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# Determinants of Nutritional Status Among Pregnant Women in Flood-Prone and Non-Flood-Prone Communities in Rivers State

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**Abstract**
The study investigated the determinants of nutritional status among pregnant women in flood-prone and non-flood-prone communities. It specifically examined the nutritional knowledge of pregnant women and the socio-demographic factors influencing their haemoglobin levels. Two research questions and one null hypothesis tested at a 0.05 level of significance guided the study. A descriptive cross-sectional survey design was adopted to assess the condition of pregnant women at a specific point in time. The population of the study comprised all pregnant women attending antenatal clinics in selected primary healthcare facilities, while a sample of 400 participants was targeted. Out of these, 368 duly completed and returned the questionnaire, representing a 92% response rate. A multistage sampling technique was employed to ensure fair representation of both flood-prone and non-flood-prone communities. Data were collected using a structured questionnaire titled Determinants of Nutritional Status of Pregnant Women in Flood-Prone and Non-Flood-Prone Communities Questionnaire (DNSPWFPNFPQ), which consisted of sections on nutritional knowledge and socio-demographic factors influencing nutritional status. Face and content validation were carried out by three experts, and the reliability of the instrument was established using the Cronbach Alpha method, yielding a coefficient of 0.86. The collected data were analysed using descriptive statistics such as frequency and percentage to answer the research questions, while Chi-square analysis was used to test the hypothesis at a 0.05 significance level. Findings revealed that many pregnant women had limited nutritional knowledge, particularly in flood-prone areas, which influenced their dietary decisions and health status. The results also showed that education and occupation significantly affected haemoglobin levels, while age and family size had no meaningful association. It was concluded that nutritional knowledge and socio-economic factors play an important role in determining the nutritional wellbeing of pregnant women. Based on the findings, it was recommended that health authorities should enhance nutrition education during antenatal care and promote policies that support women's education and economic empowerment to reduce anaemia and improve maternal health outcomes.

**Keywords:** Determinants, Nutritional Status, Pregnant Women, Communities, Rivers State

## Introduction

Determinants of nutritional status of pregnant women refer to the various factors that influence the intake and utilisation of nutrients necessary for maintaining health during pregnancy, often measured through indicators such as mid-upper arm circumference or body mass index. These determinants include household wealth, women's decision-making power, access to nutritional counselling, educational attainment, socioeconomic status, dietary diversity, and residence type, with poorer conditions in these areas linked to undernutrition (Wakwoya et al., 2022). Nutritional status in pregnancy is also shaped by pre-pregnancy body mass index, gestational weight gain patterns, dietary habits focusing on nutrient-dense foods, and micronutrient supplementation, where imbalances lead to outcomes like low birth weight or gestational diabetes (Marshall et al., 2022). In addition, determinants encompass technological access, family support, cultural values, economic factors, and education, with cultural food taboos and low income often contributing to chronic energy deficiency (Armini et al., 2020). Nutritional knowledge of pregnant women is the understanding of dietary needs, nutrient sources, and safe food practices specific to pregnancy, typically assessed


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through questionnaires covering topics like supplementation and food group recommendations. It includes awareness of folic acid for preventing neural tube defects, iron sources and absorption factors, and limits on caffeine or alcohol, though many women show gaps in serving sizes and energy requirements (Adylbekova et al., 2025). This knowledge also involves recognising increased nutrient demands in later trimesters, identifying high-risk foods to avoid infections, and understanding weight gain guidelines, with levels varying by education and access to prenatal advice (Olloqui-Mundet et al., 2024).

Socio-demographic factors influencing nutritional status, particularly haemoglobin level, are background characteristics such as age, residence, and income that affect nutrient access and health outcomes, with anaemia defined as haemoglobin below 11 g/dL. Older maternal age (over 30 years), rural residence, and low family income are associated with higher anaemia risk due to limited healthcare access and food affordability (Balcha et al., 2023). These factors also include education level, occupation, and parity, where low education and high parity increase vulnerability to malnutrition through poor nutrient knowledge and depleted body stores (Karemoi et al., 2020). In addition, distance to health centres and changes in work routines influence compliance with iron supplementation, indirectly impacting haemoglobin improvements (Thaha et al., 2025). Flood-prone communities in Rivers State are areas in the Niger Delta region of southern Nigeria that are highly susceptible to recurrent flooding due to their riverine location and low-lying terrain, leading to crop losses and food scarcity. These communities experience reduced food production and higher malnutrition rates from destroyed farmlands and eroded soil nutrients (Week & Wizor, 2020). Non-flood-prone communities in Rivers State are those less affected by flooding, often with better agricultural stability, though both types face climate-related challenges. In broader southern Nigerian riverine settings, flood-prone areas show greater food insecurity and health declines compared to non-flood-prone ones, with flooding causing price rises and poor nutritional outcomes (Enete & Onyekuru, 2022).

**Statement of the Problem**

Good nutrition during pregnancy is essential for the health of both the mother and the unborn child. Pregnant women require adequate nutrients to support the growth and development of the baby and to maintain their own wellbeing. However, several factors such as knowledge of nutrition and socio-demographic characteristics can influence the nutritional status of pregnant women. In some cases, poor dietary habits and low awareness of nutritional needs during pregnancy may lead to health problems such as anaemia and other nutrient deficiencies. In communities that experience flooding, the situation can be more challenging. Flooding often disrupts food supply, reduces access to nutritious foods, and affects general living conditions, which may negatively influence the health of pregnant women. On the other hand, women in non-flood prone communities may have better access to food and healthcare, which can improve their nutritional status. In Rivers State, differences in environmental conditions and socio-demographic backgrounds may contribute to variations in the nutritional status of pregnant women. Despite the importance of maternal nutrition, there is limited information on how nutritional knowledge and socio-demographic factors influence haemoglobin levels among pregnant women in flood prone and non-flood prone communities. This gap makes it difficult to design effective interventions to improve maternal health in these areas. Therefore, this study seeks to determine the factors that influence the nutritional status of pregnant women in flood prone and non-flood prone communities in Rivers State.

**Aim and Objectives of the Study**

The aim of the study was to examine determinants of nutritional status of pregnant women in flood prone and non-flood prone communities in Rivers State. Specifically, the study seeks to:

1. assess the nutritional knowledge of pregnant women in flood prone and non-flood prone communities in Rivers State
2. determine the socio-demographic factors influencing nutritional status (haemoglobin level) among pregnant women in flood prone and non-flood prone communities in Rivers State.

**Research Questions**

The following research questions were posed to guide the study:

1. What is the nutritional knowledge of pregnant women in flood prone and non-flood prone communities in Rivers State?
2. What is the socio-demographic factors influencing nutritional status (haemoglobin level) of pregnant women in flood prone and non-flood prone communities in Rivers State.


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**Hypothesis**

**$H0_1$:** There is no significant association between socio-demographic factors and nutritional status (HBL) of pregnant women in flood prone and non-flood prone communities in Rivers State.

**Methodology**

The study's design was a descriptive cross-sectional survey design. It is a type of study that examines the prevalence of a condition in a defined population at a specific point in time. The design allowed the researcher to collect data from a large sample of pregnant women at a specific point. The study was carried out in four Local Government Areas (Ahoada West, Ahoada East, Emuoha and Ikwerre) of Rivers State. The population for this study was all pregnant women attending antenatal clinics in the selected Primary healthcare facilities in the study area during the period of this study. A sample size of 368 respondents was selected for the study. Given the prevalence of malnutrition among pregnant women in Nigeria to be 36% (National Bureau of Statistics [NBS] and National Population Commission [NPC] 2016 as cited by Adeogun & Adeoti, 2019), the sample size for this study was determined using Cochrane formula for calculation of sample size for proportions as follows:

$n= Z^2pq/e^2$

where n = sample size, Z = standard normal deviation usually set at 1.96% which corresponds to 95% confidence level, p = proportion of the target population estimated to have the characteristics being measured which is in this case 36%, q = 1-p and e = level of statistical significance set which is 0.05.

By substitution we have that

$n = 1.96^2 \times 0.36\ (1-0.36)/0.05^2$

$= (3.8416 \times 0.2304)/( 0.0025)$

$= 354$

Therefore, n = 354

Considering the possibility of non-response, 10% of the calculated sample size was added to make up for the loss.

10% non-response rate

$=354 \times 10\%$

$=354 + 35.4$

$= 389.4$

Therefore, this is then rounded up to 400. So, the sample size targeted for the study is 400 pregnant women from the flood and non - flood impacted communities. Out of the sample of 400 respondents only 368 returned duly completed questionnaires. Multistage sampling technique was used. This is so to accommodate the different sampling techniques at various stages.

**Stage I:** Two Senatorial districts are involved. Rivers West and Rivers East were purposively selected. Rivers East represented non - flood prone while Rivers West represented flood prone.

**Stage II:** Two LGAs each were randomly selected from each Senatorial districts to represent flood prone (Ahoada East and Ahoada West) and non-flood prone LGAs (Emuoha and Ikwerre) making it four LGAs.

**Stage III:** A sampling frame of the PHC facilities in the selected flood and non – flood prone LGAs was constructed with information collected from the PHC coordinators of the selected LGAs. Sixteeen (16) health facilities that were selected randomly by balloting: Ahoada East (MPHC Ahoada, Ihuaje, Ula – Ehuda and Edeoha); Ahoada West (Akinnima, Okarki, Upatabo, Okogbe); Emuoha (Ogbakiri, Rumuji, Ndele and Rumuwehor) and Ikwerre (Omagwa, Igwuruta, Igwuruta 2 and Aluu).

**Stage IV:** Stratified proportionate random sampling was employed to determine the number of respondents from the selected flood prone and non-flood prone LGAs based on their population.

**Stage V:** Pregnant women who registered for Antenatal services in the selected PHC facilities that were not in exclusion listwere recruited one after the other in each PHC until the sample size for the PHC was reached. All pregnant women resident in the communities of the four LGAs, who attend ANC in the selected PHC facilities, who do not have chronic illness and give their consent to be part of the study were included in the study. Pregnant women who are not resident in the study area, not registered for ANC and do not give their consent were excluded from the study. Also, excluded from the study are pregnant women who have chronic medical conditions known to negatively impact nutrition and nutritional status of individuals e.g., HIV/AIDS. Sickle cell disease, Diabetes, hepatitis B, hypertension, tuberculosis, smoking, alcoholism, depression, liver or kidney problems.

A researcher-self structured questionnaire titled Determinants of Nutritional Status of Pregnant Women in Flood Prone and Non-Flood Prone Communities in Rivers State Questionnaire" was used for the study. It consisted of two (2)


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parts: Section A related to nutritional knowledge, and Section B socio-demographic factors influencing nutritional status. Thus, it was structured in two parts to accommodate the above information. The part on nutritional knowledge contains 18 items of mixed closed and open-ended questions which seek responses on the participants' knowledge of good diets, nutritional requirements, importance, and effect of maternal nutrition on pregnancy outcome, and sources of food nutrients.

Validity is the extent to which the research instrument measures the variables it is designed to measure. The validity of the questionnaire was ensured in several ways. First, the instrument was presented to the research supervisors and two experts to determine the face content validity. After due appraisal and corrections, the added information was included in the questionnaire and due corrections made. The final correction was resubmitted to the supervisor who validated the research instrument. The tape measure was compared with a plastic ruler which is a verified standard reference. It was also checked if the markings on the tape align very well to ensure consistency. Different persons measured MUAC of a respondent and the readings were compared. Also, the tape measure readings after measuring the MUAC was compared with the standard United Nation Children's Fund MUAC tape. This is validated by following the manufacturer's instruction. The same sample was tested more than once and the results were compared. The Cronbach's Alpha reliability method was used to test the consistency of the instrument to measure the variables purposed to be measured in this study. The reliability of the instrument was achieved by administration of the questionnaire to 40 pregnant women in PHC facility outside the ones to be used for the study. After two weeks, the same test was re-administered to the same participants. Reliability of the instrument was tested using Cronbach's Alpha technique to ensure internal consistency and construct validity of the instrument. The data collected was analysed using the SPSS version 27 software and the result is 0.86.

**Procedure for Data Collection**

The phases are as follows:

**Phase 1:** This involved collecting a letter of permission from the Primary Health Care Board to enable the researcher enter the Primary health care facilities.

**Phase 2:** Involved meeting and training of the research assistants.

**Phase 3:** Involved a meeting with the health care workers, trained research assistants and the researcher. The purpose, benefits and what is expected of them was explained and their cooperation throughout the period sought.

**Phase 4:** It was the recruitment of the study participants in the chosen health facilities. It took place in the ANC clinic. The health workers after offering the women ANC services then refers the participants to the researcher who explains the study and the procedure to the eligible participant, then written consent is obtained from the participants. For those who are not literate, an interpreter was used. This is done for all the participant

The questionnaire was then distributed to all pregnant women who consented to participate in the study via face-to-face. The researcher guaranteed the participants of the confidentiality of the information. A total of 400 questionnaire were administered to the respondents by the researcher and the six assistants recruited for the study. After filling the questionnaire, they were retrieved from the participants and then checked for completeness each day. Out of the 400 questionnaires, only 368 of them were sufficiently completed and used in the analysis thus making the return rate 92%. After filling the questionnaire, the MUAC of the participant was measured. In order to be effective, the researcher went with six assistants to help with the questionnaire administration, a licensed medical laboratory scientist and a nurse assisted in the medical testing and measurements respectively. The choice of medical laboratory scientist and nurse was to ensure professionalism in the process.

Data were coded and analysed using Statistical Package for social Sciences (SPSS) version 27 and summarized using frequency and percentage for the research questions. Chi-square analysis wasemployed to test hypotheses. One independent variable at a time was entered to check association with the dependent variable in bivariate analysis. At 95% confidence, variable with probability value (p-value) less than 0.05 was considered statistically significantly associated with dietary practice and nutritional status. The strength of association was described using Cramer's V or Phi coefficient of effect size. Ethical approval was collected from the Rivers State University Research, Development and Ethics Committee as well as Rivers State Hospitals' Management Board research, development and ethics committee (**Ref. No – RSHMB/RSHREC/2023/050**). Permission was also collected from the Rivers State Primary Health Care Board and the Medical officers/Coordinators in the four LGAs. The individual was made to sign an informed consent and told that participation was voluntary and that at any point she wants to with draw, she is free, Confidentiality was also ensured. They were informed not to use their names and their questionnaires were assigned


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code numbers to ensure confidentiality. When the study was completed and the data have been analyzed, the response sheet will later be destroyed. They were also accorded their due respect."

**Results**

**Research Questions One:** What is the nutritional knowledge of pregnant women in flood prone and non-flood prone communities in Rivers State?

**Table 1: Respondents' nutritional knowledge**

| | Non flood-prone | | Flood-prone | | Total | |
|---|---|---|---|---|---|---|
| **Nutritional Knowledge** | **N** | **%** | **N** | **%** | **Cases** | **%** |
| Poor (Scored <60%) | 77 | 39.7 | 102 | 58.6% | 179 | **48.6** |
| Good (Scored ≥60%) | 117 | 60.3 | 72 | 41.4% | 189 | **51.4** |
| Total | 194 | | 174 | | 368 | 100 |

The table reveals that the nutritional knowledge of pregnant women in both flood-prone and non-flood-prone communities in Rivers State varies significantly. In non-flood-prone areas, the majority (60.3%) demonstrated good nutritional knowledge (scoring ≥60%), while 77(39.7%) had poor knowledge (scoring <60%). Conversely, in flood-prone areas, a higher proportion 102(58.6%) exhibited poor nutritional knowledge, with only 72(41.4%) showing good knowledge. Overall, across both communities, 189(51.4%) of respondents had good nutritional knowledge, while 179(48.6%) had poor knowledge. Thus, it can be seen that the nutritional knowledge of pregnant women in flood-prone areas lack adequate knowledge.

**Research Questions Two:** What is the socio-demographic factors influencing nutritional status (HBL) of pregnant women in flood prone and non-flood prone communities in Rivers State?

**Hypothesis One:** There is no significant association between socio-demographic factors and nutritional status (HBL) of pregnant women in flood prone and non-flood prone communities in Rivers State.

**Table 2: Association between Socio-Demographic factors and Nutritional Status (HBL)**

| | **Nutritional Status (HBL)** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Age** | Anaemia (<11.0g/dL) | | Normal (≥11g/dL) | | Total | df | $X^2$ | P-value | Cramer's V |
| < 25yrs | 90 | 30.2% | 22 | 31.4% | 112 | 2 | 2.27 | 0.321 | 0.08 |
| 25-34yrs | 137 | 46.0% | 37 | 52.9% | 174 | | | | |
| > 35yrs | 71 | 23.8% | 11 | 15.7% | 82 | | | | |
| Total | 298 | | 70 | | 368 | | | | |
| | **Nutritional Status (HBL)** | | | | | | | | |
| **family size** | Anaemia (<11.0g/dL) | | Normal (≥11g/dL) | | Total | df | $X^2$ | P-value | Cramer's V |
| ≤ 4 persons | 195 | 65.4% | 47 | 67.1% | 242 | 1 | 0.073 | 0.787 | 0.014 |
| >4 persons | 103 | 34.6% | 23 | 32.9% | 126 | | | | |
| Total | 298 | | 70 | | 368 | | | | |
| | **Nutritional Status (HBL)** | | | | | | | | |
| **Occupation** | Anaemia (<11.0g/dL) | | Normal (≥11g/dL) | | Total | df | $X^2$ | P-value | Cramer's V |
| Farming/Fishing | 51 | 17.1% | 5 | 7.1% | 56 | 3 | 8.69 | 0.034 | 0.154 |
| Employed | 49 | 16.4% | 20 | 28.6% | 69 | | | | |
| Trading/Business | 159 | 53.4% | 34 | 48.6% | 193 | | | | |


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| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Others | 39 | 13.1% | 11 | 15.7% | 50 | | | | |
| Total | 298 | | 70 | | 368 | | | | |

| | Nutritional Status (HBL) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Education** | Anaemia (<11.0g/dL) | | Normal (≥11g/dL) | | Total | df | $X^2$ | P-value | Cramer's V |
| Non-formal/Primary | 45 | 15.1% | 2 | 2.9% | 47 | 2 | 7.75 | 0.021 | 0.145 |
| Secondary | 209 | 70.1% | 55 | 78.6% | 264 | | | | |
| Tertiary | 44 | 14.8% | 13 | 18.6% | 57 | | | | |
| Total | 298 | | 70 | | 368 | | | | |

The association between socio-demographic factors and nutritional status (HBL) of pregnant women highlights key findings. Age showed no significant association with nutritional status ($\chi^2 = 2.27$, $p = 0.321$, Cramer's V = 0.08), with anaemia being most prevalent among women aged 25–34 years (46.0%), followed by those under 25 years 90(30.2%) and over 35 years 71(23.8%). Similarly, family size was not significantly associated with nutritional status ($\chi^2 = 0.073$, $p = 0.787$, Cramer's V = 0.014), as anaemia was slightly more common in women with smaller families of ≤4 persons (195, 65.4%) compared to those with larger families of >4 persons (103, 34.6%). In contrast, occupation showed a significant association ($\chi^2 = 8.69$, $p = 0.034$, Cramer's V = 0.154), with anaemia being most prevalent among women engaged in trading/business (159, 53.4%) and lowest among those employed (49, 16.4%). Normal haemoglobin levels were highest among employed women (20, 28.6%). Education was also significantly associated with nutritional status ($\chi^2 = 7.75$, $p = 0.021$, Cramer's V = 0.145), with anaemia most common among women with secondary education (209, 70.1%), while normal haemoglobin levels were more prevalent among those with secondary (55, 78.6%) and tertiary education (13, 18.6%). These findings suggest that occupation and education significantly influence nutritional status, while age and family size have no notable impact.

**Discussion**

On nutritional knowledge of pregnant women, the good nutritional knowledge found in this study aligns previous studies. Lugowska and Kolanawski (2019) report of 55.7% average nutritional knowledge among 85.20% of their study participants supports the findings of this study. Likewise, the 63.6% by Lim et al. (2018), 61.4% by Nana and Zema (2018) of good nutritional knowledge found among pregnant women in their studies. In contrast to the good knowledge of nutrition found in this study, majority with poor knowledge by Abdellah et al. (2020), and 57.1% by However, the difference is not much and could be accounted for by differences in demographic characteristics of study respondents especially educational levels as those who had attained higher and better educational status were found to perform better in nutritional knowledge in the above cited studies. The result indicated that while nutritional knowledge is relatively better in non-flood-prone areas, a significant proportion of pregnant women, particularly in flood-prone areas, lacked adequate knowledge suggesting that flooding may be a major barrier for nutritional knowledge. Flooding affects educational and healthcare (antenatal clinic) facilities which are good source of nutritional knowledge for the people. Another plausible reason for the variation in nutritional knowledge score between the two groups is the fact that the flood prone communities are more rural compared to the non-flood prone communities. More so, the educational level of the people may have contributed to the not so good result of the nutritional knowledge of the pregnant women. Majority of the women had only attained secondary education. For the above reasons the researcher was not expecting a high knowledge level among the pregnant women. The implication of this finding is that there is need to scale up education on nutrition for both flood prone and non-flood prone communities by both community health workers and in antenatal clinics. This is very necessary as previous studies have shown that adequate information is important as it positively inform nutrition choices (Quaidoo et al., 2018) and that knowledge and good nutritional practice are related (Lim et al., 2018).

The test of association of socio-demographic factors with nutritional status revealed that occupation and education significantly influence nutritional status, while age and family size did not. The above finding is in line with the work of Adeogun and Adeoti (2019) but not in line with the works of Nwadiaru and Foluke (2021) who found association between socio-demographic factor and nutritional status. Although anaemia was most prevalent among women aged 25–34 years, there was no significant association between age and nutritional status meaning that nutritional status and age of pregnant women are independent of each other. Perhaps, the fact that the study participants were


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predominantly middle aged may have accounted for this result. Interestingly, family size was not significantly associated with nutritional status. Acting along other factors such as family income, where food availability becomes an issue, family size may become a significant factor for nutritional status.

The significant association found between occupation and anaemia is similar to this study finding and that of Adeogun and Adeoti (2019). Also, Wangui (2021) found relationship between socioeconomic factors and anaemia and age and MUAC. This could be tied to the income difference. Possibly the women who trade are engaged in petty trading and may not get much income compared to those who are gainfully employed. The later would have more purchasing power than the former. In the same vein, right education can influence a persons' attitude and choices of diet which eventually make for the persons' dietary practice. Little wonder why it was significantly associated with nutritional status. With proper education, people can make informed health decision including what to eat or not.

**Conclusion**

The study revealed clear differences in the nutritional knowledge of pregnant women across the communities studied. While most women in non-flood-prone areas displayed good nutritional knowledge, the majority of those in flood-prone areas showed poor understanding of proper dietary needs during pregnancy. Overall, the results suggest that nearly half of the respondents lacked sufficient knowledge of nutrition, which may affect their dietary choices and overall health during pregnancy. The findings also showed that socio-demographic factors play different roles in shaping the nutritional status of pregnant women. Age and family size were not significantly linked to nutritional status, suggesting that these factors do not directly influence the presence of anaemia. However, occupation and education were found to have meaningful associations. Women with higher levels of education and those who were employed showed better haemoglobin levels and fewer cases of anaemia, while those involved in trading or with lower educational attainment were more affected. This indicates that better education and stable employment can promote healthier nutritional outcomes. The study shows that nutritional knowledge and socio-economic factors such as education and occupation strongly influence the nutritional wellbeing of pregnant women. Strengthening nutrition education programmes and empowering women through education and income-generating activities may help improve their understanding of healthy dietary practices and reduce the prevalence of anaemia during pregnancy.

**Recommendations**

Based on the findings of the study, the following recommendations were made:

1. Health agencies and maternal care providers should organise regular nutrition education programmes for pregnant women, helping them understand the importance of balanced diets and how to make healthier food choices during pregnancy.
2. Policies that support women's education and promote access to stable income opportunities should be encouraged, as better education and employment can enhance nutritional awareness and reduce the risk of anaemia among pregnant women.

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