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FOOD CONSUMPTION PATTERNS, SOCIO- DEMOGRAPHIC STATUS AND NUTRITIONAL RISKS OF WOMEN IN LOW AND MIDDLE INCOME COMMUNITIES IN KWANDENGEZI, KWAZULU-NATAL, SOUTH AFRICA

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ABSTRACT

Food consumption patterns have changed dramatically in recent times. Traditional diets are replaced by "westernised diets" causing nutritional risks like malnutrition. Unemployment and lack of nutrition education have an impact on communities, in terms of the foods being purchased and consumed. This research seeks to establish a true reflection of the nutritional status, food intake patterns of the communities participating in the study and influencing factors. This is to estimate if the low income community, the north section is in a more disadvantaged situation when compared to the middle income community, the south section. The objective was to determine the socio-demographic status, food consumption patterns and nutritional risk of a low-income and middle-income community that reside in KwaNdengezi Township in KwaZulu-Natal, South Africa.The research being undertaken consists of descriptive and theoretical studies. Upon consention, participants data were collected by means of an interview setting. A set of questionnaires included, Socio-demographic, Food Frequency and 24-Hour Recall questions. The anthropometric measurements were taken in order to determine the body mass index status. Both sections of the township were affected by unemployment. The education status of the participants showed concern as both sections had fewer graduates. The mean Food Variety Scores (FVS) (±SD) for all items consumed from various food groups during seven days, indicated a medium where both sections had a good dietary diversity score ranging from 7-9 food groups, which summarize the food group diversity as being in the majority in the north section. The results of energy distribution of macronutrients from the average of the 24-hr recall when compared to the WHO dietary factor goals showed that the participants' diet was well balanced, in relation to macronutrient intake for both sections but was lacking in micronutrient intake. Overweight and obesity tests showed disturbing results with majority of women caregivers in both sections found to be obese, showing risks of obesity related illnesses (NCDs). More nutrition knowledge should be geared towards educating the most vulnerable and poverty stricken communities. The micronutrient intake must be promoted at lower and middle income communities.. The government should devise and implement projects that empower women so that they are not co-dependent.

Key words: Food, Consumption, Low and Middle- income, Education, Nutritional risks, KwaNdengezi, South Africa

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INTRODUCTION

Many emerging economies that are in the rapid process of urbanisation are experiencing health transitions categorized by a triple burden of diseases in which Non-Communicable Diseases (NCDs) have become more predominant and infectious diseases remain undefeated, causing 39% of all deaths in such countries. Stroke and Coronary Heart Disease (CHD) are causing about 12 million deaths yearly mainly in developing countries and, alarmingly, are affecting the younger population [1].

Six out of ten women in KwaZulu Natal, South Africa are vitamin A deficient. Country-wide at least 20% of women are iron deficient [2]. This results in decreased cognitive ability, stunted growth, decelerated levels of mental and physical capacity, as well as greater severity of infection rates, further adding to the illness and death burden in the country.

Post the previous apartheid era, the number of black Africans living in urban areas accelerated at a rapid pace mainly because of the belief that the urban areas provide improved work opportunities and basic needs such as health services and education. Even though urbanisation often means that a traditional diet has to be largely replaced by a more western diet, it seems that food traditions that were adopted during early socialisation are often still followed [3].

Poverty has a significant link to health, with nutrition as an intervening factor. The argument is that people cannot be called poor just because of a minimum income level but other factors contribute to the increase of poverty that can lead to malnutrition such as no access to health services, little or no access to water, low education and prejudiced rights and needs. Poverty leads to the deterioration of health and ill-health can lead to poverty as sick people cannot be fully productive and earn full wages. Malnutrition does not only apply to undernourished populations but also includes overnourished populations in the form of obesity as it may lead to multiple NCDs. Twenty percent of women in South Africa are overweight and 9.6% obese [4].

The purchasing decisions that women make shape the type of family it becomes. Families argue that barriers to healthful choices and activities were price, residential area, seasonality of foods and safety. On the other hand women often made wrong purchasing decisions although they knew which foods were healthy. But due to unaffordability women preferred purchasing foods that were high in fat and sugar because of lower cost as opposed to the healthier more expensive foods [5].

Food security in South Africa was further assessed, looking at food utilization, availability and accessibility. A great decline was revealed in food security from 1999 to 2008. The undernourished populations (consisting of 814 million people) are mainly found in countries that are at a development stage and the Sub-Saharan African region (including South Africa) accommodates about 204 million of this population [6].

Since 1994, South Africa has seen economic and political improvements but is still greatly affected by unemployment and poverty, increasing interest rates, increased

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energy tariffs, international economic crises and very high food and petrol prices, putting extreme pressure on the general population who are already unable to make ends meet [7].

As the Millenium Development Goals (MDGs) have not been entirely met, the introduction of the Sustainable Development Goals (SDGs) has changed the first MDG to cover a broader spectrum where the global population will now be able to also access adequate nutrition [8].

Women are the most vulnerable when it comes to certain factors in the community as they are often subjected to domestic violence, seen as inferior to the menfolk and are expected to put the needs of their families before their own needs, and as a result may have a diet lacking in micronutrients, hence, the study targets this group specifically [9].

Food production globally has increased; trying to keep up with the demand, yet the world is faced with a billion people without enough food and another billion without adequate nutrition. Furthermore, the population is set to double over the next fifty years thus increasing the demand for food globally [10]. Price hikes are a point of concern as households with their main caregivers unemployed cannot make proper food choices, resulting in individuals buying cheaper items in bulk in order to sustain their families longer. Bulk buying will normally include products containing starch (bread, rice, porridge etc.), meat, poultry and fats, and will exclude fruits and vegetables as they are expensive and can only be purchased in smaller quantities. The North section is more disadvantaged in this regard when compared to the South section, unemployment is higher with an increased population resulting in a lack of adequate food.

The serious challenge for human well-being and economic development in Sub-Saharan Africa (SSA) is nutrition security. It is clearly apparent that in a number of SSA countries the insufficiency of food nationally cannot meet the needs of all their citizens . The SSA food and nutrition security is affected by social policies, increasing population growth, food consumption, hasty urbanisation and migration and factorial changes [10].

A number of factors have affected the price of food and the number of people who are food insecure and this is reflected in the economic recession and price increases in the years 2008 to 2011. These factors include urbanisation, low incomes, corruption, poverty, overburdening of social services, poor water and sanitation and air pollution, leading to malnutrition [11]

It is of great importance that the governments of the emerging economies understand the state of the population's nutritional status and development in order to make sound and viable decisions that will benefit the population and alleviate nutrition insecurity. Even if such research is minimal, it is of considerable importance to conduct the studies in order to assist governments in their policy development. The South African Constitution states that every person living in the country has the right to access enough food and that safe water should be available to ensure that this goal is achieved,

especially ensuring that the population has nutritious food and can lead a healthy and fruitful life [12].

Women in poor settlements are at risk of more than one type of vitamin and mineral deficiency and lack a variety of micronutrients in the diet, especially in SSA, South and East Asia and Latin America [13].

Women that reside in informal housing are at risk of food insecurity as a result of a lower education, lowest monthly income and spend the lowest amount of money on food per week in the country when compared to households not at risk. The nutritional choices that individuals make are influenced by other family members. Barriers to healthful choices and activities are price, residential areas, safety and seasonality of food.

One of the objectives in this research study was to establish the KwaNdengezi population's nutritional status by collecting and combining data from the selected sections, the low and middle income sections, within the area and then comparing the findings. Seeking to find out which section is more likely to be affected by NCDs and micronutrient deficiencies.

MATERIALS AND METHODS

Descriptive and quantitative in nature using various measuring instruments to collect relevant data comparing two socio-economic groups. The households were visited to explain to each of the caregivers and an information letter was given in their preferred language. A consent form was then signed after which the voluntary study was conducted. The timeframe for data collection per household was under 45 minutes. Anthropometric measurements were ethically conducted.

The KwaNdengezi area is about 13.99 km² with a population size of 53 843 people. Females make up 51.87% of the population. It is a township in the province of KwaZulu-Natal, the second largest province in South Africa which has a total population of 1045 million people. The area has two sections divided by a road [14].

The households in the north and south of KwaNdengezi Township were randomly selected by using the number of roads listed in the eThekwini municipality map. A sample of 130 households per area was targeted. The north section had 39 roads and the sample number of households required was divided by the number of identified roads resulting in three households per road being targeted. The same procedure was used for the south section where 26 roads were identified resulting in five households per road being targeted.

A power calculation using the household numbers as indicated by eThekwini Municipality (2012) was used to determine sample size [15].

In 2007 there were 7105 households in this area [16] and using a 95% confidence interval, a sample of 257 households was needed to represent the community and this

number was rounded up to 260. Therefore 130 households were randomly selected per area.

$$Ss = \frac{Z^2 * (p) * (1-p)}{c^2}$$

Where:
Z=Z value (example: 1.96 of 95% confidence interval)
p= percentage picking a choice, expressed as a decimal
(0.5 used for sample size needed)
c= confidence interval, expressed as .07 decimal (three units on both sides of the normal).

The sample can be described as women caregivers/ owners of households between the ages of 18 and 50 years. The criteria included targeting only women in the north and the south section in KwaNdengezi.

Data Collection
The participants answered three sets of valid and reliable questionnaires in an interview setting, including the Socio-demographic questionnaire, the 24-Hour Recall questionnaire and the Food Frequency Questionnaire (FFQ). The participants were also weighed using a Physician Scale for weight, the Stadio-meter for height and a non-stretchable measuring tape for waist circumference. The questionnaires were checked and sorted for completeness and accuracy by the researcher

Data Analysis
The socio-demographic and adapted FFQ questionnaires data was presented on a Microsoft Excel® spreadsheet by the researcher and analysed on the Statistics Package for Social Sciences (SPSS) software version 22 for descriptive statistics and presented in the form of graphs and tables as well as Food Group Diversity Score (FGDS) and Food Variety Score (FVS).

The 24-hour Recall questionnaire was analysed using the Food finder® computer software version 3 to indicate actual nutrient intake and results presented as means and standard deviation in graphs and tables. The programme was developed by the South African Medical Research Council. Nutrient intake was compared to the DRIs. The Top 20 food items consumed per group was calculated. The AMDRs were calculated to indicate the energy contribution from the macronutrients. The Nutrient Adequacy Ratio (NAR) was also calculated and correlated with the Food Group Diversity score.

The anthropometric measurements, height, weight and waist circumference of (n=130) participants per section were captured on an Excel Spreadsheet® to determine and classify the body mass index (BMI) of the participants. The BMI was calculated by dividing the weight in kilograms (kg) by the square of the height in metres (m^2), (kg/m^2). The WHO BMI cut-off points used were underweight at <16.00 -18.49, normal weight at 18.50-24.99, overweight at ≥25.00 and obese ranging from ≥30.00 - ≥40.00 [17].

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Waist circumference was measured twice and the mean used to determine the waist-to-height ratio [17] in order to identify participants at risk of cardiovascular disease and other diseases of lifestyle, and the cut-off points for women were 88cm. The height-to-waist ratio (WHtR) was determined and interpreted with a cut-off point of 0.5. A WHtR of >0.5 is a risk indicator of metabolic syndrome [18].

Correlations were conducted using the Pearson statistical test. The inferred scatter plots of two variables positioned into coefficient quantitative terms by Pearson's correlation r = 0, indicates no association although negative associations are indicated by r = -1 and positive associations are indicated by r = 1 [19]. Significance is indicated at $p<0.05$. Mean comparison between the north and south section variables included income, money spent on food, education level, number of people per household, frequency of meals, FGDS, FVS, BMI and energy.

Ethical Consideration

Permission to conduct the study in the community was requested and granted in writing by the Councillor of KwaNdengezi Township.
The researcher took into consideration the research ethics as recommended by the Institutional Research Ethics Committee (IREC 050/12) of the Durban Institute of Technology (DUT).

RESULTS AND DISCUSSION

Socio- demographic results

A maximum of 43.85% of the participants in the north section had completed matric with 21.54% having obtained grade 10, 17.69% had a primary education, 2.31% did not have any education whilst 3.08% had graduated with a degree or diploma and 10.77% had completed college/FET. In the south section 29.23% were graduates, 11.54% had completed a college/FET education, 26.15% had matriculated, 19.23% had completed grade 10 whilst 10.00% had a primary education and 3.85% did not have any education (Table 3.2).

In respect to the formal and informal employment rate in the north section households, 21.50% (n=28) of the participants were employed but the majority of 78.50% (n=102) were unemployed, which was a slightly lower rate when compared to the south section where 36.90% (n=48) of the participants were employed and the majority 63.10% (n=82) were unemployed (Fig. 3.1).

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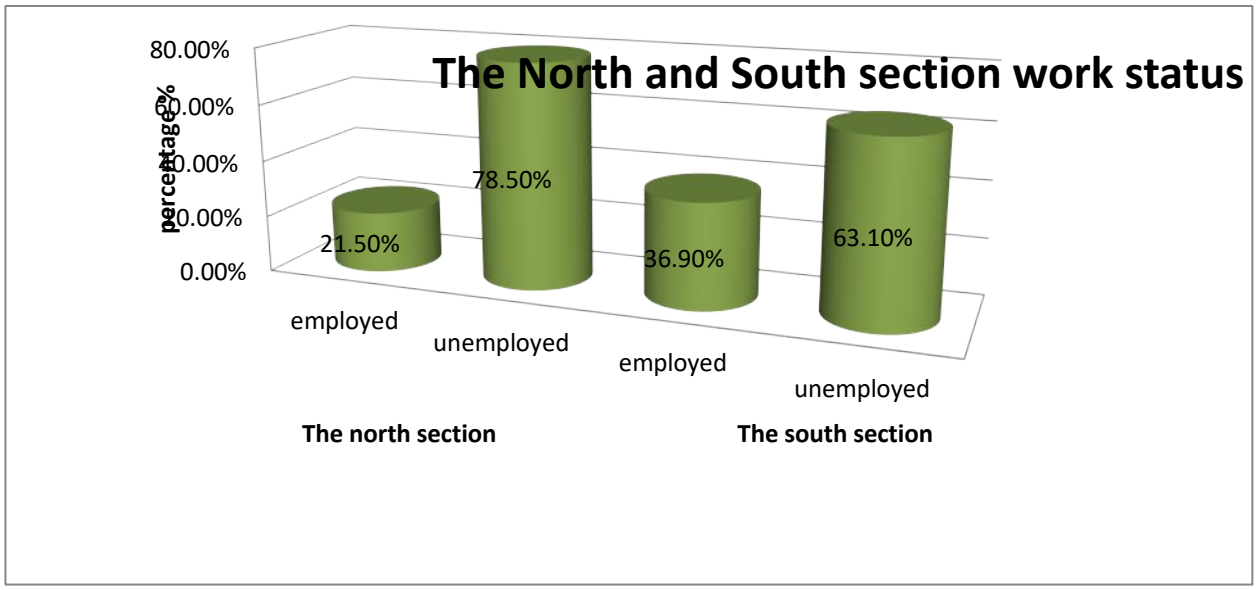

Figure 3.1: The employment rate in the north and south sections

The 2012 statistics survey on the labour force in South Africa indicated that unemployment had increased by 3.7%, which was a higher percentage when compared to the employment rate that had increased by 2.3% in the year 2011 [14].
The total income per month in the north section was at R1000 to R2000 for 62.31% (n=81) of the participants, R3000 to R4000 for 25.38% (n=33) and less than R6000 for 7.69% (n=5) of the participants whilst 7.69% (n=10) had a total income of more than R6000 per month. The south section participants' showed a total income per month of R1000 to R2000 for 18.46% (n=24) of the households, R3000 to R4000 for 15.38% (n=20), and less than R6000 for 4.61% (n=6) whilst 47.69% (n=62) of the participants' had a total income of more than R6000 (Table 3.1).

Dietary Assessment

Dietary Intake, Nutrient Analysis and Top 20 Food Items
As indicated in Table 3.3 the mean of the three 24-hour recall nutrient analyses indicated a deficient intake for certain nutrients by women in both sections.

Women in both sections did not meet the Estimated Energy Requirements (EER=10093kJ/day) whilst the protein Recommended Daily Allowance (RDA = 46 g/day) was higher than the RDA for both sections. Both the energy and protein intake had statistically significant differences $p = 0.010$ and $p = 0.000$ respectively between the participants of the two sections.

The carbohydrate Estimated Average Requirement (EAR = 100 g/day) for the women in both sections was more than double the EAR.

Both the north and south section women did not meet the Adequate Intake (AI = 25 g/day) of dietary fibre even though the south section intake was slightly higher as well

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as for calcium respectively. The statistical difference for fibre was not significant whilst it was significant for calcium ($p = 0.004$).

The north section women did not meet the EAR with regard to iron whilst the south section women met the DRI above the requirements. The statistical difference for iron was significant at $p = 0.002$.

The magnesium intake for the north section women was triple the EAR whilst the south section women did not meet the DRI for magnesium and both sections were above the DRI requirement for phosphorus.

The women in the north section did not meet the DRI for most of the macro- and micro- nutrients except for the following that met the DRI and were even over the recommendation, niacin and vitamin B12.

The women in the south section on the other hand met the DRI for some of the macro- and micro-nutrients.

Most micronutrients had a significant statistical difference as presented in Ttable 3.3, except for sodium, selenium, iodine and folate.

The starchy staple food group provided the majority of thiamine, vitamin B6, iron and zinc in the diet due to the large quantities of grains consumed. Considerable amounts of other vitamins and minerals were provided by different food groups. Legumes and nuts provided a large percent of niacin and folate intake, dairy contributed to B12 and calcium intake, all other flesh foods contributed primarily to B12 intake, vitamin C rich vegetables contributed to a large percentage of the intake of folate and vitamin C and dark green leafy vegetables to the highest percentage intake of vitamin A. The WHO recommends a daily intake of energy requirements for women of not more than 10093 Kj/day, protein daily allowance of 46 g/day as well as carbohydrate average intake of 100 g/day [15, 17].

In the current study, a similar trend was observed as both the sections only met the DRIs for a few micronutrients rather than for most of them but the south section scores were above the north section scores.

24-Hour Recall

Table 3.4 shows results of the energy distribution of macronutrients from an average of three 24-Hr Recalls in accordance with the World Health Organisation's (WHO) dietary factor goals, excluding fruit and vegetable intake. The results show that the respondents had a balanced diet in terms of macronutrient intake; however, the respondents' diet lacked variety and nutrient intake as a result of insufficient fruit and vegetable intake. Carbohydrates appeared as the main source of food consumption while fruit and vegetable intakes were very low. Only the south section group showed an intake of one type of fruit, which was still very low.

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The total fat intake was above the recommended intake of fat by the WHO for all four of the groups. Carbohydrates contributed above 55% of the daily needs in all the groups, which is on par with the WHO recommended goal of 55-75%. The protein contribution to the total intake of energy was above 15%, which is almost 100% of the WHO goal at 10-15% for all the groups, while the south section women aged 31-50 indicated a higher percentage than other groups at 16.46%.

Table 3.5 shows that in the south section community a mean ± SD of 33.81 ± 10.670 was consumed indicating a medium food variety score (medium=30-60).
The vegetable group reported the highest individual mean of FVS ± SD (6.79 ± 2.194), followed by cereals, flesh foods, fruit, fats and oils, vitamin A rich foods, dairy, legumes and nuts and eggs.

In a study conducted in 2001 in China and India, that covered 25 Indian states, sampling 83 000 women (15-49 years) and adults living in eight provinces of China (20-45 years), a population representing 2.4 billion of the people, the findings showed that China's structural shift in diet was hastier than India's. The Chinese diet was becoming more similar to the American high fat diet in terms of the macronutrient composition of energy from fat, carbohydrate and protein. Nearly 33% and 25.4% of energy come from fat in the diet in urban and rural areas, respectively. However, the Indian macronutrient structural shift was found to be much lower. Nevertheless, millions of people in the Indian population consume a diet high in fat [20].

Nutrient Adequacy
In Figures 3.2 to 3.5 the Nutrient Adequacy Ratio (NAR) values demonstrate the connection between the dietary diversity score and nutrient adequacy ratios for energy, protein and other selected vitamins and minerals. The following figures reveal an increase in NARs of some nutrients as the dietary diversity scores increases.

Figure 3.2 shows that there is an increase in NARs from food group 7 to 8, which then stagnates and slightly decreases for all women in the north section for each of the nutrients from food group 8 to 9.

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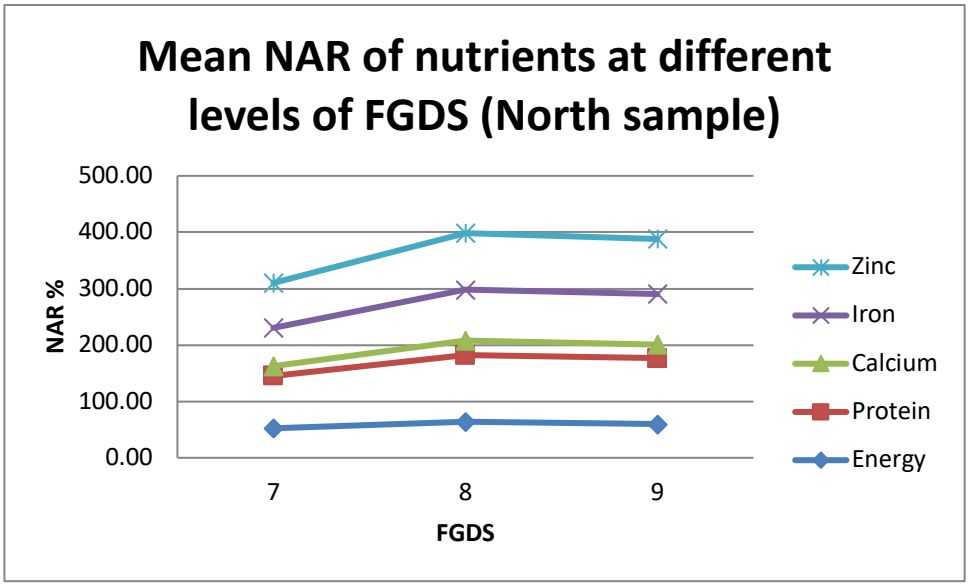

Figure 3.2: NAR% for energy and nutrients (north section sample n=130)

Figure 3.3 shows that there was a dramatic increase in the NARs for some of the nutrients from food group 7 to 8 showing a further increase also from food group 8 to 9, such as vitamin A, riboflavin as well as vitamin B, except for folate that increased drastically from food group 7 to 8 and slightly decreased from food group 8 to 9, however, none of it reached 100% of the DRIs.

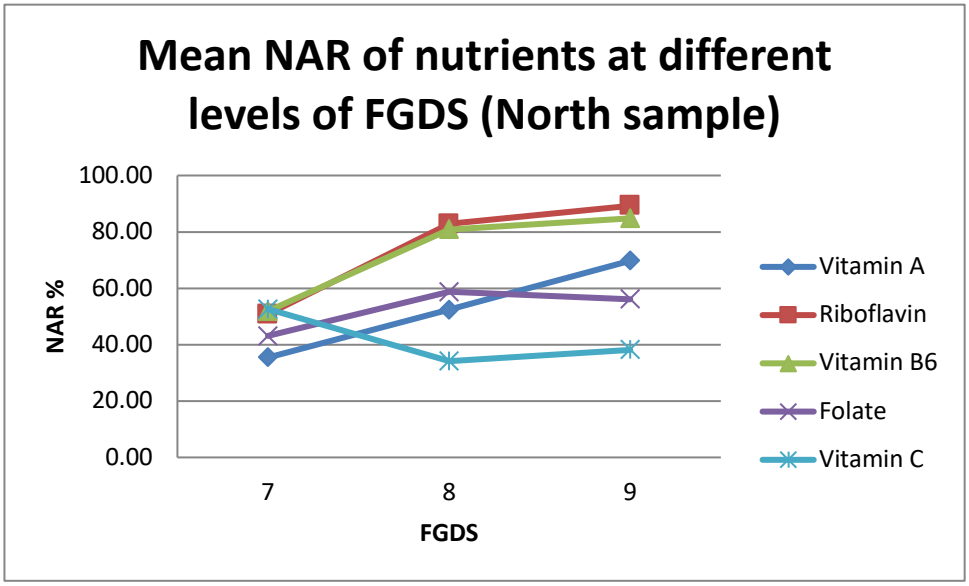

Figure 3.3: NAR% of nutrients (north section sample n=130)

Figure 3.4 demonstrates a slight but steady increase in the NARs from food group 7 to 9 for most of the nutrients such as energy, protein, calcium, iron and zinc from food group 7 to 8 and a slight decrease from FDGS 8 to 9.

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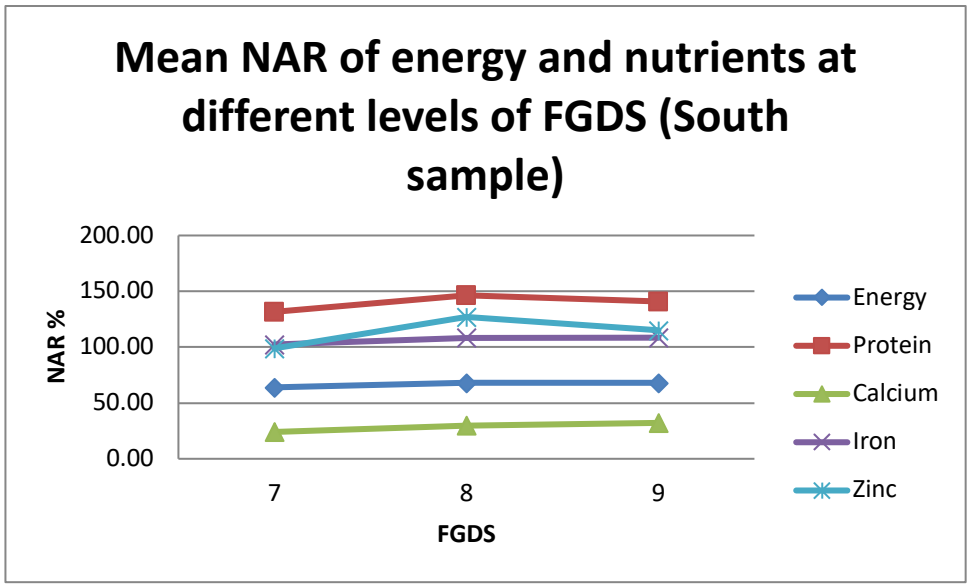

Figure 3.4: NAR% for energy and nutrients (south section sample n=130)

Figure 3.5 illustrates that there is no real pattern or increase of the NARs as the FGDS scores increase, riboflavin and vitamin B6 is above 10% of the DRIs.

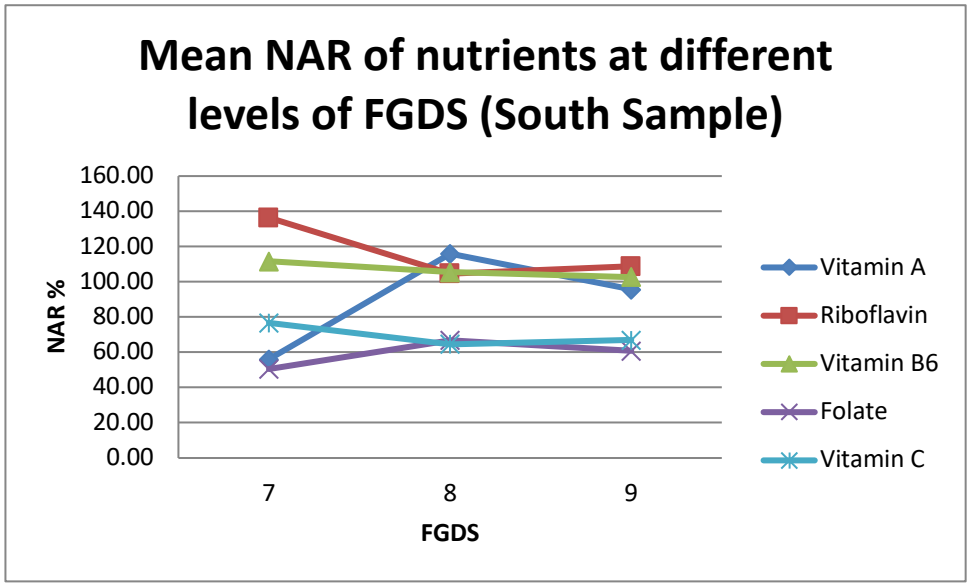

Figure 3.5: NAR% for nutrients (south section sample n=130)

Both the north and south section women did not meet the Estimated Energy Requirements (EER) with a mean ± SD energy (6116.32 ± 2591.630 kj and 6844.15 ±1800.390 kj) but the protein Recommended Daily Allowance (RDA) was found to be higher than the RDA with the mean ± SD of 52.43 ±25.150g and 65.08 ±21.420g, respectively.

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The Carbohydrate Estimated Adequate Requirement (EAR) for the women in both sections was more than double the EAR with a mean ± SD of 201.91 ± 92.870g and 207.46 ± 59.800g.

The diet of an urban sample of women was high in starchy staples, mainly refined white rice, refined wheat flour and millet, providing nearly 50% of the total energy in the diet. Fat in the form of edible vegetable oil provided a substantial proportion of the total dietary energy at 32% [15].

The vitamin intakes for 18-64 year old adults in north and south Ireland, in 2001, showed that the micronutrient intake was lower than the required average. In this study the micronutrient intake was insufficient for both sections, since the mean intake for fruit and vegetables, where most micronutrients are found, was below the WHO recommended intake of >400 g/day, at <100 g/day. However, certain micronutrients were compensated for by fortified staples such as maize and flour [21].

Anthropometric Indicators

Table 3.6 describes the mean age, weight, height and BMI of the women in both the north and south sections. The north section women's mean age was 34.6 years with an SD of 11.316 years, weight (79.06 ± 20.353kg, height (1.58 ± 0.097m) and BMI (32.19±9.994). The south section women's mean age was 39.17 years with an SD of 10.891years, weight (84.45 ± 21.790kg), height (1.59 ± 0.088m) and BMI (33.64 ± 8.469). The mean BMI indicates that the majority of both the north and south section women were above the normal BMI classification, as the BMI was 32.19 and 33.64, respectively (obese I, 30-34.99, obese II, 35.00-39.99 and obese III, ≥40 of the BMI principal cut off points). The mean waist circumference for the north section was 97.53 ± 18.799cm while the mean waist circumference for the south section was 101.26 ± 18.229cm. There was no significant difference between the north and south section women for BMI with a *p*-value of 0.209 and there was no significant difference between the north and south section women for waist circumference with a *p*-value of 0.106. However, there was a significant difference between the north and south section women for WHtR with a *p*-value of 0.000.

Table 3.7 indicates results of the BMI for women in both the north and south sections. In the north section, 1.54% women were underweight and 2.31% of the women in the south section were underweight, while 21.54% and 9.23% respectively, were within the normal range classification. Most women in both sections fell into the obese I classification at 26.15% for the north section women and 24.61% for the south section women , while 15.38% of women in the north section and 16.92% in the south section fell into the class II range for obesity respectively. Approximately 14.62% of the women in the north section and 22.30% in the south section were in even more danger, being classified in the class III range of obesity. There was no statistical significance between the women in the north and south sections ($p = 0.209$).

Figure 3.6 shows that the majority of the women in both sections were above the cut-off points for waist circumference (≥88 cm), being at 71.53% in the north section and at 78.46% in the south section while 28.46% of the women in the north section were

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within the normal value (<88 cm) as were 21.54% of the women in the south section; there was, however, no statistical significance between the two groups at $p = 0.106$.

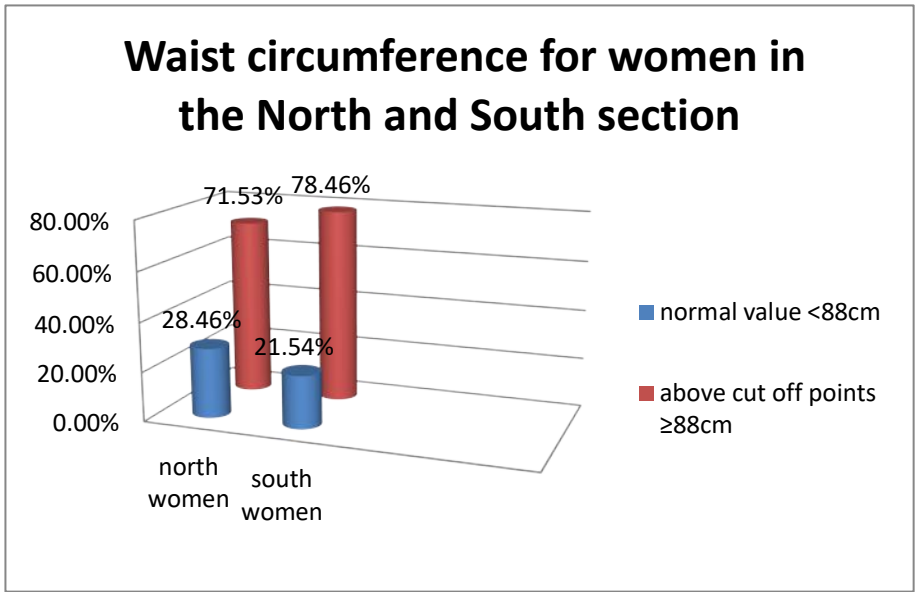

Figure 3.6: Cut-off points for waist circumference for women

Figure 3.7 shows the waist-to-height ratio (WHtR) of the women in total. The chart indicates that the majority of the participants were at risk of developing metabolic syndrome as 69.23% of the participants had a WHtR >0.5.

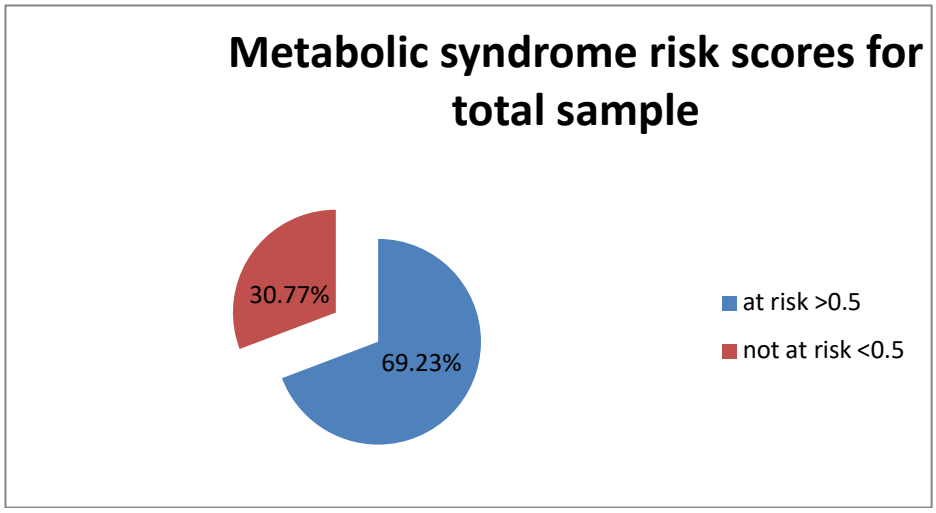

Figure 3.7: Metabolic syndrome risk scores as measured by waist-to-height ratio (WHtR)

The prevalence of diet-related diseases, poor quality diets and obesity tend to be found among high income countries between groups of lower socioeconomic status (SES). However, this is now also becoming a trend in middle income countries. The research found that as the gross national product increases in developing nations, the obesity burden moves towards a population of lower SES. The link between obesity and poor

diet emerges in this socioeconomic context [22]. The more stable the economic status for a community, the most likely the people are to indulge in the name of being "finally economically free".

A maximum number of participants consumed four different fruits and between six to seven vegetables within a seven day period. Seven different starchy foods were consumed by the majority of the participants. Most participants consumed four to five different meat foods, four different fats and oils and frequently consumed the egg group. However, the participants in the north section consumed the least foods in the legume group while in the south section majority of the participants consumed one type of legume. Also, it was only in the south section that majority of the participants consumed one type of dairy.

In the current study, the NAR percentages for energy for the north section increased from food group 8-9 by 12.83%, and from protein by 40.39%, while in the south section the energy percentage from food group 7-9 increased by 4.08% and from protein by 9.05%. This indicated that the energy percentage increased when other nutrients were introduced in the diet.

The WHO also adds that about 22% of the global population have an excessive macronutrient intake. Developing populations had increased their accessibility to caloric intake by 16% in 2010. In this study, most women in both sections were obese with 22.30% and 14.12% in the south section and north section, respectively being within the class III obesity range [23].

The obesity and overweight prevalence was much higher in women at 24.8% and 39.2%, respectively. The women had a waist circumference that put them in danger of metabolic problems at 68.2%. Obese and overweight female populations in South Africa increased during the 2003 to 2012 period from 27% to 39.2%, respectively [23].

The findings from this study indicated the same concerns. The south section women were more at risk of metabolic diseases at 98.08% than the north section at 45.38% even though the south section is seen as better informed than the north section population. Overall 69.23% of the women in the whole sample (n=260) were at risk of metabolic syndrome. Most women in both the north and south sections, at 71.53% and 78.46% respectively, were above the cut-off point (≥88 cm) for waist circumference. The south section was more at risk of diet-related diseases that lead to NCDs on average than the north section.

Correlations

The *p*-value is the probability of attaining a test statistic at least as extreme as the one that was really observed, supposing that the null hypothesis is true. However, the rejection of the null hypothesis happens when the *p*-value is less than 0.05 or 0.01. When the null hypothesis is rejected, the result is said to be statistically significant [24].

In the north section, the relationship between income and FVS ($p = 0.002$), between money spent on food and number of people in the household ($p = 0.027$), and between

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BMI and education ($p = 0.004$) was found to be significant. In the south section the relationship between money spent on food and food frequency of meals ($p = 0.052$) was found to be significant. The other variables were insignificant and there was no relationship between the variables (see Table 3.8).

In a study on South Africans aged 16 years and above, nutrient adequacy is reflected mainly by a diet that has enough variety. This is due to the fact that a single food cannot contain all the required nutrients, therefore there is a need for a diet that includes a variety of foods to meet all the required nutrients [25].

CONCLUSION

Low income communities are normally the most affected by poverty, food insecurity and malnutrition, while middle income communities show improved levels of lifestyle but are also affected by the same factors that affect the low income community leading to instability because of food price hikes, climate change and urbanisation, amongst others.

The household's livelihoods are secure when access to resources, household ownership and income are secure, ensuring that the identification of livelihood influences the essentials of life.

Many research studies have concluded that South Africa is food secure at the national level but studies of households show a different pattern, with many households experiencing poverty, and members being both undernourished or overnourished and as a result they can be described as food insecure. The unemployment rate is currently very high, with many individuals having lost their most recent jobs and many unable to obtain jobs; hence many people are sitting at home without work and not being able to further their studies, affecting the educational level of the community. Price hikes are also a point of concern as households with their main caregivers unemployed cannot make proper food choices, resulting in individuals buying cheaper items in bulk in order to sustain their families longer. Bulk buying will normally include products containing starch (bread, rice, porridge, etc.), meat, poultry and fats, and will exclude fruits and vegetables as they are expensive and can only be purchased in smaller quantities.

The country's government has committed to paying social grants as a means of dealing with the issue of unemployment and poverty, with the intended outcome that social grants will assist households to survive and mortalities due to malnutrition will be avoided. These social grants are divided between the elderly pension grants, disability grants, foster grants and children's grants. Unemployed people and those living in informal settlements are eligible to receive formal free housing in the form of RDP houses from the government and a reduced rate of payment for basic services while other services such as healthcare treatments are free.

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Interestingly, when it came to food consumption patterns, both the north and south sections showed a similar trend in terms of the individual foods consumed by participants. The food variety scores indicated medium score for both sections. However, neither the north or south sections met the Estimated Energy Requirements for energy but the protein RDA was higher for both sections. It must be noted, however, that the south section's protein RDA was still higher when compared to the north section. This corresponds with the results that the meat and poultry food consumption of participants was higher in the south section than in the north section.

The results of the energy distribution of macronutrients from the average of the 24-hr recalls when compared to the WHO dietary factor goals showed that the participants' diets were well balanced for macronutrient intake for both sections while the diets for both sections lacked in micronutrient intake.

The results in this study thus indicate that most women caregivers in both the north and south sections were overweight and falling below the obesity level as far as the participants' BMI was concerned. However, the majority of the women caregivers in the south section fell above the obesity classification, showing that the women caregivers for the south section are at an even higher risk of obesity related illnesses (NCDs). Results also showed that the majority of the south section women caregivers' waist circumferences were above the waist circumference (cut-off point ≥88 cm), placing most of the participants at risk of health problems such as cardiovascular diseases. When the weight-for-height ratio was measured for the whole sample, most of the women caregivers were at risk of developing metabolic syndrome.

The correlations drawn in this study between the north and south sections showed a significant difference in variables such as protein and fat intake. The correlations drawn simply mean that the north section can still be regarded as a low-income community while the south section is a middle -income community. However, other many variables showed no significance at all.

The policies being made by government and other stakeholders should be adapted to support and focus more on households headed by women caregivers as findings have confirmed that most households are headed by women.
Nutrition education should be conveyed using layman's terminology and even translated to mother tongue so that the whole population will be able to understand it and be able to implement the knowledge received in their daily lives.

Studies have indicated that if the country could use home-grown products instead of importing them, the state of food security would improve greatly.
The country has great potential to improve its agricultural status by supporting the farmers at grass roots level, as they are closely linked to the communities, especially women famers.

The risk factors for food insecurity such as malnutrition and poverty must be dealt with holistically.

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Table 3.1: Household Income

Variables	**North Section**		**South Section**	
Total income per month	Percentage %	Number (N=130)	Percentage %	Number (N=130)
R1000-R2000	62.31	81	18.46	24
R3000-R4000	25.38	33	15.38	20
<R6000	3.85	5	4.61	6
>R6000	7.69	10	47.69	62
Don't know	0.77	1	13.85	18
Total	100.00		100.00	

Table 3.2: Education status of participants in the north and south section households

Variables	**Percentage %**	**Number (n=130)**	**Percentage %**	**Number (n=130)**
Highest Education level	North Section		South Section	
Graduated	3.08		29.23	
College /FET	10.77		11.54	
Matriculated	43.85		26.15	
Grade 10	21.54		19.23	
Primary education	17.69		10.00	
None	2.31		3.85	
Not answered	0.77		0.00	
Total	100.00		100.00	

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Table 3.3: Dietary Intake Nutrient Analysis between the women of the north and south sections

	North Section (n=130)		South Section (n=130)		DRIs	Statistical significance between the two groups (*p*-value)
Nutrients p/day	Women Mean ±SD	% Women <100% of DRIs	Women Mean ±SD	% Women <100% of DRIs		
Energy (kJ)	6116.32±2591.630	60.60	6844.15±1800.390	67.81	10093EER	0.010
Total protein (g)	53.43 ± 25.510	116.16	65.08±21.420	141.48	46RDA	0.000
Total Fat (g)	41.54±23.510		52.98±20.440			0.000
Carbohydrates (g)	201.91±92.870	201.91	207.46±59.800	207.46	100EAR	0.590
Total Dietary Fibre (g)	13.88±7.380	55.50	14.72±6.080	58.89	25AI	0.350
Calcium (mg)	245.26±182.510	24.53	305.76±165.0610	30.58	1000AI	0.004
Iron (mg)	7.20±4.940	88.93	8.75±3.640	108.04	8.1EAR	0.002
Magnesium (mg)	797.44±85.050	75.94	215.88±68.120	83.03	255-265EAR	0.054
Phosphorus (mg)	719.83±324.690	124.11	841.17±254.920	145.03	580EAR	0.001
Zinc (mg)	6.65±3.120	97.77	8.00±2.910	117.64	6.8EAR	0.000
Selenium (mcg)	33.77±31.090	75.05	35.67±21.600	79.28	45EAR	0.594
Iodine (mcg)	34.51±28.500	36.33	36.22±20.160	38.12	95EAR	0.620
Vitamin A (RE) (mcg)	313.52±646.550	62.70	498.49±696.630	99.70	500EAR	0.030
Thiamine (mg)	0.80±0.410	89.37	0.94±0.380	104.81	0.9EAR	0.006
Riboflavin (mg)	0.77±0.690	85.44	0.99±0.650	109.72	0.9EAR	0.010
Niacin (mg)	13.26±7.400	120.58	17.64±7.130	160.34	11EAR	0.000
Vitamin B6 (mg)	0.90±0.580	82.05	1.15±0.520	104.67	1.1EAR	0.000
Folate (mcg)	180.36±109.900	56.36	199.17±113.830	62.24	320EAR	0.206

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Vitamin D (µg)	2.78±3.020	55.68	3.68±2.800	73.59	5 AI	2 EAR	0.002
Vitamin E (mg)	6.88±3.830	57.29	8.62±3.560	71.80	12 EAR	5 AI	0.000
Vitamin K (µg)	51.78±148.700	57.53	86.20±147.670	95.78	90 AI	30 AI	0.001
(mg)					60 EAR		0.000

EAR - Estimated Average Requirements
EER - Estimated Energy Requirements
AI - Adequate Intake
***p*-value** <0.05 - is seen as statistically significant

Table 3.4: Macronutrient distribution ranges as determined from 24-Hour Recalls

Dietary factor (food nutrient)	Mean ± SD	Mean % Energy contribution	AMDR goal
North section women 19-30 (n=58)			
Total Fat %	49.79±25.45	27.63	15-30
Protein %	59.78±26.19	15.24	10-15
Carbohydrate %	210.11±88.37	57.12	55-75
North section women 31-50 (n=72)			
Total Fat %	34.89±19.60	22.76	15-30
Protein %	48.33±23.22	14.48	10-15
Carbohydrate %	195.30±96.45	62.68	55-75
South section women 19 30 (n=34)			
Total Fat %	57.23±20.09	29.88	15-30
Protein %	64.90±24.25	15.57	10-15
Carbohydrate %	213.96±6.97	54.55	55-75
South section women 31-50 (n=96)			
Total Fat %	51.27±51.27	28.12	15-30
Protein %	65.33±65.33	16.46	10-15
Carbohydrate %	204.72±204.72	55.40	55-75

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Table 3.5: Summary of Food Variety Scores within the Food Groups of women in the north section (n=130)

Food Group	Mean		±SD		Range of scores	
	North	South	North	South	North	South
Cereals, roots and tubers	6.70	6.58	1.384	1.488	4-10	1-10
Other vegetables	6.80	6.79	2.382	2.194	1-12	1-12
Vitamin A rich fruit & vegetables	3.05	2.94	1.546	1.208	1-8	1-5
Flesh foods meat, poultry, fish	4.96	4.72	1.644	1.556	1-10	1-9
Fats and oils	3.69	3.48	1.044	1.023	1-6	1-6
Dairy	2.59	2.27	1.351	1.110	1-6	1-6
Other fruit	4.68	4.24	2.347	2.002	1-15	1-12
Legumes and nuts	1.79	1.79	0.939	0.909	1-5	1-5
Eggs	1.00	1.00	0.00	0.000	1	1
Total food items	34.44	33.81	8.419	10.670	11-60	15-51

Low = 0-3 food groups or <30 individual foods
Medium = 4-5 food groups or 30- 60 individual foods
High = 6-9 food groups >60 individual foods

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Table 3.6: Means, Standard Deviations (±SD) and nutritional significance differences between age, weight, height and body mass index (BMI) of north (n=130) and south (n=130)

	Variable	Mean Age in years	Mean Weight(kg)	Mean Height(m)	Mean BMI	Mean Waist Circumference (cm)
North section	±SD	±11.316	±20.353	±0.097	±9.994	±18.799
	Women (n=130)	34.60	79.06	1.58	32.19	97.53
South section	±SD	±10.891	±21.790	±0.088	±8.469	±18.229
	Women (n=130)	39.17	84.45	1.59	33.64	101.26
p-values $p<0.05$			0.000		0.209	0.106

Table 3.7: BMI classification table for the north (n=30) and south (n=130) section women

Parameter	Classification	% of North section women (n=130)	% of South section women (n=130)
Body Mass Index-BMI	Underweight (<18.50)	1.54%	2.31%
	Normal weight (18.50-24.99)	21.54%	13.07%
	Overweight (≥25.00-29.99)	20.77%	20.77%
	Obese 1 (30.00-34.99)	26.15%	24.61%
	Obese 11 (35.00-39.99)	15.38%	16.92%
	Obese 111 (≥40)	14.62%	22.32%
	Total	100.00%	100.00%

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Table 3.8: Relationship between income and body mass index (BMI), between income and frequency of meals, between income and FGDS, between income and FVS, between money spent on food and education, between people in households and other variables (Spearman's rho correlations)

Variable	Significance (*r*- value)		Relationship (*p* value)	
	North	South	North	South
Income and BMI	0.008	-0.027	0.933	0.763
Income and frequency of meals	0.138	-0.056	0.120	0.530
Income and FGDS	0.131	0.155	0.139	0.079
Income and FVS	0.272	0.145	0.002*	0.099
Money spent on food and education level	0.194	0.131	0.027*	0.136
Money spent on food and no. of people in h/h	0.033	0.124	0.710	0.160
Money spent on food and frequency of meals	0.076	0.171	0.391	0.052
Money spent on food and FDGS	0.101	-0.008	0.252	0.926
Money spent on food and FVS	0.156	-0.068	0.076	0.444
Money spent on food and BMI	0.111	-0.041	0.221	0.643
BMI and energy	0.116	-0.008	0.198	0.927
BMI and FAT	0.115	-0.022	0.205	0.802
BMI to PRO	0.137	-0.022	0.129	0.805
BMI and CHO	0.087	0.065	0.336	0.460
BMI and FVS	0.055	-0.001	0.547	0.994
BMI and FGDS	0.020	-0.015	0.822	0.867
BMI and education level	0.256	-0.028	0.004*	0.754
BMI and frequency of meals	0.084	-0.042	0.356	0.631

*Correlation is significant at the 0.05 level (2- tailed)
**Correlation is significant at the 0.01 level (2- tailed)

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