International Journal of Community Medicine and Public Health
Tamale D et al. Int J Community Med Public Health. 2019 Jul;6(7):2745-2750
http://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040

DOI: http://dx.doi.org/10.18203/2394-6040.ijcmph20192802

Original Research Article

Dietary diversity among women of reproductive age (15-49 years): implication for folate deficiency in Mbarara district, Uganda

Denison Tamale*, Grace Kagoro-Rugunda

Department of Biology, Faculty of Science, Mbarara University of Science and Technology, Mbarara district, Uganda

Received: 01 May 2019
Accepted: 13 June 2019

***Correspondence:**
Mr. Denison Tamale,
E-mail: tamaled7@gmail.com

ABSTRACT

Background: Understanding dietary diversity of women of reproductive age (WRA) is vital for better nutritional interventions of their health and that of unborn. Most diets consumed are macronutrient dense which leads to micronutrient deficiencies like neural tube defects (NTDs). Thirty three babies were born with NTDs at Mbarara Regional Referral Hospital during 2016 and 2017 for reasons among which is folate deficiency. Folate can be derived cheaply from green vegetable consumption before antenatal visits. The study's objective was to assess dietary diversity of WRA (15-49 years) living within Mbarara district.
Methods: A cross sectional study was conducted for three months using a translated dietary diversity questionnaire from Food and Agricultural Organisation. Applying a 24 h recall method at various intervals of feeding, 402 WRA living within three constituencies of Mbarara district were randomly selected to participate.
Results: 70.1% of WRA attained high Individual dietary diversity score (IDDS) of (≥6). 45.1% consumed folate rich plant and animal sources. 4.8%, 8.4%, and 17.6% consumed dark green leafy vegetables, vitamin rich fruits and animal sources respectively. Education, constituency of residence and occupation had a significant association with IDDS of P≤0.05 (0.000, 0.004, 0.030) respectively. WRA who scored IDDS ≥6, 58.2% attained at least secondary education, 51.1% lived in urban constituency and 47.5% were working. 30% consumed starchy staple groups, though at 15.8% legumes, nuts and seeds group was most consumed.
Conclusions: Low intake of folate rich sources was noted, though many WRA consumed diverse diets therefore, education and employment are suitable interventions.

Keywords: Women of reproductive age, Individual dietary diversity score, Folate, Neural tube defects

INTRODUCTION

Women of reproductive age (WRA) are a vulnerable group of women (15-49 years) in society whose bodies continuously undergo high nutrient demands before, during and after conception. Therefore, their diet has to always be equipped with macro-and micro nutrients due to the physiological demand of menstruation, pregnancy and lactation their bodies experience.[1] To ensure a good diet, emphasis would be on access (how and where), availability, quality and quantity of food whenever it is needed. However, this depends on several factors which include; education, economy, region of residence and season which if not addressed lead to arise of cases such as the 12% underweight (BMI<18.5), and 16% overweight (BMI≥25.0) double burden malnutrition among women.[2]

Malnutrition cases wouldn't be a bother in a country like Uganda that has 81% agricultural production scale for all households.[3] However, the major food crops in most regions of Uganda are bananas (matooke), cereals (maize,

rice, sorghum, finger millet) and starchy roots (sweet potatoes and cassava).[4] This makes easy access to monotonous diets that are macronutrient rich and micronutrient deficient, instead of a varied diet that reduces the risk of developing a deficiency or excess of any one content.[5] This leaves the women of reproductive age nutritionally vulnerable.

Furthermore, when the diet quality for groups like WRA becomes even more inferior with cereal or tuber-based staple foods dominating with lack of fruits, vegetables, and animal-source food, then they become more prone to micronutrient deficiencies.[6] These deficiencies include conditions like anaemia and neural tube defects (NTDs) like spina bifida, hydrocephalus and myelomeningocele.

As recorded for a period of twenty (20) months in the In-patient admission register and daily case reports of Pediatrics ward at Mbarara Regional Referral Hospital from January-2016 up to August 2017; at least 33 babies had been diagnosed with NTDs. Adequate folate intake is important for protecting against neural tube birth defects (NTDs) specifically in brain and spine.[7,8] NTDs result from malformation or failed closure of the neural tube during central nervous system development in the third and fourth weeks of gestation.[9,10] Folate as a micronutrient can be accessed through several channels, the major one being diet, as some amounts (less than 50 µg/100 g) of folate are found in meat and poultry, some vegetables and certain roots.[11,12,13] Other channels like folic acid supplements given at antenatal visits are known to be too late and also their maximum level of use is usually much less than 50%.[14,15]

A diverse diet comprising of fruits, vegetables (both green leafy and other vegetables) and animal products is micronutrient dense with several vitamins like Vitamin A, and several soluble vitamin B of which folate is part.[16] Such a diet is capable of well alleviating the micronutrient deficiencies.[17] This would be better if initiated early among women of reproductive age to supplement to the energy dense diets they consume especially before conception.

When dietary diversity is conducted, it indirectly measures diet quality and hence represents a "proxy indicator" for micronutrient adequacy of the diet of an individual.[1,18,19] Therefore, conducting this study was aimed at assessing the diet of women of child bearing age living in Mbarara district with the major focus on the consumption of folate rich foods to ensure adequacy of the micronutrient as a check on the occurring NTDs in the district.

METHODS

Study participants

Various categories of women of reproductive age (15-49 years) such as students, non-pregnant, pregnant and lactating were enrolled for the study from their areas of residence. These had neither attended a feast of any kind a day before the study nor were they on special diet as treatment.

Sample size

Mbarara district's total population of females are 242,547, of which about 51% the majority are between 15-49 years of age.[2] The sample size was 384 WRA as per the Krejcie and Morgan (1990) table of determination of sample size from a finite population at 95% confidence interval.[20] The size was up scaled to 402 women of reproductive age to cater for cases of non-compliance during the study.

Study procedure

From 17 sub-counties in the district, 3 sub-counties were randomly sampled from each of the three constituencies and then 3-villages were randomly selected per sub-county. For each village, a quick count of households was done ahead of actual data collection to list all households in each cluster and screen out non-eligible ones. All eligible households were listed and each was assigned a number to ease random selection. From each household, only one woman of reproductive age between 15-49 years, was selected randomly to participate in the study.

Dietary diversity questionnaire

A translated interviewer-administered structured tool was designed with socio-demographic characteristics and a dietary diversity questionnaire consisting of short open recall meal based questions, adapted from Foods and Agricultural Organisation (FAO) guidelines. Open recall method involved continuous probing to ensure complete recall of food consumed.[18] However, in cases of forgetting, a number of common listed food items were read out to the participant. The participant would then respond "yes" or "no" for each food item she consumed or didn't respectively during the past 24 h. The recall method was used to collect information from the women of reproductive age at five different times: morning (6–10 am); mid-morning (10 am–12 pm); afternoon (12–5 pm); evening (5–8 pm) and night (8 pm–6 am) using the multiple pass method meal after meal.[21]

These were the ten (10) specified food groups modified from FAO diet tool:[22] (1) cereals, grains and products (maize, rice, wheat, sorghum, millet): (2) starchy roots, tubers and plantains (white potatoes, white yams, white cassava, sweet potatoes, carrots, matooke): (3) dark green leafy vegetables: (4) other vegetables (e.g. tomato, onion, eggplant): (5) vitamin rich fruits: (6) meat, poultry and eggs: (7) fish: (8) legumes, nuts and seeds: (9) milk and milk products: (10) oils and fats. These were used to categorise and score the various foods consumed by women in the study. A value one (1) was accorded to

every food group consumed, and a zero (0) to a food group not consumed by the WRA.[22]

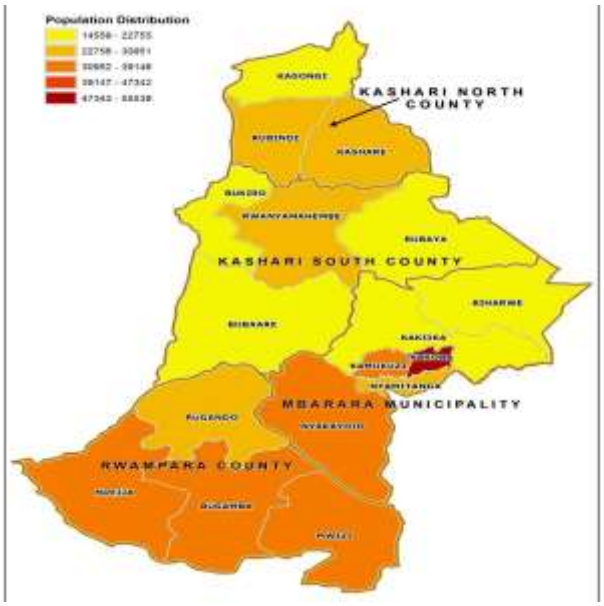

Figure 1: Map of Mbarara district showing the three constituencies of Kashari county, Mbarara municipality and Rwampara county; and the 17 sub-counties.

Informed consent

To every participant, the purpose of the study was first well explained before a written and signed consent was obtained with assurance of confidentiality. Then a face to face interview was conducted with the randomly selected woman of reproductive age.

Data analysis

Data was analysed using SPSS software package version 20, with differences at P≤0.05 being considered significant for all the tests. Proportions were used to summarize categorical variables. To determine whether variables had normal distributions or not, the Shapiro-Wilk test was run since data set was below 2000. Somers'd test was used to analyse the association between categorical variables and the individual dietary diversity score.

Study design and setting

This was a cross sectional and community based study that was conducted between January and March of 2018 in Mbarara district, south western Uganda. Mbarara district covers an area of 1846.4 sq km with a total population size estimate of 472,629.[2] Study area was divided into three constituencies; Rwampara county (RC), Kashari county (KC) and Mbarara Municipality (MM) as shown in Figure 1. RC and KC were representing the rural areas while MM the urban area.

RESULTS

As the Table 1 shows; the highest number (70.1%) of women of reproductive age (WRA) in Mbarara district are able to attain above average individual dietary diversity score (≥6) while almost 30% WRA attained a low dietary diversity score from the study.

Table 1: Distribution of frequency of WRA at various individual dietary diversity score.

Individual dietary diversity score	Frequency	Percentage (%)
≤ 3	15	3.7
Between 4 and 5	105	26.1
≥ 6	282	70.1

From the study, it showed that education level attained, constituency of residence and occupation of WRA were found to have a statistical significant association with Individual dietary diversity score of P≤0.05 (0.000, 0.004, 0.030) respectively.

Table 2: Distribution of IDDS of WRA per education level and constituency of residence.

IDDS	Education level				Constituency of residence		
	Tertiary/ University (%)	Secondary (%)	Primary (%)	None (%)	Mbarara municipality (%)	Kashari county (%)	Rwampara County (%)
IDDS≥6	22.7	35.5_b	33.0	8.9	51.1	27.3	21.6
IDDS≤5	7.5	25.0	50.8	16.7	34.2	35.8	30.0

As shown in Table 2; For IDDS≤5, 50.8% and 16.7% of the respondents had either attained only primary level education or had never attained a formal education respectively. Also more respondents 35.5% and 22.7% respectively had a higher IDDS≥6 compared to 25.0% and 7.5% of secondary and tertiary/university that attained a lower IDDS≤5. Of all respondents who attained IDDS≥6, the highest (51.1%) lived in Mbarara Municipality an urban area, yet for attainment of an IDDS of ≤5, a total of 65.8% of WRA were living in Kashari and Rwampara counties which are rural areas.

As Table 3 indicates about occupation of WRA, for all those who scored IDDS≥6, the highest at 47.5% were working, while 23.8% were housewives or sometimes known as homemakers.

Table 3: Distribution of IDDS among different occupations/employments of WRA.

Occupation/ employment	IDDS		Total (%)
	≤ 5 (%)	≥6 (%)	
Housewife	32.5	23.8	26.4
Farmer	20.0	13.1	15.2
Student	8.3	15.6	13.4
Working	39.2	47.5	45.0

Table 4: Percentage consumption of various folate rich foods by WRA in Mbarara district.

Animal folate source	Frequency (%)	Plant folate sources	Frequency (%)
Milk and milk products	11.7	Other vegetables	14.3
Meat, Poultry, eggs	4.1	Vitamin rich fruits	8.4
Fish	1.8	Dark green leafy vegetables	4.8

Table 5: Percentage consumption of food groups by WRA in Mbarara district.

Food group frequencies	Responses	
	N (Yes)	Percentage (%)
Food group 8, legumes, nuts and seeds	393	15.8
Food group 1, cereals,	390	15.7
Food group 4, other vegetables (tomatoes, onions, eggplants)	357	14.3
Food group 2, starchy roots, tubers, plantain (matooke)	356	14.3

The overall daily diet consumption of folate rich food sources was found to be low at 45.1% in both animal and plant sources. 17.6% consumed animal sources, only 4.8% consumed dark green leafy vegetables and 8.4% consumed vitamin rich fruits as shown in Table 4.

Out of 10 food groups in the study, overall; food group 8 (legumes, nuts and seeds) was the most consumed at 15.8%, followed by food group 1 (cereals) at 15.7% and then 14.3% had consumed food group 2 (starch roots, tubers, plantain-matooke) as shown in the Table 5 below.

DISCUSSION

From the study, 70.1% WRA attained above average IDDS (≥6), this is consistent with the findings of Shashikanta et al in a study done in India where it was more than 50%.[23] This diversity points to a greater likelihood that most WRA in Mbarara district can meet their micronutrient needs. However, the study revealed that almost 30% attained a low IDDS (≤5), which likely represents a group that struggles to attain adequate micronutrients, thus generally have un-imbalanced nutrient based diet. This result agrees again with findings from Shashikanta et al where 23.4% of the subjects had IDDS (≤5) and Acham et al where 19.6% of the women had a dietary score (DDS) less than four even after using a mean DDS of 4 to define poor dietary intake.[23,24]

Among several likely factors to influence IDDS, this study explored education level attained, constituency of residence and occupation of WRA which were found to have a statistical significant association with IDDS P≤0.05 (0.000, 0.004, 0.030) respectively. Such a result agrees with findings by Pal et al of strong statistical association observed between dietary diversity and level of education and occupation.[18]

The study showed that 88.2% WRA had attained formal education at various levels. Of those who scored above average IDDS (≥6), 58.2% had attained at least a secondary education level, while of those who scored IDDS (≤5), 67.5% had attained at most a primary education level. This finding addresses the importance of attaining formal education at a higher level by WRA in Mbarara district and coincides with findings by Pal et al of women who had higher level of education being 2.84 times more likely to attain "MDD" than those who were illiterate or having lower level of education.[18] This could be because higher education increases the nutrition knowledge and awareness of WRA facilitating them to care about their own health status at various stages of the growth life cycles.

51.1% of WRA who stayed in Mbarara Municipality attained above average IDDS (≥6), 65.8% of WRA who stayed in Kashari and Rwampara counties scored IDDS (≤5). This implied that living in the urban areas (Mbarara Municipality) increased the likelihood of WRA to meet their macro and micronutrient needs compared to their counterparts that live in the rural areas. This could be due to the constant availability of all kinds of food in urban areas season after season since they are high trade and money making areas. In addition urban areas have improved standards of education and living, coupled with several health and diet sensitisation campaigns that facilitate and in some way compel WRA to access a varied diet.

From the study, of all WRA who scored IDDS (≥6), the highest (47.5%) were of working class compared to 23.8% who were housewives. This implies that those working could earn and spend on accessing and availing to themselves a nutrient rich diet regularly. This study is comparable with that done by Girma et al in Ethiopia and that of Bhandari et al which showed that unemployed women had more chances of being malnourished than women doing manual work.[25,26] It is also consistent with

the findings of Parapputharu et al and Campbell et al in their study in Nepal that established that women of higher social economic status consumed more pulses, legumes and nuts, milk and milk products, tubers, fruits and vegetables, and miscellaneous snacks than those of lower social economic status.[19,27] This study also agrees with findings of Pal et al that dietary diversity was associated with higher social economic status.[19]

The overall consumption of folate rich food sources was found to be 45.1% below average, of which 17.6% were from animal sources. This agrees with Ochieng et al who found that the intake of foods from animal sources (i.e., meat, poultry and offal, fish) was low.[28] The low consumption of animal sources of food could be due to their high costs and the inadequate knowledge on the essential micronutrients they contain. Consumption of milk and milk products group was 11.7%, the highest of animal source foods since in Mbarara district almost every house hold keeps cattle as part of agricultural economic activity, in addition to the relatively low price of Milk in the region.

The study found a very low consumption of other folate rich plant foods, as only 4.8% consumed dark green leafy vegetables and 8.4% consumed vitamin rich fruits. This study's finding of low consumption frequency of folate rich foods could be due to inadequate knowledge about the richness of the micronutrients in these foods and seasonal availability of such foods, yet Zerfu et al noted that micronutrients can be obtained from vegetables, fruits, meat and milk/milk products and are essential for women especially during pregnancy and lactation.[29] The higher the regular consumption of these foods, the less likely could be micronutrient deficiency conditions among WRA. The consumption of such foods rich in micronutrients should be encouraged in order to prevent micronutrient deficiencies and ensure safe women's health.[30]

59% of households in Mbarara are engaged in growing legumes.[2] This agrees with this study's findings that the most consumed food group was Legumes, nuts and seeds with 15.8%. Thus, WRA can easily fulfill their daily need of proteins from local foods like pulses/legumes that can be grown in their own gardens. This study also found that energy dense foods dominated the diet of WRA with 15.7% consuming cereals food group while 14.3% consumed the starch roots, tubers and matooke food group. This agrees with Arimond et al who found in their study done in Bangladesh and Mozambique, that dietary patterns were heavily dominated by starchy staples, and findings of Bhandari et al on women of Nepal where the majority of women were found to depend upon cereals to fulfill their energy need.[31,26]

CONCLUSION

Majority of women of reproductive age in Mbarara district consume a diverse diet, though their consumption of animal and plant rich sources of micronutrients such as folate is still very low, a reason for the frequency of NTDs. To combat this, emphasis on attaining higher formal education and having an employment that earns one a wage or salary are key interventional factors that can be explored to elevate the micronutrient needs of WRA since these factors were found to be significantly associated with IDDS.

ACKNOWLEDGEMENTS

This study was fully funded by RELOAD (Reducing Losses Adding Value) project.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Kennedy G, Ballard T. Guidelines for measuring household and individual dietary diversity. In: Nutrition and Consumer Protection Division, Food and Agriculture Organization of United Nations; 2010: 5.
2. Uganda Bureau of Statistics (UBOS); The National Population and Housing Census 2014. Area Specific Profile Series, Kampala, Uganda. 2017: 19-27.
3. Comprehensive food security and vulnerability analysis (CSFVA) Uganda; 2013: 1-6. Available at https://www.documents.wfp.org.
4. Uganda Nutrition Profile-Nutrition and Consumer Protection Division, FAO. Nutrition Country Profile for the Republic of Uganda, 2010: 11.
5. Krebs-smith S, Smiciklas-wright H, Guthrie H, Krebs-smith J. The effects of variety in food choices on dietary quality. J Am Diet Assoc. 1987;87:897-903.
6. Daniels MC. Dietary Diversity as a Measure of the Micronutrient Adequacy of Women's Diets: Results from Metropolitan Cebu, Philippines Site. Washington, DC: Food and Nutrition Technical Assistance II Project, FHI 360; 2009: 1.
7. Arcot J, Shrestha A. Folate: methods of analysis. Trends in Food Science & Technology. 2005;16:253–66.
8. Chang H, Zhang T, Zhang Z, Bao R, Fu C, Wang Z, et al. Tissue-specific distribution of aberrant DNA methylation associated with maternal low-folate status in human neural tube defects. J Nutr Biochem. 2011;22(12):1172-7.
9. Au KS, Ashley-Koch A, Northrup H. Epidemiologic and genetic aspects of spina bifida and other neural tube defects. Dev Disabil Res Rev. 2010;16(1):6-15.
10. Beaudin AE, Stover PJ. Folate-mediated one-carbon metabolism and neural tube defects: Balancing genome synthesis and gene expression. Birth Defects Res C Embryo Today. 2007;81(3):183-203.

11. Phillips KM, Ruggio MD, Haytowitz DB. Folate composition of 10 types of mushrooms determined by liquid chromatography mass spectrometry. Food Chemistry. 2011;129:630–6.
12. Jastrebova J, Witthoft C, Grahn A, Svensson U, Jagerstad M. HPLC determination of folates in raw and processed beetroots. Food Chemistry. 2003;80:579–88.
13. Yazynina E, Johansson M, Jägerstad M, Jastrebova J. Low folate content in gluten-free cereal products and their main ingredients. Food Chemistry. 2008;111:236–42.
14. Ray JG, Singh G, Burrows RF. Evidence for suboptimal use of periconceptional folic acid supplements globally. BJOG. 2004;111:399–408.
15. Imhoff-Kunsch B, Flores R, Dary O, Martorell R. Wheat flour fortification is unlikely to benefit the neediest in Guatemala. J Nutr. 2007;137:1017–22.
16. Keding GB, Krawinkel MB, Virchow D, Maass BL, Msuya JM. Consumption of traditional and exotic vegetables and their perceived and real contributions to nutritional health in Tanzania. Acta Horticulture. 2009;806:209-16.
17. Abukutsa, MO. African indigenous vegetables in kenya: strategic repositioning in the horticultural sector. Inaugural Lecture, Jomo Kenyatta University of Agriculture and Technology, Nairobi, Kenya. 2010.
18. Pal M, Paul B, Dasgupta A. Dietary diversity among women of reproductive age: New evidence from an observational study in a slum of Kolkata. Int J Med Sci Public Health. 2017;6(8):1302-7.
19. Parapputharu S, Kumar A, Bantilan MC, Joshi PK. Food consumption patterns and dietary diversity in Eastern India: Evidence from village level studies. Food Secur. 2015;7(5):1031-42.
20. Krejcie RV Morgan DW. Determining Sample Size for Research Activities. Education and psychological measurement. 1970;30:607-10.
21. Raper N, Perloff B, Ingwersen L, Steinfeldt L, Anand J. An overview of USDA's Dietary Intake Data System. J Food Compos Anal. 2004;17:545–55.
22. FAO and Nutrition and Consumer Protection Division. Dietary diversity questionnaire and Guidelines for Measuring Household and Individual Dietary. 2007: 1-5.
23. Shashikantha SK, Sheethal MP, Vishma BK. Dietary diversity among women in the reproductive age group in a rural field practice area of a medical college in Mandya district, Karnataka, India. Int J Community Med Public Health. 2016;3:746-9.
24. Acham H, Theron WH, Egal AA. Dietary diversity, micronutrient intake and their variation among black women in informal settlements in South Africa: A cross-sectional study. Int J Nutr Metab. 2012;4(2):24-39.
25. Girma W, Genebo T. Determinants of nutritional status of women and children in Ethiopia Calverton. Maryland: ORC Macro; 2002.
26. Bhandari S, Sayami JT, Thapa P, Sayami M, Kandel BP, Banjara MR. Dietary intake patterns and nutritional status of women of reproductive age in Nepal: findings from a health survey. Arch Public Health. 2016;74:2.
27. Campbell RK, Talegawkar SA, Parul C, LeClerq SC. Seasonal dietary intakes and socioeconomic status among women in the Terai of Nepal. J Health Popul Nutr. 2014;32(2):198-216.
28. Ochieng J, Afari-Sefa V, Lukumay PJ, Dubois T. Determinants of dietary diversity and the potential role of men in improving household nutrition in Tanzania. PLoS ONE. 2017;12(12):e0189022.
29. Zerfu TA, Ayele HT. Micronutrients and pregnancy; effect of supplementation on pregnancy and pregnancy outcomes: a systematic review. Nutr J. 2013;12:1475–2891.
30. Black RE, Victora CG, Walker SP, Bhutta ZA, Christian P, de Onis M, et al. Maternal and child undernutrition and overweight in low-income and middle-income countries. Lancet. 2013;382:427–51.
31. Arimond M, Wiesmann D, Becquey E, Carriquiry A, Daniels M, Deitchler M, et al. Dietary diversity as a measure of the micronutrient adequacy of women's diets in resource-poor areas: summary of results from five sites. Washington, DC: Food and Nutrition Technical Assistance II Project (FANTA-2) Bridge, FHI 360; 2011.

Cite this article as: Tamale D, Kagoro-Rugunda G. Dietary diversity among women of reproductive age (15-49 years): implication for folate deficiency in Mbarara district, Uganda. Int J Community Med Public Health 2019;6:2745-50.