Preferences and perceptions of personal vegetable consumption: A study among young men in the Norwegian National Guard

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Abstract
A survey was developed to assess the intake, main sources and preferences related to vegetables among 578 male recruits (response rate 78%), in addition to perceptions of personal vegetable consumption. The recruits’ average vegetable intake (including potatoes) was 244 g/day. Six per cent of the recruits consumed the recommended 450 g/day or more of vegetables. However, 33% of all recruits stated that they consume enough vegetables. The most important sources of vegetables were potatoes and hot composite dishes for lunch and dinner. High (≥282 g/day) and low (≤182 g/day) consumers had distinctly different patterns of vegetable consumption. The hot dishes were a more important source among low than high vegetable consumers (P<0.01). Several recruits reported liking raw (76%) and cooked (58%) vegetables, and preferences were positively related to the vegetable intake (P<0.02) and (P<0.001). The results suggest some optimistic bias among the recruits regarding their personal vegetable consumption.

Keywords: Vegetable intake, young men, serving size, perceptions, preferences, perceived need

Introduction
Diets rich in fruits and vegetables are associated with decreased risk of certain non-communicable diseases, including cardiovascular disease (Hung et al. 2004) and certain cancers (World Cancer Research Fund/American Institute for Cancer Research 1997). Recommendations of at least five servings of fruits and vegetables per day have become official guidelines in several western countries to reduce the risk of these diseases and to maintain good health. In Norway these guidelines are further specified as a daily consumption of at least three servings of vegetables and two servings of fruits (Norwegian Ministry of Health, 2003). This corresponds to a recommended intake of 450 g (three 150 g servings) vegetables daily, including potatoes, in addition to 300 g fruit.

Studies have shown that consumers often are unsure how to translate general recommendations into dietary practices and that the majority of the public believes they consume adequate amounts of vegetables, while they in fact are far from the
target (Lechner et al. 1997; Kearney et al. 2001; Bogers et al. 2004). Making consumers aware of their low intake and the need to consume more are therefore considered important steps when promoting higher consumption of vegetables (Kearney et al. 1997).

Several studies have shown that consumption of vegetables among young adults is low (Keim et al. 1997; Thompson et al. 1999; Lallukka et al. 2001; Ma et al. 2003) and especially among young men (Johanson and Solvoll, 1999). This is alarming since dietary patterns formed during early adult years may have implications for the risk of developing certain non-communicable diseases later in life. In order to make dietary changes, nutrition messages must be seen as personally relevant. It is doubtful whether potential future health benefits of diets rich in vegetables seem appealing and motivating enough for young people.

Aims and generalizability

Young men are particularly difficult to reach with conventional dietary information. Few studies have investigated young men’s eating behaviours, and their own reflections related to eating behaviours. The present study addresses perceptions and behaviour related to vegetables by reporting from a study among young men in the military. In Norway, compulsory military service is practised (Act of 17 July 1953). This means that all men from the year they turn 19 are called up for the army. In Vaernes Military Training Centre, where the data were collected, all social classes were represented and the recruits came from all over the country. Thus, a military camp is one of the best places to reach a broad selection of young men in Norway.

The aims of the present study were to: (1) assess the intake, variation in intake and main sources of vegetables among the whole study population and among high and low consumers of vegetables; (2) assess preferences of these food items and how preferences were related to the intake of vegetables; and (3) investigate how the recruits perceive their personal vegetable intake, and the need to increase it among all recruits and between different intake groups. The study is focusing on differences in vegetable choices and perceptions between different intake groups in order to increase the knowledge about young men as vegetable consumers.

Methods

This baseline study is part of a larger intervention project with the aim to contribute to an increased consumption of vegetables and whole-grain cereals among young men in the military. Approval for the study was obtained from necessary Norwegian authorities (the Regional Committee for Medical Research Ethics, the Norwegian Social Science Data Services and the Ministry of Health and Care Services).

Subjects

A total of 739 recruits (aged 18–26) from the Norwegian National Guard in a military training centre near Trondheim, Norway were asked to participate in the baseline surveys in January 2004 \( (n = 231) \) and July 2004 \( (n = 508) \). A total of 89 recruits did not want to participate in the study. Of the remaining 650 subjects, 72 were excluded from the analysis due to incomplete data-sets. The analyses are based on the remaining 578 subjects, 78% of the original sample.
Regarding socio-economic variables, 40% of the recruits had at least one parent in middle occupational groups and 29% in high occupational groups. Most of the recruits (61%) had at least one parent with higher education (college or university), while the remaining 39% of the subjects had parents with high school as the highest obtained education. In comparison, data from Statistics Norway (2005) shows that 70% of women in the actual age group on a countrywide basis are educated at primary school or high school, while 30% have a college/university degree. The corresponding numbers observed in the present study were 49% and 51%, respectively.

Setting

In most military camps in Norway, the soldiers have the opportunity to have free meals in a mess hall or they can choose to buy food on own expenses in a canteen, both located in the military camp. They can also choose to buy food in restaurants/cafeterias or grocery stores outside the military camp. In Vaernes military training centre, breakfast, lunch, dinner and an evening meal is served in the mess hall. The breakfast and the evening meal consist of bread and a selection of different sandwich spreads. For lunch the recruits’ can choose between a hot dish, bread, different sandwich spreads and a salad bar consisting of some selected vegetables. For dinner they have the possibility to have one hot dish, in addition to a choice of vegetables (cooked or a mixed salad). The recruits decide the serving sizes of the different foods in the military mess hall themselves. In the canteen, the recruits have the possibility to buy fast food, snacks and candies. The availability of fruits and vegetables in the canteen is very limited.

Survey instruments and distribution

Two survey instruments, a diary and a questionnaire, were developed to assess the participants’ intake of vegetables, preferences and their perceptions of own vegetable consumption. Both the diary and the questionnaire were tested in a pilot study with 12 soldiers in a military camp (Lutvann) in Norway and were revised on the basis of the results and comments from this group. The revised survey instruments were test–retested among 63 recruits in another military camp in Norway (Heistadmoen). The instruments provided fairly consistent responses (correlations between time 1 and time 2 ranged from 0.11 to 0.55) over a 3-week test–retest study period.

The questionnaire and the diary given to the recruits’ in Vaernes, where the study was performed, included a short written instruction, and oral information was given to the participants to help completion of the survey instruments. Two researchers were also present during completion to answer queries. The participants answered the food diary on four following working days, while the questionnaire was completed only on day 1. Both the diary and the questionnaire were completed in the military camp, and the recruits were divided into groups of approximately 50 persons during completion.

Food diary

A validated diary developed at the Department of Nutrition, University of Oslo (sef.no/assets/11002260/vedlegg1_ungkost.PDF) was adapted to cover the diet in the military mess hall. All pre-printed choices for hot dishes in this diary were removed and replaced by open-ended questions where the participants filled in a number for
the day’s special served at lunch and dinner. Further, the revised diary gave pre-printed choices to cover the participants’ consumption of vegetables and potatoes not included in the dishes. The revised diary also included questions about how often and what they ate in the canteen in the camp and/or cafeterias/restaurants outside the military camp.

For some vegetables, like carrots, the participants stated their consumption as pieces. For dishes served at lunch and dinner and some other items, like salad, the participants stated their intake as number of servings and serving sizes (small, medium, large or extra-large). Serving sizes for these food items were decided with guidance from the kitchen personnel and from other Norwegian surveys (Oveby et al. 2003). To decide their own serving sizes, the subjects were asked to refer to photographs or weighed portion-sizes placed on a table in the mess room. Guidance was also given to the recruits for determining their own serving sizes from the two researchers.

To obtain estimates of the participants’ consumption of vegetables in grams, pieces of most vegetables pre-printed in the diary, were pre-weighed. The estimates are the average of 10 weighed pieces. For some items, like potatoes standard measures in Norway were used (Blaker and Aarsland 1989). To collect data on the participants’ consumption of vegetables included in the dishes, recipes and estimates of the amounts of the ingredients used in every dish were collected from the kitchen personnel. Average contents of vegetables in the dishes and in the small, medium, large and extra-large servings were calculated from these data.

The intake of vegetables (g/day) was calculated as the product of frequency of intake and serving sizes. The total vegetable consumption is the sum of vegetables and potatoes. The average daily consumption for each recruit in the survey period was obtained by adding up their total consumption of vegetables and divide by the number of days on which the subject kept records.

Questionnaire

The questionnaire consisted of socio-economic variables and statements related to preferences, perceptions of own vegetable intake and perceived need to increase this intake.

The recruits were asked to indicate their level of agreement to the following statements: ‘I often eat three or more servings of vegetables daily’ and ‘I find it difficult to know how much three servings of vegetables are’. Answers were presented as five-point scales, subsequently scored 1 (‘I fully disagree’) to 5 (‘I fully agree’).

Perceptions of sufficiency of own vegetable intake and the perceived need to increase their vegetable consumption were measured by two statements: ‘I eat enough vegetables’ and ‘I need to eat more vegetables’. Answers were presented as five-point scales, scored 1 (‘I strongly disagree’) to 5 (‘I strongly agree’).

Participants’ willingness to increase their vegetable intake was assessed by the following statement: ‘Indicate to what extent you want to increase your consumption of vegetables’. Responses were scored on a five-point scale from 1 (‘to a very high extent’) to 5 (‘to a very small extent’).

The following statements assessed preferences: ‘I like the taste of salad and raw vegetables’ and ‘I don’t like cooked vegetables’. Responses were scored on a five-point scale, scored 1 (‘strongly disagree’) to 5 (‘strongly agree’).
Statistical analyses

All analyses were performed using SPSS for Windows, version 12.0. Descriptive statistics such as frequencies and means were used to summarize the data. Categorical data were analysed by chi-square statistics. One-way analysis of variance was used to examine differences in intakes of vegetables among the responses to the statements about the perceptions of their own vegetable intake. Tukey’s post-hoc test was performed to conduct pair-wise comparisons for significant effects. Non-parametric tests were also applied, but the results did not differ appreciably from the parametric tests, and are therefore not reported.

For some of the analyses, the data material was split into three tertiles of intake. High consumers are defined as those who ate more than 282 g/day and low consumers as those with an intake less than 182 g/day.

Results

The recruits’ average consumption (95% confidence interval) of vegetables was 244 g/day (234–254), 43% of which was potatoes (Figure 1). Six per cent of the subjects ate 450 g or more (corresponding to the recommendations of at least 150 g three times a day) of vegetables (including potatoes) daily. Figure 2 shows the mean contribution (%) of different vegetables related to total vegetable intake in the low (≤182 g/day) and high (≥282 g/day) vegetable consumer groups. Potatoes and vegetables that were a part of the composite dishes served for lunch and dinner were the most important sources of vegetables among all the recruits. Subjects in the highest intake group had a higher proportion of their total vegetable intake from carrots, and composite dishes for lunch compared with the subjects in the lowest tertile (P<0.01). Vegetables included in the hot dishes for dinner were a more important contributor to total vegetable intake among low than high consumers (P<0.001).

Table I presents the number of respondents reporting portion sizes (small, medium, large, extra-large) or pieces for some selected vegetables and the size of the servings (g). The table shows that, for all vegetables measured in servings, most of the

Figure 1. Distribution of vegetable intake.
participants reported their size to be small or medium, corresponding to portions of 80 g or less. Very few participants reported that they were eating the large or extra-large servings, which were more in line with the recommendations. In the survey period, 224 entries of carrots and 99 entries of broccoli were observed among all the recruits. For carrots and broccoli the participants mostly reported eating one or two pieces. This corresponds to an intake of 65 g or 130 g for carrots and up to 70 g for broccoli. For cucumber, 325 entries were observed in the 4-day survey period; 54% of the recruits reported eating five or more pieces, corresponding to 45 g or more.

Of all the recruits, 76% reported that they like the taste of salad and raw vegetables. The corresponding number for cooked vegetables was 58%. For both raw and cooked vegetables, the recruits that reported high preference scores had higher intakes than those reporting low preference scores ($P < 0.05$) (Table II). Approximately one-half of the respondents (49%) felt that ‘it is difficult to know how much three servings of vegetables are’ (results not shown). Seven per cent of the recruits stated that they often had three or more servings of vegetables daily. The average intake of those who stated they often had three or more servings daily was 276 g, considerably less than the 450 g that is recommended. A higher proportion (9%) of subjects in the highest intake group ($\geq 282$ g/day) stated that they often had three or more servings of vegetables daily, compared with the 5% proportion of the lowest intake group ($\leq 182$ g/day) ($P < 0.05$).

Figure 3 shows perceptions related to adequacy of own intake, perceived need to increase the intake and willingness to increase the consumption for the participants in six different intake groups. Among all the recruits, 12% strongly agreed and 21%
tended to agree with the statement ‘I eat enough vegetables’ (results not shown). There was a tendency that the number of recruits that agreed to the statement ‘I eat enough vegetables’ increased as the intake of vegetables increased (Figure 3). About one-third of the recruits with an intake lower than recommended (450 g/day).

Table I. Events reported for each serving size of the most frequently consumed vegetables in the 4-day survey period.

| Vegetable         | Serving size       | Percentage of entries |
|-------------------|--------------------|-----------------------|
| Cabbage           | Small (47 g)       | 55                    |
|                   | Medium (77 g)      | 32                    |
|                   | Large (110 g)      | 11                    |
|                   | Extra-large (184 g)| 1                     |
| (n=74)            |                    |                       |
| Cooked mixed      | Small (40 g)       | 36                    |
| vegetables        | Medium (80 g)      | 51                    |
|                   | Large (120 g)      | 10                    |
|                   | Extra-large (160 g)| 3                     |
| (n=271)           |                    |                       |
| Mixed salad       | Small (33 g)       | 33                    |
|                   | Medium (52 g)      | 54                    |
|                   | Large (100 g)      | 10                    |
|                   | Extra-large (175 g)| 3                     |
| (n=460)           |                    |                       |
| Green salad       | Small (15 g)       | 48                    |
|                   | Medium (25 g)      | 47                    |
|                   | Large (38 g)       | 5                     |
|                   | Extra-large (50 g) | 0                     |
| (n=66)            |                    |                       |
| Carrot            | 1 piece (65 g)     | 46                    |
|                   | 2 pieces (130 g)   | 34                    |
|                   | 3 pieces (195 g)   | 11                    |
|                   | ≥4 pieces (≥260 g) | 9                     |
| (n=224)           |                    |                       |
| Cucumber          | 1–2 pieces (≤18 g) | 21                    |
|                   | 3–4 pieces (≤36 g) | 31                    |
|                   | 5–6 pieces (≤54 g) | 27                    |
|                   | ≥7 pieces (≥63 g)  | 33                    |
| (n=325)           |                    |                       |
| Broccoli          | 1 piece (35 g)     | 25                    |
|                   | 2 pieces (70 g)    | 37                    |
|                   | 3 pieces (105 g)   | 18                    |
|                   | ≥4 pieces (≥140 g) | 19                    |
| (n=99)            |                    |                       |

Note: Weighed serving sizes in grams are presented in parentheses.

Table II. Responses to the recruits’ classification of own vegetable intake and the preference scores in accordance with vegetable consumption.

| Response                                      | n   | %   | Vegetables consumption (mean g/day) |
|-----------------------------------------------|-----|-----|-------------------------------------|
| 'I often eat three or more servings of vegetables daily' |     |     |                                     |
| Disagree                                      | 452 | 78  | 235<sup>a</sup>                     |
| Neither agree or disagree                     | 85  | 15  | 284<sup>b</sup>                     |
| Agree                                         | 39  | 7   | 278                                 |
| 'I like the taste of salad and raw vegetables' |     |     |                                     |
| Disagree                                      | 77  | 13  | 210<sup>c</sup>                     |
| Neither agree or disagree                     | 62  | 11  | 233                                 |
| Agree                                         | 438 | 76  | 256<sup>d</sup>                     |
| 'I don’t like cooked vegetables'              |     |     |                                     |
| Disagree                                      | 336 | 58  | 269<sup>e</sup>                     |
| Neither agree or disagree                     | 71  | 12  | 226<sup>f</sup>                     |
| Agree                                         | 171 | 30  | 206<sup>g</sup>                     |

Notes: a–g tested with analysis of variance: difference a and b, P=0.003; difference c and d, P=0.015; difference e and f, P=0.02; difference e and g, P<0.0001.
perceived that they ate enough vegetables. Even among the lowest intake group (those who consumed ≤200 g/day vegetables), nearly one-quarter perceived that they consume enough vegetables. No significant differences in the proportion of subjects that agreed with the statement were found between the different intake groups.

Figure 3 also shows that both high and low consumers perceived a need to increase the intake. Of all recruits, more than one-half of the subjects (62%) stated a need to increase their vegetable consumption. However, there was a tendency that a lower percentage of the recruits in the highest intake groups (>400 g/day) perceived a need to increase the intake compared with those with the lowest intakes, but no significant differences were found. The majority of the respondents not only saw the need to, but were also positive to, increase their consumption of vegetables. Among all recruits, 54% wanted to increase the intake to some extent, while 17% wanted to increase it to a high or a very high extent. Figure 3 indicates that a higher proportion in the highest intake groups (≥400 g/day) was willing to increase their intake of vegetables to a high or very high extent compared with the lowest intake groups. Among subjects who consumed more than 400 g/day a discrepancy between the willingness to increase the vegetable intake and the perceived need to increase it was observed. There was a tendency that the subjects were more willing to increase their intake than they perceived a need to.

Discussion

A Norwegian national survey (Johanson and Solvoll, 1999) and studies from other countries (Keim et al. 1997; Lallukka et al. 2001; Ma et al. 2003) have shown that the consumption of vegetables is particularly low among young men. Furthermore, this is a population group that is difficult to reach with regular nutrition information. The reported average intake of vegetables (including potatoes) of the recruits in the present study (244 g/day) was in agreement with the reported intake of the national survey (Johansen and Solvoll 1999), which was on average 239 g/day (also including potatoes) for the same population group. Similar to the study by Keim et al.
(1997), who investigated the intake of fruits and vegetables in a group of young adults, the present study showed a higher consumption of mixed salad and carrots than for the cruciferous vegetables like broccoli. The importance of hot dishes or composite foods as a source of vegetables as observed in the present study has also been reported in other population groups (O’Brien et al. 2003). However, no studies have to our knowledge shown the importance of these foods as a main source of vegetables among young men, and especially among the low consumers of vegetables.

Recruits in the military belong to the population groups that have the highest energy requirement, which is reflected by frequent consumption and large serving sizes of many foods. However, the results showed that only a small proportion of the recruits stated that they consume the recommended three or more servings of vegetables daily (Norwegian Ministry of Health 2003). Furthermore, only few participants reported consumption of serving sizes in line with the recommendations. Thus, a combination of too few daily servings and too small serving sizes can explain the low consumption of vegetables among the recruits. These data are in agreement with studies carried out with other population groups (Williams 1995; Ashfield-Watt et al. 2003). For example, the study by Ashfield-Watt et al. (2003) among adults showed that average serving sizes were below the recommended 80 g for commonly consumed vegetables like carrots (56 g) and cucumber (34 g).

Nearly one-half of the recruits stated that they find it difficult to know how much three servings of vegetables are. The results confirm the findings from studies in other population groups (Williams 1995; Parmenter et al. 2000; Ashfield-Watt et al. 2003; Bere 2004) showing that consumers find it difficult to translate the meaning of the slogan ‘five-a-day’ to amounts and serving sizes. Although only 7% of the recruits stated that they consume three servings of vegetables daily and the consumption data showed low intakes, many tended to have an optimistic view of their personal vegetable intake. Other studies have shown that overestimation of the vegetable intake is common (Williams 1995; Lechner et al. 1997; Ashfield-Watt et al. 2004; Bogers et al. 2004). For example, the study by Lechner et al. (1997) among Dutch adults of both sexes showed that 88% of those who did not meet the recommendations believed they ate enough vegetables. In another study involving Australian adults (Ashfield-Watt et al. 2004), high percentages of people who consumed less than two servings of fruits and three servings of vegetables daily stated their intake to be ‘about right’.

In the present study, recruits perceiving their vegetable intake as ‘enough’ had a slightly higher intake than those perceiving it as low (difference of 70 g/day), but their average vegetable intake (263 g/day) was still far from the official national recommendations (150 g three times a day) (Norwegian Ministry of Health 2003). The perception of their vegetable consumption as adequate has probably several explanations. Confusion over serving sizes and amounts recommended might be one of the reasons. Other possible explanations may be that they do not see or value the health potential of a diet rich in fruits and vegetables. Furthermore, an explanation might be that they live under conditions where they find it difficult to have a high vegetable intake, or think their consumption of vegetables is sufficient for this stage in life. One explanation for the confusion over serving sizes among the soldiers in the present study can be that most young people, and especially men, are not used to prepare food themselves and therefore have little knowledge about serving sizes and amounts. A report by Birò (2001), comparing dietary assessment methods for data
collection, observes that women, based on their experience with food preparation, better recognize serving sizes than men.

The present study showed that the recruits’ preferences for both cooked and raw vegetables were related to their intake. Food preferences have been related to consumption in a number of studies among children and adolescents (Perez-Rodrigo et al. 2003) and adults (Van Duyn et al. 2001; Satia et al. 2002). The recent study from Spain (Perez-Rodrigo et al. 2003) among children and young people aged 2–24 years showed a significant relationship between like/dislike of vegetables and consumption. Bitter taste has been cited as the main reason for disliking cruciferous vegetables (Drewnowski and Rock 1995), and may explain the relatively low reported consumption of these vegetables in the present study.

The results from the present study showed that more than one-half of the participants (60%) perceived a need to consume more vegetables and that this perception was independent of intake group. Further, 71% of all the recruits were positive to change their behaviour. The results are opposed to Kearney et al. (2001), who showed that 41% of the subjects in the lowest vegetable quartile reported that they do not need to make changes to their diet as it is already healthy. Kearney et al.’s study focused on the participants’ perceived need to change their diet in general and not specifically about their perceived need to increase their vegetable intake.

An explanation for the positive attitude towards increased consumption of vegetables among the soldiers is probably due to the massive attention on the positive health effects of these foods in the mass media in recent years. The difficulties to translate knowledge into appropriate food choices might be one of the reasons why dietary changes have not already been made by the recruits. Other reasons might be that they enjoy the food they already are eating, economical reasons, or lack of availability and accessibility.

In interpreting the results from the present study, some aspects of the results and study sample should be noted. Firstly, the data were collected in a military camp where the subjects have some restrictions regarding their food choices since they eat most of their meals in the mess hall where the kitchen personnel decide the availability of different foods. On the other hand, they have the possibility to eat both in the military mess hall and the canteen, they can choose themselves whether or not to have vegetables as part of their meals and they decide their own serving sizes. Young men not under military service are also restricted in their choices concerning food. At home, they are under restrictions set by their parents. Outside home they are restricted by offers in school or work canteens, but also by economy and knowledge about how to prepare food. Secondly, limited generalizability of the results may be due to the fact that data were collected in just one military camp. However, compulsory military service is practised in Norway and young men from all over the country and all social classes are represented in the study sample. Thirdly, the education level of the parents in the present study was higher than in the Norwegian population in general (adults aged 40–60) (Statistics Norway 2004). An explanation for the high education and occupation levels reported in this study could be that the variables were based on the parent with the highest obtained education or occupation in the family. The fact that the education level of the parents was reported by the recruits can have influenced the results. It is possible that they had problems in reporting the exact education of their parents. Furthermore, the discrepancies between the data can be explained by different categorization of education. The term ‘high school’ in the data
from Statistics Norway included education beyond high school; for example, technical college. The recruits may have categorized these educations as college/university.

Conclusions

The present study shows that a large number of young Norwegian male recruits are satisfied with their intake of vegetables even though they consume substantially less than the official guidelines recommend. The low consumption of vegetables among the recruits can be explained by a combination of too few servings of vegetables during the day and too small serving sizes. Strategies to increase their consumption should therefore focus on clear messages regarding the quantities and number of servings that should be consumed. More information on the sizes of some common vegetables and training in recognizing amounts of vegetables to better understand the size of a serving is needed. Furthermore, the results indicate that the majority of the participants were positive to increase their consumption. More research is needed to identify the main barriers experienced among young men to increase their intake of vegetables.

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