

Exploring Barriers and Strategies for Improving Women's Dietary Quality in Rural Northern Ghana: A Qualitative Study

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Abstract

This qualitative study seeks to investigate the perceptions, attitudes, and contextual factors that influencing women's dietary quality in rural communities in the Northern Region of Ghana, focusing on the barriers hindering access to nutritious foods. Through exploratory descriptive design, a total of 90 women of reproductive age (15–49 years) were involved in focus group discussions (FGDs) across three districts, which is Sagnarigu Municipality, Kumbungu District, and Tolon District. The key themes that were identified included limited dietary diversity and reliance to staple foods, cultural food-sharing practices, economic and the seasonal barriers to nutritional variety, awareness and strong desire for improved nutrition, and community specific suggestions for dietary improvement. Economic challenge, particularly availability of seasonal nutritious foods and limited income, were seen as a primary barriers to their dietary diversity. Cultural food sharing practices were found to affect the fair distribution of nutrients within households in the communities. Despite the above challenges, participants willingly expressed a strong desire to improve on their diets and also proposed solutions which includes financial support to women, cooperative farming and nutrition education. The findings in this study points out the complex interplay of economic, cultural, and environmental factors influencing food access and emphasize on the need of community-based interventions to enhance dietary quality in rural areas.

Background

Dietary quality remains a foundational determinant of health and well-being, particularly among women of reproductive age, whose nutritional status influences not only their own health but also that of their children and wider communities [1]. In rural Northern Ghana, persistent micronutrient deficiencies, inadequate intake of diverse foods, and high rates of anemia recorded at 50.8% among pregnant women signal a systemic challenge in achieving optimal dietary quality [2]. Despite national and international efforts to promote nutrition security, the prevalence of poor dietary practices continues to undermine progress toward key health and sustainable development goals, including reductions in maternal and child morbidity and mortality [3]. This underscores the need to understand the barriers that limit women's access to and consumption of high-quality diets within these socio-cultural environments, especially since anemia affects 61.1% of women aged 15–24 in the northern zone [3]

Women in rural Northern Ghana shoulder multiple responsibilities, including food preparation and agricultural labor; yet they frequently encounter structural constraints that impede their ability to make health-promoting dietary choices [4]. These constraints include limited household income, seasonal food shortages, and cultural norms that prioritize male household members' food preferences, contributing to the fact that 45% of women in the region fail to meet minimum dietary diversity [5]. In addition, gendered power relations in household food allocation can restrict women's control over food resources, further decreasing their opportunities to consume balanced diets as evidenced by significantly higher food insecurity reporting among women (5.06) than men (3.49) within the same households [6]. While quantitative surveys have documented nutritional deficiencies using standardized diversity scores to

determine likelihood of micronutrient adequacy, there is scant evidence exploring the lived experiences, perceptions, and context-specific barriers that shape women's dietary decisions [7].

Qualitative inquiry offers a crucial lens for unpacking the interplay between individual, household, and environmental factors shaping dietary quality, such as the 60% prevalence of child hunger reported in men-dominated households [8]. By engaging directly with women's voices, beliefs, and coping strategies, researchers can illuminate the culturally embedded meanings of food, gender norms influencing dietary practices, and locally devised solutions employed by women to negotiate dietary challenges [9]. Although some studies in Ghana have addressed child nutrition and general food security, there is limited qualitative research focusing on identifying the causes of maternal anemia in rural northern settings to assess the outcomes of existing interventions [10]. This gap in contextually grounded understanding constrains the design of effective nutrition interventions that are responsive to women's lived realities, especially when average dietary diversity scores in the region remain as low as 5 out of 15 food groups [12].

Furthermore, interventions aimed at improving dietary quality often emphasize technical solutions, such as supplementation and agricultural productivity, without sufficiently addressing socio-cultural determinants or women's agency, though diet quality is significantly shaped by demographic factors like marital status and ethnicity [11]. A deeper exploration of barriers from women's own perspectives, as well as identification of locally acceptable and feasible strategies, can inform nutrition programming, policy priorities, and community-based approaches that align with women's decision-making autonomy [13]. Given the central role women play in household nutrition, enhancing dietary quality among rural women has the potential to generate intergenerational benefits, especially since over 800 women die daily from pregnancy-related complications globally [14].

In light of these considerations, this qualitative study seeks to explore the barriers to, and strategies for improving, women's dietary quality in rural Northern Ghana, focusing on gendered behaviors such as the practice of women eating last or consuming leftovers [9]

Methodology

Study design and setting

An exploratory descriptive design was used in this qualitative study to investigate the attitude, perceptions, and contextual factors influencing the dietary quality of women of reproductive age within the selected community and identify the barriers preventing their access to nutritious foods. Three (3) Focus group discussions (FGDs) were conducted within three different communities each in the Sagnarigu Municipality, Kumbungu District, and Tolon District, situated within the Northern Region of Ghana. These districts are characterized by their semi-arid climate and predominantly rural population, facing numerous challenges related to food security, poverty, and limited access to healthcare services.

Study population

This study consisted of women of reproductive age (15–49 years). This age group was chosen because the study's focus directly impacts them on dietary quality and locally available foods. Participants were eligible if they were willing to participate, could communicate in the language used for the FGDs (Dagbanli), and resided within the study area. Individuals who did not meet these criteria were excluded.

Sample size determination

A total of 90 women were included in the study, divided into three groups in each of the 3 districts: 10 younger participants (18–30 years), 10 middle-aged participants (31–45), and 10 older participants (above 45 years). This sample size was determined based on the principles of qualitative research, which prioritize in-depth exploration over large sample sizes, as well as to create an environment that allows for participants to be able to express themselves freely. No participants declined participation; all approached individuals agreed to participate.

Sampling procedures

Participants were recruited purposively using a snowball sampling technique, facilitated by our community leaders (Assemblyman or opinion leader). The community leader was approached and asked for assistance to recruit members of the community for the study after the study has been explained to the community leader. The snowball sampling method was subsequently used to expand the participant pool. Initial participants were asked to refer other individuals who met the inclusion criteria and were also willing to participate in the study.

Data collection procedure

FGDs were conducted at a location previously agreed on by participants, ensuring the environment is familiar and comfortable. Each discussion lasted approximately for about 30 minutes, where interviews were conducted in the native language, Dagbani which the researchers are fluent. Participants were informed that facilitators were researchers exploring barriers and strategies for improving women's dietary quality in rural Northern Ghana. Facilitators disclosed their research focus to build trust and encouraged an open dialogue. The KNUST Humanities and Social Sciences Ethics Committee approved the study under reference number: **HuSSREC/AP/149/VOL. 3**.

Results

Table 1 presents the socio-demographic characteristics of the participants, highlighting key variables such as the participant's Ethnicity, Marital Status, Educational status and Occupation.

Majority of the participants were found to be Dagomba (96.7%), whilst other ethnic groups represented 3.3%. Most participants were married (72.2%) with smaller portions being widowed (22.2%), divorced (3.3%) and single (never married) (2.2%). With their educational status, a large population has no formal education (84.4%), JHS/Primary education (10%) and Secondary/Technical/Vocational education (5.6%). In terms of occupational status of the participants, the majority was farmers (38.9%), which was followed by traders (27.8%), housewife (22.2%) and skilled worker (11.1%).

Table 1
Demographics Characteristics of Participants

Demographic Characteristic	No. of Participants (%) N = 90
Ethnicity	
Dagomba	87 (96.7%)
Others	3 (3.3%)
Marital Status	
Single (Never married)	2 (2.2%)
Married	65 (72.2%)
Divorced	3 (3.3%)
Widowed	20 (22.2%)
Educational Status	
No formal education	76 (84.4%)
Primary/JHS	9 (10%)
Secondary/Technical/Vocational	5 (5.6%)
Occupation	
Housewife	20 (22.2%)
Farming	35 (38.9%)
Skilled worker	10 (11.1%)
Trader	25 (27.8%)

Thematic Analysis of Focus Group Discussions on Dietary Practices and Nutrition in Rural Communities

This chapter presents a thematic analysis of focus group discussions (FGDs) conducted across three rural communities. It focuses on their dietary practices, barriers to nutritious food access, and community perspectives on improving nutrition. Several key themes were emerged through detailed analysis of participant responses, providing insight into the complexities of food choices and health within these communities. The analysis was built around five main themes; limited dietary diversity and dependence on staple foods, economic and seasonal barriers to nutritional variety, cultural food sharing practices, awareness and desire for improved nutrition, as well as community-specific suggestions for dietary improvement.

Theme 1: Dependence on Staple Foods and Limited Dietary Diversity

Heavy reliance on staple foods is one of the most significant findings across all three communities, this was often consumed as the primary source of nutrition. The dietary diversity in those communities was limited, with participants regularly consuming maize, rice, cassava and occasionally beans or dried fish, depending on availability. The limited access to other nutritious food options which are often either unavailable or too expensive leads to lack of variety in the diet.

A common pattern emerged across all three communities; participants heavily depend on staple foods, with limited diversity in their diets. For instance, in Gumo community, *Participant 7 shared, "We always consume TZ, rice balls, but sometimes when we have access to beans, we consume that one as usual."* Similarly, in Kpene community, *Participant 5 also commented, "It is always yam or TZ, and if you're lucky, you can add some kontomire (cocoyam leaves) or fish."* In Gurumancheguyilli community, *Participant 2 commented, "Most of the time, it is just fufu with groundnut soup or light soup, whatever we can afford or grow ourselves"*. Although this staple foods are energy-dense, they lack critical micronutrients such as vitamins, minerals, and proteins, leading to the limited dietary diversity in these communities. The reliance on the small number of food variety, primarily starches, limits nutritional intake, which is important for health and well-being.

Theme 2: Economic and Seasonal Barriers to Nutritional Variety

Economic challenges emerged as a dominant barrier to the consumption of a diverse and nutritious diet. Many participants stated their inability to afford healthier foods due to financial constraints as the primary obstacle in improving their diets. This economic challenges is exacerbated by seasonal fluctuations in food availability, particularly the scarcity of protein sources and fresh vegetables during dry seasons.

Participant 8 from Gumo stated, *"In my case, it depends on what's available in the household. If I can only get maize or cassava, that's what I cook."* This statement was echoed in another community, where Participant 3 said, *"Money is our main problem because apart from farming, which is seasonal, most of our small businesses produce little income which cannot afford the nutritious foods."* The difficulty of

maintaining a nutritious diet throughout the year due to the seasonal nature of food availability, particularly for vegetables and protein sources like meat and fish compounds the difficulty in maintaining a nutritious diet. As Participant 3 further stated, *“In our community, we mostly have maize, cassava, and some vegetable, but fresh food can be hard to find, especially during the dry season.”*

These seasonal variations, combined with financial constraints, leave many community members with limited options when it comes to diversifying their diets and accessing foods that are rich in essential nutrients.

Theme 3: Cultural Food-Sharing Practices and Household Distribution

Cultural norms and household food-sharing practices also play a significant role in determining how food is distributed within families. Participants discussed how food is allocated based on traditional hierarchies, with different family members receiving different portions. In some cases, these practices may influence the nutritional equity of the household, with certain individuals receiving more nutritious or larger portions of meals.

For example, Participant 7 from Gumo explained, *“When it is an animal like a fowl, the youngest child takes the feet, the next will take the wings, the head in that order. The woman takes the back and the landlord eats the chicken thigh.”* Similarly, in another community, it was noted that *“everyone gets their portion, but larger portions often go to men, while children and women take what’s left.”* Similarly, in Gurumacheguyilli, a participant noted, *“The man gets the best part of the fish, and the children share what remains. It is just the way it has always been.”* These food-sharing norms highlight the unequal distribution of nutrients within the household, where certain individuals, particularly women and children, may receive less protein or fewer portions of food, potentially impacting their nutritional intake.

Theme 4: Awareness and Desire for Improved Nutrition

Despite the barriers to accessing a nutritious diet, there was a strong awareness among participants about the importance of a healthy diet for overall health and well-being. Most of the participants expressed willingness to improve their diets but acknowledged the challenges they face in doing so. This awareness was often linked with a desire to incorporate more protein, vegetables, and other nutrient-rich foods into their diet.

Participant 1 from Gumo community indicated, *“Yes, when you eat well, you won’t be falling sick anyhow,”* reflecting the understanding and knowledge that nutrition plays a vital role in preventing illness. In Kpene community, Participant 3 stated a similar sentiment, saying, *“We know the importance of food to us, but we just don’t have enough variety.”* Another participant from the Gumo community, lamented, *“We wish we could be adding foods such as fish, meat and other nutritious foods to our meals, but they are not there, Even if available, you can’t afford to buy.”* The desire for improved nutrition was consistent across all three communities in each village, where participants expressed a keen interest in diversifying their meals,

more especially when it comes to adding more protein and vegetables to their diets, but were constrained by economic limitations and food availability.

Theme 5: Community-Specific Suggestions for Dietary Improvement

Each of the community proposed different solutions to address the challenges they face regarding food access and nutrition. The suggestions that was raised ranged from financial support to help improve their economic purchasing power, to educational programs that seeks in teaching community members on how to eat better and make use of the locally available foods in a more nutritious way.

In Gumo community, Participant 8 suggested, *“If we are supported financially,”* which indicate that financial assistance could help families purchase a range of variety of foods. Participant 2 in the same community added, *“If we’re supported to grow our businesses and also educated on how we can eat well and the foods we are not supposed to eat to make us healthy.”* Similarly, in Kpene community, the same sentiments was echoed, where some participant emphasized on the need nutrition education as well as the urge for cooperative farming efforts. Again, they recommended that this initiatives could ensure a long term remedies that could ensure food accessibility and also intensify the level of awareness of how to enhance the nutritional value of available food sources.

In Kpene community, the participants again emphasized that the issues of food accessibility could be address by nutrition education and cooperative farming. A participant in the same community stated, *“We need to work together as farmers to ensure we always have food to eat, and we also need to learn how to prepare most of the foods we have.”* Similarly, participants from the Gurumachaguyilli community, advocated for an improved agricultural practices and food storage techniques to help address a seasonal shortages. A participant from the same community also stated that, *“If we had better ways of storing our vegetables and learning how to grow them during dry seasons, we would have a more balanced diet.”*

Participants in all the selected communities declared the importance for education on nutrition and healthy eating, with a main emphasis on practical tips for improving nutrition with available resources. This could include educating participants on how to prepare balanced meals from locally available, inexpensive foods.

Discussion of Results

The thematic analysis of focus group discussions across Gumo, Kpene, and Gurumancheguyilli reveals a complex nutritional landscape defined by structural constraints and deeply embedded cultural practices [1]. The findings indicate that dietary quality in these rural communities is primarily shaped by a heavy reliance on a narrow range of staple foods [15]. This dependence on starches such as maize, rice, and cassava often leads to significant micronutrient deficiencies, particularly as these energy-dense foods lack the vitamins and proteins necessary for optimal health [15]. Research in Northern Ghana

corroborates this trend, highlighting that many adults fail to meet minimum dietary diversity scores due to the consistent consumption of these specific staples [11].

The economic and seasonal barriers identified by participants represent a major hurdle to achieving nutritional variety [4]. Financial constraints prevent families from purchasing protein-rich foods like fish and meat, making household income a more significant predictor of dietary diversity than nutritional knowledge itself [16]. Furthermore, the environmental challenges mentioned specifically the difficulty of accessing fresh vegetables during the dry season align with evidence that water scarcity directly limits the availability of nutrient-dense foods during certain months [17]. These seasonal fluctuations exacerbate existing vulnerabilities, leading to higher rates of nutritional anemia among women who cannot maintain balanced diets year-round [18].

Socio-cultural norms regarding food sharing and household distribution significantly influence nutritional equity within the home [5]. The FGD results highlighted how patriarchal hierarchies dictate that men receive the "best parts" of animal-source foods, a practice that frequently leaves women and children with less nutritious portions [9]. This gendered allocation of resources is a documented driver of food insecurity, as women in Northern Ghana report significantly higher levels of hunger compared to men within the same household [6]. Consequently, women's lack of participation in key household decisions can prevent them from accessing the diverse diet needed for maternal and child health [12].

Despite these barriers, participants demonstrated a clear understanding of the link between dietary quality and the prevention of illness [19]. The expressed desire for improved nutrition suggests that the gap between knowledge and practice is primarily rooted in affordability rather than a lack of awareness [13]. Statistics from the region confirm this, as over 50% of pregnant women fail to meet adequate nutrient intakes despite having access to basic antenatal nutrition information [2]. This disparity underscores the necessity of addressing the underlying socio-economic and structural drivers of malnutrition rather than relying solely on individual behavioral change [20].

The community-suggested solutions, including financial support and nutrition education, highlight a need for multi-faceted interventions [10]. Participants emphasized that cooperative farming and better storage techniques could mitigate the impact of seasonal food shortages [16]. Enhancing women's agency and addressing patriarchal food norms are also critical steps toward improving the long-term nutritional status of rural households [7]. Ultimately, achieving dietary equity in Northern Ghana requires a transition toward interventions that are culturally sensitive and responsive to the demographic determinants of diet quality [1].

Conclusion

The study concludes that dietary quality in rural Northern Ghana is significantly compromised by a systemic reliance on a narrow range of staple foods, which lacks the micronutrient density necessary for optimal health. Prevalence data indicates that anemia remains a severe public health crisis, affecting 61.1% of women aged 15–24 in the northern zone. While community members often understand the

connection between nutrition and health, their ability to act on this knowledge is restricted by structural barriers. Specifically, income level serves as a more critical determinant of dietary diversity than individual nutrition knowledge. Environmental challenges, such as seasonal water scarcity during the dry season, further create predictable periods of high nutritional vulnerability. These challenges are exacerbated by gendered power dynamics, as women report significantly higher food insecurity scores (5.06) compared to men (3.49) within the same households. Addressing these intersecting economic, environmental, and socio-cultural factors is essential for creating sustainable nutritional equity

Recommendations

Enhance Economic Purchasing Power

Interventions should prioritize improving women's financial capital through support for small-scale businesses to help them overcome the cost barriers of diverse food groups.

Invest in Dry-Season Infrastructure

Local authorities should provide improved irrigation and water access for dry-season gardening to ensure that fresh vegetables remain available throughout the year.

Challenge Patriarchal Food Norms

Nutrition programs must incorporate gender-based advocacy to address cultural norms that prioritize male food preferences and ensure more equitable nutrient distribution within families.

Foster Cooperative Farming

Strengthening cooperative farming efforts and shared food storage techniques can provide a sustainable platform for collective community food security.

Strengthen Women's Decision-Making Autonomy

National nutrition policies must prioritize women's participation in household decision-making to effectively translate agricultural productivity into higher dietary diversity.

Declarations

Ethics approval and consent to participate

Ethical approval for the study was obtained from the Kwame Nkrumah University of Science and Technology (KNUST) Humanities and Social Sciences Ethics Committee (Reference number: HuSSREC/AP/149/VOL. 3). Permission was also obtained from key community leaders prior to the data collection. Written informed consent was gotten from all the participants before they participated in the

study. Participation was voluntary, confidentiality and anonymity were assured as well. However, the study was conducted in accordance with the Declaration of Helsinki.

Consent for publication

Not applicable.

Availability of data and materials

Due to confidentiality considerations, datasets that was analyzed during the study are not publicly available, however, are available from the corresponding author and can be obtained on reasonable request.

Competing interests

The authors declared that they have no competing interests.

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Authors' contributions

AL: Study design, conceptualization, data collection, data analysis, manuscript drafting as well as coordination of the research process.

FB: Supervision, validation, and review of the manuscript.

MAT: Methodological guidance, supervision, critical revision of the manuscript

FMR: Supervision, review and editing of the manuscript.

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References

1. Kolbila PM, Abdul-Samed M, Rahama S, Apau-Tete AA, Abugri BA, Amoore BY, Gaa PK, Mogre V. Characterizing diet quality indicators and their demographic determinants among adults: a population-based study in Northern Ghana. *Front Nutr.* 2025;12:1633285. <https://doi.org/10.3389/fnut.2025.1633285>.

2. Wemakor A. Prevalence and determinants of anaemia in pregnant women receiving antenatal care at a tertiary referral hospital in Northern Ghana. *BMC Pregnancy Childbirth*. 2019;19(1):495. <https://doi.org/10.1186/s12884-019-2644-5>.
3. Agulu GG, Ahissou NCA, Kamiya Y, Baiden F, Matsui M. Anaemia prevalence and risk factors among nonpregnant and pregnant women of reproductive age in Ghana: an analysis of the Ghana demographic and health survey data. *Trop Med Health*. 2025;53(1):118. <https://doi.org/10.1186/s41182-025-00792-8>.
4. Zakariah-Akoto S, Armar-Klemesu M, Ankomah A, Torpey K, Aryeetey R. Socio-cultural norms in the local food system and potential implications for women's dietary quality in rural northern Ghana. *Afr J Food Agric Nutr Dev*. 2024;24(1):25052–77. <https://doi.org/10.18697/ajfand.126.23305>.
5. Chagomoka T, Unger S, Drescher A, Glaser R, Marschner B, Schlesinger J. Food coping strategies in northern Ghana. A socio-spatial analysis along the urban–rural continuum. *Agric Food Secur*. 2016;5(1). <https://doi.org/10.1186/s40066-016-0052-x>.
6. Vercillo S, McCordic C, Frayne B. Considering gender differences in measuring household food insecurity in northern Ghana. *Dev Pract*. 2022;32(4):551–65. <https://doi.org/10.1080/09614524.2022.2056144>.
7. Islam MH, Nayan MM, Jubayer A, Amin MR. A review of the dietary diversity and micronutrient adequacy among the women of reproductive age in low- and middle-income countries. *Food Sci Nutr*. 2023;12(3):1367–79. <https://doi.org/10.1002/fsn3.3855>.
8. Ooi KS, Jalal MIA, Wong JY, Choo MY, Kamruddzaman NA, Lye CW, Lum LCS. The Prevalence and Determinants of Child Hunger and Its Associations with Early Childhood Nutritional Status among Urban Poverty Households during COVID-19 Pandemic in Petaling District, Malaysia: An Exploratory Cross-Sectional Survey. *Nutrients*. 2023;15(10):2356. <https://doi.org/10.3390/nu15102356>.
9. Zakariah-Akoto S, Ankomah A, Torpey K, Armar-Klemesu M, Aryeetey R. Women's participation in the local food system and implications for their dietary quality in rural Northern Ghana: A qualitative study. *Res Square*. 2021. <https://doi.org/10.21203/rs.3.rs-1112895/v1>.
10. Tettegah E, Hormenu T, Ebu-Enyan NI. Risk factors associated with anaemia among pregnant women in the Adaklu District, Ghana. *Front Global Women S Health*. 2024;4:1140867. <https://doi.org/10.3389/fgwh.2023.1140867>.
11. Zakaria H, Laribick DB. Socio-Economic Determinants of Dietary Diversity among Women of Child Bearing Ages in Northern Ghana. *Food Sci Qual Manage*. 2014;34:12–25. <https://www.iiste.org/Journals/index.php/FSQM/article/download/18195/18570>.
12. Amugsi DA, Lartey A, Kimani-Murage E, Mberu BU. Women's participation in household decision-making and higher dietary diversity: findings from nationally representative data from Ghana. *J Health Popul Nutr*. 2016;35(1):16. <https://doi.org/10.1186/s41043-016-0053-1>.
13. Ayensu J, Annan R, Lutterodt H, Edusei A, Peng LS. Prevalence of anaemia and low intake of dietary nutrients in pregnant women living in rural and urban areas in the Ashanti region of Ghana. *PLoS ONE*. 2020;15(1):e0226026. <https://doi.org/10.1371/journal.pone.0226026>.

14. Agyei EA, Afrifa SK, Munkaila A, Gaa PK, Kuugbee ED, Mogre V. (2021). Income Level but Not Nutrition Knowledge Is Associated with Dietary Diversity of Rural Pregnant Women from Northern Ghana. *Journal of Nutrition and Metabolism*, 2021, 1–7. <https://doi.org/10.1155/2021/5581445>
15. Zanello G, Haenssge MJ, Leepreecha P, Deharo E, Srinivasan CS. Interactions with the external food environment and dietary quality in Thailand and Laos. *Global Food Secur.* 2026;49:100916. <https://doi.org/10.1016/j.gfs.2026.100916>.
16. Wegmüller R, Bentil H, Wirth JP, Petry N, Tanumihardjo SA, Allen L, Williams TN, Selenje L, Mahama A, Amoah E, Steiner-Asiedu M, Adu-Afarwuah S, Rohner F. Anemia, micronutrient deficiencies, malaria, hemoglobinopathies and malnutrition in young children and non-pregnant women in Ghana: Findings from a national survey. *PLoS ONE*. 2020;15(1):e0228258. <https://doi.org/10.1371/journal.pone.0228258>.
17. Debpuur C, Nonterah EA, Chatio ST, Adoctor JK, Dambayi E, Beeri P, Nonterah EW, Ayi-Bisah D, Watson D, Kehoe SH, Dalaba MA, Ofosu W, Aborigo R, Welaga P, Oduro AR, Newell M, Barker M, Group FTIS. Supporting maternal and child nutrition: views from community members in rural Northern Ghana. *Public Health Nutr.* 2020;24(12):3719–26. <https://doi.org/10.1017/s136898002000302x>.
18. Nonterah EA, Adomolga E, Yidana A, Kagura J, Agorinya I, Ayamba EY, Atindama S, Kaburise MB, Alhassan M. Descriptive epidemiology of anaemia among pregnant women initiating antenatal care in rural Northern Ghana. *Afr J Prim Health Care Family Med.* 2019;11(1):e1–7. <https://doi.org/10.4102/phcfm.v11i1.1892>.
19. Saaka M. Dr. Adequacy of nutrient intakes among pregnant Women in Northern Ghana. *World Nutr.* 2020;11(1):145–64. <https://doi.org/10.26596/wn.2020111145-164>.
20. Lemke S, Vorster H, Van Rensburg NJ, Ziche J. Empowered women, social networks and the contribution of qualitative research: broadening our understanding of underlying causes for food and nutrition insecurity. *Public Health Nutr.* 2003;6(8):759–64. <https://doi.org/10.1079/phn2003491>.