EXPLORING THE LEVEL OF NUTRITION KNOWLEDGE AND INFLUENCING FACTORS IN A TURKISH COMMUNITY SAMPLE

ÜNIVERSİTE ÇALIŞANLARININ BESLENME BİLGİ DÜZEYİNİN BELİRLENMESİ VE DEMOGRAFİK FAKTÖRLERİN BİLGİ DÜZEYİNE ETKİSİNİN ARAŞTIRILMASI

Ayten Aylin ALSAFFAR
Özyeğin University, School of Applied Sciences, Gastronomy and Culinary Arts Department, Istanbul, Turkey

Abstract: The aim of the study is to explore the level of general nutrition knowledge of university staff using a general nutrition knowledge questionnaire (GNKQ) and examine the effects of demographic variation in knowledge. A total of 385 employees (aged 18 and over) of a university in Istanbul participated in the study by completing the modified, translated and validated form of GNKQ by Parmenter and Wardle (1999). Participants completed the written questionnaires in their own time, without any supervision. Significant differences in knowledge between demographic groups were found, with the middle aged group (35 to 50 years) having better knowledge than both the younger and the older group and people with a university or post-graduate degree performing much better than people completing primary or high school (p<0.05). No difference was found between the knowledge levels of males and females. The mean general knowledge score was found as 46%. Although the majority of the group (75%) had a university degree or above, there were serious gaps in knowledge even on daily recommendations. Possible reasons of lack of knowledge in such a well-educated group were discussed along with the recent public health nutrition efforts in Turkey.

Key Words: Nutrition Knowledge, Turkey, Demographics, University Staff


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Introduction

Turkey faces two kinds of nutritional problems, diet-related chronic diseases on one side and undernutrition and micronutrient deficiencies on the other side (Pekcan and Karaağaoğlu, 2000). Cardiovascular diseases (CVD), cancer and diabetes are the three leading causes of death in Turkey; these conditions accounted for 65% of the nation’s deaths in 2012 (Türkiye İstatistik Kurumu, 2013). Apart from these diseases, vulnerable populations suffer from iron, iodine and vitamin D and A deficiencies. About 30 to 50% of children and 50% of pregnant/lactating women have been reported to have iron deficiency anaemia (Pekcan, 1984; Wetherilt et al., 1992; Çetin and Aydin, 1999; Pekcan and Karaağaoğlu, 2000; Erdem et al., 2009; Karaağaçlı et al., 2010; Köksal et al., 2011). Approximately one-third (30.5%) of the population was reported to have iodine deficiency and related health problems such as goitre (Urgancioğlu and Hatemi, 1989; Ersoy et al., 2006). The prevalence of rickets (due to vitamin D deficiency) in children was reported to range between 4.0 to 20.0% (Köksal, 1974; Öcal et al., 1983; Bostan et al., 2003; Özer et al., 2003). Approximately 12% of preschool aged children and 23% of pregnant women in Turkey were deficient in vitamin A (World Health Organization, 2009). These deficiencies result from inappropriate eating patterns and habits that are caused by high food costs, lack of nutrition knowledge and incorrect practices of food preparation, cooking and storage (Pekcan and Karaağaçlı, 2000).

In a study carried out among members of general public in Turkey (n=15124), it was found that only 21.6% of the participants had received information about nutrition. This information was mainly provided by the doctors (55%) and nurses and midwives (13%) (T.C. Sağlık Bakanlığı, 2004). In the Committee Report for National Food and Nutrition strategy (Devlet Planlama Teşkilati, 2003), lack of nutrition knowledge was identified as an important factor that prevents people from making healthful choices in their diet. Raising awareness about the importance of nutrition and the delivery of nutrition education programs were declared as a priority for the government to ensure the adoption of healthier eating habits (Devlet Planlama Teşkilati, 2000).

In order to establish the baseline level of nutrition knowledge and measure changes in knowledge, reliable and valid tools are necessary (Contento et al., 2002). There are many studies that attempted to develop and validate a nutrition knowledge questionnaire for use in the general population in other countries (Sapp and Jensen, 1997; Parmenter and Wardle, 1999; Obayashi et al., 2003; Hendrie et al., 2008a; Hendrie et al., 2008b; Dickson-Spillmann et al., 2011; El-Sabban and Badr, 2011; Bacardi-Gascon et al., 2012; Ferro-Lebres et al., 2014).

There are also a number of studies that aimed to measure nutrition knowledge of sub-populations in Turkey (such as adolescents, physicians, interns, cooks, students) (Bodur and Çatalkaya, 1996; Çalıştır et al., 2005; Özçelik et al., 2007; Yılmaz and Özkan, 2007; Özçelik and Uçar, 2008; Şanlier et al., 2009; Şahingöz and Şanlier, 2011; Özdogan and Özçelik, 2011a; Özdoğan and Özçelik, 2011b; Çekal, 2012; Sabbag and Sürürçüoğlu, 2012; Uçar et al., 2012; Deniz and
Alsaffar, 2013). The content and the style of the questions differed in these specific questionnaires. In addition, most of them have not been validated and therefore they were not appropriate for the measurement of the nutrition knowledge of the general public.

Previously, Alsaffar (2012) determined the validity and reliability of a modified and translated version of the general nutrition knowledge questionnaire (GNKQ) by Parmenter and Wardle (1999). The aim of the present study is to explore the level of general nutrition knowledge within a Turkish community sample using the GNKQ and examine the effects of demographic variation on knowledge.

**Materials and methods**

**Participants**

This cross-sectional study used a convenience sample of 385 university employees (consisting of academic and administrative staff) and a paper-based questionnaire to measure general nutrition knowledge. Subject participation was voluntary; to be eligible for the study participants had to be at least 18 years old and there were no other exclusion criteria. None of the participants reported that they had nutrition-related qualifications. All participants signed an informed consent form.

**Ethical approval**

The study was approved by the Research Evaluation Committee of Yeditepe University.

**Materials**

Nutrition knowledge was assessed by the modified and translated form of Nutrition Knowledge Questionnaire by Parmenter and Wardle (1999). The questionnaire contained a total of 127 items in four sections: (1) experts’ recommendations regarding increasing and decreasing intake of different food groups (11 items), (2) nutrient knowledge (70 items), (3) food choice (which asks people to choose between different options, such as to pick a bread which contains greater amounts of vitamins and minerals) (11 items) and (4) the relationships between diet and disease (35 items). The participants answered on a range of different scales such as ‘more, same, less, not sure’, ‘yes, no, not sure’, ‘high, low, not sure’, ‘agree, disagree, not sure’ or a choice of four different food options. Demographic questions covered age, gender, occupation, level of education, marital status and number of children.

**Questionnaire improvement**

The validity and reliability of the modified and translated form of the general nutrition knowledge questionnaire (GNKQ) by Parmenter and Wardle (1999) was measured in a recent study (Alsaffar, 2012). This study reported low reliability values for sections A and C. For this reason, the questionnaire used in Alsaffar (2012) was reviewed by an expert panel of dieticians and some items were re-formulated. In order to measure the reliability and the validity, the final questionnaire was administered to university students studying either nutrition (n=192) or engineering (n=70). The final questionnaire had higher internal reliability values (Cronbach’s alpha) for sections A, C, D and the overall questionnaire when compared to the values given in Alsaffar (2012) (0.55>0.47, 0.59>0.43, 0.85>0.81 and 0.92>0.89, respectively). Section B had the same reliability value (0.88).
as the previous study. The final questionnaire also satisfied the requirements for test-retest reliability (Pearson correlation values ranging from 0.53 to 0.73 for individual sections and 0.74 for the overall questionnaire) and construct validity (comparison of mean scores between nutrition and engineering students, p=0.000 for all sections and the overall questionnaire).

Procedure

The questionnaires were sent to and received from the participants by internal post during January and February 2013. The participants were requested to complete the form by not getting any help from other sources (i.e. from another employee or the Internet).

Statistical analysis

The raw data from each participant’s responses were coded numerically. The responses were converted to 1 and 0 for correct and incorrect answers, respectively (‘not sure’ responses were also coded as incorrect). Correct responses from each section were added to give a section score and the four section scores were summed up to give an overall knowledge score out of 127. Data were entered and analysed using the Statistical Package for Social Sciences Statistical Software package version 20.0 (SPSS Inc., Chicago, IL, USA). Descriptive statistics were used to analyse the demographic information. Univariate analysis was used to examine the effect of demographic characteristics on nutrition knowledge levels. As the data did not meet the requirements of a normal distribution, non-parametric tests (Kruskal Wallis and Mann-Whitney U tests) were employed. A p value of 0.05 was considered significant. For multiple comparisons, the significance level was adjusted by dividing 0.05 level with the number of tests (i.e., 3) (Ntoumanis, 2001).

Results

Sample characteristics

A sample response rate of 76.7% (n=385) was achieved, comprising 34.5% men and 65.5% women (See the Table). The per cent of the participants aged 18 to 34 (49.1) was more than the group aged 35 to 50 (36.2). The majority of the participants (75.0%) had a university or a post-graduate degree. Most of the participants were married (58.0%). The percentage of people who did not have any children was 47.2%.

Nutrition knowledge

The Table 1 shows the mean scores of correct responses for all sections and the whole questionnaire.

Section 1 - Dietary recommendations

Out of the maximum 11 points on this section the mean score was 6.0 (SD 2.8). The majority of the participants were aware of the recommendations to decrease sugar, meat, starch, fat and salt intake (ranging between 68 to 92%). The participants who were aware of the recommendations about increasing vegetable, fruit and dietary fibre intake varied between 65 to 85%. Eighty-nine per cent did not know that the recommended daily intake of fruits and vegetables was as many as five servings, with just over 50% believing that up to three portions would be adequate. Only 42 per cent were aware of the advice to cut down on saturated fat. Eighty-three per cent did not know
that daily salt consumption should not exceed 6 g (a teaspoonful).

**Section 2 - Nutrient knowledge**

Of a possible 70 points for the section on nutrient knowledge, the mean score was 35.5 (SD 14.8). There was some confusion on the identification of the foods that were high and low in sugar. For example, only one quarter of the participants correctly identified fruit yogurts and ketchup as having lower sugar content when compared to squash. When asked to categorise foods either high or low in fat, starch, salt, trans fats and dietary fibre, correct answers were provided generally by 56 to 90% of the participants. However, one half of the participants did not know that bean salad had a high protein content. Only 35% of the participants knew that nuts contained lower amounts of saturated fat. One-third of the participants knew that iron in spinach was not as useful (bioavailable) as red meat. Sixty-six percent believed that brown sugar was a healthier alternative to white sugar.

**Section 3 - Everyday food choices**

Out of the maximum of 11 points on this section, the mean score was 6.0 (SD 2.8). Eight items in this section were answered correctly by 60% or more of the participants. Half of the participants selected grilled chicken as a food that contains

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**Table 1. Univariate Analysis of Demographic Variance in Nutrition Knowledge (n=385) (p<0.05)**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Sample</th>
<th>A. Nutrition recommendations (11)</th>
<th>A. Nutrient knowledge (70)</th>
<th>B. Food choice (11)</th>
<th>C. Diet – disease relationship (35)</th>
<th>Overall nutrition score (127)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>sig</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>130</td>
<td>34.5</td>
<td>6.22</td>
<td>1.68</td>
<td>40.51</td>
<td>10.68</td>
</tr>
<tr>
<td>Female</td>
<td>247</td>
<td>65.5</td>
<td>6.35</td>
<td>1.72</td>
<td>39.92</td>
<td>10.88</td>
</tr>
<tr>
<td>Age (years)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-34</td>
<td>187</td>
<td>49.1</td>
<td>6.07</td>
<td>1.71</td>
<td>*a</td>
<td>39.01</td>
</tr>
<tr>
<td>35 - 50</td>
<td>138</td>
<td>36.2</td>
<td>6.63</td>
<td>0.71</td>
<td></td>
<td>41.51</td>
</tr>
<tr>
<td>51 and above</td>
<td>56</td>
<td>14.7</td>
<td>6.25</td>
<td>1.41</td>
<td></td>
<td>39.89</td>
</tr>
<tr>
<td>Highest level of education</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Received no education</td>
<td>9</td>
<td>2.4</td>
<td>5.78</td>
<td>2.11</td>
<td>NS</td>
<td>32.89</td>
</tr>
<tr>
<td>Primary school</td>
<td>30</td>
<td>7.9</td>
<td>6.10</td>
<td>2.01</td>
<td></td>
<td>35.47</td>
</tr>
<tr>
<td>High school</td>
<td>56</td>
<td>14.8</td>
<td>6.00</td>
<td>1.65</td>
<td></td>
<td>35.54</td>
</tr>
<tr>
<td>University</td>
<td>136</td>
<td>36.0</td>
<td>6.39</td>
<td>1.58</td>
<td></td>
<td>40.99</td>
</tr>
<tr>
<td>Masters or above</td>
<td>147</td>
<td>38.9</td>
<td>6.46</td>
<td>1.66</td>
<td></td>
<td>42.86</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>147</td>
<td>38.8</td>
<td>6.35</td>
<td>1.70</td>
<td>NS</td>
<td>40.97</td>
</tr>
<tr>
<td>Married</td>
<td>220</td>
<td>58.0</td>
<td>6.27</td>
<td>1.70</td>
<td></td>
<td>39.55</td>
</tr>
<tr>
<td>Widowed</td>
<td>12</td>
<td>3.2</td>
<td>6.00</td>
<td>1.76</td>
<td></td>
<td>37.58</td>
</tr>
<tr>
<td>Number of children</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>175</td>
<td>47.2</td>
<td>6.40</td>
<td>1.66</td>
<td>NS</td>
<td>41.12</td>
</tr>
<tr>
<td>1</td>
<td>100</td>
<td>27.0</td>
<td>6.20</td>
<td>1.66</td>
<td></td>
<td>40.67</td>
</tr>
<tr>
<td>2</td>
<td>67</td>
<td>18.1</td>
<td>6.25</td>
<td>1.80</td>
<td></td>
<td>39.43</td>
</tr>
<tr>
<td>3 or more</td>
<td>29</td>
<td>7.8</td>
<td>6.59</td>
<td>1.74</td>
<td></td>
<td>35.55</td>
</tr>
</tbody>
</table>

a Participants aged 35 to 50 have significantly higher level of knowledge than the participants aged 18 to 34.
b 'University and Masters or above' have significantly higher level of knowledge than 'Primary school' and 'High school'.
c 'No children' has significantly higher level of knowledge than '3 or more children'
low-fat and high fibre instead of lentil and bulgur patties. Almost half of the participants (45%) thought that butter and sunflower oil provided the same amount of calories. The item that was answered correctly by the least of the participants (19%) was about the energy content of the protein, fat and carbohydrate. As many as 60% of the participants opted for sugar instead of fat as the correct answer.

Section 4 - Diet-disease relationships

The mean score was 11.0 (SD 7.1) out of a possible 35 points. The participants were mostly aware of the relationship between high fat intake and diseases; however, 13% of them were unsure about the link between fat intake and heart disease. Only 65% of the participants were able to identify the consumption of fibre as a preventative measure against heart disease. As many as 66% of the participants believed that a reduction in salt intake would help reduce the risk of cancer. High blood pressure was correctly associated with high salt intake by the majority of the participants (91%); however, only 65% were able to identify kidney disease as another answer to this question. When it comes to the effects of sugar intake on health, 45 to 57% of the participants thought that cataract, anemia and hair loss were linked to sugar consumption. The most poorly answered question in this section concerned the antioxidant activity of vitamins. The portion of participants who were unsure about the antioxidant vitamins ranged from 48 to 72%. The participants who were able to identify vitamin C, E and A to have antioxidant properties were 48, 33 and 21%, respectively.

Demographic differences in knowledge

The sociodemographic variation in nutrition knowledge is given in the Table. The scores of the males and females did not seem to differ significantly (for the individual sections and the overall questionnaire). The participants aged 35 to 50 scored higher in Section A and the overall questionnaire when compared to the other groups (i.e. participants aged 18 to 34 and aged 51 and above) (p=0.010 and p=0.009, respectively). Level of education had a significant effect on the scores of Sections B and C and the overall questionnaire. Participants who had a university or post-graduate degree (such as masters or PhD) scored higher than the participants with lower levels of education (i.e. primary school and high school) (p=0.000 in each section). Marital status did not seem to influence nutrition knowledge levels significantly. Parents of three or more children had significantly lower levels of knowledge in Section C (p=0.037).

Discussion

Although the participants were aware of the major dietary guidelines on healthy eating, the answers to specific questions in the same section were poor. For example, the participants knew about the importance of increasing the intake of fruits and vegetables but they did not know how many portions they need to consume daily. This information is provided in the Turkish Dietary Guidelines (Ministry of Health, 2006) but it is likely that the participants in this study did not acquire such knowledge. In order to improve the nutrition knowledge of the Turkish people, clear and simple messages derived from the dietary guidelines need to be disseminated to the
public through a variety of channels (such as articles, brochures, radio announcement or paid advertising (Devlet Planlama Teşkilati, 2003). Another question that was poorly answered in this section was about the daily consumption of salt. A great majority of the participants were unaware of the maximum recommendation for salt intake. The amount of salt consumed daily by Turkish people (18 g) exceeds the recommended amount by three times. The Ministry of Health initiated a programme in 2011 to reduce the salt consumption and the first act in the programme was to reduce the amount of salt in bread, which is a staple food in Turkey and provides 44% of the daily energy intake (T.C. Sağlık Bakanlığı, 2011). It seems that more efforts are needed to ensure that the message of the program to reach wider public.

On the second section of the questionnaire the majority of the participants correctly identified the foods that contained trans fats (i.e. margarine, cookies and crisps). In harmony with the EU Legislation, Turkish Codex Alimentarius requires food companies to list the trans fatty acid content of the products (T.C. Gıda Tarım ve Hayvancılık Bakanlığı, 2011). If the trans fatty acid content of a food is less than 1% of total fat, companies can make a claim that ‘The product does not contain trans fatty acids’ on the package. This information is also used to promote the product as a ‘healthy’ option as a marketing strategy by the companies. This could explain why many of the participants were aware of the foods that contained trans fatty acids. In the diet of Turkish people, most of the protein is provided by the plant sources namely lentils, chickpeas and dry beans (Pekcan and Marchesich, 2001). Although widely consumed in Turkey, beans stood as a food that were not known much about in this section. Only half of the participants knew that beans had high protein content and one-third knew that they had high dietary fibre content.

Participants performed well on the section on food choices. The reason why the majority of them believed that butter and sunflower oil provided the same amount of calories could be due to the fact that they are both classified under the group ‘fats’. Being able to answer such a question can be achieved by looking at nutrition labels on foods. Unfortunately, not all products contain nutrition labels in Turkey; labelling is only compulsory if a health/nutritional claim is made about the product (T.C. Gıda Tarım ve Hayvancılık Bakanlığı, 2011). In addition, Turkish consumers tend not to use food labels as nutrition information sources. A recent study carried out with people from 26 different regions of Turkey (n=1526) demonstrated that there was a need to improve Turkish consumers’ awareness of nutrition labeling and its components (Besler et al., 2012). The question that was answered correctly by the least of the participants was about the energy content of the macronutrients. Many people made the mistake of identifying sugar as the nutrient that provided most of the calories. The participants could have been misled by the implications of excessive sugar consumption (such as obesity and diabetes) and could have chosen this option. Similar to other countries, cutting down on simple sugars and refined grains have been announced by the written media (Yıldız, 2008; T.R. Ministry of Health, 2010) and health professionals as a step toward healthier life in Turkey.
In general, the participants were aware of the diet-disease relationships and they were most successful in answering the items on fat consumption. The campaign started by the Ministry of Health (‘Let us eat healthily and protect our heart’) (T.C. Sağlık Bakanlığı, 2004) and ‘Obesity Prevention and Control Programme’ (T.R. Ministry of Health, 2010) seem to take the attention of the Turkish people. The items that the participants had the least of knowledge in this section of the questionnaire were related to the antioxidant vitamins. This was similar to the results obtained in England (Parmenter et al., 2000). The authors proposed that the people in England did not know about antioxidants as the findings of the studies were new at that time. However, numerous works over the past 20 years have studied the antioxidant capacity of various food components (Lu and Rasco, 2012). These vitamins are mentioned in the Dietary Guidelines for Turkey (Ministry of Health, 2006), but possibly this publication has not received widespread publicity.

Contrary to what was observed in the previous studies (Parmenter et al., 2000; Özçelik and Uçar, 2008; Hendrie et al., 2008a; De Vriendt et al., 2009; Bonaccio et al., 2013), the level of nutrition knowledge of males and females did not differ significantly in the present study.

Numerous studies reported that nutrition knowledge increased with age (Schaller and James, 2005; Hendrie et al., 2008a; De Vriendt et al., 2009). In the present study, the middle-aged group (35 to 50 years) performed best and this was in line with previous studies (Parmenter et al., 2000; Wardle et al., 2000). As suggested by Parmenter et al., (2000), lower scores in the youngest group might be indicative of a lack of interest in health issues. The scores of the group aged 51 and above were similar to the youngest group. Lower scores of the group aged 51 and above could be attributed to having less possibilities to reach nutrition-based information. Also, as people get older their views and habits about food are more established and therefore they are more difficult to change.

More educated people demonstrated significantly better nutrition knowledge and this was in accordance with previous studies (Parmenter et al., 2000; Wardle et al., 2000; Dallongeville et al., 2001; Bonaccio et al., 2013). It is rather reasonable that people with higher degree of education could be more interested in health and nutrition related information. They could also easily comprehend complex information and make better use of written material such as scientific articles about health. It was also interesting to see that people with no education had similar scores to the ones who finished primary or high school. This highlighted the fact that nutrition education and physical activity in primary and high schools need to be reinforced across Turkey.

The mean general knowledge score was 46%. This was higher than the mean scores obtained from a general population in a Mediterranean region (40%) (Bonaccio et al., 2013) and lower than the mean scores obtained with Belgian women (60%) (De Vriendt et al., 2009) and British adults (58%) (Wardle et al., 2000). It must be noted that apart from the study of Wardle et al. (2000), which utilised the original questionnaire, other studies employed the modified versions and therefore some caution needs to be exercised for further
comparisons. Still, if the number of participants having a university degree and above (i.e. 75%) is taken into account in the current study, the mean knowledge score at 46% can be considered low.

Limitations of the study include a relatively small sample size (n=385) and the use of convenience sampling in a specific geographic area. The sample was biased in favour of women and more educated individuals. The greater participation of women was expected as they are usually more interested in food, nutrition and health-related issues (Turrell, 1997). The response from less educated individuals were low and this could be attributed to the questionnaire being lengthy and detailed.

Future research should, if possible, engage in a more detailed study at the regional or national level to address the areas of nutrition knowledge that the public are most deficient of. The findings then can be used to develop food and nutrition policies, which would constitute the themes of various health and nutrition campaigns. There are some efforts from the government, particularly from the Ministry of Health (as outlined earlier) to improve the nutrition knowledge and dietary habits of the public, however, current study indicated that an unacceptable number of people were still unaware of the main dietary recommendations. The last Turkish Dietary Guidelines was published in 2006 and these guidelines should be kept up-to-date. Any nutrition and health promotion strategy need to be engaging, inexpensive and widely accessible to most of the population. Finally, nutrition education should be progressively part of the school curricula for all ages.

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