

# Periodontal status and treatment needs among spanish military personnel

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## Abstract

**Introduction:** Problems arising from poor gingival and periodontal health in military personnel account for around 10% of the emergencies of oral origin during deployments and manoeuvres. Consequently, it is important to ascertain the prior oral health situation among Spanish military personnel.

**Objective:** To assess the periodontal health status and treatment needs of a population of Spanish Army personnel at the General Almirante Base at Marines, in the province of Valencia, and calculate the time required to cover the treatment needs of this population.

**Materials and methods:** Observational cross-sectional study of periodontal health status in a representative sample of the population in question. The community periodontal index (CPI) was used in accordance with WHO criteria. The sample comprised 387 subjects, selected by systematically sampling those attending the sick bay at the base for different reasons. The examinations were carried out by a single examiner; the intra-observer Kappa index was 0.83. Data collection began in December 2003 and ended in July 2004.

**Results:** All sextants were healthy in 7.2% of the sample. The most prevalent condition was the presence of calculus, especially in the younger population. 7.8% had 4-5 mm periodontal pockets and 2.3% had pockets of 6 mm or more, all in the over-25 age group. The women below 25 years of age were significantly more healthy than the men. The healthy sextants mean was 2.38, without differences by rank. Privates presented a significantly higher mean figure for sextants with bleeding, while officers and non-commissioned officers presented a higher average number of sextants with pockets. Practically every subject needed oral hygiene instructions and scaling and root planing but only 2.3%, all over 25 years old, required complex treatments. The estimated treatment time need is 1 hour per person per year.

**Key words:** *Periodontal status, periodontal treatment needs, military personnel.*

## Introduction

The importance of health in general and oral health in particular entails particular considerations and repercussions from a military point of view because of the direct and indirect consequences for the Service / deployment caused by a loss of oral health. One of the aims of the military training given to soldiers and sailors is to achieve the required physical and mental fitness for the mission to be carried out. This requires sufficient general and oral health for training and taking part in exercises, manoeuvres and deployments (1,2).

Gingival and periodontal problems made up 6.73% of the emergencies of oral origin among Spanish military personnel deployed in Bosnia-Herzegovina that were treated by the dental service of the 2nd Echelon deployed at Mostar airport in the year 2000 (3). Data on the same situation in the US Army published between the years 2000 and 2003 give figures that range from 2.8% to 9.6% (4).

Localisation of bacterial plaque on the gingival edge of the tooth plays a fundamental role in the genesis of gingival problems. The pathogenesis of periodontitis is more complex, involving microorganisms in the sub-gingival

plaque and the response of the host. Several systemic pathological conditions can also be associated with periodontal pathology (5).

Figures on periodontal diseases have been collected in Spanish national epidemiological surveys. In the past 15 years it has been observed that over half the population presents bleeding and/or calculus or overhanging fillings but that pockets are not a widespread problem, although their prevalence and depth increase with age. Another sign of the improvements that have been taking place is the drop in the mean number of sextants with pockets or excluded sextants (6-8).

To the best of the authors' knowledge, no recent epidemiological data have been published on the gingival and periodontal health status of professional military personnel in the Spanish Armed Forces, although data exist for caries prevalence, oral hygiene status and the results of dental health education campaigns among conscripts. This information is very important for establishing priorities and determining the type and quantity of prevention and treatment services required, as well as the type of personnel who are needed to provide them.

The present study proposed to examine the periodontal health status and treatment needs of a representative sample of the military personnel at the General Almirante Base at Marines, Valencia.

## Materials and Methods

An observational cross-sectional study was designed. The sample was composed of 387 military personnel from the General Almirante Base at Marines, Valencia. The sample size was calculated assuming an alpha error of 5%, a 95% confidence interval and a 25% prevalence of codes 3 and 4 in the population, based on data for the 35-44 year-old population in the Spanish national epidemiological study (7).

The study employed systematic sampling of subjects visiting the Unit's Sick Bay for any of the following reasons: medical examination for a driving licence, regular check-up, inspection reasons such as sick-leave monitoring, minor injuries, vaccinations or administrative tasks. A visit to the sick bay does not necessarily mean that the subject is suffering from any illness.

The criteria for inclusion were membership of the armed forces and being stationed at the General Almirante Base at Marines (Valencia). The criteria for exclusion were any disease or ailment that could affect or cause a deterioration in the subjects' general health, or oral health problems; these made up approximately 2% of those visiting the sick bay. Approximately 6% of the subjects declined to take part in the study.

Informed consent was obtained from all those examined, who were advised of their current state of health and given specific preventive and therapeutic recommendations for their particular health situation. Where emergency care

was required, it was provided at the time or, if applicable, the person was referred to the dental services of their private health insurance company.

The data were collected by single examiner, starting in December 2003 and ending in July 2004. The examinations were made in the dental clinic of the General Almirante Base sick bay, using the dental unit light as the light source.

The periodontal status assessment criteria were those proposed in the WHO's 1997 oral health survey methods manual (9), employing the community periodontal index (CPI). The index teeth examined in each of the six sextants were 17, 16; 11; 26, 27; 36, 37; 31; 46, 47. A sextant was only examined if there were at least two teeth not indicated for extraction, otherwise that sextant was excluded. If no index tooth was found in a sextant qualifying for examination, the remaining teeth in the sextant were examined and the highest score was recorded as the value for the sextant.

The WHO periodontal probe was used, not employing a force greater than 20 g. Each sextant was defined as follows: healthy, scored as PCI code 0; bleeding observed on probing, PCI 1; calculus detected, PCI 2; pocket of 4-5 mm, PCI 3; or pocket of 6 mm or more, PCI 4.

Other variables that were recorded were the subjects' age, sex and rank.

To ensure the reliability and validity of the results, the examiner was first calibrated against an experienced examiner, obtaining a 0.85 Kappa index and a percentage agreement of 99.4% for a PCI code 3 score. Also, to ensure consistency throughout the study, a random 10% of the sample was re-examined and the intra-observer agreement was calculated; the percentage agreement was 99% and the Kappa index was 0.83 for the same PCI score.

The SPSS 12.0 software package (SPSS Inc., Chicago, IL) was used for the statistical analysis. A descriptive analysis was performed, using the arithmetic mean as the measure of the central tendency and the typical deviation as that of dispersion for the quantitative variables; for the categorical variables, the descriptive index employed was the relative percentage frequency.

Depending on the type of variables to be compared, the measures of association employed were Student's t-test for independent samples and the Mann-Whitney U test. Multiple logistic regression analysis was conducted to assess the influence on the highest CPI score of the factors of age, sex and rank and the interactions considered relevant a priori. The precision was calculated for a 95% confidence level. A value of  $p < 0.05$  was considered statistically significant.

## Results

The sample comprised a total of 387 subjects. The breakdown by sex was 302 men (78%) and 85 women (22%). By rank, 294 were troop (76%) and 93 were officers or

non-commissioned officers (NCOs) (24%). The mean age overall was 27.39 years (SD 8.14); the mean age of the officers and non-commissioned officers was 39.04 years (SD 7.3), while the troop averaged 23.7 years (SD 3.65). The men were older than the women, as the mean ages were 28.78 (SD 8.78) and 24.28 (SD 3.92) respectively (Table 1).

As regards the percentage of subjects in each highest CPI code group, it was found that only 7.2% of the sample were healthy, while 10.1% presented bleeding, calculus was present in 72.6%, and 7.8% and 2.3% respectively had pockets of 4-5 mm or of 6 mm or more. Table 2 shows the influence on highest CPI score of the three variables, dichotomised, without stratification. It will be seen that the main statistically significant differences are that the over 25-year-old group and the officers and NCOs showed a greater prevalence of sextants with pockets while those under 25 years old and troop had a higher prevalence of calculus. A higher percentage of women than men were healthy in all their sextants.

The influence of age, sex and rank on periodontal health status was assessed; as shown in table 2, it was found that the cohort aged under 25 years had a higher prevalence of calculus and no pockets of 6 mm or more. The presence of 4-5 mm pockets was more prevalent in the population of over 25 years of age (12.9%), while periodontal pockets of 6 mm or more were only found in 4.5% of the over 25-year-old population. The women were healthier than the men, to a statistically significant degree.

The cohort of troop, 15 years younger than that of officers and NCOs at 23.7 (SD 3.6) and 39 (SD 7.4) years of age respectively, was characterised by a greater prevalence of calculus, namely 76% compared to 60%, while that of officers and NCOs was characterised by the greater prevalence of pockets of either type, at 22.6% against 6.2%. There were no significant differences in the prevalence of healthy sextants or in bleeding observed after probing.

The mean of healthy sextants in the sample as a whole was 2.38 (SD 1.90), while bleeding was observed in a mean of 1.88 sextants (SD 1.72), calculus in 1.47 sextants (SD 1.45), shallow pockets in 0.22 (SD 0.75) and deep pockets in 0.03 (SD 0.28).

The relationship between the number of sextants affected and the age, sex and rank variables is shown in table 3. As regards the mean sextants per person, the most common situation was to present over 3.5 sextants per person with signs of disease. In the under 25-year-old group, these sextants were affected above all by gingivitis. The over 25 age group, on the other hand, was characterised by the presence of periodontal pockets of both types, but especially by that of deep ones, which were not found in the under-25s.

**Table 1.** Description Of Variables: Age, Sex And Rank.

<b>AGE</b>	Completed years	27.4 ±8.1
<b>SEX</b>	Men	302/387 (78.0%)
	Women	85/387 (22.0%)
<b>RANK</b>	Troop	294/387 (76.0%)
	Officers and Non-Commissioned Officers	93/387 (24.0%)

**Table 2.** Number And Percentage Of Individuals In Highest Cpi Codes By Age, Sex And Rank.

CPI CODE		Number and percentage				
		0	1	2	3	4
AGE	<25 years	13/186(7.5%)	21/186(11.3%)	148/186(79.6%)*	4/186(2.2%)	0.0%
	≥25 years	15/201(7.5%)	18/201(9.0%)	133/201(66.2%)	26/201(12.9%)*	9/201(4.5%)*
	p	NS	NS	.003	< .001	.004
SEX	Man	15/302(5.0%)	27/302(8.9%)	226/302(74.8%)	26/302(8.6%)	8/302(2.6%)
	Woman	13/85(15.3%)*	12/85(14.1%)	55/85(64.7%)	4/85(4.7%)	1/85(1.2%)
	p	.001	NS	NS	NS	NS
RANK	Troop	19/29(46.5%)	32/294(10.9%)	225/294 (76.2%)*	14/294(4.8%)	4/294(1.4%)
	O/NCO	9/93(9.7%)	7/93(7.5%)	56/93(60.2%)	16/93(17.2%)*	5/93(5.4%)*
	p	NS	NS	.002	< .001	.025

p<0.05, Mann-Whitney U test  
 O/NCO: Officer/Non-Commissioned Officer  
 NS: not statistically significant

**Table 3.** Mean sextants per person for each code By age, sex and rank.

CODE		Mean and standard deviation of sextants affected per person				
		0	1	2	3	4
AGE	<25 years	2.35 (1.95)	2.16 (1.80)*	1.46 (1.32)	0.03 (0.25)	0.00 (0.00)
	≥25 years	2.41 (1.88)	1.64 (1.60)	1.48 (1.38)	0.39 (0.99)*	0.07 (0.39)*
	p	NS	.003	NS	< .001	.004
SEX	Man	2.26 (1.82)	1.91 (1.64)	1.53 (1.33)	0.25 (0.81)	0.04 (0.31)
	Woman	2.81 (2.11)*	1.79 (1.81)	1.26 (1.39)	0.11 (0.51)	0.01 (0.11)
	p	.031	NS	NS	NS	NS
RANK	Troop	2.32(1.91)	2.04*(1.74)	1.49(1.35)	0.13(0.60)	0.017(0.15)
	O/NCO	2.59 (1.88)	1.4 (1.54)	1.41(1.34)	0.51 (1.07)*	0.11(0.50)
	p	NS	.001	NS	.001	NS

p<0.05, Mann-Whitney U test, Student's t-test  
 O/NCO: Officer/Non-Commissioned Officer  
 NS: not statistically significant

The mean number of sextants with calculus overlapped in the two cohorts and was under 1.5 per person.

The women presented more healthy sextants than the men, while these presented a higher mean number of sextants with bleeding, with calculus and with pockets, although the differences were not statistically significant.

In spite of the 15 years' difference between the troop and the officers/NCOs, the mean healthy sextants were similar (2.5/ person), as were those with calculus (1.4 sextants/person). The troop had a greater number of sextants with bleeding (2.0), half a sextant more on average than the officers and non commissioned officers (1.4). The cohort of officers and NCOs presented a greater number of sextants with shallow pockets (0.51) than the privates (0.13); there were differences in the mean number of sextants with deep pockets, but they were not statistically significant.

To assess the influence of age, sex and rank on the highest CPI score, a multiple logistic regression analysis was performed taking these three and the age/sex interaction as the predictor variables and the highest CPI score as the dependent variable, dichotomising the latter by setting the presence of calculus and pockets against healthy and bleeding when probed. The results are shown in table 4. In the logistic model, no interaction between the variables of age in completed years and military rank dichotomised as troop versus officers/NCOs was detected as regards the highest CPI score and these variables were successively eliminated from the initial model without affecting the likelihood ratio. In the final model, only sex remained as an explanatory variable of the differences in CPI. In short: the effect of men on the CPI score was 2.6 times higher (95% CI: 1.46-4.56) than that shown by women (p = 0,001).

As regards periodontal treatment needs, 92.8% of the sample required oral hygiene instructions, 82.7% also needed scaling and root planing and only 2.3%, all over 25 years of age, needed complex periodontal treatment.

**Table 4.** Multiple logistic regression.

		p	OR	(95% CI)
<b>Step 1</b>	rank	.184	0.488	( 0.17-1.405)
	age	.493	1.044	(0.923-1.182)
	sex	.389	3.974	(0.172-91.641)
	age by sex	.818	0.985	( 0.868-1.118)
<b>Step 2</b>	rank	.172	0.482	( 0.169-1.374)
	age	.296	1.031	( 0.974-1.091)
	sex	.001*	2.766	( 1.519-5.037)
<b>Step 3</b>	rank	.397	0.753	( 0.39-1.451)
	sex	.001*	2.782	( 1.527-5.067)
<b>Step 4</b>	sex	.001*	2.579	( 1.460-4.557)

Dependent variable: highest CPI, dichotomised α;  
 predictor variables: age, sex, age by sex, rank  
 α calculus and pockets versus healthy and bleeding  
 \*p<0,05  
 \*\* OR: odds ratio

With regard to the mean sextants requiring treatment, 1.69 needed scaling and root planing; the mean for sextants requiring this type of treatment was significantly higher in the over 25 age group. Only a mean of 0.03 sextants needed complex treatments, all in over 25-year-olds.

The men presented a significantly higher need for oral hygiene instructions than the women (95% compared to 84.7%) and a greater need for scaling and root planing (83.4% against 69.4%). The mean number of sextants with this treatment need was also higher among the men (1.82 compared to 1.38).

As regards distribution by rank, it was observed that both the oral hygiene instruction need and the scaling and planing need remained high and were encountered in similar proportions among troop and officers/NCOs; the statistically significant difference was found in the lower

number of sextants needing scaling and planing among the troop, compared to the officers/NCOs, at 1.63 and 2.02 sextants respectively. Complex treatment needs were also significantly more prevalent among the officers and non-commissioned officers than among privates, at 5,4% and 1,4% respectively.

The treatment time that would be required to attend to the needs of a population with the characteristics of this study population was estimated according to the following time allowances, as accepted by the FDI and the WHO: 30 minutes for oral hygiene instruction, 20 minutes per sextant for scaling and planing and 40 minutes per sextant for complex periodontal treatments. Based on the entire population of military personnel targeted by this study, which totalled 1715 officers and other ranks, 796 hours would be required for oral hygiene instruction ( $92.8\% \times 1715 \times 0.5$ ), 956 hours for scaling and planing ( $0.33 \times 1715 \times 1.69$ ) and 34 hours for complex periodontal treatments ( $0.66 \times 1715 \times 0.03$ ). The resulting total is 1786 hours per year, equivalent to 1.04 hours per person per year.

## Discussion

7,5% of the population surveyed were healthy in all their sextants; this healthy population percentage was lower than those found for adults in the Spanish national surveys of 2000 and 2005, bearing a greater resemblance to that of the 2002 survey of the population of the Canary Islands (7,8,10).

Survey results world-wide show a tendency for the percentage of healthy individuals to fall with age, with percentages ranging between 5% and 10% (11-13). The armed forces exhibit considerable variations in these figures: in 18 year-old recruits in Finland in 1986 (14), Brazilians in 1995 (15) and 2000 (16), military personnel in Israel in 2000 (17), and civilian employees of a hospital in Jerusalem in 1992 (18) the prevalence of healthy sextants did not exceed 9%, yet among military personnel in Denmark (19), with an age range of 19 to 49 years and a mean of 25 years, and in Italy (20), aged 19 to 25 years, the prevalence of healthy subjects was over 53% of the populations surveyed.

The prevalence of persons with every sextant healthy in the present study showed no differences between the two age groups studied or between privates and officers/NCOs. However, the difference by sex was significant, as the women presented a prevalence of healthy sextants three times higher than that of the men, which is in agreement, to a greater or lesser extent, with the results of surveys in Spain (6-8, 10) and other countries (19-21).

The mean number of healthy sextants per person in this survey did not reach 2.5; this result is similar to the data obtained in the Spanish national surveys (6-8) and higher than the findings of the Canary Islands survey (10). Overall, in the present survey, the women had more healthy sextants than the men, but when the cohorts of men and women were analyzed by age and rank the

differences ceased to be statistically significant.

The majority of the population surveyed presented some type of clinical situation requiring treatment. The most prevalent condition found, as in many of the surveys consulted, was the presence of calculus; in the present study this prevalence was over 70%. The mean for sextants with calculus was around 1.5 sextants per person. The men were more affected by calculus than the women, a similar result to that found in the Spain-wide surveys. (7,8).

The mean of sextants with gingivitis in this study was 1.9 in the under-25 age group and over 2 for the troop. Compared to other adult populations, these results were slightly higher, as in other surveys the mean sextants with gingivitis did not exceed 1.5 sextants per person (6-8,10, 13-15,20). Means similar to these, or even higher, were only found in surveys of young people under 27 years old (19,20,22).

The prevalence of individuals with pockets of either type in this study (10%) was similar to those found in surveys of Danish military personnel (8%) with a mean age of 25.2 years (19), Brazilian civilians aged 15 to 30 years (9%) (16) and American civilians (14%) with an average age of 30 years (23). However, the prevalence in this survey was lower than those found in the national surveys of the Spanish general population of adults (6-8) and in the population of the Canary Islands in 2002 (10).

A significantly higher prevalence of pockets of both types was found in the older age group and in the group of officers and non-commission officers, where the mean age was 15 years higher than that of the troop and could account for this significance. The prevalence of deep pockets was 2.3% of the entire population studied, but with the particularity of being concentrated in the over 25-year-old population, with a mean of half a sextant affected. Other studies of populations of under 25-year-olds such as those in the present study have also not found deep pockets (8, 13,16-18,24),

According to Gjermo (25), the term 'treatment needs' should be defined as the intervention needed in order to change the existing condition to the described goal. In a military environment the goal is to achieve a sufficient state of general health, and oral health in particular, to be able to train and to take part in exercises, manoeuvres and deployments (1-3,25).

In this survey, the most prevalent need, present in over 90% of those surveyed, was the need for hygiene instruction. This showed itself to be independent of age and more related to sex; the same tendencies have been verified by various other surveys (5,6-8,10,5,19). The need for scaling and planing (82%) showed a greater similarity to the results of the Spanish national survey of 1993 (81%) (6). Complex treatments were needed by a small percentage of the over 25-year-old population (4.5%, with 0.07 sextants per person), a result which matches those of the Spanish surveys of the years 2000 (7) and 2005 (8).

## Conclusions

It may be concluded that the practical repercussions of ascertaining the periodontal health status and treatment needs of the Armed Forces lies, on the one hand, in that it may be inferred that a percentage of the military could become unfit for duty owing to a dental emergency of periodontal origin in the space of a few months if appropriate treatment is not received, and on the other, in the calculation of the time and resources required, both quantitative and qualitative. Treatment need proves to be a very widespread factor that varies by age, sex and rank. Efforts need to be focused above all on raising this population's awareness of the importance of oral hygiene and on early diagnosis of gingival and periodontal problems. As well as its repercussions for the Service, oral health maintenance is a factor that contributes to a greater presence of the Medical Corps in support of the Forces. To meet this objective, a preventive and curative oral and dental health policy adapted to the military environment, defining resources, objectives and priorities, needs to be planned and implemented. An added benefit is that provision of such care may constitute an incentive for professional military personnel to maintain their commitment.

## References

- Inspección General de Sanidad (IGESAN). Instrucción Técnica 01/03 de 10 de julio de 2003, ampliada en el Protocolo de 7 de enero de 2005 de la IGESAN, sobre reconocimientos para determinar la aptitud del personal militar participante en misiones fuera del territorio nacional.
- Chaffin J, King JE, Fretwell LD. U.S. Army dental emergency rates in Bosnia. *Mil Med.* 2001 Dec;166(12):1074-8.
- Moss DL. Dental emergencies during SFOR 8 in Bosnia. *Mil Med.* 2002 Nov;167(11):904-6.
- Dunn WJ, Langsten RE, Flores S, Fandell JE. Dental emergency rates at two expeditionary medical support facilities supporting operations enduring and Iraqi Freedom. *Mil Med.* 2004 Jul;169(7):510-4.
- Sollecito TP, Sullivan KE, Pinto A, Stewart J, Korostoff J. Systemic conditions associated with periodontitis in childhood and adolescence. A review of diagnostic possibilities. *Med Oral Patol Oral Cir Bucal.* 2005 Mar-Apr;10(2):142-50.
- Noguerol-Rodríguez B, Llodra Calvo JC, Sicilia-Felechosa A, Follana Murcia M. La salud buco dental en España 1994. Antecedentes y perspectivas de futuro. Madrid: Ediciones Avances; 1995.
- Llodra Calvo, JC, Bravo Pérez M, Cortés Martinicorena FJ. Encuesta de salud oral en España (2000). *RCOE* 2002; 7:19-63.
- Bravo Pérez M, Casals Peidró E, Cortés Martinicorena FJ, Llodra Calvo JC. Encuesta de salud oral en España 2005. *RCOE* 2006; 11: 409-56.
- Oral Health Surveys. Basic methods. 4th ed. World Health Organization. Geneva; 1997.
- Gómez Santos G, González Sierra MA, Gómez Santos D, Moreno Gonzalez AA, Graziani González R, Rodríguez Bernal O, et al. Estudio epidemiológico de la salud oral de los adultos. Canarias 2002. Sta Cruz de Tenerife: Dirección General de Salud Pública. Servicio Canario de Salud. Consejería de Sanidad del Gobierno de Canarias; 2002.
- Morimoto T, Miyazaki H. 15 years of CPITN--a Japanese perspective. *Int Dent J.* 1994 Oct;44(5 Suppl 1):561-6.
- Miyazaki H, Pilot T, Leclercq MH, Barmes DE. Profiles of periodontal conditions in adolescents measured by CPITN. *Int Dent J.* 1991 Apr;41(2):67-73.
- Tala H. Community periodontal index of treatment needs in Finland. *Int Dent J.* 1987 Sep;37(3):179-82.
- Nordblad A, Kallio P, Ainamo J, Dusadeepan A. Periodontal treatment needs in populations under 20 years of age in Espoo, Finland and Chiangmai, Thailand. *Community Dent Oral Epidemiol.* 1986 Jun;14(3):129-31.
- Dini EL, Foschini AL, Brandão IM. Periodontal conditions in a 7-19-year-old student population in Araraquara, São Paulo, Brazil, 1995. *Cad Saude Publica.* 1997 Apr;13(2):321-324.
- Gesser HC, Peres MA, Marcenes W. Gingival and periodontal conditions associated with socioeconomic factors. *Rev Saude Publica.* 2001 Jun;35(3):289-93.
- Katz J, Peretz B, Sgan-Cohen HD, Horev T, Eldad A. Periodontal status by CPITN, and associated variables in an Israeli permanent force military population. *J Clin Periodontol.* 2000 May;27(5):319-24.
- Horev T, Katz J, Almog D, Goldberg A, Shpigelman A, Rajnay W. Oral health disparities between ranks in a military environment: Israel Defense Force as a model. *Mil Med.* 2003 Apr;168(4):326-9.
- Marker OT, Vigild M, Praetorius F. Oral health problems and treatment needs in Danish military personnel recruited for United Nations service. *Mil Med.* 1997 Jun;162(6):416-21.
- Senna A, Campus G, Gagliani M, Strohmer L. Socio-economic influence on caries experience and CPITN values among a group of Italian call-up soldiers and cadets. *Oral Health Prev Dent.* 2005;3(1):39-46.
- Sgan-Cohen HD, Donchin M, Goultschin J, Soskolne A, Brayer L. Periodontal treatment needs, by CPITN, among employees of a Jerusalem hospital. *Int Dent J.* 1992 Apr;42(2):92-6.
- Melvin WL, Sandifer JB, Gray JL. The prevalence and sex ratio of juvenile periodontitis in a young racially mixed population. *J Periodontol.* 1991 May;62(5):330-4.
- Horning GM, Hatch CL, Lutskus J. The prevalence of periodontitis in a military treatment population. *J Am Dent Assoc.* 1990 Nov;121(5):616-22.
- Brown LJ, Oliver RC, Loe H. Evaluating periodontal status of US employed adults. *J Am Dent Assoc.* 1990 Aug;121(2):226-32.
- Gjerme P. Factors influencing the assessment of treatment needs. *J Clin Periodontol.* 1991 Jul;18(6):358-61.