

## A descriptive study of mortality patterns amongst adult patients admitted to a tertiary care and teaching hospital

Lovely Dhar,<sup>1</sup> Dipankar Mondal,<sup>1</sup> Divit Sarkar,<sup>1</sup> Jigisha Rana,<sup>1</sup> Madhushree Masanta,<sup>1</sup> Manish Sarkar,<sup>1</sup> Debjyoti Maji,<sup>1</sup> Dibya Adhikary,<sup>1</sup> Diya Das,<sup>1</sup> Kismotulla Mondal,<sup>1</sup> Mayukhe Kayal,<sup>1</sup> Mazarul Rahaman Mollah,<sup>1</sup> Md. Joy Rahaman Mondal,<sup>1</sup> Md. Rafiqul Hasan,<sup>1</sup> Md. Sahil,<sup>1</sup> Madhumita Basu,<sup>2</sup> Abhijit Mukherjee<sup>3</sup>

1. MBBS students (Batch 2020-2025), NRS Medical College and Hospital, Kolkata

2. Demonstrator, Community Medicine, NRS Medical College and Hospital, Kolkata

3. Associate Professor, Community Medicine, NRS Medical College and Hospital, Kolkata

### Abstract

#### Introduction

Data on mortality among hospitalised patients mostly reflect the aetiologies and distributions of severe illnesses as well as community-level patterns of care-seeking. These hospital-based death records include details about the distribution of diseases and deaths by age and sex, among other things, that are extremely or critically important for organising healthcare services. The present study was undertaken to classify deaths and describe the causes of death based on the age and sex of the patients at the NRSMCH according to the International Classification of diseases (ICD-10).

#### Materials and methods

The present descriptive retrospective hospital-based study using records, was conducted at the Medical Records Department of NRSMCH between 1<sup>st</sup> January 2022 to 2<sup>nd</sup> March 2022, a total of 60 days. A complete enumeration of records of all 849 deaths that occurred in NRSMCH during the study period was done. All data were recorded in predesigned pre-tested schedule, entered into Microsoft Excel (Microsoft Corp. USA) and analysed using SPSS, Version 20.

#### Results

The mean age of patients in the study population was 54.9 (16.5) years with 36.2% females and 63.8% males. The commonest cause of death overall are diseases of the circulatory system (I00-I99) (39.8%) followed by injury and poisoning (S00-T98) (13.9%). Gender based analysis of deaths shows a higher proportion of deaths from diseases of the circulatory system (I00-I99) in both females (37.5%) and males (41.1%). The second most recorded cause of mortality was injury, poisoning (S00-T98) 13.9% overall and in both females (13%) and males (17.2%). Age group wise break-up of deaths show that the commonest recorded cause of death in the 18- 40-year age group was injury, poisoning (S00-T98), followed by Certain infectious parasitic diseases (A00 – B99) (18.1%). The commonest cause of death in the 41- 60-year age group was Diseases of circulatory system (I00 – I99) (39.8%), followed by Injury, poisoning (S00 – T98) (11.7%). The commonest cause of death in the 61–80-year age group was Diseases of circulatory system (I00 – I99) (50.3%) while the second most common was Injury, poisoning (S00 – T98) (9.9%). In patients over the age of 80 years the commonest cause of death is Diseases of circulatory system (I00 – I99) (56.4%) followed by Diseases of respiratory system (J00 – J99) (15.4%).

#### Conclusion

In the present study, most common cause of overall mortality were diseases of the circulatory system (I00-I99) of which the commonest was Nontraumatic intracerebral haemorrhage, Unspecified, I61.9. The single most common cause of death in the study population was “Nontraumatic intracerebral haemorrhage, Unspecified”. No major differences were observed in the proportion of males and females in terms of the causes of death. Age group wise break-up of deaths show that the commonest recorded cause of death in the 18- 40 age group were “Injury, poisoning” (S00-T98), while the commonest cause of death in the 41-60, 61-80 and e” 81-year age group were “Diseases of circulatory system” (I00 – I99).

**Key words:** Mortality, Medical records, International Classification of diseases, Diseases of circulatory system

### Introduction

Vital event records, such as death records, are a crucial part of the Health Information System.<sup>1</sup> India is going through a rapid epidemiological transformation as a result of societal and economic upheaval. There is a dearth of current, accurate, and trustworthy statistical information, despite the fact that mortality patterns are a crucial predictor of the ensuing health

### Corresponding author

Dr Abhijit Mukherjee

Associate Professor, Community Medicine

34, SN Banerjee Road, New Barrackpore, Kolkata 131.

E-mail: drabhijit71@gmail.com

Articles in The ESRF Research Journal for Undergraduate Medical Students are Open Access articles published under a Creative Commons Attribution-NonCommercial 4.0 International License. (CC BY-NC). This license permits use, distribution, and reproduction in any medium, provided the original work is properly cited, but it cannot be used for commercial purposes and it cannot be changed in any way.



repercussions.<sup>2</sup> Knowing the frequency of diseases or deaths, which is constantly changing, is significant since mortality data disclose a lot about the population's health. Determining whether the reported trend in death patterns is real or the result of adjustments to the disease classification system, diagnostic accuracy, or priority setting is equally crucial.<sup>3,4</sup>

Traditionally, mortality data have been used to start most epidemiological research. The causes and patterns of death are significant and frequently used to explain trends and differences in total mortality, to identify action priorities, and to assess and track public health.<sup>5</sup> As opposed to 8% in industrialised nations, over 40% of deaths in India are caused by infectious, parasitic, and respiratory disorders.<sup>3</sup> On the other hand, it has been observed that non-communicable illnesses (NCDs), such as coronary heart disease, hypertension, diabetes mellitus, traffic accidents, and cancer, are becoming more prevalent in this nation.<sup>5</sup>

ICD-10 is the tenth update to the World Health Organization's (WHO) International Statistical Classification of Diseases and Related Health Problems (ICD), a list of medical classifications. It includes codes for illnesses, symptoms, unusual findings, complaints, social conditions, and outside factors that can cause harm or sickness.<sup>6</sup> ICD-10 allows for specificity with relation to the origin, presentation, location, severity, and kind of injury or disease through the use of optional sub-classifications<sup>7</sup>.

Medical colleges have a system in place for compiling and maintaining records, which is called the Medical Records Department. Data on mortality among hospitalised patients mostly reflect the aetiologies and distributions of severe illnesses as well as community-level patterns of care-seeking. These hospital-based death records can include details about the distribution of diseases and deaths by age and sex, among other things, that are extremely or critically important for organising healthcare services.<sup>3,4,5,8</sup> A country needs reliable epidemiological data to organise, and carry out public health initiatives. Additionally, this data serves as the foundation for patient care and aids hospital administration in running day-to-day operations. The goal of the current study was to examine the ICD-10 mortality patterns at Nil Ratan Sircar Medical College and Hospital.

### Objectives

The objectives of the study are as follows:

- To classify deaths occurring at the NRSMCH during the study period according to the International Classification of diseases (ICD-10).
- To describe the causes of death based on the age and sex of the patients.

### Materials and methods

#### Study Type and Design:

It was a descriptive retrospective hospital-based study using records.

#### Study Period:

Study duration was from 1<sup>st</sup> January 2022 to 2<sup>nd</sup> March 2022, a total of 60 days.

#### Study Setting:

The present study was conducted in Medical Records Department of Nilratan Sircar Medical College and Hospitals, which is located in the Kolkata district of West Bengal. It a tertiary referral institute and has teaching programmes for graduation and post-graduation, affiliated to West Bengal University of Health Sciences, Kolkata. The hospital has a bed strength of 1920 and caters to a large population from Kolkata and nearby districts. The Medical Records Department in NRS Medical College has system of retention of records. Data were collected from these records.

#### Study Population:

Study subjects were records of death that occurred in NRSMCH. Records of all deaths that occurred in NRSMCH Hospital during the 60 day period between January 1, 2022 and March 2, 2022.

#### Sample size and sampling technique:

Complete enumeration technique was used as the sample size in present study, that is, all death including medico legal deaths that occurred during the 60-day period from January 1<sup>st</sup> to 2<sup>nd</sup> March 2022. A total of 849 records were analysed for this purpose.

#### Study Tools and Technique:

Tools:

1. Pre-designed pre-tested schedule.
2. Death records at the Medical Records Department of NRSMCH.
3. ICD 10 – ICD 10 is the 10<sup>th</sup> revision of International Statistical Classification of Disease and Related health problem (ICD), a medical classification list by World Health Organization. It has been implemented on the recommendation of WHO & replaces ICD 9, which has been in use since 1979. ICD 10 more closely reflects current medical knowledge than ICD 9. It is the most radical change in the ICD for 50 years. This will impact on mortality statistics by cause of death, with a discontinuity in the trends for some causes of death.

**Technique:**

1. Record review.
2. Coding of the causes of death.

**Study Variables/Parameters**

- Cause of death
- Age
- Gender
- Religion
- Cause of death
- ICD-10 classification of diseases

**Operational Definition and Descriptions of Variables:**

- **Cause of Death:** It was recorded as per diagnosis of death due to different diseases by attending doctor.
- **Age:** Age was noted as found in the records as completed years in case of adult, completed months in case of child, completed days in case of neonate.
- **Gender:** Male/ Female noted from medical record
- **Religion:** Hindu/ Muslim/ Christianity/ Others noted from medical record.

**Data Collection:**

Records of all death were kept in Medical Records Department of NRSMCH. The Medical Officer of Record Department was intimated about the study and his support, cooperation and permission was requested. Data was collected from records of Death Register. All deaths during the reference period were recorded including medicolegal cases. The underlying causes of death was recorded with great accuracy and was classified according to the ICD-10<sup>th</sup> revision. Data about age, sex and cause of death were used for analysis.

**Data Analysis:**

The recorded data was entered in Microsoft Excel data sheet. Data was organized and presented using the principles of descriptive statistics.

**Ethical Issues:**

Study purpose was explained to the MSVP and permissions obtained. Permission was also taken from the Medical Officer of the Medical Records Department of NRSMCH before the

start of the study. Anonymity and confidentiality of patient details were maintained throughout the study.

**Results**

The mean age of patients in the study population was 54.9 (16.5) years with 36.2% females and 63.8% males. The commonest age group of patients in the present cohort was 41-60 years (38.2%) followed by 61-80 year (36.7%). (Table 1)

The commonest cause of death overall are "Diseases of the circulatory system" (I00-I99) (39.8%) followed by "Injury and poisoning" (S00-T98) (13.9%). Gender based analysis of deaths shows a higher proportion of deaths from "Diseases of the circulatory system" (I00-I99) in both females (37.5%) and males (41.1%). The second most recorded cause of mortality was "Injury, poisoning" (S00-T98) 13.9% overall and in both females (13%) and males (17.2%). (Table 2, Fig 1)

Age group wise break-up of deaths show that the commonest recorded cause of death in the 18- 40-year age group was "Injury, poisoning" (S00-T98), followed by "Certain infectious parasitic diseases" (A00 – B99) (18.1%). The commonest cause of death in the 41- 60-year age group was "Diseases of circulatory system" (I00 – I99) (39.8%), followed by "Injury, poisoning" (S00 – T98) (11.7%). The commonest cause of death in the 61–80-year age group was "Diseases of circulatory system" (I00 – I99) (50.3%) while the second most common was "Injury, poisoning" (S00 – T98) (9.9%). In patients over the age of 80 years the commonest cause of death is "Diseases of circulatory system" (I00 – I99) (56.4%) followed by "Diseases of respiratory system" (J00 – J99) (15.4%). (Table 3, Fig 2)

The top three commonest causes of death were "Nontraumatic intracerebral hemorrhage, Unspecified" I61.9 (10%), "Unspecified injury of head", S09.90 (7.5%) and "Sepsis, unspecified organism", A41.9 (5.4%). In females the top three commonest causes of death were "Nontraumatic intracerebral hemorrhage, Unspecified", I61.9 (11.7%), "Sepsis, unspecified organism", A41.9 (6.8%) and "Burn of unspecified body region, unspecified degree", T30.0 (5.9%). In males the top three commonest causes of death were "Unspecified injury of head", S90.09 (9.8%), "Nontraumatic intracerebral hemorrhage, Unspecified", I61.9 (9%), and "Cerebral infarction, unspecified", I63.9 (4.6%) and "Sepsis, unspecified organism", A41.9 (4.6%). (Fig 3)

**Discussion**

Most of the deaths in the present study were seen in 41-60-year age group, in accordance with the age distribution of the study population. The proportion of males was higher in the population compared to females. Nearly a third of all deaths

in a study cohort reported by Holambe VM,<sup>9</sup> from a tertiary care setting in Latur, Maharashtra, belonged to the geriatric (>60 year) age group, similar to the present study. A third of all patients included in the present cohort were females. Similar finding was recorded by other authors.<sup>10</sup> Increased proportion of male mortality may be due to more male hospitalization than female due to gender bias.

In the present study, the leading cause of mortality based on system involved were “Diseases of circulatory system” (39.8%) followed by death due to “Injury and poisoning” (13.9%) and “Diseases of the Respiratory System (9.5%). Holambe VM et al,<sup>9</sup> reporting from a tertiary medical college in Maharashtra, showed that the leading proportion of deaths (17.77%), in their patients were diseases of the circulatory system (IHD, stroke). Bhatia et al,<sup>11</sup> reporting from a super-speciality hospital in Chandigarh, in 2008, showed that the most important cause of mortality was “Diseases of circulatory system” (35.7%), followed by “Injury, poisoning and certain other consequence of external causes” (10.5%) and “Death due to infectious and parasitic diseases” (9.5%), findings similar to the present study. The continual decrease in the infectious disease prevalence, may be the reason behind the lower prevalence of this disease group in the present study. Nandi et al,<sup>10</sup> from a study setting similar to the present study in 2021, reported that among the leading cause groups, “Diseases of Circulatory System” constituted the maximum (33.87%) of total medically certified deaths, followed by “Injury, Poisoning and certain other consequences of external causes” (15.29%). “Diseases of Circulatory System”, accounted for 33.09 and 35% respectively in males and female deaths.<sup>10</sup> Both findings were similar to the present study. The findings in hospital mortality statistics have been confirmed from verbal autopsy studies in the field settings. In their study in rural Andhra Pradesh on mortality, Joshi et al,<sup>2</sup> reported that “Diseases of the circulatory system” were the leading causes of mortality (32%), second was injury and external causes of mortality (13%) while the third were infectious and parasitic diseases (12%).

Gender based analysis of deaths, in the present study, show a higher proportion of deaths from “Diseases of the circulatory system” (I00-I99) in both females (37.5%) and males (41.1%). The second most recorded cause of mortality was “Injury, poisoning”, (S00-T98) 13.9% overall and in both females (13%) and males (17.2%). Cardiovascular disease is reported as the leading cause of death among males as well as females in death statistics reported from the Sample Registration System, SRS (2017- 2019).<sup>12</sup> The study also showed that males had a higher number of deaths from Unintentional injuries: Motor Vehicle Accidents (5.2%) versus females (1.4%).<sup>12</sup> In contrast to the differences in deaths due to poisoning and injuries, in men and women seen in the SRS study, the proportion between genders was similar in the present study. Whether it reflects a change in the disease pattern or indicates differ-

ential rates of admission following injury or poisoning needs to be studied by further research.

“Diseases of the circulatory system” continue to remain the leading cause of death in the world despite increasing preventive measures. In present study, among diseases of the circulatory system, the five-leading cause of mortality among specific diseases of the circulatory system were “Nontraumatic intracerebral haemorrhage (I61)” (26.9%), “Other and unspecified nontraumatic intracranial haemorrhage (I62)” (13.9%), “Nontraumatic subdural haemorrhage (I63)” (13%), “Other cerebrovascular disease (I67)” (9.8%) and “Acute myocardial infarction (I21)” (9.5%). Nandi, et al,<sup>10</sup> reported that the sub-groups Cerebral Infarction (I63) and Acute Myocardial Infarction (I21) were the top two leading causes of deaths constituting 52.08% and 18.04% respectively.

Based on the specific diagnosis, the top three commonest causes of death were “Nontraumatic intracerebral hemorrhage, Unspecified”, I61.9 (10%), “Unspecified injury of head”, S09.90 (7.5%) and Sepsis, unspecified organism, A41.9 (5.4%). According to reports by the World Health Organisation in 2020,<sup>13</sup> the world’s biggest killer is ischaemic heart disease, responsible for 16% of the world’s total deaths. Stroke and chronic obstructive pulmonary disease are the 2nd and 3rd leading causes of death, responsible for approximately 11% and 6% of total deaths respectively throughout the death.

Age group wise break-up of deaths show that the commonest recorded cause of death in the 18- 40-year age group was injury and poisoning followed by “Certain infectious parasitic diseases” (A00 – B99). Only 17.2% of patients in this age group had diseases of the circulatory system. The proportion increased gradually with increasing age groups with more than half of deaths in patients above 80-year age group reported to be due to diseases of circulatory system. While injury and poisoning were the second most common cause of death in patients in the 41-60 and 61-80- year age group, it was replaced by diseases of the respiratory system in patients over the age of 80 years.

## Conclusion

In conclusion, in the present study, most common cause of overall mortality were diseases of the circulatory system (I00-I99) of which the commonest was Nontraumatic intracerebral haemorrhage, Unspecified, I61.9 (10%). No major differences were observed in the proportion of males and females in terms of the causes of death. This calls for public health measures to reduce mortality by intervening on preventable causes.

## Limitation

Firstly, record keeping was insufficient. Some data were not recorded in death register, some were incomplete and some were not readable due to bad hand writing. In all such cases, the authors went through the records and arrived at a provisional cause to the best extent possible. Secondly, deaths from Gynaecological and Obstetric causes were not included

in the present study and this might have affected the proportion of deaths reported in women based on the causes. Finally, for medicolegal cases, the authors did not have access to the final diagnosis based on autopsy and were coded based on the provisional diagnosis. Some discrepancies between the provisional and final diagnosis cannot be ruled out.

Table 1: Distribution of the study population based on age and sex (n=849)

Variable	Levels	Number	Frequency
Age group	18 – 40 years	174	20.5
	41 – 60 years	324	38.2
	61 - 80years	312	36.7
	>81 years	39	4.6
Sex	Female	307	36.2
	Male	542	63.8
Total	849	100	

Table 2: Distribution of causes of system specific cause of mortality (n=849)

Cause of mortality (code)	TotalN(%)	Female N(%)	Male N(%)
Certain infectious parasitic diseases (A00 – B99)	64 (7.5)	26 (8.5)	38 (7)
Neoplasm (C00 – D48)	51 (6)	22 (7.2)	29 (5.4)
Endocrine, nutrition & metabolic diseases (E00 – E90)	26 (3.1)	11 (3.6)	15 (2.8)
Diseases of nervous system (G00 – G99)	26 (3.1)	11 (3.6)	15 (2.8)
Diseases of circulatory system (I00 – I99)	338 (39.8)	115 (37.5)	223 (41.1)
Diseases of respiratory system (J00 – J99)	81 (9.5)	31 (10.1)	50 (9.2)
Diseases of digestive system (K00 – K93)	32 (3.8)	5 (1.6)	27 (5)
Diseases of genitourinary system (N00 – N99)	36 (4.2)	14 (4.6)	22 (4.1)
Symptom, signs & abnormal clinical & lab finding (R00 – R99)	57 (6.7)	23 (7.5)	34 (6.3)
Injury, poisoning (S00 – T98)	118 (13.9)	40 (13)	93 (17.2)
Others*	20 (2.4)	9 (2.9)	11(2)
Total	849 (100)	307 (100)	542 (100)

Figure 1: Sex wise distribution of causes of death based on system involvement (n=849)

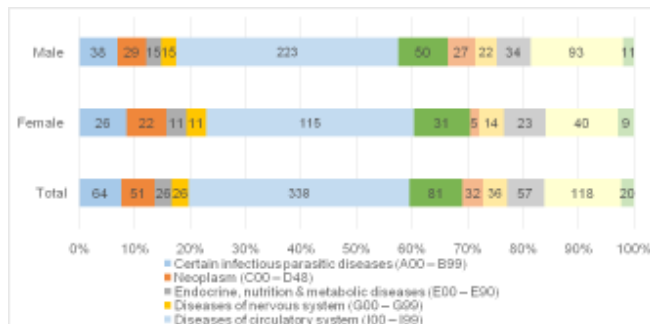
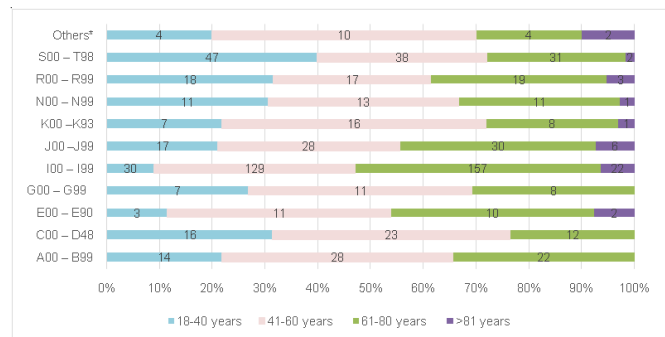


Table 3: Age groups wise distribution of deaths based on system (n=849)

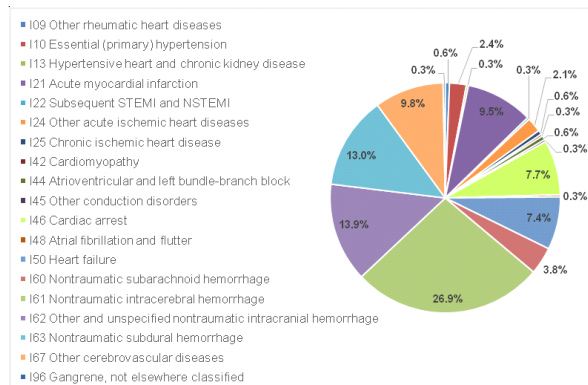
Cause of mortality (code)	TotalN(%)	Age groups			
		18-40 yearsN(%)	42-60 yearsN(%)	61-80 yearsN(%)	>81 years N(%)
Certain infectious parasitic diseases (A00 – B99)	64 (6.9)	14 (18.1)	28 (8.6)	22 (7)	0
Neoplasm (C00 – D48)	51 (6)	16 (9.2)	23 (7.1)	12 (3.8)	0
Endocrine, nutrition & metabolic diseases (E00 – E90)	26 (3.1)	3 (1.7)	11 (3.4)	10 (3.2)	2 (5.1)
Diseases of nervous system (G00 – G99)	26 (3.1)	7(4)	11 (3.4)	8 (2.6)	0
Diseases of circulatory system (I00 – I99)	338 (39.8)	30 (17.2)	129 (39.8)	157 (50.3)	22 (56.4)
Diseases of respiratory system (J00 – J99)	81 (9.5)	17 (9.8)	28 (8.6)	30 (9.6)	6 (15.4)
Diseases of digestive system (K00 – K93)	32 (3.8)	7 (4)	16 (4.9)	8 (2.6)	1 (2.6)
Diseases of genitourinary system (N00 – N99)	36 (4.2)	11 (6.3)	13 (4)	11 (3.5)	1 (2.6)
Symptom, signs & abnormal clinical & lab finding (R00 – R99)	57 (6.7)	18 (10.3)	17 (5.2)	19 (6.1)	3 (7.7)
Injury, poisoning (S00 – T98)	118 (13.9)	47 (27)	38 (11.7)	31(9.9)	2 (5.1)
Others*	*20 (2.4)	4 (2.3)	10 (3.1)	4 (1.3)	2 (5.1)
Total	849 (100)	174(100)	324(100)	312 (100)	39 (100)

Figure 2: Distribution of system involvement based on age groups (n=849)



Others include Codes for special purposes (U00-U85), Diseases of the skin and subcutaneous tissue (L00-L99), Congenital malformation, deformity (Q00 – Q99), External cause (V01 – Y98), Diseases of the musculoskeletal system and connective tissue (M00-M99) and Factors influencing health status and contact with health services (Z00-Z99).

Figure 3: Distribution of deaths due to diseases of circulatory system (n=338)



## References

- Singhi S, Gupta G and Jain V. Comparison of pediatric emergency patients in a tertiary care hospital vs. a community hospital. *Indian Pediatr.* 2004; 41: 67-72
- Joshi R, Cardona M, Iyengar S, Sukumar A, Ravi Raju C, Rama Raju K, et al. Chronic diseases now a leading cause of death in rural India—mortality data from the Andhra Pradesh Rural Health Initiative. *International Journal of Epidemiology.* 2006; 35:1522-1529.
- Kauser MM, Kinnera S, Korrapolu J, Kalyanam SN, Parameshwarappa KN, Afreen A. Study of Mortality Pattern in Adults at a tertiary care teaching hospital in South India. *Research and Reviews: Journal of Medical and Health Sciences.* 2014; 3(4): 145-9.
- Last JM, Wallace RB. *Maxcy-Rosenau-Last Public health and preventive medicine* 11th ed. Norwalk, Connecticut: Appleton & Lange. 1980: 1980. pp. 18–21.
- Park K. *Park's textbook of preventive and social medicine.* 24th ed. Jabalpur, 482001 (M.P.), India: M/s BanarsidasBhanot Publishers; 2017
- International Classification of Diseases (ICD) Information Sheet. Archived from the original on November 4, 2012. Last accessed June 2023.
- ICD-10 Second Edition Volume 2 – World Health Organization, p15" (PDF). *Who.int.* Last accessed May 2017.
- Gupte MD, Ramachandran V and Mutatkar RK. *Epidemiological profile of India: historical and contemporary perspectives.* *J Biosci.* 2001; 26:437-464.
- Holambe VM, Thakur NA. Mortality Pattern in Hospitalized Patients in a Tertiary Care Centre of Latur. *Journal of Krishna Institute of Medical Sciences (JKIMSU).* 2014 Jul 1;3(2).
- Nandi C, Mitra K, Bhaumik D, Paul SP. An observational study on pattern of mortalities as per ICD-10 classification system in a tertiary care hospital in India. *Asian Journal of Medical Sciences.* 2021 Oct 1;12(10):69.
- Bhatia SP, Gupta AK, Thakur JS, Goel NK, Swami HM. Trends of cause-specific mortality in union territory of Chandigarh. *Indian Journal of Community Medicine: Official Publication of Indian Association of Preventive & Social Medicine.* 2008 Jan;33(1):60.
- Vital Statistics Division. Sample Registration System Section. Causes of death Statistics 2017-2019. Office of the Register General, New Delhi. Available at <https://censusindia.gov.in/nada/index.php/catalog/44752>. Last accessed June 2023.
- World Health Organisation. The top 10 causes of death. Published 09/12/2020. Available at <https://www.who.int/news-room/fact-sheets/detail/the-top-10-causes-of-death>. Last accessed June 2023.