was among women when compared with men in residential aged care.¹⁷ The percentage of home deaths for the age group 65 years and above was increased in 16 districts and found highest in Chennai followed by Mayiladuthurai and Tirupathur in 2022 compared to 2018. The percentage of home deaths of females for the age group 65 years and above was higher in all districts when compared to the opposite gender in 2022. The place of death demarcated as others in a study by Joanna B Broad, it was noted nearly 80% deaths occurred there but it also included private clinics along with places like public places.¹⁷ In our study the deaths occurring in places other than institution and home was increasing in the state from 2.8% in 2018 to 3.5% in 2022 and it is higher in Kancheepuram(8.7%) followed by Tiruppur(6.1%) and Ranipet(5.6%) for the year 2022 and the pattern is in increasing trend when those districts were compared to 2018. The deaths occurring in places other than Institution and Home was higher in males (3.2% – 4.6%) double the time compared to females (1.3% -1.8%). The deaths occurring

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

CONCLUSIONS

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

RECOMMENDATIONS

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

CONFLICT OF INTEREST: Nil

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