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Review IJMNP

A Comparative Study to Assess the Fetal Outcome Among Normal and Anemic Mothers at Sultania Zanana Hospital at Bhopal

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Abstract

Anemia during pregnancy is a significant public health concern, especially in developing countries like India. It is a clinical condition characterized by a deficiency in hemoglobin levels, often due to inadequate intake of essential nutrients such as iron, folic acid, and vitamins. The World Health Organization classifies anemia during pregnancy as having hemoglobin levels under 11 g/dL, with specific thresholds varying by trimester. Maternal anemia not only affects the mother's health but also has profound implications on fetal outcomes, including intrauterine growth restriction (IUGR), low birth weight, preterm birth, and increased perinatal morbidity and mortality. This comparative study aims to assess and compare fetal outcomes among normal (non-anemic) and anemic mothers admitted to Sultania Zanana Hospital in Bhopal. It explores the extent to which anemia impacts placental function and fetal development. Factors contributing to maternal anemia, such as poor dietary habits, low socioeconomic status, early or late maternal age, and comorbid conditions, are considered. The study underscores the critical role of early identification, dietary adjustments, iron intake, and prenatal care in reducing the risk of complications. This research is expected to support the development of public health initiatives and contribute to better health outcomes for mothers and their unborn children. By highlighting the critical relationship between maternal anemia and neonatal health, the study underlines the need for coordinated efforts involving healthcare professionals, policymakers, and community organizations to mitigate anemia's impact and promote healthier pregnancies and births.

Keywords: Maternal anemia**,** fetal outcomes**,** hemoglobin levels**,** pregnancy complications**,** prenatal care

INTRODUCTION

Gold is for the mistress—Silver for the maid—Copper for the Craftsman cunning at his trade.
"Good!" said the Baron, sitting in the hall, "But Iron—Cold Iron—is master of them all."
—Rudyard Kipling

Pregnancy is the period between conception and childbirth. It starts when a sperm fertilizes an ovum, followed by implantation of the fertilized egg, which results in conception. During pregnancy, anemia refers to a condition in which hemoglobin levels drop to less than one-third of the normal range. Anemia itself is not a distinct disease but rather an indication of an underlying health issue [1].

Anemia is characterized by a decrease in the overall number of red blood cells (RBCs), which is typically reflected by lower levels of hemoglobin

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(Hb), hematocrit (Hct), or RBC count. The World Health Organization (WHO) defines anemia as a hemoglobin level <11 g/dL. However, during pregnancy, this threshold changes depending on the trimester: below 11 g/dL in the first trimester, below 10.5 g/dL in the second trimester, and below 11 g/dL again in the third trimester. Healthy consumption is vital throughout gestation to produce a baby with the need to grow and a healthy baby. Pregnant girls want 300 additional calories per day, and this ought to be returned from healthy food selections such as fruits and vegetables, whole grains, non-fat and low-fat products, and low-fat protein sources [2].

During the antenatal period, mothers need additional attention regarding their diet to induce healthy babies. If any alteration in the mother's health leads her to require a less demanding diet, such as nausea, instinctive reflex, and alternative minor unwellness, it might cause anemia. Anemia is not a disease; however, its clinical condition is characterized by a deficiency of nutrients, particularly iron and vitamins, which require immediate attention by health personnel to scale back morbidity and mortality of the mother. Thus, it is thought to be a life-threatening condition.

Anemia throughout the physiological state is a common and appreciable ill health problem in developing countries, despite the fact that almost all anemia cases are seen in the physiological state and are mostly preventable and treatable if detected in time. Anemia is a significant contributor to illness and death in several Asian countries. Its prevalence is influenced by various factors such as socioeconomic status, nutritional practices, lifestyle choices, and infectious and non-infectious diseases [3].

It can severely affect placental and fetal development. The placenta, which forms during pregnancy, is essential for delivering oxygen and nutrients to the fetus, removing waste products, and acting as a protective barrier.

If anemia affects the placenta, it can adversely impact cranial development. Consequently, neonates may experience pathological complications, including birth difficulties, prematurity, intrauterine growth restriction (IUGR), and low birth weight. The placenta also differs in size, shape, number of cotyledons, and thickness. Therefore, a decent fetal outcome depends on the mother's health and diet throughout the prenatal period.

In addition to iron deficiency anemia, several other risk factors associated with maternal anemia can lead to negative outcomes for the baby. These include nutritional deficiencies, unhealthy lifestyles, hemoglobin disorders, maternal age (younger than 20 or older than 35 years), twin or multiple pregnancies, smoking or alcohol consumption, as well as a history of pregnancy complications or previous infections. Iron deficiency anemia most commonly affects women of reproductive age, pregnant women, premature and low-birth-weight infants, older babies and toddlers, and teenage girls. Children with iron deficiency are more likely to experience lasting issues such as impaired mental and motor development, difficulty concentrating, short attention spans, easy distraction, greater susceptibility to infections, and unusual cravings such as pica. Adverse effects of anemia were observed, such as fetal growth restriction (FGR), preterm birth, and intrauterine fetal death due to severe placental insufficiency. The incidence of stillbirths and preterm births has been found to decrease if iron therapy is administered 30 weeks before gestation [4–8].

Anemia has various effects on gestation, which can result in adverse fetal and maternal outcomes. Iron and vitamin B12 deficiencies are the two most common causes of anemia in gestation, which can result in fetal complications such as low birth weight, preterm deliveries, organ process anomalies, and even death. Globally, the prevalence of low-birth-weight infants caused by iron deficiency anemia ranges between 15.5% and 20%, with higher rates—around 16.5%—found in developing regions, particularly in Asia and Africa. In the United Arab Emirates (UAE), iron deficiency anemia during pregnancy is more prevalent than folate deficiency. As a result, infants with low birth weight occur

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more frequently than infants with neural tube defects. Maternal complications related to anemia include vaginal bleeding in the first trimester (18%) and about a 1.6 times greater risk of preterm birth.

Thus, anemia during pregnancy leads to considerable negative outcomes. Early identification and treatment of maternal anemia are vital, especially iron deficiency anemia, which accounts for the majority of anemia cases during pregnancy. Four strategic approaches have been established to prevent anemia and iron deficiency. These embody dietary modifications to increase iron intake, a weekly iron supplementation regimen to stop physiological anemia, food fortification such as wheat and rice, and general public health measures. The last intervention may be an extremely crucial approach that features child spacing, raising the nutritional standing of women, sanitation, immunization, management of diarrheal diseases, etc. Therefore, imposing a strong intervention program will not only improve the health of pregnant mothers, but also that of this and the coming generations. This study aimed to evaluate the prevalence of anemia during pregnancy and its effects on fetal outcomes in the UAE [9, 10].

Collaborative social and medical initiatives are essential to enhance the overall living conditions of women. Proper antenatal care is fundamental for preventing neonatal complications in women with anemia. Focus should be placed on anemia prevention through the active involvement of government and non-government organizations, the Indian Academy of Pediatrics (IAP), local communities, and other stakeholders.

Need for the Study

Anemia is a pathological condition in which the oxygen-carrying capacity of RBCs is insufficient to meet the body's needs. This can lead to reduced placental weight and poor perinatal outcome. This is a major public health issue worldwide. According to the WHO, an estimated 56 million people in developing countries are affected, with South Asia being the most severely impacted region. In India, for example, 89% of pregnant women suffer from anemia. Anemia accounts for 12–28% of maternal deaths, 30% of perinatal deaths, and 7–10% of total neonatal mortality.

Factors influencing anemia include faulty diabetic habits, chronic protozoan infection, and faulty absorption. Pregnant health standing exceeds iron demands, as in multiple gestations, the mechanism of iron loss, excessive blood loss throughout menses, hookworm infestation, nutritional deficiency, and women with speedily occurring gestation. Anemia negatively impacts cranial development, birth physiological condition, IUGR, small for gestational age (SGA) infants, preterm birth, low birth weight, and miscarriage, and it also adversely affects the placenta.

Anemia is widespread among pregnant women in India and poses risks to both the mother and fetus. It is linked to complications, including low birth weight, IUGR, a higher incidence of premature deliveries, and elevated perinatal mortality rates.

In 2013, Nisha Shah, Chintan Upadhyay, and Ravi Sahota conducted a study at the Department of Obstetrics and Gynecology, Dr. B.R. Ambedkar Medical College and Hospital in Bangalore, over two years. This prospective randomized study included 200 pregnant women diagnosed with anemia. Each participant was thoroughly evaluated, with hemoglobin levels measured during their first visit as well as at the 30th and 36th weeks of pregnancy. Additionally, blood cultures were performed on all babies admitted to the Neonatal Intensive Care Unit (NICU) for various reasons [11–14].

The study reported that 29.5% of mothers had mild anemia, 53% had moderate anemia, and 17.5% had severe anemia. Among the 200 participants, 194 live births met the inclusion criteria. Of these, 20% were born prematurely, 28% had IUGR, and 25% (51 babies) required NICU admission for various reasons, and 9% of those admitted developed confirmed sepsis.

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Anemia was found to be more common in women aged 30 or younger (59.6%), non-Arabs (56.3%, p=0.02), uninsured women (54.7%, p=0.02), and those considered high-risk cases (50%). The likelihood of anemia was greater among first-time pregnant women and their mothers. Most cases were classified as mild anemia (45%), with fewer moderate and severe cases. Women with pre-existing health conditions had a higher risk of anemia compared to healthy women, including 60% of diabetic mothers, 72% of those with heavy bleeding (p=0.01), and 100% of mothers with thalassemia. A larger proportion of anemic women had cesarean deliveries (39%), and preterm births were significantly more frequent among anemic mothers (77.8%, p=0.01) [15].

In terms of fetal outcomes, there was no significant difference in birth weights between babies born to anemic and non-anemic mothers overall, but babies born to mothers with moderate-to-severe anemia had a lower average birth weight. The study highlights a higher prevalence of mild anemia, an increased cesarean section rate, and reduced mean birth weight in infants born to mothers with anemia. It recommends the early detection and timely treatment of anemia to avoid further complications.

In January 2010–2012 at Dow Medical College, Lyari Hospital, a cohort study was conducted to determine the association between severe anemia and maternal and perinatal complications. Fifty-one severely anemic pregnant women were compared with 108 non-anemic pregnant women with similar demographic features. The results revealed that postpartum hemorrhage occurred in 9.8%, infection in 7.8%, low-birth-weight babies in 29.6%, and small for gestational age in 27.8%, compared to 14.5% and 8.2% of controls, respectively. The study concluded that maternal anemia carries a significant risk of complications.

During the clinical posting, notable differences were observed between the fetal outcomes of anemic mothers and those of non-anemic mothers. Previous research [16–18] has demonstrated that maternal anemia adversely influences fetal outcomes and is associated with an increased risk of pregnancy-related complications. Accordingly, the present study was undertaken to further evaluate the impact of maternal anemia on fetal outcomes.

Objectives of the Study

1. Assess the fetal outcomes among normal mothers.
2. Assess the fetal outcomes among anemic mothers.
3. Compare the fetal outcomes between normal and anemic mothers.
4. Determine the association between fetal outcomes and selected demographic variables among normal and anemic mothers.
5. Determine the association between fetal outcomes and selected clinical variables among normal and anemic mothers.
6. Develop and distribute an informational pamphlet on iron deficiency anemia during pregnancy.

Research Hypothesis

H1: There is a significant difference in fetal outcomes between normal mothers and mothers with anemia.

H2: There is a significant association between fetal outcomes in normal mothers and selected demographic variables.

H3: There is a significant association between fetal outcomes among normal mothers and selected clinical variables.

H4: There is a significant association between fetal outcomes among mothers with anemia and selected demographic variables.

H5: There is a significant association between fetal outcomes among mothers with anemia and selected clinical variables.

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OPERATIONAL DEFINITIONS

Assess

Refers to the systematic observation and evaluation of fetal outcomes in normal mothers and mothers with anemia.

Fetal Outcome

Refers to the condition of a newborn at birth with respect to weight, gestational age, and overall health status.

Anemic Mother

Refers to a mother whose hemoglobin level is below 10 g/dL during pregnancy, as defined by the World Health Organization.

Normal Mother

Refers to a mother whose hemoglobin level ranges from 10–14 g/dL during pregnancy, without the presence of other medical conditions, according to World Health Organization standards.

DELIMITATIONS

- The study is limited to anemic and normal mothers who are admitted to the labor and delivery unit.
- The study focuses solely on fetal outcomes in normal and anemic mothers.

Assumptions

1. Maternal anemia may affect fetal outcomes.
2. Iron deficiency anemia is highly prevalent during pregnancy.
3. Hemoglobin levels of pregnant mothers can influence labor outcomes.
4. Pregnant women will voluntarily participate and provide honest responses.

CONCEPTUAL THEORETICAL FRAMEWORK

The conceptual model provides a structured framework for clinical practice, research, and education. It facilitates systematic observation, interpretation, and understanding of phenomena, guiding practical problem-solving and decision-making (Figure 1).

The present study is a non-experimental study aimed at comparing fetal outcomes between anemic and non-anemic mothers. The conceptual framework for this study is based on the General Systems Theory, first proposed by von Bertalanffy in 1968. This theory incorporates the concepts of input, throughput, output, and feedback, providing a comprehensive approach to understanding the interactions and processes that influence fetal outcomes in maternal anemia.

A system is composed of a set of interacting components within a defined boundary that regulates the types and rates of exchange with its environment. All living systems are open systems, meaning they continuously exchange matter, energy, and information with their surroundings. Within open systems, the degree of interaction with the environment may vary, as the system receives inputs and produces outputs in the form of matter, energy, and information.

For survival, all systems must acquire varying types and amounts of matter, energy, and environmental information. Through selective processes, the system regulates the type and quantity of input it receives. These inputs are processed through self-regulation to maintain system equilibrium or homeostasis. Matter, energy, and information are continuously transformed and released as outputs. The system constantly monitors both itself and its environment to guide its functioning. Feedback, which represents environmental responses to the system's outputs, is used to adjust, correct, and accommodate interactions with the environment. Feedback can be positive, negative, or neutral, each influencing the system's regulation and adaptation differently.

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Input

Input refers to the characteristics and conditions of individuals and the resources available to them. An individual's personal attributes can influence their learning, behavior, and interactions with others.

In the context of this study, input refers to the anemic and normal mothers, along with their characteristics and resources. This includes socio-demographic variables such as age, education, religion, type of family, family income, mother's educational status, sources of information, and type of food, as well as clinical variables such as maternal weight, hemoglobin level, gravida, sex of the newborn, and type of delivery.

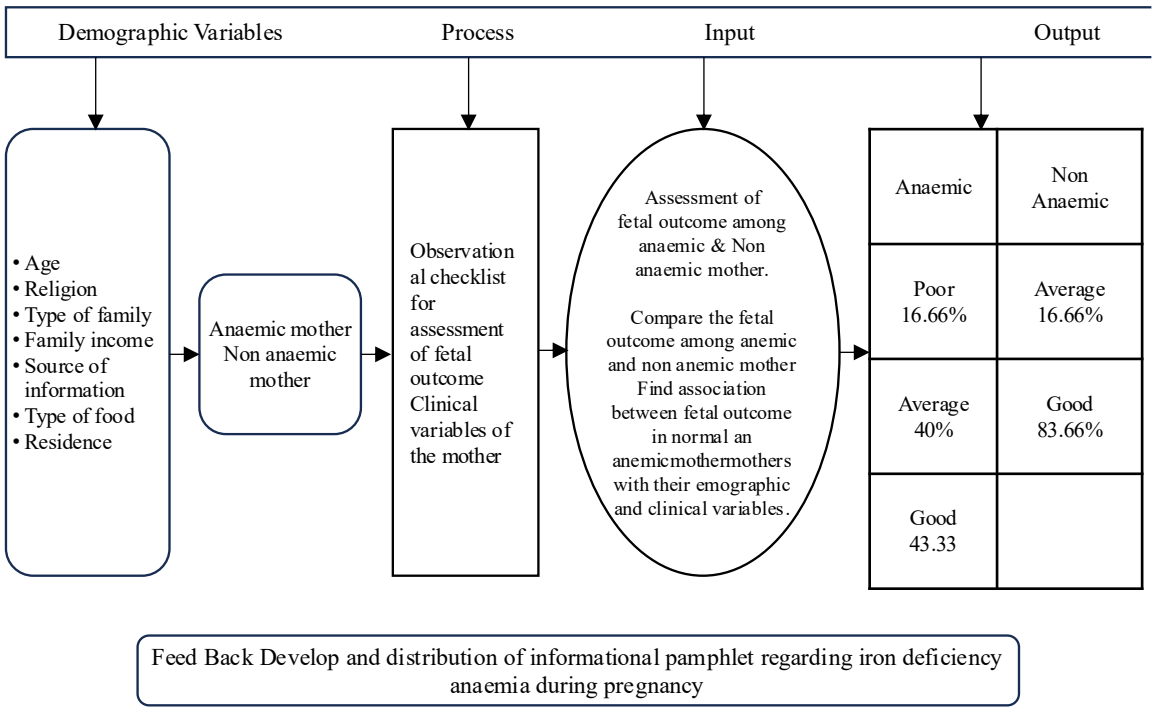

Figure 1. Conceptual framework illustrates the relationship between maternal characteristics, clinical variables, and fetal outcomes.

Process

The process refers to the operational procedures involved in the study. This includes the assessment of newborns of anemic and normal mothers. In this study, newborns will be evaluated using an observational checklist that records fetal outcomes, socio-demographic variables, and clinical variables of the mothers.

Output

After processing the input, the system produces outputs in the form of fetal outcomes, which are measured by parameters such as Apgar score, temperature, crown–heel length, head circumference, chest circumference, mid-arm circumference, abdominal circumference, newborn weight, genitalia, and the presence of congenital malformations. Based on these parameters, fetal outcomes are categorized as poor, average, or good.

Feedback

Feedback refers to the information generated from the output that is used to refine or adjust the system. In this study, the feedback includes the differences observed in fetal outcomes between anemic and normal mothers, as well as the distribution of informational pamphlets on iron deficiency anemia during pregnancy. This feedback guides for improvement of maternal and fetal health interventions.

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REVIEW OF LITERATURE

A literature review involves both the systematic process of gathering information on a specific topic and a written summary that outlines current knowledge regarding the research problem. Conducting a literature review enables the researcher to collect the most relevant information necessary to scientifically develop the study and achieve its intended outcomes.

The review is based on a comprehensive examination of books, journals, and international nursing theories. It provides a foundation for future research, justifies the necessity of the study, summarizes the data collected, and synthesizes findings from various studies. The ultimate goal is to develop a thorough understanding of the existing scientific knowledge within the professional field, from which valid and relevant theories can be formulated.

For this study, the review of literature is organized into the following categories:

1. Review of literature related to the prevalence of anemia during pregnancy.
2. Review of literature related to fetal outcomes among anemic mothers.
3. Review of literature related to the identification of risk factors for anemia during pregnancy.

Review of Literature Related to the Prevalence of Anemia During Pregnancy

A retrospective cross-sectional study was conducted on 2,213 pregnancies delivered between 2005 and 2007 in Kerman, Iran. Women with hemoglobinopathies, including monogenic disorders, were excluded from the analysis.

In this study, anemia was defined as hemoglobin (Hb) <11 g/dL throughout gestation. Categorical variables were compared using chi-squared or Fisher's exact test. Overall, 104 women (4.7%) were anemic, with 4.8% classified as having severe anemia (Hb <7 g/dL), 15.4% as moderate anemia (Hb = 7–8.9 g/dL), and 79.8% as mild anemia (Hb = 9–10.9 g/dL). The frequency of anemia by trimester was 5.0%, 3.4%, and 5.7% in the first, second, and third trimesters, respectively. Multiparity was associated with lower hemoglobin concentrations during the second and third trimesters ($p = 0.03$ and $p < 0.001$, respectively). The prevalence of anemia was significantly higher among smokers and narcotic users ($p = 0.01$ and $p = 0.003$, respectively). The study concluded that factors associated with anemia during pregnancy included parity, smoking, narcotic use, and non-use of iron supplements [19–21].

In 2012, a population-based study was conducted at Government Medical College Hospital, Punjab, to evaluate the prevalence of anemia during pregnancy, its impact on maternal and perinatal morbidity and mortality, and strategies for its prevention. The study reported a prevalence of anemia of 86.1% among pregnant women, with 56% classified as having severe anemia. Severe anemia was associated with 34.5% of maternal deaths, 28.2% of maternal hypertensive disorders, 31.2% of preterm deliveries, 7.9% of perinatal deaths, and a higher incidence of low birth weight (mean 2.23 ± 1.13 kg). The study concluded that anemia remained highly prevalent, and its adverse maternal and perinatal consequences continued unabated.

This retrospective study involved 501 pregnant women attending antenatal care at the Federal Teaching Hospital, Abakaliki, Ebonyi State, Southeast Nigeria. Antenatal case records were obtained from the hospital's records department and antenatal records unit. All pregnant women who booked at the center were included, while women with multiple pregnancies, hypertensive disorders of pregnancy, anemia-related complaints, renal or cardiac diseases, and those who experienced bleeding during pregnancy were excluded. Relevant data—including socio-demographic factors such as age, parity, occupation, gestational age at the first visit, and hemoglobin levels at booking—were collected and analyzed using tables and percentage calculations. Anemia in pregnancy was defined according to the WHO as a hemoglobin level <11 g/dL, while some authorities, including Lawson, defined anemia in third-world countries as hemoglobin <10 g/dL during pregnancy. Using the WHO criteria, 218 women were classified as not anemic, whereas 421 women were considered not anemic according to Lawson's criteria [22–24].

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The majority of the study participants, 227 women (45.3%), were in the 26–30 years age bracket, followed by 131 women (26.1%) in the 31–35 years group. Regarding occupation, 215 participants (43%) were civil servants, followed by 92 women (18.4%) engaged in business or trading. Most participants, 293 women (58.5%), were in the para 1–4 group, followed by primigravidae, who accounted for 177 women (35.3%). Additionally, 306 women (70.6%) booked their antenatal care at a gestational age of 14–27 weeks.

This study was conducted to assess the prevalence of anemia among pregnant women attending antenatal care at two hospitals and a traditional birth home, to obtain comprehensive prevalence data. Pregnant women were enrolled during their first antenatal visit and followed throughout pregnancy to monitor for anemia. Packed cell volume (PCV) was used to evaluate anemia levels, and structured questionnaires were administered to collect socio-demographic information.

Among the women studied, 365 (76.5%) were anemic during at least one trimester of pregnancy. Anemia was more prevalent among primigravidae (80.6%) compared to women with previous pregnancies (74.5%) (P >0.05). Of the anemic women, 211 (57.8%) had moderate anemia, 147 (40.3%) had mild anemia, and 7 (1.9%) were severely anemic, with 5 (71.4%) of the severely anemic women being primigravidae. All women with severe anemia were under 30 years of age. Women who received antenatal care at the traditional birth home (TBH) were more likely to be anemic (81.2%) throughout pregnancy compared to those who attended hospitals (72.5%) ($p < 0.05$). Across all antenatal centers, the highest prevalence of anemia was observed during the second trimester. Of the women enrolled, 47 (9.8%) booked antenatal care in the first trimester, 303 (63.5%) in the second trimester, and 127 (26.6%) in the third trimester. At booking, 62.5% of women were already anemic, with a significantly higher prevalence among primigravidae (69.7%) ($p < 0.05$). Delayed antenatal booking was primarily due to the absence of symptoms, reflecting poor health-seeking behavior. Additionally, anemia was more common among unemployed women and those with sickle cell traits.

Review of Literature Related to Fetal Outcomes Among Anemic Mothers

A cross-sectional analytic study was conducted to assess the effect of maternal iron deficiency anemia (MIDA) on cord blood iron status, placental weight, and fetal outcomes. The study found a significant positive relationship between maternal hemoglobin levels and placental weight ($r = 0.40$; $p < 0.001$), birth weight ($r = 0.35$; $p < 0.001$), Apgar scores ($r = 0.52$; $p < 0.001$), gestational age ($r = 0.61$; $p < 0.001$), and the incidence of birth asphyxia. Maternal serum ferritin levels also demonstrated a strong positive correlation with cord ferritin ($r = 0.94$; $p < 0.001$), placental weight ($r = 0.26$; $p < 0.001$), and birth weight ($r = 0.27$; $p < 0.001$). The study concluded that iron deficiency anemia during pregnancy adversely affects fetal outcomes.

Normal parameters for a healthy newborn include an Apgar score of 7–10, a birth weight between 2.6 and 3.1 kg, a body temperature of 99.5 °F, a crown–heel length of 50 cm, a crown–rump length of 35 cm, a head circumference of 33–35 cm, and a chest circumference of 30–33 cm. Additionally, all neonatal reflexes—including rooting, glabella, grasp, moro, suckling, and swallowing—should be present. Consequently, a favorable fetal outcome is largely influenced by the mother's health and nutritional status during pregnancy [25].

The study was conducted in the Departments of Pediatrics and Obstetrics and Gynecology at Dr. B.R. Ambedkar Medical College and Hospital, Bangalore, over a period of two years. This prospective randomized study included 200 pregnant women diagnosed with anemia. Comprehensive assessments were carried out for all participants, including hemoglobin measurements at the initial visit and again at the 30th and 36th weeks of gestation. Blood cultures were also obtained from all newborns admitted to the NICU for various clinical indications.

Among the mothers, 29.5% had mild anemia, 53% had moderate anemia, and 17.5% had severe anemia. Of the 200 cases, 194 live births met the inclusion criteria. Among these newborns, 20% were

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delivered prematurely, 28% exhibited IUGR, and 51 infants (25%) required NICU admission for various reasons, with 9% of these developing confirmed sepsis.

Severe anemia during pregnancy is a potentially hazardous hematological disorder. According to the WHO, the global prevalence of anemia among pregnant women is 55.9%. In India, the highest rate of moderate anemia was reported in Nagaon District, at 82.7%. The present study aimed to examine the relationship between placental weight and fetal outcomes in mothers with normal hemoglobin levels and those with anemia. The objectives were to assess and compare placental weight and fetal outcomes between the two groups and to explore the association between placental weight, fetal outcomes, and selected demographic variables. A quantitative research approach with a comparative descriptive design was employed. The study was conducted at Krishna Hospital, Karad, using purposive sampling to include 62 normal and 62 anemic mothers. Data analysis involved both descriptive and inferential statistics. Findings from the unpaired t-test indicated that mothers with anemia had a significantly higher average placental weight than normal mothers ($p < 0.05$). In contrast, babies born to normal mothers had significantly greater average birth weight and length compared to those born to anemic mothers ($p < 0.05$). Additionally, a significant relationship was observed between placental weight and monthly family income in normal mothers ($p < 0.05$). The study concluded that there is a significant positive correlation between placental weight and newborn birth weight in both groups, indicating that an increase in placental weight corresponds with an increase in birth weight and vice versa [26].

Findings

Anemia was more frequently observed in women aged 30 years or younger (59.6%), non-Arab women (56.3%, $p = 0.02$), those without health insurance (54.7%, $p = 0.02$), and among women already registered for antenatal care (50%). First-time pregnant women (primigravida) and first-time mothers (primipara) had a higher risk of developing anemia. The condition was categorized into mild, moderate, and severe forms, with mild anemia being the most common (45%).

Women with pre-existing health conditions were more susceptible to anemia compared to healthy mothers. Among the study participants, 60% of diabetic women, 72% of those with heavy vaginal bleeding ($p = 0.01$), and all women with thalassemia were anemic. A larger proportion of anemic women required cesarean delivery (39%), and preterm births were significantly more common in this group (77.8%, $p = 0.01$).

Although no significant difference was observed in overall birth weights between babies of anemic and non-anemic mothers, infants born to women with moderate-to-severe anemia had lower average birth weights. The study concluded that mild anemia was the most prevalent form, cesarean delivery rates were higher among anemic mothers, and birth weights were lower in their infants. These findings underscore the importance of early detection and timely management of maternal anemia to prevent potential maternal and neonatal complications.

A comparative study was conducted to examine maternal and fetal outcomes among anemic and non-anemic pregnant women at Malik Deenar Hospital. The study included 100 anemic and 100 non-anemic pregnant women. Results indicated that the prevalence of anemia over six months was 606 per 1,000 individuals (60.6%). Among the anemic participants, 76% had mild anemia, 21% had moderate anemia, and 3% had severe anemia.

Maternal complications among the anemic participants included postpartum hemorrhage in 35% of cases and delayed wound healing in 30%. Fetal complications were also significant, with 32% of births being preterm, 30.3% of newborns having low birth weight, 40% experiencing birth asphyxia, and 38% showing signs of IUGR. The study concluded that anemia is a major health concern during pregnancy, contributing to significant adverse outcomes for both mothers and their infants.

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A cohort study was conducted at Railway Hospital, Rawalpindi, to evaluate maternal hemoglobin levels and perinatal outcomes. Of a total of 860 pregnant women, 402 were found to be anemic. The findings indicated that mothers with anemia faced a higher risk of complications, including low birth weight, preterm delivery, intrauterine fetal death, low Apgar scores, and birth asphyxia. Specifically, the risk of preterm delivery was 3.4 times higher, and the likelihood of low birth weight was 1.8 times greater in anemic mothers compared to non-anemic mothers. Additionally, infants born to anemic women had a 1.7 times higher risk of low Apgar scores at one minute and a 2.2 times higher risk of intrauterine fetal death. The study concluded that anemia during pregnancy is associated with increased risks of both maternal and neonatal complications [27].

A quantitative approach with a comparative research design was employed. Using a purposive sampling technique, 100 mothers were selected, comprising 50 anemic and 50 non-anemic participants. Data were collected using a structured protocol designed to assess fetal and placental outcomes in both groups. The study was conducted in March 2016, following formal written permission from the Senior Medical Officers (SMOs) of the Civil Hospitals in Mohali and Kharar. Participants were informed of the study's purpose and objectives prior to data collection.

Data analysis was performed using both descriptive and inferential statistics, in alignment with the study objectives.

The study observed that mothers with anemia experienced poorer fetal outcomes, including lower Apgar scores, reduced birth weight, and shorter crown–heel length. Similarly, placental outcomes in this group were suboptimal, with reduced placental weight and thickness and generally poorer placental conditions.

These findings underscore the need to improve awareness and knowledge regarding proper maternal nutrition during pregnancy, particularly to prevent anemia and its associated complications.

Review of Literature Related to the Identification of Risk Factors for Anemia During Pregnancy

A study was conducted to investigate the association between third trimester hemoglobin (Hb) concentrations and the risk of low birth weight and preterm delivery in a Chinese population. The sample included women who delivered in four cities and counties across Jiangsu and Zhejiang provinces, China.

The study employed multiple logistic regression to examine the impact of maternal hemoglobin levels on the risk of preterm birth and low birth weight. Findings revealed that 48.2% of women in their third trimester were anemic, predominantly with mild or moderate severity. Women with severe anemia (Hb <70 g/L) had an 80% higher risk of preterm delivery (95% CI: 1.0–3.3) and were four times more likely to deliver low-birth-weight infants (95% CI: 2.1–7.5) compared to women with Hb levels between 90–99 g/L. Additionally, women with high hemoglobin levels (Hb >130 g/L) exhibited a 20% increased risk of preterm birth (95% CI: 1.0–1.4) and a 50% greater likelihood of low-birth-weight infants (95% CI: 1.2–1.9). The study concluded that maternal anemia is a significant risk factor for both preterm delivery and low birth weight.

A study conducted among 575 Malawian women attending Chikwawa District Hospital, Malawi, examined the prevalence of malaria parasite infection, anemia, and the incidence of low-birth-weight infants. During pregnancy, participants received one, two, or three doses of sulfadoxine-pyrimethamine (SP). Among multigravidae women, those who received two doses had a slightly but significantly higher mean hemoglobin level at delivery (10.4 ± 1.4 g/dL) compared to those who received only one dose (10.0 ± 1.6 g/dL; P = 0.009). This difference was not observed among primigravidae women (10.1 ±1.5 vs. 10.2 ± 1.7 g/dL; P = 0.92), and the frequency of hematinic supplementation did not affect hemoglobin levels in this group. When linear regression accounted for hematinic supplementation, the effect of SP on hemoglobin levels at delivery in multigravidae was no longer significant (P = 0.70).

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According to the Malawi Demographic and Health Survey (2000), 72% of mothers who delivered in the previous five years received intermittent antimalarial treatment, although coverage varied by region and socioeconomic status. For example, 86% of pregnant women in Mulanje district received intermittent malaria treatment, compared to 59% in Machinga district. Coverage was also higher in urban areas (83.3%) than in rural areas (70.1%) [28–30].

A cross-sectional study was conducted among 316 pregnant women attending antenatal care at Sunyani Municipal Hospital. Data on socio-demographic and obstetric factors, medical treatments, malaria infection, and intake of iron- and iron-rich foods were collected using a checklist and structured questionnaire. Hemoglobin levels in both the first and current pregnancies were also recorded. Descriptive analysis was performed, and factors associated with anemia were evaluated. At the time of the study, 131 women (41.5%) were anemic (Hb <11 g/dL), with a mean hemoglobin level of 11.24 g/dL (range: 8.10–14.5 g/dL). Among them, 116 women (80.9%) were mildly anemic (Hb: 9.0–10.9 g/dL), and 25 women (19.1%) were moderately anemic (Hb: 7.0–8.9 g/dL). The prevalence of anemia among women who attended the recommended four antenatal visits was 44.3%. Significant determinants of anemia included maternal age (COR 0.26; 95% CI: 0.10–0.70; P = 0.007), gestational age at first visit (AOR 1.92; 95% CI: 1.14–3.23; P = 0.014), malaria infection (AOR 0.47; 95% CI: 0.25–0.90; P = 0.021), consumption of fish and snails (COR 0.30; 95% CI: 0.11–0.82; P = 0.02), occupation (COR 3.0; 95% CI: 1.07–8.40; P = 0.037), and number of antenatal care visits (COR 0.04; 95% CI: 0.27–0.96; P = 0.04). The study concluded that the prevalence of anemia among antenatal care attendees at Sunyani Municipal Hospital was high. It emphasized the importance of educating women on early antenatal booking, the impact of maternal age and occupation, malaria prevention and treatment, and dietary guidance during pregnancy.

RESEARCH METHODOLOGY

The research methodology outlines the general pattern of organizing procedures for gathering valid and reliable data to address the problem under investigation.

Research methodology is necessary because it facilitates the smooth execution of various research operations, thereby making the research process more efficient and yielding maximal information with minimal expenditure of effort, time, and money.

The methodology provides the framework for conducting the study. It includes the research design, research approach, setting, population, sample and sample size, sampling technique, development and description of the tool, validity and reliability, pilot study, data collection process, and plan for data analysis (Figure 2).

Research Approach

The research approach refers to the fundamental procedure for collecting data in a specific research context. In this study, a non-experimental comparative approach was selected. This approach provides a wide scope for data collection, allowing the use of various techniques and tools for observational studies. For the present study, an observational checklist was used to assess fetal outcomes.

The study aimed to compare fetal outcomes between anemic and non-anemic mothers at Sultania Zanana Hospital, Bhopal.

Research Design

Research design refers to a plan for organizing a scientific investigation. It concerns the overall framework for conducting the study and includes the plan, structure, and strategy adopted by the investigators to answer the research question.

Research design assists the investigation in selecting subjects, manipulating variables, and deciding on the type of statistical analysis to interpret the data.

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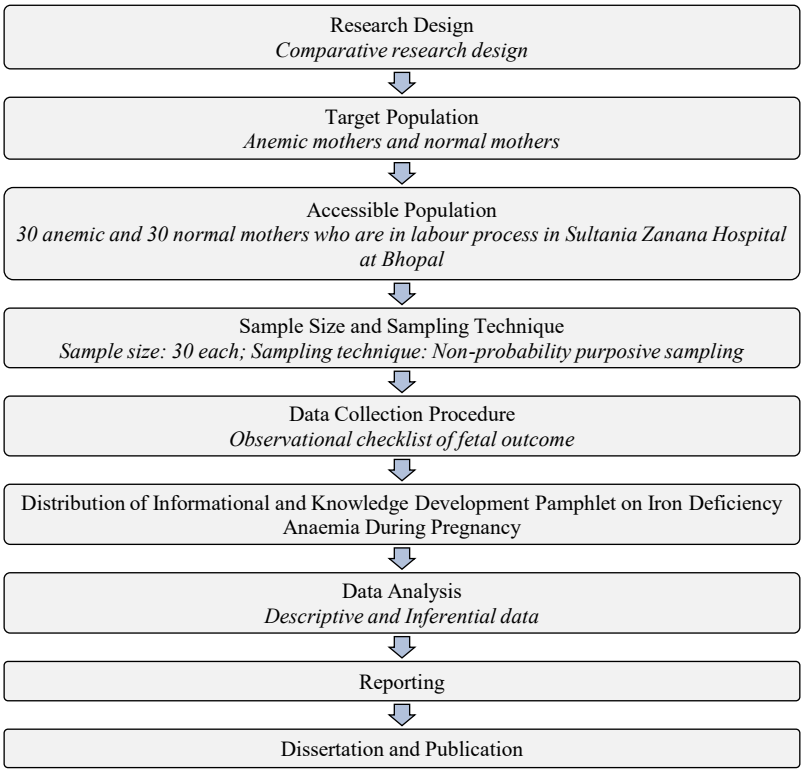

Figure 2. Schematic representation of research methodology.

A comparative non-experimental design was considered appropriate for the present study to assess fetal outcomes among anemic and non-anemic mothers and their relationship with selected variables. The research design was utilized to achieve the stated objectives (Figure 3).

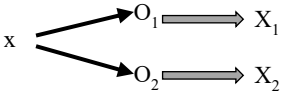

Figure 3. Research design. Notation: O_1 = anemic mothers; O_2 = non-anemic mothers; X = fetal outcome; X_1 = fetal outcome of non-anemic mothers; X_2 = fetal outcome of anemic mothers.

Variables Under Study

Variables are the qualities, properties, or characteristics of persons, objects, or situations that change or vary and can be manipulated or measured in research.

Independent Variable

In this study, the fetal outcome is the independent variable.

Dependent Variable

In this study, the knowledge gained by the participants regarding fetal outcomes among anemic and non-anemic mothers is the dependent variable.

Demographic Variables

In this study, age, religion, family income, source of previous knowledge, residence, and dietary habits are considered demographic variables.

Clinical Variables

In this study, gravida, hemoglobin (Hb) level, type of delivery, sex of the newborn, and weight of the mother are the clinical variables.

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Research Setting of the Study

The research setting refers to the physical location and conditions under which data collection occurs. Selecting an appropriate setting is crucial for the successful completion of a study.

The pilot study was conducted at Matratva Hospital, Kolar, while the main study was carried out in the labor and receiving rooms at Sultania Zanana Hospital, Bhopal.

Study Population

Polit and Hungler (2004) define the population as the entire set of individuals or subjects with common characteristics, sometimes referred to as the universe.

Target Population

The target population refers to the group to which the researcher intends to generalize the findings. In this study, the target population included mothers admitted to Sultania Zanana Hospital, Bhopal, who met the study criteria.

Accessible Population

The accessible population comprises cases that are available to the researcher for data collection. In this study, the accessible population consisted of anemic and non-anemic mothers present in the labor and receiving rooms of Sultania Zanana Hospital, Bhopal. (Sultania Zanana Hospital was selected for the main study, and Matratva Hospital was selected for the pilot study.)

Sample

The sample consisted of a subset of the population selected to participate in the study. Mothers from Bhopal who met the inclusion criteria were included.

Sample Size

A total of 60 mothers were selected: 30 anemic and 30 non-anemic mothers from Sultania Zanana Hospital, Bhopal. The sample size was determined based on the study type, the variables being investigated, the required statistical significance, the availability of participants, and the feasibility of conducting the study. The findings from the pilot study also guided the determination of sample size.

Sampling Technique

A non-probability purposive sampling technique was used for selecting participants. Inclusion and exclusion criteria were established by the researcher, and only those mothers who met these criteria were included. The purpose of this sampling technique is to increase representativeness and minimize bias and sampling errors.

Sampling Criteria

Inclusion Criteria

- Normal mothers, both primipara and multipara, with good obstetric history.
- Intranatal mothers with anemia.
- Mothers are willing to participate in the study.
- Intranatal mothers present during the data collection period.
- Mothers who can understand Hindi.

Exclusion Criteria

- Mothers with any gynecological disorder during pregnancy.
- Mothers who delivered neonates via LSCS (lower segment cesarean section or cesarean section).
- Mothers who were not available during data collection.
- High-risk mothers other than those with anemia.

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Research Tool

Selection of Tool

A research tool is an instrument used by the researcher to collect data. In this study, demographic data were collected using a structured baseline pro forma prepared by the investigator. The comparison of fetal outcomes was assessed using an observational checklist designed for fetal outcome assessment, along with clinical variables of the mothers.

Development of the Tool

In research, an instrument refers to the tools used for data collection. An observational checklist for assessing fetal outcomes was prepared by the investigator to evaluate and compare fetal outcomes among anemic and normal mothers.

Steps in Tool Development

Review of literature—Relevant literature from books, journals, periodicals, and published/unpublished articles was reviewed prior to tool preparation.

Development of blueprint—A blueprint was prepared before developing the demographic variables, clinical variables, and checklist to ensure that all questions aligned with evidence-based nursing practice and effectively assessed fetal outcomes.

Draft preparation and content validity—The first draft of the checklist, clinical variables, and demographic variables was prepared and sent to experts for content validation.

Final draft—Based on feedback from experts, the final versions of the checklist, clinical variables, and demographic variables were prepared and used in the study.

Description of the Tool

To determine significant differences in fetal outcomes between anemic and normal mothers, an observational checklist and clinical variables were constructed, comprising a total of 15 items.

Section A: Demographic Data

Demographic data includes the following items: age, religion, residence, source of prior information, monthly family income, and dietary habits.

Section B: Clinical Variables

Clinical variables include the following items: maternal hemoglobin (Hb) level, type of delivery, gravida, sex of the newborn, and maternal weight.

Section C: Fetal Outcome

Fetal outcome includes the following items: Apgar score, newborn weight, newborn temperature, newborn crown–heel length, newborn head circumference, newborn chest circumference, newborn mid-arm circumference, newborn abdominal circumference, newborn genitalia, and congenital malformation.

Table 1. Distribution of fetal outcome score.

Level of fetal outcome	Score
Poor	0–10
Average	11–20
Good	21–30

The total maximum score of the tool was 30, and the minimum score was 0. Scores were graded as follows: 0–10 = poor, 11–20 = average, and 21–30 = good. The tool was prepared in both English and Hindi to facilitate comprehension (Table 1).

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Feasibility of the Study

The feasibility of the study was demonstrated by conducting a small-scale trial test on a limited number of participants, as in a pilot study.

The primary reasons for selecting the nursing college for the research study were:

- Geographical proximity
- Ethical clearance
- Transportation facility
- Administrative approval
- Cooperation and availability of participants meeting the study criteria

Content Validity of the Tool

Content validity refers to the degree to which an instrument accurately measures what it is intended to measure. The prepared instrument, along with a validity-seeking letter, acceptance form, problem statement, objectives, hypotheses, operational definitions, blueprint, criteria checklist, and answer key, was submitted to ten experts in the field of obstetrics and gynecological nursing for content validation.

Suggestions and recommendations provided by the experts were incorporated, and necessary modifications were made to refine the tool. After these revisions, the final version of the tool was developed and used in the study.

Pilot Study

According to Treece and Treece (1999), a pilot study is a small preliminary investigation of the same general nature as the major study, designed to familiarize the researcher with potential problems that can be addressed before conducting a larger study.

The purpose of this pilot study was to determine the feasibility of the study, assess the clarity of language in the tool, and finalize the plan for data analysis.

The pilot study was conducted at Matratva Hospital, Kolar, Bhopal. Prior permission was obtained from the respective authorities before data collection.

The sample size for the pilot study was six mothers. Data were collected from respondents who met the inclusion criteria, and the purpose of the study was explained to each participant.

Analysis of the pilot study revealed that the objectives were achieved. Based on these findings, the investigator proceeded with data collection for the main study.

Reliability of the Tool

The reliability of a research instrument refers to the degree of consistency with which it measures the attribute it is intended to measure. The tool was tested for reliability on six mothers (three anemic and three normal mothers).

The reliability of the tool was determined using the Spearman-Brown split-half method, which measures internal consistency. The reliability coefficients were found to be r = 0.90 for fetal outcome and r = 0.90 for attitude, indicating that the tool was highly reliable.

The correlation was calculated using Karl Pearson's split-half formula:

Karl Pearson's Formula: $r = \frac{\sum xy}{\sqrt{(\sum x)^2 (\sum y)^2}}$

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Procedure for Data Collection

Prior to data collection, written permission was obtained from the respective authorities. Data collection for the main study was carried out in the same manner as the pilot study (Table 2).

Table 2. Data collection procedure.

	Anemic mother	Non-anemic mother
The data collection was conducted over a period of one week. The investigator collected data from a total of 60 mothers, including 30 anemic and 30 normal mothers. All participants were selected from Sultania Zanana Hospital, Bhopal.	***Day 1***	
	4	6
	Day 2	
	7	4
	Day 3	
	5	7
	Day 4	
	5	6
	Day 5	
	9	7
	30	30

Plans for Data Analysis

Data analysis is the systematic organization and synthesis of research data, along with testing research hypotheses using these data.

The data obtained from 60 mothers (30 anemic and 30 normal) were analyzed using descriptive and inferential statistics. The steps in data collection and analysis included:

1. Obtaining permission from the concerned authorities.
2. Explaining the purpose of the study to the participants.
3. Obtaining informed consent from each participant.
4. Analyzing socio-demographic data using descriptive statistics, including frequency and percentage.
5. Analyzing clinical variables using descriptive statistics, including frequency and percentage.
6. Analyzing fetal outcome data using descriptive statistics, including frequency and percentage.
7. Computing the unpaired 't' value to determine the significance of differences between the means of anemic and normal mothers.
8. Assessing associations between fetal outcomes and demographic/clinical variables using the chi-square test.

ANALYSIS AND INTERPRETATION OF DATA

Analysis is defined as the process of organizing and synthesizing data in a way that research questions can be answered and hypotheses can be tested.

This article deals with the analysis, interpretation, and comparison of data collected using an observational checklist of fetal outcomes. Data were also collected regarding socio-demographic profiles and clinical variables. The sample comprised 60 mothers, including 30 anemic and 30 non-anemic mothers. Data were analyzed according to the objectives of the study using both descriptive and inferential statistical methods.

Organization of Study Findings

Section A: Analysis of demographic and clinical data of anemic and normal mothers.

- *A.1:* Frequency and percentage distribution of anemic and normal mothers according to socio-demographic variables.

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- *A.2:* Frequency and percentage distribution of anemic and normal mothers according to clinical variables.

Section B: Findings related to fetal outcome scores of normal and anemic mothers.

Section C: Association between fetal outcome scores and selected variables.

- *C.1:* Association of fetal outcomes in anemic and normal mothers with selected demographic variables.
- *C.2:* Association of fetal outcomes in anemic and normal mothers with selected clinical variables.

Section A.1: Findings Related to Demographic Variables of Anemic and Normal Mothers According to Socio-Demographic Variables

The distribution of mothers according to age revealed the following:

- 20% of normal mothers and 30% of anemic mothers were in the age group <20 years.
- 33.33% of anemic mothers and 40% of normal mothers were in the age group 21–25 years.
- 30% of anemic mothers and 36.66% of normal mothers were in the age group 26–30 years.
- 13.33% of anemic mothers and 10% of normal mothers were in the age group 31–35 years.
- 3.33% of anemic mothers and 3.33% of normal mothers were aged 35 years and above (Table 3 and Figure 4).

Table 3. Frequency and percentage distribution of anemic and normal mothers according to age (n = 60).

S.N.	Age	Anemic		Non-anemic	
		Frequency	***Percentage***	***Frequency***	***Percentage***
1	<20	6	20%	9	30%
2	21–25	10	33.33%	6	20%
3	26–30	9	30%	10	33.33%
4	31–35	4	13.33%	3	10%
5	35 and above	1	3.33%	1	3.33%
	Total	*30*	*100%.*	*30*	*100%*

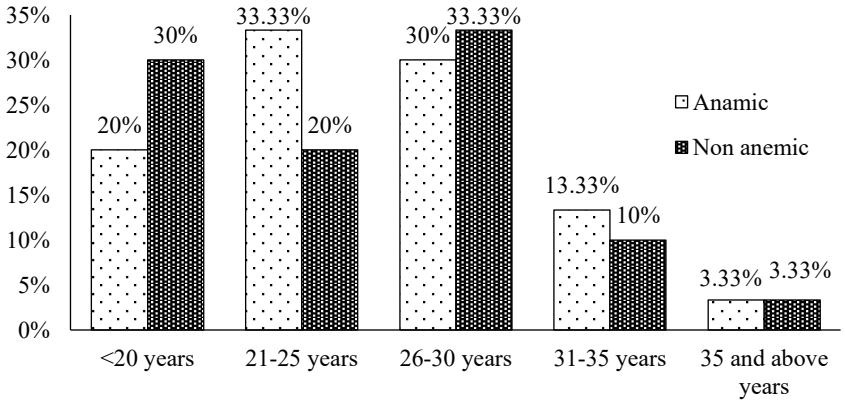

Figure 4. Graph showing the distribution of anemic and normal mothers according to age.

The distribution of mothers according to religion revealed the following:

- 30% of normal mothers and 20% of anemic mothers were Hindu.
- 50% of anemic mothers and 56.66% of normal mothers were Muslim.
- 6.66% of anemic mothers and 6.66% of normal mothers were Christian.
- 13.33% of anemic mothers and 16.66% of normal mothers belonged to other religions (Table

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4 and Figure 5).

Table 4. Frequency and percentage distribution of anemic and normal mothers according to religion (n = 60).

S.N.	Religion	Anemic		Non-anemic	
		Frequency	***Percentage***	***Frequency***	***Percentage***
1	Hindu	9	30	6	20
2	Muslim	15	50	17	56.66
3	Christian	2	6.66	2	6.66
4	Others	4	13.33	5	16.66
	Total	*30*	*100%.*	*30*	*100%*

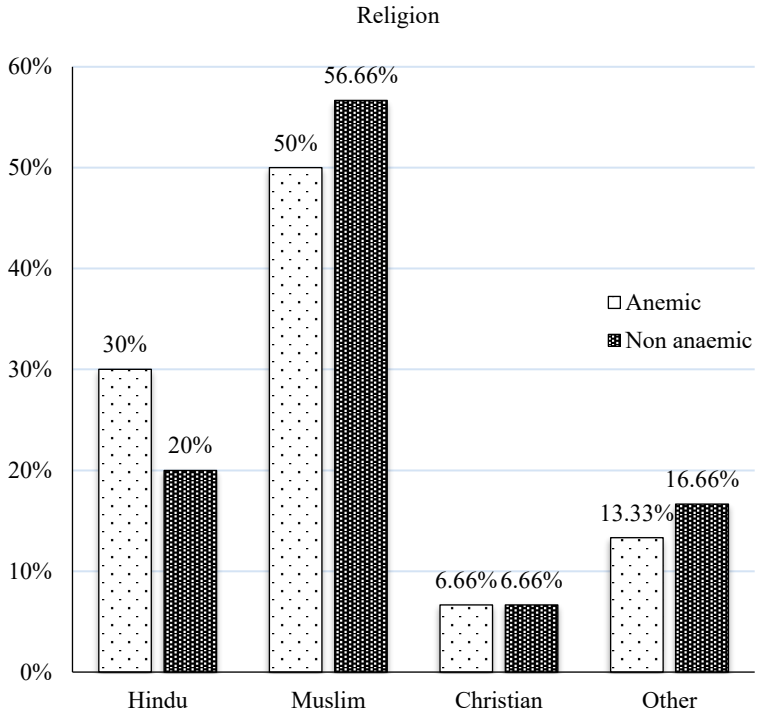

Figure 5. Column diagram showing the distribution of anemic and normal mothers according to religion.

Table 5. Frequency and percentage distribution of anemic and normal mothers according to type of family (n = 60).

S.N.	Type of family	Anemic		Non-anemic	
		Frequency	***Percentage***	***Frequency***	***Percentage***
1	Nuclear family	4	13.33	10	33.33
2	Joint family	15	50	12	40
3	Extended family	11	36.66	8	26.66
	Total	*30*	*100%.*	*30*	*100%*

The distribution of mothers according to the type of family revealed the following:

- 13.33% of normal mothers and 33.33% of anemic mothers belonged to nuclear families.
- 50% of anemic mothers and 40% of normal mothers belonged to joint families.
- 36.66% of anemic mothers and 26.66% of normal mothers belonged to extended families (Table 5 and Figure 6).

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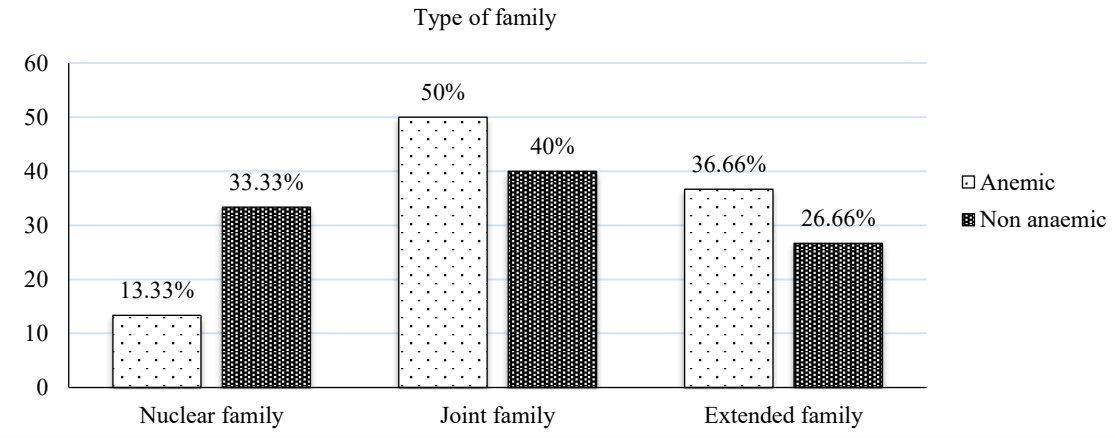

Figure 6. Column diagram showing the distribution of anemic and normal mothers according to the type of family.

Table 6. Frequency and percentage distribution of anemic and normal mothers according to family income (n=60).

S.N.	Family income	Anemic		Non-anemic	
		Frequency	***Percentage***	***Frequency***	***Percentage***
1	5000–10000	10	33.33	3	10
2	10001–15000	11	36.66	10	33.33
3	15001–20000	6	20	8	26.66
4	20000 or above	3	10	9	30
	Total	*30*	*100%.*	*30*	*100%*

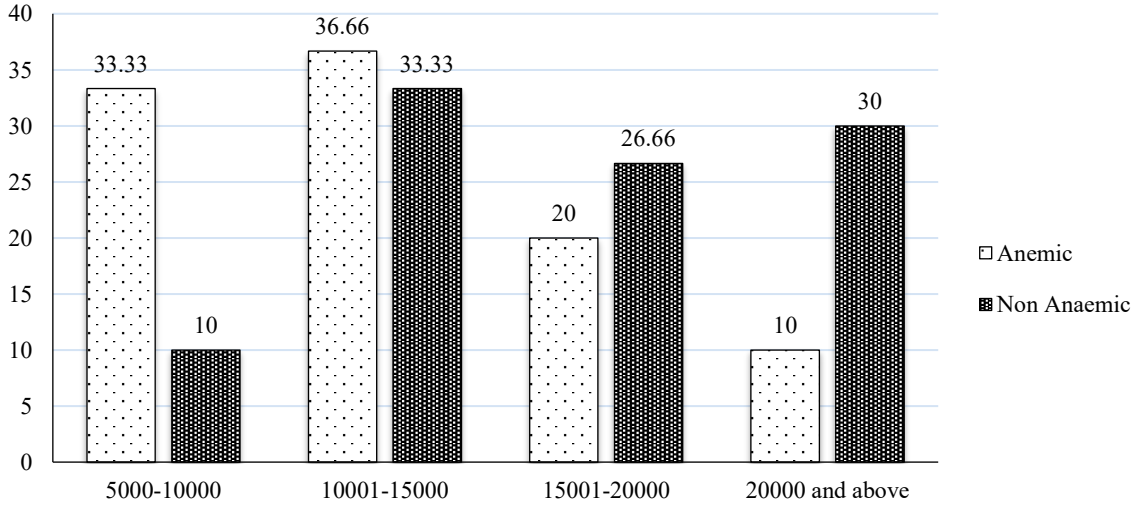

Figure 7. Column diagram showing the distribution of anemic and normal mothers according to family income.

The distribution of mothers according to family income revealed the following:

- 33.33% of normal mothers and 10% of anemic mothers had a family income of 5,000–10,000.
- 36.66% of anemic mothers and 33.33% of normal mothers had a family income of 10,001–15,000.
- 20% of anemic mothers and 26.66% of normal mothers had a family income of 15,001–20,000.
- 10% of anemic mothers and 30% of normal mothers had a family income of 20,000 or above (Table 6 and Figure 7).

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Table 7. Frequency and percentage distribution of anemic and normal mothers according to dietary habits (n = 60).

S.N.	Dietary habits	Anemic		Non-anemic	
		Frequency	***Percentage***	***Frequency***	***Percentage***
1	vegetarian	13	43.33	10	33.33
2	Non-vegetarian	17	56.66	20	66.66
	Total	*30*	*100%.*	*30*	*100%*

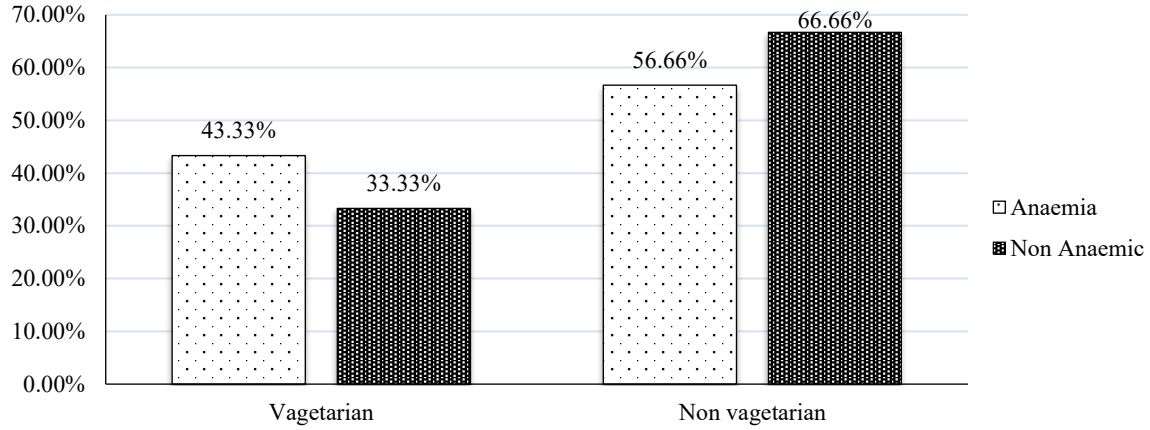

Figure 8. Column diagram showing the distribution of anemic and normal mothers according to dietary habits.

The distribution of mothers according to dietary habits revealed the following:

- 43.33% of anemic mothers and 33.33% of normal mothers were vegetarians.
- 56.66% of anemic mothers and 66.66% of normal mothers were non-vegetarians (Table 7 and Figure 8).

Table 8. Frequency and percentage distribution of anemic and normal mothers according to source of prior information (n = 60).

S.N.	Source of prior information about anemia	Anemic		Non-anemic	
		Frequency	***Percentage***	***Frequency***	***Percentage***
1	Mass media	3	10	6	20
2	Health professionals	10	33.33	8	26.66
3	Peer group	15	50	13	43.33
4	No information	2	6.66	3	10
	Total	*30*	*100%.*	*30*	*100%*

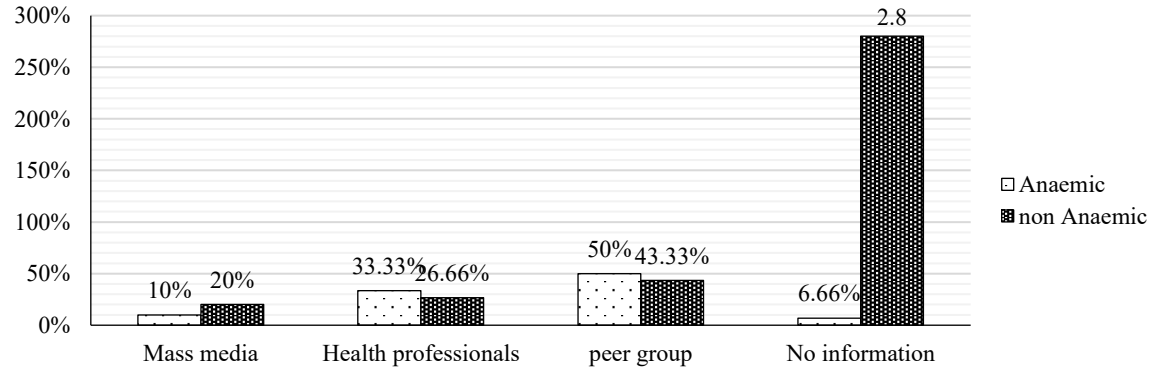

Figure 9. Column diagram showing the distribution of anemic and normal mothers according to the source of prior information.

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The distribution of mothers according to source of prior information revealed the following:

- 10% of anemic mothers and 20% of normal mothers received information from mass media.
- 33.33% of anemic mothers and 26.66% of normal mothers received information from health professionals.
- 50% of anemic mothers and 43.33% of normal mothers received information from peer groups.
- 6.66% of anemic mothers and 10% of normal mothers had no prior information (Table 8 and Figure 9).

Table 9. Frequency and percentage distribution of anemic and normal mothers according to residence (n = 60).

S.N.	Residence	Anemic		Non-anemic	
		Frequency	***Percentage***	***Frequency***	***Percentage***
1	Rural	19	63.33	12	40
2	Urban	11	36.66	18	60
	Total	*30*	*100%.*	*30*	*100%*

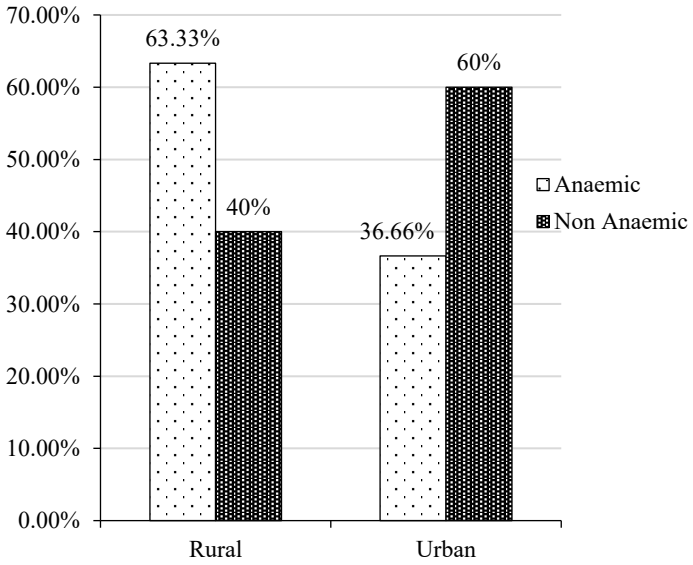

Figure 10. Column diagram showing the distribution of anemic and normal mothers according to residence.

The distribution of mothers according to residence revealed the following:

- 63.33% of anemic mothers and 40% of normal mothers were from rural areas.
- 36.66% of anemic mothers and 60% of normal mothers were from urban areas (Table 9 and Figure 10).

Section A.2. Findings Related to Clinical Variables of Anemic and Normal Mothers

The distribution of mothers according to Hb level revealed that:

- 100% of anemic mothers had Hb levels below 10 g/dL.
- 100% of non-anemic mothers had Hb levels above 10 g/dL (Table 10 and Figure 11).

The distribution of mothers according to gravida revealed the following:

- 36.66% of anemic mothers and 40% of normal mothers were primigravida.
- 63.33% of anemic mothers and 60% of normal mothers were multigravida (Table 11 and Figure 12).

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Table 10. Frequency and percentage distribution of anemic and normal mothers according to their Hb level (n = 60).

S.N.	Hb level of the mother	Anemic		Non-anemic	
		Frequency	***Percentage***	***Frequency***	***Percentage***
1	<10 g%	30	100	00	00
2	>10 g%	00	00	30	30
	Total	*30*	*100%.*	*30*	*100%*

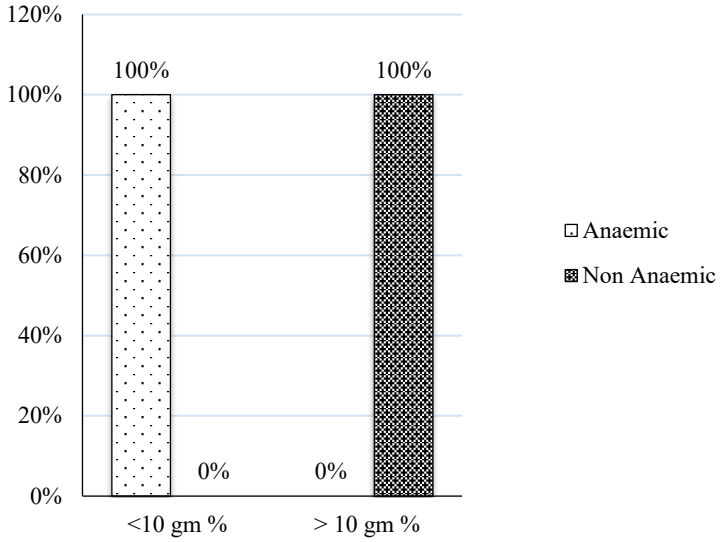

Figure 11. Column diagram showing the distribution of anemic and normal mothers according to their Hb level.

Table 11. Frequency and percentage distribution of anemic and normal mothers according to the gravida of the mother (n = 60).

S.N.	Gravida of the mother	Anemic		Non-anemic	
		Frequency	***Percentage***	***Frequency***	***Percentage***
1	Primigravida	11	36.66	12	40
2	Multigravida	19	63.33	18	60
	Total	*30*	*100%.*	*30*	*100%*

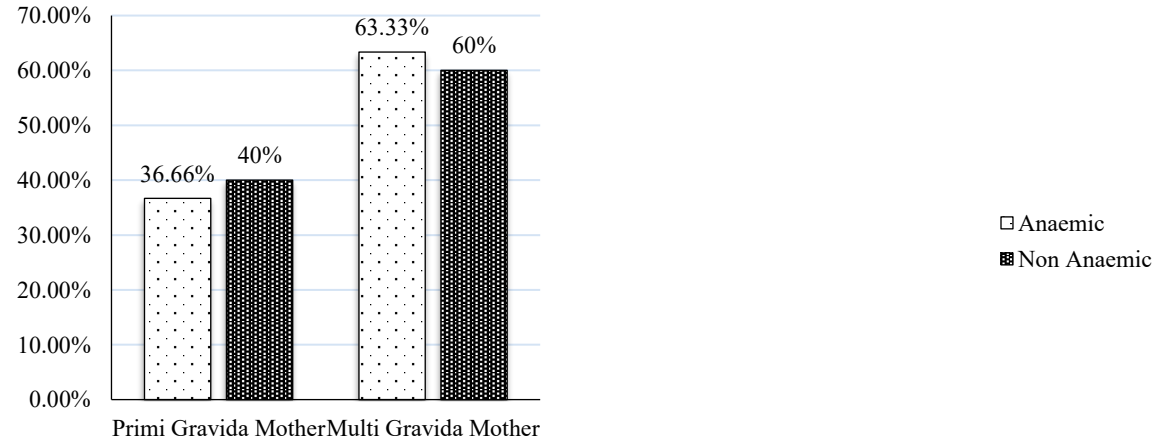

Figure 12. Column diagram showing the distribution of anemic and normal mothers according to gravida.

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Table 12. Frequency and percentage distribution of anemic and non-anemic mothers according to the sex of the newborn (n = 60).

S.N.	Sex of the newborn	Anemic		Non-anemic	
		Frequency	***Percentage***	***Frequency***	***Percentage***
1	Boy	10	33.33	19	63.33
2	Girl	20	66.66	11	36.33
	Total	*30*	*100%.*	*30*	*100%*

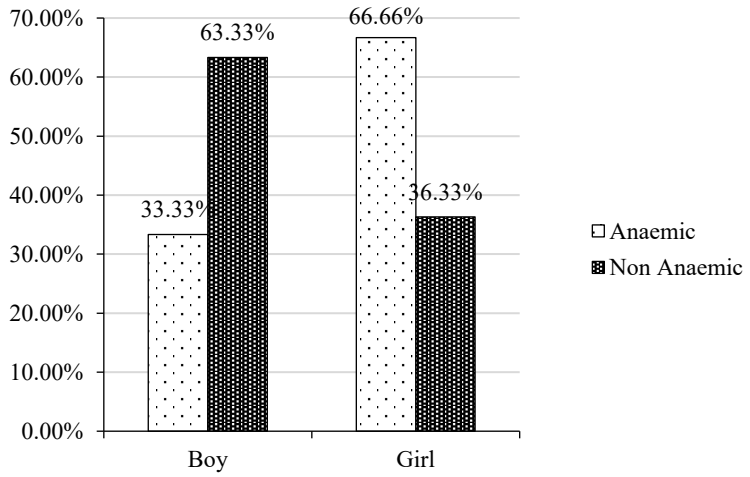

Figure 13. Column diagram showing the distribution of anemic and non-anemic mothers according to the sex of the newborn.

The distribution of newborns according to sex revealed that:

- 33.33% of anemic mothers and 63.33% of normal mothers had male babies.
- 66.66% of anemic mothers and 36.66% of normal mothers had female babies (Table 12 and Figure 13).

Table 13. Frequency and percentage distribution of anemic and non-anemic mothers according to type of delivery (n = 60).

S.N.	Type of delivery	Anemic		Non-anemic	
		Frequency	***Percentage***	***Frequency***	***Percentage***
1	Preterm delivery	9	30	2	6.66
2	post-term delivery	10	33.33	4	13.33
3	At term delivery	11	36.66	24	80
	Total	*30*	*100%*	*30*	*100%*

The distribution of mothers according to the type of delivery revealed that:

- 30% of anemic mothers and 6.66% of normal mothers had preterm deliveries.
- 33.33% of anemic mothers and 13% of normal mothers had post-term deliveries.
- 36.66% of anemic mothers and 80% of normal mothers had term deliveries (Table 13 and Figure 14).

The distribution of mothers according to weight revealed that:

- 36.66% of anemic mothers and 20% of normal mothers weighed 39–47 kg.
- 50% of anemic mothers and 40% of normal mothers weighed 48–56 kg.
- 13.33% of anemic mothers and 60% of normal mothers weighed 57 kg and above (Table 14 and Figure 15).

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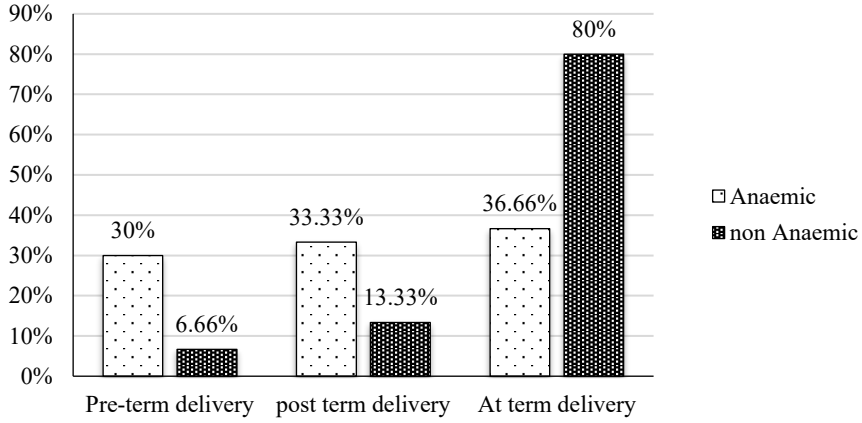

Figure 14. Column diagram showing the distribution of anemic and non-anemic mothers according to the type of delivery.

Table 14. Frequency and percentage distribution of clinical variables of anemic and non-anemic mothers (n = 60).

S.N.	weight of the mother	Anemic		Non-anemic	
		Frequency	***Percentage***	***Frequency***	***Percentage***
1	30–38 kg	00	00	00	00
2	39–47 kg	11	36.66	6	20
3	48–56 kg	15	50	12	40
4	57 kg or above	4	13.33	18	60
	Total	*30*	*100%.*	*30*	*100%*

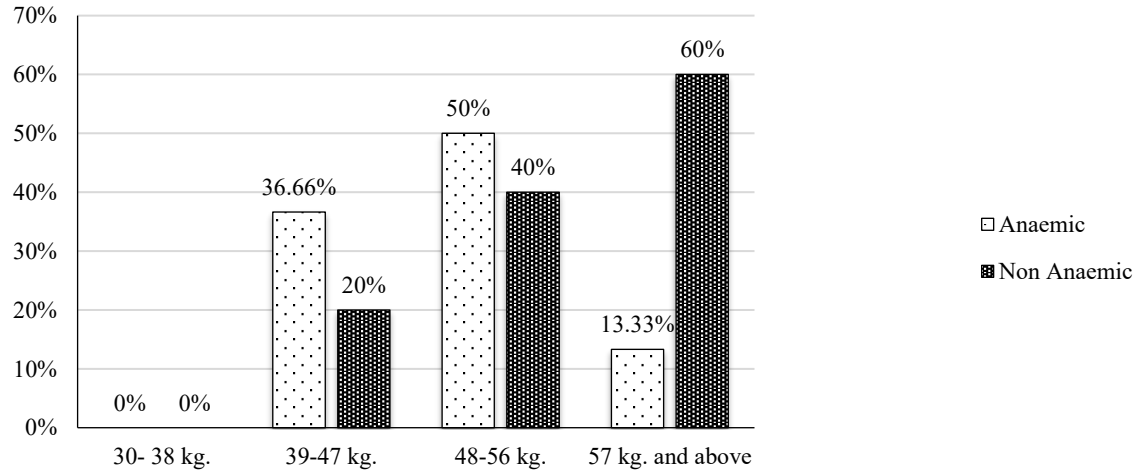

Figure 15. Column diagram showing the distribution of clinical variables of anemic and non-anemic mothers.

Section B. Frequency and Percentage Distribution of Fetal Outcomes Among Anemic and Non-Anemic Mothers

- The majority of babies had no depression: 66.66% of babies born to anemic mothers and 93.33% of babies born to normal mothers.
- Baby weight of 2.5–3.1 kg was observed in 50% of anemic mothers and 86.66% of normal mothers.
- Baby temperature of 96.8–97.7°F was observed in 27% of babies born to anemic mothers and 90% of babies born to normal mothers.

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- Crown–heel length of 50–52 cm was observed in 60% of babies born to anemic mothers and 80% of babies born to normal mothers.
- Head circumference of 33–35 cm was found in 83.33% of babies of anemic mothers and 80% of normal mothers; chest circumference of 30–33 cm in 83.33% of anemic and 80% of normal mothers; mid-arm circumference in 73.33% of anemic and 90% of normal mothers; abdominal circumference of 31–32 cm in 83.33% of anemic and 80% of normal mothers.
- 100% of babies born to both anemic and normal mothers had no congenital malformations.
- Gender distribution: 33.33% of babies born to anemic mothers and 66.66% of babies born to normal mothers were female (Table 15).

Table 15. Comparison of fetal outcomes between anemic and normal mothers.

S.N.	Fetal outcome	Anemic (n_1=30)		Non-anemic (n_2 = 30)	
		f_1	%	f_2	%
1.	***Apgar score***				
	Severely depressed (0–3)	3	10	00	00
	Moderately depressed (4–6)	7	23.33	2	6.66
	Excellent condition (7–10)	20	66.66	28	93.33
2.	***Weight of newborn***				
	<2.5 kg	13	43.33	2	6.66
	2.5–3.1 kg	15	50	26	86.66
	>3.1 kg	2	6.66	2	6.66
3.	***Temperature of newborn (axillary)***				
	<96.8°F	3	10	1	3.33
	96.8–97.70°F	27	90	27	90
	>97.70°F	00	00	2	6.66
4.	***Crown–heel length of newborn***				
	<50 cm	12	40	2	6.66
	50–52 cm	18	60	24	80
	>52 cm	00	00	3	10
5.	***Head circumference of newborn***				
	<35 cm	5	16.66	2	6.66
	33–35 cm	25	83.33	24	80
	>35 cm	00	00	4	13.33
6.	***Chest circumference of newborn***				
	<30 cm	4	13.33	2	6.66
	30–33 cm	25	83.33	24	80
	>33 cm	1	3.33	4	13.33
7.	***Mid-arm circumference***				
	<8.2 cm	6	20	1	3.33
	8.2–9.7 cm	22	73.33	27	90
	>9.7 cm	2	6.66	2	6.66
8.	***Abdominal circumference***				
	<31 cm	4	13.33	2	6.66
	31–32 cm	25	83.33	24	80
	>32 cm	1	3.33	4	13.33

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9.	***Genitalia of newborn***				
	Boy baby				
	Testes are not palpable	00	00	00	00
	Scrotum is big, and testes are palpable	10	33.33	19	63.33
	Girl baby				
	Labia is covered with labia majora	00	00	00	00
	Labia minora is visible	20	66.66	11	36.66
	Clitoris is not visible	00	00	00	00
10.	***Abnormalities at birth***				
	Physical abnormalities	00	00	00	00
	Organic abnormalities	00	00	00	00
	Absent	30	100	30	100

Section C. This Section Deals with the Association Between Fetal Outcome Scores and Selected Variables

- Among anemic mothers, out of 30 participants, 16.66% had poor fetal outcomes, 43.33% had average fetal outcomes, and 40% had good fetal outcomes.
- Among normal mothers, 83.33% had good fetal outcomes, and 16.66% had average fetal outcomes (Table 16).

Table 16. Comparison of fetal outcomes between anemic and normal mothers (n = 60).

Group	Fetal outcome					
	Poor		***Good***		***Average***	
	n_1	%	n_2	%	n_3	%
Anemic	5	16.66	12	40	13	43.33
Non-anemic	00	00	25	83.33	5	16.66

Table 17. Comparison of fetal outcomes of anemic and normal mothers.

Area	Mean	Mean %	SD	DF	Unpaired t-test
Anemic	18.96	189.6	4.16	58	4.57
Non-anemic	22.76	227.6	1.59		
Level of significance	Table value 2.617 ($p \geq 0.05$), t = 4.57, highly significant				

Fetal outcomes among anemic and normal mothers, when compared based on the source of information, show that the lowest mean percentage value is 189.6% in anemic mothers and the highest mean percentage value is 227.6% in normal mothers. The standard deviation (SD) is 4.16 for anemic mothers and 1.59 for normal mothers, and the degrees of freedom (df) is 58. The table value is 2.617 ($p > 0.05$), and the unpaired t-test value is 4.57, which reveals a highly significant difference; therefore, the hypothesis (H_1) is accepted (Table 17).

It was revealed that there is a highly significant association between religion, type of family, and family income of the anemic mothers. Therefore, the hypothesis (H2) is accepted only for these variables. However, there is no significant association between age, dietary habits, source of prior information, and place of residence (Table 18).

It was revealed that there is a highly significant association between the age of normal mothers; therefore, the hypothesis (H3) is accepted only for this variable. However, there is no significant association between religion, type of family, family income, dietary habits, source of prior information, and place of residence (Table 19).

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Table 18. Association of fetal outcomes of anemic mothers with their selected demographic variables.

S.N.	Socio-demographic variables	Anemic ($n_1 = 30$)					Non-anemic ($n_2 = 30$)		
	Age (in years)	***Poor***	***Average***	***Good***	***Frequency***	***Chi-square***	***DF***	***Probability***	***Interference***
1.	<20	2	4	0	6	6.612	**8**	15.51	NS
	21–25	2	5	4	11				
	26–30	2	5	1	8				
	31–35	0	3	1	4				
	35 or above	0	0	1	1				
2.	***Religion***								
	Hindu	2	3	4	9	45.9	6	12.59	HS
	Muslim	2	8	5	15				
	Christian	1	0	1	2				
	Others	0	2	2	4				
3.	***Type of family***								
	Nuclear family	0	2	2	4	37.019	4	9.49	NS
	Joint family	1	10	4	15				
	Extended family	4	1	6	11				
4.	***Family income***								
	5000–10000	3	5	2	10	165.38	6	12.59	HS
	10001–15000	2	4	5	11				
	15001–20000	0	1	5	6				
	20000 or above	0	3	0	3				
5.	***Dietary habits***								
	Vegetarian	2	5	9	16	1.348	2	5.99	NS
	Non-vegetarian	3	8	3	14	3.157	2	5.99	NS
6.	***Residence***								
	Rural	2	9	7	18	1.348	2	5.99	NS
	Urban	3	4	5	12				
7.	***Source of prior information about anemia***								
	Mass media	1	2	0	3				
	Health professionals	2	3	5	10				
	Peer group	2	8	5	15				
	No information	0							

Table 19. Association of fetal outcomes of normal mothers with their selected demographic variables.

S.N.	Age (in years)	Average	Good	Frequency	Chi-Square	DF	Probability	Interference
1	<20	1	2	3	36.366	4	9.49	HS
	21–25	1	11	12				
	26–30	1	10	11				
	31–35	1	2	3				
	35 or above	0	1	1				
2.	***Religion***							
	Hindu	0	1	1	1.159	3	7.82	NS
	Muslim	3	18	21				
	Christian	0	3	3				
	others	1	4	5				

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3.	***Type of family***							
	Nuclear family	1	9	10	0.798	2	5.99	NS
	Joint family	2	9	11				
	Extended family	1	8	9				
4.	***Family income***							
	5000–10000	0	3	3	0.886	3	7.82	NS
	10001–15000	2	8	10				
	15001–20000	1	7	8				
	20000 or above	1	8	9				
5.	***Dietary habits***							
	vegetarian	2	8	10	0.575	1	3.84	NS
	Non-vegetarian	2	18	20				
6.	***Residence***							
	Rural	3	12	15	1.152	1	3.84	NS
	Urban	1	14	15				
7.	***Source of prior information about anemia***							
	Mass media	1	5	6	1.43	3	7.82	NS
	Health professionals	1	7	8				
	Peer group	1	12	13				
	No information	1	2	3				

Table 20. Association of fetal outcomes of anemic mothers with their clinical variables.

S.N.	Clinical variables	Poor	Average	Good	Frequency	Chi-square	DF	Probability	Interference
1.	***Hb level of the mother***								
	<10 g%	5	13	12	30	**0**	2	5.99	NS
	>10 g%	0	0	0	0				
2.	***Gravida of the mother***								
	Primigravida	3	4	4	11	1.421	2	5.99	NS
	Multigravida	2	9	8	19				
3.	***Sex of the newborn***								
	Boy	0	5	5	10	3.026	2	5.99	NS
	Girl	5	8	7	20				
4.	***Type of delivery***								
	Preterm delivery	0	4	3	7	3.992	4	9.49	NS
	post-term delivery	3	5	2	10				
	At term delivery	3	4	6	13				
5.	***Weight of the mother***								
	30–38 kg	0	0	0	0	2.321	6	12.59	NS
	39–47 kg	2	6	3	11				
	48–56 kg	2	5	8	15				
	57 kg or above	1	2	1	4				

This revealed that there was no significant association between the Hb level of the mother, gravida, sex of the newborn, type of delivery, and weight of the mother among anemic mothers. Therefore, the hypothesis (H3) is rejected for these variables when considering the fetal outcomes of anemic mothers

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(Table 20).

Table 21. Association of fetal outcomes of non-anemic mothers with their clinical variables.

S.N.	Clinical variables	Average	Good	Frequency	Chi-square	DF	Probability	Interference
1.	***Hb level of the mother***							
	<10 g%	0	0	0	18.615	1	3.84	HS
	>10 g%	4	26	3.				
2.	***Gravida of the mother***							
	Primigravida	2	10	12	0.191	1	3.84	NS
	Multigravida	2	16	18				
3.	***Sex of the newborn***							
	Boy	3	16	19	0.269	1	3.84	NS
	Girl	1	10	11				
4.	***Type of delivery***							
	Preterm delivery	1	1	2	2.958	2	**5.99**	**NS**
	post-term delivery	0	4	4				
	At term delivery	3	21	24				
5.	**Weight of the mother**							
	30–38 kg	0	0	0	0.431	3	**7.82**	**NS**
	39–47 kg	1	5	6				
	48–56 kg	2	10	12				
	57 kg or above	1	11	12				

The findings revealed a highly significant association between the hemoglobin (Hb) level of anemic mothers and the fetal outcome. Therefore, hypothesis (H4) is accepted only for this variable. No significant association was found between the gravida of the mother, sex of the newborn, type of delivery, or weight of the mother (Table 21).

DISCUSSION

The discussion corresponds to the objectives and hypotheses of the study entitled "A Comparative Study to Assess the Fetal Outcome Among Normal and Anemic Mothers in Selected Hospitals at Bhopal."

Findings Related to Socio-Demographic Variables

The majority of the anemic mothers, 33.33% (n = 6), were in the age group of 21–25 years, while among normal mothers, 40% (n = 3) were in the same age group. Half of the anemic mothers (50%, n = 15) and 56.66% (n = 17) of the normal mothers belonged to the Muslim religion. Regarding family type, 50% (n = 15) of the anemic mothers were from joint families, whereas 40% (n = 12) and 33.33% (n = 10) of the non-anemic mothers were from joint and nuclear families, respectively.

Most of the anemic mothers, 36.66% (n = 11), had a monthly family income between ₹10,001 and ₹15,000, while among normal mothers, 33.33% (n = 10) were in the same income range. Additionally, 43.33% (n = 13) of anemic mothers were vegetarians, whereas 33.33% (n = 10) of normal mothers were non-vegetarians. About 33.33% (n = 10) of the anemic mothers had prior information regarding anemia, compared to 26.66% (n = 8) of the normal mothers.

Among the mothers, 63.33% (n = 19) of the anemic group were from rural areas, while 60% (n = 18) of the non-anemic mothers were from urban areas. Furthermore, non-anemic mothers generally had more prior knowledge about anemia than anemic mothers.

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The studies presented below support the aforementioned findings.

A researcher conducted a study in Mohali, Punjab, to compare fetal and placental outcomes between anemic and non-anemic mothers in a selected hospital. The study employed a quantitative, comparative research design and involved 100 mothers—50 anemic and 50 non-anemic—selected through purposive non-probability sampling to examine differences in fetal and placental outcomes between the two groups.

The data analysis revealed that the majority of anemic mothers (74%) were aged 21–30 years, while 86% of non-anemic mothers were in the same age group. Regarding family structure, 66% of anemic mothers belonged to joint families, whereas 71% of non-anemic mothers were from nuclear families. Nearly half of the anemic mothers (48%) had a family income between ₹5,001 and ₹10,000, while 66% of non-anemic mothers were within this income range. Sikhism was the predominant religion among both groups, with 44% of anemic and 58% of non-anemic mothers identifying as Sikh.

Educational attainment differed between groups: 46% of anemic mothers had primary education, whereas 32% of non-anemic mothers had completed secondary education. Most mothers in both groups were homemakers—78% among anemic and 66% among non-anemic participants. Dietary preferences also varied, with 54% of anemic mothers following a vegetarian diet compared to 66% of non-anemic mothers who were non-vegetarians. Geographically, 58% of anemic mothers resided in rural areas, whereas 60% of non-anemic mothers lived in urban settings.

Concerning fetal outcomes, 28% of anemic mothers experienced favorable results, while 72% of non-anemic mothers had good fetal outcomes. Conversely, poor fetal outcomes were more common among anemic mothers (68%) than among non-anemic mothers (32%).

The findings of the present study are further supported by another comparative study that evaluated fetal outcomes among anemic and non-anemic mothers. Using purposive sampling, this study included 40 participants—20 anemic and 20 non-anemic—who were admitted for care. The mean age of mothers in the anemic group was 22.81 ± 2.79 years, whereas the non-anemic group had a mean age of 23.49 ± 2.58 years. The majority of anemic mothers belonged to lower (41%), lower-middle (17%), and upper-lower (36%) socioeconomic classes, while most non-anemic mothers were from upper-middle (45%) and lower-middle (24%) classes. Additionally, a significantly larger proportion of anemic mothers (56%) had irregular antenatal checkups compared to only 8% of non-anemic mothers.

Findings Related to Clinical Variables

In the present study, all anemic mothers (100%, n = 30) had hemoglobin (Hb) levels below 10 g%, while all normal mothers (100%, n = 30) had Hb levels above 10 g%. Among the anemic mothers, 63.33% (n = 19) were multigravida, and 36.66% (n = 11) were primigravida. Similarly, among the normal mothers, 60% (n = 18) were multigravida, and 40% (n = 12) were primigravida. Regarding the sex of the newborn, 66.66% (n = 20) of anemic mothers and 63.33% (n = 19) of normal mothers gave birth to girl babies.

A 2017 study also reported similar findings. In that study, all anemic mothers had hemoglobin levels below 10 g%, whereas all non-anemic mothers had levels of 10 g% or higher. Among them, 54% of anemic and 50% of non-anemic mothers were multigravida. Regarding the sex of the newborns, 52% of anemic and 62% of non-anemic mothers delivered girl babies. Furthermore, 74% of anemic and 88% of non-anemic mothers experienced full-term deliveries.

Findings Related to Fetal Outcomes

The present study found that 66.66% of babies born to anemic mothers and 93.33% of babies born to normal mothers showed no signs of depression. Regarding birth weight, 50% of babies from anemic mothers and 86.66% from normal mothers weighed between 2.5 and 3.1 kg. Body temperature ranged

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from 96.8°F to 97.7°F in 27% of babies from anemic mothers and 90% of babies from normal mothers. Crown–heel length of 50–52 cm was observed in 60% of babies from anemic mothers and 80% from normal mothers. Head circumference between 33 and 35 cm was recorded in 83.33% of babies from anemic mothers and 80% from normal mothers. Chest circumference of 30–33 cm was found in 83.33% of babies from anemic mothers and 80% from normal mothers. Mid-arm circumference was observed in 73.33% of babies from anemic mothers and 90% from normal mothers, while the abdominal circumference of 31–32 cm was found in 83.33% of babies from anemic mothers and 80% from normal mothers. No congenital malformations were observed in babies from either group. Regarding sex, 33.33% of babies from anemic mothers and 66.66% from normal mothers were female.

A 2017 study reported similar findings. In that study, 80% of babies born to anemic mothers and 96% of those born to non-anemic mothers showed no depression. Birth weights between 2.5 and 3.1 kg were recorded in 68% of babies from anemic mothers and 96% of babies from non-anemic mothers. Temperatures ranging from 96.8°F to 97.7°F were observed in 94% of babies from anemic mothers and 96% from non-anemic mothers. Crown–heel lengths of 50–52 cm were noted in 68% of babies from anemic mothers and 96% from non-anemic mothers. Head circumference between 33 and 35 cm was found in 70% of babies from anemic mothers and 94% from non-anemic mothers. Chest circumference of 30–33 cm was recorded in 92% of babies from anemic mothers and 90% from non-anemic mothers. No congenital malformations were detected in either group, and both groups had an equal proportion of female infants (52%).

Findings Related to the Comparison

Among anemic mothers (n = 30), 16.66% had poor fetal outcomes, 43.33% had average fetal outcomes, and 40% had good fetal outcomes. In contrast, among normal mothers (n = 30), 16.66% had average fetal outcomes, and 83.33% had good fetal outcomes. The unpaired t-test value was 4.57, $p = 0.05$ (critical value = 2.617), indicating a highly significant difference.

Severe anemia during pregnancy is a dangerous blood disorder. The WHO reports that anemia affects 55.9% of pregnant women worldwide. In India, the highest prevalence of moderate anemia has been reported in the Nagaon District at 82.7%.

A related study evaluated the relationship between placental weight and fetal outcomes in mothers who delivered with and without anemia. The objectives were to compare placental weight and fetal outcomes between anemic and non-anemic mothers and to examine the relationship of placental weight and fetal outcomes with selected demographic variables. This study employed a quantitative comparative and descriptive research design at Krishna Hospital, Karad. Purposive sampling was used to select 62 anemic and 62 healthy mothers. Data were analyzed using descriptive and inferential statistics.

Results from the unpaired t-test indicated that anemic mothers had a significantly higher mean placental weight than normal mothers ($p < 0.05$). However, babies born to normal mothers had significantly higher average birth weight and length compared to those born to anemic mothers ($p < 0.05$). A significant association was observed between placental weight in normal mothers and their families' monthly income ($p < 0.05$). The study concluded that there is a strong positive correlation between placental weight and birth weight in both groups, indicating that an increase in placental weight corresponds to an increase in birth weight and vice versa.

Findings Related to Association with Socio-Demographic Variables

The assessment revealed that the socio-demographic variable age ($\chi^2 = 36.366$) was highly significant. Other socio-demographic variables—including family type, total family income, dietary habits, and residence of mothers—were not found to be significant.

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CONCLUSION

This study presents conclusions, implications, limitations, suggestions, scope, and recommendations. The primary focus was to assess fetal outcomes among anemic and normal mothers at Sultania Zanana Hospital, Bhopal.

The study involved the selection of anemic and normal mothers using purposive sampling, and data were collected using an observational checklist to assess fetal outcomes and clinical variables. The data were analyzed and interpreted using descriptive and inferential statistical methods.

Implications

In recent years, anemia among pregnant women has become a growing concern. Factors influencing maternal anemia include low socioeconomic status, younger maternal age, multiple pregnancies, pre-pregnancy underweight, faulty dietary habits, impaired nutrient absorption, increased iron loss (through sweat, repeated pregnancies, excessive menstrual bleeding), and inadequate intake of essential nutrients such as iron, folic acid, vitamin B12, proteins, amino acids, vitamin A, vitamin C, and other B-complex vitamins.

Implications for Nursing Education

These findings highlight the prevalence of stress and health challenges among bedside nurses. Nurse educators can incorporate prevention and management of anemia into nursing curricula to improve knowledge and practice.

Implications for Nursing Practice

The nursing profession is primarily responsible for providing care to patients; however, nurses may overlook self-care.

Nurses can monitor the health condition of both mother and baby. Findings from this study can help supervisors and other authorities provide relevant health information to mothers. Regular hospital visits can reduce the risk of anemia.

An informational pamphlet on iron deficiency anemia was distributed to mothers to increase awareness and reduce the risk of anemia.

Implications for Nursing Administrators

Nurse administrators can contribute to policy development that supports improved fetal outcomes among anemic and normal mothers, thereby enhancing patient care.

Several maternal and child health (MCH) programs organized by the Government of India aim to prevent anemia. Accredited Social Health Activist (ASHA) workers provide health-related information to mothers, and regular hospital visits further reduce anemia risk. This study offered valuable insights into the effectiveness of such interventions.

Implications for Nursing Research

The findings provide a foundation for further research on fetal outcomes among anemic and normal mothers. Future studies should emphasize research and clinical practices to improve fetal outcomes. This study is among the first to investigate fetal outcomes in this population.

Limitations

The study had certain limitations:

- The sample size was limited to 60 participants (30 anemic and 30 non-anemic mothers).
- Only mothers admitted to the labor room during the data collection period were included.
- Participation was limited to mothers who were available and willing to participate.

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Recommendations

Based on the findings and considering the limitations, the following recommendations are offered:

- The study can be replicated on a larger scale to generalize the findings.
- Future studies can assess the effectiveness of structured teaching programs on anemia during pregnancy.
- Research can focus on evaluating knowledge regarding iron deficiency anemia among antenatal mothers.
- Studies can explore the outcomes of mothers after targeted educational interventions on anemia.

REFERENCES

1. Smeltzer SC, Bare BG, Hinkle JL, Cheever KH. Brunner and Suddarth's Textbook of Medical-Surgical Nursing. Volume 2. 11th edition. Philadelphia (PA): Lippincott Williams & Wilkins; 2008.
2. Konar H. DC Dutta's Textbook of Gynecology. 8th edition. New Delhi: Jaypee Brothers Medical Publishers; 2020.
3. Perry ES, Lowdermilk DL. Maternity and Women's Health. London: Mosby Year Book; 2004.
4. Perry ES, Lowdermilk DL. Maternity and Women's Health. London: Mosby Year Book; 2004.
5. Annamma J. A Comprehensive Textbook of Midwifery. 2nd edition. New Delhi: Jaypee Brothers Medical Publishers; 2005. p. 324–6.
6. Wang J, Ren AG, Ye RW, Zheng JC, Li S, Liu JM, et al. A study on third trimester hemoglobin concentrations and the risk of low birth weight and preterm delivery. Zhonghua Liu Xing Bing Xue Za Zhi. 2007;28(1):15–8.
7. Agrawal VK, Agrawal P, Chaudhary V, Agarwal K, Agarwal A. Prevalence and determinants of "low birth weight" among institutional deliveries. Annals of Nigerian Medicine. 2011;5(2):48–52. DOI: 10.4103/0331-3131.92950.
8. Gangopadhyay R, Karoshi M, Keith L. Anemia and pregnancy: A link to maternal chronic diseases. Int J Gynaecol Obstet. 2011;115(Suppl 1):S11–S15. DOI: 10.1016/S0020-7292(11)60005-2.
9. Tandon R, Jain A, Malhotra P. Management of iron deficiency anemia in pregnancy in India. Indian J Hematol Blood Transfus. 2018;34:204–15. DOI: 10.1007/s12288-018-0949-6.
10. Raghu Raman TS, Parimala V, Bhalla M, Venkateshwar V, Iyengar A. A correlation study between maternal haemoglobin and birthweight. Med J Armed Forces India. 2001;57(2):110–3. DOI: 10.1016/S0377-1237(01)80126-X.
11. Gonzales GF, Steenland K, Tapia V. Maternal hemoglobin level and fetal outcome at low and high altitudes. Am J Physiol Regul Integr Comp Physiol. 2009;297:R1477–R1485. DOI: 10.1152/ajpregu.00275.2009.
12. Ghimire RH, Ghimire S. Maternal and fetal outcome following severe anaemia in pregnancy: Results from Nobel Medical College teaching hospital, Biratnagar, Nepal. J Nobel Med Coll. 2013;2:22–6. DOI: 10.3126/jonmc.v2i1.7668.
13. Mavalankar DV, Gray RH, Trivedi CR. Risk factors for preterm and term low birthweight in Ahmedabad, India. Int J Epidemiol. 1992;21(2):263–72. DOI: 10.1093/ije/21.2.263.
14. Baptiste-Roberts K, Salafia CM, Nicholson W, Duggan A, Wang NY, Brancati FL. Maternal risk factors for abnormal placental growth: The national collaborative perinatal project. BMC Pregnancy and Childbirth. 2008;8(1):44. DOI: 10.1186/1471-2393-8-44.
15. Jaleel R, Khan A. Severe anaemia and adverse pregnancy outcome. J Surg Pak. 2008;13(4):147–50.
16. Baig-Ansari N, Badruddin SH, Karmaliani R, Harris H, Jehan I, Pasha O, et al. Anemia prevalence and risk factors in pregnant women in an urban area of Pakistan. Food Nutr Bull. 2008;29:132–9. DOI: 10.1177/156482650802900207.
17. Abdallah TM, Adam I, Abdelhadi MA, Siddig MF, Ali AA. Anaemia among adults in Kassala, Eastern Sudan. BMC Res Notes. 2012;5:202. DOI: 10.1186/1756-0500-5-202.
18. Kalaivani K. Prevalence and consequences of anaemia in pregnancy. Indian J Med Res. 2009;130:627–33.
19. Kidanto HL, Mogren I, Lindmark G, Massawe S, Nystrom L. Risks for preterm delivery and low birth weight are independently increased by severity of maternal anaemia. S Afr Med J. 2009;99(2):98–102.

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20. Chumak EL, Grjibovski AM. Anemia in pregnancy and its association with pregnancy outcomes in the Arctic Russian town of Monchegorsk, 1973–2002. Int J Circumpolar Health. 2010;69:265–77. DOI: 10.3402/ijch.v69i3.17603.
21. Tolenttino K, Friedman JF. An update on anaemia in less developed countries. Am J Trop Med Hyg. 2007;77(1):44–51.
22. Molloy AM, Kirke PN, Brody LC, Scott JM, Mills JL. Effects of folate and vitamin B12 deficiencies during pregnancy on fetal, infant, and child development. Food Nutr Bull. 2008 Jun;29(2 Suppl):S101–11; discussion S112–5. doi:10.1177/15648265080292S114. PMID: 18709885.
23. Ahmad N, Kalakoti P, Bano R, Syed MAM. The prevalence of anaemia and associated factors in pregnant women in a rural Indian community. Australas Med J. 2010;3(5):276–280.
24. Khalid S, Waqar S, Faisal M, Ahmad SI. Effectiveness of weekly iron supplementation in anaemia in pregnancy. Pak J Pharmacol. 2011;28(1):9–16.
25. McLean E, Cogswell M, Egli I, Wojdyla D, de Benoist B. Worldwide prevalence of anaemia, WHO vitamin and mineral nutrition information system, 1993–2005. Public Health Nutr. 2009;12(4):444–454. doi:10.1017/S1368980008002401. PubMed: 18498676.
26. Karim SA, Khurshid M, Memon AM, Jafarey SN. Anaemia in pregnancy – its cause in the underprivileged class of Karachi. J Pak Med Assoc. 1994;44(4):90–92. PubMed: 8072131.
27. Badshah S, Mason L, McKelvie K, Payne R, Lisboa PJ. Risk factors for low birthweight in the public hospitals at Peshawar, NWFP, Pakistan. BMC Public Health. 2008;8(1):197. doi:10.1186/1471-2458-8-197. PubMed: 18533023.
28. Idowu OA, Mafiana CF, Dapo S. Anaemia in pregnancy: a survey of pregnant women in Abeokuta, Nigeria. Afr Health Sci. 2005;5(4):295–299. doi:10.5555/afhs.2005.5.4.295. PubMed: 16615838. PubMed Central: PMC1831948.
29. Okoh DA, Iyalla C, Omunakwe H, Iwo-Amah RS, Nwabuko C. A retrospective study of the prevalence of anaemia in pregnancy at booking in Niger Delta, Nigeria. J Obstet Gynaecol. 2016;36(5):594–597. doi:10.3109/01443615.2015.1116500. PubMed: 27110932.
30. Okafor CI, et al. Prevalence of iron deficiency anaemia among pregnant women in Calabar, Cross River State, Nigeria. IOSR J Pharm Biol Sci. 2013;7:60–64. doi:10.9790/3008-0726064.

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