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Factors associated with irregular consumption of fruits and vegetables among health professionals in Ouagadougou, Burkina Faso

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Fruits and vegetables (F&Vs) are an essential food group for humans and prevent non-communicable diseases (NCDs). The objective of this study is to know the level of consumption of F&Vs by health professionals in Ouagadougou and their determinants. This is a descriptive cross-sectional study conducted from May to August 2016 in the Central Region of Burkina Faso. It included 442 health workers according to cluster sampling. Data collection tools consisted of frequency of food consumption of fruits and vegetables. The results showed that the level of F&Vs consumption among health professionals is very low. Only 11.5% of respondents consumed fruits every day and 21.8% did the same for vegetables and 1.4% of health professionals consumed more than five servings of F&Vs per day. Only 1.6% of health professionals surveyed had sufficient knowledge of the functions of F&Vs, and 85.8% were not aware of the recommendations of World Health Organizations regarding the consumption of F&Vs. Gender, distance from the fruit supply, and average monthly financial income were associated with the irregularity of the fruit consumption at the threshold of 5% in the univariate analysis. However, in the multivariate analysis, gender, profession, distance from fruit supply and average monthly financial income were predictive of irregular fruit consumption. The level of F&Vs consumption in health professionals is low, as is their level of knowledge of the functions of F&Vs.

Key words: Burkina Faso, consumption, determinants, fruits and vegetables, health professionals.

INTRODUCTION

Fruits and vegetables (F&Vs) are fundamental elements of nutrition and their consumption is a healthier way to

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prevent non-communicable diseases (NCDs). F&Vs are essential for the health of individuals because they contain vitamin, minerals, trace elements, and major antioxidants that help in stimulating the immune system. According to the World Health Organization (WHO), low consumption of F&V is one of the top ten risk factors for mortality, and the global burden of disease caused by low F&V consumption is approximately 85% for cardiovascular diseases and 15% for cancers (Organisation Mondiale de la Santé (OMS), 2004). Thus, their consumption according to research would make it possible to prevent chronic diseases and some cancers (Giacconi et al., 2012; Glade, 1999; Greenwald et al., 2001; Leenders et al., 2013; Morland et al., 2006a). Previous studies have shown that if a health professional is active and has a balanced diet, he or she is more likely to advise patients on the beneficial effects of healthy diet and a physical activity (Frank et al., 2002; Huijg et al., 2015; Wells et al., 1984). For all countries, the cost of inaction is higher than the cost of non-communicable disease control measures according to WHO. In fact, some interventions to prevent and control NCDs offer a good return on investment, by earning a healthy year of life at a cost lower than the gross domestic product (GDP) per capita, and they are affordable for all countries (Chisholm et al., 2011).

In sub-Saharan Africa, the level of consumption of F&Vs is lower than the level recommended by WHO (Ruel et al., 2005). In Burkina Faso, a country located in the heart of West Africa, the level of consumption of F&Vs is very low (Ministère de la santé Burkina-Faso, 2014) with significant consequences on the prevalence and burden of chronic diseases. The relative prevalence of high blood pressure, diabetes, and high cholesterol among the Burkinabe population is estimated at 17.6; 4.9 and 3.5%. According to the WHO, a death before the age of 70 years is considered premature. Burkina Faso does not yet have specific data on NCD mortality to date, but the WHO estimates that in Burkina Faso, 32% of deaths were related to NCDs in 2013 and the probability of dying from one of the four main NCDs between the ages of 30 and 70 years is 24% (Ministère de la santé Burkina-Faso, 2016). According to the data from the national survey on the prevalence of common risk factors for NCDs (STEPS, 2013) in Burkina Faso, it was noted that only 5% of the population aged 25-64 consumed at least 5 servings of fruit and/or vegetable serving daily. In contrast, 56% of the population did not eat fruits or vegetables per day (Ministère de la santé Burkina-Faso, 2014). From this study, the fruits were also consumed on average 1.5 days per week and vegetables on an average 2.7 days per week (Ministère de la santé Burkina-Faso, 2014). In view of this low consumption of F&Vs in Burkina Faso, several questions arise concerning health professionals, such as (1) is this situation the same for health professionals? and (2) what can be the determinants? Thus, we formulated the following hypothesis: The F&V

consumption among health professionals in the central region is low, and the main determinants of this low consumption are sociodemographic, educational, cultural factors and related to food security in general. Studies on consumption of F&Vs in general population in Burkina Faso have already been conducted (Becquey et al., 2010; Ministère de la santé Burkina-Faso, 2014; Zeba et al., 2014). However, no literature exists on the nutritional behavior of health professionals regarding F&Vs. The health professionals play an important role in the Burkinabe health system for providing dietary advice to their patients. Therefore, they contribute to raising awareness in the population for the consumption of F&Vs. It is important to understand their habit on consumption of F&Vs. The overall objective of this study was to assess the level of F&V consumption among health professionals in the Central Region and its determinants.

MATERIALS AND METHODS

Population

This study was conducted throughout the Central Region of Burkina Faso. It concerned the five health districts in the Central region, namely the health districts of Baskuy, Bogodogo, Boulmiougou, Nongr-Massom, and Sig-Noghin, as well as the three university hospitals located there. This region is located in the center of the country and is centered on the capital, Ouagadougou. It corresponds exactly to the territorial boundaries of the Kadiogo Province. This is a descriptive cross-sectional study with an analytical focus. The study population consisted of all health professionals (male and female) working in health centers in the city of Ouagadougou. Health professionals are defined as all health staff including physicians, nurses, midwives, birth-attendants (BA) and itinerant health workers (IHW). Before the data collection, authorization was granted by the Center's Regional Health Management Department. Authorizations have also been granted by each University Hospital center for data collection. Ethical clearance and verbal consent were also obtained from institutions and participants for data collection. Data collection took place from May 06 to August 6, 2016, in Ouagadougou.

Sampling

The inclusion criteria were as follows: A health professional who comes into direct contact with patients as part of the health care required by their state of health; an adult between the ages of 25 and 64 on the day of the survey aged between 25 and 64 years on the day of the survey and who gave informed consent. The sampling frame consisted of all health facilities in the Central Region. With a combined staff of 3802 health professionals, a sample of 455 previously calculated health professionals was required to constitute the sample. A systematic survey was conducted with a sampling rate of 127 to select the health facilities selected for the study. At the beginning of the sampling, the number 44 was randomly drawn and formed the first cluster. In each cluster, 16 health professionals were selected in proportion to the different profiles found in this center to administer the questionnaire. The larger the number of people in the drawn health structure, the more

clusters were formed in this structure and therefore a proportional number of individuals were selected to participate in the study.

Variables of the study

The study variables include:

1. Sociodemographic data: Age, sex, occupation, educational level, ethnicity, monthly income, household size and type of housing.
2. Nutritional data: Fruit consumption, vegetable consumption, number of days of fruit and/or vegetable consumption and number of servings consumed during a day. For vegetables, one serving was equivalent to a bowl of fresh and raw green vegetables (in leaves, spinach, salad, etc.), half a bowl of other vegetables, cooked or raw, cut into small pieces (tomatoes, squash, green beans, etc.) or half a bowl of vegetable juice. For fruits, one serving was equivalent to a medium-sized fruit (orange, banana, apple, etc.) or half a bowl of fruit in pieces, cooked or in syrup or half a bowl of fruit juice (without artificial flavors).
3. Food security data on F&Vs: High cost of F&Vs, permanent availability of F&Vs and distance of supply from home.
4. Data on the knowledge of the functions of F&Vs and knowledge of WHO recommendations on F&V consumption. The variable 'knowledge of recommended daily servings according to WHO' guideline refers to good knowledge if the respondent gives a number of servings more than 5 or equal to 5 and insufficient otherwise.

The variable 'knowledge of the functions of F&Vs is composite variable computed using 5 questions. A score of 5 means that the participant has a good knowledge while a score between 3 and 4 means average knowledge and less than 2 refers to poor knowledge. A structured questionnaire was used for data collection. It was adapted from tools used for STEPS surveys. It has been pretested in interviewing ten health professionals and has been validated before beginning data collection.

Data analysis

Data entry was made by EPIDATA software version 3.1, and the analysis was possible using SPSS software version 22 and STATA version 13. Quantitative variables were expressed as average (\pm standard deviation). The qualitative variables were expressed in frequency.

The comparison of proportions was done using the chi-square test. The analysis of factors associated with an irregular F&V consumption was conducted using descriptive statistics and binary logistic regression. Two analysis models are presented: the first model (initial model) where the variables were associated two by two with the dependent variable and the final model that links all the explanatory variables with the variable to be explained. The statistical significance level for the analyses was $p \leq 0.05$ with *** <0.001 , ** <0.01 , * <0.05 . The dependent variable called 'irregular consumption of F&Vs' was represented by the proportion of people who did not consume fruits and/or vegetables every day. The independent variables were grouped into the following factors:

1. Socio-demographic factors: Age (<35 , ≥ 35), sex (male or female), occupation (physician, midwife, nurse and IHW), household size (<5 , ≥ 5) and marital status (in union, not in union);
2. Food security factors: Year-round availability of F&Vs (yes or no), high F&Vs costs in relation to income (yes or no) and location of F&Vs supply away from home (yes or no); and
3. Knowledge factors: Knowledge of F&V functions (insufficient, average, and good) and WHO recommendations (insufficient, average, and good).

RESULTS

Description of the sample of health professionals

480 health professionals were asked to voluntarily respond to the questionnaire; but a total of 442 health professionals responded, for a response rate of 92.08%. The average age of respondents was 38.85 ± 8.25 years and ages varied between 24 to 60 years. The majority of respondents were females (62.2%) and had a secondary education level (64.7%). Nurses were the most numerous (51.6%), followed by birth attendants/IHW (20.1%) and physicians (18.1%). The majority also lived-in common-law relationship (81%).

Frequency (%) of fruit and vegetable consumption by health professionals

Among professionals who reported consuming fruit, only 10.6% ($n = 47$) consumed at least one serving of fruits daily, and among those who reported consuming vegetables, only 20.1% ($n = 89$) consumed vegetables daily. The rest consumed fruits or vegetables irregularly. Regarding the distribution of respondents by the number of servings consumed, among those who regularly consumed fruits and vegetables, only a small minority ($n = 6$) consumed more than five servings of F&Vs per day, representing a prevalence of 1.5%. The average serving of fruit consumed per day was 1.6 [0.7, 2.4] and the average portion of vegetables consumed per day was 1.6 [0.8, 2.4].

Assessment of health professional's knowledge of functions of fruits and vegetables

The evaluation of knowledge on the functions of fruits and vegetables among health professionals was based on a questionnaire on the role or not of vitamin, mineral salts, tissue protection, chronic diseases prevention and their usefulness or not health. It appears that only 1.6% of health professionals have sufficient knowledge of functions of fruits and vegetables and the vast majority (82.6%) have an average knowledge. The distribution of the level of knowledge of fruits and vegetables functions by occupation shows that only a minority of health professionals had sufficient knowledge of F&V functions in 1.25, 0, 0.4 and 62% for physicians, midwives, nurses and IHW, respectively.

Assessment of the level of knowledge of WHO recommendations on fruits and vegetables

The vast majority (85.8%; $n = 379$) were not aware of the WHO recommendations for F&V consumption. Among

Table 1. Distribution of the level of knowledge of international recommendations by the occupation of respondents.

Level of knowledge WHO recommendations	Physicians n (%)	Midwife n (%)	Nurses n (%)	Birth attendants/IHW n (%)	Total n (%)
Low	31 (56.4)	22 (75.9)	113 (80.1)	47 (92.2)	213 (77.2)
Good	24 (43.6)	7 (24.1)	28 (19.9)	4 (7.8)	63 (22.8)
Total	55 (100)	29 (100)	141 (100)	51 (100)	276 (100)

Table 2. Socio-demographic factors associated with irregular fruit consumption.

Variable	(N)	% irregular consumption	p-value
Age (years)			
< 35	136	88.2	0.944
35-39	93	89.2	
40-45	96	89.6	
≥ 45	84	86.9	
Sex			
Female	257	85.2	0.007**
Male	152	94.1	
Level of education			
Primary/secondary	259	88.4	0.939
Superior	150	88.7	
Profession			
Midwife/Maieutic	43	81.4	0.05
Nurse	212	86.8	
Birth attendants/IHW	78	91	
Physicians	76	94.7	
Household size			
Less than 5	198	90.4	0.244
5 and More	211	86.7	
Marital status			
In union	336	87.5	0.170
Not in union	73	93.2	

*** p-value<0.001, ** p-value <0.01, * p-value <0.05.

health professionals claiming to be aware of WHO recommendations on F&V consumption (n = 276), 56.4% of physicians, 75.9% of midwives, 80.1% of nurses and 92.2% of birth attendants/itinerant health workers did not actually know these WHO recommendations. This difference was statistically significant (p = 0.000) (Table 1).

Univariate analysis of irregular fruits consumption

Regarding sociodemographic factors, only sex was

statistically significantly associated with irregular fruit consumption at the 5% threshold. The results are summarized in Table 2. With regard to the “food security factors”, distance from the F&V supply site and the average financial income were statistically significantly associated with the irregular fruit consumption. The unavailability of F&Vs all year round was close to the significance level. The high cost of F&Vs was not associated with irregular fruit consumption. Table 3 illustrates this. With regard to knowledge factors, the present study shows that neither knowledge of the functions of F&Vs, nor knowledge of international

Table 3. Food security factors associated with irregular fruit consumption.

Variable	(N)	% irregular consumption	p-value
Availability of F & V all year round			
Yes	249	90.8	0.075
No	160	85.0	
High prices of F & V relative to income			
Yes	269	89.6	0.328
No	139	86.3	
Average monthly financial income			
Less than USD 200	63	98.4	0.008**
More than USD 200	228	86.8	
Place of supply of the F&Vs away from home			
No	292	86.3	0.027*
Yes	117	94.0	

*** p-value<0.001, ** p-value <0.01, * p-value <0.05.

Table 4. Knowledge factors associated with irregular fruit consumption.

Variable	(N)	% irregular consumption	P-value
Level of knowledge of WHO recommendations			
Low	201	88.0	0.56
Good	61	85.2	
Level of knowledge of the functions of F&Vs			
Low	60	86.6	0.86
Average	342	88.8	
Good	7	85.7	
Concept of promoting F&Vs during vocational training			
Yes	204	87.25	0.45
No	203	89.65	
Awareness campaigns already heard			
Yes	88	84.1	0.142
No	321	89.7	

*** p-value<0.001, ** p-value <0.01, * p-value <0.05.

recommendations concerning F&V and the promotion of F&V during vocational training, nor having already heard about awareness campaigns, influenced irregular fruit consumption. Details can be found in Table 4.

Univariate analysis of factors associated with irregular vegetable consumption

Among the sociodemographic factors, results show that

neither age, gender, education, occupation, household size nor marital status were associated with irregular vegetable consumption. Regarding food security factors, neither the geographical factors nor the financial accessibility of vegetables were associated with irregular consumption of vegetable. Only the average financial income of the respondents was close to the level of significance. With regard to the knowledge factors, neither knowledge of functions of the F&Vs, nor knowledge of the related recommendations, nor having

already heard about awareness campaigns were significantly associated with irregular vegetable consumption. The results are illustrated in Table 5.

Multivariate analysis of factors associated with irregular fruit consumption

The results suggest that with a risk of less than 5% and after adjustment for the confounding variables, the following facts were observed: There is a link between gender and irregular fruit consumption with an odds ratio (OR) of 3.3 [1.4-7.8] times higher for men than for women.

There is a significant association between distance from the place of supply of fruit and irregular fruit consumption. The odd ratio is 4.3 [1.1–16.8] times higher among those whose place of supply of fruit is remote than those who place of supply is not remote. There is also a strong significant association between average monthly financial income and irregular fruit consumption with an odds ratio of 11.4 [1.1-91.3] times higher among those whose monthly income is less than US \$200 (equivalent to 100.000 FCFA). The odds ratio is 6.9 times higher among physicians than among midwives showing a significant association between occupation and irregular fruit consumption. Table 6 presents multivariate analysis results of irregular fruit consumption. It presents the OR and 95% confidence intervals of these associations.

DISCUSSION

The overall objective of this study is to assess the level of consumption of F&Vs among health professionals in the central region and its determinants. In this study, only a small minority ($n = 6$) consumed more than five servings of F&Vs per day, with a prevalence of 1.5%. This proportion is very low compared with the general population consumption in Burkina Faso according to results of STEPS survey 2013, which found a prevalence of 5% (Ministère de la santé Burkina-Faso, 2014). The health professionals in Ouagadougou can be considered bad examples concerning the consumption of F&V. Furthermore. The nutritional context in urban environment related to the nutritional transition can explain this low consumption, which is also studied by Maire B and collaborators (Maire et al., 2002).

The gender and the distance from the place of supply of fruits were associated with the irregular fruit consumption in univariate analysis. In the multivariate analysis, gender, occupation, the distance from the place of supply of fruits and average monthly financial income were predictive of irregular fruit consumption, which largely confirms the results of the univariate analysis. (Amo-Adje and Kumi-Kyereme, 2015), Dehghan et al.

(2011) and Pearson et al. (2005) who also found that female gender consumed more fruits than the male gender. Studies also confirm the association between distance from the place of supply and F&V consumption (Morland et al., 2006b). Thornton et al. (2015) finds that beyond the neighborhood with fruits and vegetables' shops the most important factors influencing F&V consumption are interpersonal factors such as personal motivation (Thornton et al., 2015). The present results are also close to those of Landais et al. (2015) who found that the high economic status of Moroccan women was associated with a high fruits consumption (Landais et al., 2015). The present study underlines that is not the price of fruit at first sight that is the determining factor for irregular fruit consumption of fruit but other factors such as gender, occupation, and distance from fruit supply and the average monthly financial income of health professionals surveyed.

These results could be explained by the fact that men prefer slightly less sweet tastes than women and children. Also the consumption of alcoholic beverages is highly male-dominated in Burkina Faso (Ministère de la santé Burkina-Faso, 2014), which does not interfere well with fruit consumption. In addition, it is women who generally buy vegetables for cooking and fruits to feed their families and especially their children, which explains their greater propensity to consume fruits than men. The unavailability of the fruits near residential areas contributes to this irregular consumption.

Unlike other studies, the present results suggest that neither age, household size, marital status, knowledge factors nor educational level were associated with irregular fruit consumption in univariate and multivariate analyses. For Thompson, an age under 24 years was associated with low F&V consumption (Thompson et al., 1999). Study by Dehghan in Canada found that single status and advanced age were statistically associated with high F&V consumption. Wolf in a study of black American migrants found that a high level of F&Vs consumption was statistically associated with considerable knowledge of F&Vs consumption recommendations (Wolf et al., 2008). This difference between the results of this study and those of other authors can be related to the large sample size of these studies, which is the representative of the total population studied. The Canadian, European and American frameworks of these studies can explain this difference. The present results can also be explained by the fact that culturally, the fruits in the context of Burkina Faso are consumed occasionally outside meals and outside the family circle so the size of the family does not influence the irregular fruit consumption. Also, the inadequacy of nutritional education for health workers could explain this fact, as evidenced by the failure to implement and operationalize the integrated communication plan provided for in Burkina Faso's new nutrition policy (Ministère de la santé Burkina-Faso, 2017). These results

Table 5. Univariate analysis of factors associated with irregular vegetable consumption.

Variable	N	% irregular consumption	p-value
Age			
≤35 years	135	79.3	0.929
35-39 years	90	77.7	
40-45	96	76.0	
≥45	88	79.5	
Sex			
Male	148	80.4	0.424
Female	261	77.01	
Level of education			
Primary/secondary	263	77.9	0.847
Superior	146	78.8	
Profession			
Physician	74	83.8	0.331
Midwife/Maieutic	43	79.06	
Nurse	210	74.8	
IHW	82	81.7	
Household size			
Less than 5	198	78.3	0.984
More than 5	211	78.2	
Marital status			
In Union	335	77.9	0.731
Not in union	74	79.7	
Do you find fruits and vegetables all year round not far from home			
Yes	159	76.8	0.555
No	250	79.2	
The place of supply of fruits and vegetables away from home			
Yes	117	78.6	0.903
No	292	78.0	
Do you think that fruits and vegetables are expensive compared to your income			
Expensive	270	76.6	0.299
Affordable	138	81.2	
Average monthly income			
Less than USD 200	66	87.9	0.052
More than uds200	225	76.9	
Knowledge of F&Vs functions			
Insufficient knowledge	14	78.5	0.719
Average understanding	162	80.2	
Good knowledge	233	76.8	
Knowledge of WHO recommendations			
Insufficient knowledge	350	79.1	0.281
Good knowledge	59	72.8	

*** p-value<0.001; ** p-value <0.01; * p-value <0.05.

Table 6. Multivariate analysis of factors associated with irregular fruit consumption.

Variable	Crude OR	Adjusted OR
Age		
≤35 year	1	1
35-39 years	1.1 [0.5 - 2.6]	1.8 [0.7 - 4.6]
40-45 years	1.1 [0.5 - 2.6]	1.5 [0.6 - 3.7]
≥45 et +	0.9 [0.4 - 2.0]	1.1 [0.4 - 2.7]
Sex		
Male	2.8**[1.3 – 5.9]	3.3** [1.4 – 7.8]
Female	1	1
Level of education		
Primary/Secondary	1	1
superior	1.0 [0.5 - 1.9]	0.4 [0.2 - 1.0]
Marital status		
In union	1	1
Not in union	1.9 [0.7 - 5.1]	1.9 [0.7 - 5.4]
Profession		
Physician	4.1* [1.2 - 14.6]	6.9* [1.5 - 31.2]
Midwife/Maieutic	1	1
Nurse	1.5 [0.6 - 3.6]	1.5 [0.6 - 3.7]
Birth attendant/IHW	2.3 [0.8 - 6.9]	2.3 [0.7 - 8.1]
Household size		
Less than 5	1.4 [0.8 – 2.5]	1.1 [0.5 – 2]
More than 5	1	1
Do you find fruits and vegetables all year round not far from home?		
Yes	1	1
No	1.7 [0.9 - 3.2]	1.4 [0.7 - 2.6]
Do you think that fruits and vegetables are expensive compared to your income?		
Yes	1.4 [0.7- 2.5]	1.25 [0.6 – 2.5]
No	1	1
Average monthly income		
Less than 200 USD	9.4*[1.3- 70.3]	11.4* [1.1- 91.3]
More than 200 USD	1	1
The place of supply of fruits and vegetables away from home?		
Yes	2.5*[1.1 – 5.8]	4.3* [1.1 – 16.8]
No	1	1
Knowledge of WHO recommendations		
Insufficient knowledge	1.4 [0.6 – 3.3]	1.4 [0.6 – 3.3]
Good knowledge	1	1
Knowledge of F&Vs functions		
Insufficient knowledge	1	1
Average knowledge	1.3 [0.3 - 6.2]	1.3 [0.2 - 6.8]
Good knowledge	1.1 [0.2 - 5.3]	1.2 [0.2 - 6.2]
Constant		155.9 [13.7-1.779.5]
Observations	408	408

*** p-value<0.001. ** p-value <0.01. * p-value <0.05.

argue for a need for communication and nutritional education first of all towards the caregivers but also towards the general public at the level of the central region by using social marketing techniques.

In addition, results show that neither the sociodemographic data nor the food security data nor the knowledge of the health professionals surveyed were associated with irregular vegetable consumption. Data differ from the literature found in developed countries (Dehghan et al., 2011; Kamphuis et al., 2006). Also according to a study carried out in Morocco by Landais et al. (2015) on the socio-economic and behavioral determinants of women's consumption of fruits and vegetables, it appears that vegetable consumption was low and was not linked to socio-economic status but was linked only to behavioral determinants such as eating outside the home or eating processed foods (Landais et al., 2015).

The large size of these studies, which was representative of the general population, may explain the difference between the present results and those in the literature. The framework for carrying out these studies could explain these differences because they were made in a context of developed and Maghreb countries.

These results suggest the existence of other potential factors that may explain the irregularity or low consumption of vegetables in the sample of this study. One possible reason is the cultural component of the diet. Indeed, the consumption of fresh vegetables is not a cultural habit among Burkinabe people, and neither the occupation nor the cost of vegetables influences the nutritional choice as we have seen above. Indeed, eating habits acquired since childhood still influence the nutritional behavior of the majority in adulthood. Research has shown a positive relationship between childhood F&V consumption and adult consumption (Maynard et al., 2006; Ponza et al., 2004). The consumption of fresh vegetables is perceived as a luxury and considered as a 'westernized' lifestyle by the majority of Burkinabe people. The Central Region also cosmopolitan is largely made up of the 'Mossi' ethnic group and the main diet is made up of a dish of cereal paste with a sauce made from dried vegetables or leafy vegetables. The consumption of fresh vegetables is not part of the eating habits of the majority. Another possible reason could be the lack of personal motivation to consume fresh vegetables.

Conclusion

This study as an exploratory study on F&V consumption among health professionals in the Central Region showed that the level of F&V consumption is very low, which confirms the first hypothesis of this study. The vast majority of respondents had an average knowledge of the functions of F&Vs but were not aware of the

recommendations for F&Vs consumption. "Knowledge" factors were not associated with irregular consumption of F&Vs, but some sociodemographic factors and "food security" factors were considerably associated with irregular fruit consumption among health professionals, which partly confirms the second hypothesis tested by this study. These factors must challenge public health policy-makers in order to initiate actions to reverse the trend of F&V consumption among health professionals first and then in the general population.

Limitations and constraints

The study design had some limitations, which were rectified up to some extent. The health facilities were selected by a cluster to participate in the study. Therefore, the first-level bias can occur. Then, the selection of the 16 people from each health facility for the study may not be proportional to each occupational category because of the absence of some staff at the time of the survey. Therefore, to prevent this, before moving on to the next health facility, we ensured that the number of people surveyed was proportionally representing the sample with respect to the size of each professional category.

The data collection period lasted from June to August 2016, which shows low vegetable presence and high mango production. Despite this, the results of the study are valid because even with a high availability of vegetables, the availability of fruits is low in the Central Region because of the alternation of the favorable season, that is, high production of either fruits or vegetables at a given time. The variables related to food security were mainly based on the respondent's declarative data without any possibility of controlling possible biases.

ABBREVIATIONS

F&Vs, Fruits and vegetables; **NCDs**, Non communicable diseases; **WHO**, World Health Organization; **BA**, Birth attendants; **IHW**, itinerant health workers.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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