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Dietary Characteristics and Measures of Adiposity among Women within the Reproductive Age (15-49 years) in Dungu,Tamale, Ghana

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ABSTRACT

Introduction: In the growth and development of women, optimum nutrition and a better dietary pattern are very essential. Poor dietary practices by women in Dungu, Tamale, are very rampant and alarming. This has led to a rise in birth defects and other delivery complications.

Methods: Cross-sectional study was conducted among 403 women between the ages of 15 and 49 years. Data was collected using online questionnaires (Kobocollect software). Three common measures of adiposity that were employed were WC, WHtR, and WHpR through anthopometric assessment. Dietary diversity was assessed using MDD-W. NOVA food classification was also used to assess the frequency of processed foods consumed by the women. Chi-square and Fisher exact test was used to determine associations.

Results: Among the women, 27.0% of them were between the ages of 21 and 25, and 85% of the women met the MDD-W. Dietary diversity based on the Nova food classification showed that 45.5% of the women do not consume ultra-processed foods, 15% do not often consume unprocessed or less processed meals, and 6.0% do not use processed culinary foods often. Measures of adiposity showed that 74% of the women fall within the normal WC category, 56.1% are healthy according to the WHpR, and 74.2% fall within the healthy category of the WHtR. There was a significant association between MDD-W and WHtR ($p<0.001$).

Conclusion: The majority of the women had a balanced diet, meeting the MDD-W. More education should be done for the women to limit the consumption of processed and ultra-processed foods.

Introduction:

The dietary characteristics include the type of food consumed, the amount of nutrients and energy the food provides, and the frequency at which the food is consumed at a time[2]. Food consumption is usually measured with 24-hour dietary recall, food frequency questionnaires, and other indicators such as minimum diet diversity[1]. The Nova classification of food is a classification system that categorises foods based on how they were processed. The Nova classification of foods explains how dietary characteristics affect fat accumulation in all people; however, it does not exclude women[3]. In the Nova Classification system, food is classified into four groups. They are unprocessed (natural foods) or minimally processed foods, processed culinary ingredients, processed foods, and ultra-processed foods[3].

Dietary characteristics among women within their reproductive age have a relationship with overweight and obesity, which affect reproduction in women[3]. High consumption of the process and the ultra-processed foods are risk factors for excessive fat accumulation and other chronic diseases such as cardiovascular diseases and atherosclerosis. It can also predispose newborn babies to other noncommunicable diseases, such as diabetes, later in life[4].

The Minimum Dietary Diversity for Women (MDD-W) is one of the tools that is used to measure the variety of foods consumed by women from the ten food groups in the past 24 hours[1]. A lower score indicates poor dietary diversity (0–4), poor food and nutrient intake, while a higher score indicates good dietary diversity (5–10), good food and nutrient intake[1]. According to Ruel (2003)[5], a low score of MDD-W is associated with an increased risk of obesity, reproductive problems, and other health problems, especially in women of reproductive age.

According to Quaye et al. (2019)[6], up to 57.8% of women within their reproductive age would become overweight or obese by 2030. This may increase the number of cases of child malnutrition. Waist circumference (WC), waist to hip ratio (WHpR), and waist to height ratio (WHtR) are the main indices to measure body adiposity[6].

Poor dietary intake can lead to underweight, obesity, and micro nutrient deficiencies, which have an impact on the fertility chances and future childbirth outcomes of women in their reproductive age[7]. Li et al. (2020)[8] reported that women who are underweight have a higher risk of infertility and miscarriage and may deliver low birth weight and preterm babies. Furthermore, obesity in pregnancy can increase the risk of birth defects such as low birth weight and childhood obesity in offspring[9].

Poor dietary intake can lead to micro nutrient deficiencies such as iron (anaemia), folate (megaloblastic anaemia), and vitamin D deficiencies, which can also have a negative effect on fertility and pregnancy outcomes such as increased risk of preterm birth and low birth weight, neural tube defects in newborns, gestational diabetes, and preeclampsia[10]. The rate at which women of reproductive age are becoming obese is on the ascendant in Ghana[11]. It was reported in Ghana that there were more in their reproductive age, but obese were 25.3% in Ghana[12].

Therefore, understanding the dietary characteristics and measure of adiposity among women within their reproductive age using the NOVA classification and MDD-W can bring out better results to develop interventions to prevent and manage many health-related conditions. This study seeks to access the relationship between dietary characteristics and measures of adiposity among women of their reproductive age (15-49) in Dungu, Tamale.

Materials and Methods

Study Design and Setting:

The study employed an analytical cross-sectional design, which took place in Dungu, a suburb of Tamale in the Northern Region of Ghana. Dungu is one of the main towns in Tamale. Tamale is the capital city of the Northern Region. The Northern Region of Ghana has a total land area of approximately 70,384 square kilometres, making it one of the largest regions in the country[13]

Eligibility Criteria

The main population of the study was female between the ages of 15 and 49 years and a resident of Dungu, Tamale. Women with major illnesses were excluded from the study. In addition, women who declined to participate in the study were excluded. Participation was voluntary, and each participant provided informed consent before being included in the study.

Sample Size and Sampling

The minimum sample size of 384 was calculated using Cochran's formula, adjusted for a non-response rate of 5%. The study utilised a systematic random sampling method in the selection of the participants.

Data Collection Tools

The data of this study were collected using online questionnaires (Kobocollect software). The questionnaire collected the dietary characteristics of the women, their socio-demographic information, the frequency at which they consume processed foods, and measures of adiposity [waist circumference (WC), waist to hip ratio (WHpR), and waist to height ratio (WHtR). Inelastic measuring tape and a stadiometer were used in the measurements of the participants.

Measurement Procedures

Three common measures of adiposity that were employed in this study were waist circumference (WC), waist-to-height ratio (WHtR), and waist-to-hip ratio (WHpR).

Waist circumference (WC) was measured using the following steps. 1.The respondent stood up straight with their feet together and arms at their sides. 2. The respondent's hip bone was located, and place a measuring tape around the waist at this level. 3. The measuring tape should be snug but not compressing the skin. 4. The respondents should take a normal breath and then exhale, and the measurement should be taken at the end of the exhale. 5. The measurement should be recorded in centimetres in two decimal places[15].The WC was categorised into three: normal (<80 cm), overweight (80 cm–88 cm), and obese (≥88 cm) (WHO, 2008)[17].

Waist-to-height ratio (WHtR) was measured using the following procedures. (1). Measure the waist circumference first by using non-stretchable measuring tape. The respondent should stand up straight with their feet together and arms at their sides. (2). Locate the top of the respondent's hip bone and place a non-stretchable measuring tape around the waist (3). The measuring tape should be snug but not compressing the skin (4). The respondent height should be measured using a stadiometer (5). The WHtR is calculated by dividing the waist circumference measurement by the height measurement. 6. The result should be recorded in two decimal places [14]. The WHtR was categorised as healthy (<0.49), overweight (0.49–54), and obese (≥ 0.58). (WHO, 2008)[17].

The waist-to-hip ratio (WHpR) was measured using the steps listed. 1. The respondents stand up straight with their feet together and arms at their sides. 2. Locate the top of the respondent's hip bone and place a non-stretchable measuring tape around. 3. The waist circumference measurement should be recorded. 4. Locate the respondent's hips and measure this circumference using the same measuring tape. 5. The hip measurement should be recorded. 6. The WHPR is calculated by dividing the waist measurement by the hip measurement. 7.The result should be recorded as a decimal in two decimal places[15]. The WHpR was categorize as healthy (< 0.80), overweight (0.80 - 0.84), and obese (≥ 0.85) (WHO, 2011)[15].

MDD-W assessment

Minimum Dietary Diversity for Women is a proxy or tool used to assess the variety of food consumed by the women over 24 hours; it can be used at the national and sub-national levels[16]. It was developed by the Food and Agriculture Organisation of the United Nations and the USAIDs- Food and Nutrition Technical Assistance III project[16].

MDD-W was used to assess the variety of food consumed by the women using the steps.1. Individual interviews were conducted with each woman to gather information about their food intake over the past 24 hours. 2. A standardised questionnaire was used to assess the variety of food groups consumed by the women. 3. Upon interviewing them, the researchers identified the food groups consumed by the women. 4. The 10 food groups were calculated by counting the number of food groups consumed by each woman: 1 = yes and 0 = no, and it was scored as 0-4 = not met and Met = 5-10.

Sample Size

The sample size was calculated using 95% confidence level, a proportion of 50%, and a 5% margin of error. The sample size was then derived using the simple formula N=, where N is sample size, z is confidence level (standard value of 1.96), p is prevalence` (50% = 0.50), and ME is margin of error (5% = 0.05).

$$N = \frac{z^2 \times p(q)}{ME^2} =$$

$$N = \frac{1.96^2 \times 0.50(1-0.50)}{(0.05)^2}$$

N= 384

Therefore, N = 384

However, 5% was added to cater for unforeseen circumstances, including incomplete and missing questionnaires (5/100× 384 = 19).

19+384= 403. Hence, the study included 403 women of their reproductive age (15-49 years).

Sampling Technique

A systematic random sampling method was employed in this study. It was employed in this study because it is the appropriate method to determine a sample from a larger population.

Plans for data analysis and data managemnets

The Statistical Package for Social Sciences (IBM SPSS version 21.0) was used to analyse the data collected. The results were reported with descriptive statistics including frequencies, percentages, bar charts, and pie charts. A chi-square and Fisher exact test was used for categorical variables, while the relationships between various variables were determined using cross-tabulations. A P-value < 0.05 (at a two-tailed test) was considered significant in the entire statistical tests performed.

Ethical consideration

Institutional approval for the study was obtained from the Scientific Review Committee of the University for Development Studies. An ethical letter with reference number UDS/RB/062/24 was issued as an approval to begin with the study. Informed consent was sought from all the respondents before their information was taken. The confidentiality of the respondent was assured. No part of this study infringed on their right. All measurements and processes (steps) were explained to the respondents before they were taken. Data collected from this study was used for its purpose. At any point in time, the respondents can maintain the right to withdraw it. Responses were securely stored, with access restricted to study researchers.

Results

Socio Demographic characteristics of respondents

The majority of the women who participated in the study were between 21 and 25 years old (27.0%), with many of them having attended college or university (41.7). Most respondents (53.1%) have no child. The highest marital status of the respondents attained was single (59.8%), with predominant students (66.5%). (Table 1).

Table 1. **Socio Demographic characteristics of respondents**

Variable	Frequency (N=403)	Percentage (%)
Age (years)		
15-20	93	23.0
21-25	109	27.0
26-30	60	15.0

31-35	59	14.6
36-49	82	20.4
Educational Level		
Primary school	67	16.6
Secondary school	70	17.4
College/University	168	41.7
None of the above	98	24.3
Number of Children		
0	214	53.1
1-2	88	21.8
3-4	56	14.0
5+	45	11.1
Marital Status		
Single	241	59.8
Married	138	34.3
Divorced	10	2.5
Widow	9	2.2
Separated	5	1.2
Employment Status		
Employed	96	23.8
Unemployed	39	9.7
Student	268	66.5

Dietary characteristics of the women (Based on the Minimum Dietary Diversity for Women)

The majority of the women (85%) met the Minimum Dietary Diversity criteria (consume 5–10 out of the 10 food items), while a smaller portion (15%) do not (consume less than 5 out of the 10 food items).**(Figure 1).**

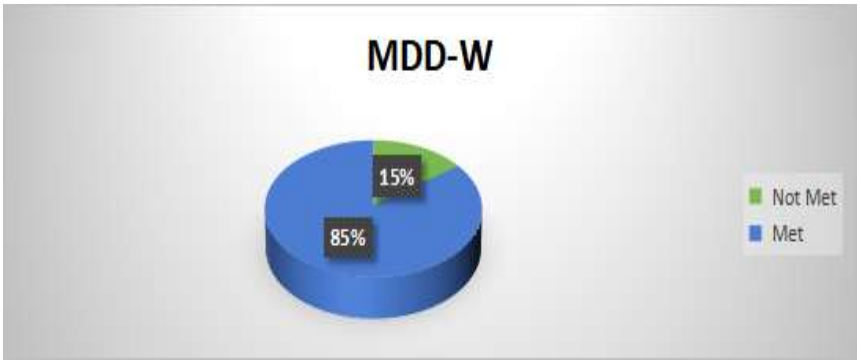

Figure 1: Dietary characteristics (Minimum Dietary Diversity for Women)

Dietary characteristics of the women (Based on the NOVA Food Classification)

- **Processed foods consumed**

The largest proportion of the women (36.8%) does not often consume processed foods. A significant proportion (33.6%) of the women consume processed foods several times throughout the week, while 21.4% consume processed foods occasionally. A smaller portion (8.2%) consumes processed foods daily. (**Figure 2)**.

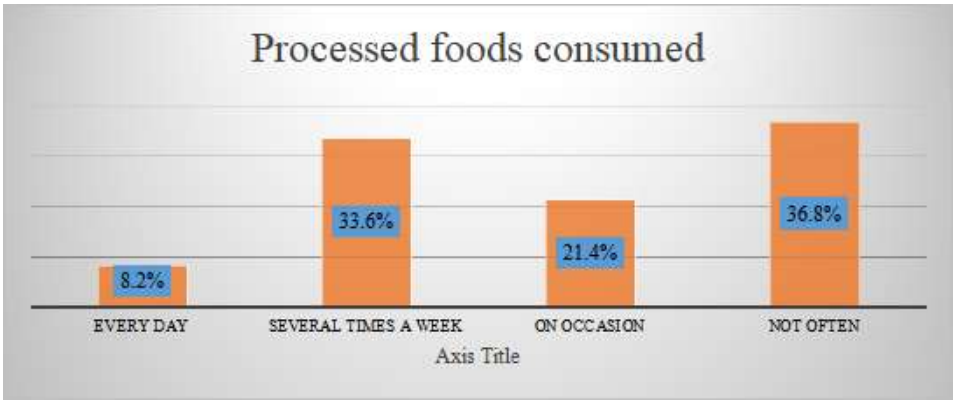

Figure 2: Processed foods consumed

- **Ultra-processed meals**

The majority (45.5%) of the women reported that they do not consume ultra processed meals frequently, while a sizable portion of the respondents (28.4%) eat ultra processed foods several times per week. 19.2% of the women consume ultra processed meals on occasion, while only 7.0% of the women consume ultra processed food daily. (**Figure 3).**

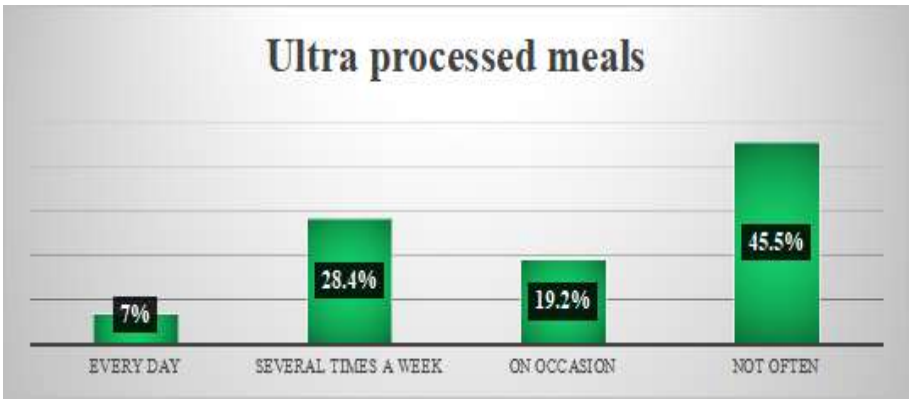

Figure 3: Ultra-processed meals

- **Unprocessed or less processed meals**

The majority (67%) of the women consume unprocessed or less processed meals several times a week. A small portion (7.0%) consumes unprocessed or less processed meals every day, while 11% consumes unprocessed or less processed meals on occasion. The remaining portion (15%) does not often consume unprocessed or less processed meals. (**Figure 4)**

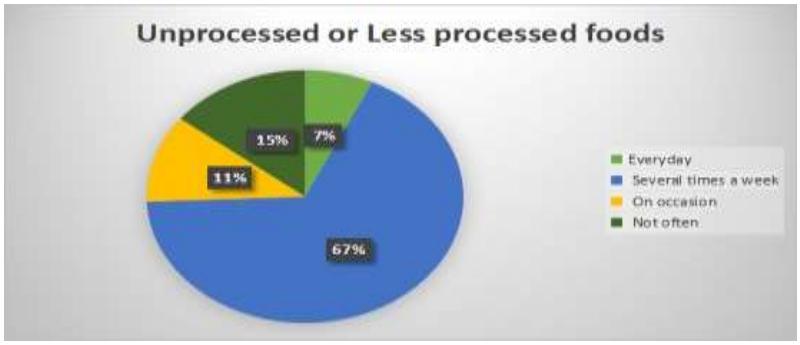

Figure 4: Unprocessed or less processed meals

- **Processed culinary foods**

The majority of the women (74%) use processed culinary foods every day. A smaller portion (14%) uses processed culinary goods several times a week. A minority (6%) uses processed culinary foods on occasion, while others (6.0%) do not use processed culinary foods often**. (Figure 5).**

Figure 5: Processed culinary foods .

4.4 Measures of adiposity [Waist circumference (WC), waist to hip ratio (WHpR) and waist to height ratio (WHtR)]

Waist circumference (WC) the of participants

The majority of the respondents (74%) fall within the normal waist circumference category. A smaller portion of the population (15%) was classified as overweight, while the smallest group (10.6%) falls into the obese category. **(Table 2).**

Table 2: WC of the participants

Variable	Frequency	Percent
Healthy (<80cm)	300	74.4
Overweight (80cm-88cm)	60	15.0
Obese (>88cm)	43	10.6

Waist to Hip ratio (WHpR) of the participants

The majority of the women (56.1%) are healthy. Nearly 25% of the women are obese. Very few women (19.1%) are overweight. **(Table 3).**

Table 3: WHpR of the participants

Variable	Frequency	Percent
Healthy (< 0.80)	226	56.1
Overweight (0.80 – 0.84)	77	19.1
Obese (≥ 0.85)	100	24.8

Waist to height ratio (WHtR) of the participants

The majority of the women (74.2%) fall within the healthy category, while a smaller portion (21.6%) is categorised as overweight. The smallest group (4.2%) falls into the obese category**. (Table 4).**

Table 4.WHtR of participants

Variable	Frequency	Percent
Healthy (<0.49)	299	74.2
Overweight (0.49-0.54)	87	21.6
Obese (≥ 0.58)	17	4.2

Association between MDD-W and Adiposity (WC,WHtR,WHpR)

There was a significant association between MDD-W and WHtR (*p<0.001)* **(Table 5).**

Table 5. Association between MDD-W and Adiposity (WC,WHtR,WHpR)

Variable	**Adiposity**			
	WC			
MDD-W	**Healthy**	**Overweight**	**Obese**	***P value***
Met Not	45 (14.7)	18 (16.7%)	19 (14.3%)	0.845
Met	255 (85.3%)	102 (83.3%)	107 (85.7%	
WHpR				
Not Met	38.3 (14.9%)	18.2 (14.0%)	25.5 (15.9%)	0.191
Met	216.7 (85.1%)	102.8 (86.0%)	144.5 (84.1%)	
WHtR				
Not Met	43 (13.4%)	39 (21.5%)	0 (0.0%)	**<0.001**
Met	277 (86.6%)	142 (78.5%)	45 (100.0%)	

Discussion

The current study indicates that 85% of the women met the Minimum Dietary Diversity criteria, consuming 5–10 out of the 10 food items; this indicates that they have access to a variety of foods. This finding is similar to Rossi et al. (2019)[17], who found diverse intake of nutrient-rich foods was associated with better nutritional status among women of their reproductive age. However, the 15% of the women who did not meet the criteria face a higher risk of nutritional deficiencies and related health issues; this is in line with findings from Burkina Faso and Senegal, where poor dietary diversity leads to increased nutritional or health risks. (Diop et al., 2020)[18].

Regarding the consumption of processed foods, this current study shows that a smaller proportion (8.2%) consumed processed foods daily; this reaffirms the findings from Italy that show healthier dietary patterns among women (Rossi et al., 2019)[17]. Almost 34% consumed processed foods several times a week; this contributes to health issues. This is similar to a study that reported high consumption of processed foods among women of their reproductive age (Nguyen et al., 2014)[19]. Lower intake of processed foods is associated with better nutritional status among women.

The majority (67.4%) of women consume unprocessed or less processed meals several times a week. The current study agrees with a study that reported positive dietary habits among women (Rossi et al., 2019)[17]. Regular consumption of unprocessed foods is linked to normal or healthy adiposity, healthy weight, and reduced chronic disease risk. Daily use of processed culinary foods (73.6%) reported in the current study can contribute to increased adiposity

among the women, which can lead to poor reproductive health. This is in agreement with the findings, where high consumption of processed foods is associated with poorer health outcomes (Nguyen et al., 2014)[19]

This current study reported, for WC, a p-value of 0.845; this indicates no significant association between WC and MDD-W. This current finding contradicts Smith et al. (2018)[20], who found a link between dietary diversity and WC. However, there was a significant relationship between WHtR and MDD-W. This finding reaffirms the study by Johnson et al. (2019)[21] that reported higher dietary diversity is associated with a healthier distribution of body fat.

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Abbreviations

MDD-W	Minimum Dietary Diversity- Women
USAID	United States Agency for International Development
WC	Waist Circumference
WHO	World Health Organization
WHpR	Waist- to Hip Ratio
WHtR	Waist-to Height Ratio
UDS	University for Development Studies