A Prospective Observational Study of The Prevalence, Risk Factors, Management and Types of Anaemia in Hospitalized Patients in Surat, India

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Abstract

Background: Anaemia is a common condition in hospitalized patients and is associated with adverse clinical outcomes, such as increased morbidity, mortality, and length of hospital stay. However, there is limited research on the prevalence, types, risk factors, and management of anaemia in Surat, India.

Methods: We conducted a prospective observational study of 407 hospitalized patients in Surat, India, to investigate the prevalence, types, risk factors, and management of anaemia. Data were collected through case report forms. Hemoglobin levels were used to diagnose anaemia, and the World Health Organization (WHO) criteria were used to classify the severity of anaemia.

Results: The results showed that the prevalence of anaemia was highest in the pediatric ward, with microcytic normochromic anaemia being the most common type of anaemia in male and female patients. Moderate anaemia was found to be the most common among the study population. The majority of patients were transfused with RBC for severe anaemia.

Conclusion: The findings of this study have implications for the management of anaemia in hospital populations, highlighting the need for targeted interventions for different patient groups and emphasizing the need for improved screening and management of anaemia, particularly in high-risk populations such as pediatric and female patient

Keywords: Anaemia, Prevalence, Risk-Factors, Hospitalized, Surat

1. Introduction

Anaemia is a condition in which the number of Red Blood Cells (RBCs), and consequently their oxygen carrying capacity, is insufficient to meet the body's physiological needs. The function of the RBCs is to deliver oxygen from the lungs to the tissues and carbon dioxide from the tissues to the lungs. This is accomplished by using hemoglobin (Hb), a tetramer protein composed of heme and globin. Anaemia impairs the body's ability for gas exchange by decreasing the number of RBCs transporting oxygen and carbon-dioxide. Anaemia results from one or more of the following processes: defective red cell

production, increased red cell destruction or blood loss. Iron is necessary for synthesis of hemoglobin. Iron deficiency is thought to be the most common cause of anaemia globally, but other nutritional deficiencies (including folate, vitamin B12 and vitamin A), acute and chronic inflammation, parasitic infections, and inherited or acquired disorders that affect Hb synthesis, red blood cell production or red blood cell survival can all cause anaemia[1]. Anaemia leads to reduced physical and mental capacity, yet it often goes undetected. Severe anaemia is associated with more noticeable negative effects on health, as well as on longer term social and economic development. During pregnancy, anaemia is associated with adverse maternal and birth outcomes such as preterm delivery, low-birth-weight infants, maternal mortality and decreased iron stores for the baby, which may lead to impaired growth and development[1]

In 2019, the global prevalence of anaemia in women aged 15–49 years was 29.9% (UI 27.0 to 32.8). Prevalence was higher among pregnant women (36.5% [UI 34.0 to 39.1]) than nonpregnant women (29.6% [UI 26.6 to 32.5]). While anaemia prevalence among women aged 15–49 years in 2019 was similar to the rate in 2000, the total number of women affected increased considerably due to population growth, from 492.9 million (UI 452.8 to 538.1 million) in 2000 to 570.8 million (UI 515.4 to 625.5 million) in 2019 (10). The prevalence of anaemia continued to be highest in the South-East Asia Region[1].
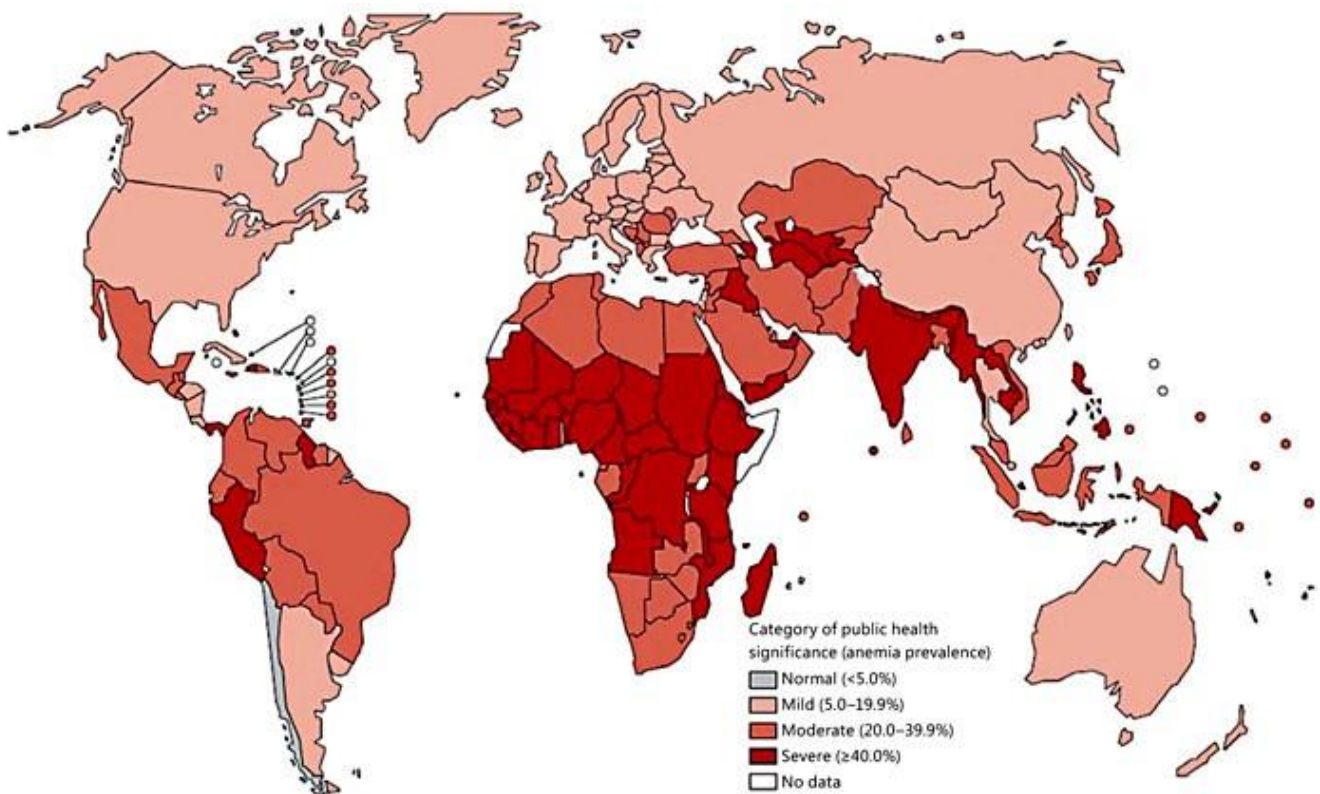
Figure 1: Prevalence of anaemia in women of reproductive age (15-49) (%)

The prevalence of anaemia among women and children has increased in the last five years . At the national level, the findings of the NFHS-5 reveal that there has been an increase in the prevalence of anaemia among women and children compared to the previous NFHS-4 survey that was conducted in 2015-16, about 4 years ago. The increase in anaemia among pregnant women is by 1.8 percentage points, among all women in the reproductive age is 3.9 percentage points, and among adolescent women by 5 percentage

points. Among children, the increase is the highest of 8.5 percentage points and is now closer to the levels recorded in NFHS-3 from 2005-06 when the prevalence was 70% [2].
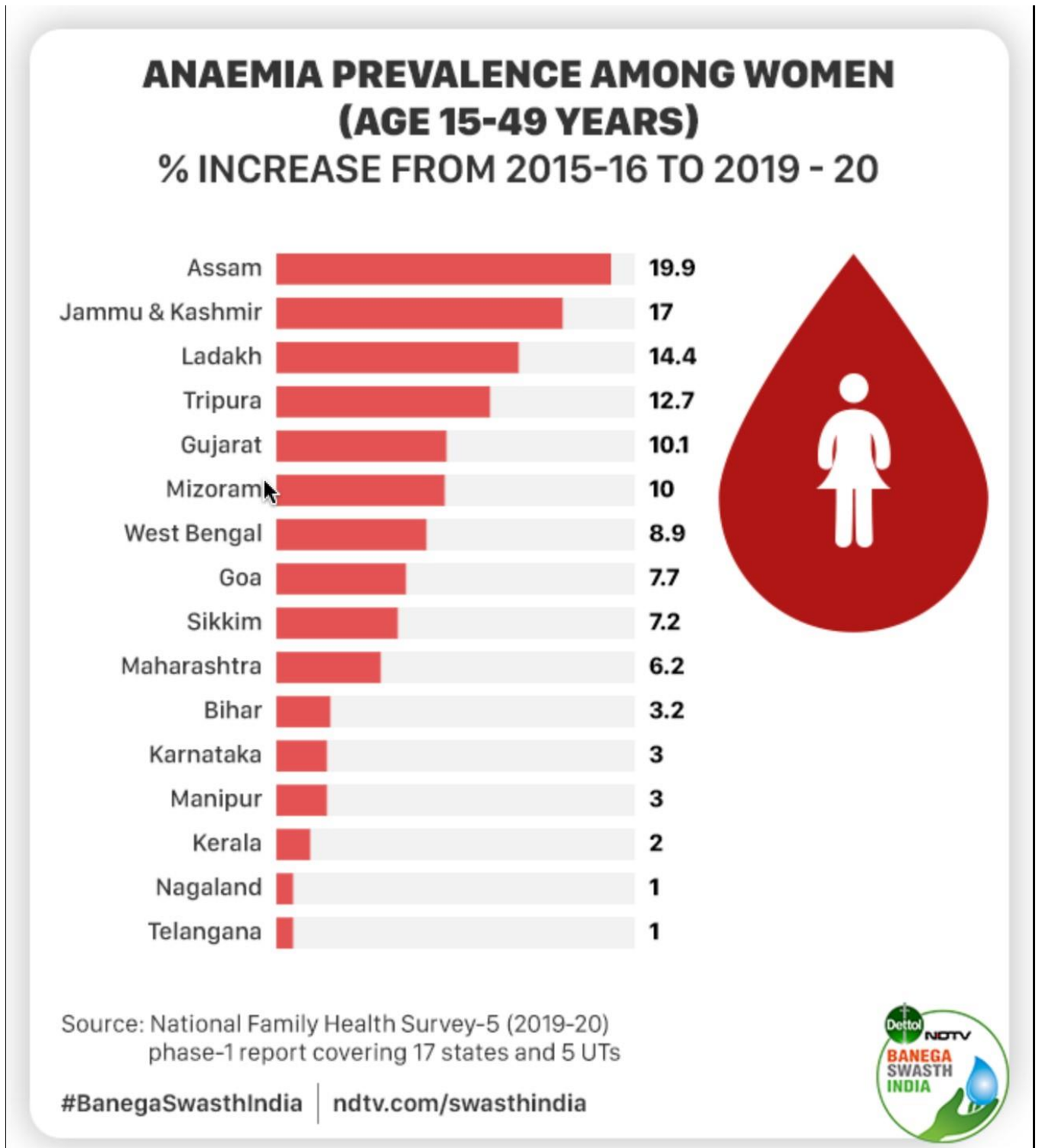
Figure 2: Anaemia Prevalence among Women (age 15-49 years)

8 out of 10 children in Gujarat are anaemic. Among children aged 6 to 59 months, anaemia is the most prevalent in Gujarat among the larger states with nearly 80% of the children in the age group diagnosed with anaemia. The prevalence in Gujarat increased by 17.1 percentage points compared to 62.6% recorded

in NFHS-4. Madhya Pradesh, Rajasthan, Punjab, Haryana, and Telangana are the major large states with a prevalence of more than 70% among children. Kerala is the only state to have recorded a prevalence of less than 40% (39.4%), though it has registered an increase of 3.7 percentage points compared to NFHS-4. The prevalence in four south Indian states except for Telangana and 6 north-eastern states except Assam is below the national average as per NFHS-5[2].
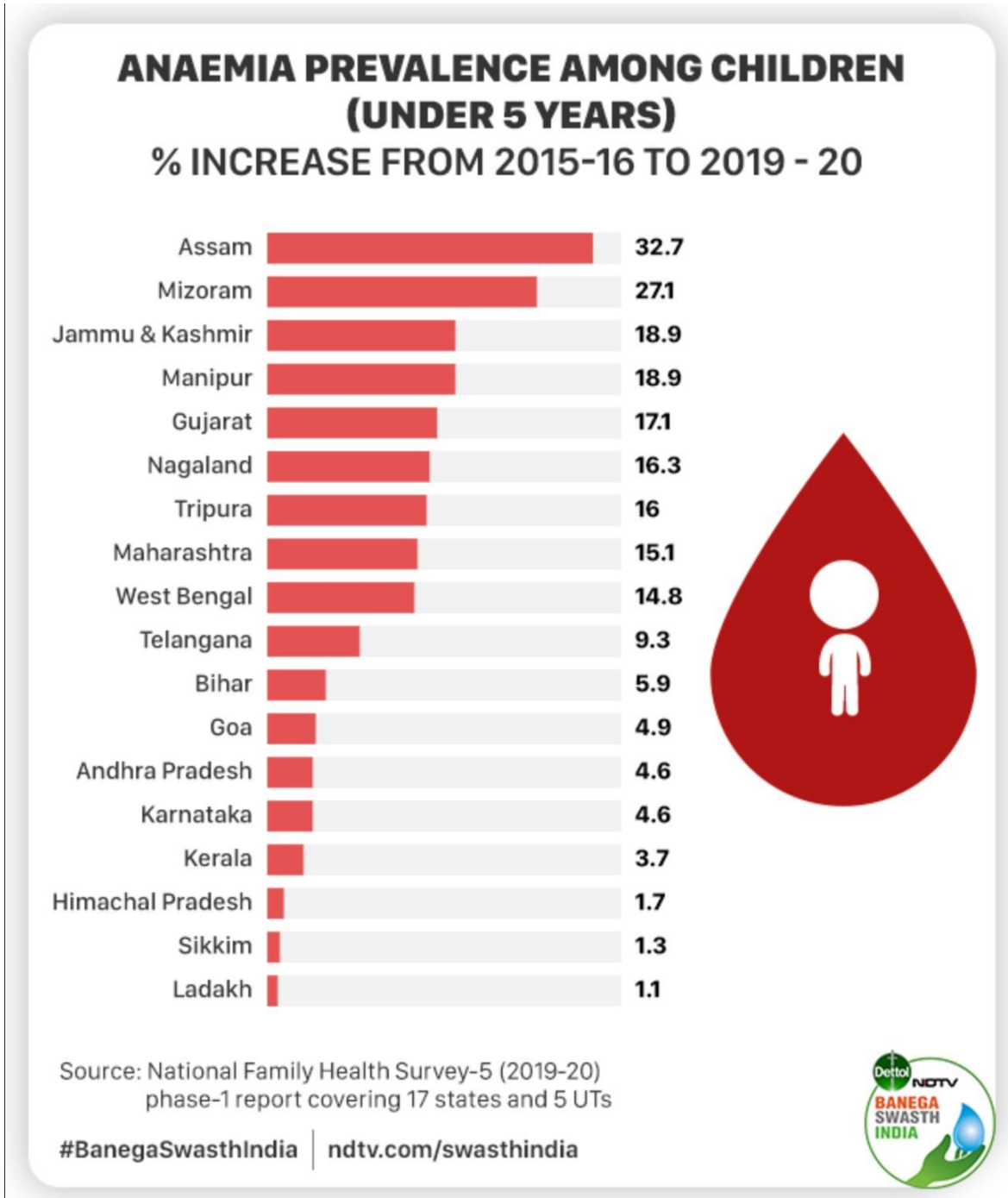

Figure 3: Anaemia Prevalence among children (under 5 years)

2. Aim and Objectives

Aim: To assess the prevalence, contributions of specified risk factors, management, and types of anaemia in hospitalized patients.

Primary objectives:
1. To determine the prevalence of anaemia among hospitalized patients in Surat, India
2. To classify the types of anaemia observed in hospitalized patients in Surat, India
3. To identify the risk factors associated with anaemia in hospitalized patients in Surat, India
4. To assess the management practices for anaemia in hospitalized patients in Surat, India

Secondary Objectives:
1. To study plausible correlations between Age, Gender, Co-morbidities, Hematological findings and types of anaemia in hospitalized patients in Surat, India
2. To assess the severity of anaemia in hospitalized patients in Surat, India

3. Materials and Methods

Study Design: A prospective observational study was conducted at Lockhat Moolla Sarvajanik Hospital in Surat.

Study Duration: The study was carried out for six months.

Number of Patients and Study Site: In this study, a total of 407 individuals were recruited. The study was a single-site study, involving patients taken from the Lockhat Moolla Sarvajanik Hospital in Batadwadi Chhada Ole, Surat, Gujarat.

4. Methodology

The study was carried out in accordance with ICH-GCP guidelines. Protocol, Data Collection Form - CRF were provided to the Ethics Committee for approval of the project. With IEC approval, the study was conducted successfully. This study analyzed prevalence, types, management and associated risk factors in anaemic patients at study site. Data was collected using physician validated case report form. Anaemic patients regardless of age and gender who had their anaemia diagnosis verified using standard diagnostic tools were included in this study. The study was carried out for 6 months and MS - Excel was used to interpret the data.
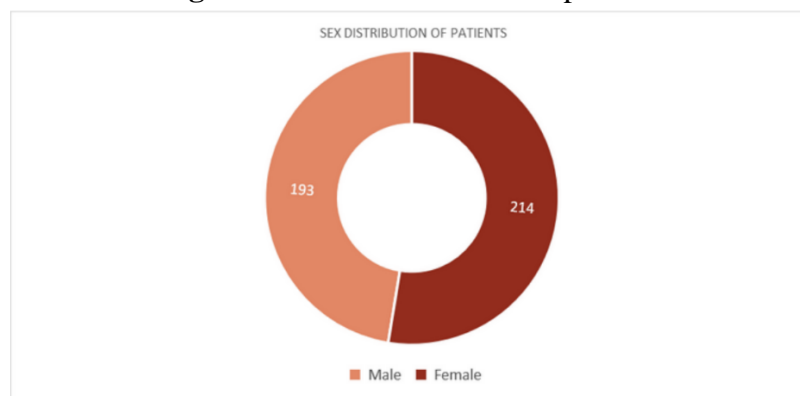
5. Inclusion and Exclusion Criteria

Inclusion Criteria: All age groups and genders were included among hospitalized patients.

Exclusion Criteria: The patients who may not fulfill the diagnostic criteria were excluded from the study and Thalassemia major patients were excluded from the study.

6. Statistics and Results

Figure 6.1: Sex distribution of patients

Table 6.1: The number of total male and female patient in hospital.

Total number of patients	No. of male patient	No. of female patient
407	193	214

Figure 6.1 shows the sex distribution of total population. Among the 407 patients included in the study, the data revealed that 193 were male, while 214 were female.

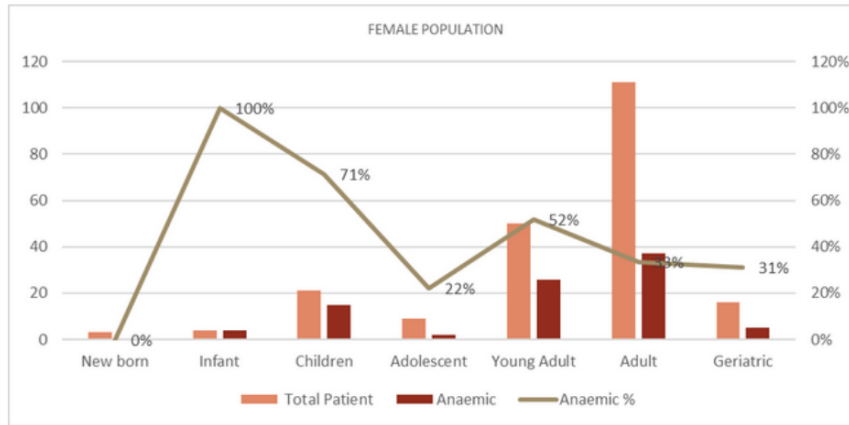**Figure 6.2:** Percentage of prevalence of anaemia in male population
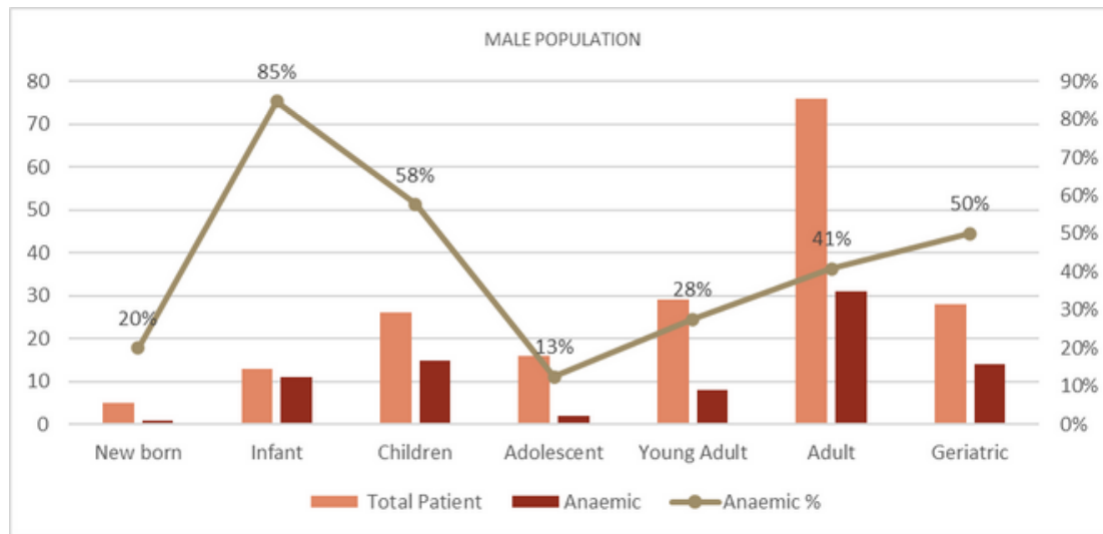
Table 6.2: The prevalence of anaemia in male population according to age group

Age group	No. of Patient	No. of anaemic patient	%
New born	5	1	20%
Infant	13	11	85%
Children	26	15	58%
Adolescent	16	2	13%
Young Adult	29	8	28%
Adult	76	31	41%
Geriatric	28	14	50%

The study investigated the prevalence of anaemia among male patients across different age groups, shown in Figure 6.2. Newborns showed a prevalence of 20%, while infants had an alarming 85% prevalence of anaemia. The percentage decreased as patients got older, with adolescents showing only 13% prevalence

and young adults with 28%. However, anaemia remains a significant concern among adult and geriatric patients, with 41% and 50% prevalence, respectively.

**Figure 6.3:** Percentage of prevalence of anaemia in female population

Table 6.3: The prevalence of anaemia in female population according to age group

Age group	No. of Patient	No. of anaemic patient	%
New born	3	0	0%
Infant	4	4	100%
Children	21	15	71%
Adolescent	9	2	22%
Young Adult	50	26	52%
Adult	111	37	33%
Geriatric	16	5	31%

Figure 6.3 shows the prevalence of anaemia in female patients across different age groups. No cases of anaemia were observed among newborns, but infants showed a concerning 100% prevalence rate. The prevalence remained high during childhood at 71% and dropped to 22% during adolescence. Young adults showed a prevalence rate of 52%, while the adult and geriatric age groups had rates of 33% and 31%, respectively. These findings emphasize the persistent burden of anaemia among female patients throughout adulthood, with infants and young adults being particularly vulnerable.

**Figure 6.4:** Percentage of anaemia in male and female population
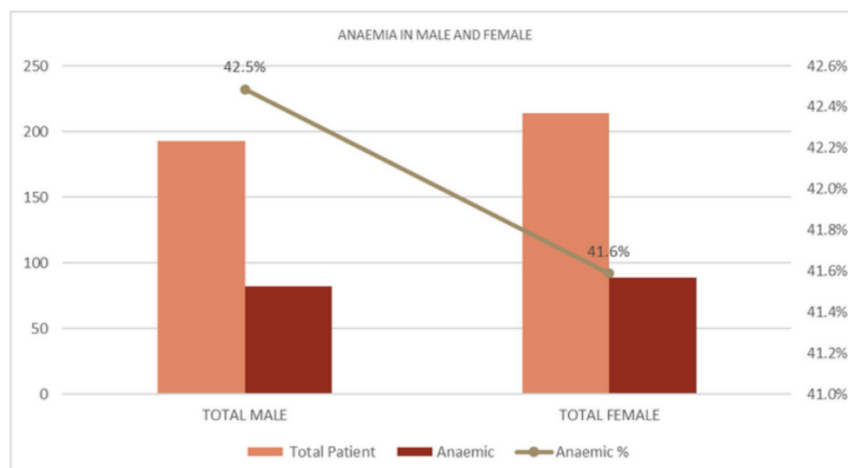
Table 6.4: The prevalence of anaemia among male and female population in hospital

Total number of patients	Total number of anaemic patients	%
193	82	42.5%
214	89	41.6%

Figure 6.4 shows the distribution for a gender-specific analysis of the prevalence of anaemia in a hospital. The results indicated that a significant number of patients were affected by anaemia, with a total of 171 individuals. Among the male patients, 82 were found to have anaemia, accounting for approximately 42.5% of the male population. On the other hand, among the female patients,89 individuals were diagnosed with anaemia, representing approximately 41.6% of the female population.

Figure 6.5: Percentage of prevalence of anaemia in pregnant women
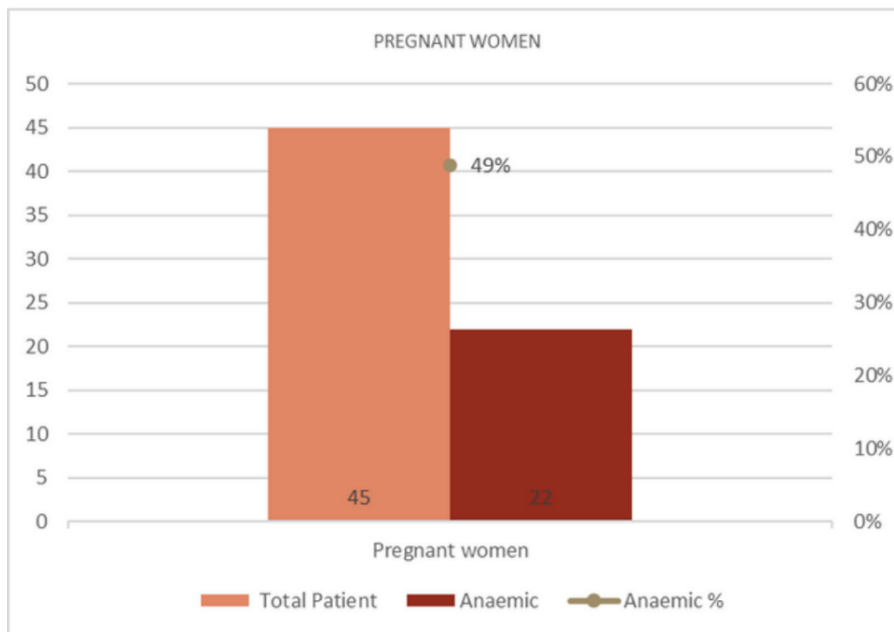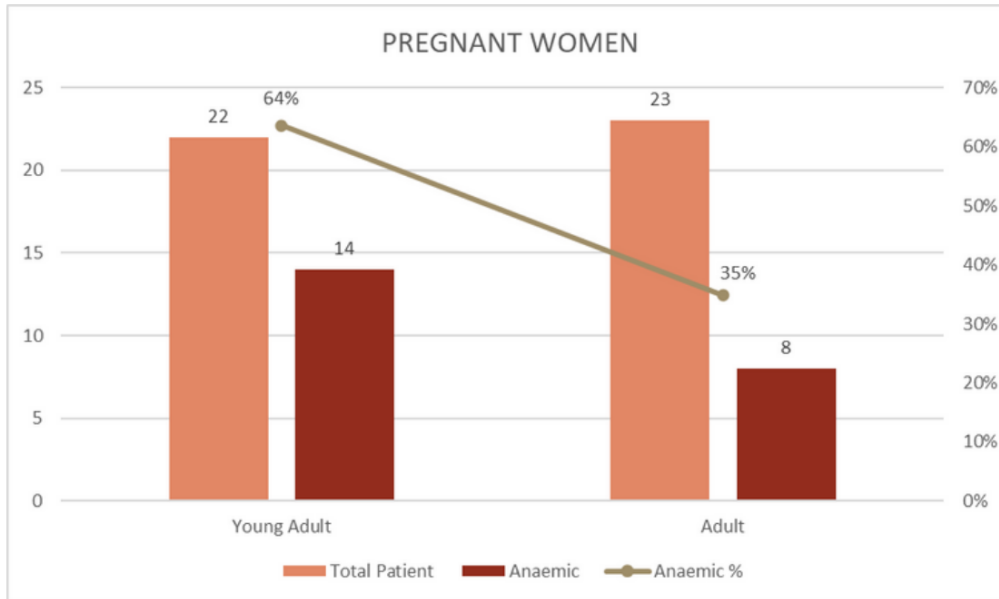

Table 6.5: The prevalence of anaemia among pregnant women in hospitalized patients

Total number of patients	No. of anaemic female	%
45	22	49%

Figure 6.5 shows the percentage of prevalence of anaemia among pregnant women within the hospital's population. Out of the total 45 pregnant women included in the study, 22 were diagnosed with anaemia, indicating a prevalence rate of 49%.

Figure 6.6: Percentage of prevalence of anaemia in pregnant women according to age-group
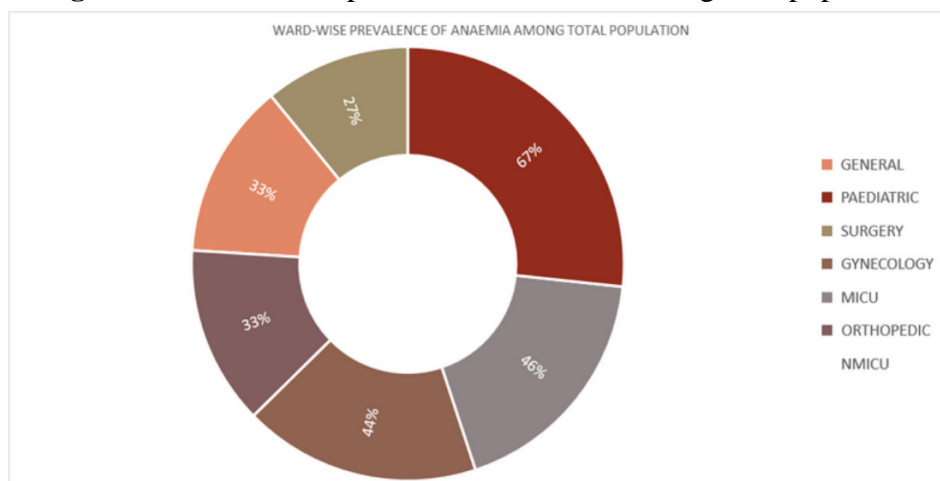

Table 6.6: The prevalence of anaemia among pregnant women according to age-group in hospitalized patients

Age group	Total number of patients	No. of anaemic female	%
Young adult	22	14	64%
Adult	23	8	35%

Figure 6.6 shows the age-specific prevalence rates of anaemia among the pregnant women. The young adult pregnant women, comprising a total of 22 patients, 14 were diagnosed with anaemia, resulting in a prevalence rate of 64%. This finding indicates a significant burden of anaemia in this age group. In contrast, among the adult pregnant women, consisting of 23 patients, 8 were found to have anaemia, yielding a prevalence rate of 35%. These results highlight a higher prevalence of anaemia among young adult pregnant women compared to adult pregnant women.

**Figure 6.7:** Ward-wise prevalence of anemia among total population

Table 6.7: The prevalence of anemia among total population in different wards of a hospital

Wards	%
General	33%
Paediatric	67%
Surgery	27%
Gynaecology	44%
MICU	46%
Orthopaedic	33%
NMICU	0%

Figure 6.7 shows the percentage of prevalence of anaemia in total population in different wards of a hospital. The highest prevalence of anaemia is seen in the paediatric ward, where 67% of the patients had anaemia. The MICU and gynaecology wards also had a significant proportion of anaemic patients, with 46% and 44% respectively. The surgery and orthopedic wards have a lower prevalence of anaemia at 27% and 33%, respectively. NMICU ward has no patients with anaemia.

**Figure 6.8:** Percentage of male population admitted to different wards in a hospital
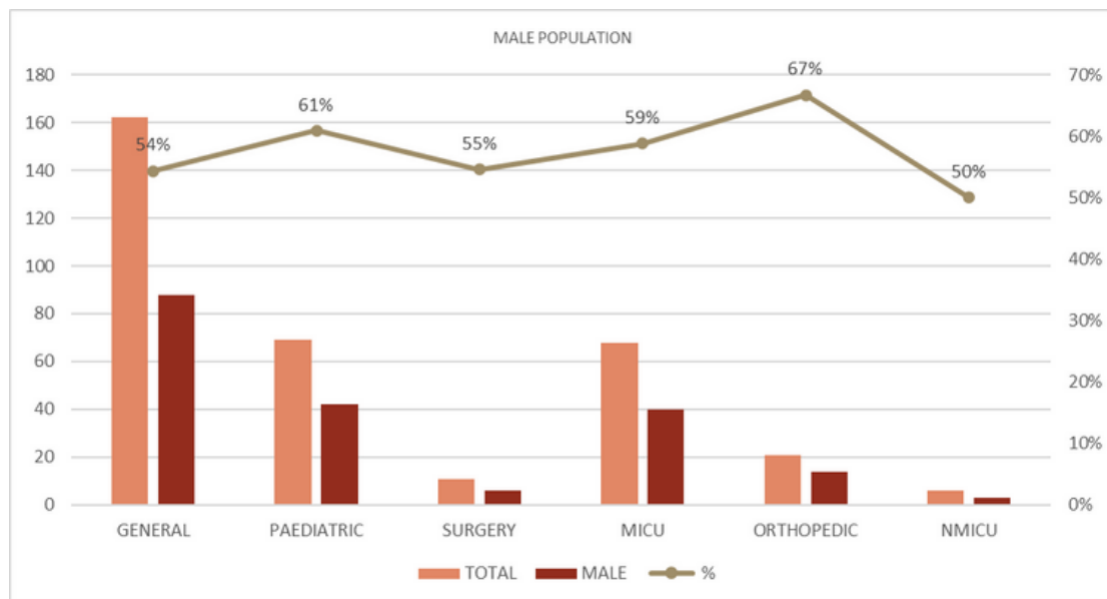
Table 6.8: The ward-wise distribution of male population in hospital

Wards	Total number of patients	Total number of male patients	%
General	162	88	54%
Paediatric	69	42	61%
Surgery	11	6	55%
MICU	68	40	59%
Orthopaedic	21	14	67%
NMICU	6	3	50%

Figure 6.8 shows ward-wise distribution of male patients in hospital. The data on the male population admitted to different wards in a hospital shows that the general ward had the highest number of male patients at 88, followed by the paediatric ward with 42 patients. The MICU ward had 40 male patients, while the orthopaedic ward had 14, and surgery had the least number of male patients at 6. The NMICU ward had only 3 male patients.

Figure 6.9: Percentage of prevalence of anaemia in male population admitted to different wards of a hospital.
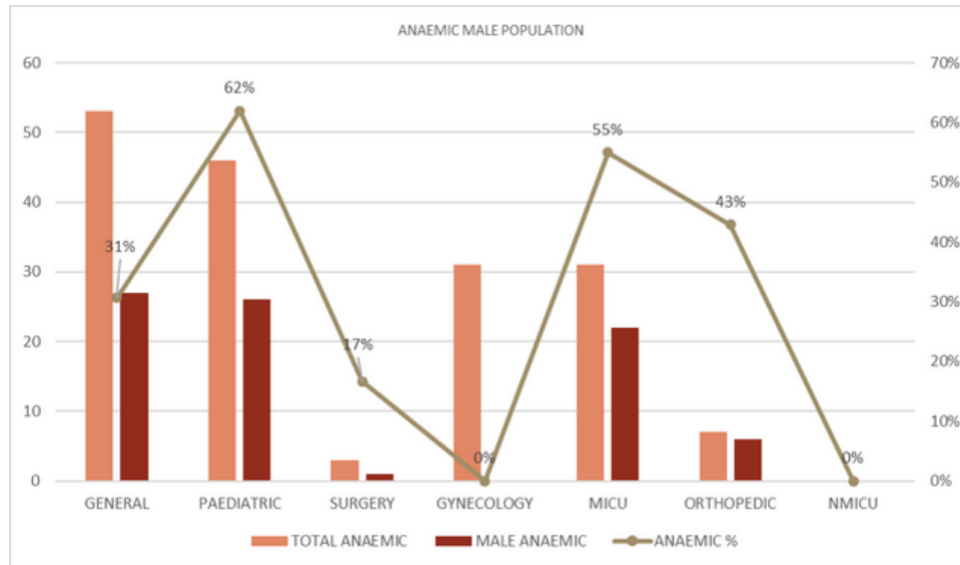

Table 6.9: The ward-wise prevalence of anaemia in hospitalized male population

Wards	Total no. of anaemic patients	No. of anaemic patient	%
General	53	27	31%
Paediatric	46	26	62%
Surgery	3	1	17%
Gynaecology	31	0	0%
MICU	31	22	55%
Orthopaedic	7	6	43%
NMICU	0	0	0%

Figure 6.9 shows the data on the percentage of anaemia in the male population admitted to different wards of a hospital reveals significant variability across wards. The general ward had the highest number of anaemic patients, with 27. The paediatric ward had 26 anaemic male patients, while the MICU ward had 22 anaemic male patients. The orthopedic ward had 6 anaemic male patients, followed by surgery, which had only 1. The percentage in the above table indicate male prevalence of anaemia out of total male patients found in each ward. (Refer table 6.8)

Figure 6.10: Percentage of female population admitted to different wards in a hospital
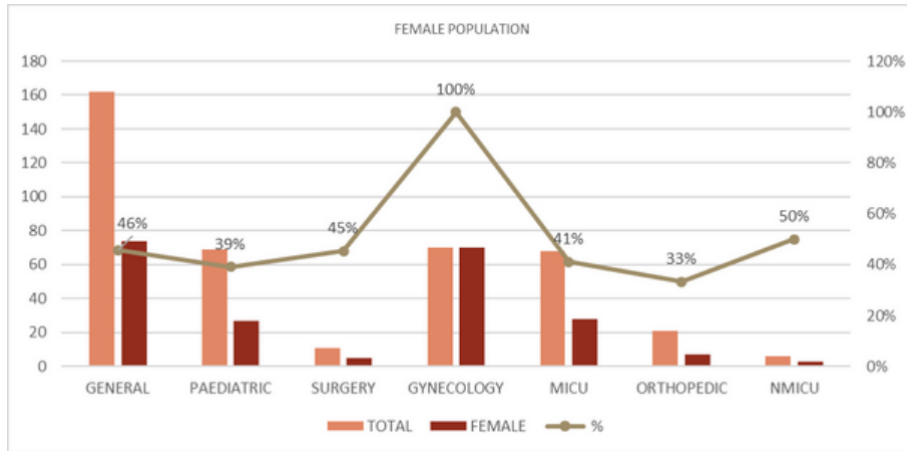

Table 6.10: The ward-wise distribution of female population in hospital

Wards	Total number of patients	Total number female patients	%
General	162	74	46%
Paediatric	69	27	39%
Surgery	11	5	45%
Gynaecology	70	70	100%
MICU	68	28	41%
Orthopedic	21	7	33%
NMICU	6	3	50%

Figure 6.10 shows ward-wise distribution of female patients in hospital. 74 female patients were admitted in general ward, 27 in pediatric, 5 in surgery, 70 in gynecology 28 in MICU, 7 in orthopedic and 3 in NICU

Figure 6.11: Percentage of prevalence of anaemia of female population admitted to different wards of a hospital
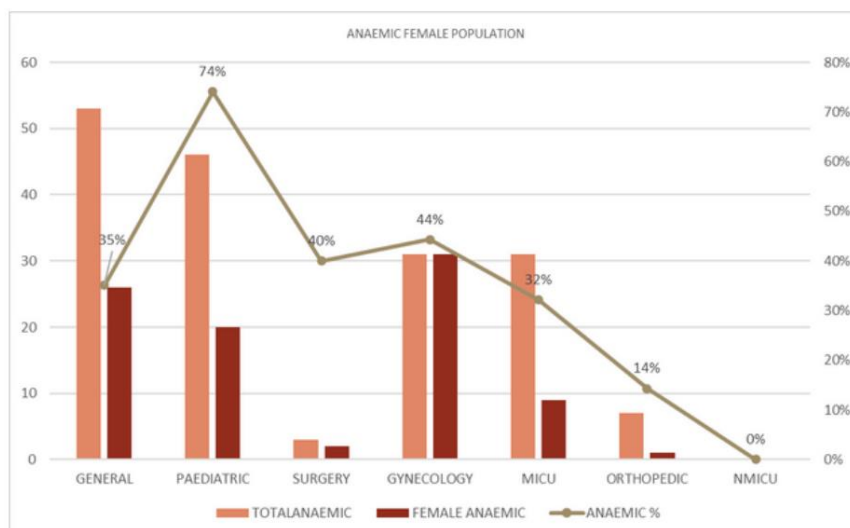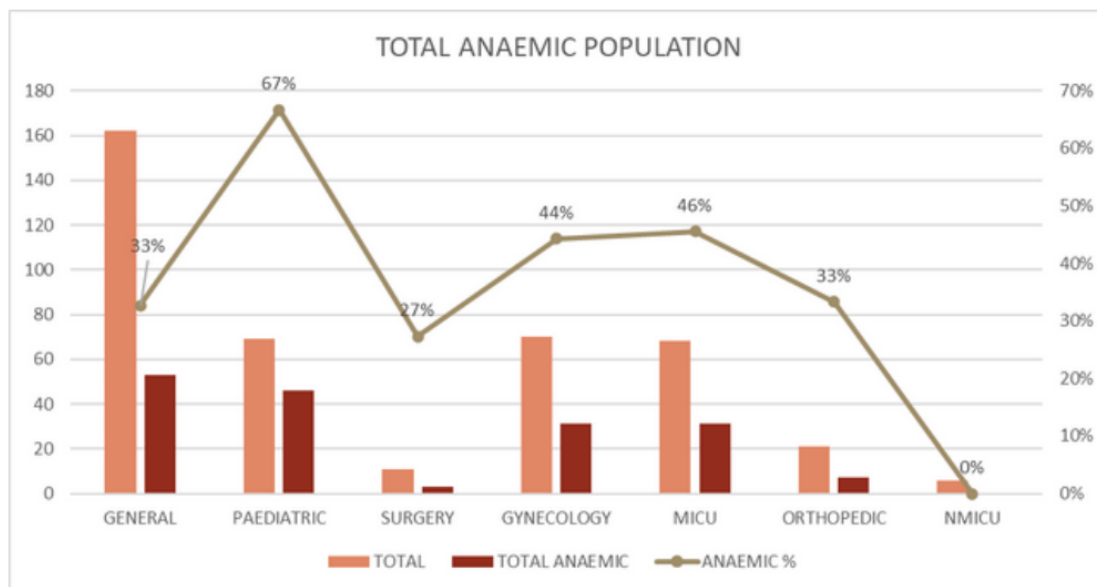
Table 6.11: The ward-wise prevalence of anaemia in hospitalized female population

Wards	Total no. of anaemic patients	No. of anaemic patient	%
General	53	26	35%
Paediatric	46	20	74%
Surgery	3	2	40%
Gynaecology	31	31	44%
MICU	31	9	32%
Orthopaedic	7	1	14%
NMICU	0	0	0%

Figure 6.11 shows ward-wise prevalence of anaemia in female patients. Female share of anaemic patients in general ward was 26 patients, in paediatric 20, surgery 2, in MICU 9, in orthopedic 1 patients and in gynecology 31 patients. The percentage in the above table indicate female prevalence of anaemia out of total female patients found in each ward.(Refer table 6.10

Figure 6.12: Percentage of anaemia of total population admitted to different wards of a hospital


Table 6.12: The ward-wise prevalence of anaemia in hospitalized population

Wards	Total number of patients	Total number of anaemic patients	%
General	162	53	33%
Paediatric	69	46	67%
Surgery	11	3	27%
Gynaecology	70	31	44%
MICU	68	31	46%
Orthopaedic	21	7	33%
NMICU	6	0	0%

Figure 6.12 shows ward-wise prevalence of anaemia in total hospitalized patients. From the result it can be noted that prevalence of anaemia was highest in paediatric ward (67%). In comparison, MICU had 46%, gynecology 44%, orthopedic and general 33% and surgery 27% of anaemic patients.

**Figure 6.13:** Percentage of severity of anaemia of total population in a hospital
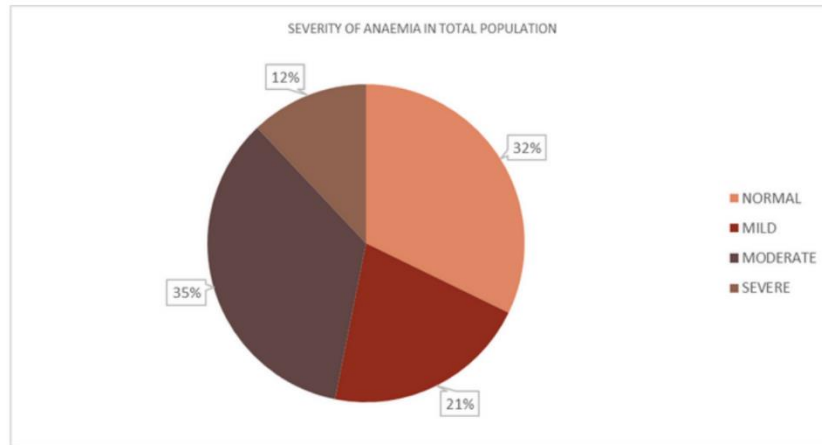
Table 6.13: The prevalence of anaemia according to severity in hospitalized population

	Normal	Mild	Moderate	Severe
Total number of patients	32%	21%	35%	12%

Figure 6.13 shows the prevalence of anaemia according to severity in hospitalized patients. From the results it can be noted that prevalence of normal patient was 32%. However, mild anaemia was 21%, followed by moderate anaemia 35% and only 12% of the cases were severe anaemia.

Figure 6.14: Percentage of severity of anaemia among male and female population in a hospital
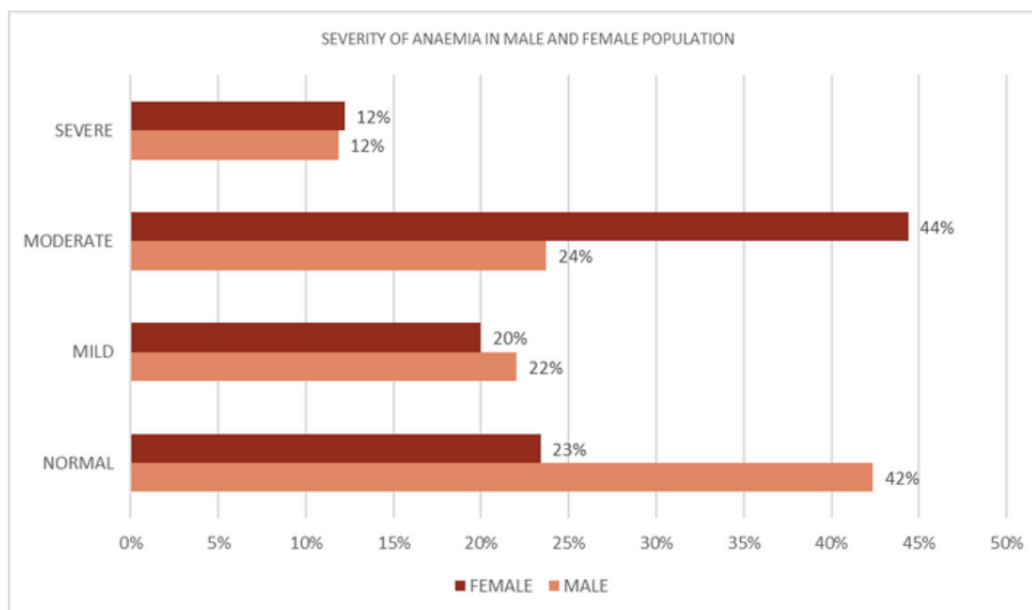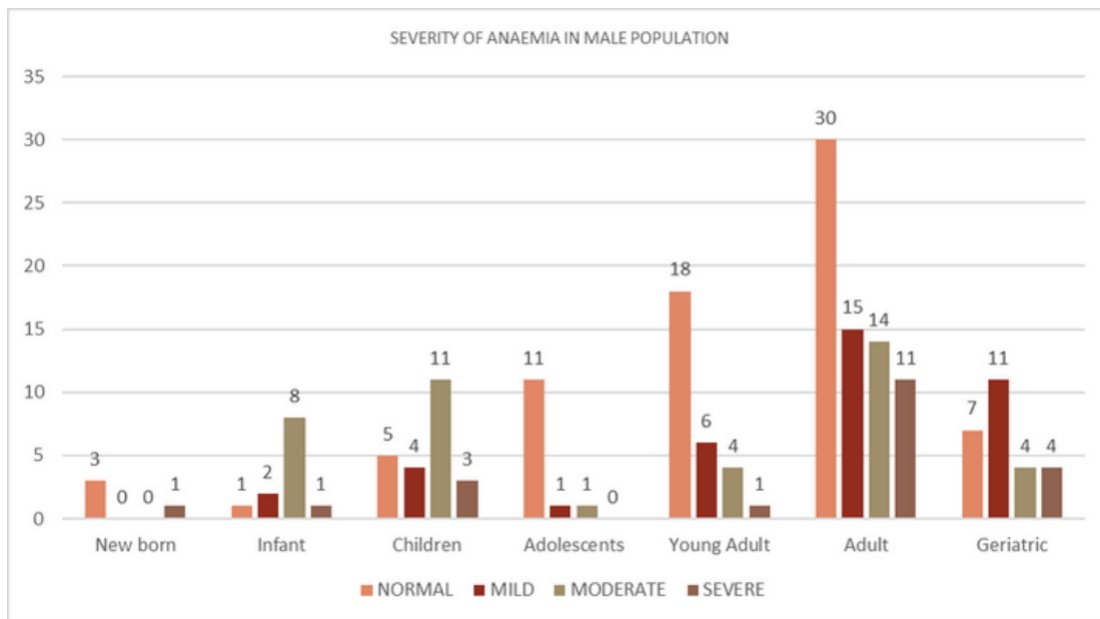

Table 6.14: The prevalence of anaemia according to severity among male and female hospitalized population

Gender	Normal	Mild	Moderate	Severe
Male	42%	22%	24%	12%
Female	23%	20%	44%	12%

Figure 6.14 shows the prevalence of anaemia according to severity among male and female hospitalized population. From the results, it was indicated that moderate anaemia was more prevalent among female patients, accounting for 44%. In contrast, only 24% of male patients had moderate anaemia. While in both male and female patients severe anaemia was found to be 12%.

Figure 6.15: Distribution of male population according to severity of anaemia and age group
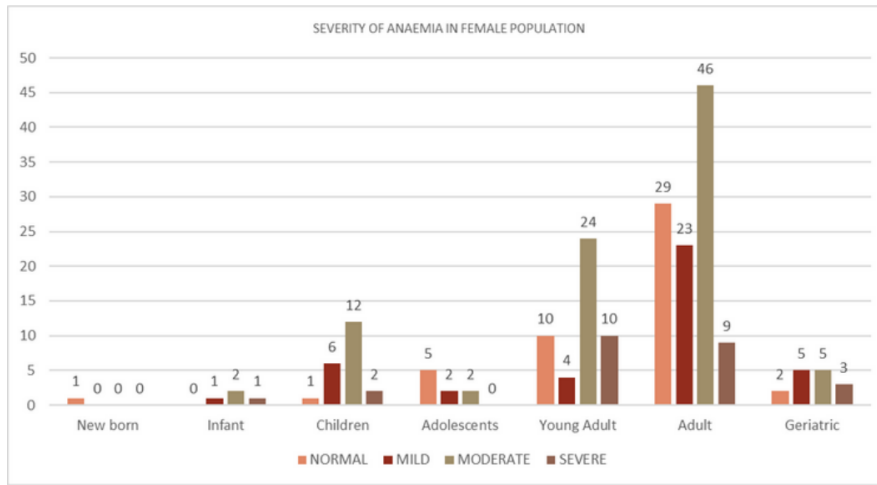

Table 6.15: The prevalence of anaemia according to severity and age group of a male hospitalized population

Age group	Normal	Mild	Moderate	Severe
New born	3	0	0	1
Infant	1	2	8	1
Children	5	4	11	3
Adolescent	11	1	1	0
Young Adult	18	6	4	1
Adult	30	15	14	11
Geriatric	7	11	4	4

Figure 6.15 shows the prevalence of anaemia according to severity in male patients with respect to their age. Prevalence of mild anaemia (15) was highest in adult males, in comparison moderate and severe anaemia were found in 14 and 11 patients respectively.

Figure 6.16: Distribution of female population according to severity of anaemia and age group
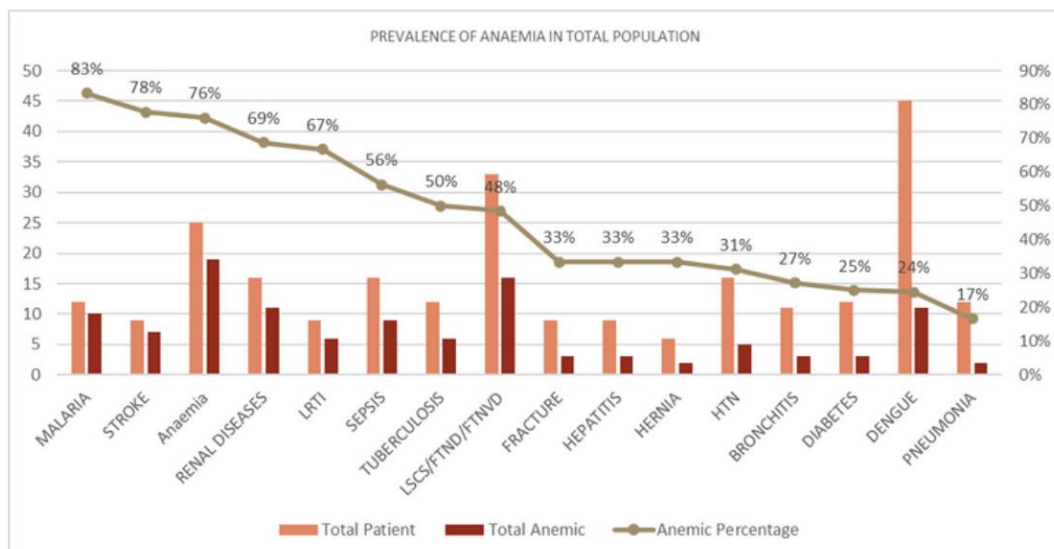

Table 6.16: The prevalence of anaemia according to severity and age group of a female hospitalized population

Age group	Normal	Mild	Moderate	Severe
New born	1	0	0	0
Infant	0	1	2	1
Children	1	6	12	2
Adolescent	5	2	2	0
Young Adult	10	4	24	10
Adult	29	23	46	9
Geriatric	2	5	5	3

Figure 6.16 shows the prevalence of anaemia according to severity in female patients in respect to their age. Prevalence of moderate anaemia was highest in adult females (46),in comparison 23 and 9 patients were mild and severely anaemic.

Figure 6.17: Percentage of anaemia in total population according to diseases condition
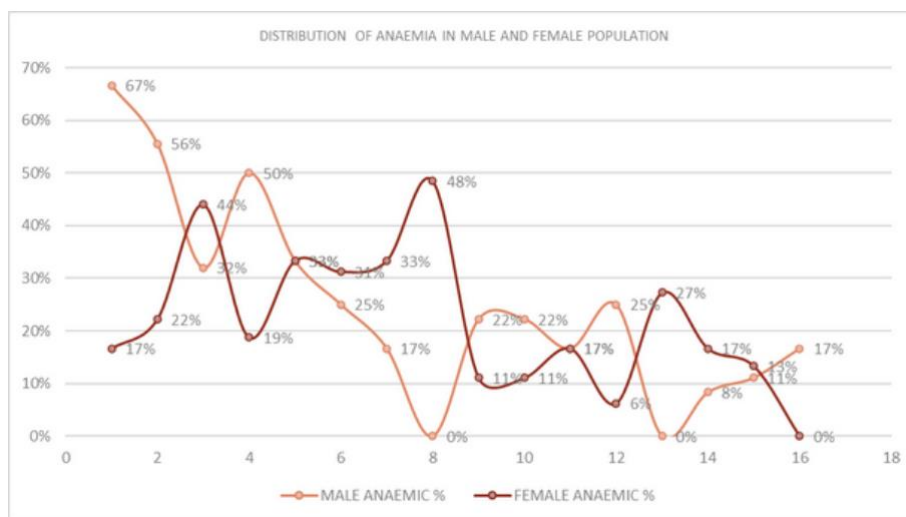
Table 6.17: The prevalence of anaemia according to diseases condition in total hospitalized population

Diseases	Total number of patients	Total number of anaemic patients	%
Malaria	12	10	83%
Stroke	9	7	78%
Anemia	25	19	76%
Renal diseases	16	11	69%
LRTI	9	6	67%
Sepsis	16	9	56%
Tuberculosis	12	6	50%
LSCS/FTND	33	16	48%
Fracture	9	3	33%
Hepatitis	9	3	33%
Hernia	6	2	33%
HTN	16	5	31%
Bronchitis	11	3	27%
Diabetes	12	3	25%
Dengue	45	11	24%
Pneumonia	12	2	17%

The figure 6.17 shows the percentage of prevalence of anaemia according to disease condition in total hospitalized population. The prevalence of anaemia was highest among patients diagnosed with malaria i.e., 83% In comparison, the prevalence of anaemia in patients diagnosed with stroke, renal diseases, LRTIs are 78%, 69%, 67% respectively.

Figure 6.18: Percentage of anaemia among male and female population according to diseases condition
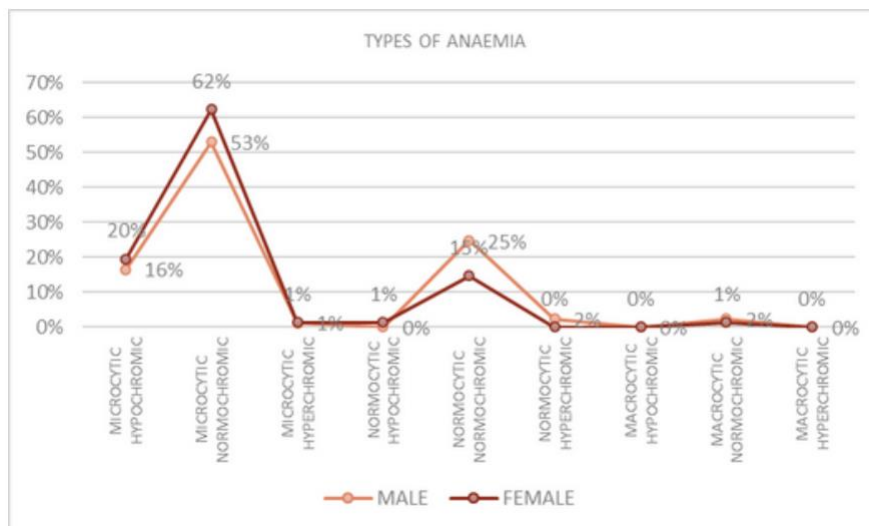
Table 6.18: The prevalence of anaemia according to diseases condition among male and female hospitalized population

Diseases	Male anaemic (%)	Female anaemic (%)
Malaria	67%	17%
Stroke	56%	22%
Anemia	32%	44%
Renal diseases	50%	19%
LRTI	33%	33%
Sepsis	25%	31%
Tuberculosis	17%	33%
LSCS/FTND	0%	48%
Fracture	22%	11%
Hepatitis	22%	11%
Hernia	17%	17%
HTN	25%	6%
Bronchitis	0%	27%
Diabetes	8%	17%
Dengue	11%	13%
Pneumonia	17%	0%

The figure 6.18 shows the percentage of prevalence of anaemia according to diseases condition among male and female hospitalized patients. It can be noted from above results that male patients diagnosed with malaria had a higher prevalence of anaemia (67%) compared to female patients (17%). On the other hand, for patients diagnosed with stroke, 56% of males and 22% of females were found to be anaemic. Therefore, the prevalence of anaemia varied among male and female patients depending on their diagnosis.

Figure 6.19: Percentage of different types of anaemia among male and female population in a hospital

Table 6.19: The prevalence of different types of anaemia among male and female hospitalized population

Diseases	Male anaemic (%)	Female anaemic (%)
Microcytic Hypochromic	16%	20%
Microcytic Normochromic	53%	62%
Microcytic Hyperchromic	1%	1%
Normocytic Hypochromic	0%	1%
Normocytic Normochromic	25%	15%
Normocytic Hyperchromic	2%	0%
Macrocytic Hypochromic	0%	0%
Macrocytic Normochromic	2%	1%
Macrocytic Hyperchromic	0%	0%

The figure 6.19 illustrates the percentage of prevalence of different types of anaemia among male and female patients. It can be noted from above table that microcytic normochromic anaemia was the most prevalent among both male (53%) and female (62%) patients. Additionally, microcytic hypochromic anaemia was prevalent in 16% and 20% of male and female patients respectively.

Figure 6.20: Percentage of blood transfused among anaemic population in a hospital
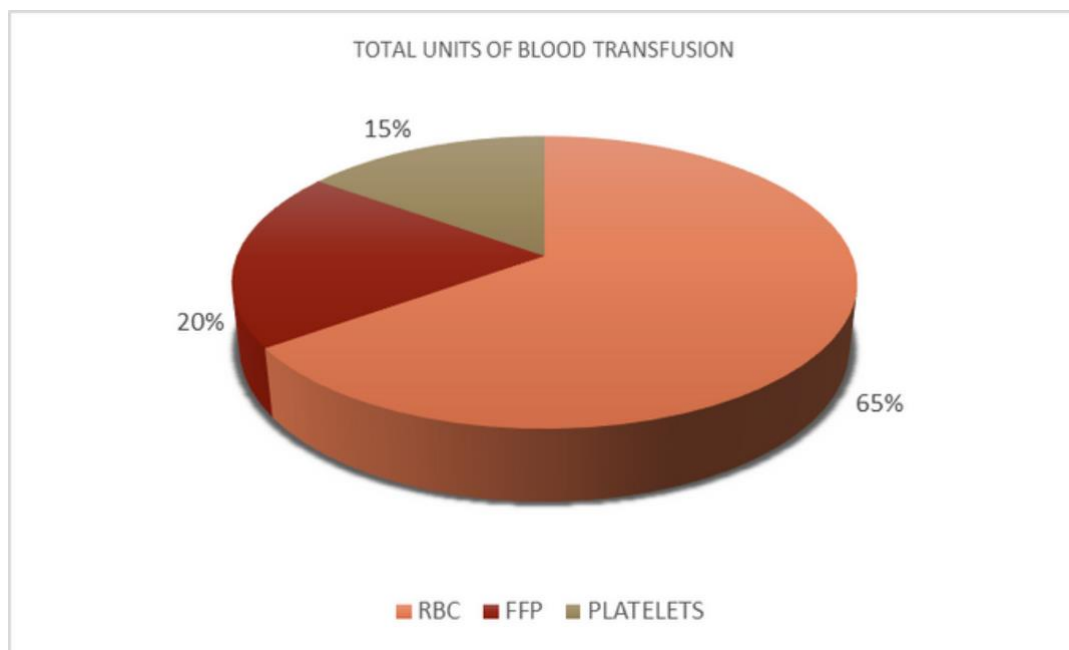
Table 6.20: The distribution of blood transfusion among anaemic hospitalized population

	RBC	FFP	Platelets
Total units	151	46	35

The figure 6.20 shows the percentage of blood transfused among anaemic population in a hospital. The result shows that most of the blood transfused was in the form of RBC i.e., a total of 151 units. In comparison 46 and 35 units of FFP and Platelets were transfused respectively.

7. Discussion

Anaemia is a common health condition that affects millions of people worldwide and is a significant public health issue in India, particularly among hospitalized patients. Anaemia can lead to a range of adverse outcomes, such as impaired physical and cognitive function, increased morbidity and mortality, and increased healthcare costs. Despite its high prevalence, there is limited research on anaemia among hospitalized patients in Surat, India. To address this gap, this study aimed to investigate the prevalence, types, risk factors, and management practices for anaemia in hospitalized patients in Surat, India. The primary objectives of the study were to determine the prevalence of anaemia, classify the types of anaemia observed, identify the risk factors associated with anaemia, and assess the management practices for anaemia in this population. In addition to these primary objectives, the study also aimed to investigate plausible correlations between age, gender, co-morbidities, haematological findings, and types of anaemia among hospitalized patients in Surat, India. Furthermore, the study aimed to assess the severity of anaemia in this population. Overall, this study is essential as it can provide critical insights into anaemia among hospitalized patients in Surat, India, and inform the development of more effective prevention and management strategies for this condition. The findings of this study can also have broader implications for improving the health outcomes of hospitalized patients in India and other similar settings.

7.1 Prevalence of anaemia gender-wise and age-wise

The prevalence of anaemia varies across different populations and can be influenced by various factors such as age, sex, and nutritional status. In this study, the prevalence of anaemia was found to be high among hospitalized patients, with 42.5% of males and 41.6% of females being anaemic. These findings are consistent with previous studies that have reported a high prevalence of anaemia among hospitalized patients in different regions of the world, including India, Pakistan and Ethiopia[13][14] . The study also found that the prevalence of anaemia varied across different age groups, with the highest percentage of anaemic patients being found in infants and children. This is consistent with previous studies that have reported a high prevalence of anaemia among children under five years of age in developing countries[15][16]. The prevalence of anaemia was lower among young adults, adults, and the elderly, with no significant difference between males and females in these age groups. The study also found that gender has an impact on the risk of anaemia, with women generally having a higher incidence of anaemia than men throughout much of the life course. This is due to the physiological events that women undergo, such as menstruation and pregnancy, which can lead to a higher risk of anaemia. In this study, the prevalence of anaemia was higher among pregnant women, with 49% of them being anaemic. This finding is consistent with previous studies that have reported a high prevalence of anaemia among pregnant women in developing countries[17][18]. Overall, these findings highlight the need for effective strategies to prevent and manage anaemia, especially among high-risk groups such as hospitalized patients and pregnant women. These strategies may include improving access to nutritious food, providing iron supplementation, and implementing public health programs to raise awareness about the importance of iron-rich diets and regular blood screenings.

7.2 Prevalence of anaemia by wards and disease condition

The current study observed the prevalence of anaemia in hospitalized patients, with a focus on ward-wise distribution and disease association. The results revealed that the prevalence of anaemia varied widely among different wards and patient populations. The highest prevalence of anaemia in male patients was observed in the paediatric ward (62%) followed by the MICU (55%) and orthopaedic (43%) wards. Similarly, the highest prevalence of anaemia in female patients was also observed in the paediatric ward (74%) followed by the obs/gyne (44%) and surgery (40%) wards. These findings are consistent with previous studies that have reported a higher prevalence of anaemia in paediatric and female populations[15][16]. The reason for this may be due to the higher nutritional demands during growth and development in children and the menstrual blood loss in females[18]. The wards prevalence of the total anaemic population was greatest in the paediatric (67%) and MICU (46%) wards. These findings may be attributed to the high prevalence of infectious diseases, including malaria, etc. in these wards, which are known to cause anaemia. In terms of the association between anaemia and different diseases, the study found that malaria had the highest prevalence of anaemia (83%), followed by stroke (78%), renal disease (69%), and LRTI (67%). These results are consistent with previous studies that have reported a high prevalence of anaemia in patients with malaria and other infectious diseases[15]. In conclusion, this study highlights the significant burden of anaemia in hospitalized patients, particularly in the paediatric and female populations, and its association with various diseases. The findings suggest that efforts should be made to improve the nutritional status of patients, particularly children, and to prevent and treat infectious diseases to reduce the burden of anaemia in hospitals.

7.3 Types of anaemia in male population

The given data presents the prevalence of various types of anaemia in the male population, based on their red blood cell morphology and hemoglobin content. Microcytic normochromic anaemia was found to be the most prevalent type of anaemia, accounting for 53% of cases. This type of anaemia is characterized by small red blood cells with normal hemoglobin content, which can be caused by iron deficiency, thalassemia, or other conditions[15]. The second most common type of anaemia was normochromic normocytic anaemia, accounting for 25% of cases. This type of anaemia is characterized by normal-sized red blood cells with normal hemoglobin content, which can be caused by chronic disease, kidney failure, or other conditions[15]. Microcytic hypochromic anaemia accounted for 16% of cases, which is characterized by small red blood cells with reduced hemoglobin content, often caused by iron deficiency anaemia. Normochromic macrocytic anaemia and normochromic hyperchromic anaemia were less prevalent, accounting for only 2% of cases each. Normochromic macrocytic anaemia is characterized by larger red blood cells with normal hemoglobin content, often caused by vitamin B12 or folate deficiency, while normochromic hyperchromic anaemia is characterized by normal-sized red blood cells with increased hemoglobin content, often caused by certain medications or conditions[19]. Lastly, microcytic hyperchromic anaemia was the least prevalent type, accounting for only 1% of cases. This type of anaemia is characterized by small red blood cells with increased hemoglobin content, which is a rare condition that can be caused by certain genetic disorders [15]. In conclusion, the data highlights the high prevalence of microcytic normochromic anaemia and the importance of addressing an iron deficiency in the male population. It also emphasizes the need for proper diagnosis and treatment of anaemia, as different types of anaemia can have different underlying causes and require specific interventions.

7.4 Types of anaemia in female population

The given data presents the prevalence of different types of anaemia in the female population based on their red blood cell morphology and hemoglobin content. Microcytic normochromic anaemia was found to be the most prevalent type of anaemia, accounting for 62% of cases. This type of anaemia is characterized by small red blood cells with normal hemoglobin content, which can be caused by iron deficiency, thalassemia, or other conditions[16]. Microcytic hypochromic anaemia was found to be the second most common type of anaemia in females, accounting for 20% of cases. This type of anaemia is characterized by small red blood cells with reduced hemoglobin content, which is commonly caused by iron deficiency anaemia. Normochromic normocytic anaemia was the third most common type, accounting for 15% of cases. This type of anaemia is characterized by normal-sized red blood cells with normal hemoglobin content, which can be caused by chronic disease, kidney failure, or other conditions. Microcytic hyperchromic, normochromic macrocytic, and normochromic hypochromic anaemia were found to be the least prevalent types, accounting for only 1% of cases each[16]. Microcytic hyperchromic anaemia is characterized by small red blood cells with increased hemoglobin content, which is a rare condition that can be caused by certain genetic disorders. Normochromic macrocytic anaemia is characterized by larger red blood cells with normal hemoglobin content, often caused by vitamin B12 or folate deficiency. Normochromic hypochromic anaemia is characterized by normal-sized red blood cells with reduced hemoglobin content, which is less common than other types of anaemia[16]. In conclusion, the data highlights the high prevalence of microcyctic normochromic anaemia in the female population and the importance of addressing an iron deficiency in this group. It also emphasizes the need for proper diagnosis and management of anaemia to prevent complications and improve overall health.

7.5 Severity of anaemia in male population

The data indicate that severe anaemia was most prevalent among adults, with 11 cases, while it was least severe in infants and young adults, with only 1 case each. Moderate anaemia was highest among adults, with 14 cases, while it was least prevalent among adolescents, with only 1 case. Similarly, mild anaemia was most common among adults, with 15 cases, while it was least prevalent among adolescents, with only 1 case. Finally, the data shows that normal hemoglobin levels were most prevalent among adults, with 30 cases, while it was least prevalent among infants, with only 1 case[18].

7.6 Severity of anaemia in female population

The data suggest that severe anaemia was most prevalent among young adults, with 10 cases, while it was least prevalent in infants, with only 1 case. Moderate anaemia was highest among adults, with 46 cases, while it was least prevalent among adolescents and infants, with only 2 cases each. Similarly, mild anaemia was most common among adults, with 23 cases, while it was least prevalent among infants, with only 1 case. Finally, normal hemoglobin levels were most prevalent among adults, with 29 cases, while it was least prevalent among newborns and children, with only 1 case each[18].

7.7 Severity of anaemia in total population

The data suggests that out of 382 patients, moderate anaemia was the most prevalent type, affecting 35% of patients, which is equivalent to 133 patients. Normal haemoglobin levels were found in 32% of patients, which is equivalent to 123 patients. Mild anaemia was present in 21% of patients, which is equivalent to

80 patients. Finally, severe anaemia was the least prevalent type, affecting only 12% of patients, which is equivalent to 46 patients[18].

7.8 Blood transfusion in study population

The data suggest that among the patients in the study population, the majority (65%) were transfused with RBCs, which is equivalent to a total of 151 units. It is unclear from the data what the reasons were for the blood transfusions or if any complications were observed. Blood transfusions are typically given to patients who have lost a significant amount of blood due to injury, surgery, or a medical condition such as anaemia. Transfusions may also be given to patients who have certain blood disorders, such as sickle cell disease or thalassemia, or who are undergoing cancer treatments that affect the bone marrow[20][21]. While blood transfusions can be life-saving in some situations, they also carry some risks, such as the possibility of transfusion reactions, infections, or iron overload. Therefore, it is important to carefully consider the risks and benefits of transfusion and to closely monitor patients who receive transfusions[21].

8. Conclusion

In conclusion, anaemia is a significant public health issue among hospitalized patients in Surat, India, with a high prevalence observed in both males and females, particularly in the paediatric and female populations. The study also identified various risk factors associated with anaemia, such as age, gender, and presence of co-morbidities, and found that infectious diseases, particularly malaria, had a high association with anaemia. The most prevalent type of anaemia was microcytic normochromic anaemia, followed by macrocytic normochromic anaemia. These findings highlight the need for effective strategies to prevent and manage anaemia in hospitalized patients, including improving access to nutritious food, providing iron supplementation, and implementing public health programs to raise awareness about the importance of iron-rich diets and regular blood screenings. Additionally, efforts should be made to prevent and treat infectious diseases, particularly malaria, to reduce the burden of anaemia in hospitals. Further research and interventions targeting high-risk populations, such as paediatric and pregnant patients, may also be warranted to address the issue of anaemia in Surat, India, and similar settings. Overall, addressing anaemia among hospitalized patients is crucial to improve health outcomes and reducing healthcare costs associated with this condition

9. Study Limitations

Sample size: The sample size of the study was limited, which may affect the generalizability of the findings. A larger sample size would have provided a more representative picture of the prevalence, types, risk factors, and management of anaemia in hospitalized patients in Surat, India.

Potential confounding variables: There may have been other variables, such as socioeconomic status, medications, etc. That could have influenced the prevalence, types, risk factors, and management of anaemia in hospitalized patients in Surat, India, that were not accounted for in the study. Future studies should consider the influence of these variables in their analyses to obtain a more accurate understanding of the factors that contribute to anaemia in hospitalized patients.

Lack of information on management practice: The study did not evaluate the effectiveness of different management strategies in improving patient outcomes. While the risk factors for anaemia were identified, the impact of transfusion and iron supplementation on patient outcomes was not evaluated.

Lack of information on patient outcomes: Patient outcomes such as length of hospital stay, mortality rates, and quality of life were not evaluated in the study, limiting the ability to fully understand the impact of anaemia on patient health and well-being.

10. Future Directions

- Further research can be conducted to investigate the causes of the high prevalence of anaemia in male and female populations. This could include studying the effects of various medical conditions and treatments on the prevalence of anaemia.
- Further investigation into the most effective treatments for anaemia could be conducted. This could include evaluating the use of blood transfusions, iron supplements, and other interventions in specific patient populations to determine the most beneficial approach to treatment.
- Efforts could be made to increase awareness of anaemia among healthcare providers and the general public. This could include developing educational materials and outreach campaigns to improve screening and early detection of the condition, as well as to encourage individuals to take steps to prevent anaemia through healthy lifestyle choices and appropriate medical care.
- Future studies could be conducted to explore the long-term health outcomes associated with anaemia, particularly in patients with severe or chronic forms of the condition. This could help to better understand the impact of anaemia on patient health and quality of life over time.

11. Acknowledgements

12. References

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