A STUDY ON IMPORTANCE OF INTERNATIONAL CLASSIFICATION OF DISEASES (ICD) IN ANALYSIS OF INPATIENT MORBIDITY & MORTALITY DATA WITHIN HOSPITAL SETTINGS IN INDIA

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in

Hospital and Health Management

By

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Under the Supervision and Guidance of

Dr Anupam Mehrotra

2024

ETERNAL HOSPITAL

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Dr Saumya Kabra** student of **IIHMR University, Jaipur** has completed her internship at **"Eternal Hospital, Jaipur"** from **18th March 24 to 15th June 24.**

Eternal Heart care Centre & Research Institute, Jaipur is a 225-bedded multispecialty Hospital.

During this period, she was inducted, oriented and trained in the working and processes of **Operations Department** under the guidance of **Mr Syed Kabir Hossain.**

During the period we found her sincere, intelligent, obedient, and hard working.

We wish her all the best for future endeavours.

For **ETERNAL HEART CARE CENTRE AND RESEARCH INSTITUTE, JAIPUR**

Ashok K Jeenwal
Head- HR & Training

JAIPUR

DECLARATION BY STUDENT

I hereby declare that this dissertation titled, **"A STUDY ON IMPORTANCE OF INTERNATIONAL CLASSIFICATION OF DISEASES (ICD) IN ANALYSIS OF INPATIENT MORBIDITY & MORTALITY DATA WITHIN HOSPITAL SETTINGS IN INDIA"** is the bonafide record of my original research work. I declare that it has not been submitted to anyother university or institution for the award of any degree or diploma. Information derived from the published or unpublished work of others has been duly acknowledged in the text.

(Signature)

Name of Student: Dr. Saumya Kabra

Date-21/06/24

IIHMR UNIVERSITY

CERTIFICATE

This is to certify that dissertation titled **" A STUDY ON IMPORTANCE OF INTERNATIONAL CLASSIFICATION OF DISEASES (ICD) IN ANALYSIS OF INPATIENT MORBIDITY & MORTALITY DATA WITHIN HOSPITAL SETTINGS IN INDIA"** is a record of the research work undertaken by **Dr Saumya Kabra** in partial fulfillment of the requirements for the award of the degree of MBA (Hospital and Health Management) from the IIHMR University, Jaipur under my guidance and supervision and his/her approach to the research study has been sincere, scientific, and analytical.

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ABSTRACT

Hospitals are complex systems with generation of wide variety of datasets including demographic data of patients, clinical data such as disease diagnosis, cause of death, procedures, comorbidities, administrative data etc. Data management, standardization & analysis become extremely important within hospital settings to capture these rich datasets, classify them, so that they can be utilized for evidence-based decision making & achieving better clinical & administrative outcomes. This requires a disease classification system that allows standardized collection, analysis & presentation of disease data, thereby allowing national & international comparability. International Statistical Classification of Diseases & related Health problems, commonly known as ICD is a global standard medical classification system.(1) Published by WHO, ICD is widely used for generation of morbidity & mortality statistics, reimbursement systems & automated clinical decision support systems.

Aim

To study the importance of International Classification of Diseases (ICD) for analysis & presentation of inpatient morbidity & mortality data within hospital settings in India

Objectives

- To classify the annual inpatient diagnosis data according to International Classification of Diseases[1]
- To identify the annual case mix of inpatients
- To identify the top diagnosis & Disease related groups (DRG) among the inpatients
- To identify the top causes of mortality among the inpatients
- To perform demographic, seasonal & discharge outcome wise analysis

Methodology

A descriptive cross-sectional record-based review study was done that included the inpatients admitted in the hospital in 2020. Data was collected from HMIS archives by accessing the

[1] For this study, 10th revision of ICD has been used.

discharge/deaths summaries. Extracted data was entered into a master excel sheet for carrying out descriptive analysis.

Results

A total of 21602 inpatients were studied. Gender stratification revealed that 9160 (42.41%) were females & 12442 (57.59%) were males. Age wise analysis showed that. maximum inpatients belonged to the age category of 15-45 years (38%). Discharge Outcomes analysis showed that 90% of the inpatients got Normal Discharge, 7% LAMA & 3% Expired. It was seen that mortality was higher in males (69.17%) compared to females (30.83%). Highest mortality was seen in age group 46-65 years (38.04%) & lowest for age group 6-14 years (0.009%). Chapter (UOO-U99)-Codes for special purposes account for 13% of the total cases, (C00-D48) Neoplasms & (K00-K93) Disorders of digestive system with 12% each, (I00-I99) Disorders of circulatory system (11%) of the annual cases. Top causes of morbidity & mortality for males & females were also identified.

Conclusion

The study highlighted the importance of ICD in standardization, analysis & presentation of inpatient morbidity & mortality data & utilize this data for clinical & administrative decision support.

Key words

ICD, Statistical Classification, Morbidity & mortality statistics, Hospital case-mix, Disease related groups (DRGs)

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Btach-2022-24

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LIST OF ABBREVIATIONS

IPD	Inpatient Department
ICD	International Classification of Diseases
WHO	World Health Organization
CM	Clinical Modification
PCS	Procedure Coding System
LAMA	Left Against Medical Advice
DAMA	Discharge Against Medical Advice
DRG	Disease Related Group
HMIS	Hospital Management Information System
MRD	Medical Records Department

Table 1: List of Abbreviations

Dissertation Report

A Study on Importance of International Classification of Diseases (ICD) in analysis of inpatient morbidity & mortality data within hospital settings in India

Chapter 1-Introduction

1.1 Rationale of Study

Hospitals are complex systems with generation of wide variety of datasets including demographic data of patients, clinical data such as disease diagnosis, cause of death, procedures, comorbidities, administrative data etc. Data management, standardization & analysis become extremely important within hospital settings to capture these rich datasets, classify them, so that they can be utilized for evidence-based decision making & leveraging out insights for achieving better clinical & administrative outcomes.

Inpatients are those patients who stay in the hospital for more than 24 hours during which they receive treatment for their diagnosis. This study focused on the IPD patients only. Inpatients, during their stay generate a lot of data at each touch point with the hospital system. For e.g. During their admission, demographic data is captured, which holds significance not only for the clinicians but also for management. Post admission, they undergo various investigations to reach a diagnosis. This generates another significant data – Primary Diagnosis. i.e. the main underlying disease which is the reason for admission into the hospital. Primary diagnosis is accompanied with other antecedent conditions & comorbidities that may be pre-existing for which the patient is already on medication. These are equally important to capture as they significantly affect the treatment plan. These can be sub grouped as Secondary Diagnosis. Once, the diagnosis is confirmed, a treatment plan is outlined, which may be Medical Management or Surgical Management. Finally, when the patient is discharged from the hospital, another important data is captured, which is the discharge outcome. Discharge Outcome can be categorized as Normal Discharge, Expired or LAMA (Left Against Medical Advice)/DAMA (Discharge Against Medical Advice). Mapping the entire inpatient journey to capture analytically useful data so that this important asset can be utilized for better resource allocation, planning, descriptive analytics & predictive analytics.

For Hospitals, quality inpatient disease data is the need of the hour for identification of annual

case mix, analysis of morbidity & mortality trends & patterns, seasonal variations, discharge outcome analysis of different diseases, case fatality rates, demographic analysis, cause of death certification & reporting of notifiable diseases. This requires a statistical classification system that allows standardized collection, analysis & presentation of disease data, thereby allowing national & international comparability.

In practical terms, the International Classification of Diseases (ICD) has emerged as the globally recognized diagnostic classification system for a wide range of epidemiological and health management applications. The ICD serves the purpose of transforming disease diagnoses and other health-related issues from verbal descriptions into an alphanumeric coding system, facilitating standardization. The primary aim of the ICD is to enable methodical documentation, scrutiny, comprehension, and contrast of mortality and morbidity statistics.(2)

1.2 ICD- Background

International Statistical Classification of Diseases & related Health problems, commonly known as ICD is a global standard medical classification system.(1) Published by the World Health Organization (WHO), the International Classification of Diseases (ICD) is extensively utilized for the compilation of morbidity and mortality data, establishment of reimbursement mechanisms, and development of automated clinical decision support systems. This classification system is an integral component of the broader framework known as the "WHO Family of International Classifications" (WHO-FIC).(3)

1.2.1 WHO Family of International Classification

WHO-FIC can be divided into 3 broad classifications- Reference classifications, Related Classifications & Derived Classifications. The clear depiction of WHO-FIC has been shown in Fig1.1. These are a network of statistical classifications based on reliable scientific and taxonomic principles, emphasizing the multifaceted elements of health.

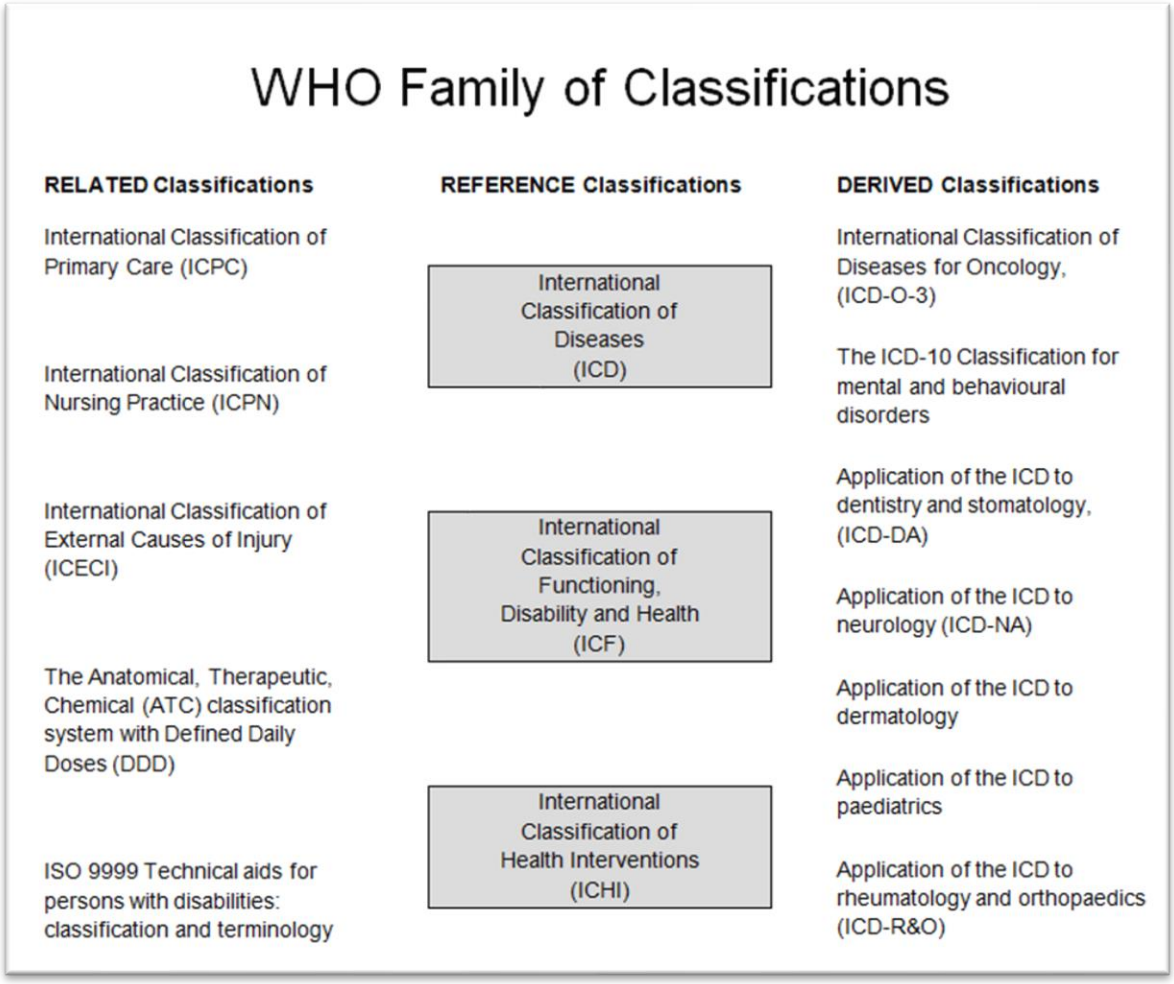

Figure 1.1 WHO Family of International Classifications (WHO-FIC)(2)

1.2.2 Brief History & Revisions of ICD

The origin of ICD can be traced back to 1856. The first basic statistical classification was developed by William Farr. In William Farr's views, "Classification is a method of generalization. A statistical classification of diseases must be confined to a limited number of mutually exclusive categories that are able to encompass the whole range of morbid conditions. Every disease or morbid condition must have a well-defined place in the list of categories. Consequently, Throughout the classification, there will be residual categories for other miscellaneous conditions that cannot be allocated to specific categories. This is the difference between a statistical classification & nomenclature."(2)

Taking over the classification system in 1948, the World Health Organization (WHO) expanded it the following year to code not only causes of death but also for illness.(1) Hence,

the birth of ICD took place & has seen revisions on a decade-to-decade basis. The International Classification of Diseases (ICD) has progressed and transformed into a pragmatic classification system, departing from a purely theoretical approach. This evolution has involved modifications to cater to the diverse statistical purposes for which the ICD is intended.

The sixth, seventh, eighth revisions were published in 1949, 1957 & 1968 respectively. While early revisions were concerned with only causes of death, ICD-6 revision was the first to include non-fatal diseases under its ambit.(1) The next pivotal transition was ICD-9 that came out in 1977, with increased granularity & allowing detailed coding up to 4-digit level sub-categories.(1) Its expansion, ICD-9CM (Clinical Modification) allowed capturing of enhanced morbidity data of outpatients & inpatients.(1) ICD 10^{th} Revision Clinical Modification was introduced for its annual process review in 1992 & finally came into effect in 1993.(1) With an increase in codes from 17000 to over 155,000, ICD-10 is far more detailed& comprehensive than ICD-9.(1)

1.3 ICD-10 CM- Basic structure & design

ICD is a dual axis classification system based on – etiology & site involved. ICD involves converting a disease diagnosis into an alphanumeric code, where the alphabet identifies with the Disease Related Group (DRG) & the numeric part identifies the specific disease.(2) The fundamental ICD consists of a unified coded inventory comprising three-character classifications, with the possibility of additional segmentation into a maximum of 10 four-character sub-classifications.(2)

1.3.2 Chapters

ICD classification is segmented into 22 chapters. The initial symbol of the ICD classification signifies a letter, with each letter being linked to a specific section, except for the letters D and H. Each section encompasses an ample number of three-character classifications to

address its subject matter; not all existing codes are utilized, thus allowing room for potential updates and extensions. In four sections (namely, Chapters I, II, XIX, and XX), multiple letters are employed at the start of their codes.(2)

The Chapters are as follows-

Chapter	ICD-10-CM Chapter Description
A00-B99	Certain infectious and parasitic diseases
C00-D49	Neoplasms
D50-D89	Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism
E00-E89	Endocrine, nutritional, and metabolic diseases
F01-F99	Mental, behavioral, and neurodevelopmental disorders
G00-G99	Diseases of the nervous system
H00-H59	Diseases of the eye and adnexa
H60-H95	Diseases of the ear and mastoid process
I00-I99	Diseases of the circulatory system
J00-J99	Diseases of the respiratory system
K00-K95	Diseases of the digestive system
L00-L99	Diseases of the skin and subcutaneous tissue
M00-M99	Diseases of the musculoskeletal system and connective tissue
N00-N99	Diseases of the genitourinary system
O00-O9A	Pregnancy, childbirth, and the puerperium
P00-P96	Certain conditions originating in the perinatal period
Q00-Q99	Congenital malformations, deformations, and chromosomal abnormalities
R00-R99	Symptoms, signs, and abnormal clinical and laboratory findings, not elsewhere classified
S00-T88	Injury, poisoning, and certain other consequences of external causes
V00-Y99	External causes of morbidity
Z00-Z99	Factors influencing health status and contact with health service

Table 1.1 ICD 10-CM Chapters(4)

1.3.3 Disease Related Groups (DRGs)

The chapters are divided into coherent sections based on three-character categories. This makes it easier to group related illnesses together into Disease Related Groups (DRGs). For example, in ICD-10 CM Chapter 1, Intestinal infectious disorders are represented by A00-A09, while different kinds of tuberculosis are covered by A15-A19, and so on.

1.4 Aim

To study the importance of ICD for analysis & presentation of inpatient morbidity &

mortality data within hospital settings in India

1.5 Objectives

- To classify the annual inpatient diagnosis data according to International Classification of Diseases[2]
- To identify the annual case mix of inpatients
- To identify the top diagnosis & Disease related groups (DRG) among the inpatients
- To identify the top causes of mortality among the inpatients
- To perform demographic, seasonal & discharge outcome wise analysis

1.6 Research Question

How can International Classification of Diseases be utilized for comprehensive analysis & presentation of inpatient diagnosis data within multi-specialty hospital settings in India?

[2] For this study, 10th revision of ICD has been used.

Chapter 2- Review of Literature

For this study, unavailability of a significant amount of literature within India was a constraint due to which international literature was taken for reference. Implementation of ICD in India has not been as successful as compared to developed countries. Hence, this study aims to contribute to literature in this area.

S no	Title	Author	Methodology	Salient Features
1	"Improving & Strengthening the use of ICD-10 & Medical Records Systems in India" – A case study by CBHI -2004, 2005(5)	Dr Ashik Kumar et al	CBHI conducted the study, which encompassed 20 hospitals in Delhi and Rohtak. The significance of implementing ICD 10 and its effective usage was realized & communicated to the stakeholders. The problems and limitations affecting the application of ICD 10 were identified and their workable solutions were thoroughly discussed via workshops, review sessions, and visits to the medical facilities during this	CD-10 should be mandated for all records and reports in both government and private health facilities nationwide, enforced through clear guidelines and continuous oversight. To enhance ICD-10 application, the CBHI should be strengthened to serve as the National Nodal Institute, focusing on monitoring, assessment, and capacity building, including training Master Trainers. Medical and paramedical education programs should

			case study. Important suggestions for better ICD 10 utilization have been made by this study.	incorporate ICD-10 instruction in their curricula.
2	"Causes of morbidity & mortality among patients admitted in a tertiary care hospital in Southern Nigeria: A 6-year evaluation" (6)	Okoroiwu H et al	The International Classification of Diseases, 10th edition, was used to document the causes of death (ICD-10).	Infectious and parasitic infections, as well as circulatory system abnormalities (cardiovascular ailments), were the leading causes of death. HIV/AIDS, diabetes, liver diseases, septicemia, stroke, and tuberculosis were among the other major reasons of death.
3	"A study on morbidity patterns amongst hospitalized patients attending a new tertiary care Institute, India" (7)	Brij Bhushan et al	Data includes details from the clinicians' case notes about the patient's demographics, diagnosis, cause of death, etc. The data were analyzed and compared using World Health Organization (WHO) standards.	The most common cause of illness in men was chronic ischemic heart disease, which was followed by diseases associated with live births, hypertension, lymphoid leukemia, and malignant brain tumors. The most common cause of

			The 10th Revision ICD.	malignant neoplasm in women was predominant, which was followed by problems associated with live births, cesarean delivery,
4	"Pattern & outcome of medical admissions at Ogun State University Teaching Hospital, Sagamu- a 3-year review" (8)	S A Ogun et al	A three-year retrospective study of the pattern and outcome of acute medical admissions	The primary reasons for admission included infectious diseases, neurological disorders, gastrointestinal disorders, genitourinary tract disorders, endocrine disorders, cardiovascular disorders, respiratory disorders, and hematological disorders. Tuberculosis was the most common disease leading to medical admissions. Infections also had the highest mortality rate, while malaria had the lowest.
5	"Morbidity Patterns amongst Hospitalized patients in a	Brij Bhushan et al	It was a retrospective, record-based study, utilizing diagnoses coded according to	The leading cause of admission was neoplasms, followed by diseases of the circulatory and

	secondary care Hospital of Dehradun, Uttarakhand State, India" (9)		ICD-10. Socio-demographic data, diagnoses, and discharge outcomes for inpatients were retrieved from HMIS archives and analyzed descriptively.	genitourinary systems. In males, the primary causes were infectious parasitic diseases.

Table2.1- Review of Literature

Chapter 3-Methodology

3.1 Study Design

A descriptive cross-sectional study was undertaken at a multi-specialty tertiary care hospital in Jaipur, India. It was a retrospective record-based review study that included inpatients admitted in the hospital from 1st January 2020 to 31st December 2020.

3.2 Study Population

Annual Inpatient data for the calendar year 2020 with the following inclusion & exclusion criteria was used-

3.2.1 Inclusion criteria-

- Inpatients admitted for Medical Management for all departments
- Inpatients admitted for Surgical Management for all departments
- Planned & Emergency admissions through ER both included
- Patients admitted in all wards included
- Female inpatients admitted for labor & delivery
- Inpatients with Discharge Outcome as Normal Discharge, LAMA & Expired

3.2.2 Exclusion criteria-

- Transplant & donor cases
- Follow up surgical cases
- Cases whose discharge/death summaries could not accessed through HMIS
- Cases with a high proportion of missing, ambiguous ICD-10 codes, or poor documentation of diagnosis

3.3 Data Collection, tools, and analysis

The discharge/death summary of inpatients were extracted & studied through the Hospital Management Information System (HMIS) archives. Physical medical record files were also taken into consideration for some patients & were accessed from MRD. The study mainly aimed to extract the Primary Diagnosis which was the main cause for admission into the hospital. Other significant comorbidities were also captured as the Secondary Diagnosis. For those with multiple diagnoses, morbidity with the longest duration or the final diagnosis (supported by relevant laboratory investigations) was recorded as primary diagnosis for the patient. The World Health Organization (WHO) standards were used for analyzing and comparing the data. The abstracted data was coded by using manual of International Statistical Classification of Disease and Related Health Problems, 10th Revision, Volume 1, 2 and 3 published by the WHO, Geneva, 2010 Edition. Rules laid out in these ICD volumes were followed for morbidity coding, mortality coding & multi-disease coding. ICD-1 was assigned to the Primary diagnosis, the primary disease code based on which disease index is sorted. Other significant comorbidities were assigned ICD-2, 3 & up to ICD-4. Relevant demographic data pertaining to socio-such as patient's age & sex were also captured. Date of Admission, Date of Discharge & Discharge Outcome of each inpatient was also recorded & captured as Normal Discharge, Expired or LAMA. Validity checks were carried out on all the captured parameters to ensure quality control of data & check for any typing or coding errors. Missing codes were entered manually.

Study tools used for reference include ICD-10 CM Coding manuals Volume 1 ,2 & 3(2) (4)& ICD-10CM online application(10) for the codification of diseases in the study.

Data collected was captured into a Master sheet in Microsoft Excel. Tags were created to group patients according to the ICD-10 CM Disease related Groups (DRGs). Similarly, inpatient data was classified into the 22 Chapters of ICD-10CM.[3] Age wise groups were created as follows– Below 1 year, 1-5 years, 6-14 years, 15-45 years, 46-65 years & Above 65 years, according to the recommendations made in ICD Volume 2.(2)

Descriptive analysis was performed which included Age wise analysis, Sex wise analysis. Discharge Outcome Analysis, Seasonal analysis & identifying the top causes of morbidity & mortality among the inpatients. fatality rates can be calculated as well.

Based on these analysis, various recommendations were on how this data can be utilized

[3] For classification of inpatient data into Chapters & DRGs, only the Primary Diagnosis & assigned ICD-1 is considered. Secondary Diagnosis is not considered.

further for evidence-based decision making & achieving better clinical & administrative outcomes.

3.4.1 Operational definitions

- Inpatients- A patient who stays in the hospital for more than 24 hours to seek treatment
- Primary Diagnosis- Primary Diagnosis is defined as the main underlying disease for which the patient is admitted to the hospital to seek treatment.
- Secondary Diagnosis- Secondary Diagnosis can be defined as comorbidities that are pre-existing for which the patient may or may not be taking medication.

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Chapter 4-Results and Analysis

A total of 21602 patients from all departments and all wards were admitted to the hospital in 2020. Of them, 12442 (57.6%) and 9160 (42.4%) were inpatient males and females, respectively. There were 736 females for every 1000 males. Males were 45.52 years old on average, and females were 43 years old.

Age Group	Female	Male	Total
Under 1 year	260	436	696
1-5 years	225	403	628
6-14 years	360	619	979
15-45 years	4069	4182	8251
46-65 years	2787	4320	7107
Above 65 years	1459	2482	3941
Grand Total	**9160**	**12442**	**21602**

Table 4.1- Age-wise & Sex-wise distribution of inpatients

Table 4.1 shows the age-wise & sex-wise distribution of inpatients. Based on age groups, highest admissions were seen in 15-45 years-8251 (38.19%), followed by 46-65 years-7107 (32.87%) & above 65 years-3941(18.24%).

For males, maximum admissions were observed above 65 years (34.72%) &15-45 years (33.61%). For females as well, these age groups showed the maximum admissions constituting about 44.42% for 15-45 years & 30.42% for 46-65 years. This finding is also justifiable as for females, 15-45 years represent the reproductive age range. For age groups, less than 1 year, 1-5 years & 6-14 years, admitted patients show a higher a percentage of males compared to females.

Donut chart Fig 4.1 shows the visual representation of age wise distribution of inpatients.

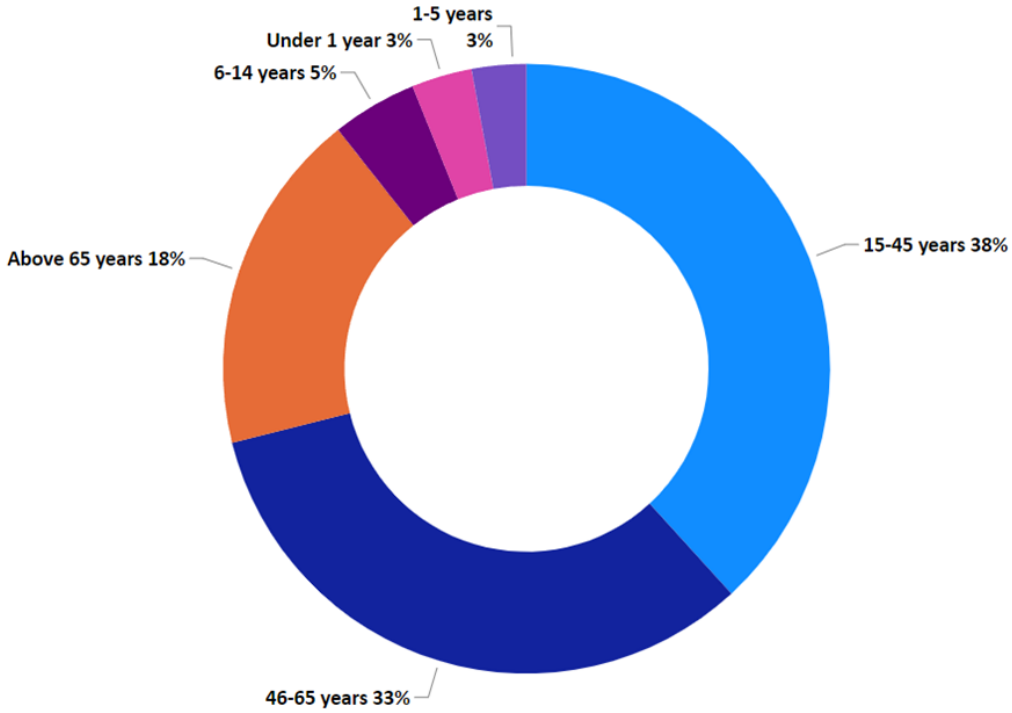

Figure 4. 1 Age-wise distribution of inpatients

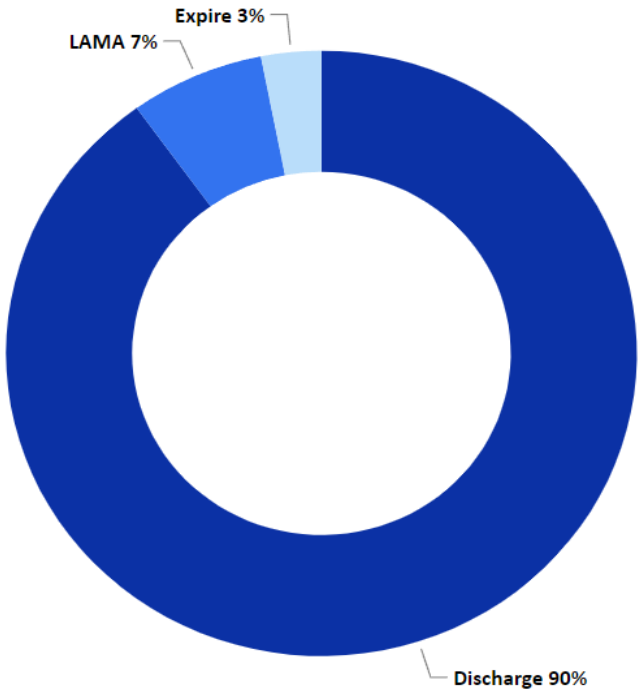

Figure 4.2 Discharge Outcome wise distribution of inpatients

Discharge Outcomes analysis represented through the donut chart in Fig 4.2 showed that 90% of the inpatients got Normal Discharge, 7% Left Against Medical Advice (LAMA) & 3% Expired.

A detailed analysis can be seen in the Table 4.2. It was seen that mortality was higher in males (69.17%) compared to females (30.83%). Deaths to admission ratio for males was 0.0369 & 0.0223 for females. LAMA for males accounted for 61.4% while for females, it was 38.6%.

	Female	Male	Total
Normal Discharge	8382	11068	19450
Expired	205	460	665
LAMA	573	914	1487
Total	**9160**	**12442**	**21602**

Table 4.2 Sex-wise distribution of discharge outcome

Age-wise distribution of Discharge outcome was also studied which is depicted in Table 4.3. Highest mortality was seen in age group 46-65 years (38.04%), while mortality was lowest for age group 6-14 years (0.009%). Age groups 15-45 years, 46-65 years & above 65 years collectively account for 93.83% of mortality among the inpatients.
A similar trend was observed for LAMA, with highest in the age group 46-65 years (34.7%) & lowest for 6-14 years (2.1%).

Age Group	Normal Discharge	Expire	LAMA	Total
Under 1 year	584	28	84	696
1-5 years	585	7	36	628
6-14 years	941	6	32	979
15-45 years	7618	133	500	8251
46-65 years	6338	253	516	7107
Above 65 years	3384	238	319	3941
Grand Total	**19450**	**665**	**1487**	**21602**

Table 4.3 Age-wise distribution of discharge outcome

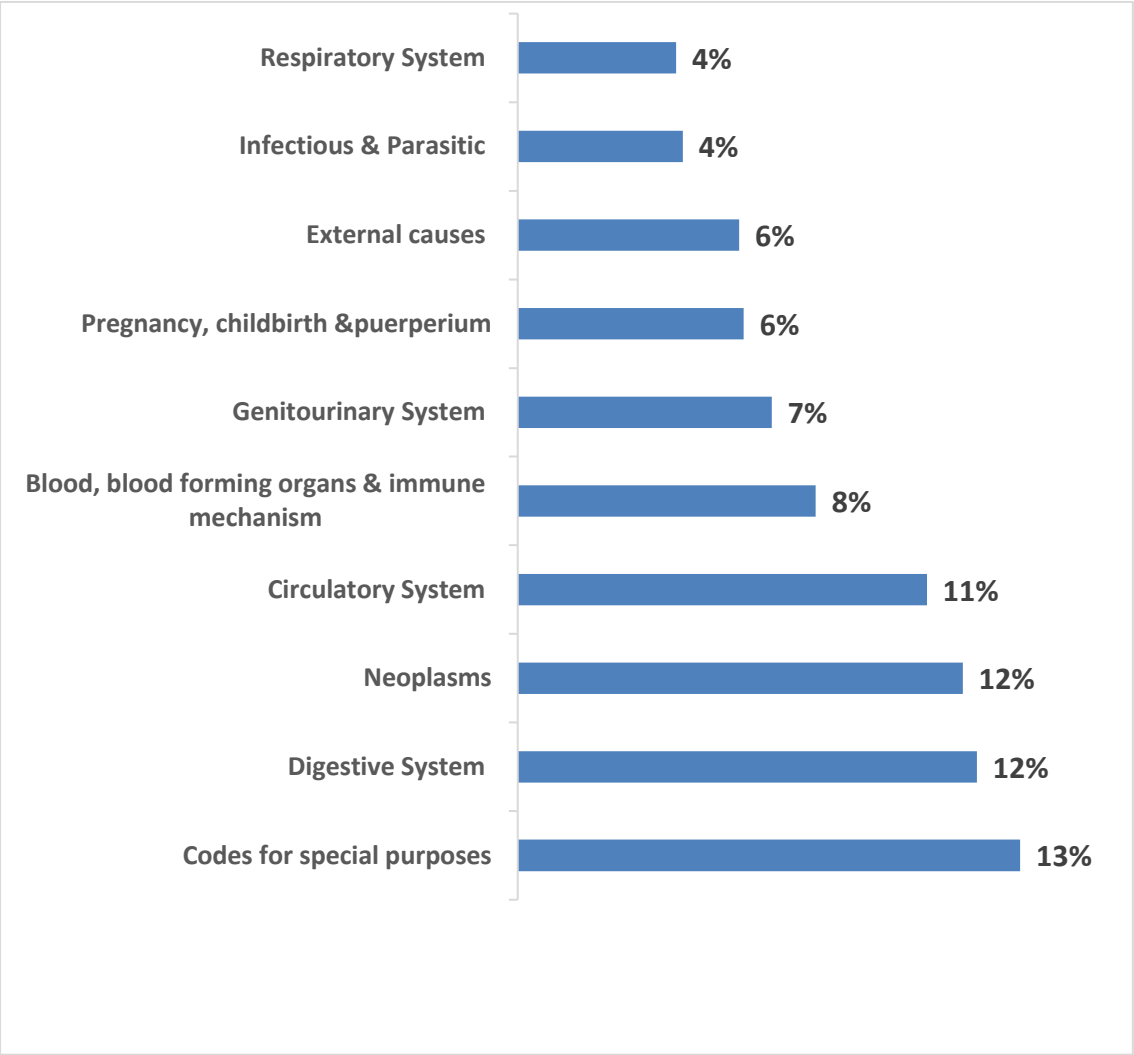

Figure.3.3 Top 10 1CD-10 CM Chapters accounting for 80% of the case-mix

Chapter wise analysis was performed for the inpatients, which has been shown in the annexure.

To narrow down the analysis, chapters are further sub-classified into Disease related Groups (DRGs). Figure 4.4 shows the Top 10 DRGs responsible for admission among the inpatients. These include Provisional assignment of new diseases (U00-U49) accounting for 9% of the cases, malignant neoplasms (C00-C97) accounting for 8%, Hemolytic anemias (D55-D59) 5%, delivery (O80-O84) 4% etc.

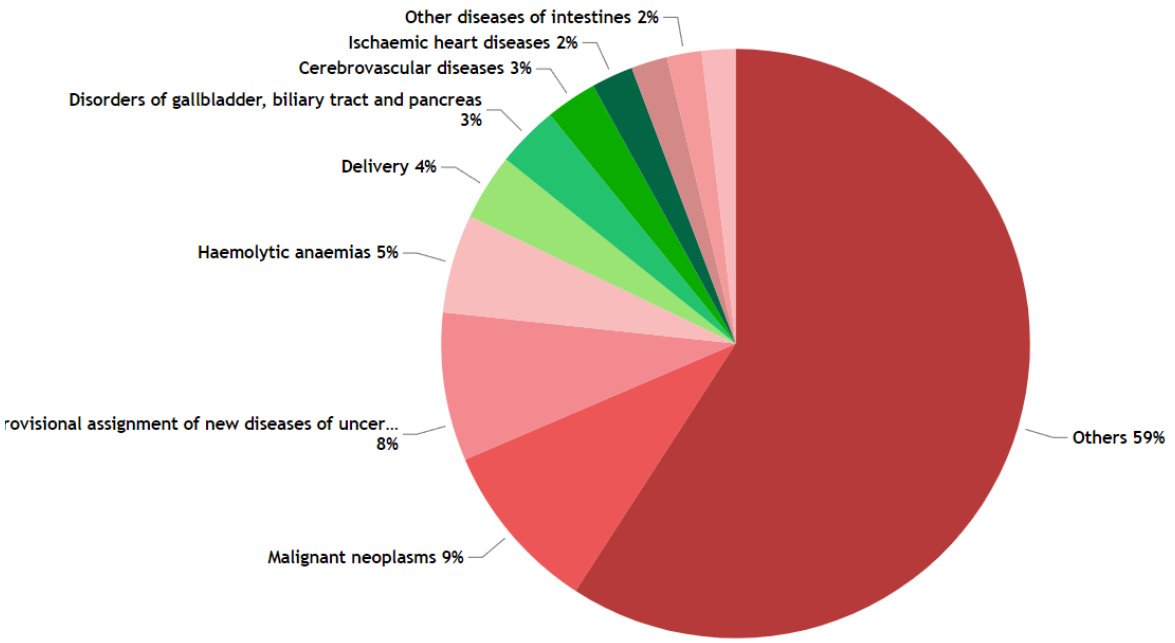

Figure 4.4 Top Disease related groups (DRGs) among the inpatients

Top causes of morbidity can be identified among females & males leading to admissions in the hospital. These can be seen in Figure 4.5 & Figure 4.5 respectively.

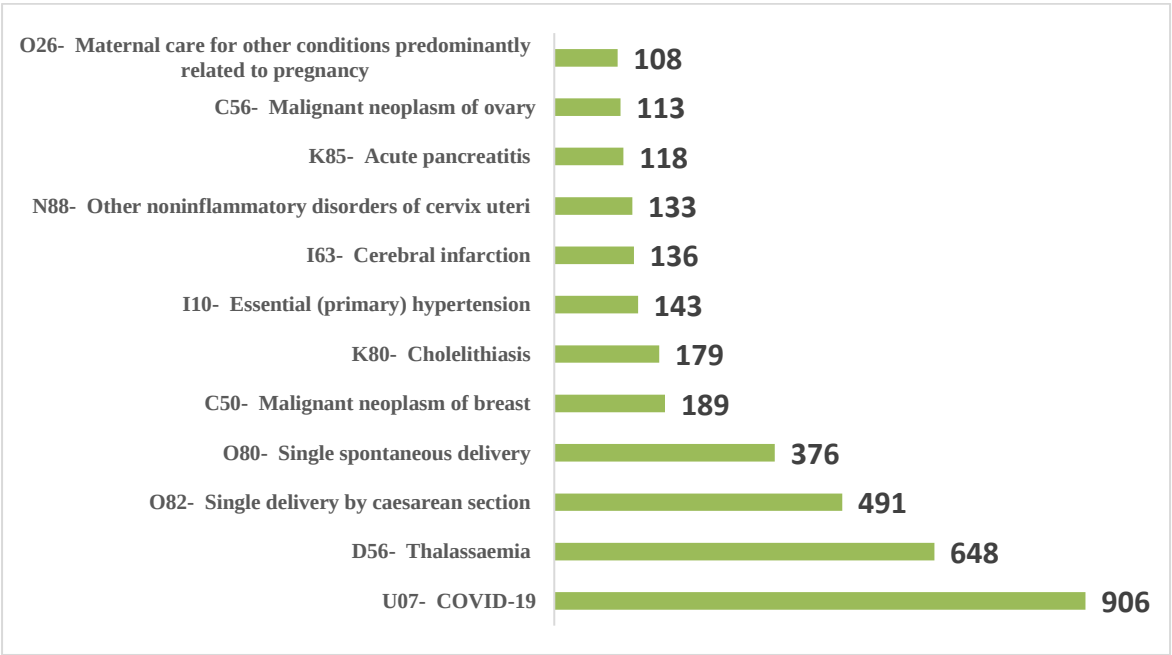

Figure 4.4 Top causes of morbidity among females

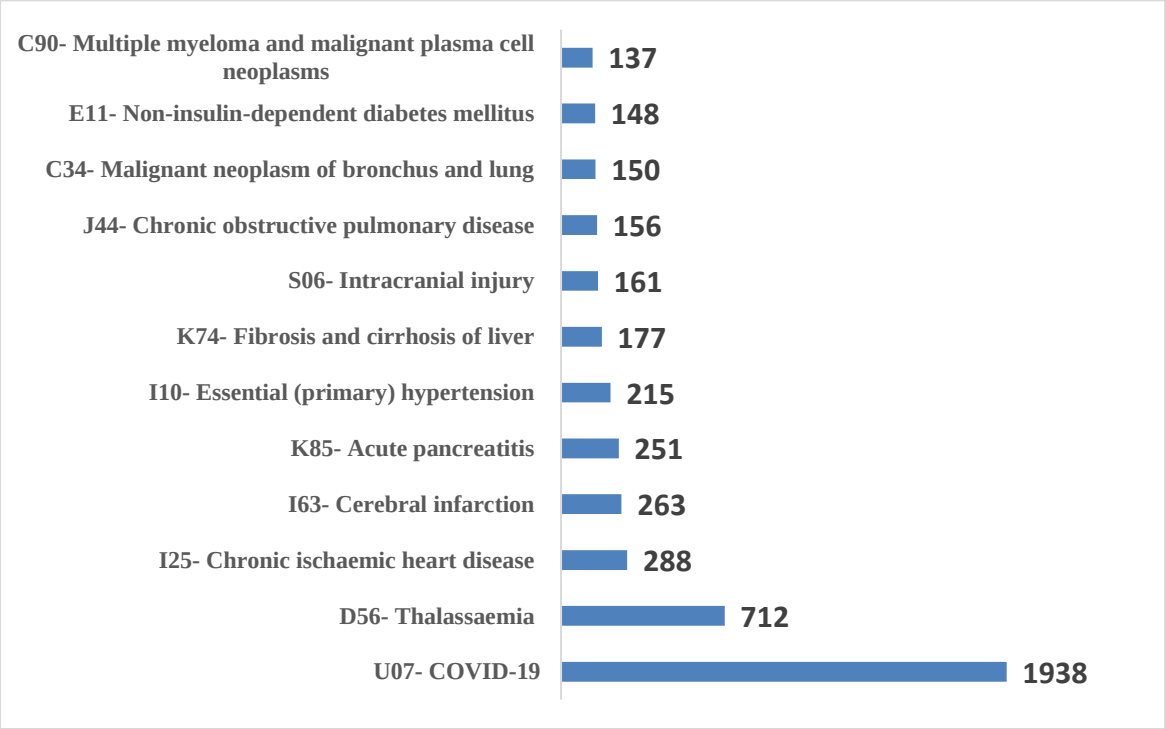

Figure 4.5 Top causes of morbidity among males

Causes of mortality among males & females was also studied & the top 10 causes of death are shown in Figure 4.7 & Figure 4.8 respectively.

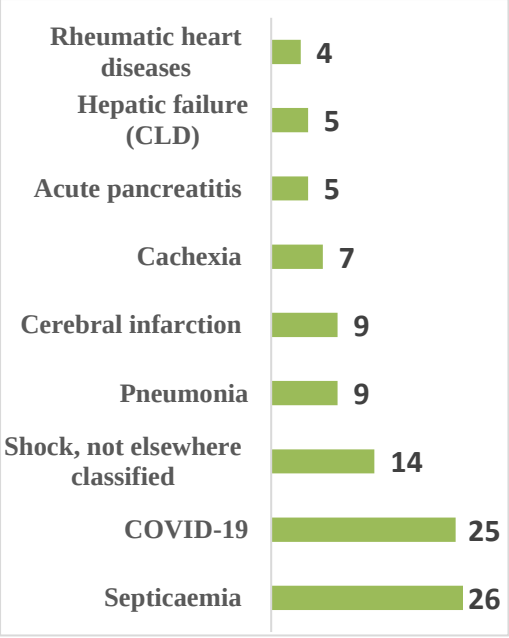

Figure 4.7 Top causes of mortality among females

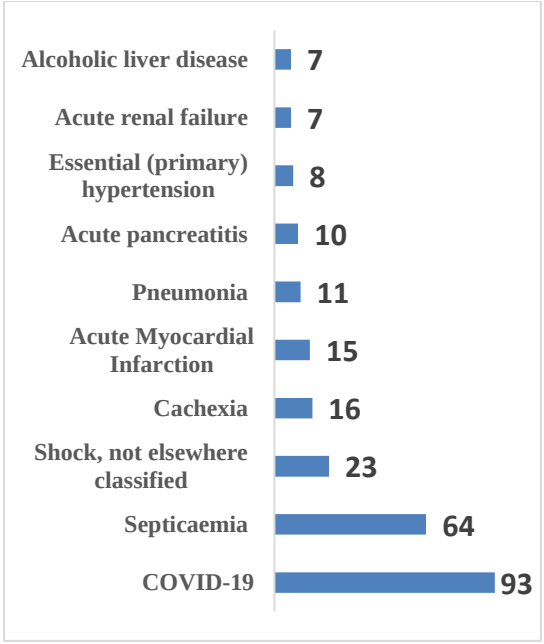

Figure 4.8 Top causes of mortality among males

	Normal Discharge	Expired	LAMA	Total
January	2071	74	165	**2310**
February	2293	63	187	**2543**
March	2040	46	147	**2233**
April	841	27	79	**947**
May	989	58	56	**1103**
June	1166	30	98	**1294**
July	1445	51	117	**1613**
August	1607	55	121	**1783**
September	2187	71	154	**2412**
October	1882	46	123	**2051**
November	1788	87	149	**2024**
December	1141	57	91	**1289**
Grand Total	**19450**	**665**	**1487**	**21602**

Table 4.5 Month wise distribution of inpatients

Seasonal analysis was also studied to see the changes among the number of inpatients, mortality rates over different months in the year 2020. Table 4.4 shows the month-wise distribution of inpatients. It was observed that admissions were more in the winter months compared to summers. Highest mortality was observed in the month of November accounting for 13% of annual deaths & lowest in the month of June. COVID-19 first wave was observed during this time due to which high number of admissions can be seen during the month of January, February & March. In March, due to national lockdown being announced, admissions were significantly decreased. Peak of the first wave of COVID1 coincided with September, which can be seen that admissions were again rising since September.

From the Master Excel sheet, seasonal wise & discharge outcome wise trend can be seen for any disease. Figure 4.3 shows the month-wise distribution of COVID-19 (U-07) admitted in the hospital. COVID cases observed a hike in September with 794 admissions in October & 836 in November. Another disease category that shows seasonal variation includes infectious & parasitic diseases. This DRG constitutes ICD codes A00-B99. The month wise variation of A00-B99 is depicted by Figure 4.8 & also showed a peak in September. This period usually marks the rainy season, thereby showing a spike in the number of cases of infectious & parasitic diseases.

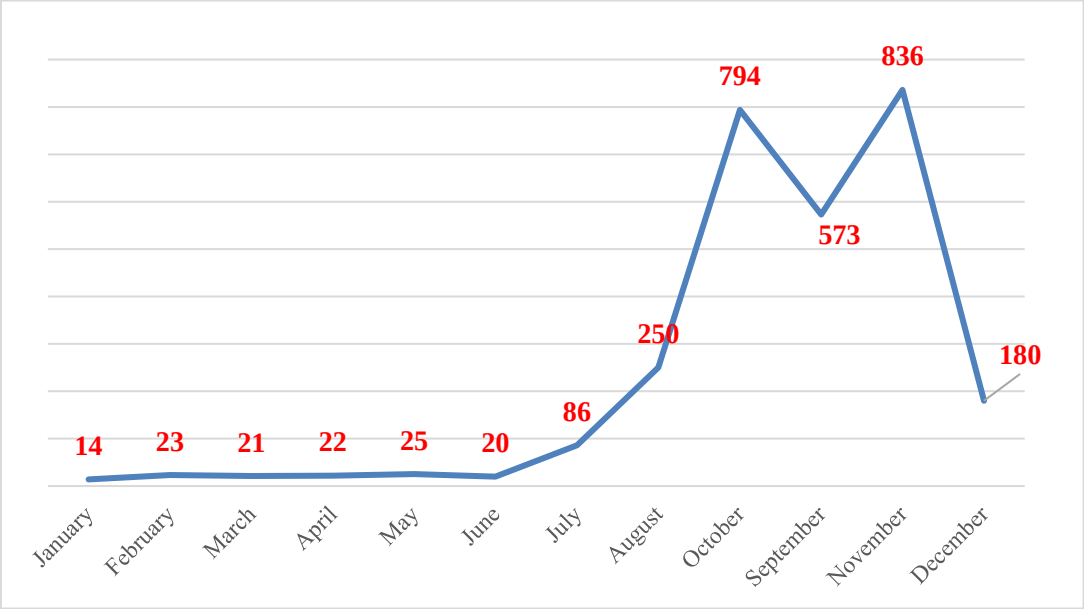

Figure 4.9 Seasonal Analysis of COVID-19 (U-07)

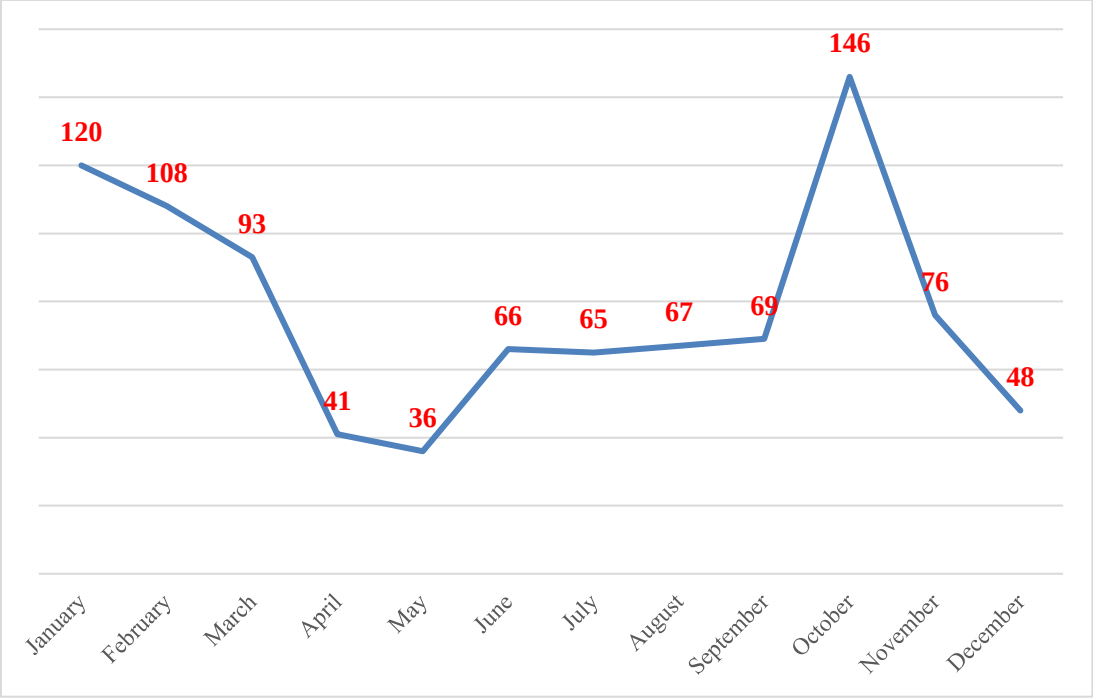

Figure 4.10 Seasonal Analysis of Infectious & Parasitic diseases (A00-B99)

Chapter 5-Disscussion

Quality morbidity & mortality data is the need of the hour for hospitals for strategic planning, allocation of limited resources, bed management, assessment of any targeted intervention, monitoring the case fatality rates, epidemiology& disease surveillance. This rich data is an unexplored asset that hospitals currently in India are utilizing efficiently. Using gold standard statistical classifications like ICD, Indian hospitals can benefit in generating reliable morbidity & mortality statistics & also draw national and international comparisons for benchmarking.

Knowing the case mix of the hospital not only provides a comprehensive picture of the disease burden of patients, thereby helping in facility planning & designing new service mix. At the same time, these statistics help in planning for public health interventions, policy making & monitoring of healthcare system.

The findings in this study conclude that gender stratification showed that out of 21602, 9160 (42.41%) were females & 12442 (57.59%) were males. Age wise analysis showed that. maximum inpatients belonged to the age category of 15-45 years (38%), followed by 33% inpatients in the 46-65 years age group, 18% above 65 years, 5% in 6-14 years age group & 3% each for under 1 year & 1-5 years category. For females, 90% of the admissions were in the age group of 15-45 years (44%) , 46-65 years (34%) & above 65 years (16%). For males, 88% of the patients belonged to the age category of 46-65 years (35%), 15-45 years (34%) & above 65 years (20%).Discharge Outcome wise analysis concluded that 97% got Normal Discharge (D), 3% Expired (E) & 7% took LAMA. For females, 91% got Normal Discharge, 2% Expired & 6% Left Against Medical Advice. For males, 89% took Normal Discharge , 3% Expired & 7% took LAMA.

10 Chapters have been identified that account for 80% of the case mix. Chapter (UOO-U99)-Codes for special purposes account of 13% of the total cases, (C00-D48) Neoplasms & (K00-K93) Disorders of digestive system with 12% each, (I00-I99) Disorders of circulatory system(11%), (D50-D89) Disorders of the blood & blood forming organs & certain disorders involving the immune mechanism (8%), (N00-N99) Disorders of the genitourinary system

(7%), (O00-O99) Pregnancy, childbirth & puerperium (6%), (S00-T98) Injury, poisoning and certain other consequences of external causes (6%), (A00-B99) Certain infectious & parasitic diseases (4%) & (J00-J99) Disorders of respiratory system (4%).

Limitations of the study are as follows- Firstly, the study took a retrospective approach due to which data validation had certain limitations. Secondly, the study was limited to IPD patients only. To find out the case mix of the entire hospital, OPD patients need to be included too. Thirdly, the actual prevalence of the disease entities so recorded may change if final diagnoses from patient files containing multiple complaints or morbidities are extracted. Finally, depending on experience, qualifications, and other considerations, the attending physician's clinical soundness in diagnosing patients was the study's deciding criterion. The doctor-wise index was also removed from this study for confidentially and ethical considerations.

Chapter 6 - Conclusion

The study highlights the importance of International Statistical classification of diseases recommended by WHO in analysis & presentation of morbidity & mortality data for the patients admitted in the hospital. This is the study in this area that has been undertaken in the city of Jaipur, Rajasthan, India which highlighted the role of ICD coding systems in systematic statistical analysis , classification of inpatient diseases data & leverage it for evidence-based decision making, hospital planning, bed management, epidemiology & disease surveillance & for drawing out national & international comparisons for benchmarking.

Chapter-7 Recommendations

- Availability of ICD Volumes at all nursing stations, typing pools where discharge/death summaries are prepared
- Integration of ICD coding systems with HMIS
- Training & capacity building of Resident doctors, typists & MRD staff
- Discharge Summaries/Death summaries to be prepared through HMIS with ICD as mandatory field marked by *
- Periodic review & assessment through conducting Morbidity & Mortality committee meetings (M&M) for continuous monitoring, improvement & for stewardship & accountability
- Proceeding towards ICD-Procedure Coding systems & other coding systems
- Annual compilation & analysis of morbidity & mortality data
- 5 year trend analysis of morbidity & mortality patterns of inpatients

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10. ICD 10-CM Coding Application .

Annexure

ICD Chapter	Chapter Name [4]	No of cases
A00-B99	Certain infectious & parasitic diseases	935
C00-D48	Neoplasms	2523
D50-D89	Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism	1689
E00-E90	Endocrine, nutritional, and metabolic diseases	512
F00-F99	Mental and behavioural disorders	134
G00-G99	Diseases of the nervous system	482
H00-H59	Diseases of eye & adnexa	249
H60-H95	Diseases of ear & mastoid process	34
I00-I99	Diseases of circulatory system	2319
J00-J99	Diseases of respiratory system	897
K00-K93	Diseases of digestive system	2602
L00-L99	Diseases of skin & subcutaneous tissue	182
M00-M99	Diseases of the musculoskeletal system and connective tissue	617
N00-N99	Diseases of the genitourinary system	1440
O00-O99	Pregnancy, childbirth, and the puerperium	1280
P00-P96	Certain conditions originating in the perinatal period	342
Q00-Q99	Congenital malformations, deformations, and chromosomal abnormalities	184
R00-R99	Symptoms, signs, and abnormal clinical and laboratory findings, not elsewhere classified	777
S00-T98	Injury, poisoning and certain other consequences of external causes	1254
U00-U99	Codes for special purposes	2847
V01-Y98	External causes of morbidity and mortality	26
Z00-Z99	Factors influencing health status and contact with health services	277

[4] These Chapters have been taken directly from WHO ICD Volumes 10th revision.