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Original Research Article

Epidemiology and Analysis of Mortality in Tertiary Care Hospital in a Metropolitan City, India: A Record Based Study

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ABSTRACT

Background: Mortality statistics are essential for understanding population health, guiding public health efforts, and tracking disease trends. In India, reliable mortality data is often insufficiently documented and analyzed, limiting its utility for identifying leading causes of death.

Materials and Methods: A retrospective cross-sectional study was conducted on patient death records from 2018 to 2023 at a tertiary care hospital, excluding incomplete records. Data were analyzed using SPSS version 22.0 and MS-Excel, applying descriptive statistics and Chi-square tests to assess associations at a 5% significance level.

Results: From 2018 to 2023, 9,087 deaths were recorded, with a peak in 2020. Non-communicable diseases had the highest mortality share (52.67%–58.75%), followed by communicable diseases (13.05%–21.25%) and postmortem cases (20.49%–26.43%). The mortality trend was significantly linear ($p < 0.0001$). Most deaths occurred in adults (15–60 years), with no significant gender association. A shift in disease patterns was noted, with communicable diseases peaking in 2020.

Conclusion: This study highlights non-communicable diseases as the leading cause of mortality, with a 2020 spike in communicable diseases, seasonal variations, and a predominance of adult deaths, emphasizing the need for ongoing monitoring and targeted interventions.

Keywords: Mortality trends, Non-communicable diseases, Seasonal variation, Demographic factors

INTRODUCTION

Mortality statistics are crucial for understanding population health and guiding public health interventions, resource allocation, and priorities. They help in assessing changes in disease incidence, case fatality, or both, and determining whether observed trends reflect genuine shifts or are due to changes in classification or diagnostic practices. Epidemiological studies often rely on mortality data, which is widely used to explain trends and inform public health decisions. Disease patterns evolve over time, with each decade producing distinct trends.[1]

In 2019, while 93% of estimated deaths were registered, only 19% had a medically certified cause of death (MCCD). The remaining deaths were recorded based on relatives' reports, which were not included in official annual reports. State-wise variations are substantial, with death registration completeness ranging from 28% to 100%, and MCCD varying from 3% to 100%. Despite an annual increase in death registration completeness, MCCD improvements have been slower. Additionally, there is a delay of over one year in releasing the vital statistics (VS) and MCCD reports.[2,3]

In India, accurate and current data on mortality patterns, particularly in rural areas, is often lacking or inadequately documented. Additionally, mortality data is frequently not analyzed or transformed into actionable information to identify the leading causes of death in both specific and general populations.[4] Thus, this study was conducted with the aim of analyzing mortality trends, causes, and their associations in a tertiary care hospital over six years.

OBJECTIVES

1. To analyze mortality trends and identify the leading causes of death in a tertiary care hospital over a six-year period.

2. To assess the association between demographic factors, including age and gender, and mortality outcomes.

MATERIALS AND METHODS

Retrospective cross sectional six-years record based study conducted at the Medical Record department of (a tertiary care hospital) Chhatrapati Shivaji Maharaj Hospital & Rajiv Gandhi Medical College, Thane, after clearance from Institutional Ethics Committee.

Data of deaths of patients in a tertiary care teaching hospital from 2018 to 2023 (January to December) were collected. Death was classified using a standard system of ICD-10. Incomplete records were excluded.

STATISTICS

Statistical analysis was done using SPSS version 22.0 statistical software package for Microsoft Windows (SPSS Inc., Chicago, IL) and MS-Excel. Descriptive statistics was carried out for the demographic and other variables. Association has been checked by using Chi-square test at 5% level of significance.

RESULTS

In 6 years, i.e., from 2018 to 2023, a total 9087 deaths were registered in the Medical Records Section.

Table-1: Year wise Mortality Rate

Year	No. of deaths	No. of admissions	Mortality Rate per 1000 admissions	95% CI Upper limit	95% CI Lower limit
2018	1365	43365	31.48	33.15	29.81
2019	1510	48521	31.12	32.69	29.55
2020	1931	29733	64.94	67.84	62.05
2021	1186	26339	45.03	47.59	42.47
2022	1370	31529	43.45	45.75	41.15
2023	1725	38699	44.57	46.68	42.47
Total	9087	218186	41.65	42.50	40.79

Mortality rate per 1000 indoor admissions was calculated. It was suddenly increased in 2020 and then dropped and remained stable till 2023. (Table 1) The mortality trend was studied, which was linear, (χ^2 = 669.84, P<0.0001).

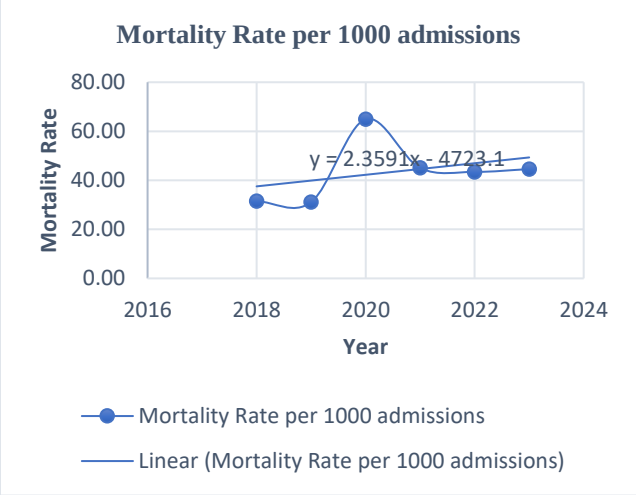

Figure-1: Trend of Mortality Rate

The linear trend equation was calculated. (Figure 1) The trend line equation for mortality rate is Y = 2.3591(X) + 44.612. Here Y is Mortality rate and X is Year where, X has converted as (x – 2021)

In hospital record, maximum death proportion has been in the adult age group (15 to 60 age -group). It was maximum in 2020 (54.01%). Nearly 1/3rd of the hospital deaths were in patients aged 60 years and above in every year.

Early neonatal period, which were almost 10% of total deaths at every year. It was maximum in 2023.

The seasonal distribution of mortality shows peak mortality in rainy season (June, July, August) and lower rates in summer (February, March, April), demonstrating significant seasonal variation in figure 2.

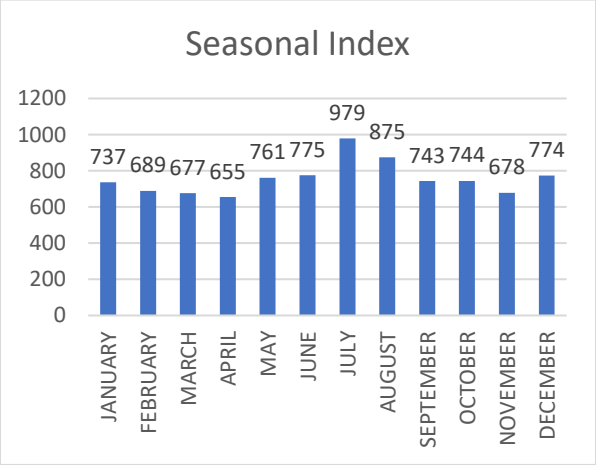

Figure-2: Month-wise seasonal index of Deaths during 2018 to 2023

Table 3 reveals communicable diseases accounted for an overall mortality rate of 22.94%, with infectious and parasitic diseases comprising the largest proportion at 66.91%. Respiratory diseases and CNS infections also contributed significantly, showing variations over the years, particularly in 2020 with an increase in both infectious diseases and respiratory conditions.

Non-communicable diseases consistently accounted for the highest mortality share, ranging from 52.67% to 58.75%, compared to communicable diseases (13.05% to 21.25%) and postmortem cases (20.49% to 26.43%) as seen in table 4. Within non-communicable diseases, cardiovascular causes led at 37.63%, followed by gastro-intestinal, perinatal, and respiratory diseases. Postmortem cases peaked in 2022 and 2023.

Gender has not showing significant association with mortality during these 6 years. Additionally, non-communicable diseases show statistically significant prevalence across the years with a notable shift in diagnosis patterns, with communicable diseases peaking in 2020 as seen in table 5.

DISCUSSION

In our study, the mortality rate per 1000 indoor admissions surged in 2020, likely attributed to the COVID-19 pandemic, which caused a notable increase in hospital admissions and mortality, consistent with findings by Lewnard J.A. et al.[5] This was followed by a decline, with the rate stabilizing from 2021 to 2023 as healthcare interventions improved.

In our study, the highest proportion of deaths occurred in the adult age group (15 to 60 years), peaking in 2020 (54.01%), which could be attributed to the increased mortality during the COVID-19 pandemic, particularly among adults. Additionally, around one-third of the deaths occurred in patients aged 60 years and above, a group generally more vulnerable to chronic diseases and complications, a trend that has also been reported in other studies, where older adults exhibit higher mortality due to age-related health issues.[6-9] The early neonatal period consistently contributed to about 10% of total deaths each year, with a peak in 2023, possibly reflecting an increase in perinatal complications or improved documentation during that year.

Peak mortality during the rainy season suggests a correlation between seasonal weather patterns and health outcomes, potentially due to increased incidences of waterborne diseases, respiratory infections, or exacerbations of chronic conditions affected by humidity and temperature variations. Lower mortality rates in summer may correspond to more favourable weather conditions that mitigate these health risks. However, it was contradictory to findings of Nandi C et al study, where mortality was maximum in summer.[10] This could be due to regional climatic differences and local health infrastructure influencing seasonal mortality patterns.

Non-communicable diseases, particularly cardiovascular conditions, consistently account for the highest percentage of mortality (ranging from 52.67% to 58.75%) across the years, aligning with findings from other studies.[6-10] This prevalence underscores the enduring impact of chronic health conditions on mortality rates, highlighting ongoing public health priorities in managing and preventing these diseases.

The peak in communicable diseases in 2020 underscores their vulnerability to health crises like the COVID-19 pandemic, emphasizing the importance of responsive public health strategies.

Table-2: Proportional Mortality Rate for different age-group

Proportional Mortality Rate by age during 2018 to 2023							
year	**Early neonatal**	**late neonatal**	**Post neonatal**	**1 to 5 years**	**5 to 15 years**	**15 to 60 years**	**More than 60 years**
2018	9.67	0.88	5.42	2.93	4.32	43.52	33.26
2019	7.75	0.53	3.44	1.92	2.78	53.11	30.33
2020	8.49	1.76	2.54	0.98	2.18	54.01	30.04
2021	9.44	2.95	3.96	2.61	2.45	50.59	27.91
2022	9.42	2.19	4.23	2.19	2.04	49.20	30.66
2023	9.74	2.09	4.70	2.78	2.26	48.52	29.62

Table-3: Year-wise Distribution of Communicable Disease-related Mortality by Specific Causes

	2018	**2019**	**2020**	**2021**	**2022**	**2023**	**Total**
Communicable diseases	20.37	18.81	37.86	22.77	16.57	17.10	22.94
Infectious and parasitic diseases	60.79	72.18	74.56	65.93	57.27	56.95	66.91
Respiratory diseases	15.47	11.97	16.28	13.33	19.38	19.32	15.97
CNS infection and inflammatory diseases	9.71	7.39	4.79	12.59	13.66	15.59	9.30
Infections of skin and subcutaneous tissues	5.04	3.87	0.55	3.70	3.52	2.37	2.59
Cardio-vascular infective diseases	1.80	0.70	2.74	2.96	1.32	2.37	2.16
Gastro-intestinal diseases	2.52	1.41	1.09	1.48	0.88	2.37	1.53
Uro-genital diseases	3.96	2.46	0.00	0.00	1.76	0.68	1.15
Perinatal specific infections	0.72	0.00	0.00	0.00	2.20	0.34	0.38

Table-4: Year-wise Distribution of Non-communicable Disease-related Mortality by Specific Causes

	2018	**2019**	**2020**	**2021**	**2022**	**2023**	**Total**
Non Communicable Diseases	58.75	58.21	52.67	57.93	57.01	56.46	56.56
Cardio-vascular diseases	37.28	35.72	43.17	34.50	35.98	37.37	37.63
Gastro-intestinal diseases	13.34	18.66	13.86	16.16	17.29	15.20	15.68
Perinatal causes	13.84	12.06	14.55	18.34	16.13	14.48	14.75
Respiratory diseases	14.34	12.17	10.23	13.54	15.24	15.61	13.42
Uro-genital diseases	12.47	11.15	8.948	11.21	9.48	9.14	10.29
CNS diseases	5.237	6.826	6.588	5.39	4.23	5.85	5.76
Neoplasms	2.868	2.844	1.082	0.73	1.54	1.85	1.83
Others	0.623	0.569	1.573	0.15	0.13	0.51	0.64
Postmortem	20.88	22.98	9.48	19.31	26.42	26.43	20.49

Table-5: Association between mortality and socio-demographic variables

Socio-demographic variables		**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**P value**
Gender	Female	561	607	720	474	521	639	0.094
	Male	804	903	1211	712	849	1086	
Diagnosis	Communicable	278	284	731	270	227	278	**0.000**
	Non Communicable	802	879	1017	687	781	802	
	Post-mortem	285	347	183	229	362	285	

LIMITATIONS

Being a single-center study, the results may not be generalizable, and potential confounding factors not accounted for further limit the applicability, highlighting the need for similar studies across diverse regions.

CONCLUSION

This study underscores the evolving mortality trends in a tertiary care hospital, with non-communicable diseases consistently being the leading cause of death. The increase in mortality rates during 2020 aligns with the global health crisis, followed by a stabilization in subsequent years. Seasonal variations indicate higher mortality in the rainy season, while age group analysis highlights a significant burden in the adult population. The shift in disease patterns, especially the peak in communicable diseases in 2020, emphasizes the dynamic nature of health challenges. The findings suggest the need for ongoing monitoring and targeted interventions to address both communicable and non-communicable diseases effectively.

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