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Consumption of fruits and vegetables among university students in Denmark

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ABSTRACT

Background: The existent duality between an intake of Fruits and Vegetables (F & V) lower than recommended, calls for effective interventions. Therefore, it is necessary to consider the factors influencing food choices. For instance, and due to an increasing level of migration, a recognition of F & V preferences among a segment of mobile populations is needed. Therefore, we aimed to investigate if there is a difference between Danish vs non-Danish regarding fruit and vegetable habits.

Methods: The data was analysed from a cross-sectional observational study with 388 university students. The applied questionnaire with 8 questions focusses on habits regarding intake and preparation of F & V. A Logistic regression analysis was used to assess associations between each factor related to F & V consumption and nationality. A model adjusted by age and education stratified by gender was also run to check if the initial findings would remain the same. All analyses were run in SAS 9.4.

Results: The respondents were mainly Danish 63.1% and females 58.5%. In the crude model, non-Danish were more likely to eat more fruits compared to Danes. However, models adjusted showed that this difference was related to Danish female students compared to non-Danish ones. Non-Danish females also eat more fruits in compotes. In regards to vegetables, both Danish males and females prefer to eat them in a soup or a hot meal compared to non-Danish male and female students respectively Danish males eat more vegetables a day than non-Danish ones. No differences were found in other variables studied.

Conclusions: Our findings show that female non-Danish students had a healthier intake compared to Danish ones, eating more fruits a day and more fruits in compotes. On the other hand, male Danish students eat more vegetables a day than non-Danish counterparts do. The study provides information about consumers F & V habits, and the groups that should be targeted for interventions to increase the intake of F & V. It reinforces the need to consider different backgrounds of the target population when planning specific interventions.

Introduction

Fruits and vegetables (F & V) are an important nutritional component for human health (Thow and Priyadarshi, 2013). A higher intake of fruits and vegetables can reduce the risk of non-communicable diseases, such as cardiovascular disease, cancer and obesity (Wang et al., 2014; Thow and Priyadarshi, 2013; He et al., 2004; Liu et al., 2000) and therefore, people that have a low consumption of F & V have a higher risk of chronic and non-communicable disease (Wang et al., 2014). Although healthy eating guidelines are in place in most EU countries, vegetable consumption is very low. The consumption levels in EU range from 20% to 54% of daily recommendations (Dinnella et al., 2016). In fact, in the southern parts of Europe the consumption of F & V is higher (Roos et al., 2001). In Denmark, mean intake of fruits and vegetables per day is 316 g (European Food Safety Authority, 2008) around 53% of the recommended daily intake, which is 600 g per day (Danish Food Administration, 1998).

Therefore, the existent intake of F & V lower than recommended calls for effective interventions. In order to do so, a multidisciplinary approach is needed to food-related consumer behaviour, since also aspects as pleasure (Nicklaus, 2016), taste, liking, culture, religion, individual mood, or social constructs influence food consumer behaviour (Gedrich, 2003). The increasing level of migration, is an example of the influence that different determinants have on food consumption. Dietary acculturation is a multidimensional, dynamic,

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and complex process, that highlights the fact that people do not change linearly from their traditional pattern to another (acculturated) (Reichman, 2006; Satia-Abouta et al., 2002; Szapocznik et al., 1978; Berry, 1980). As part of the concept has been suggested that immigrants may retain and find new ways to use traditional foods, exclude others, and (or) consume "new" foods. Socio-cultural determinants are interconnected with psychological ones (Gedrich, 2003; Holmboe-Ottesen and Wandel, 2012). For instance, the persistent retention of the dietary habits of migrants may be addressed as the one self's impression of affiliation to a group, which can be provided through nutrition (Bush et al., 1995; Holm, 1995; Koct ¨urkand Bruce, 1995). International students represent a segment of mobile populations that move from their countries of origin for different reasons (Perez-Cueto et al., 2009). This group facing a temporal migration situation have shown to apply distinct mechanisms to cope with diet-related transitional stress, where 85% of the respondents reported dietary changes since their arrival, according to the findings of a previous study (Perez-Cueto et al., 2009). Systematic reviews of the literature suggests the dietary habits of some ethnic groups living in Europe are likely to become less healthy as individuals increase consumption of processed foods that are energy dense and contain high levels of fat, sugar, and salt (Holmboe-Ottesen and Wandel, 2012; Osei-Kwasi et al., 2016).

Hence, the aim of this study is to investigate if there is a difference between Danish vs non-Danish university student population regarding intake and preparation of fruits and vegetables.

Methodology

Study population and design

This study used the same questionnaire as a previous cross-sectional study named 'Smoothies Made of Food Waste' (not published) conducted at Aalborg University – Copenhagen, which objective was to decrease food waste. A questionnaire of 13 questions was developed for the previous study, and eight questions were used in this study (Appendix) to investigate participants' sociodemographic characteristics, F & V preferences and daily intake. The questionnaire was developed in SurveyXact platform and respondents could have access to it through a QR-Code provided. The questionnaire was distributed by STADS (Students Administrative System at Aalborg University) via email to 3400 students at the Copenhagen campus to be filled out voluntarily; therefore, a convenience sample was used. Data were collected for a period of 18 weeks during the spring of 2014.

Questionnaire

The applied questionnaire focusses on factors related to preparation and consumption of F & V. Participants' daily consumption of F & V was assessed with the questions 'How many pieces of fruit do you eat a day?' and 'How many pieces of vegetables do you eat a day?', a reference for the meaning of one piece was given to facilitate answering (1 piece = 1cup = 100 g). These variables were coded into two categories: 0–2 pieces a day = 1; 3 or more pieces a day = 2.

Preparation habits in relation to F & V were reviewed by asking whether they eat their fruit raw, in compote/pureed, in juices/beverages/smoothies and/or in sweets/desserts. For vegetables, the options available differ slightly: raw, in juices/beverages/smoothies and in a hot meal/soup. The options that the participants selected were coded as yes or no (for example, if a participant select that she/he eats fruit raw it would be coded as 'yes' for raw; if she/he does not select the option in juices, it would be coded as 'no' for juice, and so on).

Data analysis

Logistic regression analysis was used to assess associations between each factor related to F & V consumption (dependent variable) and nationality. After, a logistic regression model stratified by gender and adjusted by age and education was run to check if the results would remain the same. A p value of < 0.05 was used to define statistical significance. All analyses were run in SAS 9.4.

Results

The questionnaire was answered by 395 students, which is about a 12% response rate from the total population. We had 7 people that were neither bachelor nor master students (visiting students, interns, visiting researchers) that were excluded from the study because they generally stay for a short period at this University. Our respondents were from bachelor and master programs (n = 388). In our sample, 63.1% of the respondents had Danish nationality, 227 females and 161 males. Non-Danish participants had several nationalities (Afghanistan = 1; Bulgaria = 13; Cameroon = 1; Canada = 2; Chile = 1: China = 4; Czech Republic = 2; Ecuador = 2; England = 2; Estonia = 1; Faroe Islands = 1; France = 2; Germany = 9; Greece = 6; Greenland = 1; Hungary = 5; Iceland = 1; India = 4; Iran = 2; Israel = 1; Italy = 6; Latvia = 4; Lithuania = 5; Mexico = 2; Nepal = 13; the Netherlands = 1; New Zealand = 1; Poland = 6; Portugal = 6; Romania = 17; Russia = 3; Singapore = 1; Slovakia = 8; Spain = 3; Switzerland = 1; Turkey = 2; Ukrain = 1; USA = 2). As the number of people in each nationality was very low, it was not feasible to run the analysis by nationality. The mean age was 26.0 years (4.89 SD and age range 19–51 years) for Danish students and 26.4 years (4.75 SD and age range 17–49 years) for non-Danish students.

In Table 1, it is shown the comparison between Danish and non-Danish in relation to gender and education. No differences were found in relation to gender between the groups, however non-Danish students had a higher educational level (most of them were master's students).

Table 2 shows the crude model for each factor related to preparation and consumption of F & V. Non-Danish participants have a higher consumption of fruits (p = 0.007). On average, there are no differences regarding the preparations of F & V among participants. Nevertheless, non-Danish eat less vegetables in a hot meal or in a soup than Danish (p = 0.002).

The adjusted models by age and education and stratified by gender are found in Tables 3 and 4. It is possible to notice that, after the adjustment and the stratification, the general finding "non-Danish eat more fruits a day" remained only for females (p = *0.023*). In addition, non-Danish female students eat more fruits in compote than Danish ones (p = *0.037*). For males, it was found that Danish male students eat more vegetables a day than non-Danish (p = *0.043*). Both non-Danish males and females eat less vegetables in a soup than their Danish counterparts even after the adjustment (p = *0.007* for females and p = *0.037* for males). These findings show the importance of controlling the crude model by important variables that influence the preparation and consumption of F & V.

Table 1
Proportional comparison with (%) of variables between Danish and non-Danish students.

	Danish (n = 245)	Non-Danish (n = 143)	P value
Gender			0.569
Male	99 (40.4)	62 (43.4)	
Female	146 (59.6)	81 (56.6)	
Education			0.001
Bachelor	101 (41.2)	24 (16.8)	
Master	144 (58.8)	119 (83.2)	