

An observational study on pattern of mortalities as per ICD-10 classification system in a tertiary care hospital in India



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ABSTRACT

Background: Records of vital events like death constitute an important component of the Health Information System. Patterns of mortality decline that occur with the demographic transition is a change in the distribution of deaths by cause away from a pattern dominated by communicable diseases toward one in which non-communicable diseases account for the overwhelming majority of deaths. **Aims and Objective:** To identify the mortality pattern in Burdwan Medical College as per ICD-10 classification in the year 2017. The study also evaluated socio-demographic distribution and causes of deaths during that period. **Materials and Methods:** It was an Institution based retrospective observational study. Complete enumeration of all hospital records of medically certified deaths of in-patients from different departments except the Paediatrics who died in 2017 was done. The underlying cause of death was classified according to I.C.D 10th revision, version 16. Information collected included also the demographic characteristics like age, gender, date of admission, place of residence and date of death for the study. **Results:** In this study, most of the deaths were seen in males (59.99%), with a sex ratio of female to male deaths to be 667 per thousand. The major proportion of deaths was in the age group of 55 to 64 years (23.53%). The percentage distribution of ten major cause groups of death for the period from January to December during 2017 reveals that the group "Diseases of the Circulatory System" had occupied the position of the top-most killer and it had maintained the trend throughout the year with the highest rate in the month of March (43.9%). The cause of death was more in Non-Communicable diseases (Chapter IX, Chapter XIX) compared to that of Communicable diseases. **Conclusion:** Procedures for death certification and coding of underlying causes of death need to be streamlined to improve reliability of registration data needed for epidemiological research or public health policy formulation.

Key words: Mortality; ICD-10; Tertiary Care Hospital; Diseases

INTRODUCTION

Records of vital events like death constitute an important component of the Health Information System.¹ Patterns of mortality decline that occur with the demographic transition is a change in the distribution of deaths by cause away from a pattern dominated by communicable diseases toward one in which non-communicable diseases account for the overwhelming majority of deaths. This process,

known as the epidemiologic transition.² Life expectation at birth and at various subsequent ages is often cited as an indicator of population health when comparisons are made over time and between nations for designing intervention programs, allocation of resources or setting priorities. Life expectancy in India shows a continuous increasing trend from 23.63 years for male and 23.96 years for females in 1901 it has gone up to 63.9 years for males and 66.9 years for females in 2001.³ India is undergoing a

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rapid epidemiological transition consequent to economic and social change. Although the pattern of mortality is a key indicator of the consequent health effects, there is a scarcity of updated, precise and reliable statistical data, particularly in the rural areas.⁴ As the mortality statistics reveal a lot about the health of the population, it is quite important to know the frequency of diseases or death which keeps changing over time. It is equally important to determine whether that observed trend in mortality pattern is genuine or due to a change in classification system of diseases, changes in accuracy of diagnosis or allocation of priorities.^{5,6}

Traditionally, most epidemiological studies begin with mortality data. Many countries have routine systems for collection of mortality data. The causes and patterns of death are important and widely used for various purposes in explaining trends and differentials in overall mortality, indicating priorities of actions and in the assessment and monitoring of public health.⁷

The disease manifestations may not have changed significantly through human history, but their patterns have changed. The pattern of diseases in developing countries is very different than those in developed ones where we see that most deaths result from infectious and parasitic diseases compounded by malnutrition.⁵ In India, about 40% of deaths are from infectious, parasitic and respiratory diseases as compared with the 8% in developed countries.⁵ On the other hand, an increase in the frequency of new health problems of Non-communicable diseases (NCDs) such as coronary heart disease hypertension, diabetes mellitus road traffic accidents and malignancy has been noted in this country.⁷ It has already been mentioned that many parts of India are undergoing rapid epidemiological transition as a consequence of social and economic changes.⁸⁻¹⁰ Thus in keeping with these changes, ongoing modification of the health system is urgently required to ensure that the health care services provided address the main diseases suffered by the population.

The causes of mortality are often poorly documented in developing countries like India. The Medical Records Department in a medical college hospital has a system of compilation and keeping of records. But obtaining meaningful statistics from these records for health care planning and review is considerably lacking. Mortality data from hospitalized patients essentially reflect the causes and patterns of major illnesses as well as the care-seeking behaviour of the community. Besides, the standard of care being provided can be discerned. Records of vital events like death form an important component of the Health Information System. Therefore these hospital-based death records can provide information regarding the causes

of deaths, age and sex distribution of diseases and deaths, case fatality rates which are of immense or vital importance in planning health care services.⁵⁻⁸

A country needs sound epidemiological information to prioritize, plan and implement public health programmes. This information also provides the basis for patient care and helps the administration in managing day-to-day hospital affairs.

The optimal source of information on causes of death in populations is Vital registration data based on Medical certificates of causes of death (MCCD), issued by attending physicians. The World Health Organization (WHO) has prescribed a standard form for the Medical certificate of cause of death, which allows for the listing of multiple diseases or conditions that occur in a chronological and patho-physiological sequence terminating in death, as well as there are mention of associated diseases or conditions that are not directly linked to the causal sequence.¹¹ In each case, the listed causes are usually based on the attending physician's first-hand knowledge of the illness and circumstances leading to death. In some instances, deaths in hospitals are also subjected to pathological autopsies to determine the cause, but these are reserved largely for medico-legal cases.¹² Thus these necessary data is collected in the prescribed forms (Form 4 for Hospital deaths) which have been so designed by the World Health Organization (WHO). Here the forms are filled-up by the medical professionals attending to the deceased at the time of terminal illness. Thereafter, these forms are to be sent to the concerned Chief Registrars of Births and Deaths of every state/Union Territory for onward transmission to the office of the Registrar General, India for tabulation as per the National List of Causes of Death based on Tenth Revision of International Classification of Disease (ICD-10) under the Registration of Births & Deaths Act, 1969.

Purba Bardhaman district in West Bengal was formed on 7 April 2017 after bifurcation of the erstwhile Bardhaman district and its headquarters is the Bardhaman town. As per the 2011 Census of India data, recast after bifurcation of erstwhile Bardhaman district in 2017, Purba Bardhaman district has a total population of 4,835,532. There are 2,469,310 (51%) males and 2,366,222 (49%) females. Population below 6 years is 509,855.¹³ The Burdwan Medical College & Hospital (BMCH) is the only public sector tertiary level as well as teaching hospital in the district of Purba Bardhaman. The present study was aimed to study the trend or pattern of mortality in Burdwan Medical College Hospital as per ICD-10 classification and coding system of diseases during last one year (2017) and an attempt had been made to obtain epidemiological information related to mortality.

MATERIALS AND METHODS

The present study was an Institution based retrospective observational study. All case records of indoor patients after discharge or death are submitted to the Medical Record Section of Burdwan Medical College & Hospital (BMCH). Complete enumeration of all hospital death records of medically certified deaths from medical record section of in-patients from different departments of the hospital except the Paediatric department who died during the last one year i.e. from 1st January to 31st December 2017 in Burdwan Medical College Hospital, a tertiary care hospital attached to Burdwan Medical College in Purba Bardhaman district of West Bengal. The present study was conducted in a period of three months, i.e., between July 2018 to September 2018.

The underlying cause of death was classified according to ICD 10th revision, version 16. Information collected included also the demographic characteristics of the deceased i.e. age, gender, date of admission, place of residence and date of death for the study. Outcome variables include proportion of deaths from different conditions as classified in ICD-10, proportion of deaths from different conditions in different age groups and gender of patients, proportion of different causes of deaths in different months of the study year.

Data were checked for completeness and consistency; coded and entered into MS-Excel sheet. Data was analyzed using principles of descriptive statistics using appropriate software. Being a descriptive type of study with complete enumeration, data were summarized in percentages and proportion Data were presented in suitable tables.

The research protocol was approved by the Institutional ethics committee of the Burdwan Medical College. Necessary permission was sought from the hospital administrative authority to access the hospital records.

RESULTS

A total of 4289 medically certified deaths were registered in one year from the month of January to December 2017 in Medical Records Sections of Burdwan Medical College and hospital, Bardhaman. The Study included all deaths from each and every department of the hospital except Paediatrics ward data which was not obtainable from the medical record section. Overall, most of the deaths were seen in males that were 2573 (59.99%), with a sex ratio of female deaths to male deaths to be 667 per thousand. The major proportion of deaths was in the age group of 55 to 64years (23.53%) wherein also males predominated (67.49%)

Table 1: Age & Sex-wise distribution of all Medically Certified Deaths in BMCH in 2017

Age groups in years	Male		Female		Total	
	No.	%	No.	%	No.	%
15 – 24	142	(5.52)	270	(15.74)	412	(9.6)
25 – 34	215	(8.36)	208	(12.12)	423	(9.86)
35 – 44	316	(12.28)	198	(11.54)	514	(11.98)
45 – 54	526	(20.44)	301	(17.54)	827	(19.28)
55 – 64	681	(26.47)	328	(19.11)	1009	(23.53)
65 – 69	218	(8.47)	128	(7.46)	346	(8.08)
70 & above	475	(18.46)	283	(16.49)	758	(17.67)
Total	2573	(100)	1716	(100)	4289	(100)

Percentage figures in parenthesis indicate column percentages

The other cause groups of deaths viz., Pregnancy, Childbirth & Puerperium (Chapter XV) and External causes of morbidity & mortality (Chapter XX) accounted for the rest (8.9%).

DISCUSSION

In almost all developing countries where death registration is functional or operational, even for only a fraction of the population, it would be reasonable to expect that the correct diagnosis of causes of death would be the highest for those deaths that occur in hospitals compared with those that occur elsewhere. In principle at least, the clinical history of the deceased ought to be more reliably and comprehensively described in the medical records of patients who were hospitalized prior to death or died in the hospital.

Among the leading cause groups (Table 2), Diseases of Circulatory System (Chapter IX) constituted the maximum i.e. 33.87% of total medically certified deaths, followed by Injury, Poisoning and certain other consequences of external causes (Chapter XIX) that had contributed to 15.29%. The Diseases of Respiratory System (Chapter X) had contributed to 10.49% followed by Certain Infectious and Parasitic diseases (Chapter I) 9.9%, Diseases of the Digestive system (Chapter XI) 6.09%, Diseases of the Genito-Urinary system (Chapter XIV) 5.83% and Diseases of the Nervous system (Chapter VI) 3.87%. The Endocrine, Nutritional & Metabolic diseases (Chapter IV) constituted 3.61% and Neoplasms (Chapter II) 2.15%. In respect of certain leading causes of deaths, the gender difference was present where in Injury, Poisoning and certain other consequences of external causes (Chapter XIX) category females (18.75%) were more affected compared to the males whereas in case of the Diseases of Respiratory System (Chapter X), males (12.81%) predominated. Among the Diseases of Circulatory System (Chapter IX), there was slight female (35%) preponderance compared to the males (33.09%).

The percentage distribution of ten major cause groups of death for the period from January to December during 2017 (Table 3) reveals that the group Diseases of the Circulatory System had occupied the position of the top-most killer and it had maintained the trend throughout the year with the highest rate in the month of March (43.9%). The proportion of deaths due to Injury (other than RTA), Poisoning, and certain other consequences of external causes had exhibited a pattern next to it with the highest percentage distribution in the month of March (26.83%). The share of medically certified deaths due to Diseases of Respiratory System had remained on higher side in the month of April (13.17%) and May (11.78%). Interestingly, Certain Infectious & Parasitic diseases showed a higher trend from the month of April to October with the maximum distribution in the month of July (12.37%).

The Diseases of the Circulatory System (Chapter IX) was the topmost ranking major group of diseases, constituting 33.87% of total medically certified deaths. It accounted for

33.09 and 35% respectively in males and female deaths. The distribution of major components under this cause group is presented in Table 4. The sub-groups Cerebral Infarction (I63) and Acute Myocardial Infarction (I21) are reported to be the top two leading causes of deaths constituting 52.08% and 18.04% respectively. Cardiac arrest (I46) and Intra-cerebral Haemorrhages (I61) had respectively constituted 8.82% and 5.78% of total deaths reported under this major group. The percentages of male deaths due to Cerebral Infarction (I63) and Acute Myocardial Infarction (I21) were 52.62% & 18.67% respectively that were higher as compared to total female death rates. The female deaths due to Cardiac arrest (I46) were on a higher side (10.36%) as compared to corresponding percentages of male deaths.

The present study has shown that most of the deaths had occurred in males (59.99%), with a sex ratio of female deaths to male deaths to be 667 per thousand. This is being corroborated from the "Report on Medical Certification of

Table 2: Distribution of all Medically Certified Deaths by sex & Ten leading cause groups as per ICD-10 in BMCH in 2017

Sl. No.	Major cause groups	Male		Female		Total	
		No.	%	No.	%	No.	%
1	Diseases of the Circulatory system (I00-I99)	850	(33.09)	602	(35)	1452	33.87
2	Injury, Poisoning & certain other consequences of external causes (S00-T98)	334	(13)	322	18.75	656	15.29
3	Respiratory system (J00-J99)	329	(12.81)	121	(7.03)	450	10.49
4	Certain Infectious & Parasitic diseases (A00-B99)	260	(10.12)	165	(9.59)	425	(9.9)
5	Diseases of the Digestive system (K00-K92)	180	(7)	81	(4.7)	261	(6.09)
6	Diseases of the Genito-Urinary system (N00-N99)	161	(6.27)	89	(5.17)	250	(5.83)
7	Diseases of the Nervous system (G00-G99)	112	(4.36)	54	(3.14)	166	(3.87)
8	Endocrine, Nutritional & Metabolic diseases (E00-E90)	86	(3.35)	69	(4.01)	155	(3.61)
9	Neoplasms (C00-D48)	61	(2.37)	31	(1.8)	92	(2.15)
10	Others	196	(7.63)	186	10.81	382	(8.9)
	Total	2569	(100)	1720	(100)	4289	(100)

Percentage figures in parenthesis indicate column percentages

Table 3: Percentage distribution of leading cause group of deaths in BMCH during different months in 2017

Months in 2007	Ch.IX	Ch.XIX	Ch.X	Ch.I	Ch.XI	Ch.XIV	Ch.VI	Ch.IV	Ch.II	Others	Total
January	34.12	14.71	9.4	4.71	11.18	9.41	4.12	2.35	2.94	7.06	100
February	43.3	20.47	8.77	6.43	3.5	3.5	1.17	1.75	1.17	9.94	100
March	43.9	26.83	2.44	2.44	0	7.32	0	0	0	17.07	100
April	39.51	14.5	13.17	11.64	3.63	5.34	3.24	2.48	0	6.49	100
May	32.24	22.44	11.78	12.22	5.33	4	4.22	0.88	2.67	4.22	100
June	35	19.4	8.8	9.4	8	4.8	4	1.8	2	6.8	100
July	39.25	11.16	12.3	12.37	3.76	5.24	6.18	1.21	0.2	8.33	100
August	20.94	12.29	11.96	10.96	10.3	6.64	2.99	7.64	6.31	9.97	100
Sept.	26.68	13.52	12.1	6.76	10.68	8.9	3.56	4.63	2.14	11.03	100
Oct.	23.27	22.52	11.07	12.21	6.49	6.11	3.05	5.73	1.53	8.02	100
Nov.	36.72	13.67	8.99	8.63	7.19	6.47	2.16	9.71	3.23	3.23	100
Dec.	38.07	11.72	10.46	8.79	5.65	7.74	4.6	7.32	2.09	3.56	100

Leading major causes of deaths (Chapter-wise as per ICD-10)

Table 4: Distribution of major causes of deaths among diseases of Circulatory System in BMCH in 2017

SI. No.	Causes of death	Male		Female		Total	
		No.	%	No.	%	No.	%
1	Cerebral Infarction	462	(52.92)	294	(50.78)	756	(52.08)
2	Acute myocardial Infarction	163	(18.67)	99	(17.1)	262	(18.04)
3	Cardiac arrest	68	(7.79)	60	(10.36)	128	(8.82)
4	Intracerebral hemorrhage	53	(6.07)	31	(5.35)	84	(5.78)
5	Cardiomyopathy	42	(4.81)	23	(3.97)	65	(4.48)
6	Heart failure	33	(3.78)	26	(4.49)	59	(4.06)
7	Chronic Ischaemic Heart Disease	31	(3.55)	22	(3.8)	53	(3.65)
8	Others	21	(2.41)	24	(4.15)	45	(3.09)
	Total	873	(100)	579	(100)	1452	(100)

Percentage figures in parenthesis indicate column percentages

Cause of Death-2015²¹ of RGI, Govt. Of India where the contribution of male deaths in the total medically certified cases were reported to be 62.3 per cent with a sex ratio of female deaths to male deaths to be 605 per thousand during the period from 2000-2015. It seems that more males are admitted to hospital during last moments of life as compared to females.¹⁴ More male deaths than female deaths had also been documented in various other studies viz. Holambe VM et al.¹⁵ Joshi R et al.⁴ Godale L et al.¹⁶ Bhatia S et al.¹⁷ and Peres LC et al.¹⁸ In the present study, a major proportion of hospital deaths were in patients of 55 to 64 years of age group and in deceased population of more than 70 years of age. The studies of Kauser Murtuza M et al.⁵ and Holambe VM et al.¹⁵ also reported the same.

Further, in the present study, the Diseases of the Circulatory System (Chapter IX) was the topmost ranking major group of diseases, constituting 33.87% of total medically certified deaths that had been corroborated by studies of Holambe VM et al.¹⁵ and Joshi R et al.⁴

The cause of death was more in Non-Communicable diseases (Chapter IX, Chapter XIX) compared to that of Communicable diseases (Chapter I) and this upward trend of non-communicable diseases as leading cause of death might be due to many reasons such as change in lifestyle and behaviour or epidemiological transition.⁷ Similar findings were seen in the study of Peres LC et al.¹⁸ and Saha et al.¹⁹ Omran²⁰ found a changing pattern of disease and a high prevalence of deaths due to infectious and parasitic diseases probably due lower socioeconomic status similar to the present study. But, cardiovascular deaths ranked second in his study.

CONCLUSIONS

Knowledge of mortality pattern which may vary from region to region is crucial in formulating health care programs and policies. It also plays an important role in furtherance of medical research and is fundamental for monitoring as

well as improving the methods of diagnosis and analysis. Procedures for death certification and coding of underlying causes of death need to be streamlined to improve reliability of registration data needed for epidemiological research or public health policy formulation. Estimates of cause-specific mortality from this research or researches of similar kinds shall contribute towards burden of disease estimation and guide interventions to reduce avoidable mortality in hospitals India.

Limitations of the study

The study excluded the deaths from the paediatric department. The pattern of death would have been more evident if all cases are included in the study. To know the distribution of deaths in different months, data of more than one year is required.

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Author's Contribution:

CN-Concept and design of the study; prepared first draft of manuscript; **KM**-Interpreted the results; reviewed the literature and manuscript preparation; **DB**-Concept, Coordination, review of literature and manuscript preparation; **SPP**-Data collection, statistical analysis and interpretation, preparation of manuscript and revision of the manuscript.

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