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MATERNAL ANEMIA AND PREGNANCY OUTCOMES AMONG WOMEN ATTENDING GOVERNMENT HOSPITALS IN RURAL SINDH, PAKISTAN

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ABSTRACT

Maternal anemia is a major public health concern and one of the most common nutritional disorders affecting pregnant women, particularly in developing countries. It is associated with increased risks of maternal complications, premature delivery, low birth weight, restricted fetal growth, and adverse neonatal outcomes. In Pakistan, maternal anemia remains an important healthcare challenge due to nutritional deficiencies, inadequate antenatal care, limited healthcare accessibility, poverty, and insufficient awareness regarding maternal nutrition. Women living in rural areas of Sindh may faceN additional difficulties in obtaining regular antenatal examinations, nutritional supplements, and timely medical treatment. This study aims to investigate the prevalence of maternal anemia and examine its relationship with pregnancy outcomes among women attending selected government hospitals in rural Sindh, Pakistan. The research will focus on maternal age, educational background, socioeconomic status, dietary practices, iron and folic acid supplementation, antenatal care utilization, and pregnancy-related medical conditions. A quantitative cross-sectional research approach is proposed, involving pregnant women attending selected government healthcare facilities. Data will be collected through structured questionnaires, medical record reviews, and relevant hemoglobin measurements. Maternal anemia will be assessed according to established pregnancy-related hemoglobin criteria, while pregnancy outcomes will include preterm birth, low birth weight, maternal complications, and neonatal health indicators. Statistical analysis will be conducted to examine associations between anemia severity, maternal characteristics, and pregnancy outcomes. The study is expected to provide valuable evidence regarding maternal nutritional health and pregnancy-related risks in rural Sindh. Its findings may support improved antenatal screening, nutritional interventions, maternal healthcare services, and preventive strategies aimed at reducing anemia-related complications among pregnant women in Pakistan.

KEYWORDS

Maternal Anemia, Pregnancy Outcomes, Hemoglobin Levels, Iron Deficiency, Antenatal Care, Low Birth Weight, Preterm Birth, Maternal Health, Rural Sindh, Pakistan.

INTRODUCTION

Maternal anemia is a significant global public health problem that affects millions of pregnant women and contributes to adverse maternal and neonatal health outcomes. It is generally characterized by reduced hemoglobin concentration, which limits the capacity of blood to transport sufficient oxygen to body tissues. During pregnancy, iron requirements increase

substantially because of maternal blood volume expansion, placental development, and fetal growth. When nutritional requirements are not adequately met, pregnant women may develop anemia, particularly iron-deficiency anemia. The World Health Organization (2024) identifies anemia as an important nutritional and reproductive health concern that requires early detection, appropriate treatment, and effective preventive interventions. Maternal anemia can contribute to fatigue, weakness, reduced physical capacity, and increased vulnerability to complications during pregnancy and childbirth.Pakistan continues to face considerable challenges in maternal nutrition and reproductive healthcare, particularly among women belonging to economically disadvantaged and rural communities. Inadequate dietary intake, poverty, limited educational opportunities, repeated pregnancies, infections, and insufficient antenatal care contribute to maternal nutritional deficiencies. The National Nutrition Survey of Pakistan (2018) highlighted the considerable burden of nutritional deficiencies among women of reproductive age, emphasizing the need for stronger maternal nutrition interventions. These circumstances make maternal anemia an important research priority, particularly in regions where healthcare facilities and nutritional resources are not equally accessible.Sindh is one of Pakistan's major provinces and includes numerous rural communities where women may experience significant barriers to maternal healthcare. Geographic distance, transportation difficulties, financial limitations, shortages of healthcare professionals, and limited availability of diagnostic facilities can affect the timely identification and management of pregnancy-related complications. Women attending government hospitals in rural Sindh may also experience differences in the quality and frequency of antenatal services. Investigating maternal anemia in these healthcare settings can provide useful information about nutritional health conditions and the effectiveness of existing maternal healthcare practices.Iron deficiency is one of the leading causes of anemia during pregnancy, although other factors, including folate deficiency, vitamin B12 deficiency, infections, and inherited blood disorders, may also contribute. Pregnancy increases the body's demand for iron because it is required for maternal hemoglobin production and fetal development. When iron intake and absorption are insufficient, maternal hemoglobin concentrations may decrease, potentially affecting maternal well-being and fetal growth. Stevens et al. (2013) examined global trends in hemoglobin concentration and anemia prevalence and demonstrated the substantial worldwide burden of anemia among women of reproductive age. Their findings emphasize the importance of addressing nutritional deficiencies through preventive healthcare and appropriate supplementation programs.

Maternal anemia has also been associated with several adverse pregnancy outcomes. Severe anemia may increase the likelihood of maternal fatigue, reduced tolerance to blood loss, complications during childbirth, and the need for medical intervention. It may also be associated with preterm delivery, low birth weight, and impaired fetal development. Rahman et al. (2016), in a systematic review and meta-analysis, identified significant associations between maternal

anemia and adverse pregnancy outcomes, including low birth weight and preterm birth. These findings highlight the importance of identifying anemia during pregnancy and ensuring timely clinical management to reduce potential risks to both mothers and newborns.The nutritional status of pregnant women is strongly influenced by socioeconomic and dietary conditions. Women experiencing food insecurity may have limited access to iron-rich foods, fruits, vegetables, animal-source proteins, and other essential nutrients. Educational background may also influence awareness regarding balanced diets, nutritional supplementation, and the importance of antenatal visits. In rural settings, cultural practices and household decision-making arrangements may further influence women's ability to seek medical care and follow nutritional recommendations. These factors demonstrate that maternal anemia should be understood as a health condition influenced by broader socioeconomic and environmental circumstances rather than nutritional intake alone.

Antenatal care plays an essential role in preventing and managing maternal anemia. Regular antenatal visits provide opportunities for hemoglobin screening, nutritional counseling, iron and folic acid supplementation, and early identification of pregnancy-related complications. The World Health Organization (2016) recommends daily iron and folic acid supplementation during pregnancy to reduce maternal anemia and improve pregnancy outcomes. However, implementation may be affected by inadequate awareness, limited availability of supplements, gastrointestinal side effects, financial constraints, and inconsistent follow-up. Consequently, examining antenatal care utilization and supplementation practices among women attending government hospitals in rural Sindh is important for understanding existing healthcare challenges.Maternal anemia is also a concern because its effects may extend beyond pregnancy and influence the health of newborn children. Low birth weight and premature delivery can increase neonatal vulnerability to infections, feeding difficulties, developmental complications, and other health problems. Black et al. (2013) emphasized the substantial contribution of maternal and child undernutrition to disease burden and mortality in low- and middle-income countries. Their research demonstrates the importance of improving maternal nutritional status as part of broader strategies for reducing preventable maternal and child health complications.Despite existing maternal health programs in Pakistan, further regional research is required to examine anemia prevalence, nutritional characteristics, and pregnancy outcomes among women living in rural Sindh. Localized investigations can help identify the contribution of maternal age, dietary practices, socioeconomic conditions, antenatal screening, and supplementation adherence to anemia-related pregnancy risks. Research conducted among women attending government hospitals can also provide valuable information regarding the clinical and healthcare-related factors associated with maternal anemia. Therefore, the present study aims to investigate maternal anemia and its relationship with pregnancy outcomes among women attending selected government hospitals in rural Sindh, Pakistan. The research is

expected to contribute to improved maternal screening, nutritional awareness, antenatal care practices, and evidence-based healthcare interventions.

RESEARCH OBJECTIVES

1. To determine the prevalence and severity of maternal anemia among pregnant women attending selected government hospitals in rural Sindh, Pakistan.
2. To examine the relationship between maternal anemia and pregnancy outcomes, including preterm birth, low birth weight, and maternal complications.
3. To identify nutritional, socioeconomic, and healthcare-related factors associated with maternal anemia among pregnant women.

RESEARCH QUESTIONS

1. What is the prevalence and severity of maternal anemia among pregnant women attending government hospitals in rural Sindh, Pakistan?
2. How is maternal anemia associated with pregnancy outcomes, including preterm birth, low birth weight, and maternal complications?
3. Which nutritional, socioeconomic, and healthcare-related factors contribute to maternal anemia among pregnant women in rural Sindh?

LITERATURE REVIEW

Maternal anemia has received considerable attention in international public health research because of its widespread occurrence and association with maternal and neonatal complications. It is particularly prevalent in low- and middle-income countries, where nutritional deficiencies, inadequate healthcare services, and socioeconomic inequalities contribute to poor maternal health. Stevens et al. (2022) conducted a comprehensive pooled analysis of anemia prevalence among women and children across different geographical regions and demonstrated the continuing global burden of anemia. Their findings emphasized the importance of strengthening nutritional interventions, improving diagnostic services, and addressing the underlying causes of anemia among vulnerable population groups.Research conducted in Pakistan has identified maternal nutritional deficiencies as an important concern, particularly among women living in rural and economically disadvantaged communities. The Government of Pakistan and UNICEF (2019), through the National Nutrition Survey 2018, documented substantial nutritional deficiencies among women of reproductive age and pregnant women. The survey identified Sindh as a particularly important region for nutritional interventions, reporting a high burden of

iron deficiency among women. The findings demonstrated geographical and socioeconomic differences in nutritional status, with poorer and less-educated women experiencing greater nutritional disadvantages. This evidence provides an important foundation for investigating maternal anemia among women attending government hospitals in rural Sindh.

The relationship between maternal anemia and adverse pregnancy outcomes has been examined through several systematic reviews and meta-analyses. Rahman et al. (2016) conducted a systematic review and meta-analysis focusing on maternal anemia in low- and middle-income countries. Their findings demonstrated that anemia during pregnancy was associated with increased risks of low birth weight, preterm birth, perinatal mortality, and neonatal mortality. The researchers reported that approximately 42.7% of pregnant women included in the reviewed studies experienced anemia. Their findings also indicated that South Asian populations experienced a particularly substantial burden. This evidence highlights the importance of examining maternal hemoglobin levels alongside birth outcomes in countries such as Pakistan.Rahman et al. (2020) further investigated maternal anemia and adverse obstetric and neonatal outcomes across South Asian countries. Their systematic review and meta-analysis demonstrated that maternal anemia was associated with increased risks of unfavorable pregnancy outcomes. The research emphasized that nutritional deficiencies and inadequate maternal healthcare contribute to the continuing burden of anemia throughout South Asia. These findings are particularly relevant to rural Sindh, where differences in dietary quality, household income, educational attainment, and access to antenatal services may influence maternal nutritional status and pregnancy-related health risks.

The severity and timing of anemia during pregnancy are also important considerations in maternal healthcare research. Young et al. (2019) examined maternal hemoglobin concentrations across pregnancy and their relationship with maternal and child health outcomes. Their systematic review and meta-analysis demonstrated that low maternal hemoglobin concentrations were associated with low birth weight, preterm birth, stillbirth, perinatal mortality, postpartum hemorrhage, and preeclampsia. The researchers also highlighted the importance of considering the timing of hemoglobin measurements because maternal physiological changes during pregnancy can influence hemoglobin concentrations. These findings support the need for standardized screening and appropriate interpretation of laboratory results throughout different stages of pregnancy.Recent research has further strengthened the evidence regarding the relationship between maternal anemia and pregnancy complications. Wang et al. (2025) conducted a systematic review and meta-analysis of 31 cohort studies examining anemia during pregnancy and adverse maternal and neonatal outcomes. Their findings identified increased risks of postpartum hemorrhage, premature rupture of membranes, preterm delivery, low birth weight, cesarean delivery, gestational hypertension, and neonatal asphyxia among women with anemia.

This research provides recent evidence that maternal anemia is associated with multiple clinical outcomes and supports the importance of early screening, nutritional supplementation, and appropriate medical management during pregnancy.

International maternal healthcare guidelines also emphasize the importance of preventing anemia through appropriate nutritional interventions and regular antenatal monitoring. The World Health Organization (2016) recommends daily iron and folic acid supplementation during pregnancy to reduce maternal anemia and improve pregnancy outcomes. The organization also emphasizes the importance of antenatal care as an opportunity for identifying nutritional deficiencies, monitoring maternal health, and providing preventive interventions. However, the effectiveness of these recommendations depends on the availability of supplements, women's awareness, healthcare accessibility, and adherence to prescribed treatment.Overall, the reviewed literature demonstrates that maternal anemia is influenced by nutritional, socioeconomic, demographic, and healthcare-related factors and is associated with several adverse pregnancy outcomes. Existing research provides strong international and regional evidence regarding the health consequences of maternal anemia. However, further hospital-based research is required to investigate the relationship between anemia severity and pregnancy outcomes among women attending government hospitals in rural Sindh. The proposed study will address this research need by examining maternal hemoglobin levels, nutritional practices, antenatal care utilization, socioeconomic characteristics, and pregnancy-related complications within the selected healthcare settings.

METHODOLOGY

The proposed study will employ a quantitative research methodology to investigate maternal anemia and its relationship with pregnancy outcomes among women attending selected government hospitals in rural Sindh, Pakistan. The target population will consist of pregnant women receiving antenatal care or maternal healthcare services at participating government hospitals. A sample of approximately 400 pregnant women will be considered, subject to formal sample-size calculation based on the expected prevalence of maternal anemia, confidence level, desired precision, and anticipated non-response rate. Participants will be selected through consecutive or systematic sampling, depending on patient attendance and hospital arrangements. Women who provide informed consent and meet the inclusion criteria will be included in the study. Data will be collected through structured questionnaires, clinical records, and laboratory investigations. The questionnaire will obtain information regarding maternal age, educational attainment, household income, occupation, residential location, dietary habits, pregnancy history, iron and folic acid supplementation, and antenatal care attendance. Hemoglobin measurements

will be obtained from laboratory records or conducted through approved clinical procedures. Maternal anemia will be classified according to trimester-specific diagnostic criteria, using the applicable World Health Organization thresholds and current clinical guidance. Pregnancy outcomes will include preterm delivery, low birth weight, mode of delivery, postpartum hemorrhage, and relevant neonatal health indicators. Information about delivery outcomes will be obtained through hospital records or subsequent follow-up where necessary. Ethical approval will be obtained from the relevant institutional ethics committee and participating hospital authorities. Informed consent, confidentiality, voluntary participation, and secure management of participants' medical information will be maintained throughout the research process.

RESEARCH DESIGN

A descriptive analytical observational research design will be adopted to examine the prevalence of maternal anemia and its association with pregnancy outcomes. A prospective hospital-based cohort approach is preferable because it allows researchers to assess maternal hemoglobin levels during pregnancy and subsequently observe delivery and neonatal outcomes. Pregnant women will be enrolled during antenatal visits and categorized according to their hemoglobin levels and anemia severity. Their clinical information will be recorded and monitored until delivery, allowing the researcher to examine differences in pregnancy outcomes between women with and without anemia. The study will be conducted in selected government hospitals serving rural communities in Sindh, with attention to including participants from different socioeconomic and educational backgrounds. Maternal anemia will serve as the principal exposure variable, while pregnancy outcomes, including preterm birth, low birth weight, and maternal complications, will represent the main dependent variables. Additional independent variables will include maternal age, parity, dietary intake, educational attainment, household income, iron supplementation, and antenatal care utilization. The research instruments will be reviewed by maternal healthcare professionals to establish content validity, and a pilot study will be conducted before full-scale data collection. Standardized clinical and laboratory procedures will be followed to improve measurement reliability. This design will provide an opportunity to examine the relationship between maternal anemia and subsequent pregnancy outcomes while accounting for potential confounding factors.

DATA ANALYSIS

The collected data will be coded, entered, cleaned, and analyzed using the Statistical Package for the Social Sciences (SPSS) or an equivalent statistical software program. Descriptive statistical methods will be applied to summarize maternal demographic characteristics, nutritional

practices, hemoglobin concentrations, and pregnancy-related clinical information. Frequencies and percentages will be calculated for categorical variables, while means and standard deviations will be used for continuous variables where appropriate. Maternal anemia prevalence will be calculated according to the established diagnostic criteria, and participants will be categorized according to anemia severity and pregnancy trimester. Chi-square tests will be used to examine associations between maternal anemia and categorical pregnancy outcomes, including preterm delivery, low birth weight, and postpartum complications. Independent-sample t-tests or appropriate non-parametric tests will be applied to compare continuous variables between study groups. Multivariable logistic regression analysis will be conducted to identify independent associations between maternal anemia and adverse pregnancy outcomes after adjusting for relevant maternal age, parity, nutritional, and socioeconomic characteristics. Adjusted odds ratios or risk estimates, as appropriate to the statistical model, will be reported with 95% confidence intervals. Statistical significance will be assessed using a conventional p-value threshold of less than .05. The analysis will also examine the relationship between iron and folic acid supplementation, antenatal care attendance, and maternal hemoglobin levels. These statistical procedures will provide a comprehensive assessment of the factors associated with maternal anemia and its potential effects on pregnancy outcomes.

FINDINGS

Since the proposed study has not yet involved actual participant recruitment, clinical measurements, or primary data collection, its findings cannot be presented as observed research results. The expected findings are anticipated to demonstrate that maternal anemia represents an important nutritional and reproductive health concern among pregnant women attending government hospitals in rural Sindh. Based on the National Nutrition Survey 2018 and previous international investigations, nutritional deficiencies, inadequate dietary intake, and socioeconomic disadvantages are expected to be important factors associated with maternal anemia. The study may also identify differences in anemia prevalence according to maternal age, educational attainment, household income, pregnancy history, and antenatal care utilization.The research is expected to provide further information regarding the relationship between maternal hemoglobin levels and pregnancy outcomes. Women experiencing moderate or severe anemia may demonstrate a higher likelihood of adverse outcomes, including preterm delivery, low birth weight, and postpartum complications. The study is also expected to identify differences in pregnancy outcomes according to the frequency of antenatal visits and adherence to prescribed iron and folic acid supplementation. Furthermore, the findings may highlight challenges associated with nutritional awareness, availability of supplements, laboratory screening, and access to maternal healthcare services in rural communities. These anticipated findings will require confirmation through actual clinical measurements, hospital records, and appropriate

statistical analysis.

CONCLUSION

Maternal anemia remains an important public health challenge in Pakistan, particularly among pregnant women living in rural and economically disadvantaged communities. Its potential association with preterm delivery, low birth weight, postpartum hemorrhage, and other pregnancy-related complications makes early identification and appropriate clinical management essential for improving maternal and neonatal health. The proposed study aims to investigate the prevalence and severity of maternal anemia and examine its relationship with pregnancy outcomes among women attending selected government hospitals in rural Sindh. By examining maternal hemoglobin levels, nutritional practices, socioeconomic circumstances, and antenatal healthcare utilization, the research will provide an opportunity to understand the major factors contributing to anemia during pregnancy.The study is expected to contribute to improving maternal healthcare practices through evidence-based screening, nutritional counseling, and appropriate iron and folic acid supplementation. Strengthening antenatal care services, improving access to laboratory investigations, and increasing awareness regarding balanced nutrition may help reduce anemia-related pregnancy complications. Furthermore, government hospitals and public health authorities can use the research findings to identify vulnerable maternal populations and develop targeted nutritional and preventive healthcare interventions. Overall, this research may provide valuable evidence for improving maternal nutritional health, reducing preventable pregnancy complications, and strengthening maternal and neonatal healthcare services in rural Sindh, Pakistan.

REFERENCES

Alam, A. U., Kaul, P., Jain, V., Wu, C., & Sun, H. L. (2026). Suboptimal screening and correction of maternal iron deficiency anaemia in the general population and in inherited bleeding disorders: A population-based cohort study. British Journal of Haematology, 208(4), 1389–1397.

Booman, A., Bateman, B. T., Siadat, S., Berube, C., Igbinosa, I., Leggett, C., Lyell, D. J., Main, E. K., & Leonard, S. A. (2026). Pregnancy outcomes associated with anemia in the first trimester and anemia resolution by late pregnancy. Obstetrics & Gynecology, 147(4), 518–527.

Khalil, S., Memon, A. A., Batool, A., Fatima, N., Fatima, L., Mohsin, M., Iqbal, M., Naseer, M., & Abubakar, A. (2026). Maternal anemia prevalence and associated risk factors during pregnancy in Pakistan: A mixed-methods study. Journal of Health, Wellness and Community Research, 4(6), 1–12.

Liu, X., Xie, Y., Zhu, J., Zhang, Y., Mu, Y., Chen, P. R., Wang, Y., Zhou, S., Li, M. R., Liu, Z., Liang, J., & Zhou, R. (2026). Prevalence, risk factors, and adverse maternal and fetal outcomes of anemia during pregnancy: A retrospective study in China, 2012–2020. BMC Pregnancy and Childbirth, 26.

Ochola, H., Roberts, I., Webb, E. L., Lieber, J., Lawn, J. E., Blencowe, H., Chaudhri, R., Kayani, A., Javaid, K., Olayemi, O., Bello, F. A., Muganyizi, P., Lubeya, M. K., Vwalika, B., Shakur-Still, H., Balogun, E., Prowse, D., Brenner, A., et al. (2026). Severity of maternal anemia and the risk of giving birth to a small vulnerable newborn: A cohort analysis of the WOMAN-2 trial in four countries. International Journal of Gynecology & Obstetrics.

Qazi, M., Khan, B. A., Kumar, V., Amin, M., Shaikh, M., & Ateeque, K. (2026). The association between maternal anaemia in the third trimester and low birth weight neonates: A cross-sectional study. Journal of the Pakistan Medical Association, 76(7), 1200–1205.

Yu, H., Dong, C., Liu, Y., Zhu, Y., Wang, C., & Li, H. (2026). Haemoglobin concentrations and maternal and neonatal outcomes: Identifying optimal haemoglobin ranges. Paediatric and Perinatal Epidemiology, 40(5), 564–574.