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Evaluation of fruit and vegetable consumption as phytonutrients potential in Jordan

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Abstract

Fruits and vegetables (FV) are known to contain considerable amounts of vitamins and minerals in addition to phytonutrients and bioactive compounds having many positive health effects in the prevention of diseases. In frame of a project related to status of human nutrition in the East Mediterranean the consumption of FV as sources of phytonutrients was studied in Jordan. A cross sectional analysis of 144 Jordanian individuals aged between 20 and 65 years old living in Amman and the surrounding, was conducted. Sociodemographic, lifestyle, eating behaviour, food frequency questionnaire (FFQ) and awareness information were collected through a questionnaire specifically adapted for the purpose of the study. Statistical analysis was carried out and multivariate models were used in order to evaluate the association between fruits and vegetables consumption and different independent criteria. The FV consumption among the Jordanian population was not as high as expected according to the international recommendations, even though these produces are highly available in the country. Regarding vegetables, 38.0% of the Jordanian respondents, showed a medium level of consumption versus 29.3% having a low level of consumption. Related to fruit consumption, 36.8% Jordanian respondents consuming low level of fruits compared to 31.9% of the Jordanian respondents, showing a high fruits intake. Furthermore, it was observed that the majority 54% of the study population was highly aware of the importance of phytonutrients in FV and were willing to increase their consumption of FV so they can benefit from more phytonutrients. The FV consumption was the most associated with age, education level, employment, salary ranges, expenses on a monthly basis assigned for FV and herbs consumption. The findings stated that the most frequently consumed produces were cucumber, tomato, sweet potato, apple, orange, banana, olives, mint and thyme, and the consumption of FV in Jordan is low to medium, due to the effect of several socio demographic and lifestyle factors. Future governmental or national programs and interventions could be settled to encourage and increase the FV consumption among all the population age levels. Furthermore, laboratory analysis would be recommended in order to determine the exact amount of phytonutrients in the more frequently consumed FV, therefore, the proper recommendation regarding the quantities and types could be settled.

Introduction

For generations, our parents have said, "An apple a day keeps the doctor away." Scientific research during the last several decades suggests that they may be right. The simple message, "5 a day" has been shown to pack a powerful payoff for disease prevention. However, what is so unique about fruits and vegetables? They are considered as essential food groups in the dietary pyramid, due to their important content of nutrients such as vitamins, minerals and some of the

important phytonutrients as carotenoids, ellagic acid, flavonoids, resveratrol, glucosinolates and phytoestrogens. These phytonutrients are as well natural compounds giving plants their colour, flavour, smell and texture. Furthermore, their role is to support immunity as antioxidants and prevent against cardiovascular diseases and different types of cancer (Ali, 2008; Manach *et al.*, 2004).

For instance, the Mediterranean diet has been shown to be one of the richest diets in phytonutrients bearing in mind its content in fruits, vegetables, grains and olive oil.

Jordan is considered as self-sufficient in FV and it exports the surplus (FAO, 2007), and most of the exports are regulated by the codex alimentarius standard. Indeed, FV are consumed in different amounts according to different factors based on the countries, such as age, gender, socioeconomic status and eating patterns (Sharaf and Azagba, 2011).

In order to benefit from the positive effects of fruits and vegetables, people should consume at least five servings per day (USDA, 2007). Therefore, a good goal is to have at least 3 to 4 servings of fruits each day, and to eat at least 3 to 4 cups of vegetables per day. Taking into consideration that many internal and external factors affect the bioavailability of phytonutrients in humans (Saura-Calixto *et al.*, 2006). Therefore, the evaluation of FV consumption is of primary importance as it helps to determine if the Jordanian respondents are consuming the required quantities of these food products.

Material and Methods

Study area

Jordan is an East Mediterranean country, out of the 89.342 Km², 6.2 % of the land is cultivated. The economy of the country is free and open, though Jordan became the 136th member of the WTO in 2000. The agriculture sector is considered small compared to the overall economy, but this sector contributes about 3 % of Jordan gross domestic product (GDP), employs 6 % of the work force and accounts 23 % of total exports (Lavizarri, 2012).

Measurement tools

This study is a transversal descriptive study conducted for the Jordanian population aging between 20 years old and 65 years old and above and free of significant chronic disease. The questionnaires used for the study were constituted of four essential sections, in addition to the fruits and vegetables frequency consumption. In the study, two types of variables or factors could be defined. The dependent ones that were targeted were the consumption of fruits and vegetables. These variables or factors are considered as independent and will be correlated throughout the statistical analysis with the dependent variables related to the consumption of fruits and vegetables.

Sampling Method

150 individuals were randomly selected from Amman, 70 male and 80 female individuals aging between 20 and 65 years old. During the selection of the persons to be questioned, the interviewers tried as much as possible to vary the choice in terms of age, place of living in Amman while making sure that people are mainly not relatives, so we can reach different lifestyles and eating behaviours.

Statistical Analysis

Statistical analysis was executed using the statistical programs: SPSS (version 16.0), XL stat and Stata 10.0, noting that the level of significance was set up to $p \leq 0.05$. Frequencies and descriptive variables were conducted stratified either by gender, area of residence, education level, money spent for the purchase of food, degree of awareness. Bivariate analysis was performed, using ANOVA, chi square tests, fisher's exact test, etc. In addition to the multivariate assessed by using the stepwise multivariate logistic regression, in order to show the most significant associations related to the fruits and vegetables consumptions with the independent variables.

Results and Discussion

Based on our study results, it was surprisingly revealed that there no gender differences regarding F&V consumption, therefore men and women are equally consuming these produces.

Very important is the awareness of the consumers regarding the health improving effect of fruit and vegetable consumption. The study in Amman, Jordan shows the degree of awareness of the respondents is with 54% quite high, it seems the respondents are aware and interested to increase their consumption of fruit and vegetables as phytonutrients (Figure 1).

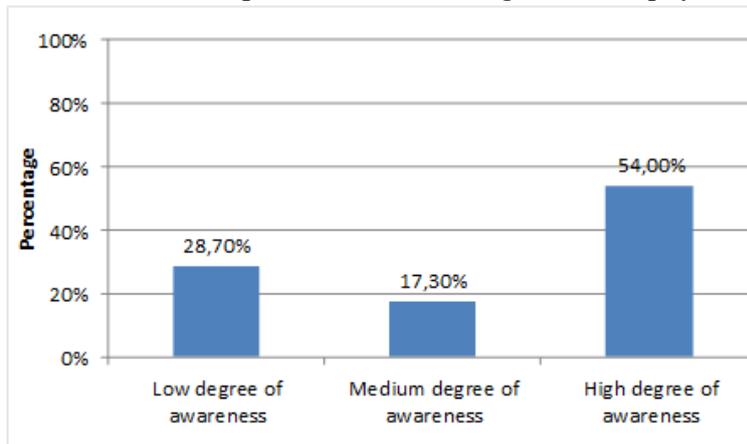


Figure 1: General degree of awareness in percentage of the Jordanian respondents

In Jordan, the vegetables consumption is affected by age categories with $p=0.03$, it was determined 61.5 % of the individuals aging between 20 and 35 have a high consumption of vegetables and only 16.7 % of the eldest group aging between 50 and 65 have a high consumption (Figure 2). Whereas the fruits consumption is completely not related to the age of the population, $p=0.4$. Similar results for fruit and vegetable consumption were conducted by the National heart foundation of Australia (Asif, 2011), it was revealed that older people aging between 55 and 64 are relatively consuming more fruits and vegetables than younger individuals are. 55.6% compared to 41.4% (people aging between 18 and 24), for the fruit intake and 10.7 % compared to 5.3 % (people aging between 18 and 24), for vegetable consumption.

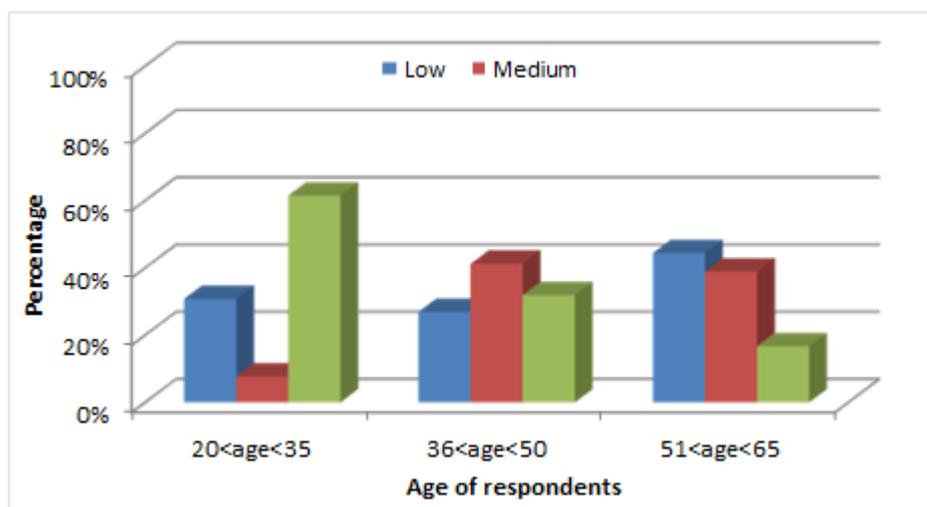


Figure 2: Vegetables consumption (in %) for three age categories and three groups of consumption levels in Jordan. Significant differences - Chi-squared test (χ^2) ($p \leq 0.05$)

Regarding the influence of the age on fruits and vegetables consumption the ‘National Health and Nutrition Examination Survey’ (NHANES) observed related to American’s consumption of food (USDA, 2007), that older Americans consume their fruits in the form of a whole fruit, and their consumption is higher than their younger counterparts are. In compliance with the dietary recommendations, their intake levels are less than the amount recommended for sedentary people. Similarly, to their vegetable intake, this is lower than the recommendations. Therefore, education efforts have to aim at older people to increase their fruits and vegetables consumption, in addition to making this consumption varied and focusing on dark green vegetables seeing their important content of phytonutrients (USDA, 2007).

On the subject of the weight loss diet effect on vegetables consumption, , the difference of vegetables consumption based on whether the respondents are following a weight loss diet or not is significant ($p=0.004$) (Figure 3).

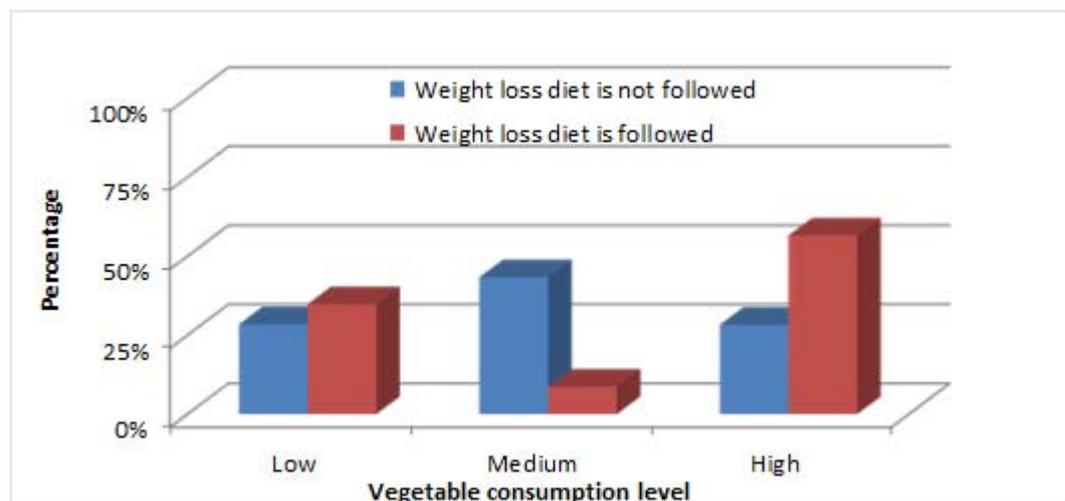


Figure 3: Vegetables consumption in percentage based on respondents weight loss diet and three groups of consumption levels in Jordan. Significant differences - Chi-squared test (χ^2) ($p \leq 0.05$)

Regarding the influence of employment, the fruits consumption of Jordanians was affected by their employment, in addition work lifestyle is associated with lower consumption of fruits with $p < 0.001$, but no effect of the salary ranges has been shown on the consumption of fruits ($p=0.5$).

The consumption of vegetables is neither affected by employment nor by the salary with respective p values of 0.9 and 0.06, but we can still observe that people having the lowest income, are having as well the lowest vegetable intake.

Usually within the budget of the household, there is a certain amount assigned for the purchase of food on a monthly basis. It is observed based on the statistical results that the different ranges of this amount are only the vegetables consumption in Jordan with $p=0.05$. The category of people spending the lowest amount of expense on food, have the tendency to consume less vegetables compared to the others. It could be determined that 39.8% of the Jordan individuals spending less than 350 \$ on food per month have a low vegetables consumption.

According to the international project data performed to estimate the effect of price and income on the demand of different food categories, the budget allocated to fruits and vegetables represents 10 % to 25 % of the food budget of most countries (Nayga et al., 1995).

Finally, the most frequently consumed vegetables, fruits and herbs in Jordan were collected from the food frequency questionnaire conducted to our respondents. It can be determined that the most consumed vegetables are cucumber, tomato, sweet potato, lettuce onion and fresh garlic. Based on a study conducted by FAO in 2011, the most consumed types were tomato, cucumber, lettuce, but okra, bell pepper, green beans, cauliflower and eggplant were also occupying a

primary place in the vegetables consumption of the Jordanian population. Therefore, our study results are confirming the literature regarding the consumption of cucumber, tomato and lettuce.

Conclusions and Outlook

In Jordan, age, education level, employment, salary ranges, expense on a monthly basis for food and fruits and vegetables were influencing the intake of the Jordanian population in F&V.

Finally, considering the major importance of fruits and vegetables effects on health, it would be recommended that the Jordanian population, increase its daily intake of fruits and vegetables to at least 3 to 4 varied fruits per day and 3 to 5 portions of vegetables per day. Noting that different types of phytonutrients can be obtained from different species of FV, therefore there is no preferred type to be consumed over the others, so the individuals are advised to select the most phytonutrient dense categories in order to fulfil their needs. It is recommended to vary among the types consumed, since each kind of F&V may contain different vitamins, minerals and phytonutrients, even though more quantitative studies on F&V in the East Mediterranean countries need to be performed aiming to address more specified nutritional recommendations.

As a continuity to complete and make more valuable the results of this study, it will be recommended to pursue further researches following the below recommendations:

- 1) Investigation of relationship between F&V consumption and health benefits in order to explain the relationship between the different species and varieties of F&V and their source of phytonutrients.
- 2) Comparison of the content in phytonutrients between fruits and vegetables.
- 3) Evaluation of the consumption method and investigations regarding effects of phytonutrient content by analysing and comparing the amounts of raw, cooked and canned types of vegetable.

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