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ORIGINAL ARTICLE

TRENDS IN MORTALITY STATISTICS OF TAMIL NADU, 2000 - 2022

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ABSTRACT

INTRODUCTION : Mortality trends shed light on the impact of social determinants of health and inform the planning of healthcare services, particularly for chronic diseases and aging populations. This study aims to examine the distribution and trends of mortality statistics in Tamil Nadu from 2000 to 2022.

METHODS : The study was a time series study on the MCCD (Medical Certification of Cause of Death) annual reports of Tamil Nadu State for the period 2000 to 2022. The data was taken by ICD 10 chapters by age, gender, and Major cause groups available in the reports which were collated in Excel sheet. The data was analyzed by calculating proportions by major cause groups for each year by overall, age & gender from 2000 to 2022.

RESULTS: The MCCD coverage in the state increased to 45% in 2022. Chapter IX increased to 50.8% in 2022. Chapter XIX has reduced to 3.6% in 2022. Chapter XVI, third in 2000 (8.6%), was at around 2% since 2018. Chapter XXII peaking at 8.1% in 2021 and dropped to 0.8% in 2022. In 2022, the proportions of deaths increased in chapter by IX (Male: 12%, Female: 23%) and had change in gender proportions. Chapter IX was the leading cause of death among age group 15 years and above in 2022, and in those aged 45 years and above in 2000. Chapter I, the third-leading cause overall, was the leading cause of death for the age group 1–14 years in 2022.

CONCLUSION: MCCD coverage has increased with marked rise in deaths due to circulatory diseases, particularly in older populations. Age and gender-specific mortality patterns further reveal important public health trends, with infectious diseases still being a leading cause of death in children, while non-communicable diseases like cardiovascular diseases are becoming increasingly prominent in older age groups and have started to raise in younger age groups.

KEYWORDS : Mortality statistics, MCCD, ICD codes

INTRODUCTION

Mortality statistics is the best source of information and a vital event to assess the health status of the community. It provides an overview of the current health problems, patterns of risk persistent in the community, and trends in the mortality of a specific cause over time.[1] The mortality statistics are collected in India through the Medical Certification of Cause of Death (MCCD) form. The MCCD form must be provided only by a registered medical practitioner who has attended to the deceased during the last illness of the deceased. MCCD is provided in Form 4 for institutional deaths and deaths occurring other than institutions it is provided in Form 4A. It is vital to compare the current health systems data of the same country with the previous years to identify the trends and patterns.[2]

The significance of analyzing mortality patterns is clear in global health statistics. For example, the World Health Organization (WHO) reports that non-communicable diseases (NCDs) are responsible for 74% of deaths worldwide, with cardiovascular diseases accounting for nearly 18 million fatalities each year. On the other hand, the incidence of mortality due to infectious diseases has decreased in affluent nations thanks to advancements in healthcare, while many low- and middle-income countries continue to face a substantial burden from infectious diseases. The COVID-19 pandemic led to a temporary decline in life expectancy in various countries, underscoring the crucial role of ongoing mortality monitoring.[3]

At a national scale, grasping mortality trends enables policymakers to distribute healthcare resources more effectively. For instance, the increasing prevalence of NCDs in India—causing over 60% of total deaths—has prompted a shift in policy towards preventive healthcare and chronic disease management initiatives. Likewise, examining mortality trends at the state level in India can guide targeted interventions, such as addressing the high maternal mortality rates in specific states or tackling healthcare access disparities between rural and urban areas. By tracking mortality trends,

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governments can enhance disease surveillance, anticipate healthcare demands, and develop policies that tackle both urgent and long-term health issues. Furthermore, these trends allow for international comparisons, assisting policymakers in aligning national health strategies with global initiatives like the WHO's Sustainable Development Goals (SDGs).[4] The objective of the study was to learn the distribution and trends of mortality statistics for the state of Tamil Nadu during 2000 – 2022.

METHODS

The study design was a time-series analysis of the MCCD annual reports of Tamil Nadu State for the period 2000 to 2022. The MCCD form consists of the main cause of death in Part 1 and other causes that are not relevant to this main cause but are associated with death in Part 2. The underlying cause of death recorded in Part 1 along with demographic data is collected by district. The cause of death was classified according to the International Classification of Diseases, Tenth Revision (ICD-10) which consists of 22 chapters as major cause groups with subchapters and codes. The major 22 chapters are

Table1: Description of Major cause groups and ICD codes

Major Cause Groups	Description and ICD Codes
I	Certain Infectious and Parasitic Diseases (A00 - B99)
II	Neoplasm (C00 - D48)
III	Diseases of Blood and Blood forming organs & certain disorders involving the Immune mechanism (D50-D89)
IV	Endocrine, Nutritional and Metabolic Diseases (E00-E89)
V	Mental and Behavioural Disorders (F01- F99)
VI	Diseases of the Nervous System (G00 - G98)
VII	Diseases of the Eye and Adnexa (H00-H59)
VIII	Diseases of the Ear and Mastoid (H60-H95)
IX	Diseases of the Circulatory System (I 00-I 99)
X	Diseases of the Respiratory System (J00 -J98)
XI	Diseases of the Digestive System (K00 - K92)
XII	Diseases of the Skin and Subcutaneous Tissue(L00-L98)
XIII	Diseases of the Musculoskeletal system and Connective tissue(M00-M99)
XIV	Diseases of the Genito Urinary System (N00 - N99)
XV	Pregnancy Childbirth and Puerperium (O00 - O99)
XVI	Certain conditions originating in the Perinatal Period (P00 - P96)
XVII	Congenital Malformations, Deformations and Chromosomal abnormalities (Q00 - Q99)
XVIII	Symptoms Signs & Abnormal Clinical & Laboratory Findings, not elsewhere classified (R00 - R99)
XIX	Injury Poisoning and Certain Other Consequence of External Causes (S00 - T98)
XX	External Causes of Morbidity and Mortality V01-Y89)
XXI	Persons encountering health services for examination and investigation (Z00-Z13)
XXII	Codes for Special purposes (U00-U99)

The data is collated annually by the State Bureau of Health Intelligence and the reports are submitted to the Registrar General of India in the prescribed format provided every year. The MCCD annual reports from 2000 to 2022 were collected as soft copies from the department of SBHI. The data was taken by ICD 10 chapters for all the 23 years by age, gender, and major cause groups available in the reports which were collated in a single Excel sheet by Nosologist. A total of 41,19,347 deaths were taken for analysis ranging from 71,794 in 2000 to 3,11,661 in 2022. 10,241(0.3%) deaths were excluded due to incompleteness (age was not stated). The major leading causes of death for the years 2000 and 2022 were identified, and data were analyzed using proportional distribution across major cause groups for each year. Analysis was conducted overall, as well as stratified by age and gender, to observe trends from 2000 to 2022. Data were processed using Excel to calculate proportions and trends.

Ethical Considerations

This study utilized secondary data from MCCD reports, which contain aggregated and anonymized information. As no individual identifiers were involved, a waiver of informed consent was obtained.

RESULTS

The MCCD (Medical Certification of Cause of Death) coverage in the state was 19% in 2000 and gradually improved over the following two decades, reaching 45% in 2022. However, this percentage is lower than the previous year (52% in 2021). The coverage rates for male and female medically certified deaths have remained relatively unchanged from 2000 to 2022. On average, males had higher certification of 61%, while females had an average proportion of 39%certification during this period. Overall, from the trend of male and female certification, there have been no notable changes in the certification for either gender from 2000 to 2022.

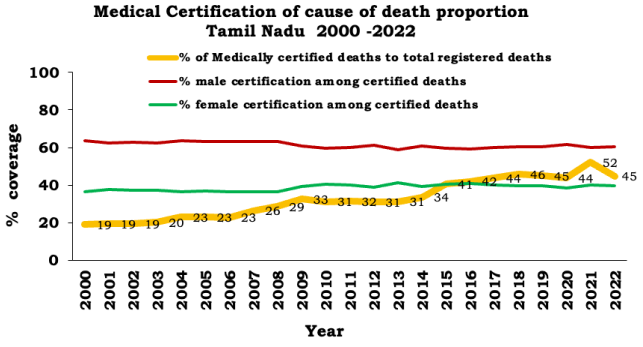


Figure1: Medical Certification of cause of death proportion Tamil Nadu 2000 -2022

Over the past 23 years, the distribution of medically certified deaths in the state has shifted significantly across 22 major cause groups. Notably, Chapter IX has become

the leading cause, increasing from 35.2% in 2000 to 50.8% in 2022. Chapter XIX, the second leading cause (17.3%) in 2000, has drastically reduced to 3.6% in 2022, though it remains higher than in 2021. Chapter XVI, ranked third in 2000 (8.6%), dropped to 5% in 2010, rose to 8.2% in 2013, and has remained static at around 2% since 2018. Chapter I have declined slightly from 7.0% in 2000 to 6.5% in 2023, moving from the fourth to third leading cause. Chapter X, the fifth leading cause (4.8%) in 2000, became the second leading cause from 2018-2022, but has started to decrease in 2022. Chapter II saw their highest percentage (9.4%) in 2017 and the lowest (2.1%) in 2021. Chapter IV grew from 3.8% in 2000 to 6.0% in 2020 but declined to 2.9% by 2022. Once at 3.8% in 2000, Chapter XIV reached its lowest (1.7%) in 2013 and was at 2.9% in 2022. Chapter XVIII, initially at 8.2% in 2000, peaked at 28.5% in 2013, and dropped to 9% by 2022. Chapter XX, which had minimal impact until 2016, gradually rose to 3.9% in 2022. Chapter XXII started increasing in 2020, peaking at 8.1% in 2021 before dropping to 0.8% in 2022. Deaths from other cause groups consistently represented less than 0.5% across the 23 years (Table 2).

Table 2: Proportion of deaths by Major Cause Groups, Tamil Nadu, 2000-2022

Major cause groups	Year																						
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
I	7.0	6.4	6.9	7.3	7.2	6.3	6.5	6.7	6.0	5.6	5.9	5.3	6.1	6.4	5.1	4.5	4.4	4.7	4.3	4.3	4.5	5.9	6.5
II	4.2	4.1	4.2	4.1	4.4	4.6	3.6	3.6	3.6	3.5	3.2	2.9	2.8	2.6	2.5	2.8	3.5	9.4	2.9	3.0	2.6	2.1	3.0
IV	3.8	3.9	4.5	4.9	4.6	4.2	3.9	3.3	4.1	4.4	4.1	3.7	3.6	1.0	3.3	4.8	6.1	6.3	5.5	5.7	6.2	4.4	2.9
IX	35.2	36.7	37.2	35.7	37.0	37.8	38.5	36.7	39.2	42.7	41.8	36.0	41.4	37.7	48.8	50.0	49.2	51.5	49.4	45.5	47.5	40.4	50.8
X	4.8	5.4	6.4	7.7	7.0	7.4	6.9	6.1	6.7	7.2	7.8	6.8	6.5	3.6	2.8	6.1	8.1	7.0	8.4	9.6	9.2	13.0	8.3
XIV	3.7	2.9	3.2	3.0	3.4	3.2	3.4	2.9	3.1	3.1	3.0	2.6	2.6	1.7	2.3	3.3	3.9	2.8	3.3	3.2	2.8	1.9	2.9
XVI	8.6	8.0	7.0	4.5	4.6	4.1	6.0	6.7	5.5	4.6	5.0	4.4	3.6	8.1	4.6	3.7	3.3	2.3	2.0	2.0	1.9	1.7	2.0
XVIII	8.2	9.1	11.4	14.8	16.3	18.6	19.7	22.0	19.8	19.1	18.8	18.2	22.5	28.5	21.1	16.3	11.4	6.1	14.7	17.0	13.8	14.6	9.0
XIX	17.3	15.8	12.7	11.2	9.5	8.4	6.7	7.2	7.8	6.2	6.3	5.8	7.2	7.0	6.0	3.9	4.4	3.6	3.3	3.1	2.7	2.5	3.6
XX	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	2.0	2.3	2.1	2.2	3.9
Other groups	0.7	0.7	0.6	0.6	0.5	0.5	0.4	0.4	0.4	0.3	0.4	0.3	0.3	0.3	0.3	0.4	0.5	0.4	0.4	0.4	0.6	1.0	0.6

The proportion of deaths by major cause groups for each gender was calculated from the gender mortality for the years 2000,2006,2011,2016 and 2022. The gender-specific mortality data from 2000 to 2022 reveals notable trends. In 2022, the proportions of deaths increased in chapters by IX (Male: 12%, Female: 23%), X (Male: 3.7%, Female: 3.2%), and XX (Male: 5.1%, Female: 2.1%) for both genders compared to 2000. Conversely, deaths decreased in chapters by (XIX (Male: 11.1%, Female: 18%), XVI (Male: 5.7%, Female: 8.3%), IV (Male: 1.2%, Female: 0.6%), XIV (Male: 0.7%, Female: 1%), II (Male: 1.1%, Female: 1.4%), and XI (Male: 0.2%, Female: 0.4%)) for both genders by 2022. Chapter I remained unchanged for females but saw a slight increase (0.8%) for males in 2022 when compared to 2000. Meanwhile, Chapter XVIII remained the same for males, while it increased by 2.2% for females compared to 2000. In 2000, the chapters where the proportion of deaths was higher in males than females by Chapter I (1.1%), Chapter X (0.9%), and Chapter XIV (0.2%). By 2022, these differences were prevalent with males being still higher by Chapter I (0.3%), Chapter X (1.4%), & Chapter XIV (0.5%) when compared with females. Conversely, in 2000, the chapters with a higher proportion of deaths in females than males by Chapter XVI (2.7%), Chapter IV (0.1%), and Chapter II (1.3%) which was still higher in the same gender by (XVI- 0.1%, IV -0.7% & 1%) by 2022. Additionally, in 2000 had higher proportions of deaths in males by Chapters IX (6.3%), XI (1.5%), and XVIII (0.4%), but by 2022, these chapters saw higher proportions in females by (IX: 5.6%, XI: 1.7%, XVIII: 1.8%). (Table 3).

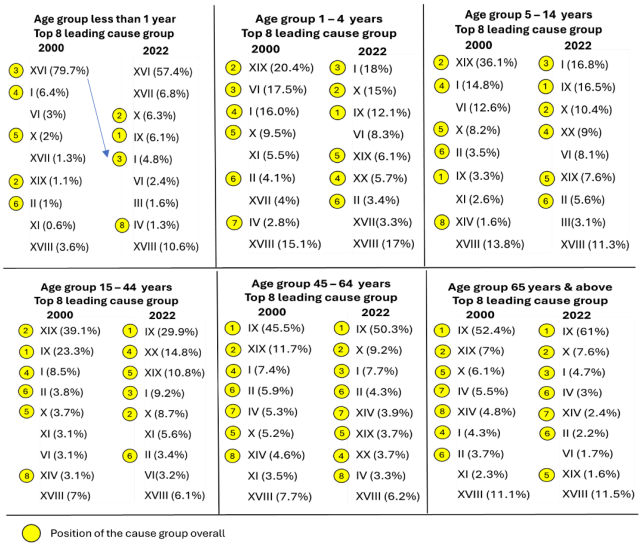
The proportion of deaths by major cause groups for specific age groups was calculated for the years 2000,2006,2011,2016 and 2022 and compared with the leading causes of death overall. It was observed that Chapter IX (the leading cause group overall) was the leading cause of death in individuals aged 15 years and above in 2022, and in those aged 45 years and above in 2000. Chapter I, the third-leading cause overall, was the leading cause of death for the age group 1–14 years in 2022, while Chapter XIX, the second-leading cause overall, was the top cause for those aged 1–44 years in 2000. It was also noted that the age group 45 years and above showed a similar pattern to the overall top three leading cause groups in 2022, and the overall top two leading

cause groups in 2000. In contrast, the age group 1–44 years exhibited a more varied pattern in both 2000 and 2022, with the overall leading cause groups appearing in a somewhat jumbled order with two exception for Chapter IX, which remained the same position as overall leading group in age group15- 44 years, and at same time it was not present among the leading causes in the 1–4 years age group. Additionally, in 2000, Chapter IX was absent from the leading causes in the 1–14 years age group but was present in 2022 as 4th leading group. In 2022, for the less than 1 year age group, the top leading cause groups, Chapters XVI and XVII, were not among the overall major leading cause groups. Chapter XVIII showed little change across most age groups, except for the less than 1year group, where it increased by nearly 7%. (Table 4).

Table 3: Proportion of deaths of Major Cause Groups by gender, Tamil Nadu, 2000-2022

Major cause group	Year									
	2000		2006		2011		2016		2022	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
I	7.4	6.3	6.6	6.4	6.4	5.3	3.9	5.1	6.6	6.3
II	3.7	5	3.1	4.5	2.7	4.1	3.2	3.9	2.6	3.6
IV	3.8	3.9	3.8	4.2	4	4.5	6.1	6.1	2.6	3.3
IX	37.5	31.2	39.2	37.4	40.2	40.8	51	46.5	48.6	54.2
X	5.1	4.2	7.1	6.5	7.8	7.4	7.1	9.5	8.8	7.4
XIV	3.8	3.6	3.5	3.3	2.9	2.9	3.5	4.6	3.1	2.6
XVI	7.6	10.3	5.6	6.7	4.7	5.4	3.3	3.3	1.9	2
XVIII	8.3	7.9	19.4	20.2	20.2	19.8	10.6	12.4	8.3	10.1
XIX	15.5	20.4	6.9	6.4	6.8	6.1	4.5	4.1	4.4	2.4
XX	0	0	0	0	0	0	0	0	5.1	2.1
Other groups	0.7	0.6	0.4	0.4	0.4	0.3	0.6	0.4	0.7	0.5

Table 4: Proportion of deaths by Major Cause Groups by age group, Tamil Nadu 2000-2022



DISCUSSION

The trends in MCCD (Medical Certification of Cause of Death) coverage and the distribution of deaths by major cause groups in the state from 2000 to 2022 highlight several key developments in public health reporting and mortality patterns over the past two decades. First, the gradual increase in MCCD coverage from 19% in 2000 to 45% in 2022 is a positive indication of improving cause-of-death certification. However, despite this increase, the coverage remains relatively low compared to the previous year (52% in 2021). This may suggest that while progress has been made in improving data quality and certification practices, there is still a need for further improvements in medical certification processes, especially in underreported or rural areas. An approach in collaboration with WHO-India known as District CRS Approach has been initiated in the districts of Karur and Krishnagiri for the year 2023 to cover deaths which are not medically certified through verbal autopsy in two districts of Tamil Nadu. The gaps in the existing MCCD framework is also studied and a minimum of one master trainer has been created from each district to strengthen the MCCD quality and quantity. This project will not only improve cause of death availability but also may give insights regarding the death certification and the existing patterns. The 52% hike during 2021 may be also due to COVID-19 as medical seeking behaviour was high during this period. The gender-wise coverage remained relatively stable during this period, with male deaths having a higher proportion of certified causes of death (61%) compared to female deaths (39%). This persistent gender disparity in MCCD coverage could reflect differences in healthcare access, reporting practices, or cultural factors that may influence death certification for females.

The substantial changes in the distribution of medically certified deaths across different cause groups between 2000 and 2022 reveal notable shifts in the state's health landscape. Of particular significance is the rise of Chapter IX (which refers to diseases of the circulatory system) as the leading cause of death, increasing from 35.2% in 2000 to 50.8% in 2022 with a noticeable shift increasing in both genders over the 22 years especially higher among females and also emerged as the dominant cause of death for those aged 15 years and older in 2022, which aligns with the overall rise of cardiovascular diseases but however in 2000 it was the dominant cause only from age group 45 years and above. Chapter XIX (Injury Poisoning and Certain Other Consequence of External Causes) and Chapter XVI (Certain conditions originating in the Perinatal Period) saw significant declines in their proportion of deaths, which could reflect changes in the prevalence of those conditions, with either advancements in treatment, or even improved prevention and early detection measures. The marked reduction in Chapter

XIX (Injury Poisoning and Certain Other Consequence of External Causes), for instance, could be due to advances emergency response and medical care, changes in workplaces and occupational safety or preventive Health and safety interventions. In contrast, some other chapters like Chapter XX (external causes of morbidity and mortality), which had minimal impact until 2016, showed a gradual rise, likely due to increased awareness of external injuries, violence, and road traffic accidents.

The rise of Chapter XXII in 2021, followed by a decline in 2022, can be largely attributed to the impact of the COVID-19 pandemic, which significantly affected mortality rates in Tamil Nadu during this period. The surge in 2021 was marked by a substantial increase in deaths directly attributed to COVID-19, as well as indirect factors such as disruptions in healthcare services and delayed medical care for non-COVID conditions. According to studies on excess mortality during the pandemic, the number of deaths in 2021 exceeded expected levels, even when accounting for deaths directly attributed to COVID-19.[5,6] The surge in 2021 was exacerbated by overwhelmed healthcare systems, reduced access to routine medical care, and delays in treatments for chronic diseases such as cardiovascular diseases, diabetes, and cancer.[7] A study by the World Health Organization[8] found that disruptions in health services during the pandemic led to significant reductions in routine medical procedures and screenings, contributing to increased mortality in both COVID and non-COVID cases.

In 2022, as COVID-19 cases began to decline and the healthcare system started recovering, there was a noticeable reduction in COVID-related deaths, leading to a decrease in Chapter XXII deaths. However, the long-term effects of the pandemic, such as lingering disruptions in healthcare infrastructure and delayed interventions for certain conditions, may continue to influence mortality trends in the years to come.[9] These findings highlight that while the immediate impact of COVID-19 on mortality may have declined, the enduring consequences of healthcare disruptions, increased mental health issues, and long-term effects of untreated non-COVID conditions may continue to influence mortality statistics in the future.

In terms of gender-specific mortality, the data reveals interesting patterns in mortality trends over the past 22 years, with notable gender differences. Chapters XIX (Diseases of the Digestive System) and XVI (Certain Infectious and Parasitic Diseases) have decreased notably, particularly among females. This may be due to improved access to healthcare, changes in lifestyle, or better management of specific conditions, such as a decline in infections and digestive diseases due to enhanced public health measures and improvements in sanitation and nutrition.[10] However, certain chapters, such as Chapter I (Certain Infectious and Parasitic Diseases), X (Diseases of the Circulatory System), and XIV (Diseases of the Musculoskeletal System), have been notably more prevalent among males since 2000. This trend may be related to the higher prevalence of risk factors like smoking, alcohol consumption, and occupational hazards among men, which increase susceptibility to conditions such as circulatory diseases and musculoskeletal disorders.[11]

Conversely, for Chapters XVI (Certain Infectious and Parasitic Diseases), IV (Endocrine, Nutritional, and Metabolic Diseases), and female gender predominance, the shift in prevalence might reflect changing health behaviours and greater healthcare access among women, particularly regarding diseases like diabetes and metabolic disorders. This could also be related to increased awareness of diseases that disproportionately affect women, such as autoimmune conditions, and enhanced health-seeking behaviour among women.[12]

Notably, the gender distribution in certain chapters (IX - Diseases of the Circulatory System, XI - Diseases of the Respiratory System, and XVIII - Diseases of the Nervous System) has shifted, reflecting changing gender dynamics in health risks and access to care. This could be due to a combination of factors, including evolving patterns in lifestyle risk factors, such as the increasing prevalence of smoking among women[13], or better access to early diagnosis and care for certain diseases that have traditionally affected men more, such as cardiovascular diseases.

The rising burden of non-communicable diseases (NCDs) among women may also be influenced by societal factors like urbanization, changing dietary patterns, and work-related stress.[14] This has led to initiatives such as Makkalai Thedi Maruthuvam in Tamil Nadu which brings doorstep medication and multiple screening programmes have been initiated in the state.

The age-specific mortality patterns from 2000 to 2022 indicate that while the broad distribution of deaths remains similar across age groups, there are some notable exceptions. Chapter I (infectious diseases) was the top cause in children aged 1–14 years in 2022, reflecting the continued vulnerability of children to infectious diseases in some regions despite advances in vaccination and hygiene. Age group patterns further underscore the changes in mortality trends. The distribution of leading causes across different age groups in 2022 suggests that while there is overlap, there

are distinct patterns, particularly with Chapter I (infectious diseases) being the leading cause of death in children aged 1–14 years in 2022, and Chapter XIX (Injury Poisoning and Certain Other Consequence of External Causes) being prominent in the 1–44 years age group in 2000 which has decline in the recent timeline.

The potential underreporting of certain causes of death, such as maternal mortality and suicides, remains a significant challenge in mortality data accuracy. Factors such as social stigma, lack of proper death certification, and limited access to healthcare in rural areas contribute to this underreporting.

These findings suggest that infectious diseases, particularly in younger populations, remain an important public health concern, although non-communicable diseases like cancer are becoming increasingly significant in middle-aged adults.

CONCLUSION

In conclusion, the state has made notable progress in increasing MCCD coverage. However, continued efforts are needed to further improve the quality and accuracy of medical death certification, especially to address the persistent gender disparities in coverage.

The distribution of deaths by cause group has shifted significantly over the past two decades, with a marked rise in deaths due to circulatory diseases, particularly in older populations, while deaths from respiratory diseases, and certain infectious diseases have fluctuated.

Age and gender-specific mortality patterns further reveal important public health trends, with infectious diseases still being a leading cause of death in children, while non-communicable diseases like cardiovascular diseases are becoming increasingly prominent in older age groups and have started to raise in younger age groups.

Public awareness campaigns should be implemented to highlight the importance of MCCD for improving public health data and policy planning. Engaging community leaders, local governments, and NGOs in this process can help increase the awareness of the value of accurate death certification among the public.[15]

Specific focus should be given to marginalized and rural populations, where MCCD coverage is often lower due to challenges such as poor healthcare access, lack of trained professionals, and limited infrastructure. Mobile health clinics and telemedicine services could be deployed to bridge these gaps, ensuring that cause-of-death data is captured in remote and underserved areas.[16]

LIMITATIONS

The study has variable and incomplete coverage across the 22-year period. In 2000, the coverage was only 19%, which limits the representativeness of the data for the entire population. Rural or remote populations are less likely to have complete cause-of-death reporting compared to urban areas, introducing potential geographic bias. Quantifying the rural-urban disparity in MCCD reporting is essential to highlight the unequal access to healthcare and reporting infrastructure. Rural areas often face challenges such as limited healthcare facilities, fewer trained professionals, and logistical barriers, leading to lower MCCD coverage compared to urban regions. The trends were not tested statistically for significance.

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CONFLICT OF INTEREST

None

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