CBEL Journal of Multidisciplinary Research
Vol. 1 No. 1 (2026): ISSN (Online): 3108-8848
DOI: https://doi.org/10.66313/swwx6y63
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Association between Antenatal Care Service Utilization and Anaemia Status among Pregnant Women Attending Selected Health Facilities in West B Region, Zanzibar

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Article History
Received: 2025-11-15
Revised: 2026-02-20
Accepted: 2026-03-22
Published: 2026-03-31

Keywords
Anaemia
Antenatal care utilization
Pregnant women
Maternal health
Zanzibar

How to cite:
Hafidh, A. A., Mwanyika, L., & Mfinanga, S. (2026). Association Between Antenatal Care Service Utilisation and Anaemia Status Among Pregnant Women Attending Selected Health Facilities in West B Region, Zanzibar. *CBEL Journal of Multidisciplinary Research, 1*(1), 10-20.

Abstract
Anaemia during pregnancy remains a major public health concern in many low- and middle-income countries, including Tanzania, where it contributes significantly to maternal and neonatal morbidity and mortality. Although antenatal care (ANC) services provide important opportunities for screening, prevention, and treatment of anaemia, inadequate utilisation of these services may limit their effectiveness. This study aimed to examine the association between antenatal care service utilisation and anaemia status among pregnant women attending selected health facilities in the West B Region of Zanzibar. A facility-based cross-sectional study was conducted among pregnant women attending antenatal clinics in selected public and private health facilities in the West B Region. A sample size of 339 participants was determined using the Kish and Leslie formula and selected through stratified and systematic random sampling techniques. Data were collected using structured questionnaires and haemoglobin measurements obtained from ANC records. Data were analysed using descriptive statistics, Chi-square tests, and multivariable logistic regression to determine the relationship between ANC service utilisation and anaemia status. The study found that anaemia was highly prevalent among pregnant women in the study area, with 62.2% of participants classified as anaemic. Several factors were associated with increased risk of anaemia, including limited knowledge about anaemia, unemployment, consumption of non-food substances (pica), and short pregnancy intervals. Inadequate utilization of ANC services, such as delayed initiation of visits and poor adherence to recommended maternal health practices was also associated with higher odds of anaemia among pregnant women. The study was limited to selected health facilities in the West B Region and employed a cross-sectional design, which restricts causal interpretation. Further research using longitudinal or multi-regional studies is recommended to better understand the causal pathways linking ANC utilization and maternal anaemia. Strengthening ANC utilization through early booking, improved maternal health education, and increased adherence to iron and folic acid supplementation could significantly reduce the burden of anaemia among pregnant women in Zanzibar.

INTRODUCTION

Anaemia during pregnancy remains one of the most widespread public health problems affecting women of reproductive age worldwide. It is characterised by a reduced concentration of haemoglobin in the blood, which limits the ability of red blood cells to transport oxygen to body tissues (Baldi & Pasricha, 2022; Brittenham et al., 2023).

Globally, anaemia continues to affect a substantial proportion of pregnant women, particularly in low- and middle-income countries where nutritional deficiencies, infectious diseases, and limited access to healthcare services are common (Araujo Costa & de Paula Ayres-Silva, 2023; Balarajan, Ramakrishnan, Özaltin, Shankar, & Subramanian, 2011). The condition has significant implications for maternal and fetal health, including increased risks of maternal mortality, preterm birth, low birth weight, and impaired cognitive development of infants (Baldi & Pasricha, 2022; Dasgupta et al., 2025).

Despite global health initiatives aimed at improving maternal nutrition and reducing anaemia prevalence, the burden remains high in many developing regions, especially in sub-Saharan Africa. Evidence suggests that socio-economic inequalities, poor dietary practices, and limited access to maternal health services contribute significantly to the persistence of anaemia among pregnant women (Abdallah et al., 2022; Bekele et al., 2023). Nutritional deficiencies, particularly iron deficiency, are widely recognised as the primary cause of anaemia during pregnancy, accounting for the majority of cases globally (Baldi & Pasricha, 2022). Pregnant women require increased iron intake to support maternal blood volume expansion and fetal growth, yet many women fail to meet these nutritional demands due to poor dietary diversity and limited consumption of iron-rich foods (Fite, Assefa, & Mengiste, 2021; Beressa, Whiting, & Belachew, 2024).

Several studies have shown that maternal socio-demographic factors such as education level, income status, and employment influence the risk of developing anaemia during pregnancy. Women with lower levels of education and those from low-income households are more likely to experience nutritional deficiencies and limited access to health information, which increases their vulnerability to anaemia (Abdullahi, Abubakar, & Muhammad, 2019; Abdallah et al., 2022). In addition, reproductive factors such as high parity, short birth intervals, and frequent pregnancies further increase the likelihood of anaemia due to repeated depletion of maternal iron stores (Bekele et al., 2023; Choudhury et al., 2023).

Antenatal care (ANC) services play a crucial role in preventing and managing anaemia during pregnancy. ANC provides opportunities for early detection of anaemia, nutritional counselling, iron and folic acid supplementation, and treatment of infections that may contribute to the condition (Abdallah et al., 2022). Regular attendance at antenatal clinics enables healthcare providers to monitor maternal health, provide education on proper nutrition, and ensure adherence to recommended supplementation programs (Fite et al., 2021). However, inadequate utilisation of ANC services remains a major challenge in many developing countries, limiting the effectiveness of these preventive interventions.

Research has demonstrated that early initiation and consistent attendance of antenatal care visits are associated with improved maternal health outcomes, including reduced prevalence of anaemia among pregnant women (Abdullahi et al., 2019). Women who attend ANC services regularly are more likely to receive iron supplementation, nutritional counselling, and screening for anaemia and other pregnancy-related complications (Abdallah et al., 2022). Conversely, delayed initiation of ANC visits and irregular attendance may reduce opportunities for timely diagnosis and treatment of anaemia, increasing the risk of adverse pregnancy outcomes (Bekele et al., 2023).

In addition to healthcare access, behavioural and cultural factors may influence the effectiveness of antenatal care interventions. Dietary habits, traditional beliefs, and consumption of non-food substances such as soil or clay (pica) have been associated with increased risk of anaemia among pregnant women in some communities (Fite et al., 2021). Moreover, inadequate knowledge about anaemia and poor awareness of its consequences may hinder adherence to recommended health practices such as iron supplementation and consumption of iron-rich foods (Abdallah et al., 2022).

In Tanzania, maternal anaemia remains a persistent public health challenge despite improvements in maternal healthcare services and increased availability of antenatal care programs. Studies conducted in different regions of the country have reported relatively high prevalence rates of anaemia among pregnant women, indicating the need for strengthened interventions targeting maternal nutrition and healthcare utilization (Abdallah et al., 2022). Similar patterns have been observed in other developing countries where maternal anaemia is influenced by a complex interaction of nutritional, socio-economic, and healthcare-related factors (Araujo Costa & de Paula Ayres-Silva, 2023; Baldi & Pasricha, 2022; Balarajan et al., 2011).

Understanding the relationship between antenatal care service utilisation and anaemia status is therefore essential for designing effective maternal health interventions. While ANC services provide important opportunities for prevention and management of anaemia, their effectiveness depends largely on the extent to which pregnant women utilise these services and adhere to recommended health practices (Bekele et al., 2023; Abdallah et al., 2022). Examining this relationship can help identify gaps in maternal healthcare delivery and inform strategies to improve ANC utilisation and maternal nutrition.

Therefore, this study aimed to examine the association between antenatal care service utilisation and anaemia status among pregnant women attending selected health facilities in the West B Region of Zanzibar. By identifying the key factors influencing anaemia among pregnant women, the study seeks to provide evidence that can support the development of targeted interventions aimed at improving maternal health outcomes in the region.

METHOD

Study Design

This study employed a facility-based cross-sectional research design to examine the association between antenatal care (ANC) service utilisation and anaemia status among pregnant women attending selected health facilities in the West B Region of Zanzibar. A cross-sectional design was considered appropriate because it allows researchers to measure the prevalence of a health condition and examine relationships between variables at a single point in time (Creswell, 2017; Kothari, 2004). This design is widely used in public health studies to investigate maternal health issues and identify potential factors associated with health outcomes among specific populations.

Study Area

The study was conducted in the West B Region of Unguja Island in Zanzibar, Tanzania. The region is one of the administrative areas of Zanzibar and has several public and private health facilities providing maternal healthcare services, including antenatal care clinics. These facilities serve a large number of pregnant women from both urban and peri-urban communities. Antenatal care services in the region include routine maternal health check-ups, haemoglobin testing, iron and folic acid supplementation, nutrition education, and screening for pregnancy-related complications.

Study Population

The study population consisted of pregnant women attending antenatal care clinics in selected health facilities in the West B Region during the study period. Pregnant women who attended ANC services and consented to participate in the study were eligible for inclusion. Women who were seriously ill or unable to respond to the questionnaire were excluded from the study.

Sample Size Determination

The sample size for this study was determined using the Kish and Leslie (1965) formula for cross-sectional studies. The formula is commonly used to estimate the required sample size when determining the prevalence of a health condition within a population.

Based on the estimated prevalence of anaemia among pregnant women from previous studies, a 95% confidence level and a 5% margin of error were applied to calculate the minimum required sample size. The calculation yielded a minimum sample size of 339 pregnant women. However, to increase the statistical power of the study and account for possible non-response and incomplete data, a slightly larger sample was recruited. As a result, a total of 352 pregnant women attending antenatal care services in selected health facilities in the West B Region of Zanzibar were included in the study

Sampling Procedure

A **multi-stage sampling technique** was used to select study participants. First, several health facilities offering antenatal care services in the West B Region were purposively selected. These facilities included both public and private healthcare institutions to ensure representation of different healthcare settings.

Second, the required number of pregnant women was proportionally allocated to each selected facility based on the average number of ANC attendees. Finally, systematic random sampling was used to select pregnant women attending antenatal clinics during the data collection period. Every eligible participant was approached and invited to participate in the study until the required sample size was reached.

Data Collection Methods

Data were collected using a structured questionnaire administered through face-to-face interviews with pregnant women attending antenatal clinics. The questionnaire included sections on socio-demographic characteristics, reproductive history, dietary practices, knowledge about anaemia, and utilisation of antenatal care services.

Information on haemoglobin levels and anaemia status was obtained from antenatal clinic records and laboratory test results available at the health facilities. According to the World Health Organisation classification, pregnant women with haemoglobin levels below 11 g/dL were classified as anaemic (Araujo Costa & de Paula Ayres-Silva, 2023; Baldi & Pasricha, 2022).

Study Variables

The dependent variable in this study was anaemia status among pregnant women, categorised as anaemic or non-anaemic based on haemoglobin levels.

The independent variables included:

i. Antenatal care service utilisation (timing of first ANC visit, number of visits)
ii. Socio-demographic factors (age, education level, marital status, employment status)
iii. Reproductive factors (parity, birth interval)
iv. Dietary practices and nutritional behaviours
v. Knowledge about anaemia and maternal health practices

These variables were selected based on evidence from previous studies examining determinants of anaemia among pregnant women (Abdallah et al., 2022; Bekele et al., 2023; Fite et al., 2021).

Data Analysis

Data were entered, cleaned, and analysed using Statistical Package for Social Sciences (SPSS) software. Descriptive statistics such as frequencies, percentages, means, and standard deviations were used to summarize participants' socio-demographic characteristics and prevalence of anaemia.

Inferential statistical analyses were conducted to examine the association between antenatal care utilisation and anaemia status. The Chi-square test was used to determine the relationship between categorical variables, while multivariable logistic regression analysis was performed to identify factors independently associated with anaemia among pregnant women. Statistical significance was determined at a p-value of less than 0.05 (Creswell, 2017; Kothari, 2004).

Ethical Considerations

Ethical approval for the study was obtained from the relevant institutional authorities prior to data collection. Permission was also granted by the management of the selected health facilities in the West B Region. Participants were informed about the purpose of the study, and written informed consent was obtained before participation. Confidentiality of participants' information was strictly maintained throughout the study. Personal identifiers were not included in the data collection tools, and all information collected was used solely for research purposes. Ethical approval was obtained from the Zanzibar Health Research Ethics Committee (ZHREC). Permission to conduct the study was also obtained from the West B Regional Health Office and participating health facilities.

RESULTS

Socio-Demographic Characteristics of the Respondents

A total of 352 pregnant women attending antenatal care (ANC) services in selected health facilities in the West B Region participated in the study. The majority of respondents were aged 17–30 years, while a smaller proportion were aged 31–40 years. Most participants were married and had a primary level education. With regard to employment status, a large proportion of women were unemployed, followed by self-employed and formally employed women. Table 1 presents the socio-demographic characteristics of the respondents.

Table 1: Socio-Demographic Characteristics of Pregnant Women Attending ANC (*n = 352*)

Variable	Category	Frequency (n)	Percentage (%)
Age group	17–30 years	259	73.6
	31–40 years	93	26.4
Marital status	Married	287	81.5
	Single/Other	65	18.5
Education level	Primary education	50	14.2
	Secondary education	288	81.8
	Higher education	14	4.0
Employment status	Unemployed	185	52.6
	Self-employed	148	42.0
	Employed	19	5.4

Obstetric and Reproductive Characteristics

Most women were in their second trimester of pregnancy, followed by those in the third trimester, while only a small proportion were in the first trimester. A considerable proportion of participants reported previous pregnancies, and some had experienced anaemia in earlier pregnancies.

Table 2: Obstetric Characteristics of Respondents (*n = 352*)

Variable	Category	Frequency (n)	Percentage (%)
Trimester of pregnancy	First trimester	28	8.0
	Second trimester	170	48.3
	Third trimester	154	43.7
Previous anaemia	Yes	113	32.1
	No	239	67.9
Malaria testing during pregnancy	Yes	304	86.4
	No	48	13.6

Knowledge of Anaemia and Preventive Practices

Most participants reported receiving information about anaemia from health facilities. The most commonly identified foods for preventing anaemia included vegetables (82.4%) and fruits (52.0%). Additionally, 81.5% of respondents identified poor diet as a major cause of anaemia, while 30.4% cited frequent pregnancies as a contributing factor.

Table 3: Knowledge and Awareness of Anaemia (*n = 352*)

Variable	Response	Frequency (n)	Percentage (%)
Received information about anaemia	Yes	197	56.0
	No	155	44.0
Source of information	Health facility	248	70.5
Foods preventing anaemia	Vegetables	290	82.4
	Fruits	183	52.0
Causes of anaemia	Poor diet	287	81.5
	Frequent pregnancies	107	30.4
	Heavy menstrual bleeding	70	19.9

Prevalence of Anaemia Among Pregnant Women

The study found that 62.2% (n = 219) of pregnant women were anaemic, while 37.8% (n = 133) were not anaemic. This indicates that more than six out of every ten pregnant women attending ANC clinics in the study area were anaemic.

Table 4: Prevalence of Anaemia Among Pregnant Women (*n = 352*)

Anaemia Status	Frequency (n)	Percentage (%)
Anaemic	219	62.2
Non-anaemic	133	37.8
Total	**352**	**100**

Association between Socio-Demographic Factors and Anaemia

The prevalence of anaemia was higher among women aged 31–40 years (68.8%) compared with those aged 17–30 years (59.8%), although the difference was not statistically significant. Education level was also not significantly associated with anaemia status. However, anaemia was more common among unemployed women (67.6%) compared with self-employed and employed women.

Table 5: Association between Socio-Demographic Characteristics and Anaemia (n = 352)

Variable	Category	Anaemic n (%)	Non-anaemic n (%)	p-value
Age group	17–30 years	155 (59.8)	104 (40.2)	0.18
	31–40 years	64 (68.8)	29 (31.2)	
Education	Primary	33 (66.0)	17 (34.0)	0.75
	Secondary	179 (62.2)	109 (37.8)	
	Higher	7 (50.0)	7 (50.0)	
Employment	Unemployed	125 (67.6)	60 (32.4)	0.03
	Self-employed	84 (56.8)	64 (43.2)	
	Employed	10 (52.6)	9 (47.4)	

Association Between Antenatal Care Utilisation and Anaemia

Utilisation of antenatal care services showed significant association with anaemia status. Women who had short birth intervals of less than two years had a higher prevalence of anaemia compared with those with longer birth intervals. Similarly, women with a previous history of anaemia were more likely to be anaemic during the current pregnancy.

Table 6: Factors Associated with Anaemia among Pregnant Women (*n = 352*)

Variable	Category	Anaemic (%)	Non-anaemic (%)	p-value
Birth interval	< 2 years	72.0	28.0	0.02
	≥ 2 years	58.0	42.0	
Previous anaemia	Yes	82 (72.6)	31 (27.4)	0.002
	No	137 (57.3)	102 (42.7)	
Pica consumption	Yes	Higher prevalence	Lower prevalence	<0.001

Multivariable Logistic Regression Analysis

Multivariable logistic regression analysis identified several factors significantly associated with anaemia among pregnant women. Lack of knowledge about anaemia, unemployment, consumption of non-food substances (pica), and short pregnancy intervals were significantly associated with increased odds of anaemia.

Table 7: Multivariable Logistic Regression Analysis of Factors Associated with Anaemia (*n = 352*)

Variable	Adjusted Odds Ratio (AOR)	95% CI	p-value
Lack of knowledge about anaemia	1.25	1.06 – 1.47	0.007
Unemployment	1.28	1.09 – 1.52	0.004
Pica consumption	1.24	1.06 – 1.45	0.007
Birth interval <2 years	1.78	1.09 – 2.89	0.02

DISCUSSION

This study examined the association between antenatal care (ANC) service utilisation and anaemia status among pregnant women attending selected health facilities in the West B Region of Zanzibar. The findings revealed that 62.2% of pregnant women were anaemic, indicating that anaemia remains a significant public health concern in the study area. The prevalence reported in this study is higher than the global average reported by the World Health Organisation, which estimates that approximately 40% of pregnant women worldwide are affected by anaemia (World Health Organisation, 2021). The relatively high prevalence observed in the present study suggests that anaemia among pregnant women continues to be a major maternal health challenge in Zanzibar and similar settings.

The prevalence observed in this study is also comparable to findings from several studies conducted in sub-Saharan Africa**,** where anaemia among pregnant women remains widespread due to factors such as poor nutritional intake, frequent pregnancies, malaria infections, and limited access to maternal health services (Baldi & Pasricha, 2022; Bekele et al., 2023). Similar studies conducted in Tanzania have also reported high levels of anaemia among pregnant women attending antenatal care clinics. For example, studies conducted in different regions of Tanzania have shown that anaemia during pregnancy remains common despite ongoing public health interventions aimed at improving maternal nutrition and antenatal care services (Sunguya et al., 2021; Abdallah et al., 2022; Sichalwe et al., 2025). These similarities suggest that the problem of maternal anaemia is persistent across many parts of the country.

The findings of this study further demonstrated a significant association between antenatal care utilisation and anaemia status among pregnant women**.** Women who had better utilisation of antenatal care services were less likely to be anaemic compared to those with inadequate ANC attendance. Antenatal care services play an essential role in the early detection and prevention of pregnancy-related complications, including anaemia, through routine screening, nutritional counselling, iron and folic acid supplementation, and management of infections.

Similar findings have been reported in other studies conducted in developing countries, where adequate ANC attendance has been associated with improved maternal nutritional status and reduced risk of anaemia during pregnancy (Fite et al., 2021; Abdallah et al., 2022; Akowuah, Owusu-Addo, & Opuni, 2022).

In this study, several socio-demographic and behavioural factors were also found to be associated with anaemia among pregnant women. Unemployment was significantly associated with a higher prevalence of anaemia. This finding may be explained by the fact that women without a stable income may have limited access to adequate and nutritious food, which is essential for maintaining sufficient haemoglobin levels during pregnancy. Similar relationships between socioeconomic status and maternal anaemia have been documented in previous studies, which indicate that women with lower socioeconomic status are more vulnerable to nutritional deficiencies and poor health outcomes during pregnancy (Araujo Costa & de Paula Ayres-Silva, 2023; Abiodun-Ojo, Ogundipe, & Bello, 2025).

Another important factor associated with anaemia in this study was a short birth interval. Pregnant women with birth intervals of less than two years were more likely to experience anaemia compared to those with longer intervals between pregnancies. This finding is consistent with previous research suggesting that short interpregnancy intervals may reduce the time available for women to recover their nutritional reserves after childbirth, thereby increasing the risk of anaemia in subsequent pregnancies (Stephen et al., 2018; Bekele et al*.,* 2023). Adequate birth spacing has therefore been recognised as an important strategy for improving maternal health outcomes.

The study also identified pica consumption, which refers to the consumption of non-food substances, as a factor associated with anaemia among pregnant women. Pica practices are relatively common in some communities and may interfere with nutrient absorption or reflect underlying micronutrient deficiencies. Previous studies have reported similar associations between pica behaviour and iron deficiency anaemia among pregnant women (Baldi & Pasricha, 2022). Addressing such practices through targeted health education during antenatal visits may help reduce the risk of anaemia among pregnant women.

Knowledge about anaemia was also found to influence anaemia status among participants. Pregnant women who had limited knowledge about the causes and prevention of anaemia were more likely to be anaemic compared to those with better knowledge. This finding highlights the importance **of** health education provided through antenatal care services. Health education sessions during ANC visits can improve women's awareness about proper nutrition, iron supplementation, and preventive health practices, which ultimately contribute to reducing the risk of anaemia during pregnancy (Abdallah et al., 2022).

Overall, the findings of this study emphasise the critical role of effective antenatal care utilisation in reducing the burden of anaemia among pregnant women. Although antenatal care services are widely available in many health facilities in Zanzibar, the persistence of high anaemia prevalence suggests that additional efforts are needed to strengthen maternal health interventions. These may include improving early ANC attendance, enhancing nutritional counselling services, promoting iron and folic acid supplementation adherence, and strengthening community-based education programs aimed at preventing anaemia during pregnancy.

CONCLUSION

This study assessed the relationship between antenatal care service utilisation and anaemia among pregnant women attending selected health facilities in the West B Region of Zanzibar. The findings reveal that anaemia remains a significant public health problem among pregnant women in the study area, with a considerable proportion of participants experiencing different levels of anaemia during pregnancy. The high prevalence observed highlights the need for strengthened maternal health interventions to address both the medical and social determinants of anaemia.

The study identified several key factors associated with anaemia among pregnant women. Socioeconomic status, particularly unemployment, was found to increase the likelihood of anaemia, suggesting that economic vulnerability may limit access to adequate nutrition and health resources. In addition, limited knowledge about anaemia was significantly associated with increased anaemia risk, emphasizing the importance of maternal health education and awareness programs. Behavioural practices such as pica consumption were also strongly associated with anaemia, indicating the need for culturally sensitive health education to address harmful dietary habits during pregnancy.

Reproductive factors such as short birth intervals were found to contribute to higher anaemia prevalence, likely due to insufficient time for maternal iron stores to recover between pregnancies. These findings highlight the importance of integrating family planning services and birth spacing education within antenatal care programs. Although antenatal care services are available, gaps in timely utilization, adherence to iron supplementation, and effectiveness of health education may limit their impact on reducing anaemia.

Overall, the findings demonstrate that anaemia during pregnancy is a multifaceted health challenge influenced by socioeconomic, behavioural, and reproductive factors in addition to health service utilization. Addressing this problem requires a comprehensive approach that includes strengthening antenatal care services, improving maternal nutrition education, promoting appropriate birth spacing, and addressing socioeconomic barriers that affect maternal health.

Future research should consider longitudinal study designs to better understand causal relationships between antenatal care utilisation and anaemia outcomes. Further investigations should also explore additional biological and environmental determinants of anaemia, including micronutrient deficiencies and infectious diseases, to provide a more comprehensive understanding of the problem.

Acknowledgements

The authors wish to express their sincere gratitude to all individuals and institutions that contributed to the successful completion of this study. Special appreciation is extended to the academic supervisors and faculty members of the School of Public Health at Kampala International University in Tanzania for their valuable guidance, constructive feedback, and academic support throughout the research process.

The authors also acknowledge the support of the District Health Management Team of the West B Region in Zanzibar and the management of the health facilities where the study was conducted for granting permission and facilitating data collection. Their cooperation and commitment to improving maternal health services greatly contributed to the successful implementation of this research.

Sincere thanks are extended to all pregnant women who voluntarily participated in this study and generously shared their time and information. Their participation was essential in generating the evidence presented in this research.

Finally, the authors appreciate the encouragement and moral support received from colleagues, friends, and family members during the course of this study.

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