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SOCIO-DEMOGRAPHIC AND HEALTH CHARACTERISTICS ASSOCIATED WITH MATERNAL MALNUTRITION AMONG PREGNANT WOMEN IN KENEMA DISTRICT, SIERRA LEONE

William Foday Moiforay[1], Mohamed Musa Kabba[2],

Joseph Kortu[3], and Khalifa Konneh[4].

[1,4]Department of Public Health, Faculty of Health Sciences and Disaster Management, Eastern Technical University of Sierra Leone.
Emails: [1]wfmoiforay@etusl.edu.sl, [4]kkonneh@etul.edu.sl

[2]Department of Community Health and Clinical Sciences, School of Medicine, Njala University, Bo Campus.
Email: mohamed.kabba@njala.edu.sl

[3]Department of Information Technology and Computer Science, Faculty of Engineering and Innovation, Eastern Technical University of Sierra Leone.
Email: jkortu@etusl.edu.sl

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ABSTRACT: *This study examines the socio-economic, cultural, and health system characteristics associated with maternal malnutrition among pregnant women in Kenema, Sierra Leone. Using a descriptive cross-sectional design, 127 pregnant women attending antenatal clinics were surveyed between January and July 2025. Data were collected through structured questionnaires administered in local languages and analyzed using descriptive statistics. The findings reveal that poverty is the dominant driver of malnutrition, with 63.8% of respondents earning less than Le5, 000 monthly (approximately $0.25 USD per day), 75.6% skipping meals due to financial constraints, and 66.1% experiencing hunger during pregnancy. Dietary patterns were heavily carbohydrate-based (90.6%), with limited access to protein and micronutrient-rich foods. Adolescent pregnancy was prevalent (43.4%), and most women were single (72.4%), unemployed, or students. Despite high antenatal care attendance (94.5%) and supplement provision (93.7%), adherence to supplementation and nutrition education remained suboptimal. Cultural and religious food restrictions affected a minority, but poverty overshadowed these as the primary barrier. The study concludes that maternal malnutrition in Kenema is a multidimensional issue requiring integrated interventions that address economic vulnerability, food insecurity, adolescent health, and health system strengthening. These findings provide critical evidence for policymakers and health practitioners designing context-specific nutrition programs in similar low-resource settings.*

KEYWORDS: Adolescent Pregnancy, Antenatal Care, Dietary Diversity, Food Insecurity, Maternal Malnutrition, Pregnancy, Poverty, Sierra Leone.

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INTRODUCTION

Maternal malnutrition remains one of the most pressing public health challenges in sub-Saharan Africa, with profound implications for maternal and child health outcomes. The World Health Organization defines malnutrition as "the cellular imbalance between the supply of nutrients and energy and the body's demand for them to ensure growth, maintenance, and specific functions." During pregnancy, this imbalance can lead to severe complications, including anemia, low birth weight, preterm birth, and maternal mortality (WHO, 2016). In Sierra Leone, the situation is particularly dire, with maternal and child undernutrition rates ranking among the highest globally. Recent global estimates indicate that maternal malnutrition remains a significant public health concern. According to the Global Nutrition Report (2023) and the World Health Organization, anemia affects approximately 37% of pregnant women globally, with the highest prevalence observed in low- and middle-income countries. Sub-Saharan Africa continues to carry a disproportionate burden due to poverty, food insecurity, and limited access to diversified diets (WHO, 2023; Global Nutrition Report, 2023).

The eastern region of Sierra Leone, including Kenema District, faces acute nutritional vulnerabilities exacerbated by poverty, limited dietary diversity, and inadequate healthcare infrastructure.

Despite global initiatives such as the Sustainable Development Goals and national efforts to improve maternal health, localized data on the specific drivers of malnutrition in regions like Kenema remain insufficient (Black et al., 2013; WHO, 2022). Existing studies often focus on national-level statistics, overlooking the unique socio-cultural and economic factors that influence nutritional status at the community level. This research gap hinders the development of targeted, effective interventions. This study, therefore, investigates the prevalence and determinants of malnutrition among pregnant women in Kenema, with particular attention to socio-economic status, cultural practices, and health system factors. By providing context-specific evidence, the findings aim to inform more effective policies and programs to enhance maternal nutritional status and pregnancy outcomes not only in Kenema but in similar low-resource settings across sub-Saharan Africa.

LITERATURE REVIEW

Global and Regional Context of Maternal Malnutrition

Malnutrition during pregnancy represents a significant global health burden, affecting approximately 32 million pregnant women worldwide with anemia alone (WHO, 2015). Anemia is closely linked to maternal malnutrition because it often results from deficiencies in essential micronutrients such as iron, folic acid, and vitamin B12, which are necessary for hemoglobin production. During pregnancy, nutritional demands increase significantly to support fetal development and maternal physiological changes. When dietary intake is insufficient, women are at higher risk of developing anemia, which can contribute to complications such as fatigue, preterm birth, low birth weight, and maternal mortality (WHO, 2020; Balarajan et al., 2011). The problem is most acute in low- and middle-income countries, where poverty, food insecurity, and limited healthcare access converge to create perfect conditions for nutritional deficiencies. Sub-Saharan Africa bears a disproportionate burden, with the region accounting for nearly 40% of global maternal deaths and 25% of neonatal

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deaths associated with malnutrition (Black et al., 2021, or WHO 2023). Recent reports indicate a worsening situation, with the number of malnourished pregnant women increasing by 25% in conflict-affected regions between 2020 and 2022 (UNICEF, State of the World's Children Report 2023).

Determinants of Maternal Malnutrition

Research identifies multiple intersecting factors contributing to maternal malnutrition. Economic constraints consistently emerge as the primary determinant, with poverty limiting both the quantity and quality of food available to pregnant women (Smith & Haddad, 2015). Food insecurity, defined as limited or uncertain access to adequate food, affects approximately 76% of Sierra Leone's population living on less than $3.20 per day (MoHS, 2020). This economic vulnerability is compounded by cultural factors, including food taboos and traditional beliefs that may restrict consumption of nutrient-rich foods during pregnancy. For instance, some communities in Sierra Leone avoid eggs, certain meats, or leafy vegetables during pregnancy due to beliefs about their effects on the fetus (Kennedy et al., 2011).

Adolescent pregnancy represents another critical risk factor. Young mothers face unique nutritional challenges as their own growth and development compete with fetal demands for nutrients. Globally, pregnancy and childbirth complications are the leading cause of death among adolescent girls aged 15-19 (WHO, 2021). In Sierra Leone, where 28% of girls aged 15-19 have begun childbearing (SLDHS, 2019), this represents a significant public health concern.

Health System Factors

Antenatal care (ANC) serves as a crucial platform for addressing maternal malnutrition through supplementation, nutrition education, and monitoring. The WHO recommends at least eight ANC contacts during pregnancy, including nutrition counseling and iron-folic acid supplementation (WHO, 2016). However, implementation gaps persist. Studies across West Africa reveal that while ANC attendance may be high, the quality and comprehensiveness of services often fall short (Bhutta et al., 2013). Common challenges include supplement stockouts, inadequate counseling time, and poor communication of diagnostic results. These system-level deficiencies undermine the potential impact of ANC on maternal nutrition outcomes.

Research Gap

While substantial literature exists on maternal malnutrition in sub-Saharan Africa, few studies provide a detailed, context-specific analysis of the factors operating in districts such as Kenema. Most research employs broad national-level indicators that may mask important local variations. This study addresses this gap by describing the socio-economic, dietary, cultural, and health-service characteristics associated with maternal nutritional vulnerability among pregnant women in Kenema District.

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METHODOLOGY

Study Design and Setting

This study describes the socio-economic, dietary, cultural, and health-system characteristics associated with maternal nutritional vulnerability among pregnant women in Kenema, Sierra Leone. The study was conducted between January and July 2025. Kenema, the third-largest city in Sierra Leone, serves as the capital of the Eastern Province. With an estimated population of 100,000, Kenema represents a mix of urban, peri-urban, and rural characteristics. The city serves as a commercial hub for the surrounding agricultural region but faces significant challenges, including poverty, limited infrastructure, and healthcare access disparities. The main healthcare facility, Kenema Government Hospital, provides antenatal services to women from across the district.

Study Population and Sampling

The target population comprised pregnant women of reproductive age (15-49 years) attending antenatal clinics in Kenema. Inclusion criteria required participants to be pregnant, residing in Kenema District, and willing to provide informed consent. Exclusion criteria included women with severe medical conditions requiring hospitalization and those unable to communicate in either Mende or Krio, the local languages.

The sample size was determined using the Fisher et al. formula for finite populations:

$$nf = \frac{n_n}{1 + (\frac{n_n}{N})}$$

Where:

n_n = sample size for infinite population (384 based on Z=1.96, p=0.5, d=0.05)

N = estimated population of pregnant women in Kenema (178 based on health facility records)

nf = required sample size for finite population

This calculation yielded a required sample size of 120. Accounting for potential non-response, 127 participants were recruited through purposive sampling at antenatal clinics in Kenema Government Hospital and surrounding health centers.

Data Collection Instrument and Procedure

Data collection employed a structured questionnaire comprising four sections:

- **Socio-demographic characteristics:** Age, marital status, education, occupation, income, household composition
- **Dietary practices and food security:** Meal frequency, dietary diversity, food sources, experience of hunger
- **Health service utilization:** ANC attendance, supplement use, nutrition education, healthcare access

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- **Cultural and behavioral factors:** Food decision-making, cultural beliefs, pregnancy history

The questionnaire was developed in English, translated into Mende and Krio, and back-translated to ensure accuracy. The pretest involving 15 participants was conducted primarily to assess clarity, cultural appropriateness, and comprehension of the questionnaire. Due to the exploratory nature of the study and limited resources, formal reliability testing, such as Cronbach's alpha, was not conducted, which is acknowledged as a limitation. Trained research assistants administered the questionnaire through face-to-face interviews, each lasting approximately 30-40 minutes.

Ethical Considerations

Ethical approval was obtained from the Sierra Leone Ethics and Scientific Review Committee (Ref: SLERC/2024/PH/089). Written informed consent was obtained from all participants after explaining the study purpose, procedures, risks, and benefits. For participants under 18 years, additional assent was obtained along with consent from parents or guardians. Confidentiality was maintained through anonymous coding of data, secure storage, and restricted access to identifiable information. Participants received no monetary compensation but were provided with nutrition education materials and referrals to available support services.

Data Analysis

Data were entered into Microsoft Excel and analyzed using descriptive statistics. Continuous variables were summarized using means and standard deviations, while categorical variables were presented as frequencies and percentages. Results were visualized using bar charts, pie charts, and tables.

RESULTS

Socio-Demographic Characteristics

Age Distribution of Respondents

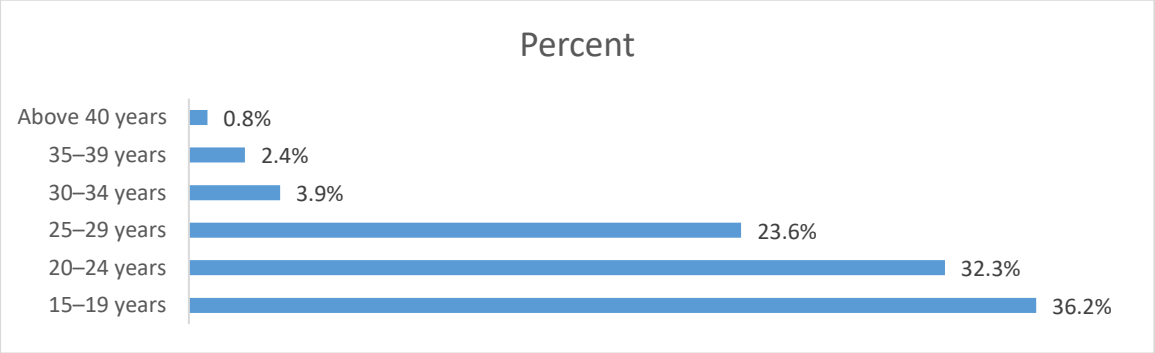

Figure 1 - Age Distribution of Respondents

The data reveal a predominantly young population, with 36.2% classified as adolescents (15 – 19 years) and 32.3% classified as young adults (20 – 24 years). This high proportion of

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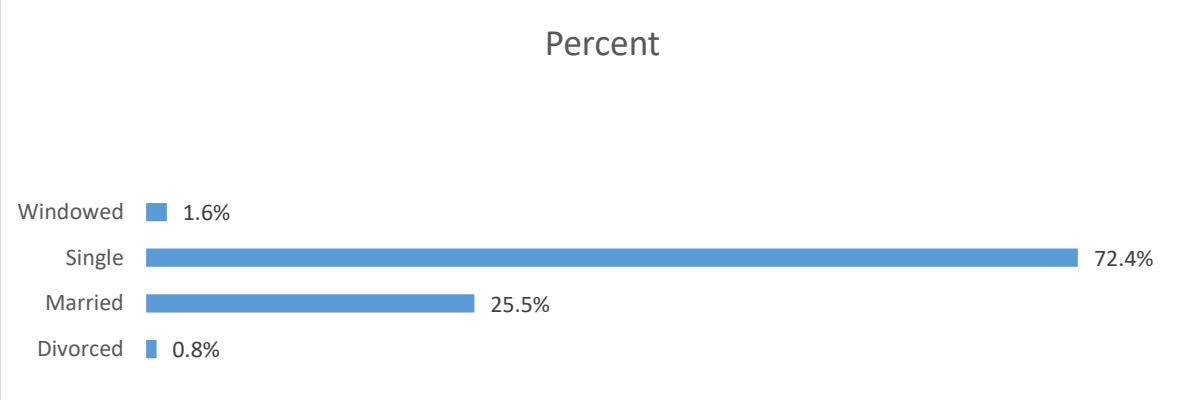
adolescent and young adult mothers aligns with national patterns of early childbearing in Sierra Leone. The limited representation of women over 30 (7.1% combined) suggests either lower pregnancy rates in this age group or potential selection bias in ANC attendance patterns.

Marital Status Distribution

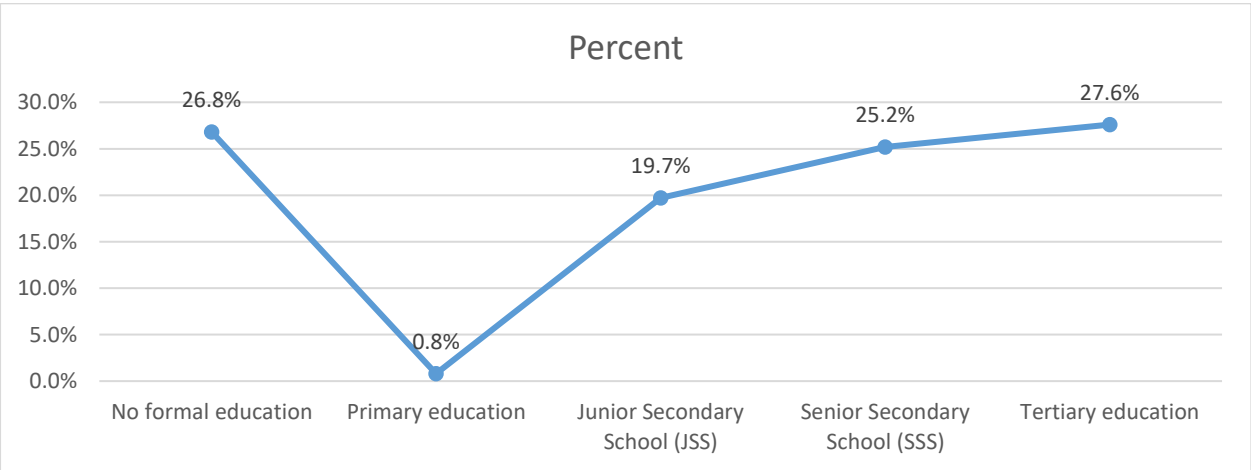
Figure 2 - Marital Status



The overwhelming majority of respondents were single (72.4%), with significant implications for economic security and social support during pregnancy. Married women represented only a quarter of the sample (25.2%), while divorced and widowed women accounted for minimal proportions (0.8% and 1.6%, respectively). This marital status distribution reflects broader social patterns in Sierra Leone, where many pregnancies occur outside formal marriage, particularly among adolescents and young adults.

Educational Attainment

Figure 3 - Education Level



Educational attainment showed a bipolar distribution, with significant proportions at both extremes: 26.8% had no formal education, while 27.6% had tertiary education. This pattern suggests that while educational barriers exist for some women, lack of education alone does not fully explain nutritional vulnerabilities. The middle categories (primary, JSS, SSS) together

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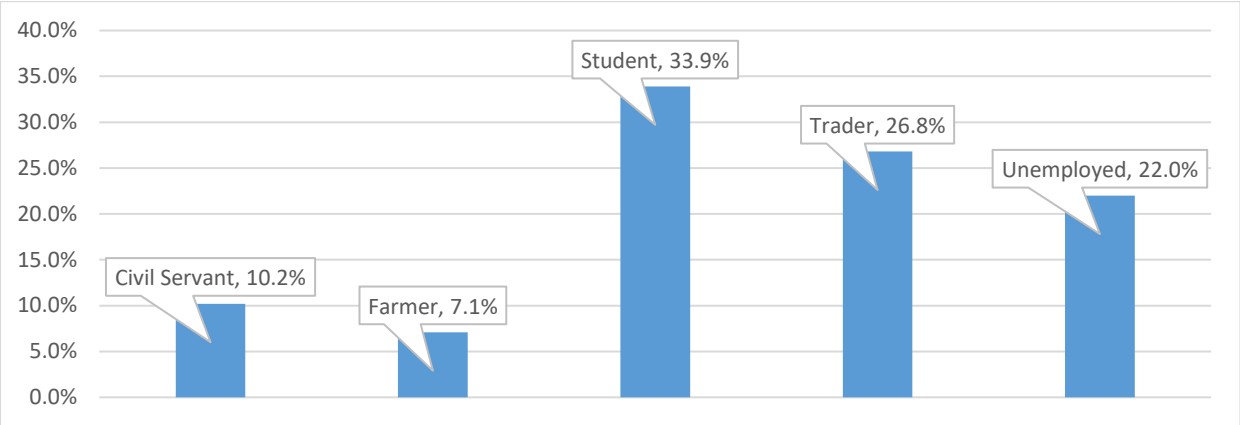
accounted for 45.7% of respondents, indicating moderate educational attainment for nearly half the sample.

Occupational Distribution

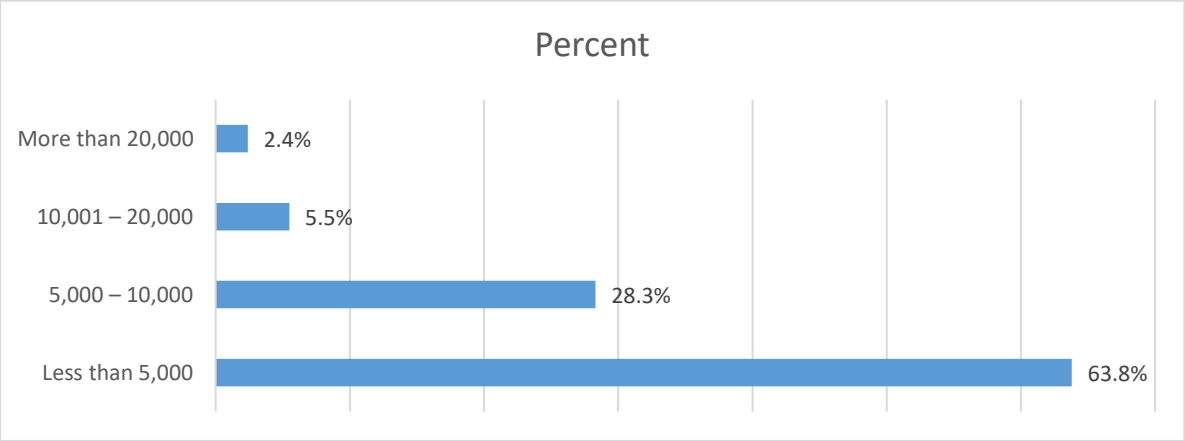
Figure 4 - Respondents' occupation



Students represented the largest occupational group (33.9%), followed by traders (26.8%) and unemployed women (22.0%). Formal employment was limited, with only 10.2% working as civil servants and 7.1% engaged in farming. This occupational profile reflects the economic realities of Kenema, where formal employment opportunities are scarce, and many women engage in small-scale trading or remain economically dependent.

Household Income Distribution

Figure 5 - Monthly Income (Leones)



The income data reveal extreme poverty among respondents, with 63.8% earning less than Le5, 000 monthly. Only 2.4% reported incomes above Le20, 000 monthly. This economic deprivation directly impacts food purchasing power and nutritional quality.

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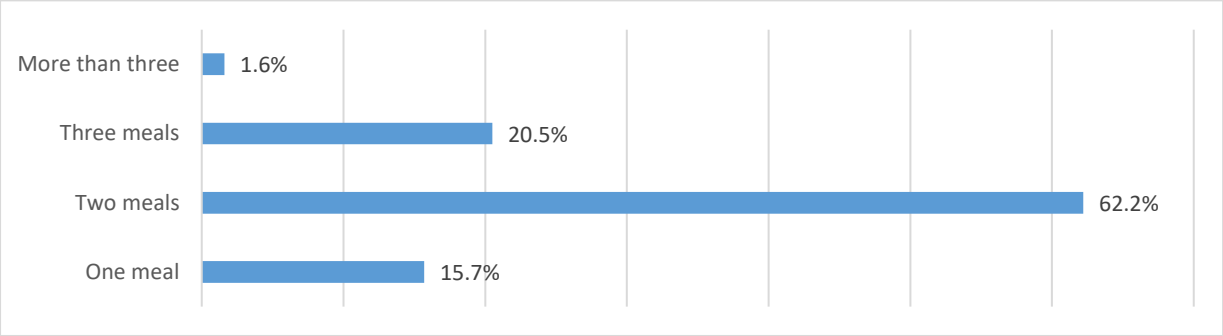
Dietary Practices and Food Security

Meal Frequency Patterns

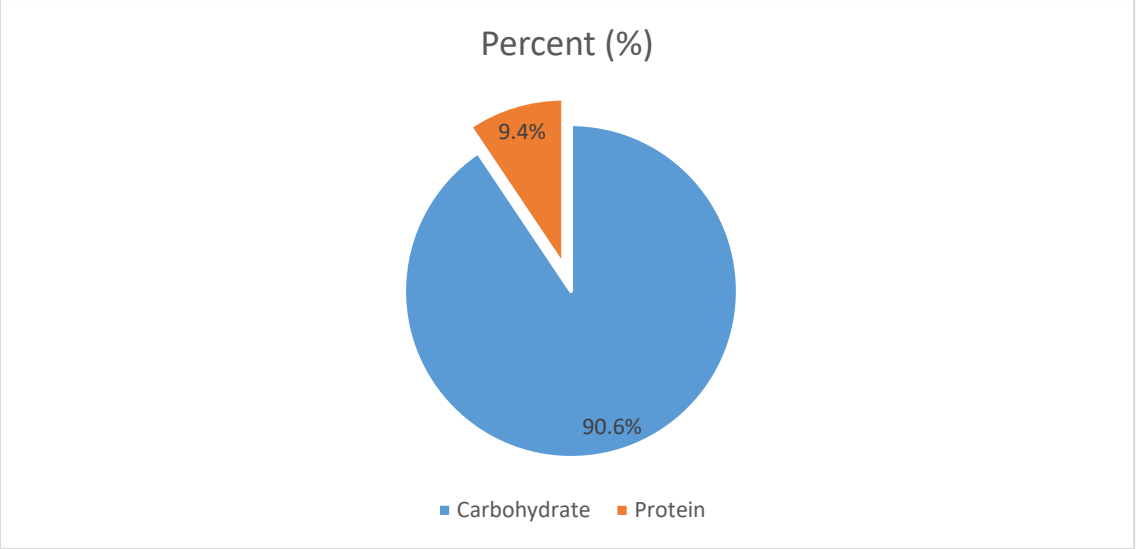
Figure 6 - Meals per Day



The majority of pregnant women (62.2%) consumed only two meals daily, falling below the recommended increased nutritional intake during pregnancy. Alarmingly, 15.7% reported eating only one meal per day, indicating severe food restriction. Only 22.1% achieved three or more meals daily.

Nutrient Composition of Main Meals

Figure 7 - Primary Nutrient Source in Main Meals



Dietary patterns showed overwhelming reliance on carbohydrate-based foods (90.6%), primarily rice, cassava, and maize. Protein-rich foods (meat, fish, eggs, legumes) constituted the main component of meals for only 9.4% of respondents. This nutritional imbalance reflects both economic constraints and local dietary preferences.

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Food Security Indicators

Table 1- Food security indicators

Indicator	Response	Frequency	Percent
Access to balanced meals	Yes	36	28.3%
	No	91	71.7%
Experienced hunger during pregnancy	Yes	84	66.1%
	No	43	33.9%
Skipped meals due to finances	Yes	96	75.6%
	No	31	24.4%

Food insecurity was widespread, with 71.7% lacking access to balanced meals, 66.1% experiencing hunger, and 75.6% skipping meals due to financial constraints. These intersecting indicators paint a picture of chronic food deprivation among pregnant women in Kenema.

Health Service Utilization

Antenatal Care Utilization

Table 2 - Antenatal Care Utilization

ANC Indicator	Category	Frequency	Percent
ANC attendance	Yes	120	94.5%
	No	7	5.5%
Number of visits	1-2	70	55.1%
	3-4	42	33.1%
	Above 4	13	10.2%
	None	2	1.6%

While ANC attendance was high (94.5%), the frequency of visits was suboptimal, with 55.1% attending only 1-2 visits against the WHO recommendation of at least eight contacts. This pattern suggests that while women initiate ANC, many do not complete the recommended schedule.

Supplement Utilization Patterns

Table 3 - Supplement Utilization Patterns

	Category	Frequency	Percent (%)
Taking Iron–Folic Acid (IFA)	No	11	8.7
	Yes	116	91.3
Following Supplement Instructions	No	9	7.1
	Yes	56	44.1
	Sometimes	62	48.8
Provision of Supplements at Health Facility	No	8	6.3
	Yes	119	93.7

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Supplement provision and uptake were generally positive, with 93.7% receiving supplements and 91.3% currently taking iron-folic acid. However, adherence was inconsistent, with only 44.1% always following instructions and 48.8% taking supplements daily. This gap between provision and consistent use represents a critical intervention point.

Nutrition Education and Anemia Awareness

Table 4 - Health Education Aspect

	Response	Frequency	Percent
Received nutrition education	Yes	119	93.7%
	No	8	6.3%
Knows the importance of folic acid	Yes	112	88.2%
	No	15	11.8%
Diagnosed with anemia	Yes	12	9.4%
	No	61	48.0%
	Not sure	54	42.5%

Nutrition education coverage was excellent (93.7%), and knowledge of folic acid importance was high (88.2%). However, anemia diagnosis and awareness showed concerning gaps, with 42.5% unsure of their anemia status. This suggests either inadequate testing or poor communication of results within ANC services.

Cultural and Behavioral Factors

Household Dynamics and Decision-Making

Table 5 - Factor

	Category	Frequency	Percent
Food decision-maker	Self	40	31.5%
	Partner	25	19.7%
	Relative	3	2.4%
	Shared	59	46.5%
Grows own food	Yes	38	29.9%
	No	89	70.1%

Food decision-making was primarily shared (46.5%) or autonomous (31.5%), suggesting moderate female agency in food choices. However, 70.1% did not grow their own food, indicating dependence on market purchases and vulnerability to price fluctuations.

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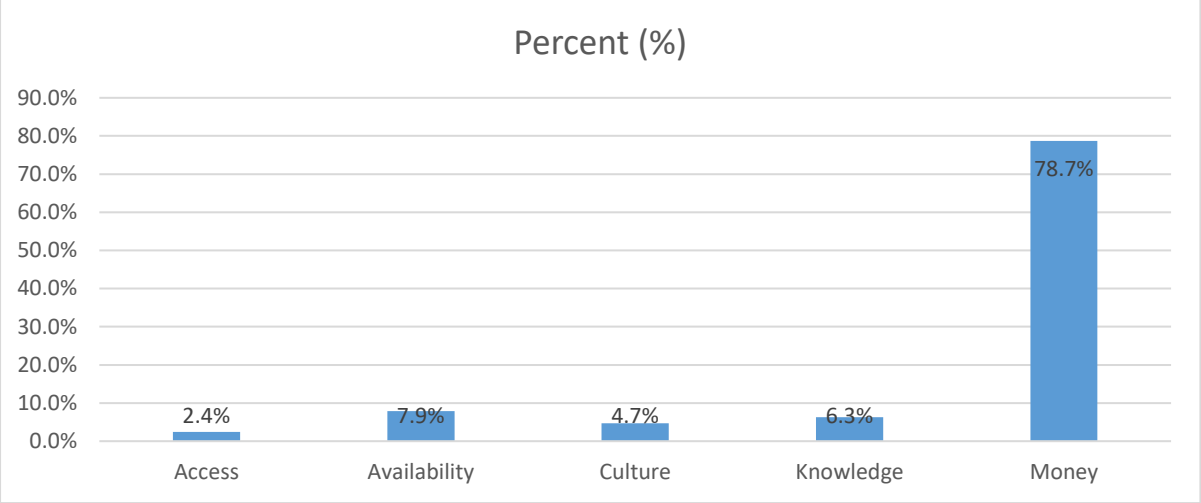
Barriers to Adequate Nutrition

Figure 8 - Perceived Barriers to Good Nutrition



Financial constraints dominated as the primary barrier to adequate nutrition (78.7%), far exceeding other factors like food availability (7.9%), knowledge (6.3%), cultural restrictions (4.7%), and physical access (2.4%). This finding underscores the centrality of poverty in driving maternal malnutrition.

Pregnancy potential risk and History

Table 6 – Pregnancy potential risk and history

	Response	Frequency	Percent
First pregnancy	Yes	95	74.8%
	No	32	25.2%
History of low birth weight	Yes	28	22.0%
	No	50	39.4%
	Not sure	49	38.6%
Experienced weight loss	Yes	30	23.6%
	No	25	19.7%
	Not sure	72	56.7%

Most respondents were experiencing their first pregnancy (74.8%), highlighting the predominance of young, first-time mothers. A history of low birth weight deliveries was reported by 22.0%, though 38.6% were unsure, indicating poor tracking of birth outcomes. Weight loss during the current pregnancy affected 23.6%, with 56.7% unsure of their weight status, a concerning finding given the importance of adequate weight gain during pregnancy.

DISCUSSION

This study examined the socio-economic, dietary, cultural, and health system factors influencing maternal malnutrition among pregnant women in Kenema, Sierra Leone. The findings demonstrate that maternal malnutrition in this context is primarily driven by structural

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poverty and food insecurity, compounded by adolescent pregnancy and gaps in the quality of antenatal care (ANC) services. These results align closely with existing evidence from low-resource settings in sub-Saharan Africa and directly address the study objectives.

Socio-Economic Factors and Maternal Malnutrition

In line with assessing socio-economic determinants, the findings clearly identify poverty as the dominant driver of maternal malnutrition. Nearly two-thirds of respondents (63.8%) reported a monthly income of less than Le5, 000 (approximately USD 200). This level of deprivation translated directly into food insecurity, with 75.6% of respondents skipping meals due to financial constraints and 66.1% experiencing hunger during pregnancy.

These findings are consistent with evidence that identifies poverty as a fundamental cause of malnutrition, operating through limited purchasing power and reduced access to diverse, nutrient-rich foods (Link & Phelan, 1995; Smith & Haddad, 2015). The high proportion of single mothers (72.4%) and women who were students (33.9%) or unemployed (22.0%) further exacerbates economic vulnerability. Similar patterns have been documented in Sierra Leone and other low-income settings, where unmarried and economically dependent women face heightened nutritional risk during pregnancy (MoHS, 2020; UNICEF, 2021).

Dietary Practices and Food Insecurity

With respect to dietary practices and food security, the study revealed widespread nutritional inadequacy. Only 22.1% of respondents consumed three or more meals per day, while 62.2% ate only two meals and 15.7% consumed just one meal daily. Such intake levels are insufficient to meet the increased energy and micronutrient requirements of pregnancy (WHO, 2016).

Dietary composition further highlights the severity of nutritional imbalance. A total of 90.6% of respondents relied primarily on carbohydrate-based meals, while only 9.4% reported protein-rich foods as a major dietary component. Additionally, 71.7% lacked access to balanced meals. This pattern mirrors findings from similar contexts, where economic constraints force households to prioritize calorie-dense but nutrient-poor staples (Kennedy et al., 2011; Black et al., 2013). The high prevalence of pregnancy-related weight loss (23.6%) observed in this study is likely a direct consequence of this chronic food insecurity.

Adolescent Pregnancy and Nutritional Vulnerability

The objective of examining demographic risk factors is strongly supported by the age distribution of respondents. More than two-thirds (68.5%) of pregnant women were aged 15–24 years, with adolescents aged 15–19 years accounting for 36.2%. Furthermore, 74.8% were experiencing their first pregnancy. These findings reflect national trends in early childbearing in Sierra Leone (SLDHS, 2019).

Adolescent pregnancy poses significant nutritional challenges, as young mothers must meet the demands of both their own growth and fetal development (WHO, 2021). This dual burden increases the risk of undernutrition, anemia, and adverse birth outcomes. In the present study, this vulnerability is reflected in the high levels of food insecurity, uncertainty regarding weight changes (56.7%), and limited awareness of anemia status (42.5%). Similar associations between adolescent pregnancy and poor maternal nutritional outcomes have been reported in other low- and middle-income countries (Conde-Agudelo et al., 2005; WHO, 2021).

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Health System Factors and Antenatal Care Utilization

Regarding health system factors, ANC attendance was high, with 94.5% of respondents reporting at least one visit. Supplement provision was also strong, with 93.7% receiving iron–folic acid and 91.3% reporting current use. These findings suggest that access to basic maternal health services in Kenema is relatively good.

However, the frequency and quality of care were suboptimal. More than half of the respondents (55.1%) attended only one to two ANC visits, far below the WHO-recommended minimum of eight contacts (WHO, 2016). Supplement adherence was inconsistent, with only 44.1% always following instructions. Additionally, although 93.7% received nutrition education and 88.2% understood the importance of folic acid, a large proportion of women were unsure of their anemia status (42.5%).

These findings align with studies showing that high ANC coverage does not necessarily translate into improved nutritional outcomes when service quality, continuity of care, and patient-provider communication are weak (Bhutta et al., 2013; Kruk et al., 2018). The results indicate missed opportunities within ANC to effectively monitor nutritional status and reinforce consistent supplement use.

Cultural and Behavioral Influences

The study further explored cultural and behavioral factors influencing maternal nutrition. Contrary to findings from some settings, cultural food restrictions were reported as a major barrier by only 4.7% of respondents. Similarly, lack of nutrition knowledge was cited by just 6.3%, reflecting the relatively high coverage of nutrition education during ANC visits.

In contrast, financial constraints were identified as the primary barrier to adequate nutrition by 78.7% of respondents. Although food decision-making was shared (46.5%) or controlled by the woman herself (31.5%), economic limitations severely constrained actual dietary choices. Moreover, 70.1% of respondents did not grow their own food, increasing reliance on market purchases and vulnerability to food price fluctuations. These findings support broader evidence that economic access, rather than cultural norms, is the key determinant of maternal diet quality in many low-income settings (Smith & Haddad, 2015; UNICEF, 2021).

Integrated Interpretation of Findings

Overall, the findings indicate that maternal malnutrition in Kenema is driven primarily by poverty-induced food insecurity, with adolescent pregnancy and health system quality gaps acting as reinforcing factors. Despite high ANC attendance and widespread nutrition education, economic constraints prevent women from translating knowledge into adequate dietary practices. Cultural factors play a comparatively minor role.

These results support calls for integrated, multisectoral interventions that address the underlying socio-economic determinants of maternal nutrition, rather than relying solely on supplementation and education (Black et al., 2013; WHO, 2020). Addressing maternal malnutrition in Kenema, therefore, requires coordinated action across health, social protection, agriculture, and education systems.

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IMPLICATIONS FOR RESEARCH AND PRACTICE

Practical Implications for Maternal Health Programs

Integrated Economic-Nutrition Interventions: Nutrition programs must address the economic root causes of food insecurity. Potential strategies include conditional cash transfers for pregnant women, food vouchers for nutrient-rich foods, and livelihood support for vulnerable households. These economic interventions should be combined with nutrition education to maximize impact.

Adolescent-Focused Services: Given the high proportion of young mothers, ANC services should be adapted to adolescent needs. This includes youth-friendly counseling approaches, peer support groups, and addressing the specific nutritional requirements of growing mothers. Schools and community centers can serve as additional platforms for reaching adolescents before and during pregnancy.

Quality Improvement in ANC: Beyond increasing coverage, efforts should focus on enhancing the quality and continuity of ANC. This includes ensuring the recommended eight contacts, improving communication of diagnostic results (especially anemia status), and supporting consistent supplement adherence through better counseling on side effect management.

Food-Based Nutrition Strategies: While supplementation is crucial, long-term solutions must address dietary patterns. Programs promoting home gardening of nutrient-rich vegetables, small-scale animal husbandry, and preservation of seasonal foods can improve dietary diversity. Community kitchens or meal programs for pregnant women could provide immediate relief for those experiencing hunger.

Strengthening Monitoring Systems: The high levels of uncertainty regarding weight changes, anemia status, and birth outcomes indicate weak monitoring and communication systems. Simple tools like maternal health cards with clear tracking of key indicators, coupled with effective patient-provider communication, could significantly improve awareness and early intervention.

Research Implications

Longitudinal Studies: Future research should employ longitudinal designs to track nutritional status, supplement adherence, and birth outcomes over time. This would provide stronger evidence of causal relationships and intervention effectiveness.

Mixed-Methods Approaches: Qualitative research is needed to explore the lived experiences of food insecurity, decision-making dynamics within households, and cultural beliefs about pregnancy nutrition. Such insights would inform more culturally appropriate interventions.

Intervention Research: Experimental or quasi-experimental studies testing integrated economic-nutrition interventions would provide valuable evidence for program design. Particular attention should be paid to cost-effectiveness and scalability in resource-limited settings.

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Health Systems Research: Further investigation into health system barriers, including supply chain management for supplements, health worker training needs, and patient-provider communication patterns, would identify specific leverage points for improvement.

Comparative Studies: Research comparing different districts or regions within Sierra Leone could identify context-specific factors and transferable strategies. International comparisons with similar settings could also yield valuable insights.

CONCLUSION

This study provides comprehensive evidence that maternal malnutrition in Kenema, Sierra Leone, is fundamentally driven by poverty and food insecurity, with adolescent pregnancy, health system gaps, and cultural factors contributing roles. The findings challenge simplistic approaches focusing solely on nutrition education or supplement distribution, instead highlighting the need for integrated strategies that address the socioeconomic determinants of health.

The extreme economic deprivation documented, with nearly two-thirds of pregnant women living on less than Le5,000 monthly and three-quarters skipping meals due to finances, represents both a public health crisis and a social justice issue. While health services have achieved commendable coverage in ANC and supplement provision, quality gaps in continuity of care, patient communication, and supplement adherence limit their effectiveness.

Addressing maternal malnutrition in Kenema requires moving beyond traditional health sector approaches to embrace multisector collaboration. Social protection programs, agricultural interventions, economic empowerment initiatives, and education systems all have roles to play in creating an enabling environment for maternal nutrition. Within the health system, attention must shift from mere service delivery to quality improvement, patient engagement, and continuity of care.

Ultimately, improving maternal nutrition is not only a health imperative but also an investment in human capital and economic development. Well-nourished mothers are more likely to have healthy babies, who in turn have better cognitive development, educational achievement, and economic productivity throughout their lives. By addressing the root causes of malnutrition today, Sierra Leone can break the intergenerational cycle of poverty and poor health, building a foundation for sustainable development.

FUTURE RESEARCH DIRECTIONS

Based on the findings and limitations of this study, several promising directions for future research emerge:

Research examining how to effectively integrate economic support with nutrition services within existing health systems. This includes operational research on delivery mechanisms, targeting strategies, and cross-sectoral coordination.

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Development and evaluation of nutrition interventions tailored to the biological, psychological, and social needs of pregnant adolescents. This should include attention to their continued growth, educational aspirations, and evolving autonomy.

Systematic assessment of Kenema's food environment, including availability, affordability, and desirability of nutrient-rich foods. Such research could identify specific leverage points for improving dietary diversity.

In-depth investigation of how gender norms, household decision-making, and women's empowerment influence maternal nutrition. This could inform interventions aimed at increasing women's control over resources and food choices.

Exploration of how mobile technologies could support maternal nutrition through appointment reminders, nutrition education, supplement adherence tracking, and peer support networks.

Economic evaluation of different intervention packages to guide resource allocation decisions in resource-constrained settings.

Research following children born to malnourished mothers to document the extended consequences on growth, development, and health across the life course.

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