

Dental health behavior, gastroesophageal disorders and dietary habits among Norwegian recruits in 1990 and 1999

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Myklebust S, Espelid I, Svalestad S, Tveit AB. Dental health behavior, gastroesophageal disorders and dietary habits among Norwegian recruits in 1990 and 1999. *Acta Odontol Scand* 2003;61:100–104. Oslo. ISSN 0001–6357.

A questionnaire was given to representative samples of Norwegian recruits in 1990 and 1999 to explore dental health habits, history of gastroesophageal disorders and diet with possible relations to dental erosion. The samples were 792 (mean age 20.9 years) and 676 (mean age 21.6 years), respectively, and the corresponding responses were 62% and 100%. Minor differences in self-reported dental health habits and gastroesophageal disorders were found. The respondents' dentists had provided information about dental erosion for 8.2% of the respondents in 1990 versus 14.5% in 1999. There was an increase in the reported frequency of daily intake of juice from 17% to 24% ($P = 0.006$) and carbonated soft drink from 54% to 61% ($P = 0.025$) in the period 1990–99. The frequency of training activity showed minor changes, but in 1999 it was more common to drink during exercise (94% versus 74% in 1990, $P < 0.001$), and the majority drank water. Sixteen percent of recruits ate oranges daily in 1990; in 1999 this had dropped to 11% ($P = 0.012$). The corresponding proportion that ate apples daily had dropped from 17% to 8% in the period ($P < 0.001$). It is likely that lifestyle factors related to diet among young men have changed in the period 1990–99 in a direction that may increase the prevalence of dental erosions. □ *Dental erosion; diet*

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Dental erosion is a progressive loss of dental hard tissues through a chemical process which does not involve bacteria (1, 2). Acids from intrinsic or extrinsic sources dissolve the dental surfaces, and either alone or in combination with movements of the soft tissues and other abrasive factors gradually reduce the amount of dental hard tissues. Traditionally, factors that may cause erosion have been described as originating from regurgitation, environment, or diet. Regurgitation or gastroesophageal reflux disease (GER) (3) can be symptomatic or asymptomatic. A connection between dental erosion and vomiting induced by gastric disorder was first suggested by Holst & Lange in 1939 (4). Although the occurrence of dental erosions in patients with reflux disease is reported to be more frequent for the older patients (5), the disease affects the younger ones as well (3). Extrinsic factors involved in dental erosion are diet, medication, lifestyle, or environment (6). The etiology of dental erosion has been considered multi-factorial (7). Soft drinks have been shown to be erosive to dental hard tissues (8–10). Modern lifestyle seems to include the use of soft drinks, as consumption is steadily increasing (11). Lifestyle is always changing, and in groups of young people the use of acidic drinks or sports drinks may be frequent. Drinking pattern, in particular, may be of importance for the erosive effect of acidic drinks. Young people often walk around sipping from a screw-capped bottle, thus maintaining an acidic milieu in the mouth. People using the drug ecstasy have been claimed to have erosions (12). The explanation suggested is that ecstasy leads to dry mouth and the patient drinks soft drinks to compensate (12). The number of training or

sports centers has been increasing during the past decade, so also the number and types of sports drinks. The frequency of consuming acidic drinks can therefore be expected to be higher in 1999 than in 1990.

The aim of this study was to display self-reported dental behavior, gastroesophageal disorder, and dietary habits among Norwegian recruits in 1990 and 1999 to find out if potential erosive factors among young men had changed during this period.

Materials and Methods

Recruits attending their first day in the naval forces of Norway were given a questionnaire in connection with their routine call at the dental office. In 1990, a total of 798 were given the questionnaire, while in 1999 the number of recruits receiving the questionnaire was 676.

The number of completed questionnaires received from the recruits in 1990 was 492, a response rate of 61.7%; in 1999 the figure was 100% of the completed questionnaires collected. The first group was given the option whether to choose to complete the questionnaire or not, the second group (1999) was told to complete the questionnaire as part of the dental examination and thus all participants had to answer. After completion, the questionnaires contained no information that could identify the respondent.

Background information collected in the questionnaire (questions 1–3) included sex, year of birth and profession. In question 4, the respondents had to state the lapse of

time since the previous visit to a dentist. Question 5 asked whether the dentist had mentioned any erosive damage on the teeth. In the second part of this question, they had to indicate if they believed they had such lesions. Questions 6 through 8 were meant to reveal the dental prophylactic habits of the respondents as to frequency and length of tooth brushing and any use of fluoride. In question 9 the respondents were asked if they were active in sports or physical activities, how often they trained and if and what they had to drink during the exercise. Question 10 enquired whether the respondent had used or was using any medicine for stomach or intestinal disturbances. In question 11 the respondent was asked whether or not he had a history of regurgitation and, if so, what frequency and for how long this had been going on. Question 12 asked if the respondent had been vomiting over time and, if so, for how long and what frequency. In question 13 the respondent had to state whether he drank juice, fruit syrup, soft drinks or sports drinks. Each item was precoded for variable frequencies – several times a day, daily, weekly or seldom/never. The same precode was used in question 14, where the respondent had to answer if he ate yoghurt, oranges/grape fruit or apples.

The data from the questionnaires were statistically analyzed using SPSS (version 10.0) using descriptive statistics and chi-square testing for differences between groups. The level of significance chosen for the statistical analyses was 5%.

Results

The recruits were mostly men. In the 1990 group, 0.8% of the respondents were female and the corresponding fraction in 1999 was 1.6%. The mean age in 1990 was 20.9 years, and in 1999, 21.6 years. There was no statistically significant difference in self-reported time since previous dental check-up between the groups ($P = 0.121$). Of the 1990 group, 70.2% of the respondents had visited a dentist during the previous year, whereas the corresponding figure for the 1999 group was 65.7%. For 18.5% of the 1990 group 13–24 months had elapsed since the previous dental check-up versus 20.5% for the 1999 group, while more than 2 years had passed since 11.2% of the 1990 and 13.8% of the 1999 group had seen a dentist.

A significantly higher proportion of the respondents in 1999 had received information from their dentist that their teeth had traces of dental erosion (Table 1). Also, the number of recruits who, although their dentists had never mentioned it, suspected such dental damage, was statistically significantly higher in 1999 (Table 2).

In 1990, 57.3% of the respondents brushed their teeth twice a day versus 56.7% in the 1999 group. However, a significantly higher proportion brushed more than twice a day in 1990 (10.4%) than in 1999 (6.5%) ($P = 0.037$). The time spent on brushing did not differ significantly between groups. Nearly 60% replied that the daily time allocated for brushing was between 2–5 min. One-third of the

Table 1. At the last dental check up, did the dentist mention dental changes caused by acid or brushing? The difference between the groups is statistically significant ($P = 0.001$)

	1990		1999	
	Frequency	%	Frequency	%
Yes	39	8.2	96	14.5
No	434	91.8	565	85.5
Total	473	100.0	661	100.0

Table 2. Even though the dentist did not mention any changes on your teeth caused by acids or brushing, do you think yourself that your teeth have such changes? The difference between the groups is statistical significant ($P < 0.0005$)

	1990		1999	
	Frequency	%	Frequency	%
Yes	44	11.1	117	21.7
No	353	88.9	421	78.3
Total	397	100.0	538	100.0

Table 3. Frequencies of answers to the question: 'Do you have problems with gastroesophageal reflux or heartburn?' There is no statistical difference between the groups ($P = 0.486$)

	1990		1999	
	Frequency	%	Frequency	%
No	388	83.1	529	80.8
Yes, daily	17	3.6	21	3.2
Yes, 1–5 times a week	17	3.6	20	3.1
Yes, 1–4 times a month	24	5.1	49	7.5
Yes, seldom	21	4.5	36	5.5

respondents spent 30 s to 2 min on their daily tooth-brushing. The use of fluoride tablets or fluoride containing mouthrinse has not changed much in the actual timespan. In 1990, 96.5% of the respondents used toothpaste with fluoride and in 1999 the number was 95.7%. In 1990, 21.7% of the respondents used additional fluorides (tablets or rinse) compared to 19.6% in 1999. The questions about physical exercise and gastrointestinal disorders revealed no significant differences between the groups. Less than 20% of each group reported gastroesophageal reflux or heartburn (Table 3). Of these respondents, some 50% had experienced problems for years and approximately 5% were taking medicine for the condition. A small number of the respondents reported a problem with vomiting (Table 4) and approximately 50% of this group has had the problem for years.

The questionnaire revealed a significantly higher ($P < 0.001$) proportion of recruits drinking juice several times a day in 1999 (Fig. 1). Approximately 24% of the respondents stated that they drank juice daily or several

Table 4. Frequencies of answers to the question: 'Have you had problems with vomiting?' There is no statistical difference between the groups ($P = 0.271$)

	1990		1999	
	Frequency	%	Frequency	%
No	432	93.3	611	95.2
Yes, daily	1	0.2	4	0.6
Yes, 1–5 times a week	5	1.1	3	0.5
Yes, 1–4 times a month	10	2.2	13	2.0
Yes, seldom	15	3.2	11	1.7

times a day in 1999 as compared to 17% in 1990. There was no significant difference in the use of fruit syrup in the two groups ($P = 0.402$). About 60% of the respondents drank carbonated beverages daily or several times a day in 1999 as compared to 54% in 1990. The use of sports drinks was low both in 1990 and in 1999, with a small decline in use by time. Eating of yoghurt, oranges and apples was significantly less frequent in 1999 compared to 1990 (Fig. 2).

Discussion

Enrollment of recruits to the naval forces takes place according to a fixed schedule. This study was performed during the March enrollment both in 1990 and in 1999. For most purposes, one should imagine that the soldiers came from comparable social classes, but the military administration has no demographic data to support this assumption. One person conducted the first part of the study, while in 1999 two persons were involved. In a complex situation with hundreds of recruits lining up for all enrollment procedures, including dental examination,

one person had difficulty trying to collect the questionnaires. This explains the difference in percentage retrieval of the questionnaires. When discussing the data obtained from questionnaires like the one used in this study, it has to be borne in mind that only self-reported concepts are discussed. However, as all questionnaires were filled in anonymously one could not expect any systematic deviation from the recruits' real situation to the reported one. In addition, the recruits should have no reason to give answers they might think were expected, or in any way are 'correct'. Hence, one cannot expect any significant differences among the answers given by the two groups despite the difference in percentage retrieval of the questionnaires.

Regarding the timespan between dental check-ups for the groups in this study, other investigations have shown that normally more than 1 year will pass between recalls (13), and that a recall interval of 1.5 to 2 years might be recommended for persons with low caries activity (14). Haugejorden & Klock (15) found that 59.2% of 25-year-old respondents regularly visited their dentist annually and 27.3% had a frequency of 3–4 visits per 5 years.

In 1999 a significantly higher proportion of the recruits' dentists had made comments about changes caused by acids or brushing. This would be expected taking into account the numerous publications (6, 16–22) and headlines in the press focusing on this subject. This might also explain the increase in numbers of soldiers fearing that they had such changes on their teeth despite the fact that their dentist had not mentioned it.

In 1996, Haugejorden & Klock (pers. comm.) found that among 25-year-olds in the 3 counties in Western Norway 21.2% brushed their teeth more than twice a day. This is well over the frequencies in the 2 groups in the

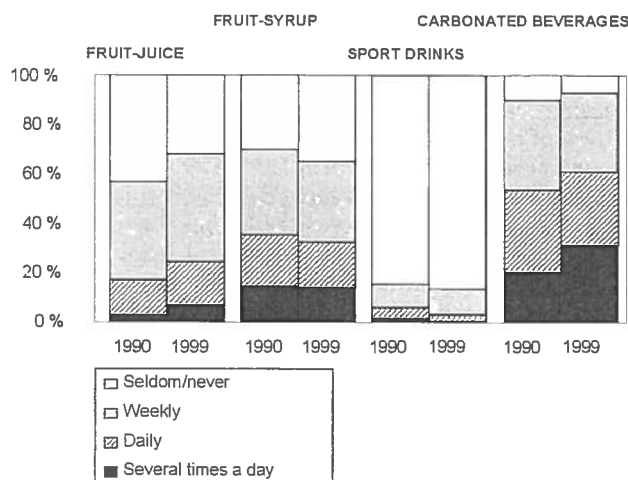


Fig. 1. Frequency of drinking of potentially erosive drinks among Norwegian recruits in 1990 and 1999.

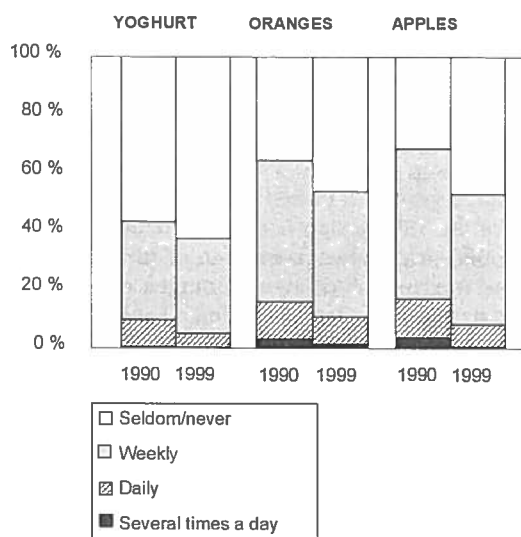


Fig. 2. Frequency of consumption of yoghurt, oranges and apples among Norwegian recruits in 1990 and 1999.

present study (10.4% and 6.5%). However, the vast majority of respondents in this study were males, and Sakki et al. (23) found that Finnish urban adult males brushed their teeth less often than females. In their study, only 38% of the males brushed their teeth twice a day versus 80% of the females. When, in the present study, it was found that 57.3% and 56.7% of the respondents brushed their teeth twice a day, this is more frequent than Sakki et al. (23) found for males. In the study by Haugejorden and Klock (pers. comm.), 62.8% of the respondents brushed their teeth twice daily.

Meurman et al. (5) stated that approximately one-third of the population in industrialized countries occasionally or continuously has upper gastrointestinal disorders. In the present study it was found that about 13% of the respondents had problems with gastroesophageal reflux or heartburn at least once a month. The lower frequency among the soldiers could possibly be explained by better physical status compared to average people. According to Järvinen et al. (24), the risk for erosion is high in individuals who vomit. In the present survey only about 3% of the respondents said they had problems with vomiting more than once a month. O'Sullivan et al. (25) found no linear relationship between the severity of GER and the severity of dental erosion, while Meurman et al. (5) found that GER correlated with the occurrence of dental erosion. On the other hand they stated that not all individuals would have dental erosion even after more than 10 years with GER (5). The age of the present respondents and their low self-reported prevalence of digestive problems indicate a relatively low prevalence of dental erosion due to GER.

Järvinen et al. (24) found a strong association between patients diagnosed with dental erosion and consumption of citric fruits more than twice per day, soft drinks daily, and apple vinegar or sports drink once a week or more. A significant association between dental erosion and citrus fruits, other fruits (apples, pears and plums) and fruit juice was also reported by Lussi et al. (26). On the other hand, Eccles & Jenkins (27) could only find minor differences in erosive pattern when they grouped patients with dental erosion according to excessive consumption of fruit, acidic drinks or both. This is in contrast to the findings reported by Ganss et al. (28), who found that the occlusal lesions were of similar shape but more extensive in a group of patients having an acidic diet compared to a group with average Western diet. In addition, they observed that shallow lesions on buccal smooth surfaces were predominant in the acidic diet group. So, the higher frequency of soft drink and juice consumption among the recruits in 1999 compared to 1990 indicates a risk for more dental erosions in the last group.

Based on the results from the present survey, the consumption of fruit and yoghurt seems to have been reduced during the 10 years. Fruit, especially oranges, has potential erosive effect due to low pH (27). Though severe erosions have been found in patients who consume large quantities of fruit (27), it is unlikely that the small fruit

intake reported in the present questionnaire study should lead to any harmful effect. Only about 5% of the recruits said they ate yoghurt daily. This low consumption in addition to the fact that yoghurt, due to its high calcium and phosphate concentration, seems to have no erosive potential in spite of its low pH (29), places yoghurt in the non-risk group. This fact was not obvious in 1989 when the present questionnaire was developed. Meurman et al. reported (30) that strawberry yoghurt had an erosive capacity greater than Coca Cola and orange juice. Though they suggested that it had no local effect on the teeth, this must be the reason for including yoghurt in studies dealing with erosion and diet, for instance Lussi et al. (9), and why it was part of the present study.

Conclusion

The dental health habits and the magnitude of gastroesophageal disorders for the two cohorts investigated in this study showed only minor differences. The use of fruit juice and carbonated beverages, however, had increased significantly from 1990 to 1999. Being factors with potential erosive power, a higher frequency of dental erosion might be expected.

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Received for publication 12 June 2002

Accepted 29 November 2002