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SOCIO-DEMOGRAPHIC, HOUSEHOLD FOOD SECURITY AND NUTRITIONAL STATUS OF OLDER (> 50 Y) WOMEN FROM RURAL ZAMBIAN COMMUNITIES: A DESCRIPTIVE STUDY

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ABSTRACT

Socio-demographic factors and household food insecurity are considered to influence the nutritional status of older women. The rapidly growing elderly population in Africa is a concern particularly in sustaining their health and nutritional status. In spite of this, there is a scarcity of information in older Zambian women and this study aimed to assess the socio-demographic factors, nutritional status and household food insecurity status of older women in rural Zambian communities. This cross-sectional study was conducted in Twatasha compound of Kitwe and Ndeke community of Ndola. The socio-demographic characteristics, anthropometric measurements, dietary intakes and household food security were evaluated in a convenience sample of 153 older women (≥ 50 years) through the Household Food Insecurity Access Scale (HFIAS). IBM SPSS version 26 was used for descriptive (frequencies, means and standard deviations, and medians with interquartile frequencies) and inferential (bivariate and Spearman correlations) statistical analyses. The socio-demographic characteristics showed that almost all (98.7%) of the participants had other members of the family residing with them. Most participants (57%) had attained primary school education, 19% had secondary education and 5% had college education. Almost half (49%) of the participants did not report their employment status and 36% reported to be unemployed. Over-nutrition was most prevalent (37.3% overweight and 39.8% obese) while 20.9 % and 2.0% of the respondents were normal weight and underweight respectively. The median (25th percentile; 75th percentile) dietary intakes showed inadequate intakes for most nutrients, except for carbohydrates (170 g [133;225]). The total fat intake represented 14% of total energy intake. The majority (86.0%) of the participants were identified as severely food insecure while only 6.0% were food secure. The majority of the participants (80-90%) used at least seven out of the nine behavioural responses to food insecurity. The findings show resource-poor and severely food insecure communities. We recommended urgent interventions to improve access to healthy foods (such as home gardening projects) and promote healthy dietary habits (including nutrition education).

Key words: Socio-demographics, nutrition, food insecurity, post-menopausal, Zambia

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INTRODUCTION

The nutritional status of the elderly has been found to be highly correlated with their health conditions, quality of life, basic social circumstances, age, gender and type of residence [1, 2]. Household food insecurity is also a serious contributing risk factor that is compounded by social risk in this population [3]. The rapidly growing elderly population raises a lot of concerns, in several countries, specifically in care-giving responsibilities, poverty and for maintaining a good nutritional status [4]. Furthermore, post-menopausal health problems present an additional burden to public health systems, especially in women from rural areas residing in poor conditions [1, 5]. Accumulating evidence highlights the urgent need for increased efforts in this group to investigate nutrition barriers and the development of nutrition interventions [1-4]. Zambia, like other countries in sub-Saharan Africa (SSA) has similar socio-economic settings with an older population that has limited access to quality health care and nutrition. The other challenges include the nutrition transition, the social stigma that comes from being suspected of being involved in witchcraft, being excluded from survey programmes, inadequate family support, the burden of orphans, as well as poor shelter and clothing [6-8]. Despite this, there is sparse evidence available on the socio-demographic or socio-economic status and nutritional vulnerabilities experienced by this population group in Zambia. This information could be used by policymakers to plan and develop nutritional, social and welfare assistance programs for the elderly especially in post-menopausal women [3-5]. The purpose of this study was thus to address the paucity of information and to assess the socio-demographics, nutritional status, dietary intakes and household food insecurity of older Zambian women, from Twatasha compound in Kitwe and Ndeke community of Ndola, Zambia.

MATERIALS AND METHODS

Ethical considerations

Ethical approvals for this study were obtained from the Tropical Diseases Research Centre (TDRC) Ethics Review Committee (STC/2017/19), the National Health Research Ethics Board (NHREB), University Teaching Hospital, Zambia and the Institutional Review Board, Texas Tech University (TTU) (IRB2017 1040). Permission to undertake the study was obtained from the community leaders of the two communities after explaining the purpose, objectives and methods of the study.

Sampling

A power calculation based on 95% confidence level [9] was used to determine a sample size of 372 women needed for this study. However, a convenience sampling method was used, and only 153 participants were recruited due to a cholera outbreak in the country and a subsequent temporary ban on public gatherings. Inclusion criteria were apparently healthy women aged > 50 years old residing in Twatasha Compound of Kitwe and Ndeke Community of Ndola, Zambia.

Data collection

Trained field-workers were used to assist the participants with completion of questionnaires. The same field-worker completed a specific questionnaire for all

participants. Data collection instruments included a validated socio-demographic questionnaire [10], the Household Food Insecurity Access Scale (HFIAS) questionnaire [11] to determine food security status of the participants and 24-hour recall questionnaire to determine dietary intakes. The validated five-step multiple pass method [12] was used for completing the 24-hour dietary recall questionnaire for actual dietary intakes. Standardized procedures were used to measure height and weight with a stadiometer and digital bathroom scale (Beurer, Germany), respectively. Two measurements were taken to the nearest 0.1 cm for height and to the nearest 0.1 kg for weight. If the two readings were not the same, another measurement was taken and if it corresponded with one of the other two measurements, it was recorded. If three different measurements were obtained, the average of the three was used.

Data analysis

The data were coded in Microsoft excel, cross checked for completeness and cleaned and tested for normality using the Shapiro-Wilkes test. Descriptive statistics including frequencies, means and standard deviations (SD) were calculated using the IBM SPSS software, version 26 for normally distributed data. Medians and Interquartile Frequencies (IQFs) were calculated for dietary data which were not normally distributed. Level of significance was $p < 0.05$. Descriptive statistics were used for the socio-demographic data. The HFIAS questionnaire was analyzed to calculate mean±SD HFIAS and household food insecurity prevalence score (HFIAP) categorized as frequencies for food secure, mildly, moderately and severely food insecure households. In addition, prevalence of the perceptions of food vulnerability (worry about not having enough food) and behavioral responses to food insecurity (reducing food portion, frequency of meals) were calculated [11]. Dietary intake data were analyzed using Food Finder, version 3, a software program developed by the Medical Research Council of South Africa. Food Finder is based on the South African food composition tables. Unfortunately, Zambia does not have a similar program and due to many food items being imported from South Africa, we decided to use Food Finder for the dietary intake analyses. Nutrient intakes were compared with Estimated Average Requirements (EAR) for women aged 50 years and older. Estimated Energy Requirements (EER) were calculated for each participant using a moderate Physical Activity Level (PAL) as the women worked in small farms during the day [13]. Frequencies were used to determine the respondents with inadequate intakes. Body mass index (BMI) was calculated as weight divided by height squared (kg/m^2) [14, 15]. The World Health Organization (WHO) guidelines were also used to categorize the participants as underweight, normal weight, overweight and obese [16]. Bivariate Pearson and Spearman correlations were calculated among all variables and only significant correlations are reported.

RESULTS AND DISCUSSION

Socio-demographic variables

All participants were black women with a mean±SD age of 58±10 years. The majority (98.7%) lived with other family members. The average household size was 6 people. Regarding highest education level, more than half of the participants 56.9% had attained primary school education, and 19.6% did not have any formal education. A

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large percentage (49.0%) of the participants did not report their employment status, 36.6% were unemployed while the rest (14.4%) had some income either through fulltime employment (4.6%), part-time employment (2.0%) or retirement benefits (7.8%). Only 8.5% of the participants reported a monthly household income above Kwacha (K)1,000 (Table 1).

The majority (51.7%) of the women were single (never married, divorced or widowed), owned their homes (81.7%) and had access to tap water either inside or outside the house (56.8%). The majority of the participants (75.8%) had waste removal from their homes, 47.1% had access to a pit latrine while 30.1% had access to a sewage enabled toilet (Table 2). Analysis of the socio-demographic characteristics of the two small rural communities showed low income with high rates of unemployment. In spite of having some form of education, very few participants were employed and only 14.0% reported that they had some form of monthly income to contribute to the household. These results were consistent with other studies conducted among Zambian women [17, 18]. National data from 2016 showed similar trends whereby, in spite of increased school enrolments, average number of completed school years did not increase above six years [19].

In spite of several government policies prioritizing rural poverty reduction since 2002, the 2010 report from the Central Statistical Office (CSO) showed that 78% of the rural Zambian households were still living under poverty [19]. The World Bank defines extreme poverty as people living under $1.90 (United States dollar [USD]) per person per day [20], which would be roughly equivalent to Kwacha (K)875 ($48.18) per person per month. Considering the high poverty rate in the country as well as other country parameters, the National Poverty Line of Zambia was set at a much lower value of K214.26 (=$11.8) per adult equivalent per month [21]. Therefore, for a six member household (average household members for the study participants) to live above the National Poverty Line the minimum monthly income should be K1,285 ($70.76). However, only 8.5% of the respondents had a household income above K1,000 (5% did not know their income), thus indicating the majority (86.5%) had a low average monthly household income compared to the National Poverty Line and were living in poverty. Concurrent to our results, other studies also found that large household size was a contributing factor for the existing income inequality between urban and rural households [19, 22]. Although the majority (81.7%) of our participants lived in family-owned houses, 77.8 and 22.2% of the houses were built with brick or clay, respectively. Personal and household hygiene was poor as 22.8% of the households did not have proper sanitation facilities and pests like ants, cockroaches and rodents were reported in the majority of the households (86.9%). Access to water was also a major problem as 43.2% of the households still did not have a running tap and had to fetch water from wells, boreholes or elsewhere. These results are consistent with Zambian national survey data which shows that, despite some improvements in living conditions of the poor, the availability and use of flush/pit latrines was still a major problem in the country, especially in rural households [19, 23].

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Anthropometric measures

The mean±SD BMI for the sample was 29±5 kg/m^2, indicating overweight. The anthropometric results showed that 20.9% of the participants were of normal weight, 37.3% were overweight, 39.8% were obese while 2.0% were underweight (Table 3). The majority (79.7%) of the participants bought food from supermarkets even though their food budgets were low (<$8 per month).

This phenomenon of rising rates of over-weight and obesity in low income, food insecure households riddled with hunger and undernutrition can be contributed to nutrition transition in developing countries [7]. Like other countries in sub-Saharan Africa, Zambia is currently going through a nutrition transition and researchers have found a clear shift from buying food from local markets towards buying from the supermarkets. Although this shift initially effected the upper and middle income populations in the country, it soon percolated to the poor urban neighbourhoods as well [24].

Dietary intakes

Total energy and macronutrients showed low intakes when compared to EER and EAR, respectively. The Acceptable Macronutrient Distribution Ranges (AMDR) for carbohydrate, proteins and fats are 45-65%, 10-35% and 25-35% of total energy consumption, respectively. The participants consumed a high carbohydrate and low fat diet with a mean energy intake of 73%, 12% and 14% from carbohydrates, proteins and fats, respectively. Although carbohydrate showed a median intake much higher than EAR, 13.7% of the respondents did not have an adequate carbohydrate intake. Similarly, the median for dietary fiber showed adequate intakes, while a large percentage (49.0%) had inadequate fiber intakes (Table 4).

Maize is the staple food in Zambia and it is widely produced and available in the Zambian market. Studies among Zambian women showed that cereal based products or maize porridge called *nshima*, were consumed frequently [18]. The dietary intake patterns of these two Zambian communities also showed an abundant consumption of a cereal based diet with low fat and inadequate protein intakes (88.2%). These results were consistent with the findings of another study where the mean energy intake per capita per day was lower than the recommendation of 8400 kJ and 71% of energy intake was from starchy staple food sources [25].

The availability of nutrient-dense foods from a variety of food groups like fruits and vegetables, pulses, meat, fish and milk have declined over the years in Zambia [24]. This was reflected in the poor intakes of almost all nutrients among the participants. Median intakes for protein as well as fat were low and the majority of the participants (88.2%) did not meet required intakes for proteins. The protein source was entirely from plant sources and none of the participants reported to consume any animal proteins such as meat (beef, chicken, mutton or pork) or eggs and dairy products. Only two micronutrients showed adequate median intakes namely iron and thiamine (vitamin B1). While none of the respondents met the EAR/AI for calcium, chromium, fluoride, iodine, vitamin E and biotin, a large percentage of respondents (>75%) had inadequate intakes for vitamins A, C, D, K, B2, B3, B5, B6, B12 and folate. A paucity of

information exists about the dietary intake of Zambian older women; however, other studies have reported high rates of vitamin and mineral deficiencies already prevalent among the reproductive aged Zambian women [26, 27]. A dietary survey among elderly Zambian women showed a poor dietary diversity which may be contributing to the large percentage of women with inadequate micronutrient intake [28]. However, similar to the results of the current study, another study reported adequate mean iron intakes in rural Zambian women in spite of inadequate intakes for all other micronutrients [27]. Adequate iron intakes may be a result of maize fortification in the country. Although iron fortification of maize is not yet mandatory in Zambia, significant amounts of maize are fortified [29].

Household food insecurity

The mean±SD HFIAS score for the participants was 16.0±6.9 on a scale of 0-27. The majority (86.0%) of the participants were living in severely food insecure households while only 6.0% were food secure (Figure 1). Food insecurity is often associated with malnutrition and both have important consequences for individuals' health and well-being [30]. Households experiencing food insecurity immediately experience an inadequate dietary diversity and nutrient intakes that can ultimately lead to hunger and under nutrition. The issues of malnutrition and hunger can result in mortality, morbidity and disability and it has important long term implications for nations, such as hindering citizens' cognitive abilities, economic productivity, reproductive performance and increasing the prevalence of metabolic and cardiovascular diseases [31, 32]. A lack of nutrition knowledge of food insecure and undernourished people has been considered as one of the potential factors that hinders their ability to choose the most appropriate foods and beverages to have an adequate diet that meets their nutritional needs to lead a healthy and active life [33].

However, in 2001, Townsend *et al.* [35] established a positive relationship between food insecurity and overweight in American women. This paradox of food insecurity and obesity was later explained by the resource scarcity hypothesis which proposes that the uncertainty of food availability in food insecure households may cause the body to store more fat for future periods of hunger [34]. This enigma was also apparent from the higher percentages of overweight (37.3%) and obesity (39.8%) observed in the current study participants. Other studies conducted in younger women of reproductive age in Zambia found similar percentages of overweight (33%) among the study population, and they showed an association of higher age with higher BMI and greater prevalence of overweight and obesity [26, 35]. However, this association was not observed in the current study and there is a lack of research data on older women in Zambia.

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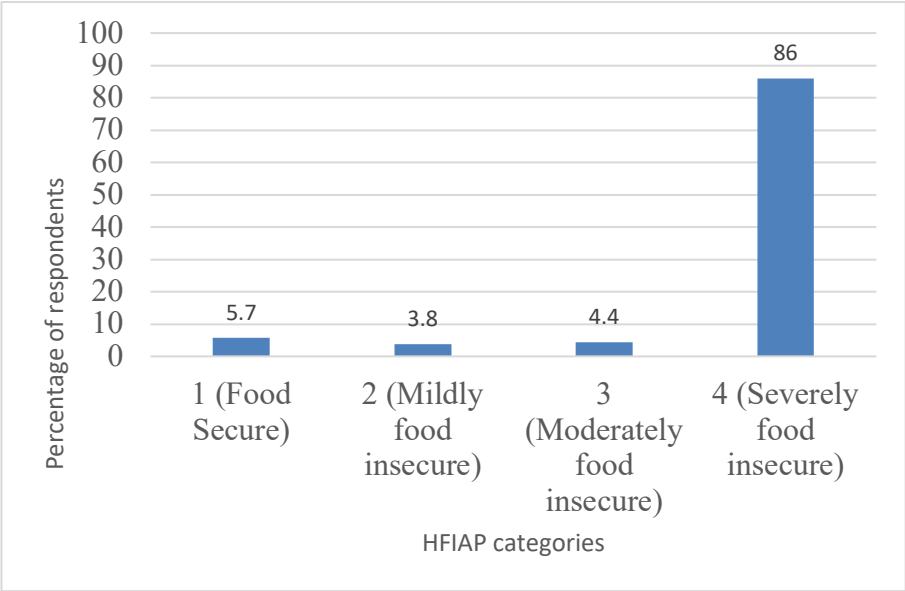

Figure 1: Severity of household food insecurity prevalence (HFIAP) among the study participants

Food shortages are often experienced by food insecure households and this leads to the adoption of coping strategies/behavioural responses to food insecurity that exacerbate the households' food security situation and nutritional status in the short and long term [36, 37]. Most of the participants worried about not having enough money for food and the majority of the participants (80-90%) used behavioral responses to food insecurity, with 37.9% who had gone without eating for an entire day due to the lack of food in the household (Table 5).

Bivariate correlations between socio-demographic characteristics, nutrition status and food insecurity of the participants

The correlations in Table 6 showed that higher education level of the participants was positively associated with increased household income (r=0.4, p=0.000) and better living conditions in terms of housing (r=0.2, p=0.005), waste removal (r=0.3, p=0.000) and access to tap water (r=0.2, p=0.011). Increased household income was also associated with better living conditions (type of housing; r=0.2, p=0.005 and access to water on property r=0.2, p=0.004). Both education and household incomes was adversely associated with household food security (r=0.4, p=0.000 respectively). In addition, household income was also positively associated with dietary energy (r=0.2, p=0.003) and protein intakes (r=0.3, p=0.000). Apart from education and income, household food security was associated with other living conditions such as type of housing (r=0.2, p=0.011), access to water on the property (r=0.2, p=0.028) and waste removal (r=0.2, p=0.023) (Table 6). These results are consistent with findings from South African [38] and Nigerian [39] older adults where higher socio-economic status was associated with food security. Higher socio-economic status was also associated with dietary diversity and nutrient intakes among Nigerian older adults. The results of the needs assessment survey in the study population offers a situation analysis, typical of the poverty cycle as indicated in Figure 2. Low education level and high

unemployment rates typically lead to poor household income, poverty and living conditions which leads to food insecurity, poor dietary intakes and malnutrition.

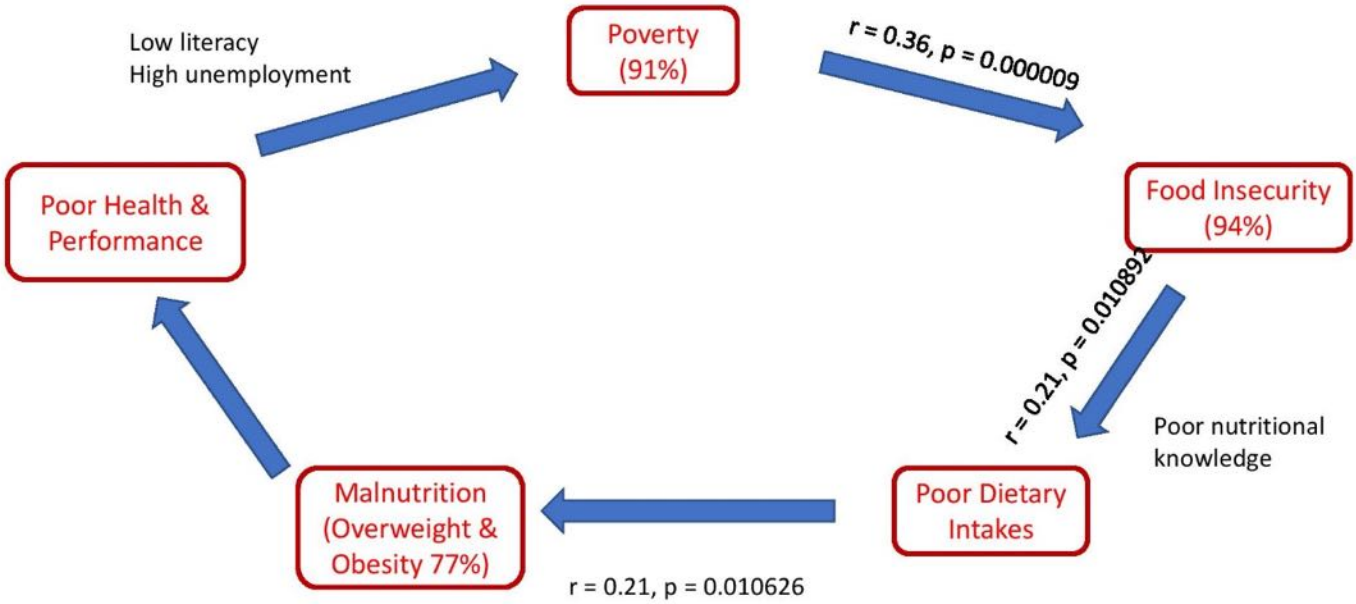

Figure 2: Summary of results

STRENGTHS AND LIMITATIONS

The strengths of this study were that it was a collaboration between researchers from two universities and the community leaders in both Kitwe and Ndola. As we know community collaborations take years to build and this study was an important first step that opened the door for future research opportunities in these communities. Another strength is that inter-interviewer bias was overcome by having the same field-worker complete a specific questionnaire for all participants. However, the power of this study was not achieved due to the small sample as a result of the cholera outbreak in the country and a subsequent temporary ban on public gatherings. Although a single 24-hour dietary recall may not represent the dietary intakes and at least two interviews spaced over different days are recommended, only one interview with the participants was possible due to the cholera outbreak. In addition, respondents had to rely on memory for dietary intake measurements, thus resulting in recall bias. Therefore, our findings should not be generalized as the sample is not statistically representative.

CONCLUSION

The findings show that these older Zambian women were resource poor and severely food insecure that resulted in poor dietary intakes and high prevalence of overweight and obesity as observed in these women. At the convergence of all these factors, the paradox of food insecurity was underscored by the high rate of overweight and obesity

among the respondents. The results of this study contribute to new knowledge concerning the plight of these Zambian women living in poverty and the detrimental effect it has on food insecurity and nutritional status. The findings justify the need for continued efforts to ensure food and nutrition security among the rural resource poor communities in Kitwe and Ndola. It is recommended that an intervention to address healthy food access through a home gardening program be implemented. This can be supplemented by a nutrition education program, based on the food based dietary guidelines to educate the participants about the health impact of consuming an affordable, diversified and balanced diet to address overweight and obesity and prevent its comorbidities in the short term. In addition, policy makers should consider programs to address the socio-economic factors contributing to poverty and food insecurity in the long-term.

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Table 1: Education and economic status of the participants

Description	Number of Participants	Percentage (%)
Highest level of Education		
None	30	19.6
Primary school	87	56.9
Secondary school	29	19.0
College	7	4.5
Employment		
Employed	7	4.6
Part-time/temporarily employed	3	2.0
Retired	12	7.8
Unemployed	56	36.6
Didn't want to report	75	49.0
Total Household Income		
<K300 ($16.52)	79	51.6
K301-K500 ($16.57-$27.53)	39	25.5
K501-K1000 ($27.59-$55.07)	14	9.2
K1001-K1500 ($55.12-$82.6)	3	2.0
>K1501 ($82.65)	10	6.5
Didn't know	8	5.2

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Table 2: Living conditions of the participants

Description	Number of Participants	Percentage (%)
Marital Status		
Single	16	10.5
Married	72	47.0
Divorced	4	2.6
Widowed	59	38.6
No response	2	1.3
Housing		
Own house	125	81.7
Rented	23	15.0
Homeless/living with others	5	3.3
Type of Housing		
Brick	119	77.8
Clay	34	22.2
Pests		
Yes	133	86.9
No	20	13.1
Access to Water		
Tap inside house	64	41.8
Tap outside house	23	15.0
Borehole/Well	37	24.2
Fetch from elsewhere	29	19.0
Toilet		
None	1	0.6
Bucket System	34	22.2
Flush/Sewage	46	30.1
Pit Latrine	72	47.1
Waste Removal		
Yes	116	75.8
No	37	24.2

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Table 3: Number and percentage of participants in each weight category

Adult weight category according to BMI	Number of participants	Percentage (%)
Underweight (BMI ≤ 18.5)	3	2.0
Normal weight	32	20.9
Overweight	57	37.3
Obesity (BMI > 30.00)	61	39.8
Class I (BMI 30.00 - 34.99)	43	28.1
Class II (BMI 35.00 - 39.99)	12	7.8
Class III (BMI > 40.00)	6	3.9

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Table 4: Nutrient intakes of the participants measured by 24-H recall

Nutrients	EAR/EER^/AI*/FAO and WHO guideline#	Median (IQF) of 24-H recall	Inadequate intakes (%)
Energy (Kcal)	2511 (2282;2665) ^	962 (689; 1295)	100
Energy (KJ)		3939 (2888; 5409)	
TE from carbs (%)	45-65	73.0 (66; 83)	
TE from protein (%)	10-35	12.0 (11; 16)	
TE from fats (%)	25-35	14.0 (11; 19)	
Carbohydrate (g)	100	170 (133; 225)	13.7
Dietary fiber (g)	21 *	21.8 (15; 29)	49.0
Protein (g)	56.9 (49;64)	31.3 (19; 45)	88.2
Plant protein		16.6 (11; 22)	
Animal protein		0 (0; 0)	
Total Fat		16.8 (9; 24)	
Saturated fat (g)	<21 #	3.4 (2; 6)	
Trans fat (g)		0.01 (0.00; 0.02)	
MUFA (g)		5.3 (3; 8)	
PUFA (g)		6.0 (4; 9)	
Cholesterol (mg)	<300 #	12.0 (0; 64)	
Minerals			
Calcium (mg)	1200 *	112.0 (50; 218)	100
Iron (mg)	5	8.1 (6; 11)	13.7
Magnesium (mg)	265	244.0 (184; 363)	58.2
Phosphorus (mg)	580	537.0 (383; 820)	53.6
Sodium (mg)		409.0 (169; 662)	
Zinc (mg)	6.8	4.8 (4; 7)	71.2
Chromium (mcg)	20	0 (0; 0)	100
Iodine (mcg)	95	0 (0; 0)	100
Selenium (mcg)	45	18.0 (3; 38)	77.8
Vitamins			
A (mcg)	500	58.0 (25; 124)	96.1
C (mg)	60	2.0 (1; 15)	86.9
D (mcg)	10 *	0.1 (0; 1)	98.0
E (mg)	12	3.7 (3; 5)	100
K (mcg)	90 *	20 (7; 56)	91.5
B1 (mg)	0.9	1.2 (1; 2)	24.8
B2 (mg)	0.9	0.6 (0; 1)	81.7
B3 (mg)	11	7.4 (5; 11)	75.2
B5 (mg)	5 *	1.8 (1; 2)	97.4
B6 (mg)	1.3	0.7 (0.6; 1)	86.9
Folic acid (mcg)	320	127 (78; 179)	98.7
B12 (mcg)	2	0.3 (0; 2)	80.4
Biotin (mcg)	30 *	11.0 (7; 15)	100

EAR- Estimated Average Requirement for women 51-70 years old; EER- Estimated Energy Requirement for women; AI- Adequate Intake; TE- Total Energy.

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Table 5: Use of behavioral responses to food insecurity by the participants

Coping strategies	Number of participants	Percentage (%)
Worry (that the household would not have enough food)	139	90.8
Preference (not able to eat the kinds of foods preferred because of a lack of resources)	138	90.2
Variety (eat a limited variety of foods due to a lack of resources)	132	86.3
Not want (eat some foods that they really did not want to eat)	136	88.9
Small meal (eat a smaller meal than felt needed because there was not enough food)	133	86.9
Few meal (eat fewer meals in a day because there was not enough food)	131	85.6
No food (no food to eat of any kind in the household)	126	82.4
Sleep hungry (go to sleep at night hungry because there was not enough food)	113	73.9
No eat (go a whole day and night without eating anything because there was no food)	58	37.9

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Table 6: Significant correlations observed between socio-demographic characteristics and dietary intakes of the participants

Variables	Coefficient value (r)	Level of significance (p-value)
Education		
- Household income	0.4	0.000
- Type of housing	0.2	0.005
- Waste removal	0.3	0.000
- Household food security (HFIAS – higher score more food insecure)	0.4	0.000
Household income		
- Type of housing	0.2	0.005
- Water source	0.2	0.004
- Dietary energy intake	0.2	0.003
- Dietary protein intake	0.3	0.000
- Household food security (HFIAS – higher score more food insecure)	0.4	0.000

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