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### Dietary diversity score (HDDS) in measuring food security status among refugees in the White Nile State, Sudan

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#### Abstract

This paper was designed to assess food security status among Refugees in the White Nile State, Sudan by used Dietary Diversity Score (HDDS) method that is meant to reflect, in a snapshot form, the economic ability of a household to access a variety of foods. The study was based on primary data collected through the questionnaire. The sample was selected using a simple random technique, three camps were selected from seven camps, most of the camps populations are women and children, a sample size was 90 respondents. These camps are more or less homogeneous and hence the sample of 90 respondents is judged to be adequate. The dominant tribes were Sholok and Newir tribes. The results of the analysis reveal that most of the refugees fall within the age group between 35-45 years, family member's 7-10 individuals, According to 2018 survey the respondents depend on food donations in refugee's camps, ration distributed by household members, some of the refugees consider the ration distributed insufficient according to household consumption. Water is available in the study area but the source of water was far from their residence, not ready for utilization because it is not pure water, there is one health centre in any camp. They take medicine for the health centres. The proxy measure for HH food access examined 7-16 targets of food consumption. The high group and often their consumption consist of cereal groups, surge group, legumes, and nut group. The rare consumption was from meat and fish group. The not consumption from milk and other dairy products group and fruit and vegetables group. Half of the respondent's don't consume all food groups. The high percentage recorded by low food value (sugar and oil) but the high-value food recorded low percentage a more diversified diet is highly correlated with such factors as caloric and protein adequacy, percentage of protein from animal sources (high-quality protein), this result detected lack in access to 5 groups (meats, eggs, fruits, milk, and vegetables) the most important high-value groups that supplies body with all vitamins minerals protein needed.

**Keywords:** food security, refugee, status, Sudan, (HDDS)

#### Introduction

The last ten years have observed the widespread suffusion of the mass movement of refugees into Sudan from Syria and South Sudan as a result of civil war. Most of the refugees came from South Sudan directly settle down in Horseshoe cities in the White Nile state. The refugee population became a cultural construct. As Gatrell (2014) <sup>[3]</sup> notes refugees became insecure of basic needs because they lost their livelihood, accommodation, education. Food security is a condition whereby according to FAO (2006) <sup>[2]</sup> "all people, at all times, have physical and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy life". Therefore Cavaglieri (2005) <sup>[1]</sup> notes, during the past few decades the main focus of the international humanitarian response in refugee camps has been to stress assistance at the expense of protection, mostly in the initial emergency stage, where physical assistance is given priority over protection concerns. The South Sudanese refugee population in the White Nile state faces several major food and nutrition insecurity challenges. According to WFP Relief food assistance and distribution of non-food items.

Measuring food security status is an important issue to help decision making, development planning and determine the type of intervention in food-insecure areas. In addition to serving nutritional needs, food is an important factor in cultural identity; food can reveal relationships between the past and the present, reflect epochal transformation, and mark changing identities of various groups of people through new ways of appropriations. The study focuses on measuring food security status among refugees in the White Nile State in addition to nutritional assessment through dietary methods used for screening and provides the basis for appropriate counseling and decision making about the need for interventions such as food support. Valid and reliable dietary methods that indirectly measure or alarm nutritional status, is helpful for the detection of nutritionally vulnerable population groups like refugees and the implementation of effective strategies addressing these issues in the resource-limited situation. The household dietary diversity score (HDDS) is meant to reflect, in a snapshot form, the economic ability of a household to access a variety of foods. Studies have shown that an increase in dietary diversity is associated with

socioeconomic status and household food security (household energy availability) (Hoddinot and Yohannes, 2002; Hatloy *et al.*, 2000) [6, 5]. Food insecurity has been associated with a lower nutrient intake as well as a lower intake of fruits and vegetables.

### Research Method

This study was conducted in the White Nile State which is composed of 7 refugee camps (at study time). This study targeted households, there are no accurate statistics about the total population due to permanent movement in and out of the camps. The sample was selected using simple random techniques, three camps were selected from seven camps, and most of the camp's populations are women and children, the sample size of 90 respondents was selected. These camps are more or less homogeneous and hence the sample of 90 respondents is judged to be adequate. The dominant tribes were Sholok and Newir tribes. The primary data used in this paper was collected from the respondents by using an interview the secondary data were gathered from official records of SRCS\ Sub office supplement in any camp, UNHCR, FAO, Internet, and other relevant sources. Data analysis consisted of using the computer software SPSS (Statistical Package for Social Science). Different statistical procedures used, including descriptive analysis and Dietary Diversity Score (HDDS) statistical tabulation and average analysis method. Food Security Analysis Indicators as a major concern in the analysis is to base food security on nutritional status depending on deriving Household dietary Dietary Diversity Scale (HDDS) assessment tools among the members of target groups, through questionnaires.

### Field work of the study HDDS Food Consumption Groups Questions

1. In the past month, how often has the household eaten any food made from grain?
2. In the past month, how often has the household eaten any tubers?
3. In the past month, how often has the household eaten any pulses?
4. In the past month, how often has the household eaten any vegetables?
5. In the past month, how often has the household eaten any fruits?
6. In the past month, how often has the household eaten any meat, fish?
7. In the past month, how often has the household eaten any eggs?
8. In the past month, how often has the household eaten any dairy products?
9. In the past month, how often has the household eaten any sugar or honey?
10. In the past month, how often has the household eaten any oils, fat, or butter?

According to Swindle (2006) tabulation of the HDDS is a relatively simple matter that can be done by hand or with the aid of computer software such as a database or spreadsheet. First, the HDDS variable is calculated for each household. The value of this variable will range from 0 to 10. Total number of food groups consumed by members of the household. Values for 1 through 10 will be either "0" = NO

or "1" = Yes. Sum (1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 + 9 + 10) = HDDS

The average HDDS indicator is calculated for the sample population. Compute total number of food groups consumed by members of the household.

$$\text{Average HDDS} = \frac{\text{sum (HDDS)}}{\text{Total number of household}}$$

**Table 1: HDDS Categorical Indicator**

Household dietary diversity score	Household dietary diversity categories
+ 6	High = good dietary diversity
4-5	Medium dietary diversity
< 4	Low dietary diversity

*Source:* Food Security indicator /Vhurumuku, (2014)

### Results and Discussions

#### Characteristics and Background Information

In this study the researcher targeted women head household but coincidentally most of the refugees are women and children over all three camps.

#### Respondent Age

Table 2 shows that (41.1%) of respondents fall within the age group between 35-45 years the percentage represents vulnerable young mothers, the age determines eating pattern nutritional needs change with different life stages according to Burwell, *et al.*, (2015), the combination of foods and beverages that constitute an individual's complete dietary intake over time. Often referred to as a "dietary pattern," an eating pattern may describe a customary way of eating or a combination of foods recommended for consumption.

**Table 2: Frequency Distribution of Respondents by Age**

Age	Frequency	Percent %
15-25	37	15.6
25-35	30	33.3
35-45	14	41.1
>45	9	10.0
Total	90	100

#### Marital Status

As shown in table 3 (55.7%) of respondents were married. The marital status affects women's economic and food security levels as Hanson, *et al.*, (2007) note, similar demographic patterns were observed across marital categories married women were most likely to have higher incomes than other marital categories. Separated women were the marital category most likely to report less. Never married, cohabiting, separated and divorced women all reported lower levels of food security, with divorced and separated women, had the lowest mean income, and the lowest level of food security. Widowed women have experienced relatively high levels of food security.

**Table 3: Frequency Distribution of Respondents by Marital Status**

Marital Status	Frequency	Percent %
Married	50	55.6
Single	23	25.5
Widow	17	18.9
Total	90	100

### Family Size

As shown in table 4. 40.0% of respondents were having a family size, 7-10 individuals, Whenever the size of household members grow up the income increase in rural Africa according to women traditionally, Klemesu (2000) [7] note that a household is food secure when it has access to the food needed for a healthy life for all its members.

**Table 4:** Frequency Distribution of Respondents by Family Members

Family Size	Frequency	Percent %
2-6	34	37.8
7-10	36	40.0
>10	20	22.2
Total	90	100

### Household Ration Distributed

According to a 2018 survey the respondents depend on food donations 100% in refugee camps, ration distributed by household members, some the refugees consider the ration distributed moderate, enough, or insufficient according to household consumption. As shown in table 5. 43.3% of respondents consider the ratio distributed moderate, the respondents consider the ration distributed enough, food becomes accessible by individuals with adequate resources for acquiring appropriate foods for a nutritious diet. The most important problem facing the refugees they didn't have a source of income, As Klemesu (2000) [7] report, the stability of household food supplies depends on the ability of a household, even when faced with unpredictable crises, to procure through income, production, and/or transfers of adequate food supplies on a continuing basis

**Table 5:** Frequency Distribution of Respondents by Ration Distributed

Income Level	Frequency	Percent %
Enough ration	14	15.6
Moderate ration	39	43.3
Insufficient ration	37	41.1
Total	90	100

### Water Destination

According to the survey (2018), sources of water were the White Nile River and water station inside the camp for cleaning and supply. Table 6. shown that 83.3% of respondents the source of water far from their residence, not ready for utilization because it is not pure water, this percentage represents those people who depend on the river for supplying water, and (16.7%) were those who depend on water from the camp station which is pure for utilization. Siddig (2007) [8] reported the water of the White Nile is very turbid, therefore, it is expected to be contaminated with chemicals, just as well as microorganisms and accordingly it may cause health problems such as toxicity and some diseases and disorders.

**Table 6:** Frequency Distribution of Respondents by Destination of Water to Residence

Location of water	Frequency	Percent %
Near to Residence	15	16.7
Far from Residence	75	83.3
Total	90	100

### Water Stability

As shown in Table 7. that 73.3% of respondents have available water unavailability of water affects food security and health, water is important to factor for a stable life. Siddig (2007) [8] reported careless pollution or contamination of streams lakes and underground sources has greatly impaired the quality of the available water. It is therefore of at most importance for the future that good conservation and sanitary measures be practiced to ensure enough water supply.

**Table 7:** Frequency Distribution of Respondents by Water Stability

Stability of Water	Frequency	Percent %
Available all over the year	66	73.3
Not Available all over the year	24	26.7
Total	90	100

### The Sickness

There is one health center in any camp, table 8. shows that percentage of 55.6% of households felt sick, for a period of time during the past 30 days from the time of the field survey. However, 42.2% of respondents reported that most during the past 30 days was sick. Health problems were probably caused by low quality and the low diversity of food consumed. As Gibson, *et al.*, (2004) [4] note, lack of food security presents itself in many ways. On the surface observe personal health impacts food-related illness and disease. Residents face a paradox of hunger and obesity and the nutritional health concerns associated with such conditions. They also face ill-health due to contaminants in their food. Some links between these personal health issues are readily apparent, while others are less obvious.

**Table 8:** Frequency Distribution of Respondents by Sickness

In past 30 d HH feel Sick	Frequency	Percent %
Never feel sick	2	2.2
Feel sick during past 30 days	50	55.6
Always feel sick	38	42.2
Total	90	100

### Attitude of Sickness

Table 9. clarifies that the vast majority of respondents 95.6% visit the health center for treatment meaning that they have well care of illness and the importance of going to the health care center. These percentages indicate that respondents nutrition-oriented. However, 3.3% of respondents were taking curing grass and 1.1%) of respondents do not visit a health center, these two percentage represents the respondents which in need nutrition-oriented action should ensure that households and individuals have the knowledge and supportive health and environmental conditions necessary to obtain adequate nutritional benefit from the food. As Gibson, *et al.*, (2004) [4] note, there is a strong connection between nutrition and certain chronic diseases, in particular cardiovascular disease and diabetes.

**Table 9:** Frequency Distribution of Respondents by Sickness Attitude

What HH do when feel sick	Frequency	Percent %
Go health centre	86	95.6
Taking curing grass	3	3.3
Do not visit health centre	1	1.1
Total	90	100

### Availability of Medicine

able 3.9 showing that (68.9%) of the surveyed population go to the health center and found medicine available, (26.7%) of the surveyed population goes to the health center but they didn't found the medicine they need, (4.4%) of the surveyed population they don't know and they didn't go to the health center. It is important to improve overall health services and well-being and/or have a broad preventive impact on a wide variety of physical and mental health problems. As Gibson, *et al.*, (2004) <sup>[4]</sup> note, certainly eating habits and food handling practices play a role, but why is it that they eat the way they do? If they look below the surface, observe that food-related illness and disease are symptoms of the current food system

**Table 10:** Frequency Distribution of Respondents by Availability of Medicine

Availability of medicine	Frequency	Percent %
medicine is available	62	68.9
medicine is not available	24	26.7
They don't know	4	4.4
Total	90	100

**Table 11:** Frequency Distribution of Respondents by Food Groups used for HDDS Category

Food Groups Used for HDDS		Often	Rarely	No
A	Cereals and grain	83 (92.2%)	2 (2.2%)	5 (6.5%)
B	Roots and tubers	0 (00.0%)	0 (00.0%)	90 (100.0%)
C	Legumes / nuts	87 (96.7%)	3 (3.3%)	0 (00.0%)
D	Orange vegetables rich in Vitamin A, green leafy vegetables and other vegetables	0 (00.0%)	39 (43.3%)	51 (56.7%)
E	Orange fruits (Fruits rich in Vitamin A) Other Fruits	0 (00.0%)	12 (13.3%)	78 (86.7%)
F	Meat Liver, kidney, heart and / or other organ meats Fish / Shellfish /	0 (00.0%)	36 (40.0%)	54 (60.0%)
G	Eggs	0 (00.0%)	8 (8.9%)	82 (91.1%)
H	Milk and other dairy products	0 (00.0%)	4 (4.4%)	86 (95.6%)
I	Sugar, or sweet	56 (62.2%)	27 (30.0%)	7 (7.8%)
J	Oil / fat / butter	90 (100.0%)	0 (00.0%)	0 (00.0%)

### HDDS Average Percent of Indicator Questions Responses

Table 12 reveals HDDS average percent of food groups consumed by responses compute the total number of food groups (10) divided into a total number of households in every single column at the table (16) to identify the average of HDDs. From table (16) the sum of the total household divided by 10 equal 32 frequency were represent (35.6%) of respondents have often consumed all food groups, at second column the sum of rarely consumed all food groups divided into 10 equal 13 frequency were represent (14.4%) of respondents rarely consumed all food groups and food groups divided into 10 equal 45 frequency were represent (50.0%) of respondents they don't consume all food groups.

**Table 12:** Frequency Distribution of Respondents by Average Percent of HDDS three Responses

Responses	Frequency	Percent
Often consumed all groups	32	35.6
Rarely consumed all food groups	13	14.4
Don't consume all food groups	45	50.0
Total	90	100

### HDDS Categorical Indicator

The result in table 13 shown the HDDS three categories scores (ranging 1-9) gained by different household were (35.6%) of respondents recorded score + 6 category good

### Food Security Indicator HDDS

Dietary diversity represents the number of different foods or food groups consumed over a given reference period. It is a proxy measure for HH food access Number of food groups examined: 7-16 targets: individuals (IDDS), household (HDDS), or women (WDDS).

According to table 11. 10 food group consumed by respondents in dissimilar percentages (92.2%) were consuming group A cereals, (62.2%) were consuming group I sugar, (96.7%) were consuming group C nuts, and group J oil consumed by all respondents 100%, while group D vegetables consumed by (43.3%), group E fruit consumed by (13.3%), (40.0%) consumed group E meats, (8.9%) consumed group G eggs and (4.4%) consumed group H milk. As Gibson, *et al.*, (2004) <sup>[4]</sup> note Food-borne illness is a significant food security concern.

This does not involve too little or too much food – it is a concern about the food itself. Contaminants in food (bacteria, protozoa, viruses, prions, metals, and chemicals) are contributing to illness

dietary diversity, (14.4%) of respondents recorded scores 4-5, medium dietary diversity, (50.0%) of respondents recorded score < 4 low dietary diversity. The high percentage recorded by low food value (sugar and oil) but the high-value food recorded low percentage a more diversified diet is highly correlated with such factors as caloric and protein adequacy, percentage of protein from animal sources (high-quality protein), this result detected lack in access to 5 groups (meats, eggs, fruits, milk, and vegetables) the most important high-value groups of supplies the body all vitamins minerals protein needed.

**Table 14:** Frequency Distribution of Respondents by HDDS Categorical Indicator

Household dietary diversity score	Dietary Diversity percent	Household Dietary Diversity categories
+ 6	32 (35.6%)	High = good dietary diversity
4-5	13 (14.4%)	Medium dietary diversity
< 4	45 (50.0%)	Low dietary diversity

### Conclusion

This paper studies the food security situation in White Nile State among South Sudan refugees, using three food security indicators HDDs with spotlighting the health situation in the area. The general situation of refugees was that all respondents were vulnerable women depend on donations from the UN and NGOs, the main source of water



is the White Nile River mainly, the medicines were available at the camp's health centers. The refugees have good health awareness visiting the health centers for curing at sickness situations. According to the result of Household Dietary Diversity (HDDS) categories indicates low dietary diversity, the highest value group's semi absent and not accessible for all refugees. The general food security situation in the camps according to indicators results tends to acceptable mild food insecurity. Monitoring and evaluate food insecurity situation and hunger among refugee and develop the ration distributed to refugees to involve high-value foods such as (milk, meats, eggs, vegetables, and fruits).

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