

Prevalence and factors contributing to maternal megaloblastic anemia among pregnant women attending Ndejje Health Centre IV in Wakiso District. A cross-sectional study.

Raymond Alex Mwesige*, Hasifa Nansereko, Francisco Ssemuwemba, David Kavuma, Jane Frank Nalubega
Mildmay Institute of Health Sciences

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Abstract

Background.

Maternal megaloblastic anemia, primarily caused by folic acid and vitamin B12 deficiency, is an important public health concern during pregnancy because it increases the risk of maternal and fetal complications. This study assessed the prevalence and socioeconomic factors associated with maternal megaloblastic anemia among pregnant women attending antenatal care at Ndejje Health Centre IV.

Methods.

A descriptive cross-sectional study employing a retrospective review of secondary data was conducted using 163 antenatal records of pregnant women who attended Ndejje Health Centre IV. Data were extracted using a structured checklist, entered into Microsoft Excel, and analyzed using SPSS version 25. Descriptive statistics summarized participant characteristics and prevalence, while Chi-square tests assessed associations between socio-economic factors and maternal megaloblastic anemia at a significance level of $p < 0.05$.

Results.

The prevalence of maternal megaloblastic anemia was 22/163 (13.7%). The majority of pregnant women were aged 20–29 years (44.2%), while 58 (35.6%) were engaged in small businesses. Regarding the study objectives, no statistically significant association was found between age and maternal megaloblastic anemia ($\chi^2 = 3.21$, $p = 0.36$). Similarly, education level ($\chi^2 = 4.18$, $p = 0.24$) and occupation ($\chi^2 = 2.76$, $p = 0.43$) were not significantly associated with the condition.

Conclusion.

The condition was not significantly associated with age, education level, or occupation, suggesting that nutritional deficiencies and antenatal care practices may play a greater role than socio-economic factors.

Recommendation.

Health facilities should strengthen nutrition education, ensure uninterrupted folic acid supplementation, and promote early and regular attendance at antenatal care.

Keywords: Maternal megaloblastic anemia, Socio-economic factors, Antenatal care, Folic acid deficiency, Vitamin B12 deficiency, Pregnant women, Ndejje Health Centre IV.

Submitted: August 05, 2026 **Accepted:** September 20, 2026 **Published:** October 21, 2026

Corresponding Author: Raymond Alex Mwesige
Mildmay Institute of Health Sciences

Background.

Megaloblastic anaemia is a type of anaemia caused mainly by deficiency of folic acid and vitamin B12. The condition results in the production of abnormally large and immature red blood cells which are unable to function properly in carrying oxygen around the body. Pregnant women are more vulnerable to developing megaloblastic anaemia because pregnancy increases the body's demand for nutrients required for blood formation and fetal growth (Keats *et al.*, 2021). Globally, anaemia remains one of the major health problems affecting pregnant women. According to recent global reports, about 40% of pregnant women worldwide are anemic, with the highest burden occurring in developing countries (Bongomin *et al.*, 2021). In sub-Saharan Africa,

poor nutrition, poverty, infections, and limited access to healthcare services continue to contribute greatly to anaemia during pregnancy. In Uganda, anaemia among pregnant women is still common despite efforts by the Ministry of Health to improve maternal healthcare services. A systematic review conducted in Uganda reported a pooled prevalence of about 30% among pregnant women (Bongomin *et al.*, 2021).

Although iron deficiency anaemia is more commonly discussed during antenatal care, megaloblastic anaemia caused by folate and vitamin B12 deficiency is also an important public health concern among pregnant women. Deficiency of these nutrients during pregnancy may result in maternal weakness, preterm delivery, low birth weight,

poor fetal development, and other adverse pregnancy outcomes (Mezzano *et al.*, 2022). Poor feeding habits, low income, inadequate health education, irregular antenatal attendance, and poor adherence to folic acid supplementation have been identified as some of the factors contributing to maternal anaemia among pregnant women (Bashir *et al.*, 2021). Additionally, repeated pregnancies and increased nutritional demands during late pregnancy increase the risk of nutrient deficiency and anaemia. Despite the availability of antenatal care services at Ndejje Health Centre IV, cases of anaemia among pregnant women continue to be reported. However, there is limited information regarding the prevalence and factors contributing specifically to maternal megaloblastic anaemia in the area. Therefore, this study was carried out to assess the prevalence and factors contributing to maternal megaloblastic anaemia among pregnant women attending antenatal care at Ndejje Health Centre IV in Wakiso District.

Methodology.

Study Design

The study used a descriptive cross-sectional design using a retrospective review of secondary data. This design was appropriate because it enabled the researcher to assess the prevalence of megaloblastic anemia and associated socio-economic factors using existing antenatal records at a single point in time.

Study Area.

The study was conducted at Ndejje Health Centre IV. The facility serves a large catchment population comprising both urban and peri-urban communities. The area is characterized by diverse socio-economic conditions, which may influence maternal nutritional status and anemia risk.

Study Population

The study population consisted of antenatal care records of pregnant women who attended ANC services at Ndejje Health Centre IV during the selected study period.

Inclusion Criteria

Records with documented hemoglobin (Hb) results
Records with Mean Corpuscular Volume (MCV) results
Records containing socio-demographic information (age, occupation, education level)

Exclusion Criteria

Incomplete records missing key laboratory results
Duplicate entries for the same patient
Records with missing socio-demographic information

Sample Size Determination

The sample size was determined using the Kish and Leslie formula for cross-sectional studies:

$$n = Z^2 p(1-p) / d^2$$

Where: **n** = desired sample size

Z = standard normal deviation at 95% confidence level = 1.96

p = estimated prevalence of maternal megaloblastic anemia. A prevalence of **10.7%** was adopted from a study conducted among pregnant women in Uganda (Nakimuli *et al.*, 2023). Therefore, **p = 0.107**.

d = margin of error (precision) = 0.05

Substituting into the formula:

$$n = \frac{(1.96)^2 \times 0.107(1 - 0.107)}{(0.05)^2}$$

n = 147

Adjusting for a 10% non-response or incomplete record rate:

Adjusted sample size = 147 / (1 – 0.10)

Adjusted sample size = 163

Therefore, a total of **163 records** were used in the study.

Sampling Technique.

A **convenience sampling technique** was used in this study. All antenatal records that met the inclusion criteria and were readily available during the data collection period were selected until the required sample size of 163 records was reached.

Records that were incomplete or lacked key variables were excluded.

This method was chosen due to the retrospective nature of the study and the limited availability of fully completed records.

Data Collection Methods, Tools, and Procedure

Data were collected retrospectively from antenatal registers (HMIS tools), laboratory registers, and patient files at the health facility.

A structured data extraction checklist was used to capture: Socio-demographic characteristics (age, education level, occupation, residence)

Laboratory findings (Hb and MCV values)

Data were extracted manually from records and entered into the checklist until the required sample size was achieved.

Study Variables

Dependent Variable

Megaloblastic anemia was defined as:

Hemoglobin level < 11 g/dL

Mean Corpuscular Volume (MCV) > 100 fL

Because vitamin B12 and folate levels were not routinely assessed in facility records, diagnosis was based on hematological indices suggestive of megaloblastic anemia.

Independent Variables

Socio-demographic factors: age, education level, occupation, residence

Data Analysis and Presentation

Data were entered into Microsoft Excel, cleaned, and exported to SPSS version 25 for analysis.

Descriptive statistics (frequencies, percentages, means) were used to summarize data.

Prevalence was calculated as the proportion of anemia cases among total sampled records.

A chi-square test was used to assess associations between socio-demographic factors and megaloblastic anemia.

A p-value < 0.05 was considered statistically significant.

Results were presented in tables, bar graphs, and pie charts.

Quality Control

The data extraction tool was pre-tested on 10% of records from a nearby facility.

Standard laboratory cut-off values (Hb < 11 g/dL, MCV > 100 fL) were used consistently

Data were double-checked to minimize entry errors.

The supervisor reviewed the process for accuracy and consistency.

Ethical Considerations.

Ethical approval was obtained from the institutional research ethics committee of Mildmay Institute of Health Sciences. Permission was granted by the management of Ndejje Health Centre IV before accessing records.

Since secondary data were used, informed consent was not required. Confidentiality was maintained by using codes instead of patient identifiers. Data were securely stored and used only for academic purposes.

Results.**Socio-demographic Characteristics of Respondents****Table 1: Socio-demographic characteristics (n = 163)**

Variable	Category	Frequency (n)	Percentage (%)
Age (years)	15–19	15	9.2
	20–39	72	44.2
	30–39	56	34.4
	40 and above	20	12.3
Education level	No formal education	18	11.0
	Primary	64	39.3
	Secondary	55	33.7
	Tertiary	26	16.0
Occupation	Unemployed	45	27.6
	Small business	58	35.6
	Large business	40	24.5
	Formal employment	20	12.3

The majority of respondents were aged 20–29 years (44.2%), indicating that most pregnant women attending antenatal care were within the active reproductive age group. Most participants had attained primary education (39.3%), while the majority were engaged in running small businesses (35.6%), reflecting a generally low socio-economic status of the study population.

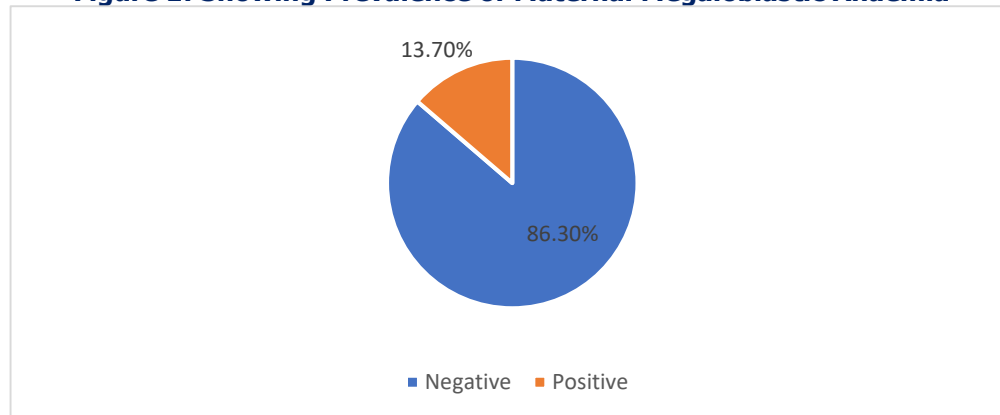
Prevalence of Maternal Megaloblastic Anemia.

The first objective was to determine the prevalence of maternal megaloblastic anemia among pregnant women attending ANC. Out of 163 records reviewed, cases meeting the diagnostic criteria (Hb < 11 g/dL and MCV > 100 fL) were identified.

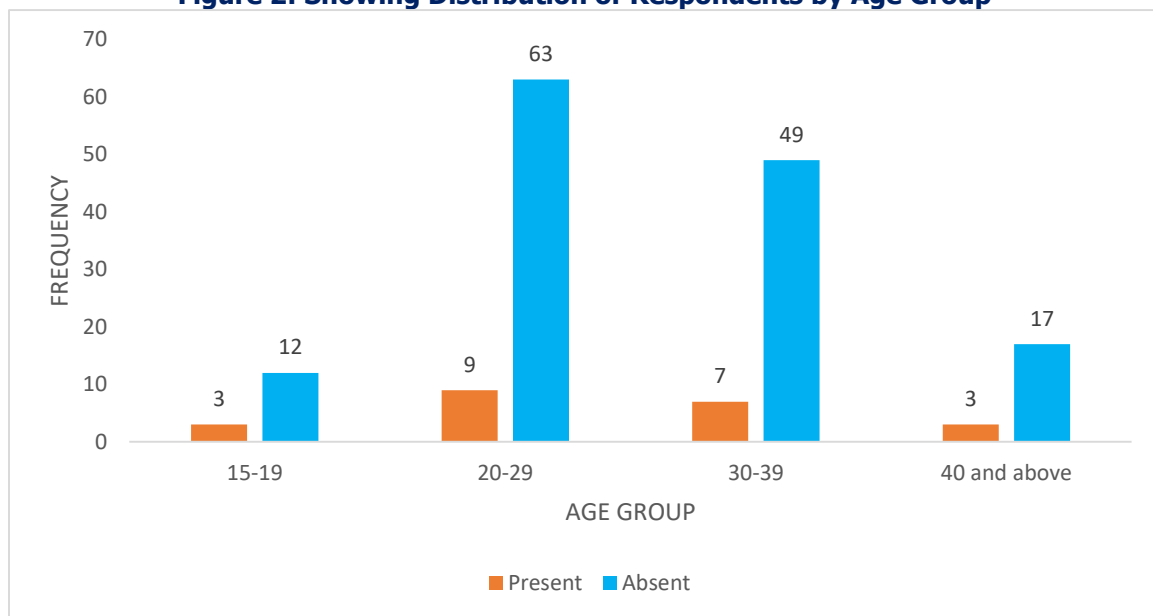
Table 2: Prevalence of megaloblastic anemia

Status	Frequency (n)	Percentage (%)
Positive	22	13.7
Negative	141	86.3
Total	163	100

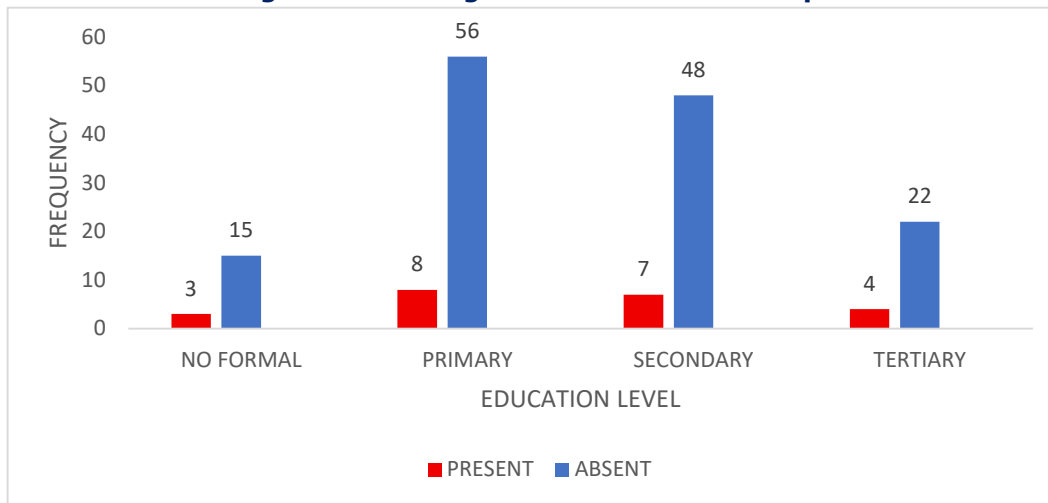
The prevalence of maternal megaloblastic anemia among pregnant women attending antenatal care at Ndejje Health Centre IV was 13.7%.

Figure 1: Showing Prevalence of Maternal Megaloblastic Anaemia**Socio-economic Factors Associated with Megaloblastic Anemia among pregnant women.****Table 3: Association between age and megaloblastic anaemia**

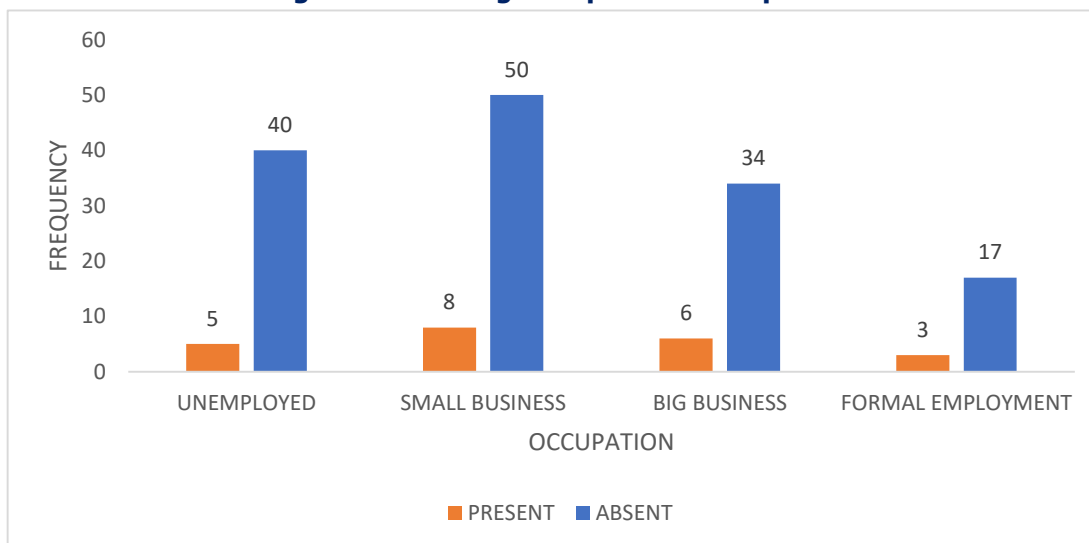
Age group	Megaloblastic anaemia present	Megaloblastic anaemia absent
15-19	3	12
20-29	9	63
30-39	7	49
40 and above	3	17

 $\chi^2 = 3.21$ $p = 0.36$ **Figure 2: Showing Distribution of Respondents by Age Group** $\chi^2 = 4.18$, $p = 0.24$ **Table 4: Association between education level and megaloblastic anemia**

Education level	Present	Absent
No formal	3	15
Primary	8	56
Secondary	7	48
Tertiary	4	22

Figure 3: Showing Education Levels of Respondents

$$\chi^2 = 2.76, p = 0.43$$

Figure 4: Showing Occupation of Respondents.**Table 5: Association between occupation and megaloblastic anemia.**

Occupation	Anemia Present	Anemia Absent
Unemployed	5	40
Small business	8	50
Big business	6	34
Formal employment	3	17

There was no statistically significant association between socio-economic factors (age, education level, and occupation) and maternal megaloblastic anemia among pregnant women attending ANC ($p > 0.05$). This suggests

that in this study, anemia was not strongly influenced by the measured socio-economic variables.

population experience similar dietary and economic challenges, as also noted in studies from Uganda and Kenya.

Education Level and Megaloblastic Anemia

Education level was not significantly associated with megaloblastic anemia ($p = 0.24$). This finding contrasts with studies by Hiraoka (2019) and Kibret *et al.* (2021), which reported that higher education improves nutritional knowledge and reduces the risk of micronutrient deficiencies.

However, the current findings agree with Kassa *et al.* (2022), who observed that even educated women may still experience anemia due to persistent household food insecurity and limited access to diverse diets. This suggests that knowledge alone may not be sufficient to prevent megaloblastic anemia without adequate economic capacity and food availability.

Occupation and Megaloblastic Anemia

Occupation mainly highlights a lack of good jobs where people don't earn enough to support certain foodstuffs, leaving dietary gaps. So, occupation does not directly affect anemia, but rather through supplements and dietary interventions. The findings indicate that age, level of education, and occupation may not have a direct influence on the development of megaloblastic anemia in this setting. Instead, the condition seems to be linked more closely to factors such as poor nutrition, inadequate intake of folate and vitamin B12, limited use of supplements, and food insecurity within households, which is consistent with earlier studies (WHO, 2021; Smith *et al.*, 2022).

Conclusion

The 13.7% prevalence of the above condition among pregnant women at Ndejje Health Centre IV indicates a moderate public health concern. Socio-economic factors were not significantly associated with the condition; however suggests that other factors such as nutrition and antenatal care practices contribute more to the development of megaloblastic anemia.

Study Limitations

Some records had missing or incomplete data.

The retrospective design limited control over data quality. Interactions with patients could not be established due to use of only records.

Recommendations

Strengthen nutrition education. Antenatal care services should enhance education on folate- and vitamin B12-rich diets, as recommended by WHO (2021).

Improve supplementation adherence. Health facilities should ensure consistent supply and adherence to folic acid supplementation to prevent megaloblastic anemia.

Discussion of Findings.

Prevalence of Maternal Megaloblastic Anemia among pregnant mothers.

The study found that the prevalence of maternal megaloblastic anemia was 13.7% among pregnant women attending antenatal care at Ndejje Health Centre IV. This finding is consistent with global and regional literature indicating that megaloblastic anemia accounts for approximately 10–15% of anemia cases in pregnancy, particularly in low- and middle-income countries (O'Leary & Samman, 2018; WHO, 2021). The prevalence also aligns with systematic reviews showing that folate and vitamin B12 deficiencies remain common in sub-Saharan Africa due to poor dietary diversity and limited access to animal-source foods (Smith *et al.*, 2022). Similarly, studies in Uganda have reported that a significant proportion of pregnant women exhibit macrocytic anemia patterns suggestive of folate and vitamin B12 deficiency (Uganda Ministry of Health, 2022; Nankinga & Aguta, 2019). The current study's findings are therefore consistent with national evidence showing that micronutrient-related anemia remains a persistent maternal health problem. However, the prevalence in this study (13.7%) is slightly lower than general anemia prevalence reported in Uganda (32%–34%) (Uganda Ministry of Health, 2022). This difference may be explained by the fact that not all anemia cases are megaloblastic in nature, as iron deficiency and other causes contribute significantly to overall anemia burden. This agrees with WHO (2021), which notes that iron deficiency remains the most common cause of anemia globally, while megaloblastic anemia contributes a smaller proportion.

The relatively moderate prevalence observed may also reflect improved antenatal supplementation programs, particularly folic acid distribution, which reduces the severity of folate deficiency among pregnant women attending health facilities.

Socio-economic Factors Associated with Megaloblastic Anemia among pregnant mothers.

The study assessed the relationship between socio-economic factors (age, education level, and occupation) and maternal megaloblastic anemia. No statistically significant associations were observed ($p > 0.05$ for all variables).

Age and Megaloblastic Anemia

The study found no significant association between age and megaloblastic anemia ($p = 0.36$). This finding is consistent with literature indicating that anemia in pregnancy is not strongly age-dependent but is instead influenced by nutritional intake and physiological demands (Kassa *et al.*, 2022; WHO, 2021). Although some studies suggest higher vulnerability among adolescents due to ongoing growth and pregnancy demands, the current study did not confirm this trend. This may be because all age groups in the study

Enhance antenatal care utilization. Early initiation and regular attendance of ANC visits should be promoted to allow timely screening and prevention.

Address broader food insecurity. Since socio-economic variables alone were not significant, interventions should focus on improving household dietary diversity and food security.

Further research: Future studies should investigate dietary intake patterns, supplementation compliance, and biochemical confirmation of folate and vitamin B12 levels.

Acknowledgement

I thank the Almighty God for granting me life, wisdom, strength, and guidance throughout the period of my study and during the preparation of this research report.

I sincerely extend my appreciation to the administration and lecturers of Mildmay Institute of Health Sciences for the knowledge, support, and guidance they provided during my training in Medical Laboratory Technology.

My special gratitude goes to my supervisor and the Institutional Research Committee for their professional guidance, constructive criticism, encouragement, and continuous support throughout the research process.

I also thank the administration and staff of Ndejje Health Centre IV for allowing me to conduct this study at their facility and for the cooperation offered during data collection.

Special appreciation goes to my family and friends for their encouragement, moral support, and prayers throughout my academic journey.

Finally, I appreciate all those who contributed directly or indirectly towards the successful completion of this study.

List of Abbreviations

ANC – Antenatal Care

Hb – Hemoglobin

HC IV – Health Centre IV

HMIS – Health Management Information System

MCV – Mean Corpuscular Volume

SPSS – Statistical Package for the Social Sciences

WHO – World Health Organization.

Source of funding.

The study was not funded.

Conflict of interest.

There is no conflict of interest.

Availability of data.

Data used in this study are available upon request from the corresponding author.

Authors contribution.

RAM designed the study, conducted data collection, cleaned and analyzed data, and drafted the manuscript; HN supervised all stages of the study from conceptualization of the topic to manuscript writing and submission; and FS supervised the study

Authors biography.

Raymond Alex Mwesige is a student of a diploma in medical laboratory technology at Mildmay Institute of Health Sciences.

Hasifa Nansereko is a research supervisor at Mildmay Institute of Health Sciences.

Francisco Ssemuwemba is a research supervisor at Mildmay Institute of Health Sciences.

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