State of fruit and vegetable consumption in N'Djamena, Chad

Abstract

Diet plays a significant role in health. Fruits and vegetables are an important component of a healthy diet and, when consumed daily in sufficient quantities, they could help to prevent major conditions, such as cardiovascular disease and certain cancers. The objective of the study is to assess the state of consumption of fruits and vegetables by the population of the city of N'Djamena. Through a descriptive cross-sectional analysis, this study would permitted to make the state of fruit and vegetable consumption of 440 households in the 10 districts in the city of N'Djamena in Chad over a period from February 20 to June 20, 2015. The study described the hygiene conditions of fruits and vegetables, the timing of fruit consumption and the portions of fruits and vegetables consumed per day in N'Djamena.The results show that 60% of those surveyed are male and 40% female. The age group (25-40 years) represents 79.31% of the respondents, followed by the group (41-55 years) with 17.93% and 2.75% for the age group between 56 and 75 years. As for the socio-professional category, the results reveal that 31.72% of those surveyed are civil servants. The results show that households whose size varies between 0 and 5 people represent 45.51% against 31.03% for households whose size varies from 6 to 10 people. It should be noted that 11.03% of households spend a daily food ration less than or equal to 1000 FCFA, 24.13% of households spend between 1001 F to 2000 FCFA per day for their daily food ration and 28.27% of households use a sum ranging from 2001 FCFA to 3000 FCFA. The majority of respondents (93.79%) do not respect hygienic conditions while 20% of respondents consume one serving of fruits and vegetables per day and 39.31% consume two portions. The impact of socio-economic difficulties on fruit and vegetable consumption is confirmed. One prospect raised is to consider further surveys in population subgroups accompanied by nutrition education in order to improve the consumption of this food group.

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Keywords: Fruits and vegetables, households, consumption, N'Djamena

Introduction

Several surveys and reports have highlighted the precarious food and nutritional situation of African populations living in desert areas (FAO, 2019). Chad is one such country and its situation has been aggravated by the massive influx of Sudanese refugees from Darfur and the Central African Republic. The food situation in some countries of Sahelian West Africa has been found in countries such as Chad, much of which is desert and sandy (FAO, 2019; Makhlouf *et al.,* 2022). However, responses to the current nutritional situation in Chad are most often focused on urgency through clinical management (therapeutic care, treatment) of patients. It has become a major intervention but has a limited scope. The response must also shift to community-level care. A community-based approach allows for the efficient use of community resources for prevention (awareness). However, there are several types of malnutrition, including micronutrient deficiencies. Because of the role that vitamins and minerals play in the human body, a lack or insufficiency of intake has serious consequences (WHO, 2016; FAO, 2019). Hence the need to consume fruits and vegetables that are a good source of micronutrients. In the same vein, several studies have shown that millions of deaths due to nutrition-related noncommunicable diseases (heart disease, type 2 diabetes, obesity and some cancers) are linked to a diet low in fruits and vegetables (FAO/WHO, 2018).

The nutritional profile of Chad in 2001-2003 (FAO, 2009) and the National Food Security Survey (ENSA) of October 2014, based on science, showed that the consumption of fruits and vegetables increased from 1% to 7% of food consumption. However, the consumption of fruits and vegetables often remains sulky and yet it is essential to our health. Most people are unaware of the benefits of fruits and vegetables such as antioxidants and substances called phytochemicals that act as real medicines by playing the essential role. That is to say, that of ensuring protection against various diseases including non-communicable diseases related to nutrition.

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It is with this in mind that our work will have the benefit of increasing the consumption of fruits and vegetables through behavioural change in the short, medium and long term in order to prevent non-communicable diseases related to nutrition and diet in Chad. Through the respect of hygiene of fruits and vegetables, the time of consumption of fruits and the portions of fruits and vegetables consumed per day in N'Djamena.

Materials and methods

Type and period of study

This is a descriptive cross-sectional studywas carried out in the city of N'Djamena. It took into account the 10 districts of the city.

Study population and sampling

The study population consisted of the city of Ndjamena. This population is 1,270,763 according to population projections by region from 2009 to 2050 by assumption. According to the simplified Lorenz formula, the sample size required for a known total population is:

$$n = N / (1+N \times e^2)$$

where n: Minimum sample size required

N: total population size (1,270,763)

e: Margin of error (5%)

Then: $n = 1,270,763/ (1+1,270,763 \times 0.05^2) = 400$

By adding 10% to alleviate the problem or risk of erroneous and non-response responses, 440 people are included in the study. The total number of the population of N'Djamena is 1,270,763 for 10 districts. We carried out a 2-degree cluster sample:

- The first degree was a simple random survey without discount for the 10 arrondissements; each rounding constituting a cluster.
- The second degree was a systematic random draw from households in the 10 arrondissements until 44 households (1,270,763/ 10) making up each cluster.

Materials

The teaching material used in the conduct of this study consists mainly of a survey sheet containing open-ended and closed-ended questions.

Procedure

After household selection, only households with the inclusion criteria at the time of the survey were included in our sample. Selected households were provided with a consent form and a survey sheet regarding the household's food consumption, socio-demographic and cultural data. We ourselves were responsible for collecting this information. Socio-demographic and cultural information was collected according to household-related characteristics. We selected those that influence the nutritional situation based on the literature review and the availability of variables (Sex of the head of household, age range of the head of household, socio-professional category, marital status, household size). For food consumption we explored the daily expenditure on food, non-compliance with hygiene conditions, the time of fruit consumption and the portions of fruit and vegetables consumed per day by households. Subsequently, households benefited from some nutritional advice on fruits and vegetables.

Ethical considerations

With a view to respecting the rights of the respondents, some measures have been taken, namely: a research permit, an investigation authorization issued by the town hall of N'Djamena, a questionnaire with the approval of the National Center for Nutrition and Food Technology, an informed consent form was sent to the households surveyed. Measures have been taken to ensure confidentiality and professional secrecy.

Study limitations

The results of this study are valid only for the city of N'Djamena. In addition, since our study is of a transversal type, we do not claim to highlight causal relationships. Nevertheless, we believe that these shortcomings do not affect the validity of our study.

Data analysis

The primary data was processed and analyzed using SPSS 20.0 software (version for Windows). Quantitative variables were expressed as numbers and percentages (frequencies).

Results and discussion

Characteristic of the study population by sex of head of household

Of the 440 respondents, 264 were male and 176 were female, representing 60% male and 40% female (Figure 1). After compiling the data, 60% of the households in our study had a man as their head of household and 40% a woman. These data relate the national indicators. According to multiple Indicator Cluster Survey (MICS, 2019), 77,3% of the heads of households surveyed are men compared to only 22,7% of women. This proportion is similar to that observed in the 2009 RGPH. This result does not only corroborate the results of the surveys. Even in our cultures the heads of households are men and for most households managed by women, the heads were deceased or they are single. In this study, the gender of the household head did not influence fruit and vegetable consumption, unlike other socio-demographic characteristics. Ballesteros et al. (2022) showed that the lowest consumption of fruits and vegetables was observed in households with lower incomes, with lower educational levels, without elderly members, with children under age 14, with a male head of household, and those residing in the Argentine Northeast region.

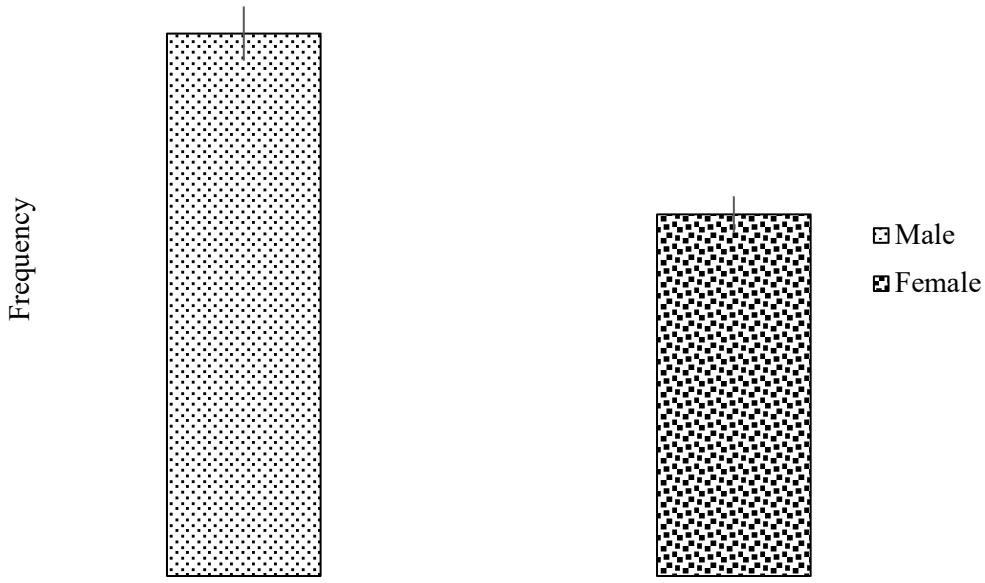

Figure 1: Distribution of the study population by sex of head of household

Characteristic of the study population by age group of head of household

The study shows that 79.31% of the heads of households surveyed are aged 25-40, 17.93% between 41 and 55 and 2.75% are between 56 and 75 years old (Figure 2). In the age group of the study population, there were 79.31% of people between the ages of 25 and 40, followed by those between the ages of 41 and 55 with a percentage of 17.93%. This justifies life expectancy in Chad of 41 to 45 years (MICS, 2010). Also, the age structure of the Chadian population reveals a young population with 68,1% under 25 years of age in 2019 (MICS, 2019). It should be noted that in this study, the age ranges mentioned were for the heads of the households surveyed, not all household members. This does not show the link between age and frequency of consumption of fruit and vegetables. Luszczki et al. (2019) by analyzing children's fruit and vegetable by Children in School Canteens Depending on Selected Sociodemographic Factors found a statistically significant relationship between age and frequency of fruit and vegetable consumption, and it increases with age in both sexes.

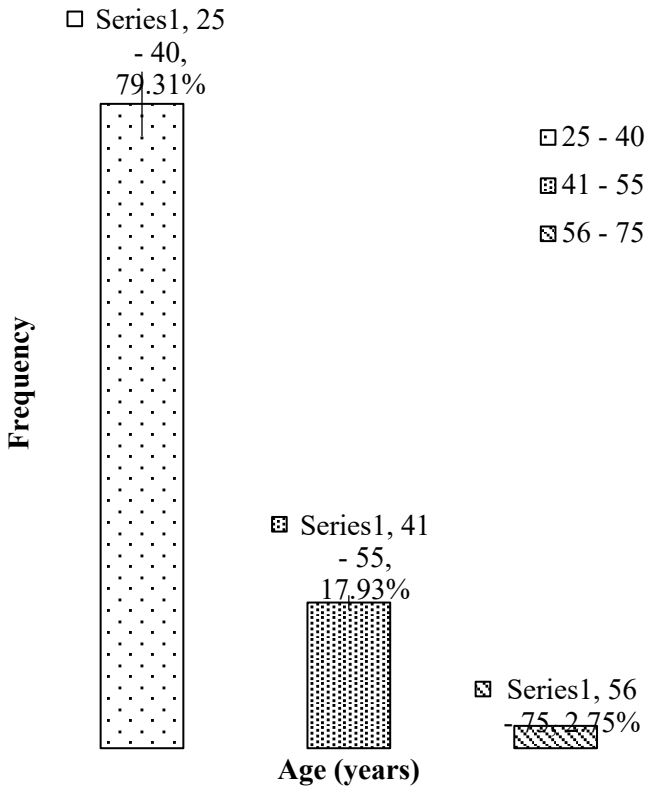

Figure 2: Distribution of the study population by age groups of the head of household

Characteristics of the study population by socio-professional category

With regard to the socio-professional category of our study, we note that 31.72% of the respondents are civil servants (Figure 3). According to the socio-professional structure of this study, we mentioned the high rate of the others, grouping the unemployed and the resourceful in the households surveyed, with a percentage of 33.79%. This is due to the high unemployment rate in Chad. Heads of households engage in small trades to support their families. Which limits their consumption of fruits and vegetables. Dietary analysis revealed low intake of fruits and vegetables and milk and alternatives in the sample, with high intake of 'other' foods. Healthy eating was considered to be a health-promoting behaviour, yet a lack of availability, high costs and difficulties accessing various foods were the most noted barriers to healthy eating (Bruner and Chad, 2014).

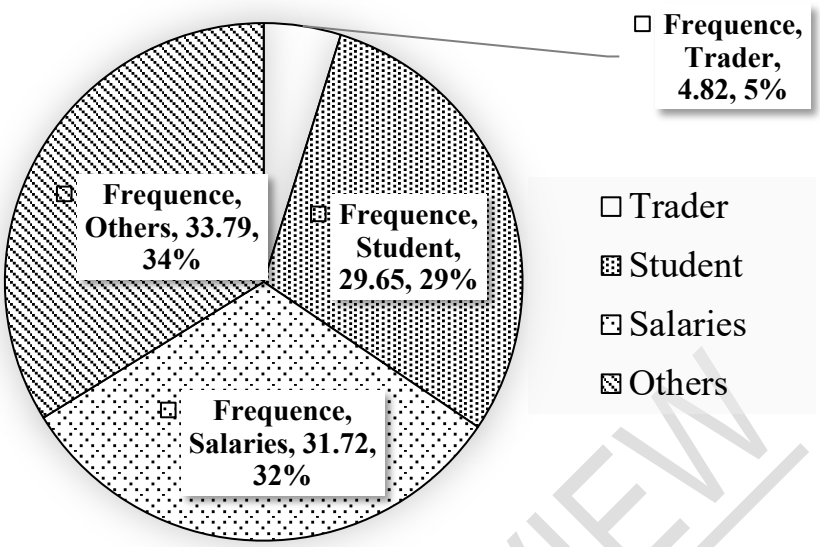

Figure 3: Distribution of the study population by socio-professional category

Study population characteristic by marital status

Figure 4 shows that of those surveyed 58.62% are married and 34.48% are single. The results of our study, divided households by marital status, more than half 58.62% are married; then singles nearly 34.48% followed by widows and divorcees with respective percentages of 4.13% and 2.75%. These results are similar to the 2009 RGPH. Studies suggest that married individuals have healthier dietary behaviors, including more consumption of fruits and vegetables, compared to never married, divorced, or widowed individuals. However, Mouttapa and Sharonda (2017) indicated that the married and never married women had statistically similar body mass index (BMI). When controlling for demographic variables, married women had higher frequencies of vegetable consumption, diet beverages, and caffeinated beverages, while never married participants had higher frequencies of sugared beverage consumption.

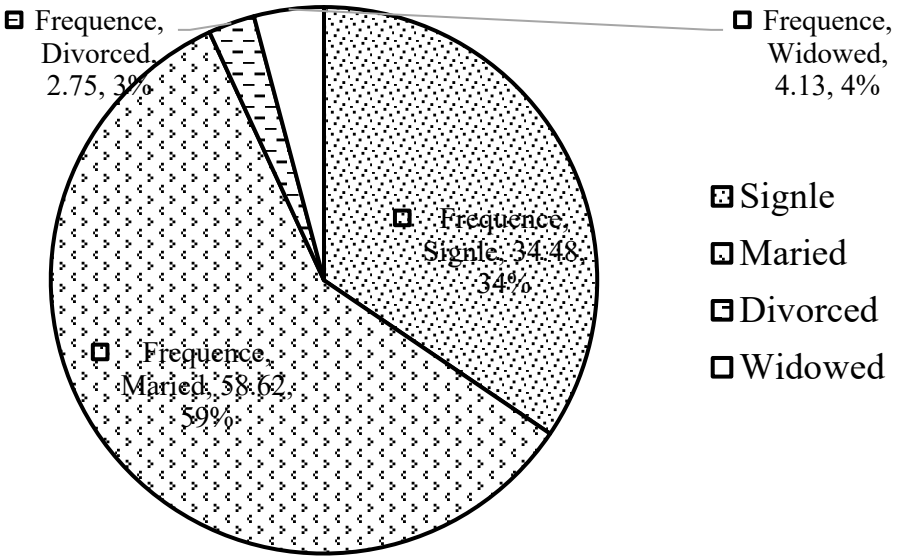

Figure 4: **Distribution of the Study Population by Marital Status**

Study population characteristic by household size

Regarding household load, 45.51% have household size between 0 and 5 people, followed by 31.03% from 6 to 10 people (Figure 5). As Africans and more particularly Chadians always have large families, we note here in our study that 54.49% of families have six (6) or more people on their roof, because Chad is among the sub-Saharan African countries with a high level of fertility. This situation is mainly due to the pro-natalist socio-cultural environment according to MICS 2010. Having mentioned above that the bride and groom are more than half of the households, they are fertile and this gives the exorbitant results in the sizes of the households.Given the size of the household, it will be difficult for families to make fruit and vegetables available on a regular basis.Existing data suggests that despite the protective effects of fruits and vegetables, their intakes are still inade-quate in many countries, especially developing ones. Consequently enhancing strategies to promote fruit and vegetable intake are essential for health promotion among population. A number of reviews confirm that a well planned and behaviour focused nutrition education intervention can significantly improve behaviour and health indicators(Pem and Jeewon, 2015).

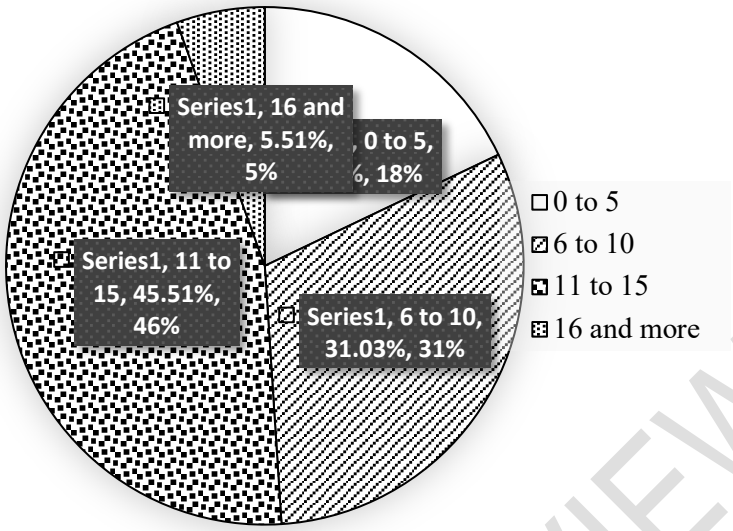

Figure 5: **Distribution of the Study Population by Household Size**

Characteristic of the study population according to daily expenditure on food

Figure 6 shows that 24.13% of households spend between 1000 F to 2000 FCFA per day for their daily food ration. Most of the households surveyed have relatively modest food budgets: 28.27% of households use a sum ranging from 2001 FCFA to 3000 FCFA, 23.13% with a sum of 1001 to 2000 FCFA and 11.03% live with a sum of 0 to 1000 FCFA. This is also explained by the lack of profitable work, money and inequality in the management of state assets.

According to the WHO (2018), the consumption of at least 400 g, or five servings, of fruits and vegetables per day reduces the risk of noncommunicable diseases (2) and ensures an adequate daily intake of dietary fiber. The World Health Organization (2018) emphasizes that a healthy diet helps protect against all forms of malnutrition, as well as non-communicable diseases including diabetes, heart disease, stroke and cancer.Lo *et al*. (2012) show that vegetable and fruit expenditures are associated with less risk of death in the elderly in Taiwan. Both of these expenditures are higher than that for grains, but less than that for animal-derived foods. Contrary to the original hypothesis, there was no identifiable association between animal or grain food costs and all-cause mortality.Moreover, food costs are a barrier for low income-families to healthier food choices. Several studies indicate that diet costs are associated with dietary quality and also food safety. Therefore, people who change

their diet pattern for economic reasons may develop a range of nutritionally related disorders and diseases, from so-called over-nutrition to or with under-nutrition even within the one household (Lo et al. 2009). maybe a more recent reference will be better

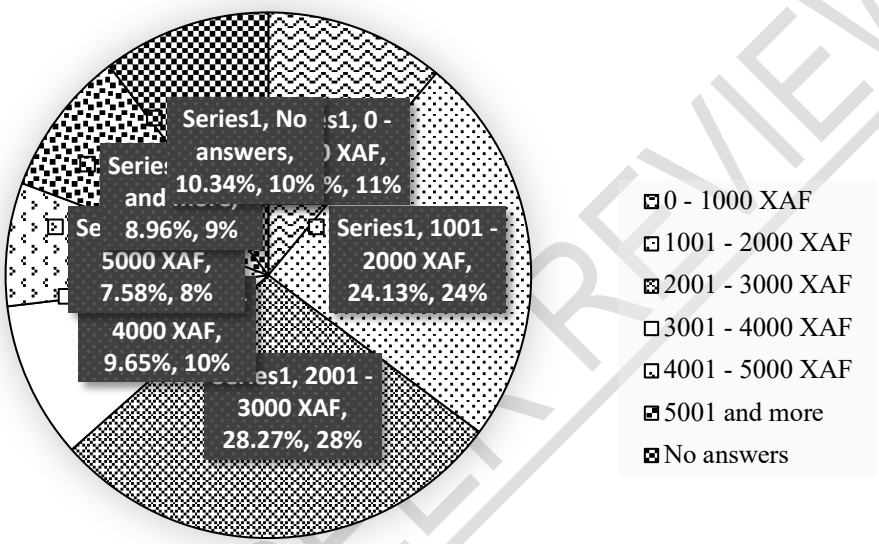

Figure 6: Distribution of the Study Population by Daily Expenditure on Food

Characteristic of the study population according to non-compliance with hygienic conditions

It should be noted that 93.79% of the people surveyed do not respect the hygiene conditions and 6.21% confirm that they respect the conditions (Figure 7). The results of our survey also highlighted the non-compliance with household hygiene conditions. The 93.79% of households surveyed do not respect hygiene conditions when preparing and consuming fruits and vegetables. Corroborating at MICS 2010, where the health situation in Chad remains very precarious, particularly due to the lack of unfavorable hygiene, as well as a very low health coverage rate. This justifies the high rate of pathologies related to disrespect such as salmonellosis, intestinal worms and digestive diseases in N'Djamena. According to Keraita and Drechsel (2015),with increasing change of traditional diets, and the emergence of new supply

and marketing chains, urban food consumers in low-income countries are faced with multiple food safety challenges, among which microbial contamination and pesticides are key concerns for fruits and vegetables sold on urban markets in West Africa. Although consumers have a genuine interest in healthy food, and are willing to pay premiums, their interpretation of food quality and risks deviates from scientific health risk assessments and does not translate into recommended risk mitigation behavior.

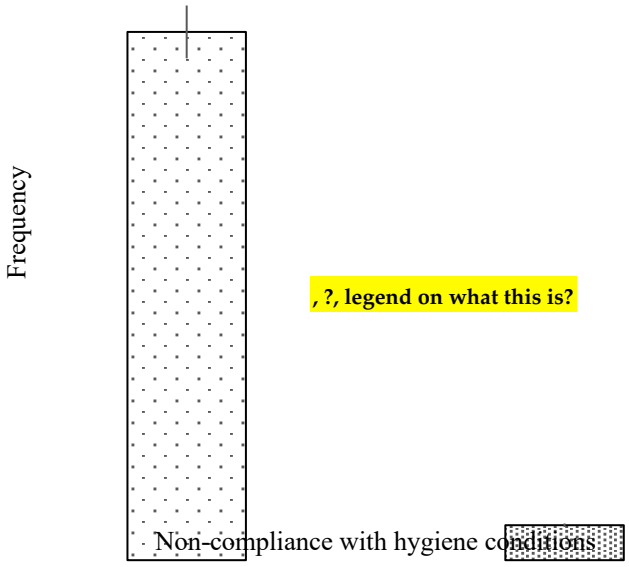

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Figure 7: **Distribution of the study population by non-compliance with hygienic conditions**

Characteristic of the study population by time of fruit consumption

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Fruits and vegetables are foods with a high nutrient density, i.e. a low caloric intake and a great richness in vitamins, minerals and specific substances, the modes of action of the latter beginning to be better known. For some micronutrients, fruits and vegetables are important sources of our diet: this is the case of vitamin C, folate and vitamin A provided by pro-vitamin A carotenoids. In addition, fruits and vegetables contribute to the daily intake of other vitamins, especially those of group B, as well as to a wide variety of minerals.

The study shows that the majority of people (43.44%) consume fruit before and after meals. Regarding the timing of consumption of fruits and vegetables, 43.44% of households consume them before and after meals. These are not based on a scientific basis, they do so because they find it at the moment (Combris *et al.,* 2008; WHO, 2018).Nutritional education should be conducted to raise awareness for behavioral change. Despite challenges in nutrition education intervention programs, they are considered as a good investment in terms of cost benefit ratio. Rapid improvement in trends of nutrition education can be seen in many countries and majority of interventions has been successful in increasing fruits and vegetables intake. It is recommended that health professionals use multiple interventions to deliver information in several smaller doses over time to ensure improved outcomes(Pem and Jeewon, 2015). not listed in the reference

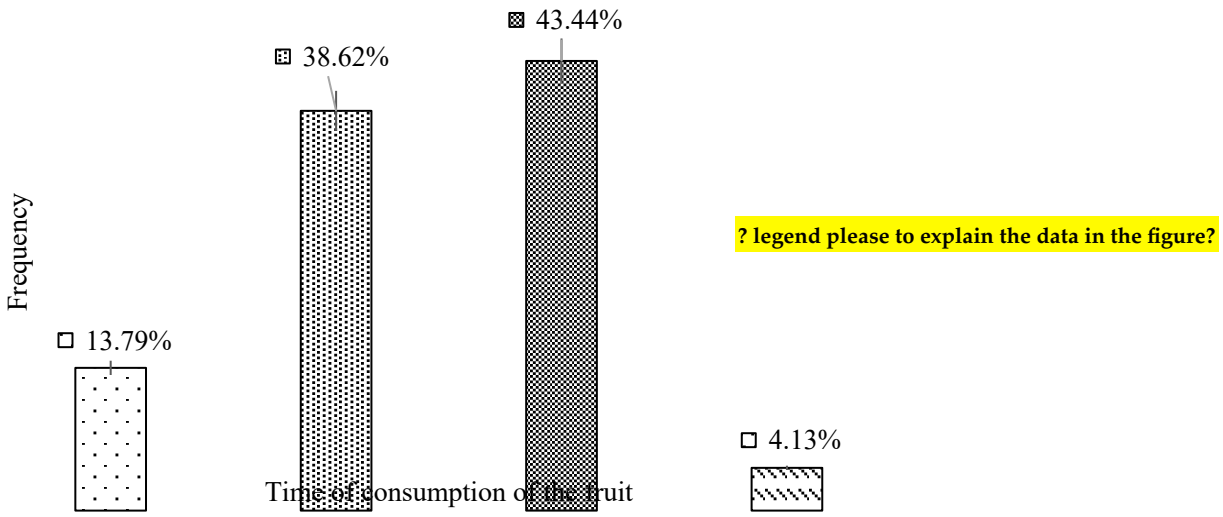

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Figure 8: **Distribution of the study population by time of fruit consumption**

Characteristic of the study population by servings of fruits and vegetables consumed per day

Fruits and vegetables provide in our daily diet fiber, vitamins, minerals, whose recommended nutritional intakes have been established (Combris *et al.,* 2008). They also contain a wide variety of compounds, devoid of nutritional value stricto sensu. These compounds belong to different families: polyphenols, carotenoids (apart from provitamin carotenoids A) such as lycopene or lutein, sulfur compounds

(glucosinolates and allyl sulfides) and phytosterols. Today, there is no ANC for these microconstituents, although much work establishes that they could also have a preventive effect on our health (Combris *et al.,* 2008; WHO, 2018).

The diagram in Figure 9 opposite shows the results of the daily consumption frequencies of fruits. Of those surveyed 39, 31% consume two servings of fruits and vegetables per day. N'Djamena has a sufficient quantity of fruits and vegetables but households consume them either because they do not know the virtues and find fruits as food for children or the high household size and low daily expenses for food does not allow them to consume the 5 recommended portions. This insufficient consumption of fruits and vegetables is part of a context of galloping urbanization, upheavals in lifestyles and rising food prices. The dietary practices in this study indicate the limited consumption and variety of fruits and vegetables, and a high consumption of 'other' foods, which suggests inadequate intakes of various vitamins and nutrients (Bruner and Chad, 2014).

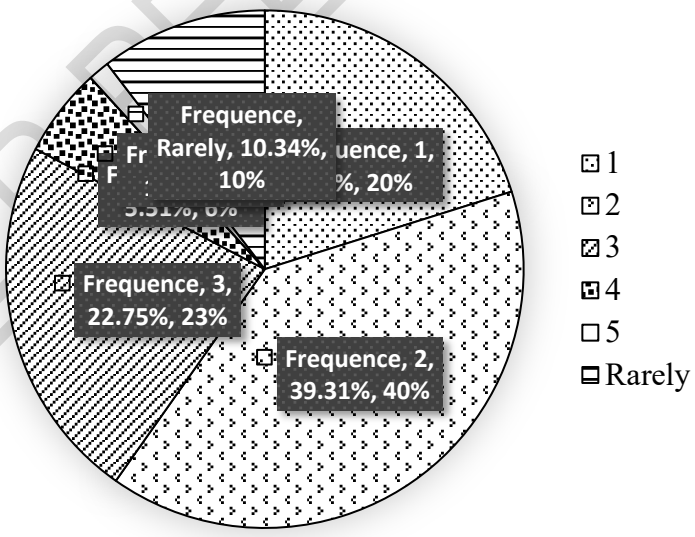

Figure 9: **Distribution of the study population by servings of fruits and vegetables consumed per day**

CONCLUSION

Several surveys on food and nutrition security in Chad have highlighted that fruit and vegetable consumption is low in Chad. According to INSEED's projections of the population by region from 2009 to 2050, the population of N'Djamena is estimated at 1,270,763 inhabitants in 2015. A community-based approach surveyed 440 households in the 10 boroughs divided into 44 households per borough. In order to change in the short, medium and long term the behavior of the Chadian population in the consumption of fruits and vegetables through a community approach. The study shows that the households surveyed are mostly headed by young men, without stable occupations living with their wives and more than 5 people in charge. Daily expenses are around 2000 FCFA, with a frequency of consumption of fruits and vegetables of two servings per day. Most often consumed after meals without the hygienic conditions being respected. In the minds of the people of N'Djamena surveyed, fruits are recognized as one of the healthiest foods there is, a nourishing food that they must eat because of its vitamin content. The households surveyed do not realize that fruits and vegetables have exceptional nutritional qualities, few people give them the place they deserve in their diet.

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The known impact of socio-economic difficulties on fruit and vegetable consumption is confirmed. One perspective raised is to consider future surveys in subgroups of the population, i.e. people at high risk, those suffering from food insecurity, younger people, and also communities, such as those of disadvantaged, isolated workers.

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