The Impact of Food Consumption Pattern on Women’s Health at Sana’a Governorate, Yemen

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Abstract
This research was aimed at studying the impact of food consumption pattern (FCP) via the Household Dietary Diversity Scores and Women Dietary Diversity Scores and also Households income on the malnutrition status of women (MUAC) in the two zones, Sana’a Dry (SD) that represents the rural part and Sana’a Temperate (ST) that represents the urban part of Sana’a Governorate, Yemen. The investigation based on data that extracted from a comprehensive survey conducted by UNICEF during 2016 with a total sample of 1396 women in the reproductive age 15-49 years from the two zones SD and ST. The prevalence of middle upper arm circumference (MUAC) in SD’s women is about 2.4 more than the ST’s women. The relationship between income quintiles and MUAC in the two zones is highly significance (P-Value <0.001). Based on the income data of HHs, and the exchange rate of 2016, it was found that 85.5% of HHs are living on less than 1 US$ per capita/day. While MUAC rates are the highest among women consuming cereals, miscellaneous, oils, sugar honey and diary in the SD zone, they are sugar honey, diary, oils and legumes in the ST zone. Only when meat, fruits and seafood came into the FCP of women, MUAC rates have been reduced significantly in both zones. New thresholds for both HDDS and WDDS that based on the mean number of food groups consumed (FGC) were suggested and lead to more realistic results.

Keywords: FCP; FGC; HDDS; WDDS; Income quintiles; Sanaa Governorate

Introduction
It is well known that all health-related issues are on the hands of the social and economic structures of any society. So, changing these structures first is the corner stone for making life prospects more dignified, healthier and acceptable. The maternal mortality and morbidity are positively related to the inadequate maternal nutrition. This inadequacy could lead to increasing the preterm births and fetal growth retardation among the exposed women [1]. In most of the developing countries, malnutrition continues to be the most important health burden. In fact, it is the most important risk factor for illness and death of millions of pregnant women and young children globally [2]. Zahan argues that women’s health cannot be understood without existing a full definition of health related to women’s role and position in society and more particularly in the context of family [3].

Food security of households can be addressed in either able to produce their own food or able to purchase it and in both cases, income is the main burden. This is the reason behind considering malnutrition as a direct consequence of poverty and lack of economic resources [4]. Good nutrition is also vital on enhancing healthy life, education and productivity of people [5]. The most acceptable definition to household food insecurity stated that “a household (HH) is considered food insecure if it has a limited or uncertain physical and economic access to secure sufficient quantities of nutritionally adequate and safe foods in socially acceptable ways to allow HH members to sustain active and a healthy living” [6-12]. Yet, in Yemen no research has been performed to assess the relationship between household food security and nutritional status of women either nationally or on a governorate level.

Due to the war that is running since March 2015, poverty, household food insecurity and malnutrition have become prevalent problems in Yemen [13]. The last human development report 2018 issued by UNDP Yemen has indicated that the country ranks 172 amongst 188 nations on the Human Development Index (HDI) [14]. The HDI of females in this country is 0.223 which is very low comparing to males (0.524). The life expectancy of women is 66.3 years and the Maternal Mortality Ratio is 385 per 100,000 live
The survey population consisted of:

1. anthropometry: children aged 6 to 59 months
2. mortality: all people that have lived at the household (currently residing, left, born or died) over a set recall period
3. women anthropometry: women 15-49 years. The data collection was completed over a 12 days period.

Definitions

Women’s Health Measures

Data of women 15-49 years were entered, calculated and analyzed using ENA for SMART software. Classifying of malnutrition levels of Women [24-27]

- MUAC GAM <23cm = Global Acute Malnutrition Prevalence Rates
- MUAC GAM ≥ 2 cm = Normal
- MUAC: 21cm< MUAC<23 cm = (MAM) Global Moderate Malnutrition Prevalence Rates
- MUAC: MUAC<21 cm = (SAM) Global severe Malnutrition Prevalence Rates
- MUAC ≥ 23cm = Normal

Undernourishment (Malnutrition)

Undernourishment is defined as the condition in which an individual’s habitual food consumption is insufficient to provide the amount of dietary energy required to maintain a normal, active, healthy life [15].

HDDS and WDDS

Dietary diversity scores are calculated by summing the number of food groups consumed in the household or by the individual respondent over the 24-hour recall period. The HDDS and WDDS...
are calculated based upon different numbers of food groups because the scores are used for different purposes. The HDDS is meant to provide an indication of household economic access to food, thus items that require household resources to obtain, such as condiments, sugar and sugary foods, and beverages, are included in the score. Individual scores are meant to reflect the nutritional quality of the diet. The WDDS reflects the probability of micronutrient adequacy of the diet and therefore food groups included in the score are tailored towards this purpose [18,20].

Twelve food groups are proposed for the HDDS, while nine food groups are proposed for the WDDS [18,20]. The food groups used to calculate HDDS are:

- Cereals
- White tubers and roots
- Vegetables
- Fruits
- Meats
- Eggs
- Fish and other seafood
- Legumes, nuts and seeds
- Milk and milk products
- Oils and fats
- Sweets (Sugar Honey)
- Miscellaneous (Spices, condiments and beverages)

The food groups used to calculate WDDS are:

- Starchy staples (Cereals and white roots and tubers)
- Dark green leafy vegetables
- Other vitamin A rich fruit and vegetables and red palm oil
- Other fruits and vegetables (other fruit and other vegetables)
- Organ meat
- Meat and fish
- Eggs
- Legumes, nuts and seeds
- Milk and milk products

**DD based on HDDS**

(Will be referred as the original categorization of HDDS) categorized into three categories, i.e., low if consumption was <=3 various of food, moderate if consumption was 4-5 various of food and high if consumption was >=6 various of food [18].

**FCP**: Food consumption pattern that the people used to eat without specifying the food group.

**Statistical analysis**

Data analysis was done using Excel, ENA and SPSS (version 24.0). Some descriptive statistics including frequencies and percentages were produced for the assigned variables. Chi-square test was used to assess the relationships among the categorical variables whenever necessary. Significance was defined as (P<0.05).

**Results and Discussion**

**Food groups consumed (FGC), Income quintiles and MUAC**

According to the food groups classification of HDDS, (Table 1) indicates that oil, sugar honey, diary, cereals and miscellaneous are the most consumed among the women of this governorate. Clearly, the FCP tends to depend mainly on the less nutrient food items. Factually and due to many factors, the health status of peoples varies from one zone to another and even within a country’s regions. So, when the FCP was recalculated for each zone separately, two similar patterns were emerged. While there are some similarities in some food items (oils, sugar honey, diary and vegetables) in the two zones, the consumption percentages of the more nutrient food items are in favor of the ST zone (Table 2). In other words, ST’s women are having better or healthier FCP.

**Table 1: Percentages of the FGC by all women.**

| FGC                  | n  | %   |
|----------------------|----|-----|
| Oils                 | 1347 | 96.5 |
| Sugar Honey          | 1344 | 96.3 |
| Diary                | 1277 | 91.5 |
| Cereals              | 1188 | 85.1 |
| Miscellaneous        | 1019 | 73   |
| Legumes              | 901  | 64.5 |
| Roots Tubers         | 865  | 62   |
| Vegetables           | 777  | 55.7 |
| Meat                 | 494  | 35.4 |
| Fruits               | 456  | 32.7 |
| Seafood              | 229  | 16.4 |
| Eggs                 | 207  | 14.8 |
| Total                | 1396 | 100  |

**Table 2: FGC by zone.**

| FGC               | SD | Zone | ST |
|-------------------|----|------|----|
|                   | n  | %    | n  | %  |
| Cereals           | 609 | 99.8 | 579 | 73.7 |
| Miscellaneous     | 601 | 98.5 | 418 | 53.2 |
| Oils              | 598 | 98   | 749 | 95.3 |
| Sugar Honey       | 573 | 93.9 | 771 | 98.1 |
| Diary             | 533 | 87.4 | 744 | 94.7 |
Vegetables 344 56.4 433 55.1
Roots Tubers 325 53.3 540 68.7
Legumes 295 48.4 606 77.1
Meat 138 22.6 356 45.3
Fruits 75 12.3 381 48.5
Eggs 52 8.5 155 19.7
Seafood 26 4.3 203 25.8
Total 610 43.7 786 56.3

Table 3: Income quintiles by zone: *YR: Yemeni Rial.

| Income Quintiles | Zone | SD | % | ST | % | Total | % |
|------------------|------|----|---|----|---|-------|---|
| Q1 (< 17,800*)   |      | 120| 19.7| 156| 20|       |   |
| Q2 (17801 - <24,000) |    | 49 | 8  | 142| 18.2|       |   |
| Q3 (24,000 - <34,000) | | 182| 29.8| 122| 15.6|       |   |
| Q4 (34,000 - <46,200) | | 120| 19.7| 137| 17.6|       |   |
| Q5 (46,200 - <480,000) | | 139| 22.8| 223| 28.6|       |   |
| Total            |      | 610| 43.9| 786| 56.1|       |   |

There are some pros and cons in living in urban zones. Accessibility to education, healthcare, clean water, sanitation and better economic opportunities are among the positive impacts, while crime, low physical activity and poor dietary habits are among the negative impacts [28]. To examine the contribution of income level in creating these patterns, (Table 3) shows the income quintiles of the HHs in the two zones. From which, income distribution seems similar in the two zones with slight improvement in ST zone and more specifically in Q5. Similar results were reported in many other studies [2,29,30]. The exchange rate of 2016 (data gathering date) was 300YR = 1US$ [31]. So, converting the income quintiles distribution into US$ and taking into consideration the number of HH’s members results in (Table 4).

Table 4: Income quintiles per day per capita: *US$.

| Income Quintiles | n  | %   |
|------------------|----|-----|
| Q1 (< 0.18*)     | 271| 19.5|
| Q2 (0.19 - < 0.33) | 246| 17.7|
| Q3 (0.33 - < 0.53) | 317| 22.8|
| Q4 (0.53 - < 0.88) | 278| 20  |
| Q5 (> 0.88)      | 278| 20  |
| Total            | 1390| 100 |

Further calculations revealed that only 202 women (14.5%) out of the sample are having more than or equal 1US$ per day, or in other words 85.5% of them are living on less than 1US$ a day. To elaborate more, FGC was compared with the income quintiles in the two zones (Table 5). As known, the fruits, meat, eggs and seafood groups are normally more expensive than the other food groups. Therefore, and despite of the income quintiles similarities, ST’s women are having the chance to consume more nutrient food groups. Such situation is very much clear when income quintiles were compared with MUAC in each zone (Table 6).

Table 5: FGC, income quintiles and zone.

| FGC       | SD | Q1 | Q2 | Q3 | Q4 | Q5 | ST | Q1 | Q2 | Q3 | Q4 | Q5 |
|-----------|----|----|----|----|----|----|----|----|----|----|----|----|
|           | % | % | % | % | % | % | % | % | % | % | % | % |
| Cereals   | 15.7| 14.5| 14.6| 14.3| 14.1| 9.2| 11.7| 10.1| 9.6| 8.9|
| Roots Tubers | 6.3| 7.9| 6.8| 9.2| 9| 8.7| 8.7| 9.2| 9.8| 9.3|
| Vegetables | 7.1| 8.2| 9.5| 7.6| 8.2| 5.7| 7.4| 7.5| 7.4| 8|
| Fruits    | 1.3| 1.8| 2.3| 1.9| 1.4| 9.9| 4.1| 4.9| 5.2| 6.9|
| Meat      | 2.1| 4.5| 3.3| 3.7| 3.5| 5.3| 3.9| 6.8| 5| 7.6|
| Eggs      | 0.9| 0.6| 1.1| 1.6| 1.6| 1.1| 1.5| 2.7| 2.9| 3.9|
| Seafood   | 0.5| 0| 0.6| 0.6| 0.9| 4.3| 1.7| 3| 5.2| 3.1|
| Oil       | 15.7| 14.8| 13.9| 14.2| 13.9| 13| 14.3| 12.4| 12.8| 11.6|
| Diary     | 13.7| 13.9| 12.4| 12.2| 12.6| 13.4| 12.9| 12.3| 12.7| 11.9|
| Legumes   | 8.2| 5.4| 7| 6.4| 7.4| 9.5| 11.4| 10.1| 10.6| 9.8|
| Sugar Honey | 13.4| 14.2| 13.9| 14| 13.5| 13.9| 14.8| 12.5| 12.6| 12|
| Miscellaneous | 15.1| 14.2| 14.6| 14.3| 13.9| 6| 7.7| 8.6| 6.2| 7|
| Total     | 764| 33.1| 12.47| 838| 989| 1100| 947| 969| 1022| 1852|

In Table 6, the malnutrition rate is 40.1% in the SD zone comparing to only 16.5% in the ST zone. The table also shows no significant association between income quintiles and MUAC. However, by separating the MUAC affected women in the two zones, the association was found highly significant. This result is crucial as it proves how the slight difference improvement in income plays a significant role in improving the women’s health and definitely all members of the HHs. In (Table 7), a comparison between the FGC with MUAC according to zone is presented. Many important points can be drawn: 1) 39.5% and 16.5% of the SD’s women and ST’s women are malnourished respectively; i.e. malnutrition among the SD’s women exceeds the double of ST’s women (the slight difference in the malnutrition rates is due to some missing values). 2) MUAC rates are the highest among women consuming cereals,

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miscellaneous, oils, sugar honey and diary in the SD zone. 3) MUAC rates are the highest among women consuming sugar honey, diary, oils and legumes in the ST zone. 4) The common FGC between the two zones are oils, sugar honey and diary. 5) Only when the last four groups (meat, fruits, eggs and seafood) were entered into the consumption pattern, MUAC rates have been reduced significantly in both zones.

### Table 6: Income quintiles, zone and MUAC: *YR.

| Income Quintiles | Zone | MUAC >= 23cm | MUAC < 23cm | MUAC >= 23cm | MUAC < 23cm |
|------------------|------|--------------|-------------|--------------|-------------|
|                   |      | n            | %           | n            | %           |
| Q1*              | SD   | 76           | 21.4        | 43           | 18.5        |
|                  | ST   | 121          | 19.5        | 19           | 15.4        |
| Q2               | SD   | 29           | 8.2         | 19           | 8.2         |
|                  | ST   | 112          | 18          | 28           | 22.8        |
| Q3               | SD   | 98           | 27.6        | 77           | 33.2        |
|                  | ST   | 99           | 15.9        | 21           | 17.1        |
| Q4               | SD   | 78           | 22          | 41           | 17.7        |
|                  | ST   | 111          | 17.8        | 18           | 14.6        |
| Q5               | SD   | 74           | 20.8        | 52           | 22.4        |
|                  | ST   | 179          | 28.8        | 37           | 30.1        |
| Total            |      | 355          | 59.9        | 232          | 40.1        |
|                  |      | 622          | 83.5        | 123          | 16.5        |

### Table 7: Distribution of FGC by zone and MUAC.

| FGC              | Zone | MUAC >= 23cm | MUAC < 23cm | MUAC >= 23cm | MUAC < 23cm |
|------------------|------|--------------|-------------|--------------|-------------|
|                  |      | n            | %           | N            | %           |
| Cereals          | SD   | 355          | 100         | 231          | 99.6        |
|                  | ST   | 469          | 74.9        | 85           | 68.5        |
| Miscellaneous    | SD   | 351          | 98.9        | 227          | 97.8        |
|                  | ST   | 339          | 54.2        | 61           | 49.2        |
| Oils             | SD   | 349          | 98.3        | 227          | 97.8        |
|                  | ST   | 599          | 95.7        | 116          | 93.5        |
| Sugar Honey      | SD   | 340          | 95.8        | 212          | 91.4        |
|                  | ST   | 619          | 98.9        | 119          | 96          |
| Diary            | SD   | 310          | 87.3        | 205          | 88.4        |
|                  | ST   | 594          | 94.9        | 118          | 95.2        |
| Roots Tubers     | SD   | 195          | 54.9        | 116          | 50          |
|                  | ST   | 436          | 69.6        | 80           | 64.5        |
| Vegetables       | SD   | 193          | 54.4        | 135          | 58.2        |
|                  | ST   | 355          | 56.7        | 60           | 48.4        |
| Legumes          | SD   | 173          | 48.7        | 108          | 46.6        |
|                  | ST   | 477          | 76.2        | 101          | 81.5        |
| Meat             | SD   | 83           | 23.4        | 44           | 19          |
|                  | ST   | 289          | 46.2        | 53           | 42.7        |
| Fruits           | SD   | 39           | 11          | 33           | 14.2        |
|                  | ST   | 319          | 51          | 45           | 36.3        |
| Eggs             | SD   | 33           | 9.3         | 18           | 7.8         |
|                  | ST   | 128          | 20.4        | 14           | 11.3        |
| Seafood          | SD   | 19           | 5.4         | 7            | 3           |
|                  | ST   | 177          | 28.3        | 23           | 18.5        |
| Total            |      | 355          | 60.5        | 232          | 39.5        |

### HDDS, WDDS, Income quintiles and MUAC

While the individual dietary diversity score (IDDS) is used as a proxy measure of the nutritional quality of an individual diet, the HDDS is used as a proxy measure of the socio-economic level of the HH [18]. The distributions of HDDS and WDDS are shown on (Table 8), where the minimum is two with HDDS and one in WDDS. Both distributions look normally distributed with mean 7.24 and standard deviation 1.83 for HDDS and 5.09 and standard deviation 1.97 for WDDS. Now, and due to the ongoing conflict and economic crisis, Yemen is the largest food security emergency in the world. Nearly 16 million people—approximately 53 percent of Yemen’s population—face Crisis (IPC 3) or worse conditions countrywide, according to the Integrated Food Security Phase Classification (IPC). In other words, the IPC analysis has declared that from December 2018 to January 2019, a total of 15.9 million people, i.e., 53% of the population analyzed are severely food insecure [32, 33]. (Table 9), shows the HDDS and WDDS categories by zone. Clearly, in the HDDS classification (categorization), only 1.3 of women in the two zones is consuming less than four food groups. On the other side, in WDDS categories those women consuming less than four food groups are 30.6% and 15.3% in SD and ST respectively. Therefore, using this categorization under the ongoing circumstances is unrealistic and we suggest using the mean number of FGC as a cut-off instead.
Table 8: The distributions of HDDS and WDDS by zone with some descriptive statistics.

| HDDS | Zone | WDDS |
|------|------|------|
|      | SD   | ST   |      | SD   | ST   |
|      | n    | %    | n    | %    | n    | %    |
| 2    | 3    | 0.5  | 2    | 0.3  | 1    | 1.6  | 7    | 0.9  |
| 3    | 5    | 0.8  | 8    | 1    | 2    | 14.9 | 36   | 4.6  |
| 4    | 17   | 2.8  | 43   | 5.5  | 3    | 86   | 14.1 | 77   | 9.8  |
| 5    | 91   | 14.9 | 72   | 9.2  | 4    | 172  | 28.2 | 107  | 13.6 |
| 6    | 157  | 25.7 | 108  | 13.7 | 5    | 110  | 18   | 150  | 19.1 |
| 7    | 147  | 24.1 | 158  | 20.1 | 6    | 63   | 10.3 | 120  | 15.3 |
| 8    | 98   | 16.1 | 130  | 16.5 | 7    | 48   | 7.9  | 112  | 14.2 |
| 9    | 63   | 10.3 | 119  | 15.1 | 8    | 24   | 3.9  | 127  | 16.2 |
| 10   | 16   | 2.6  | 105  | 13.4 | 9    | 6    | 1    | 50   | 6.4  |
| 11   | 13   | 2.1  | 33   | 4.2  |      |      |      |      |      |
| 12   | 0    | 0    | 8    | 1    |      |      |      |      |      |
| Total| 610  |      | 786  |      | 610  |      | 786  |      |      |
| Mean | 6.83 |      | 7.55 |      | 4.34 |      | 5.67 |      |      |
| Std  | 1.58 |      | 1.96 |      | 1.72 |      | 1.96 |      |      |
| Median| 7.00 |      | 8    |      | 4    |      | 6.00 |      |      |
| Mode | 6.00 |      | 7    |      | 4    |      | 5.00 |      |      |

Table 9: HDDS and WDDS by zone.

| Indicators | Categories | Zone |
|------------|------------|------|
| HDDS       | <=3        | SD   |
|            |            | %    |
|            | 8          | 1.3  |
|            | >=4 – 5    | 108  | 17.7 |
|            | 494        | 81   | 661  | 84.1 |
|            | 10.438 (0.296) |      |      |      |
|            | >=6        |      |      |      |
| Chi-square |            |      |      |      |
|            | P-value    |      |      |      |
| HDDS by mean| <=7      | 420  | 68.9 |
|            | 391        | 49.7 |
|            | >=8 – 10   | 177  | 29   |
|            | 354        | 45   |
|            | 13         | 2.1  |
|            | 41         | 5.2  |
|            | 53.212 (0.000) |      |      |      |
|            |           |      |      |      |
| WDDS       | <=3        | 187  | 30.7 |
|            | 120        | 15.3 |
|            | 4 – 5      | 282  | 46.2 |
|            | 257        | 32.7 |
|            | 141        | 23.1 |
|            | 409        | 52   |
|            | 126.187 (0.000) |      |      |      |
|            |           |      |      |      |
| WDDS by Mean| <=5      | 469  | 76.9 |
|            | 377        | 48   |
|            | 6 – 7      | 111  | 18.2 |
|            | 232        | 29.5 |
|            | 8 – 9      | 30   | 4.9  |
|            | 177        | 22.5 |
|            | 137.071 (0.000) |      |      |      |

Comparing the results of using the ordinary categorization with the suggested one (Table 9), reveals immediately how using the mean of the FGC as a threshold is giving more realistic figures for both HDDS and WDDS. Furthermore, only the association between HDDS original categorization and zone was insignificant. It is known that no universal cut-off level that indicates whether HH food is sufficiently diverse or not. However, a critical value of 4 was widely used to categorize the target population into food-secure and food-insecure [18,29,34]. In (Table 10), with minimal mathematics one can realizes easily that only 5.6% of the sample is food-insecure while using the mean as a threshold showed 58.1% which is close to the ICP estimation [33].

Table 10: HDDS, food security status by zone.

| Indicators | Food security status | Zone |
|------------|----------------------|------|
|            | HDDS                 | SD   |
|            | Insecure (<=4 groups)| 25   | 41  |
|            | Secure (> 4 groups)  | 585  | 95.9| 733 | 93.3|
|            | HDDS by mean         | 420  | 68.9| 391 | 49.7|
|            | Insecure (<=7 groups)| 190  | 31.1| 395 | 50.3|
|            | Secure (>7 groups)   |      |      |      |      |

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In (Table 11), the prevalence rates of MUAC are compared with the original HDDS and WDDS categories and also with the suggested categorization for both zones. Many important points
can be noticed: 1) Using the original HDDS categories revealed that only 1.3% of women consuming less than 4 food groups are MUAC affected, 2) The original categorization gives an impression that the more food groups consumed, the more women MUAC affected that has no rationale base, 3) The suggested categorization, gives an opposite impression that the more food groups consumed the less women MUAC affected which is more rational, 4) Only with the new suggested categorization, the relationship between MUAC and both HDDS and WDDS are significant in ST zone, 5) Based on zone, MUAC is highly associated with the new categorization of HDDS and both the original and the new categorization of WDDS.

Table 11: HDDS, WDDS, FGC categories, zone and MUAC.

| Indicators | FGC Categories | Zone |   |   |   |   |   |   |   |
|------------|----------------|------|---|---|---|---|---|---|---|
|            |                | SD   |   |   |   | ST |   |   |   |
|            |                | >=23cm | <23cm | >=23cm | <23cm |
|            | n   | %   | n   | %   | n   | %   | n   | %   |
| HDDS       | 3-Jan | 5   | 1.4 | 3   | 1.3 | 5   | 0.8 | 2   | 1.6 |
|            | 5-Apr | 66  | 18.6| 37  | 15.9| 87  | 13.9| 22  | 17.7|
|            | >=6   | 284 | 80  | 192 | 82.8| 534 | 85.3| 100 | 80.6|
| Chi-square (P-value) | 0.704 (0.703) | 2.053 (0.358) |
| Chi-Square (P-value)   | 0.26 (0.878) |
| HDDS by mean | <=7 | 236 | 66.5| 173 | 74.6| 294 | 47  | 77  | 62.1|
|            | 10-Aug | 110 | 31  | 55  | 23.7| 297 | 47.4| 43  | 34.7|
|            | >10   | 9   | 2.5 | 4   | 1.7 | 35  | 5.6 | 4   | 3.2 |
| Chi-square (P-value)  | 4.379 (0.112) | 9.625 (0.008) |
| Chi-Square (P-value)  | 6.134 (0.047) |
| WDDS       | 3-Jan | 116 | 32.7| 65  | 28  | 86  | 13.7| 25  | 20.2|
|            | 5-Apr | 155 | 43.7| 120 | 51.7| 205 | 32.7| 40  | 32.3|
|            | >=6   | 84  | 23.7| 47  | 20.3| 335 | 53.5| 59  | 47.6|
| Chi-square (P-value)  | 3.662 (0.160) | 3.587 (0.166) |
| Chi-Square (P-value)  | 29.045 (0.000) |
| WDDS by mean | <=5 | 271 | 76.3| 185 | 79.7| 291 | 46.5| 65  | 52.4|
|            | 7-Jun | 67  | 18.9| 35  | 15.1| 183 | 29.2| 44  | 35.5|
|            | 9-Aug | 17  | 4.8 | 12  | 5.2 | 152 | 24.3| 15  | 12.1|
| Chi-square (P-value)  | 1.409 (0.494) | 9.004 (0.011) |
| Chi-Square (P-value)  | 28.85 (0.000) |

Conclusion

Any population or a community has its own way of dieting and it may differ from one place to another. So, any food study should take the habitual dieting into consideration before any further analysis. In the present research, it has been found that even inside one governorate, there are some differences in the habitual dieting between the two zones SD and ST. So, using international measures to describe the FCP of any nation or community is almost irrational and cannot be free of errors.

This research was aimed at studying the impact of food consumption pattern (FCP) via the Household Dietary Diversity Scores and Women Dietary Diversity Scores and also the Household’s income on the malnutrition status of women (MUAC) in the two zones, Sana’a Dry (SD) that represents the rural part and Sana’a Temperate (ST) that represents the urban part of Sana’a Governorate, Yemen. The investigation based on data that extracted from a comprehensive survey conducted by UNICEF during 2016 with a total sample of 1396 women in the reproductive age 15-49 years from the two zones SD and ST. The prevalence of MUAC in SD’s women is about 2.4 more than the ST’s women. The relationship between income quintiles and MUAC in the two zones is highly significance (P-Value <0.001). Based on the income data of HHs, and the exchange rate of 2016, it was found that 85.5% of HHs are living on less than 1US$ per capita /day. While MUAC rates are the highest among women consuming cereals, miscellaneous, oils, sugar honey and diary in the SD zone, they are sugar honey, diary, oils and legumes in the ST zone. Only when meat, fruits, eggs and seafood came into the FCP of women, MUAC rates have been reduced significantly in both zones.

The original categorization of HDDS and WDDS suggested by Swindale and Bilinsky, (2006) that is widely used to categorize the FGC as low, moderate and high was used in this study [13]. However, under this categorization, only 1.3% of women involved in the study were found to consume less than four food groups in the two zones. Further, under the original categorization of WDDS, only 30.6% and 15.3% are consuming less than four food groups on SD and ST zones respectively.
Both the USAID and IPC organizations have declared that about 53% of the Yemeni population is severely food insecure. Even when the food security criterion (less than five food groups = food insecure) was introduced only 4.1% and 6.7% of women under HDDS were food insecure. So, using these original categorization thresholds in understanding the real situation of women’s dietetics in this governorate is not realistic. For such reason, thresholds based on the mean FGC are suggested for both HDDS and WDDS. These new thresholds have produced more realistic results that are comparable to the international estimates and appropriately portray the Yemen’s present situation. Based on the present research and results, any national or international interventions to help or improve the nutritional status of the peoples of this governorate, should focus on increasing the accessibility to the more nutrient food groups and more specifically the protein-based groups.

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Conflict of Interest

No Conflict of Interest.

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