Socio-economic Influence on Caries Experience and CPITN Values among a Group of Italian Call-up Soldiers and Cadets

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Purpose: Dental care in Italy is carried out mainly by private professionals and therefore the collection of epidemiological data on dental health is not often possible. Thus, the aim of this study was to collect the DMFT and CPITN values in a population of young Italian male subjects, namely call-up soldiers and cadets, and relate them to the socio-economic status of the subjects.

Material and Methods: The sample was made up of two groups from different Italian academies: call-up soldiers: 1184 male call-up soldiers aged from 19 to 25; cadets: 2477 cadets aged from 19 to 25. The level of education was evaluated by means of a questionnaire which the soldiers had to fill in before being examined. Two trained dentists carried out the epidemiological survey following WHO guidelines. Data elaboration was carried out at the 'WHO Collaboration Centre of Milan for Epidemiologist and Community Dentistry'. Data on DMFT were compared by ANOVA. A p value < 0.01 was considered as statistically significant.

Results: The mean DMFT value observed was 3.69 ± 3.31. The differences between the two groups were statistically significant for D e F components ($p < 0.05$). The caries-free rate is lower in the call-up soldiers group (12.57%) than that reported for the cadets group (25.26%) and the difference was statistically significant ($p < 0.01$). Statistically significant differences were observed in DMFT values between the two groups stratified by educational level. A healthy periodontium was observed in more than 50% of the sample. In the call-up soldiers group, 40.95% had healthy periodontal conditions; 40.25% of the subjects showed bleeding on probing; 19.03% presented with calculus; and 2.77% presented periodontal pockets 4–5 mm deep. In the cadets group, 57.95% had healthy periodontal conditions; 38.18% of the subjects showed bleeding on probing; 3.52% presented with calculus; and 0.35% presented periodontal pockets 4–5 mm deep. The differences in proportion between the two groups were always statistically significant except for the bleeding score where an almost similar percentage for both groups was recorded.

Conclusion: The results showed that call-up soldiers have a higher DMFT index and the D value is higher in less educated subjects. Bleeding on probing did not vary either between call-up soldiers and cadets or among socio-economic subgroups. Such results have underlined the need of a systematical information campaign on oral hygiene in Italian schools.

Key words: epidemiology, dental caries, DMFT, CPITN

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There is overwhelming evidence in the scientific literature of a decrease of the prevalence of dental caries in the majority of western populations. However, although the prevalence and severity varies according to age, sex, race, geographic areas, socio-economic factors, local oral as well as systemic factors, and methods of oral cleaning, there are no reliable national statistics in Italy. The Italian Dental Health System is not broadly based enough to allow for the national collection of epidemiological data. In the past 20 years, various local organizations and universities have tried to make up for this deficiency. In 2001, the 'WHO Collaboration Center of Milan for Epidemiology and Community Dentistry' attempted to implement an epidemiological oral examination of young individuals aged from 19 to 25 and collect the resulting prevalence data.

In Italy, the military service system will no longer be compulsory from 2007. For this reason, the collection of data from this source appeared to present a very good opportunity to obtain a cross-sectional image of young male subjects' oral health.

DMFT and CPITN indexes of young soldiers from different countries have been described (Ankkuriniemi and Ainamo, 1997; Gomez-Santos et al, 1998; Rababa'h et al, 1998). A recent Danish publication has underlined the difference in DMFT among soldiers of different socio-economic levels (Antoft et al, 1999). British and American studies claim that socio-economic conditions are oral health status determining factors (Murray et al, 1991; Chisick, 1995). The aims of the present study were:

1. To report DMFT and CPITN indexes of young Italian male subjects aged from 19 to 25
2. To evaluate DMFT and CPITN indexes according to the level of education.

MATERIALS AND METHODS

Sampling

The oral examination was performed from January to June 2001 in the military bases of the Milan district and in some Italian military academies, each of them hosting soldiers from all over the Italy.

According to WHO guidelines, CPITN and DMFT were used as indexes for the evaluation of dental and periodontal pathologies. These indexes have been reported separately for cadets attending the military academies, and for call-up soldiers hosted in Milan. Thus, the sample consisted of two groups.

Call-up soldiers group: 1184 male call-up soldiers aged from 19 to 25. The wide age range is due to the fact that in Italy call-up soldiers are generally 19-years-old but some of them are allowed to defer their military service until after they have completed their academic studies.

Cadets group: 2477 cadets aged from 19 to 25 from different Italian military academies, e.g. the Modena Military Academy, the Pozzuoli Airforce Academy, the Livorno Navy Academy, the Caserta Military Academy and the Rome Carabinieri Academy.

Because there are few and not recent hierarchical structures of occupation classification in Italy, educational level was used as a measure of socio-economic status. The level of education, i.e. the subjects' highest study degree, was evaluated by means of a self-administered questionnaire which the soldiers had to fill in before being examined. All subjects signed a consent form.

Clinical Examination

All oral examinations were performed in the medical facilities inside the military bases and academies under standard conditions. Dental mirror no. 5, a traditional probe, a WHO periodontal probe and a source of white light were used for the purpose.

The epidemiological survey was carried out following WHO guidelines as regards planning, choice of indexes, diagnostic criteria and methodology, preventive and therapeutic indications, and data codification (http://www.whocollab.od.mah.se/).

Examiners' Training and Calibration

In order to reduce any variability in the data collection, two examiners performed all the examinations. Both were trained and calibrated at our centre following the Geneva 'Oral Health Survey Methods'. Particular attention was paid to inter- and intra-examiner variation. According to WHO guidelines, the two examiners performed double observations on 10% of the subjects included in the study, with variability resulting in less than 25%.

Table 1 Educational level, recorded as the maximum grade achieved at school in whole sample and in the two groups

Educational level	Call-up soldiers		Cadets	
	n	(%)	n	(%)
Degree	41	(4.7)	12	(0.6)
High school	489	(56.5)	1546	(75.7)
Secondary school	308	(35.6)	478	(23.4)
Primary school	27	(3.1)	7	(0.3)
Total no respondents 2 (0.07%)	865		2043	

$\chi^2 = 162.9$ $p < 0.0001$

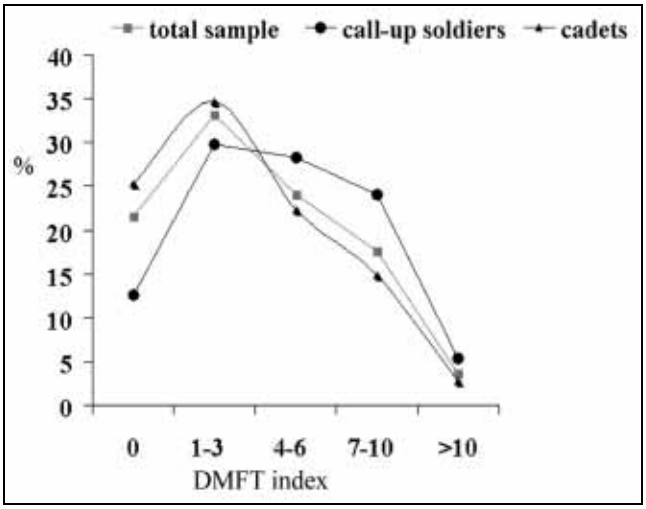

Fig 1 DMFT distribution in whole sample and the two groups.

Data Collection and Analysis

The following variables were quantified and recorded:
- DMFT and its components
- The necessity of treatment required through CPITN.

CPITN was evaluated based on the highest value recorded and mean sextant value for each patient. Data elaboration was carried out at the 'WHO Collaboration Centre of Milan for Epidemiology and Community Dentistry' using SPSS 10 for Windows.

Comparison of a quantitative variable among groups was carried out using one-way analysis of variance (ANOVA). To avoid the attenuating effect of unequal variability among groups on the value of *t*, a square root transformation was performed when the response variable was a count. Independence among qualitative variables was tested using the χ^2 test. The caries prevalence was calculated as the number of subjects with DMFS > 0 compared to the whole sample.

Data on DMFT were compared by ANOVA. A p value < 0.05 was considered as statistically significant.

RESULTS

In the call-up soldiers group the total number of non-responders was 317 (26.77%). The average reason for non-response was that soldiers were on external assignments or on leave. None of the presenting call-up soldiers refused to be examined or be included in the study.

In the cadets group, the total number of non-responders was 434 (17.52%): 8.24% failed to attend the examinations; 3.46% refused to be examined; and 7.52% agreed to be examined but did not want their results included in the study.

Table 1 reports the distribution of the subjects in the two groups by education level. In both groups, the highest percentage of subjects had completed high school (56.5% for call-up soldiers vs.75.7% for cadets). The different educational stratification of the two groups was statistically significant.

DMFT

The mean DMFT value observed was 3.69 ± 3.31. The call-up soldiers showed a higher level of caries indices both for DMFT and subgroups. The difference between the two groups was statistically significant for D e F components ($p < 0.05$) (Table 2). The depiction of the different component of DMFT (D, M and F) by educational level showed statistically significant differences for D and F subgroups ($p < 0.05$) in the call-up soldiers group and for F in the cadets group.

The distribution of caries index in the total sample and in the two groups is displayed in Fig 1. It is noteworthy that the caries-free rate is lower in the call-up soldiers group (12.57%) than that reported

Table 2 Number of subjects, mean ± standard deviation of DMF(T) index by military classification (call-up soldiers and cadets) and educational level

	n° subjects	Decayed Mean ± S.D.	Missing Mean ± S.D	Filled Mean ± S.D	DMFT Mean ± S.D
Total sample	2910	0.72 ± 1.26	0.26 ± 0.79	2.72 ± 3.07	3.69 ± 3.31
Call-up soldiers	867	1.20 ± 1.62	0.28 ± 0.83	3.16 ± 3.24	4.64 ± 3.38
Cadets	2043	0.51 ± 1.00	0.25 ± 0.78	2.53 ± 2.98	3.29 ± 3.20
*Anova one-way		p < 0.05	p > 0.05	p < 0.05	p < 0.05
Call-up soldiers					
Educational level primary school		1.89 ± 1.92	0.15 ± 0.36	1.59 ± 2.41	3.63 ± 2.65
Educational level secondary school		1.53 ± 1.92	0.33 ± 0.81	2.75 ± 3.23	4.61 ± 3.59
Educational level high school		1.00 ± 1.38	0.25 ± 0.84	3.40 ± 3.20	4.64 ± 3.27
Educational level degree		0.68 ± 1.21	0.39 ± 1.02	4.10 ± 3.43	5.17 ± 3.03
*Anova one-way		p < 0.05	p > 0.05	p < 0.05	p < 0.05
Cadets					
Educational level primary school		0.57 ± 0.98	0.57 ± 0.79	1.29 ± 1.60	2.43 ± 1.51
Educational level secondary school		0.53 ± 1.05	0.24 ± 0.85	1.73 ± 2.443	2.50 ± 2.79
Educational level high school		0.50 ± 0.98	0.25 ± 0.75	2.78 ± 3.09	3.53 ± 3.29
Educational level degree		0.51 ± 1.00	0.58 ± 1.24	3.33 ± 3.50	4.42 ± 3.03
*Anova one-way		p > 0.05	p > 0.05	p < 0.05	p < 0.05

Table 3 Caries experience, DMFT (mean ± Standard Deviation) by educational level

	Primary school caries exp (%) mean ± S.D.		Secondary school caries exp (%) mean ± S.D.		High school caries exp (%) mean ± S.D.		Degree caries exp (%) mean ± S.D.	
Total sample	(88.24)	3.38 ± 2.49	(74.05)	3.32 ± 3.29	(79.71)	3.80 ± 3.32	(92.40)	5.00 ± 3.19
Call-up soldiers	(88.89)	3.63 ± 2.65	(86.69)	4.61 ± 3.59	(87.32)	4.64 ± 3.27	(92.68)	5.17 ± 3.26
Cadets	(85.71)	2.43 ± 1.51	(65.90)	2.50 ± 2.79	(77.30)	3.53 ± 3.29	(91.67)	4.42 ± 3.03
Anova one-way	p < 0.01		p < 0.01		p < 0.051		p < 0.051	

for the cadets group (25.26%), and the difference was statistically significant ($p < 0.01$). Results of the DMFT index for the different educational levels are presented in Table 3. In the call-up soldiers group, subjects with a university degree had a mean DMFT index of 5.17 ± 3.26, while in the cadets group subjects with a university degree had a mean DMFT of 4.42 ± 3.03. Thus, for each education level the mean DMFT was higher in the call-up soldiers group. The difference was always statistically significant.

CPITN

Table 4 reports gingival and periodontal conditions in all samples and in the two groups. A healthy periodontium was observed in more than 50% of the samples. In the call-up soldiers group, 40.95% had healthy periodontal conditions; 40.25% of the subjects showed bleeding on probing; 19.03% presented with calculus; and 2.77% presented periodontal pockets 4–5 mm deep. In the cadets group, 57.95% had healthy periodontal conditions;

Table 4 Gingival and periodontal conditions in total examined sample and in the two groups

	Healthy		Bleeding		Calculus		4–5 mm pockets	
	n°	(%)	n°	(%)	n°	(%)	n°	(%)
Total sample	1539	(52.89)	1129	(38.79)	211	(7.25)	31	(1.07)
Call-up soldiers	355	(40.95)	349	(40.25)	139	(16.03)	24	(2.77)
Cadets	1184	(57.95)	780	(38.18)	72	(3.52)	7	(0.35)
χ^2	$p < 0.001$		$p > 0.05$		$p < 0.001$		$p < 0.001$	

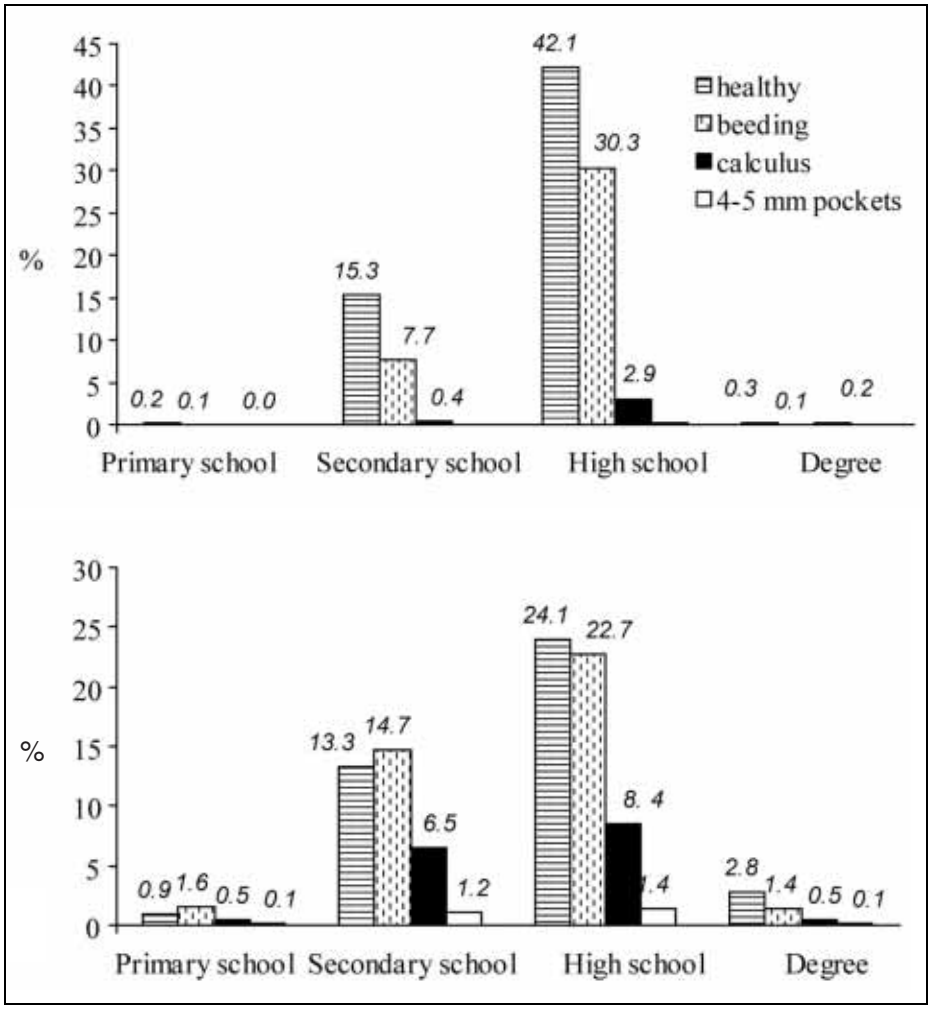

Fig 2 Distribution of CPITN index in the two groups stratified for educational level.

38.18% of the subjects showed bleeding on probing; 3.52% presented with calculus; and 0.35% presented periodontal pockets 4–5 mm deep.

The differences in proportion between the two groups were always statistically significant except for the bleeding score where an almost similar percentage for both groups was recorded. The distribution of the CPITN index in the two groups stratified for educational level is displayed in Fig 2.

A healthy periodontium was observed in 42.71% of high school graduates in the call-up soldiers group. In this subgroup, 34.70% of the subjects

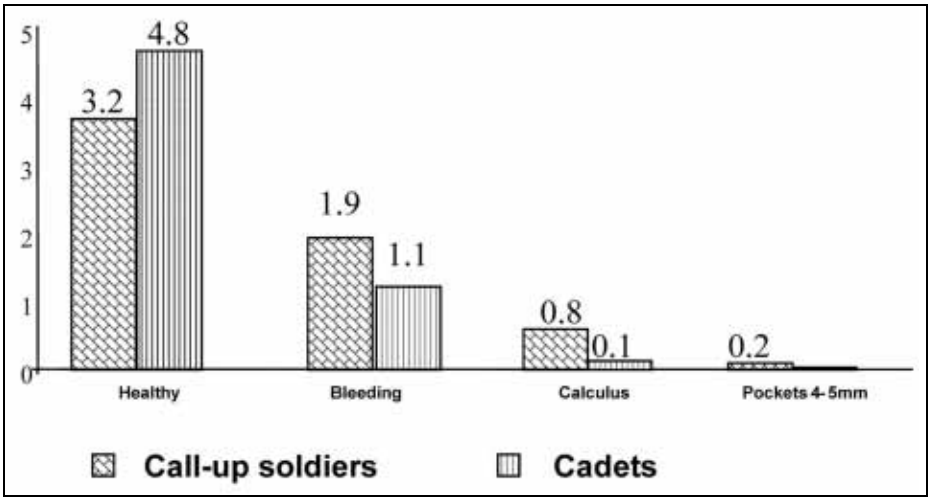

Fig 3 Sextants' mean number in call-up soldiers and cadets.

showed bleeding on probing; 18.89% presented with calculus; 3.29% presented periodontal pockets 4–5 mm deep. The corresponding values for secondary school graduates were: 37.58%, 35.29%, 22.22% and 4.58%, respectively. Finally, 19.63% of subjects who completed only elementary school had healthy periodontal conditions; 48.15% of the subjects showed bleeding on probing; 18.52% presented with calculus; and 3.70% presented periodontal pockets 4–5 mm deep. In the cadets group the distribution of the CPITN by educational level was: high school graduates 24.34% healthy; 23.75% bleeding; 8.55% calculus; and 2.36% pockets 4–5 mm deep; Secondary school graduates: 13.78% healthy; 16.22% bleeding; 7.47% calculus; and 2.33% pockets 4–5 mm deep.

For the other two educational levels, please refer to Fig 2. In Fig 3, the sextants' mean number is presented. The differences between the two groups were statistically significant for CPITN = 0 (healthy condition 3.2 vs. 4.8 $p < 0.05$); CPITN = 1 (bleeding at probing 1.9 vs. 1.1 $p < 0.05$); and CPITN = 2 (calculus 0.8 vs. 0.1 $p < 0.05$).

DISCUSSION

In the present study, higher values for DMFT were observed in the call-up soldiers group than in the cadets group. Furthermore, the various components of the DMFT index varied consistently according to the subjects' level of education.

Concerning the CPITN index, periodontally healthier subjects were more frequently observed in the cadets group, although bleeding on probing was similar in both groups. A variation according to the soldiers' level of education was also observed for the CPITN index.

In Italy, military service has only recently been extended to include women. Thus, the report's sample only consisted of male subjects. Strohmenger et al (1991) performed a nationwide periodontal examination on 55314 subjects, both men and women aged from 15 to 84, either still working at SIP (Societa' Italiana Postelegrafonici) or already retired. The results, expressed by CPITN index, did not show any relevant difference between males and females.

The higher DMFT index of call-up soldiers compared to the cadets group might be related to higher educational level of the cadets group according to Italian standards. Most subjects had completed a high school education, although some individuals from the call-up soldiers group only had an elementary education. This is also demonstrated by the distribution curve of DMFT in the two groups.

These results might suggest that individuals with a higher socio-economic status undergo dental treatment more often than individuals with a low socio-economic status. Similar correlations between different socio-economic groups, together with the presence of carious lesions and their treatment, have been reported in Great Britain (Downer, 1991; Murray et al, 1991), in Belgium (Nieuwenhuysen et al, 1992), in Norway (Asmyhr et al, 1994), in the USA (Chisick, 1995) and in Denmark (Antoft et al, 1999).

The DMFT scores observed in the Italian soldiers included in the study are not dissimilar to those reported in recent international publications. Antoft

et al (1999) reported a DMFT of 6.1 in Danish soldiers, and Menghini et al (2001) reported a DMFT of 5.06 in Swiss soldiers.

In the present study, no radiological examination was performed in order to help the detection of interproximal caries. The above-mentioned studies by Asmyhr et al (1994) and Menghini et al (2001) included bitewing radiographs in their examinations. In particular, Asmyhr et al (1994) reported an increase in the DMFT value of about 8.5% when radiographs supported the clinical examination. In the study by Menghini et al (2001), the radiological examination increased the DMFT value by 0.64 (from 4.42 to 5.06).

Bleeding on probing was found to be similar for both groups. On the other hand, the proportion of periodontally healthy subjects and subjects with calculus was quite different in the two groups. The same trend can be applied when sextants are taken into consideration. The similarity of bleeding on probing in the two groups might be explained by the fact that only 1% of call-up soldiers as well as cadets practised appropriate oral hygiene techniques. This is supposed to have an effect on bleeding on probing but not on calculus, which is removed by the dentist during further recall visits.

Strohmenger et al (1991) reported on the periodontal health status of 1924 young Italians aged from 20 to 24. Data were collected in 1984–1985 by the 'WHO Collaboration Centre of Milan for Epidemiology and Community Dentistry' and showed a lower proportion of healthy subjects (13.30% vs. 41.23% in the present study).

Among the military academies involved in this study, the best results in terms of CPITN index were found in those academies which provided their own dental facilities (Pozzuoli and Livorno), and where the resident dentist performed periodical dental check-ups and gave oral hygiene and preventive instructions to the soldiers. Gomez-Santos et al (1995) performed a study comprising 290 Spanish soldiers stationed in Tenerife, Canary Islands. Comparing the results from the Spanish study with this study, it appears that periodontal health is much better among Italian soldiers than among their Spanish colleagues (41.23% healthy subjects among the Italian soldiers vs. 21.10% among the Spanish soldiers) (Table 5).

WHO guidelines are especially applicable to the purpose of this paper because the procedures are easy to understand, can be quickly implemented, provide both a reliable evaluation of the actual pathologies and a quantification of the needed treatment, and allow the comparison of data from different geographical areas. Furthermore, WHO experts are always available on a consultancy basis.

Table 5 Gingival and periodontal condition among Italian and Spanish recruits

Healthy	Italian recruits	Spanish recruits
Bleeding	52.89%	21.10%
Calculus	38.79%	10.00%
4–5 mm pockets	7.25%	44.40%
5 < mm pockets	1.07%	24.10%
Healthy	0.00%	0.40%

In conclusion, the present study shows that call-up soldiers have a higher DMFT index than cadets; moreover, the D value is higher in less educated subjects. This could be explained by the fact that the level of education might play an important role in caries prevention (Marthaler, 2002).

According to the CPITN criteria, our results show that there were no marked differences of BOP as measured. Gingivitis is a disease that can affect all social groups, probably because a vast majority of the Italian population does not practise appropriate oral hygiene techniques. Thus, this study underlines the need for a systematic information campaign on oral hygiene in Italian schools (Campus et al, 2000).

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