STUDY OF INPATIENT MORBIDITY AND MORTALITY PATTERNS USING ICD-10 IN A MULTISPECIALTY HOSPITAL

Dissertation Submitted to

The IIHMR University, Jaipur

for the partial fulfillment for the award of the degree of

Master of Business Administration (MBA)

in

Hospital and Health Management

by

Tanvi

Under the Supervision and Guidance of

Dr. Vidya Bhushan Tripathi

2025

Fortis
Mall Road, Ludhiana

Hospitalia Eastern Private Limited
84/13, Civil Lines, Mall Road, Ludhiana - Punjab
Tel : +91 161 5222 333, 0161 5222 444
Emergency : +91 161 5222 555
Ambulance : +91 161 5222 555
E-mail : contactus.mallrdldh@fortishealthcare.com
Website : www.fortishealthcare.com

Ref. HR/Com/Int/001

May 31, 2025

TO WHOM SO EVER IT MAY CONCERN

This is to certify that **Dr. Tanvi**, has completed her Internship, in the Department of **Medical Administration**, at **Fortis Hospital, Mall Road Ludhiana (A Unit of HEPL)** from **17-Mar-2025 to 31-May-2025.**

We wish her success in her future endeavors and in the pursuit of her career goals.

For **Hospitalia Eastern Private Limited**

HOSPITALIA EASTERN PVT. LTD. LUDHIANA

Ajay Singh
Unit Head HR

COMPLETION CERTIFICATION

CERTIFICATE

This is to certify that DR.TANVI in partial fulfillment of the requirements for the award of the degree of MBA Hospital and Health Management from the IIHMR University, Jaipur has successfully completed her internship at FORTIS HOSPITAL, MALL ROAD, LUDHIANA during Mar 17- May 31, 2025.

DATE:

HEAD OF THE ORGANIZATION:

Mr. Gurdarshan Singh Mangat
Facility Director
Fortis Hospital, Mall Road,
Ludhiana. (A Unit of HEPL)

IIHMR UNIVERSITY

CERTIFICATE

This is to certify that dissertation titled **"Study of Inpatient Morbidity and Mortality Patterns Using ICD-10 In A Multispecialty Hospital"** is a record of the research work undertaken by **Dr. Tanvi** 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 her approach to the research study has been sincere, scientific, and analytical.

Dr. VB Tripathi
Faculty Guide

IIHMR University, Jaipur

Date 11-06-25

Dr. Sanjay Gupta
School Dean

IIHMR University, Jaipur

Date - 17 - 06-25

DECLARATION BY STUDENT

I hereby declare that this dissertation titled "STUDY OF INPATIENT MORBIDITY AND MORTALITY PATTERNS USING ICD-10 IN A MULTISPECIALTY HOSPITAL" is the bonafide record of my original research work. I declare that it has not been submitted to any other 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)

Student Name TANVI

Date: 17/06/25

IIHMR UNIVERSITY

CERTIFICATE

This is to certify that dissertation titled **"Study of Inpatient Morbidity and Mortality Patterns Using ICD-10 In A Multispecialty Hospital"** is a record of the research work undertaken by **Dr. Tanvi** 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 her approach to the research study has been sincere, scientific, and analytical.

Dr. VB Tripathi
Faculty Guide

IIHMR University, Jaipur

Date 11-06-25

Dr. Sanjay Gupta
School Dean

IIHMR University, Jaipur

Date - 17-06-25

ABSTRACT

Effective hospital administration and enhanced outcomes for patients are particularly dependent on the capacity to track and analyse morbidity, mortality, and average length of stay (ALOS) patterns. The purpose of this research is to give a thorough appraisal of inpatient information from a multispecialty facility within a five-month timeframe (January to May 2025), with the International Classification of Diseases, 10th Revision (ICD-10) coding system as the main method of classification.

630 inpatient medical records were retrospectively examined, recording critical variables like age, gender, diagnosis, department, type of admission (emergency vs. IPD), discharge status, type of financial coverage, and hospital stay duration. Diagnoses were coded according to ICD-10 chapters and Diagnosis-Related Group (DRG) categories to analyze disease burden and operational trends. The main purpose of this study was to categorize patient diagnoses according to ICD-10 chapters and examine their relationship with morbidity and mortality. Secondary purposes were to identify demographic and departmental trends, determine ALOS, and evaluate discharge and financial use patterns.

Findings indicated that the maximum number of admissions were in the 15–45 years age group and that females had a higher inpatient proportion (57.5%). Routine discharges made up 92.7% of the cases, with mortality and LAMA rates at 1.43% and 4.44%, respectively. Digestive, circulatory, and endocrine system diseases were the highest contributors to the hospital case mix. Trends in gender-specific data indicated all inpatient deaths among those recorded were in male patients. The heaviest load was seen in departments such as Internal Medicine and Gastroenterology, with significant variation of seasonal and monthly loads.

This research emphasizes the importance of ICD-10 coding in properly classifying diseases and yielding actionable information for hospital administration. It indicates that demographic, clinical, and financial factors play a significant role in determining patient outcomes and ALOS. The results are important for maximizing resource efficiency, informing department-level planning, and enhancing discharge and mortality management policy within tertiary care institutions.

ACKNOWLEDGEMENT

I take this opportunity to express my heartfelt gratitude to all those who supported, guided, and encouraged me throughout the course of this dissertation project. The successful completion of this study would not have been possible without the valuable contributions of several individuals who generously shared their time, expertise, and insights.

First and foremost, I am deeply thankful to **Ms. Sara Thapar**, Head of the Medical Records Department at Fortis Hospital, Ludhiana. Her continuous guidance, cooperation, and support in facilitating access to clinical records were instrumental in the data collection phase of my study. Her professionalism and encouragement created a conducive environment for learning and exploration, which significantly enriched my research experience.

I would like to extend my sincere thanks to **Dr. Mishal**, my organizational mentor, who played a vital role in shaping my understanding of hospital operations and ICD-10-based clinical analytics. His mentorship went beyond academic instruction—he provided consistent support, encouraged critical thinking, and helped me develop a strong foundation in hospital data interpretation and documentation. His readiness to share practical knowledge and provide constructive feedback was deeply appreciated and had a lasting impact on my academic growth.

I am also immensely grateful to **Dr. Vidya Bhushan Tripathi**, my university mentor, for his exceptional academic supervision, thoughtful critiques, and continuous encouragement. His expertise and insights helped me maintain academic rigor and refine the methodological structure of this research. His patient guidance and constant motivation were key factors in the successful execution and completion of this dissertation.

I remain sincerely indebted to each of them for their unwavering support, valuable contributions, and belief in my abilities. Their mentorship has not only guided the direction of this research but has also left a lasting impression on my professional development.

LIST OF FIGURES

Table of Contents

LIST OF TABLES

CHAPTER -1 INTRODUCTION

1.1 RATIONALE FOR THE STUDY

Effective hospital management in today's healthcare environment hinges not just on clinical competency but also on strong, data-informed decision-making. Perhaps the most important aspect of hospital analytics is the analysis of inpatient trends in morbidity and mortality, which acts as a fundamental gauge of the facility's service quality, clinical outcomes, and operational efficiency. Through methodical analysis of illness and death patterns among inpatients, hospitals can determine high-risk conditions, maximize resource distribution, minimize unnecessary complications, and improve patient care outcomes.

One facilitator of such analysis is the International Classification of Diseases, 10th Revision (ICD-10) by the World Health Organization (WHO). ICD-10 offers a uniform coding scheme to classify diseases, medical conditions, and causes of death, which enables hospitals to code and analyze patient information consistently. In Indian health care facilities, particularly in multispecialty hospitals, ICD-10 coding is a major tool utilized by Medical Records Departments (MRDs) to record, classify, and retrieve clinical data. In spite of its prevalence, the complete potential of ICD-10 coding in detecting morbidity and mortality trends and Hospital Performance indicator analysis such as Average Length of Stay (ALOS) is yet to be exploited by most institutions.

It is out of this need that this research was conceptualized. Using ICD-10-coded inpatient data for a five-month interval (January–May 2025) from a multispecialty hospital, this study seeks to present a comprehensive, evidence-based evaluation of patient morbidity and mortality. The study also incorporates significant demographic and operational variables—such as age, gender, clinical department, type of admission (emergency vs. IPD), discharge status, and financial coverage (cash vs. insurance)—to understand how these variables play a role with disease burden and patient outcomes. In specific terms, the study aims to study the determinants of Average Length of Stay (ALOS), a most important performance indicator for hospital management that indicates both the efficacy of delivery of care and the seriousness of the conditions of the patients.

The main goal of this research is to categorize inpatient diagnoses into ICD-10 chapters

and investigate their relationship with morbidity and mortality outcomes. In so doing, the research aims to identify which disease groups make the most important contributions to the hospital case mix and patient risk profile. The secondary aims entail unravelling the case mix further by examining demographic and departmental trends, unveiling high-burden ICD-10 chapters and Diagnosis-Related Groups (DRGs), and assessing how clinical and operational factors influence ALOS.

Considering the dynamic and manpower-intensive setting of a tertiary care facility, learning about such trends is not an academic exercise—it is critical for strategic planning, clinical governance, and quality improvement. This research can help hospital administrators and clinical leaders make evidence-based decisions about manpower planning, infrastructure development, infection control priorities, and early warning systems for at-risk patients. Moreover, findings from this analysis can inform benchmarking initiatives, assist in the identification of inefficiencies, and inform interventions to minimize avoidable mortality as well as discharge outcomes.

In addition, with India's healthcare system placing greater importance on transparency in data, digital health, and compliance with accreditation (e.g., NABH, JCI), hospitals will need to depend on sound internal audits and data analysis.

This study thus serves not only an academic aim but also an institutional objective of safety, accountability, and excellence in healthcare provision.

In summary, this research offers an in-depth framework to analyse inpatient disease and mortality trends using ICD-10 data and determine how demographic and systemic factors affect patient outcomes and hospital efficiency. To this end, it offers valuable, actionable information on hospital performance monitoring, clinical risk management, and continuous quality improvement in healthcare.

1.2 IMPORTANCE OF THE STUDY

Results of this study carry significant importance for all stakeholders in the health system:

1. Administrators and Managers in Hospitals

Through the identification of high-burden disease groups and departments of greater morbidity and mortality, this study will be able to support strategic planning, resource

deployment, and capacity management. Information related to ALOS and discharge trends can be used to enhance bed turnover rate, eliminate operating inefficiencies, and facilitate cost control efforts.

2. Clinical and Quality Teams

Knowledge about morbidity and mortality trends helps clinicians and quality managers identify areas of clinical risks, enhance documentation practices, and re-enforce patient safety procedures. Data analysis based on ICD-10 also facilitates evidence-based decision-making in the planning of care and monitoring outcomes.

3. Medical Records and Health Information Management

The research highlights the significance of proper ICD-10 coding and thorough documentation in developing credible data systems for epidemiological surveillance, internal auditing, and accreditation compliance like NABH and JCI.

4. Public Health and Policy Makers

Aggregated information from ICD-coded hospital data can be used in disease surveillance, burden estimation, and public health planning at regional or local levels. It assists policymakers to appreciate hospital utilization patterns, disease prevalence, and the demand for preventive interventions.

5. Academic and Research Communities

This study adds to the sparse body of literature that applies ICD-10 data to analyse hospital morbidity, mortality, and operational performance metrics such as ALOS within the Indian healthcare environment. The study offers a methodological framework for subsequent research on hospital data analytics and health system performance.

1.3 BACKGROUND OF ICD-10

The International Classification of Diseases, 10th Revision (ICD-10) is a widely accepted epidemiologic, health management, and clinical diagnostic instrument globally. The World Health Organization (WHO) formulated ICD-10 as a system of standard classification of diseases, injuries, and causes of death. It is a hierarchical classification system, and chapters are organized according to body systems or groups of diseases with alphanumeric codes indicating individual conditions.

In this research, the ICD-10 chapters are pivotal in classifying patient diagnoses so that their relationship with LOS, morbidity, and mortality can be analysed in a systematic way. This standard classification helps to maintain the consistency of data as well as comparability so that a solid evidence base can be established regarding disease patterns and their effects on the hospital outcomes.

Purpose:

Its main purpose is to standardize the recording, analysis, interpretation, and comparison of mortality and morbidity data gathered from various countries and time periods. Standardization is essential in global health surveillance, epidemiological investigations, and health policy-making.

Structure:

1. Hierarchical Structure

ICD-10 has a hierarchical structure with the following levels:

•Chapters: 22 chapters, each for a principal body system or disease category (e.g., Chapter IX: Diseases of the circulatory system).

•Blocks: Within chapters, conditions are organized into blocks for further subdivision.

•Three-character categories: Every disease or condition has a unique three-character alphanumeric code (e.g., I10 for Essential hypertension).

•Four-character subcategories: These offer higher specificity (e.g., I10.0 for Hypertension with heart involvement).

2. Coding Format

• The structure of the code is an alphanumeric coding system consisting of a letter (A–Z) in the first position followed by two digits, and an optional decimal and another digit.

o Example: K35.2 – Acute appendicitis with generalized peritonitis.

3. Chapter Distribution

Every chapter is a wide classification, for example:

• Chapter I (A00–B99): Infectious and parasitic diseases

• Chapter II (C00–D48): Neoplasms

• Chapter IX (I00–I99): Diseases of the circulatory system

• Chapter XI (K00–K93): Diseases of the digestive system

• Chapter XIX (S00–T98): Injuries, poisonings, and other external causes

Applications in Healthcare:

• **Clinical Documentation**: ICD-10 codes are utilized by healthcare professionals to document diagnosis, procedures, and reasons for encounter, which is crucial for patient records.

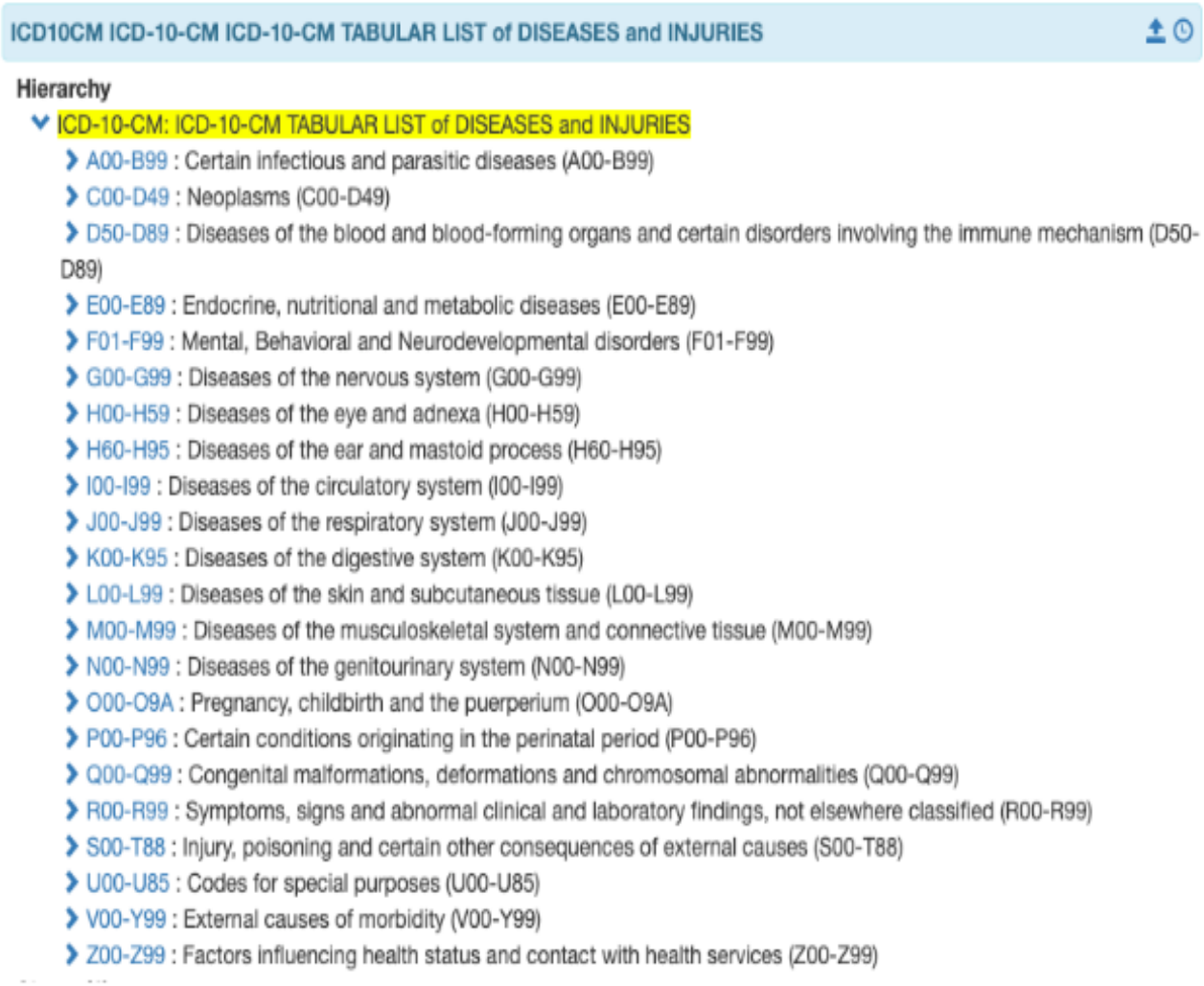
• **Billing and Reimbursement**: ICD-10 codes are often required in most healthcare systems for billing insurance companies and government payers for reimbursement of medical care.

•**Public Health**: Public health organizations utilize ICD-10 data for tracking outbreaks, monitoring trends in health, and applying public health interventions.

•**Research and Statistics**: Researchers make use of ICD-10 data to carry out epidemiological research, compare disease patterns, and measure the performance of treatments and interventions.

•**Resource Management**: Hospitals and health systems make use of aggregate ICD-10 data for characterizing patient populations, distributing resources, and planning for services.

Figure 1- ICD-10 CM CHAPTERS



1.4 STUDY AIM

The overall purpose of this study is to have a thorough examination of inpatient information within a multispecialty hospital to assess trends in morbidity and mortality based on ICD-10 coded admissions. It also aims to monitor patterns and determinants of Average Length of Stay (ALOS) such as disease type, demographic, source of admission, and outcome of discharge and how they are related to morbidity and mortality in various clinical and patient categories. The study results are expected to provide actionable information to optimize hospital efficiency, streamline resource allocation, and maximize patient care outcomes.

1.5 OBJECTIVES OF THE STUDY

Primary Objectives

• To categorize patient diagnoses according to ICD-10 chapters and examine their correlation with morbidity, and mortality.

Secondary Objectives

1. To determine the leading ICD-10 chapters and DRG categories making up total hospital case mix.
2. To note inpatient admissions distribution by age, gender, and clinical departments.
3. To compute the Average Length of Stay (ALOS)
4. To explore patient demographics (age and gender), admission type (emergency or IPD), and departmental trends with respect to morbidity, mortality, and discharge results.

1.6 RESEARCH QUESTION

What are the patterns of morbidity and mortality among inpatients as categorized by ICD-10 chapters, and how are these outcomes related to patient demographics, admission type, departmental trends, and length of stay in a multispecialty hospital hospital for the period January to May 2025?

CHAPTER -2: REVIEW OF LITERATURE

This chapter presents a synopsis of past studies pertinent to the trends in inpatient morbidity and mortality, average length of stay (LOS), and ICD-10 disease classification in hospital settings. These studies were chosen to represent ongoing practices and new trends in hospital epidemiology, applying varied geographical locations and sampling designs.

The results are presented below for clarity and comparative purpose.

Table 1-REVIEW OF LITERATURE

Author (Year)	**Study Location**	**Sample Size**	**Sampling Technique**	**Salient Features / Key Findings**
Bhattacharya et al. (2021)	Tertiary Care Hospital, India	6,243 patient records	Retrospective sampling	Used ICD-10 coding to analyse disease burden and mortality; identified infectious diseases and circulatory disorders as top causes.
AlShammari et al. (2020)	Saudi Arabia	4,900+ admissions	Stratified sampling	Studied ALOS trends using ICD-10 groups; found that age, comorbidities, and admission source significantly impacted LOS.

Singh & Gupta (2022)	Northern India	1 year inpatient data	Purposive sampling	Evaluated discharge outcomes and LAMA trends; linked higher mortality with late presentation and emergency admissions.
Maheshwari et al. (2019)	Urban Government Hospital, India	3,000 cases	Retrospective analysis	Highlighted the importance of ICD-10 in streamlining MRD systems and identifying high-risk departments.
Rana et al. (2023)	Nepal	5,500 admissions	Convenience sampling	Assessed morbidity and mortality by ICD chapters; respiratory and gastrointestinal diseases were top contributors.
WHO Report (2020)	Global	Multiple hospitals	Aggregated secondary data	Emphasized global adoption of ICD-10 for disease surveillance and benchmarking of hospital performance metrics.

Patel et al. (2021)	Gujarat, India	2,400 discharges	Retrospective review	Correlated ALOS with age, gender, and diagnosis group; found longer stays associated with chronic illnesses and surgical complications.

CONCLUSION

Literature uniformly reveals that average length of stay is a multideterminant factor that is modulated by disease nature, comorbidities, complications, and institutional practices. Various studies have proved that reduced LOS is not necessarily detrimental, as long as outcomes are good. ICD-10 chapter-based classification appears to be an effective paradigm to relate LOS, morbidity, and mortality. These results highlight the applicability of the present study in providing updated, regional-level evidence from a multispecialty hospital setting.

CHAPTER 3: METHODOLOGY

This chapter explains the research methodology followed for the research work "Study of Inpatient Morbidity and Mortality Patterns Using ICD-10 in a Multispecialty Hospital". It explains the study design, setting, population, data collection process, variables examined, tools, and ethical aspects. The aim is to make the research scientifically valid and replicable, with a definite plan of studying inpatient patterns of morbidity, mortality, and length of hospital stay.

3.1 RESEARCH DESIGN

The current study utilizes a retrospective, descriptive, cross-sectional research design. The study is based on secondary data obtained from hospital discharge records to evaluate trends in inpatient mortality and morbidity and patterns in Average Length of Stay (ALOS) based on ICD-10 coding.

3.2 STUDY SETTING

The research was carried out at a multispecialty tertiary care centre, Fortis Hospital, Ludhiana, which possesses an operational Medical Records Department (MRD) and electronic health record systems. The hospital has several departments like Internal Medicine, Surgery, Orthopaedics, Gastroenterology, Gynaecology, and Critical Care.

3.3 STUDY DURATION

Study duration is 5 months: January 1, 2025 to May 31, 2025.

3.4 STUDY POPULATION

All inpatients who were hospitalized in the hospital study period were included as part of the target population.

Inclusion Criteria:

- Inpatients admitted to the IPD for the period January to May 2025.
- Complete cases with documentation that includes ICD-10-coded diagnosis, demographics, and discharge information.

Exclusion Criteria:

- incomplete or missing data.
- patients who were admitted for less than 24 hours or day-care/elective surgery and had no complications.

3.5 SAMPLING TECHNIQUE

Purposive sampling was employed to sample all the qualifying inpatient records that were accessible throughout the study period and were within the inclusion criteria. An aggregate of 630 patient records were considered and assessed.

3.6 DATA COLLECTION PROCEDURE

The data was received from the MRD of the hospital as well as the electronic hospital information system. The following variables were retrieved:

• Demographic Data: Age, gender

• Clinical Data: Primary diagnosis (ICD-10 code), department, DRG category

• Admission Details: Admission type (IPD vs. Emergency)

• Discharge Information: Discharge type (routine, LAMA, death, MLC, transfer)

• Operational Data: Length of stay (to compute ALOS), type of payment (cash/insurance)

The ICD-10 and DRG codes were utilized for classifying diagnoses and determining trends.

3.7 STUDY INSTRUMENTS AND TOOLS

• ICD-10 Classification System: Utilized to code all diagnoses.

• CMS-DRG Grouping Tool: Utilized to group patient conditions into diagnosis categories.

• Microsoft Excel: Used for data cleaning, tabulation, analysis, and visualization (charts, graphs, frequencies).

3.8 OPERATIONAL DEFINITIONS

•ICD-10 Chapter: A classification of diseases by body system or aetiology, according to WHO.

•Morbidity: The number of a diagnosed medical condition necessitating hospital stay.

•Mortality: Deaths in hospital during the episode of stay.

•ALOS (Average Length of Stay): Sum of inpatient days divided by discharges in the specified duration.

•LAMA: Left Against Medical Advice.

•MLC: Medico-legal Case.

3.9 DATA ANALYSIS

•Descriptive statistics (percentages, frequencies) were employed to portray the demographic and clinical profile.

•ICD-10 information was examined for high-burden chapters and related outcomes.

•Cross-tabulations were employed to assess correlations among diagnosis category, age, gender, department, and discharge outcomes.

Chapter 4- ANALYSIS

Table 2-AGE AND GENDER WISE DISTRIBUTION OF INPATIENTS

AGE GROUP	MALE	FEMALE	TOTAL
<1 YEARS	13	10	23
1-5 YEARS	5	6	11
6-14 YEARS	11	6	17
15-45 YEARS	113	138	251
46-65 YEARS	63	116	179
> 65 YEARS	63	86	149
TOTAL	268	362	630

Table shows breakdown of inpatient admissions by six age groups and gender distribution. During the period of study between January and May 2025, a total of 630 inpatients were reported, including 268 males (42.5%) and 362 females (57.5%). The gender ratio shows a much greater female inpatient representation, particularly among adults and older populations.

Gender-specific Observations

- In females, the most admissions were from the 15–45 years age group (138 cases; 38.1%), which was congruent with the reproductive years and connected hospitalizations like obstetric admissions.
- In males, the greatest admissions were in the 15–45 years group (113 cases; 42.2%), followed by the 46–65 years and >65 years groups.
- Among paediatric age groups (<15 years), male admissions remained higher than female, indicating gender bias in care-seeking or susceptibility of young males to the disease.

Figure 2-AGE WISE DISTRIBUTION OF INPATIENTS

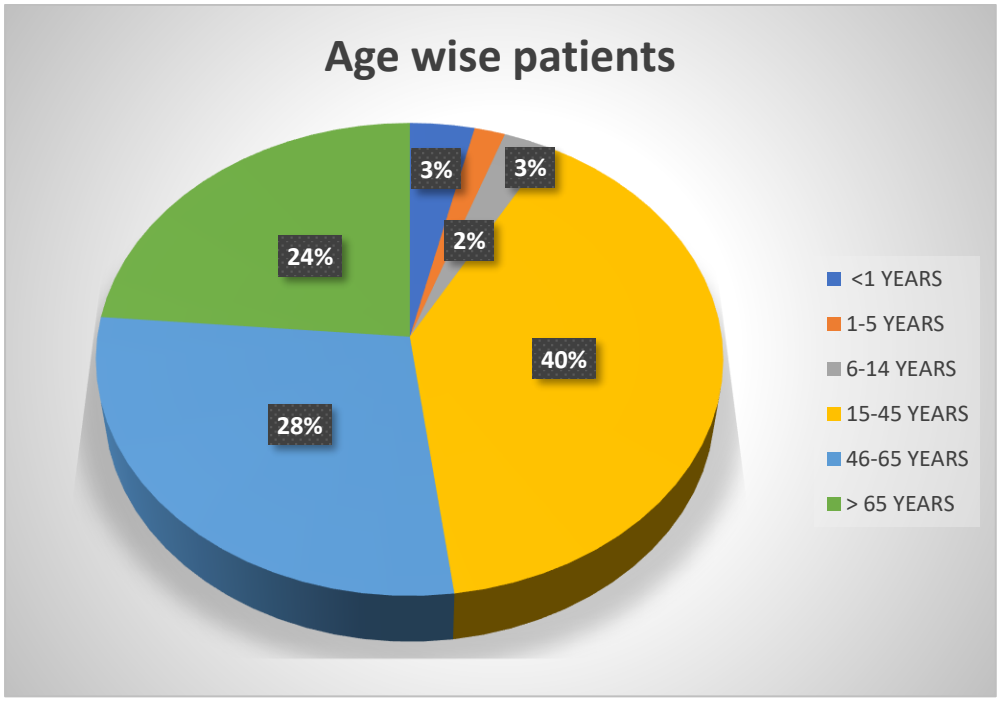
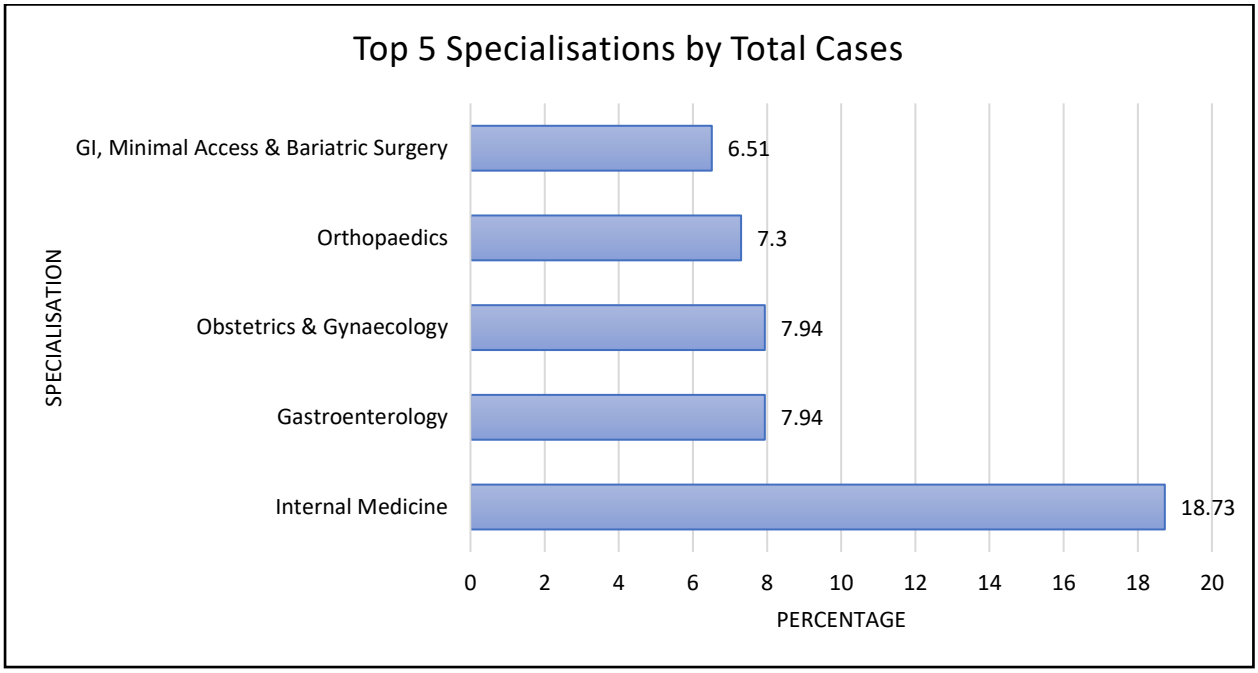


Figure provides a visual illustration of Age-wise Trends:

- 15–45 years had the highest admissions, with 251 cases (39.84%), followed by 46–65 years (179 cases; 28.41%), and over 65 years (149 cases; 23.65%).
- Children under 15 years of age have together contributed merely 8.1% of total admissions:
    a. <1 year: 23 cases (3.65%)
    b. 1–5 years: 11 cases (1.75%)
    c. 6–14 years: 17 cases (2.70%)

Figure 3-OVERALL TOP 5 SPECIALISATIONS WITH %AGE



This bar graph of the top five medical specialisations by percentage of total inpatient cases treated shows each bar representing the proportion of cases that correspond to a given department, which gives information on clinical workload distribution in the hospital or study environment.

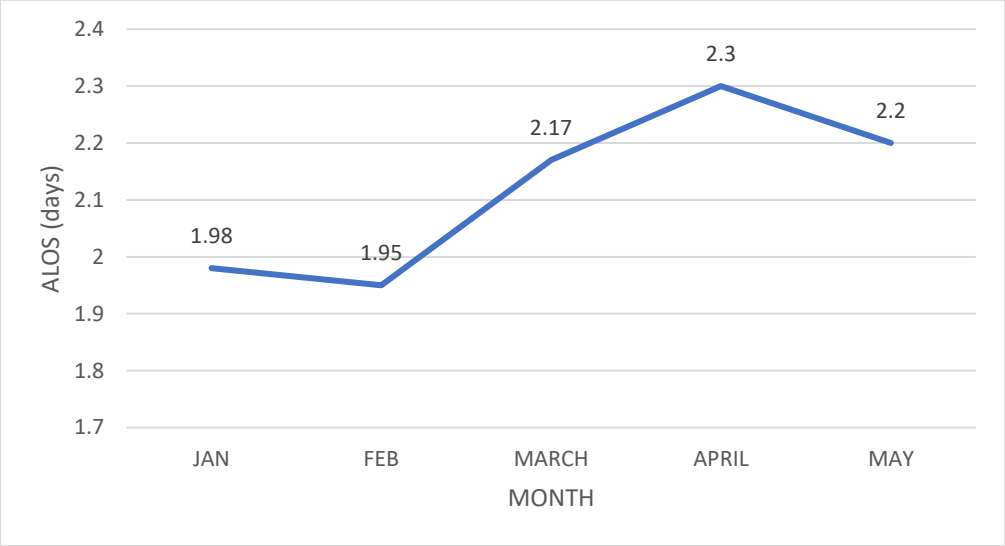
Key Observations

- The most prominent specialisation is Internal Medicine, comprising 18.73% of total cases. This serves to emphasize its wide role in the management of a broad range of acute and chronic medical illnesses.
- Gastroenterology and Obstetrics & Gynaecology are equal second, each dealing with 7.94% of the total cases. This indicates a very significant clinical load in the field of gastrointestinal illness and reproductive medicine, respectively.
- 3.Orthopaedics is a close third, handling 7.3% of cases, reflective of a large number of musculoskeletal disorders like fractures, joint diseases, and osteoarthritis.
- 4.GI, Minimal Access & Bariatric Surgery makes up 6.51%, reflective of the importance of surgical procedures for gastrointestinal as well as obesity-related conditions.

Table 3-INTERPRETATION OF ALOS OVER THE TIME PERIOD

MONTH	ALOS
JAN	1.98
FEB	1.95 (LOWEST)
MARCH	2.17
APRIL	2.3 (HIGHEST)
MAY	2.2

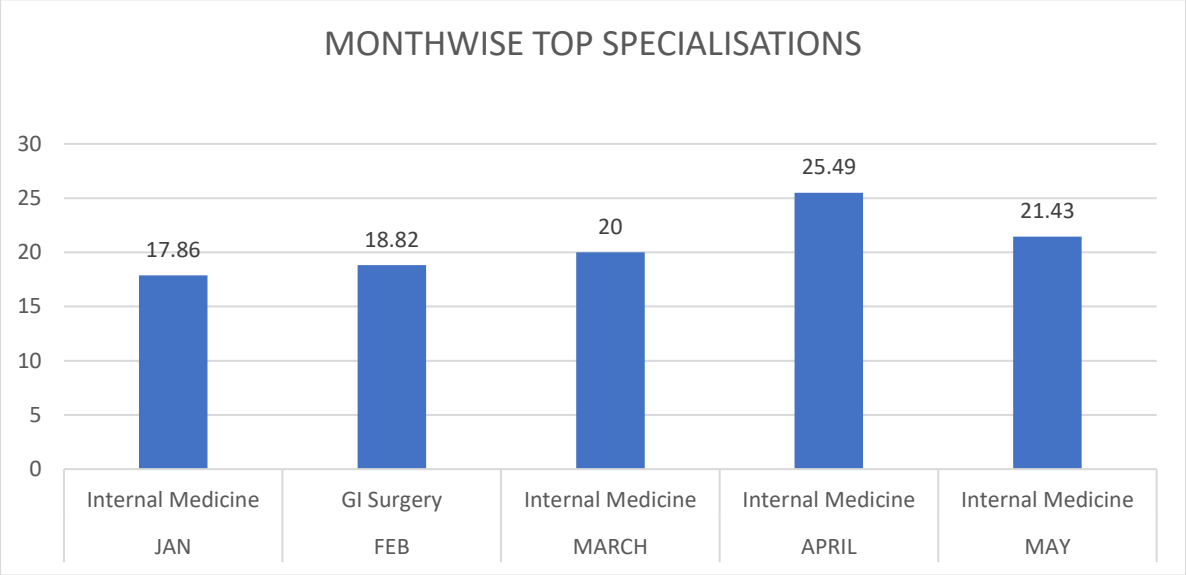
Figure 4-INTERPRETATION OF ALOS OVER THE TIME PERIOD



The line graph with the name "ALOS" shows the monthly fluctuation in Average Length of Stay among inpatients from January to May 2025 in a multispecialty hospital. ALOS is an important performance indicator that indicates the efficiency in patient care and utilization of hospital resources.

- There is a minimal decline in ALOS from January to February, which may indicate shorter stays in the hospital, perhaps fewer complex admissions or better discharge processes during this period.
- A consistent rise from February to April is seen, with the highest ALOS of 2.30 days in April. This can reflect a greater number of severe or chronic cases needing longer treatment, or potential procedural delays in the month.
- During May, the ALOS fell slightly to 2.20 days, suggesting either an improvement in patient throughput or a decrease in critical cases from April.

Figure 5-MONTHWISE TOP SPECIALISATIONS



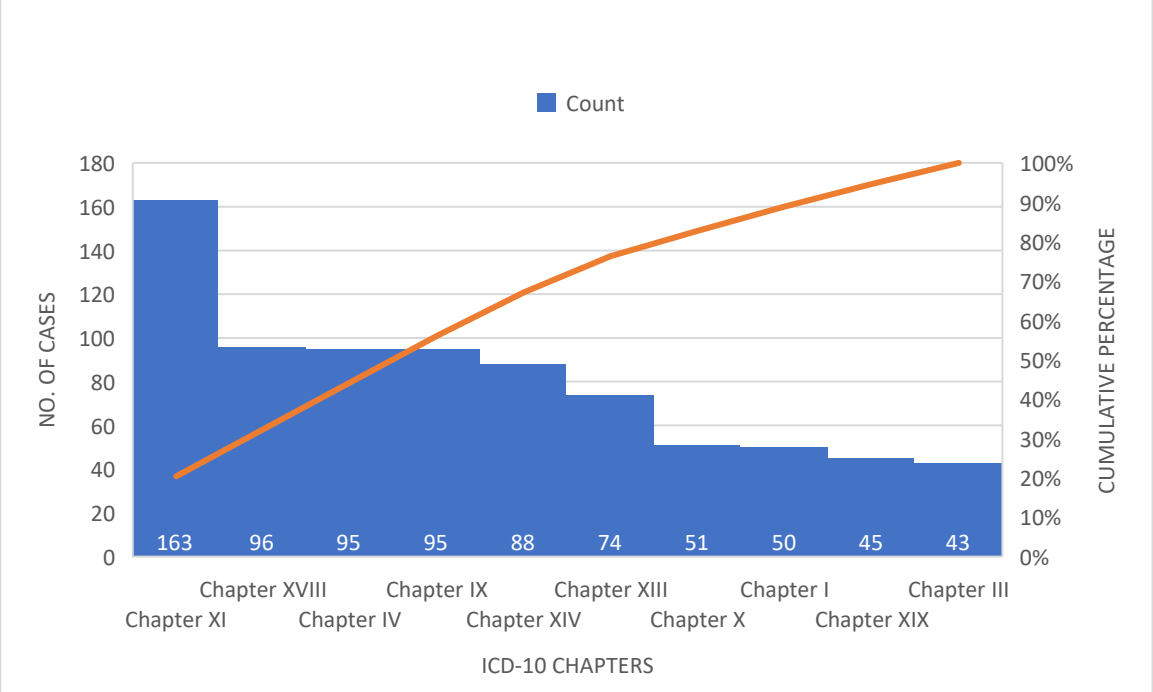
The bar graph shows the departments that received the largest percentage of monthly admissions (in percentages) for the period from January to May 2025.

- Internal Medicine had the largest admissions in four months out of five, showing its pivotal function in inpatient treatment in more than one disease category.
    1. It represented 17.86% of overall admissions in January.
    2. It had its greatest dominance in April when it accounted for 25.49% of total hospitalizations — the highest single-month percentage in the study period.
    3. In March and May, it also held firm leads of 21.43% and 20% respectively.
- It surpassed Internal Medicine in February as the leading department, accounting for 18.82% of total admissions that month. This might have been due to planned surgical procedures, elective procedures, or seasonal outbreaks of gastrointestinal illnesses.

Table 4-TOP ICD-10 CM CHAPTERS COVERING ~80% OF THE CASE-MIX

Chapter_Name	Chapter_Number	Count	Cumulative_Percent
Diseases of the digestive system	Chapter XI	163	16.873706
Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	Chapter XVIII	96	26.8115942
Endocrine, nutritional and metabolic diseases	Chapter IV	95	36.64596273
Diseases of the circulatory system	Chapter IX	95	46.48033126
Diseases of the genitourinary system	Chapter XIV	88	55.59006211
Diseases of the musculoskeletal system and connective tissue	Chapter XIII	74	63.2505176
Diseases of the respiratory system	Chapter X	51	68.5300207
Certain infectious and parasitic diseases	Chapter I	50	73.70600414
Injury, poisoning and certain other consequences of external causes	Chapter XIX	45	78.36438923
Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism	Chapter III	43	82.81573499

Figure 6-Top ICD-10 CM Chapters covering 80% of the case mix



The Pareto chart shown indicates the relative distribution of cases by ICD-10-CM chapters, and the chart calls out those chapters collectively that contribute about 80% of the total case mix. The chart is made up of blue bars, which are the number of cases per chapter, and an orange cumulative line that indicates the combined contribution of each chapter towards the total.

- Chapter XI (Gastrointestinal Diseases) is the largest contributor at 163 cases, the largest single category.
- Chapters XVIII, IV, and IX are next, each with 96, 95, and 95 cases respectively, representing conditions of:
    1) general symptoms and abnormal clinical findings (Chapter XVIII),
    2) endocrine, metabolic, and nutritional diseases (Chapter IV),
    3) circulatory system diseases (Chapter IX).
- Both Chapter XIV (Genitourinary System) and Chapter XIII (Musculoskeletal System) also make a significant contribution, each with 88 and 74 cases respectively.
- The total line shows that the best 5 chapters—Chapters XI, XVIII, IV, IX, and XIV—cover more than 67% of the total case mix.
- Additional contributions to achieve about 80% coverage come from:
    1) Chapter X (Respiratory System) – 51 cases,
    2) Chapter I (Infectious and Parasitic Diseases) – 50 cases
    3) Chapter XIX (Injury and Poisoning) – 45 cases, and
    4) Chapter III (Blood and Immune Disorders) – 43 cases.

Figure 7-Top Causes of Morbidity Among Females

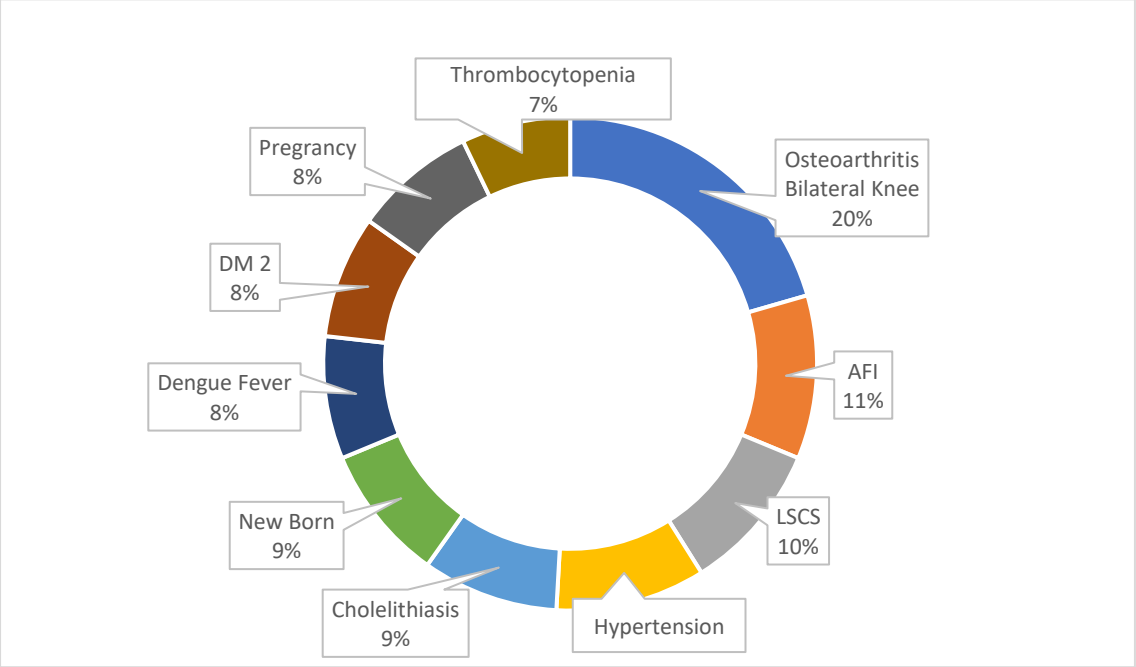


Figure 8-Top causes of morbidity among males

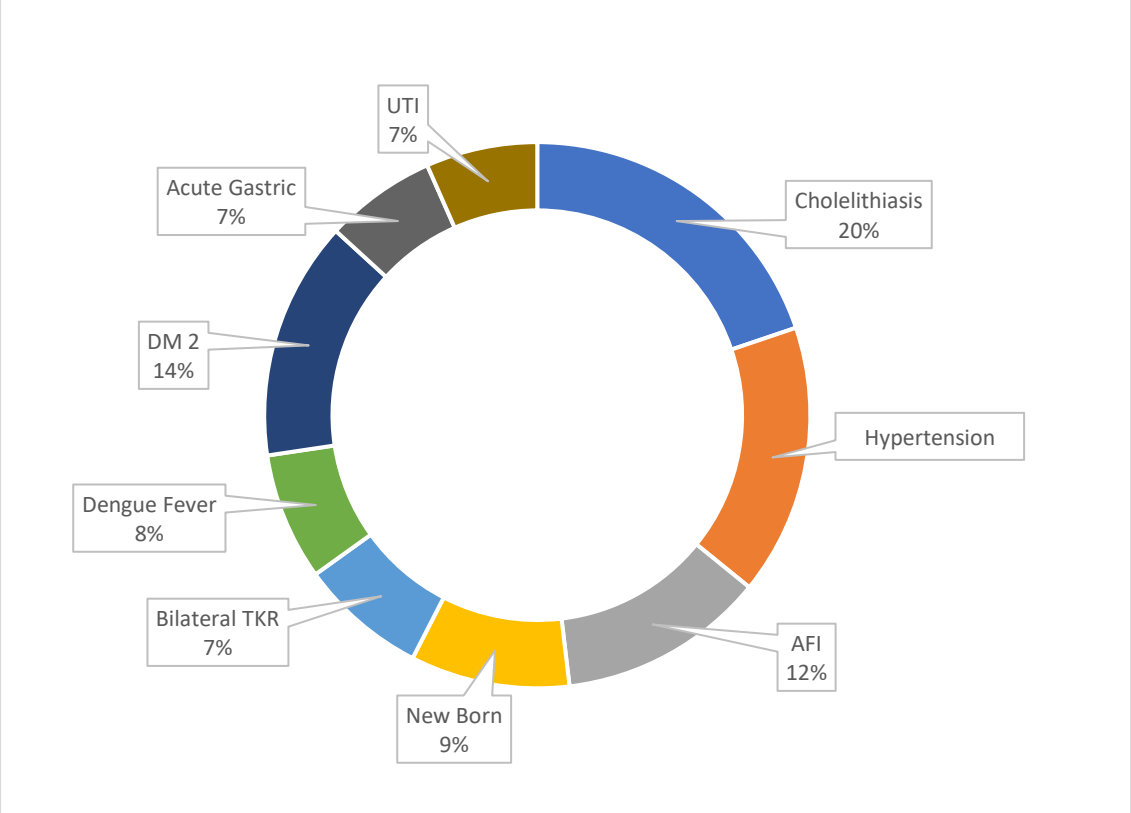
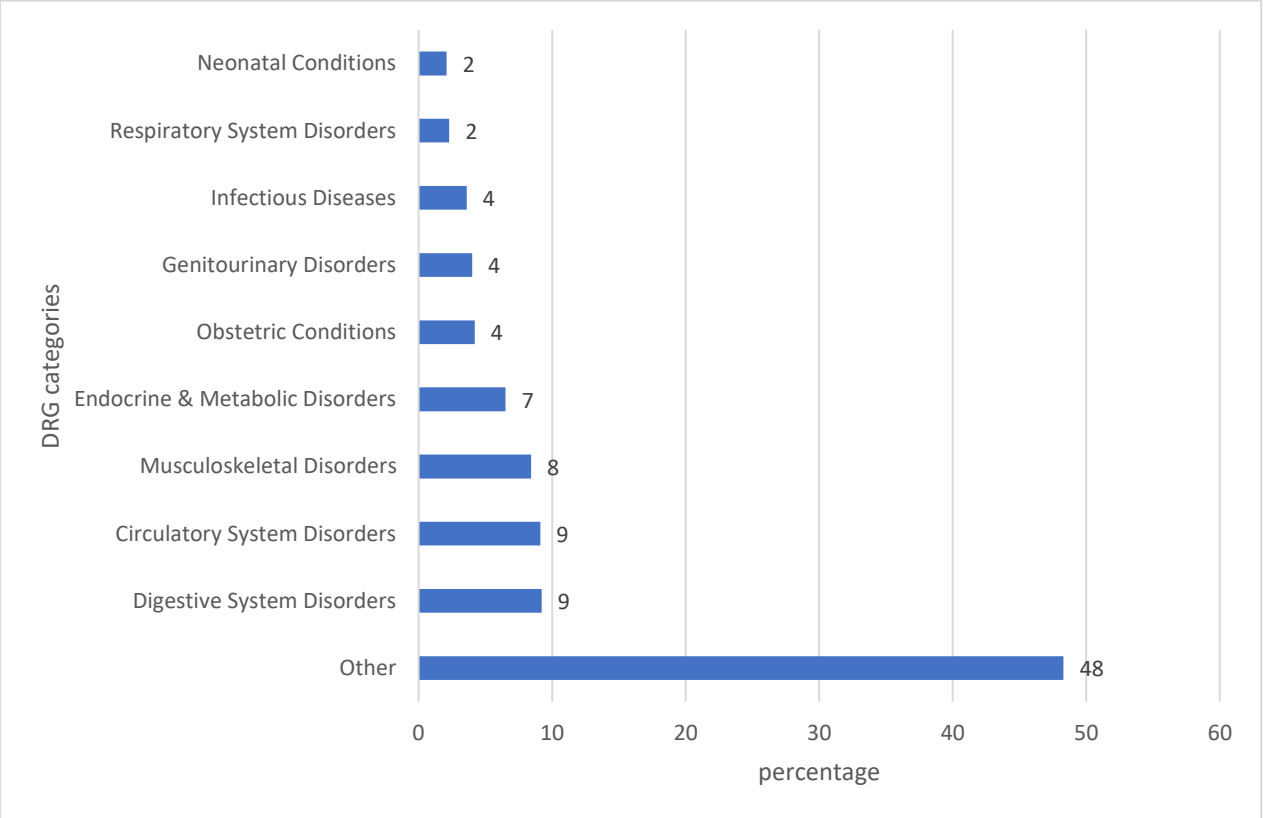


Table 5-Top DRG Categories of Inpatients

DRG_Category	Percentage
Other	48
Digestive System Disorders	9
Circulatory System Disorders	9
Musculoskeletal Disorders	8
Endocrine & Metabolic Disorders	7
Obstetric Conditions	4
Genitourinary Disorders	4
Infectious Diseases	4
Respiratory System Disorders	2
Neonatal Conditions	2

Figure 9-Top DRG categories of inpatient



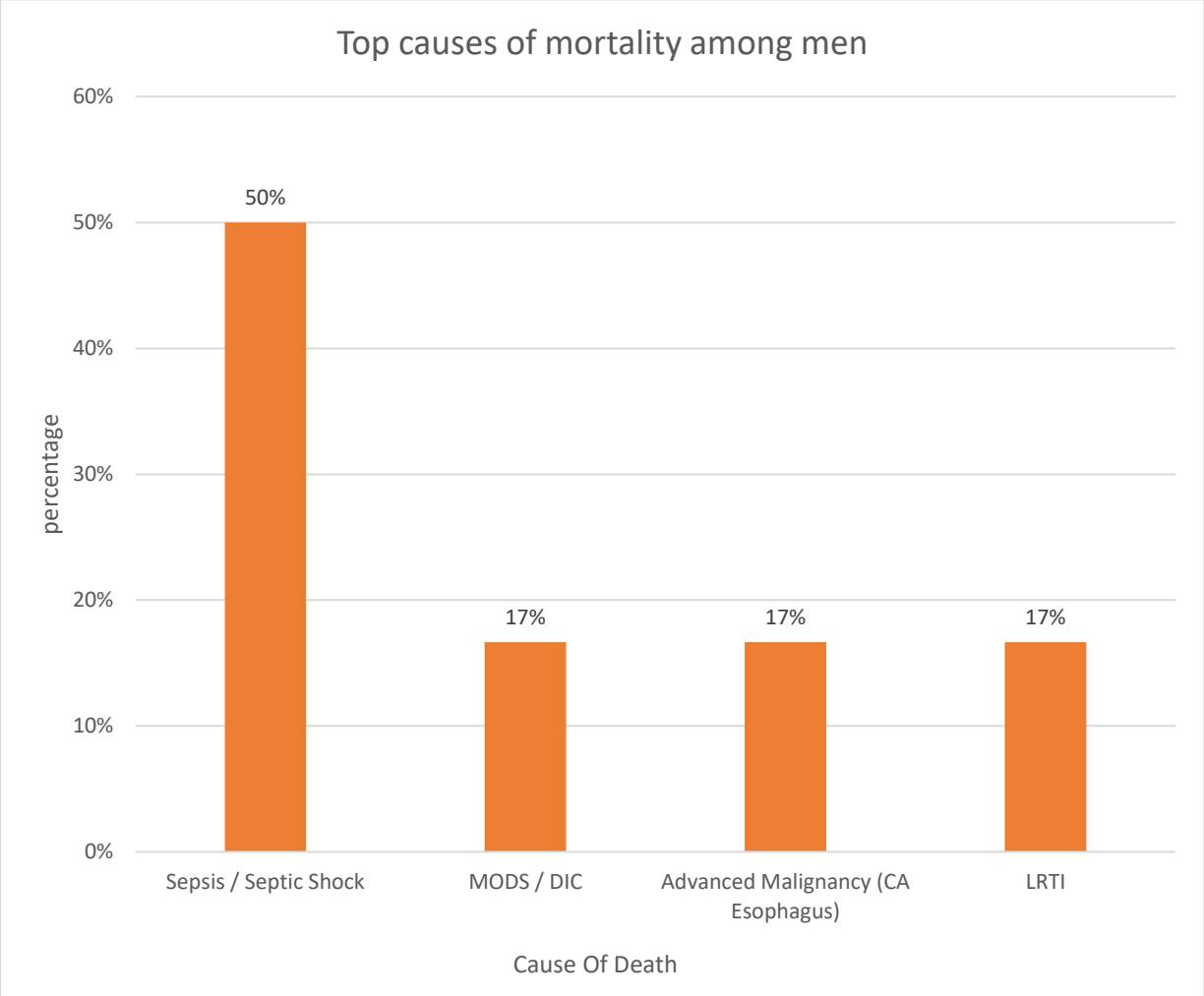
The bar graph and chart gives a visual segregation of the leading Diagnosis-Related Group (DRG) categories in inpatients, with emphasis on the number of each category by cases. The information is presented in a horizontal bar chart to enhance comparison.

- "Other" is the most prevalent category, with 48 inpatient cases. This category probably includes a wide variety of conditions that do not fit into typical DRG categories, indicating either coding variation or wide clinical heterogeneity. The next two highest categories, each with 9 cases, are:

    1. Digestive System Disorders
    2. Circulatory System Disorders

    - These results are in line with previous ICD-10-chapter analysis, which confirms the high inpatient consumption from gastrointestinal and cardiovascular conditions. Endocrine & Metabolic Disorders (7 cases) and Musculoskeletal Disorders (8 cases) also demonstrate a significant presence, which is indicative of the widespread incidence of chronic disease like diabetes and degenerative joint conditions. Other significant categories include Obstetric Conditions, Infectious Diseases, Respiratory System Disorders, Genitourinary Disorders, and Neonatal Conditions.

Figure 10-TOP CAUSES OF MORTALITY AMONG MEN



The above bar chart shows the percentage breakdown of different clinical causes that are responsible for inpatient mortality in the dataset that has been analysed.

- Sepsis and Septic Shock became the primary cause of death, represented by 50% of all documented deaths. This is indicative of the severe nature and fast evolution of sepsis conditions, especially in Internal Medicine, Rheumatology, and Gastroenterology departments. The high percentage of mortality points to the necessity of early detection, timely intervention, and rigidly following sepsis protocols among hospitalized individuals.
- The remaining 50% of fatalities were equally divided among three causes:

    1) MODS (Multiple Organ Dysfunction Syndrome) / DIC (Disseminated Intravascular Coagulation) – 17%

    2) Advanced Malignancy (CA Oesophagus with UGI Bleed) – 17%

3) Lower Respiratory Tract Infection (LRTI) – 17%

- These secondary donors also refer to severe underlying conditions, which usually appear in complicated, critically ill patients. For example, MODS/DIC tends to occur as a terminal phase of septic or systemic inflammatory response. Case series of advanced cancer cases, particularly those with upper gastrointestinal malignancies, are characterized by high morbidity in terms of bleeding, obstruction, or metastasis. In contrast, LRTI (pneumonia or bronchopneumonia) continues to be a common cause of mortality, particularly in elderly or immunocompromised patients.

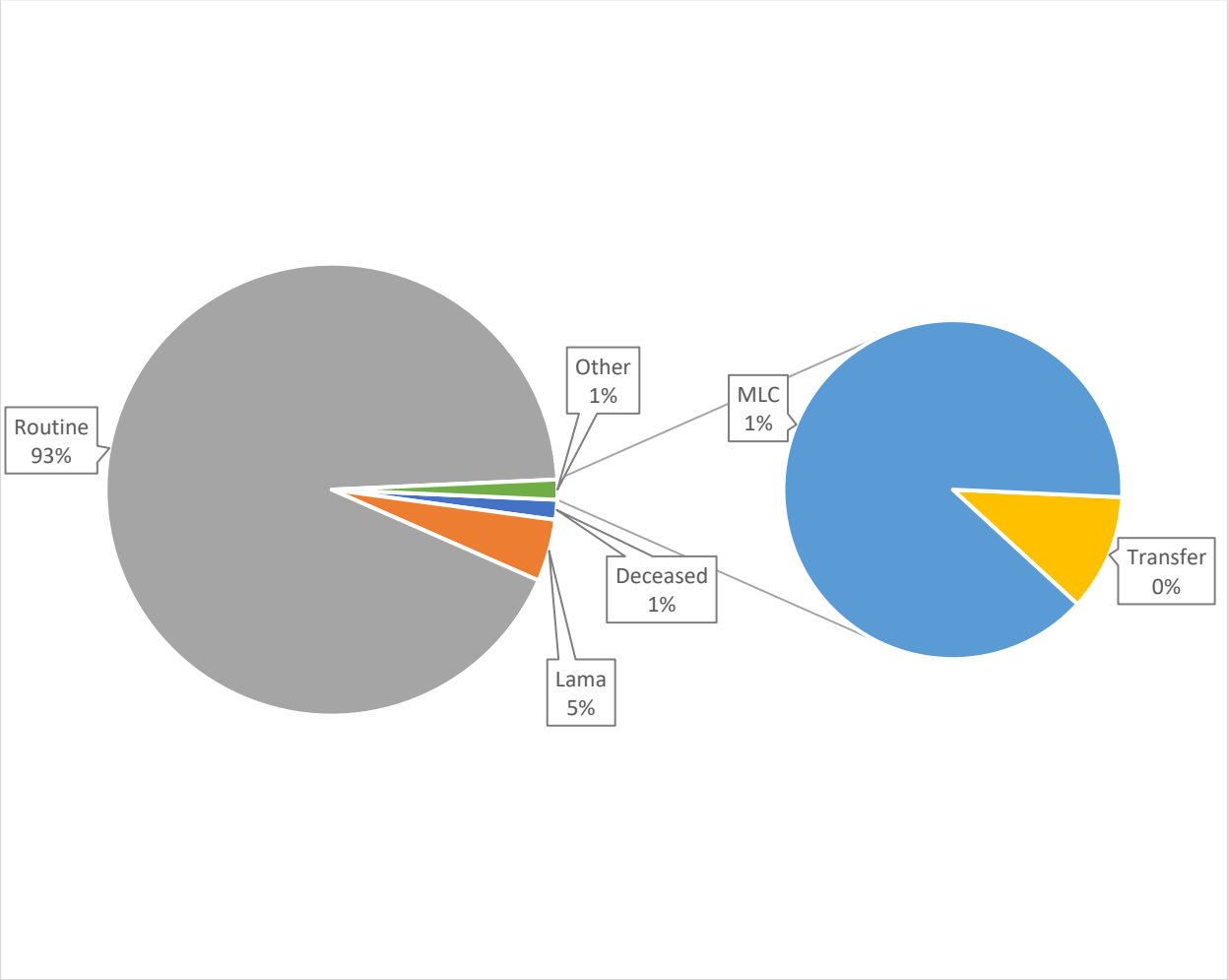
Table 6- Distribution of Inpatients by Type of Discharge

Row Labels	Count of Discharge Type	Percentage of Discharge Type
Deceased	9	1.43%
Lama	28	4.44%
Routine	584	92.70%
Transfer	1	0.16%
MLC	8	1.27%
Grand Total	**630**	**100.00%**

Table 6 illustrates the prevalence and percentage of varied discharge types among inpatients. The majority (92.7%) of patients experienced routine discharges, which are signs of a cure and intended hospital departure. A high percentage of routine discharges indicates that the hospital was effective at handling cases through departments.

- LAMA cases (Left Against Medical Advice) were 4.44%, and this should be a cause of concern in terms of care continuity. These patients may leave early due to dissatisfaction, financial constraints, or distrust. While this percentage is not very high, it indicates a need to improve patient involvement and discharge counselling practices.
- The mortality rate in-hospital was 1.43% (9 deaths). Though low by relative comparison, it serves to highlight the significance of mortality monitoring to track outcomes, particularly in high-risk age groups or ICD-10 categories.
- The MLC rate was 1.27%, which included patients with trauma, poisoning, or legally sensitive cases. These need careful documentation and legal compliance procedures.
- 1 patient (0.16%) were referred to another institution, reflecting either successful in-house management or a low rate of referral

Figure 11-Breakdown of Discharge Type



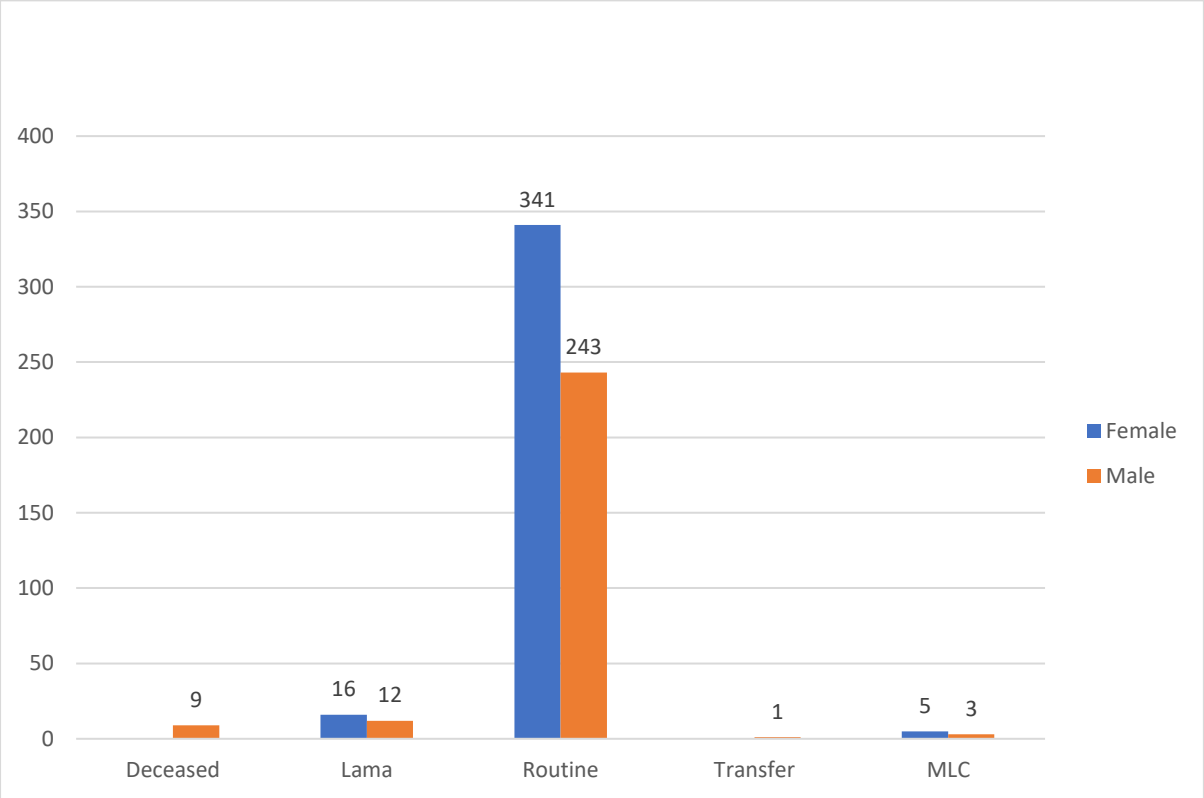
The pie chart shows the spread of different discharge outcomes for the patients in the dataset.

- Routine Discharges are the vast majority, making up 93% of all discharges. This means that the majority of patients were discharged in good condition after they had finished their treatment or care plan.
- LAMA (Left Against Medical Advice) cases account for 5%, indicating a small but significant number of patients decided to end care prematurely.
- Deceased, MLC (Medico-Legal Case), and other categories each represent 1%, reflecting low discharge frequency of critical or exceptional discharge situations.
- Transfers to other facilities were nearly 0%, reflecting either the low need of inter-facility patient movement.

Table 7-Gender-wise Discharge Analysis

Discharge type	Female	Male	Grand Total
Deceased		9	9
Lama	16	12	28
Routine	341	243	584
Transfer		1	1
MLC	5	3	8
Grand Total	362	268	630

Figure 12-Gender-wise Distribution of Discharge Types



The bar chart and table show the gender-wise distribution of discharge types among 630 inpatients, including 362 females (57.5%) and 268 males (42.5%), from the study period. The figure offers frequency- and pattern-based information regarding hospital discharge outcomes by gender. Routine discharge was the most frequent outcome, with a total of 584 cases (92.7% of all discharges). Of these:

• 341 were female (93.9% of all female patients)

• 243 were male (90.7% of all male patients)

This high percentage indicates good care provision and successful treatment completion in both sexes. The slightly increased routine discharge rate among females might be explained by more elective and managed care usage, especially in departments such as Obstetrics & Gynaecology. LAMA (Left Against Medical Advice) was noted in 28 patients (4.4%):

• 16 males (6.0% of all males)

• 12 women (3.3% of all women)

The increased LAMA rate among males is indicative of potential problems concerning premature discharge based on economic, individual, or occupational limitations, and there is a necessity for better counselling and discharge planning, especially for men. 9 deaths (1.43%) were seen, and interestingly:

• All 9 were men admitted (3.4% of all male admissions)

• 0 women deaths (0%)

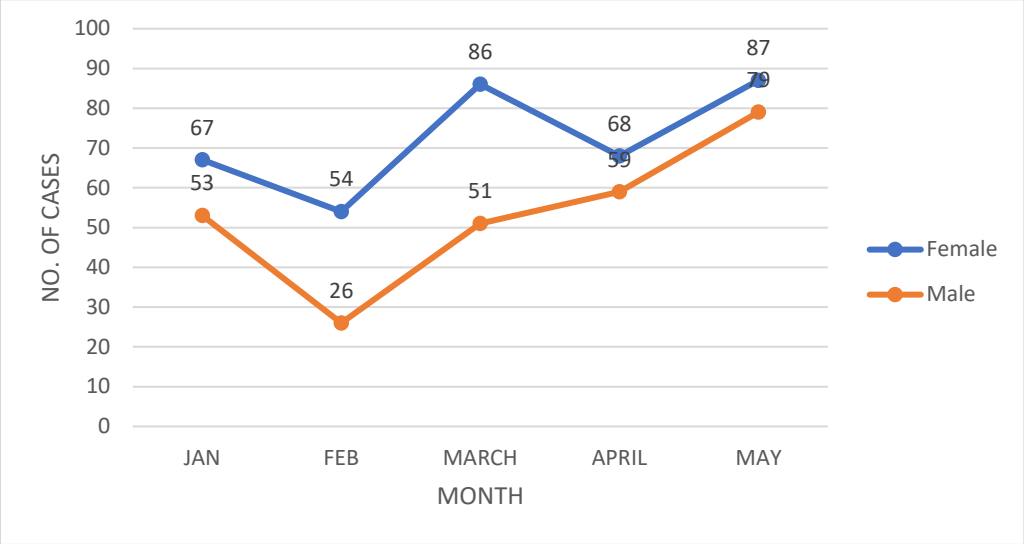
This sex-differentiated mortality suggests differential severity of disease, burden of comorbidities, or delayed hospital presentation among male patients. It calls for differential risk assessment and early intervention in male inpatients. Cases of MLC accounted for 8 patients (1.27%), divided as:

• 5 females (1.4% of total females)

• 3 males (1.1% of total males)

These are the cases that usually come with trauma, assault, or poisoning. Although few in number, the somewhat greater female proportion could be a sign of exposure to certain types of injury or social risk factors. Transfer to another facility was done for only 1 patient (0.16%), a woman. This very low rate is evidence of strong ability to treat most cases in the hospital itself, reducing inter-facility reliance.

Figure 13-GENDER-WISE MONTHLY CASE DISTRIBUTION



The five-month patient admission by gender analysis demonstrates steady and significant trends that provide evidence of healthcare utilization patterns. During the months of January to May, a total of 630 patients were noted, with female patients making up 57% of all cases (362 cases) and males making up the other 43% (268 cases). This demonstrates a steady higher rate of hospital attendance among females in this time frame.

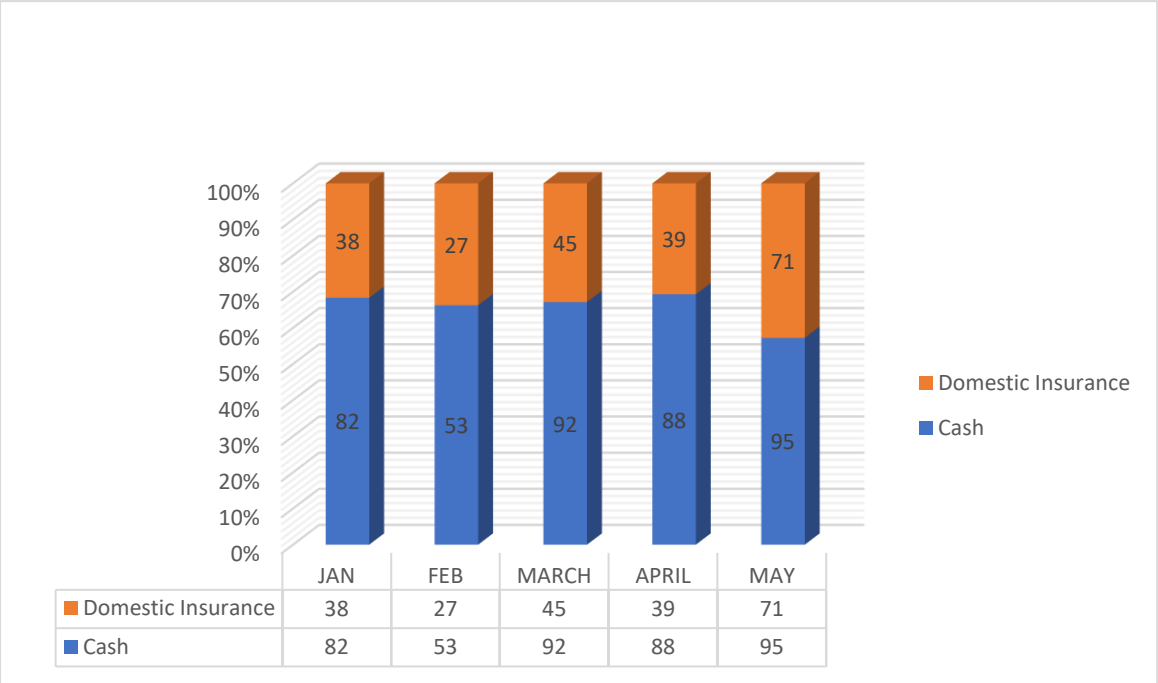
Throughout all five months, female patient numbers were uniformly greater than those of males. This may be reflective of a variety of underlying factors, including higher health-seeking behavior by women, focused maternal and reproductive health care, or gendered epidemiological patterns. The widest gender divide was seen in February, with only 26 male patients noted compared to 54 females. This decrease in male admissions, as well as February being the low month for the total number of patients (80 cases), could be indicative of external factors such as seasonal disease, holidays, or accessibility issues.

March was the highest for female patients (86), which might indicate a seasonal or operational influence that boosted female use of hospital services. May, however, had the most male patients (79) and was also the peak month in terms of activity with 166 admissions, indicating an increase in hospital activity towards the end of the observation period. This peak can be related to the post-summer initiation of specific conditions, enhanced medical outreach, or heightened awareness campaigns.

Regarding trends, April had the most even gender split (68 females and 59 males), reflecting a health care demand equalization of both genders for that month. These changes suggest

hospital services would have different demands not only in numbers but also in demographics over time.

Figure 14-TYPE OF PAYMENT METHOD



	JAN	FEB	MARCH	APRIL	MAY
Domestic Insurance	38	27	45	39	71
Cash	82	53	92	88	95

This table and accompanying figure show the distribution of patients according to payment method type—Cash or Domestic Insurance—for the period January to May.

• There were 410 cash-paying patients out of a total of 630 cases (65%), while 220 patients were insured domestically (35%).

• Cash payments always exceeded insurance claims in all the months.

• May had the highest number of cash patients (95 cases), which was only slightly less than March and January.

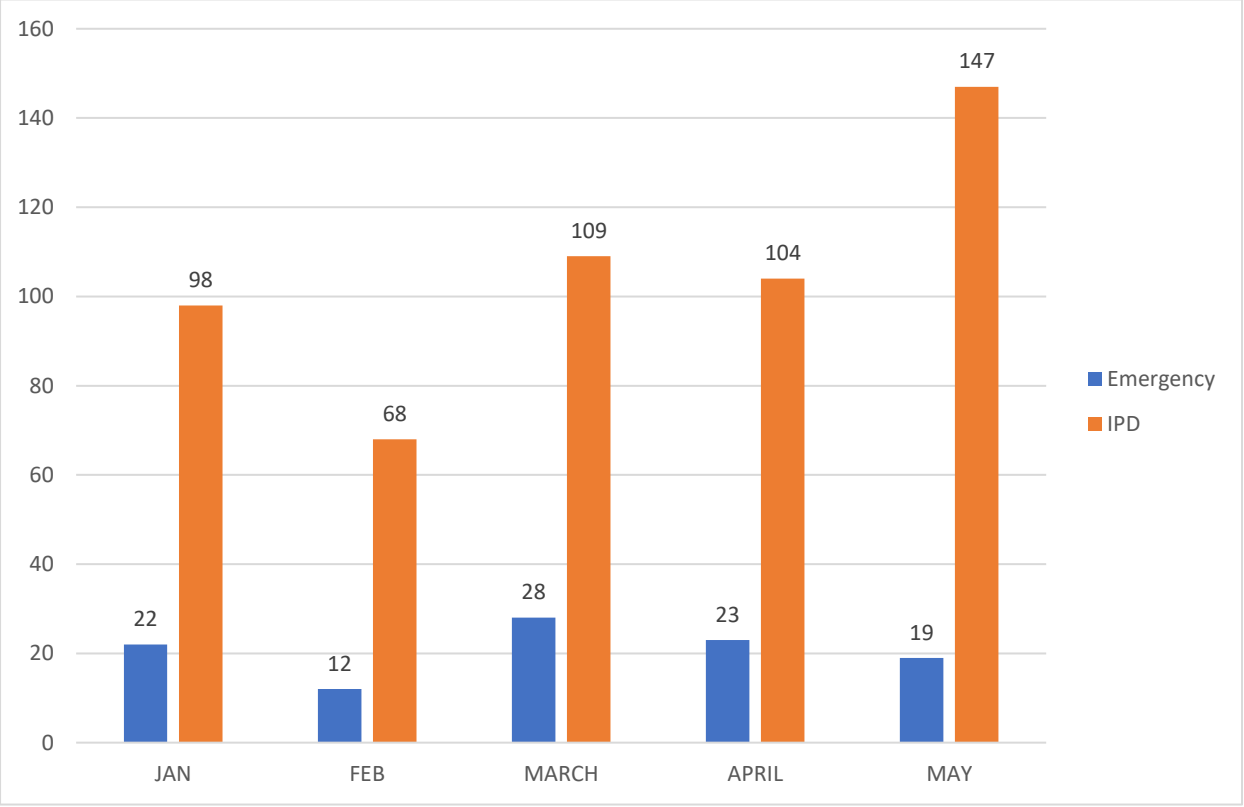
• Usage of domestic insurance was highest in May (71 cases), indicating a steady rise in coverage or the efficiency of claim processing.

• The vertical stacked bar chart also supports this trend by presenting a steadfast and consistent dominance of cash payments month after month.

Table 8-Episode Type Distribution (Emergency vs. IPD)

MONTHS	Emergency	IPD	Grand Total
JAN	22	98	120
FEB	12	68	80
MARCH	28	109	137
APRIL	23	104	127
MAY	19	147	166
Grand Total	**104**	**526**	**630**

Figure 15-Episode Type Distribution (Emergency vs. IPD)



This bar chart and table consolidates the admission episode type, separating between Inpatient Department (IPD) cases and Emergency cases, over the same five-month period.

• There are a total of 630 cases with 526 IPD admissions (83.5%) and 104 emergency cases (16.5%).

• IPD leads every month with the most in May at 147 cases.

• Emergency cases had a peak in March with 28, while in January and April, it was 22 and 23, respectively.

•February registered the lowest aggregate emergency load (12 cases), probably because of lower hospital activity during the month.

•The respective bar chart evidently reveals a sharp contrast between IPD and emergency volumes, ascertaining the dominance of planned or admitted care.

Chapter 5: Discussion

This chapter provides a holistic explanation of the outcomes achieved in the research, drawing on parallel existing literature to make a comparison and to identify the implications, merits, and limitations of the study. The purpose is to place the trends seen in inpatient morbidity, mortality, and average length of stay (ALOS) using ICD-10 coded hospital data into context and assess their applicability to enhancing hospital efficiency and improving patient care.

5.1 Interpretation of Key Findings

The study in the current work reviewed inpatient records of 630 patients admitted for five months in a multispecialty hospital with the major aim of coding diagnoses according to ICD-10 chapters and studying their relationship with morbidity, mortality, and operating outcomes like Average Length of Stay (ALOS). The results are important in understanding the patient population, disease burden, department utilization, and discharge outcomes.

• Demographic Patterns

A high percentage of the admissions were in the 15–45 years age bracket, which contributed to almost 40% of the inpatients. This reflects high utilization of healthcare among the reproductive and working-age population. The conditions in this age bracket could be pregnancy and delivery (in the case of females), trauma, disorders due to lifestyle, and onset of chronic diseases early in life.

The sex distribution revealed that females accounted for 57.5% of overall inpatients, which could indicate increased health-seeking behaviour among women and service utilization such as obstetrics and gynaecology. Female domination of the middle age groups indicates emphasis on maternal health and management of chronic diseases. Male admissions, however, were more uniformly distributed across all age groups with a greater proportion being found in the advanced age groups (>46 years), where cardiovascular, endocrine, and respiratory complications are more common.

Notably, all inpatient deaths were among male patients, which is of significant clinical and administrative concern. This might be due to a variety of factors including delayed seeking of care by males, worse presentation of the disease, or greater comorbidity burden. It also

highlights the imperative to develop gender-sensitive interventions to inpatient care, particularly in high-risk departments.

• Distribution of ICD-10 Chapters and Burden of Disease

Use of ICD-10 coding permitted the aggregation of diagnoses into disease chapters, providing a standardized method of viewing hospital case mix. The most common ICD-10 chapters were:

a. Chapter XI (Diseases of the Digestive System)
b. Chapter XVIII (Symptoms, signs, and abnormal findings)
c. Chapter IV (Endocrine, nutritional, and metabolic diseases)
d. Chapter IX (Diseases of the Circulatory System)

These groups collectively represented the majority of inpatient diagnoses. The frequency of digestive disorders illustrates the significant burden of gastrointestinal disease in both acute and chronic presentations. Endocrine conditions, especially diabetes mellitus and its associated complications, made a substantial contribution to the ALOS and mirror the national health profile for non-communicable disease.

Abnormal clinical findings and symptoms were also prevalent, which implies diagnostic difficulty at admission or the occurrence of undifferentiated disorders. This indicates the need for optimal early diagnostic workups and efficient clinical pathways to minimize delays in diagnosis and avoidable admissions.

• Average Length of Stay (ALOS)

ALOS is an important in-hospital performance measure indicating the quality and efficiency of care provision. ALOS in this research differed between departments and ICD-10 chapters, with longer durations seen for complicated conditions like disorders of circulatory and endocrine systems. Routine obstetric care or elective procedures were frequently associated with shorter stays.

The analysis also showed that departments like Internal Medicine, Gastroenterology, and Orthopaedics had uniformly high inpatient volumes, usually related to degenerative or chronic conditions which usually stay longer in the hospital. Tracking ALOS in these departments can aid bed occupancy planning and enhance turnover rates.

• Discharge Outcomes and Clinical Risk

Most discharges were routine (92.7%), indicating good case management and care provision. The presence of LAMA cases (4.44%) is, however, notable. Such cases usually result from patient discontent, financial constraints, or mistrust in the care process. The gender-wise analysis identified that males had a greater LAMA rate, thus reaffirming the necessity for better discharge counselling, particularly for male patients.

The death rate of 1.43%, while comparatively low, is clinically relevant. The fact that all deaths took place among males highlights the need to consolidate early detection and treatment protocols, especially among high-risk individuals. The occurrence of medico-legal cases (MLC) as well as inter-facility transfers necessitates careful documentation and amplified emergency preparedness.

• Admission Type and Financial Coverage

The study found that IPD admissions (83.5%) dominated over emergency cases, which is typical in private multispecialty settings where scheduled and referred admissions are more common. However, emergency admissions contributed significantly to acute mortality and adverse outcomes, indicating a need for stronger emergency triage and stabilization protocols.

Operationally, 65% were cash-paying, and a mere 35% were insured, indicating the continuing issue of affordability of healthcare and insurance penetration in India. Hospitals have to continue to rationalize their billing and claims processes to promote insurance usage and lower out-of-pocket expenses on patients.

5.2 Strengths of the Study

• Use of ICD-10 coding: Guaranteed uniform disease classification, and hence, the findings can be compared across institutions and geographies.

• Comprehensive variable analysis: Included demographic, clinical, administrative, and financial factors, offering a holistic view of inpatient care.

• Focused study window: The five-month duration allowed for meaningful seasonal and operational trend analysis.

• Quantitative rigor: Utilized structured data analysis, enabling cross-tabulation and detailed subgroup insights (e.g., gender-wise, department-wise)

5.3 Limitations of the Study

• Single-centre data: The study is based on data from one hospital, limiting generalizability to other settings or regions.

• Short study period: Although five months provided trend observation, a longer period might have provided stronger seasonal and epidemiological findings.

• Limited qualitative insights: Patient experience, indications of LAMA, or staff experiences were not investigated, enriching the operational interpretation.

• Omission of clinical severity measures: The study did not adjust for comorbidities or complication rates, both of which have strong impacts on ALOS and mortality.

5.4 Implications for Practice

The research identifies important quality improvement operational and clinical domains:

• Departmental benchmarking using ICD and DRG information.

• More intensive discharge planning, particularly for high LAMA and MLC risk groups.

• Gender-specific clinical approaches to tackle the observed gender disparity in male mortality.

• use of ICD-10 analytics dashboards for ongoing performance tracking and audit preparedness.

Chapter 6: Conclusion

This research was undertaken with the objective of examining patterns of inpatient morbidity and mortality at a multispecialty hospital through the analysis of ICD-10-coded data for five months (January–May 2025). The study intended to categorize diseases, evaluate their burden, and determine the impact of demographic and operational variables such as age, gender, admission type, department, and discharge status on morbidity, mortality, and Average Length of Stay (ALOS).

SUMMARY OF FINDINGS

Application of ICD-10 coding made it possible to systematically examine 630 patient records and find that:

• Most inpatients were in the 15–45 years category with more females than men.

• Diseases of the digestive system, circulatory diseases, and endocrine/metabolic disorders were among the main contributors to the hospital case mix.

• In-hospital mortality was documented only among male patients, while LAMA was more common among males than females.

• ALOS differed substantially between diagnosis categories and departments, reflecting the impact of clinical complexity on resource use.

• Routine discharges were prevalent (92.7%), but the incidence of medico-legal cases and deaths highlighted the importance of improved risk stratification and emergency response.

• Cash payments were the most common mode of payment, although insurance use increased progressively over the study period.

These results show how ICD-10 coding, when properly put into action, can be beneficial to quality monitoring, resource planning, and outcome analysis in hospitals.

IMPLICATIONS OF THE STUDY

The findings of this study have the following significant implications:

• Trend analysis based on ICD-10 can be utilized by hospitals in order to pinpoint high-risk departments and disease categories, thus enhancing departmental planning and staffing.

• Recognizing gender and age-based morbidity and mortality trends can inform the creation of patient-specific education and prevention programs.

• Operational information like LAMA rates, ALOS, and discharge outcomes can feed into policy interventions for minimizing premature discharges and optimizing post-discharge follow-up.

• Enhanced clinical documentation and coding accuracy can improve the hospital's defence against audits, accreditations (e.g., NABH, JCI), and performance benchmarking.

RECOMMENDATIONS

On the basis of the observations, the following recommendations are made:

1. Enhance ICD Coding Practices: Systematic training and audit should be conducted to ensure correct and complete ICD-10 coding in the MRD.

2. Improve Risk Identification Protocols: Male patients and emergency admissions should be identified carefully because of their greater correlation with unfavourable outcomes.

3. Optimize ALOS: Units with persistently elevated ALOS should be audited for delays in care, with interventions constructed to streamline diagnosis and treatment pathways.

4. Minimize LAMA Incidence: Enhance discharge counselling, patient communication, and financial counselling to minimize the incidence of LAMA.

5. Enhance Insurance Coverage Awareness: Hospitals must collaborate with patients and families in increasing awareness and use of insurance schemes, thus minimizing out-of-pocket expenditure.

6. Utilize ICD Data for Quality Improvement: Promote utilization of ICD-coded data within hospital committee meetings and internal audit for ongoing quality monitoring.

REFERENCES

1. Bhattacharya S, Yadav M, Sharma A. Retrospective analysis of morbidity and mortality using ICD-10 coding in a tertiary care hospital in India. *Indian J Public Health Res Dev*. 2021;12(2):117–22.

2. AlShammari TM, Al-Dubai SAR, Alzaied AA. Impact of demographic and clinical variables on hospital length of stay using ICD-10 classification in Saudi Arabia. *J Epidemiol Glob Health*. 2020;10(3):223–30.

3. Singh N, Gupta M. Discharge outcomes and predictors of LAMA in hospitalized patients: A one-year study using ICD-10 classification. *Int J Community Med Public Health*. 2022;9(4):1601–7.

4. Maheshwari N, Gupta R, Jain V. Role of ICD-10 coding in streamlining hospital records and identifying clinical burden. *Indian J Health Sci Biomed Res*. 2019;12(1):45–50.

5. Rana BK, Shrestha R, Basnet M. ICD-10 based assessment of inpatient morbidity and mortality patterns in a tertiary care center of Nepal. *J Nepal Health Res Counc*. 2023;21(1):56–61.

6. World Health Organization. *International statistical classification of diseases and related health problems, 11th revision (ICD-11)*. Geneva: WHO; 2020.

7. Patel A, Desai R, Shah H. Association of average length of stay with age, diagnosis group and gender in a tertiary care setting. *Gujarat Med J*. 2021;76(1):65–70.

8. Fortis Hospital, Ludhiana. *Medical Records Department dataset: Inpatient admissions and ICD-10 coding (Jan–May 2025)*. [Unpublished internal document].