

Periodontal conditions of Swiss Army recruits – Positive effects of prevention-oriented dentistry

Abstract

The purpose of this survey was to compare the periodontal conditions of Swiss Army recruits in 1996 with those of a previous survey in 1985. This allowed an evaluation of the effects of prevention-oriented dentistry, practiced in Switzerland for the last two decades, on a representative young male Swiss population.

419 Swiss Army recruits were examined for their oral health status including periodontal conditions, caries prevalence, stomatological and functional aspects of the masticatory system. In particular, this report deals with the assessment of Plaque Index (PII), Retention Index (RI) and Gingival Index (GI), as well as Pocket Probing Depth (PPD) and Probing Attachment Loss (PAL). The latter two parameters were assessed on four aspects on the teeth in the 1st and 3rd quadrants, while the PII, RI and GI were scored on four surfaces of all teeth. 1.8% of the teeth were missing, mostly because of first premolar extractions (85%) due to orthodontic indications. The mean PII was 0.99, the mean RI was 0.13 and the mean GI = 0.91. On an average, 17.4% of the gingival units bled on probing. The mean PPD was 2.25 mm and the mean PAL 0.47 mm. Only 4.5% of the recruits showed at least one site of PPD \geq 5 mm, and only 0.7% yielded more than one site with PPD \geq 5 mm. In comparison to a survey of similar nature in 1985, this 1996 Army survey yielded substantial reductions in mean BOP from 38% to 17.4% and a substantial reduction by approximately 70% in the prevalence of periodontal pockets of 5 mm or more. This in turn means, that the efforts in oral health prevention practiced by the dental profession for the last decades has dramatically improved periodontal health in young adults.

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Introduction

Epidemiological studies in well defined population groups or in randomly selected populations provide adequate information for the determination of the treatment needs and the calculation of manpower within the dental profession to effectively prevent the most common diseases of civilization within modern societies (WHO 1978). Both diseases, i.e. caries and periodontal disease, have been shown to represent opportunistic infections with a chronic and predominantly slow progressive nature as a result of a multifactorial etiology.

In Switzerland, a number of cross-sectional studies have been performed within the last decade (SCHÜRCH et al. 1988, 1990, 1991, TRAM 1997) indicating that advanced periodontitis affects a relatively small proportion (4–7%) of the population, while approximately 25–30% are affected by mild to moderate periodontitis. However, localized gingivitis appears to be prevalent in a high proportion of individuals (>90%). Also, both the periodontal conditions and dental caries have been evaluated in several epidemiological surveys in Switzerland within the last 3 decades. First, a group of 522 recruits was examined in an infantry military base in 1970 (CURILOVIC et al. 1972, GERMAN 1973 et al., SAXER et al. 1972). Subsequently, 1119 recruits at the Army base of Thun were examined in 1974 (RAMEL 1976). In this study, the functional aspects of the masticatory system were especially considered. Then, in 1985, 753 Swiss Army recruits were examined at the Army base of Thun with respect to their oral health status. In this latter survey, the periodontal conditions (JOSS et al. 1992), the status of dental caries (MENGHINI et al. 1991) and the functional aspects (JENNI et al. 1987, INGERVALL et al. 1988) of the masticatory system were all subject of evaluation. In addition, an analysis of bitewing radiographs was performed (LANG

et al. 1988). In Switzerland, the entire young male population is required to serve in the Army with the exception of exemptions due to medical reasons. Furthermore, the Army Base at Thun represents a federal training camp in which recruits representing all four national languages and different professional backgrounds are encountered. Hence, it can be assumed that the Army recruits represent a cross-sectional sample of the socio-economic structure as well as the geographic distribution of the young male population of Switzerland. Surveys of Army recruits will also reflect light on the efficiency of preventive school dentistry programs and the effect of professional and self-care during adolescence in preventing oral diseases. The results of the 1985 survey, therefore, provide an ideal basis for the comparison with today's conditions. Hence, the purpose of this survey was to compare the various aspects of oral health in young male Swiss Army recruits with the results obtained 11 years prior at the same location. This report, in particular, deals with the periodontal conditions of the 1996 survey.

Material and Methods

In 1996, 419 Swiss Army recruits, aged 19 to 20 years, were examined for their oral health status including periodontal conditions, caries prevalence, stomatological, tooth structural and functional aspects of the masticatory system. As already shown in a similar study 11 years ago (JOSS et al. 1992), the recruits at the Army Base at Thun, Switzerland, represent a typical ethnic distribution of the young Swiss male population. According to the Federal Office for Statistics the different language percentages of the population in 1996 were used for the appropriate selection of subjects recruited for this cross-sectional study.

The following parameters were chosen to evaluate the periodontal conditions: The oral hygiene status was assessed using the Plaque Index System (PII; SILNESS & LÖE 1964). Furthermore, plaque retaining areas such as calculus, overhanging margins of restorations and open carious lesions, if present, were registered using the criteria of the Retention Index System (RI; BJØRBY & LÖE 1967). Gingival health or inflammation was evaluated according to the criteria of the Gingival Index System (GI; LÖE & SILNESS 1963). Pocket Probing Depths (PPD) as well as Probing Attachment Loss (PAL) were determined to the nearest millimeter using a calibrated Michigan M1 periodontal probe

with a point diameter of 0.4 mm (GLAVIND & LÖE 1967). No special attempt was made to standardize the probing pressure. All the parameters, however, were scored by experienced specialists in periodontology. Prior to the clinical examinations the investigators were calibrated and yielded high reproducibility. For the GI, the overall Kappa statistics were 0.78 and 0.83 at two different occasions ($p < 0.0001$). The intraexaminer variance was 0.116 mm². Of >2000 repeated measurements of PPD, 89% of the sites scored identical at 2 examinations and only 0.29% of repeated measurements differed 2 mm or more.

For the determination of the PII, GI and RI all the four surfaces of all teeth (28) (mesial, buccal, distal, oral) were scored. However, for PPD and PAL the proximal (mesial and distal), the oral and the buccal aspects of the teeth in the maxillary right and mandibular left dentitions (1st and 3rd quadrants) were assessed. Descriptive statistics were used to present the data obtained. Means and standard deviations per subject were computed as well as site means. Frequency analyses for different scores and probing measurements were depicted graphically.

Results

Tooth loss

In all 419 subjects, 211 teeth representing 1.8% of all teeth were missing which results in a mean of 27.5 teeth present per recruit. By and large tooth loss was encountered in the first premolar region ($n=179$), i.e. 85% of the teeth lost were first premolars. 13 molars representing 6.2% of the teeth lost and 11 maxillary lateral incisors representing 5.2% were missing. Also, 4 canines (1.9%) and 3 mandibular central incisors (1.4%) were missing. 3 of the missing teeth (2 lateral incisors and one premolar) had been replaced with dental implants.

Clinical Indices

The mean clinical indices (PII, GI & RI) are depicted in Fig. 1. Plaque accumulation was registered with a mean PII=0.99 (S.D.=0.46). While the mean PII was higher on the oral and proximal surfaces (PII(o)=1.14 and PII(p)=1.02), the buccal surfaces yielded lower mean PII (PII(b)=0.82). The mean Retention Index for all surfaces was RI=0.13 (S.D.=0.18). Here, the highest mean RI=0.20 (S.D.=0.20) was encountered on oral surfaces. The mean GI on all surfaces was GI=0.91 (S.D.=0.43). However, very little variation in the mean GI was seen on the oral, proximal and the buccal gingival units, respectively.

In Fig. 2, the percentages of subjects with various mean indices are shown. Only 10% of the recruits showed a mean PII value <0.5, and approximately 50% yielded a PII \geq 1.0. Close to 90% of the subjects yielded a mean RI < 0.25. However, 68% of the subjects showed RI < 0.25 on oral surfaces.

The percentage of the different clinical sites scoring indices of 0, 1, 2 or 3 are depicted in Fig. 3. 24% of all the surfaces scored PII=2 or 3 representing plaque deposits visible by the naked eye. On proximal gingival units, 15.6% scored GI=2 or 3, while on buccal gingival units only 13.6% and on oral units 22.1% yielded GI=2 or 3. This corresponds to a mean Bleeding on Probing (BOP) for 17.4% of all gingival units (Fig. 4). However, 24.9% of the molar surfaces yielded BOP as indicated by a GI of 2 or 3.

Fig. 5 depicts the mean clinical indices for anterior teeth (1, 2, 3), premolars (4, 5), molars (6, 7) and for all different surfaces at

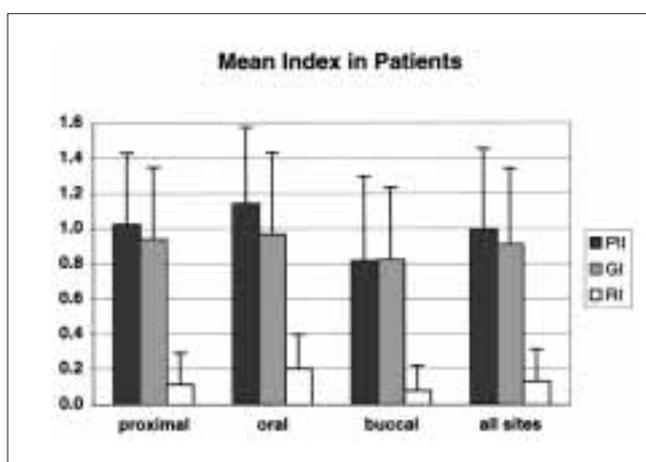


Fig. 1 Mean clinical indices for all 419 subjects. Plaque Index (PII), Gingival Index (GI) and Retention Index (RI) are presented for all teeth as well as for proximal, oral and buccal surfaces.

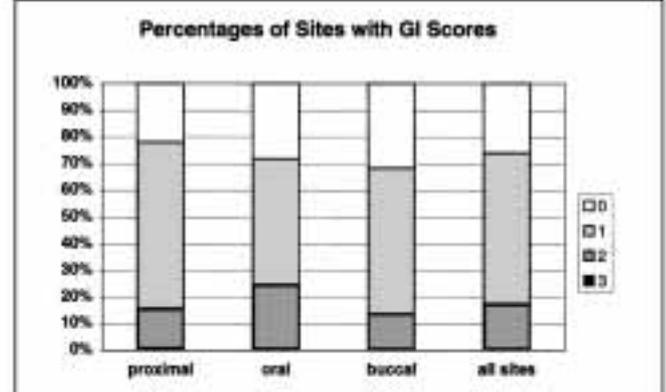
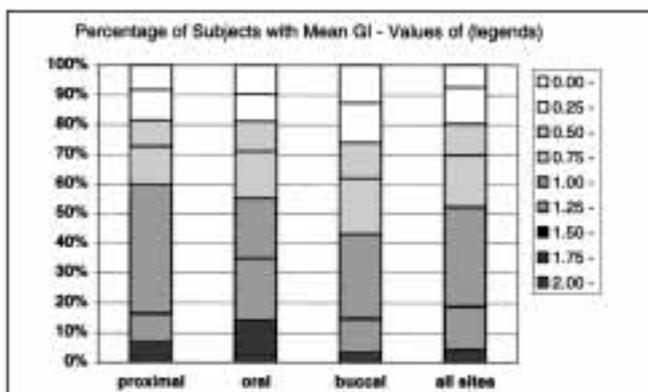
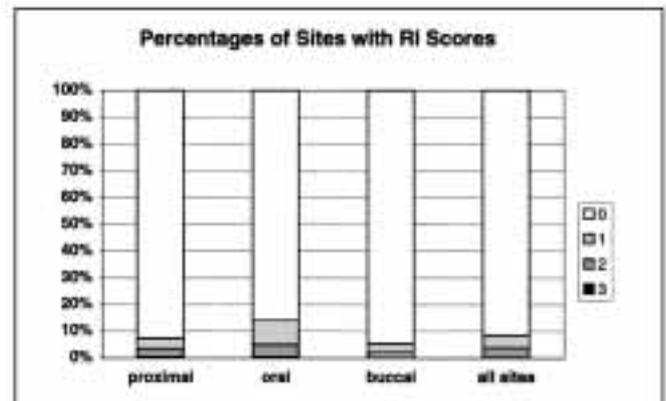
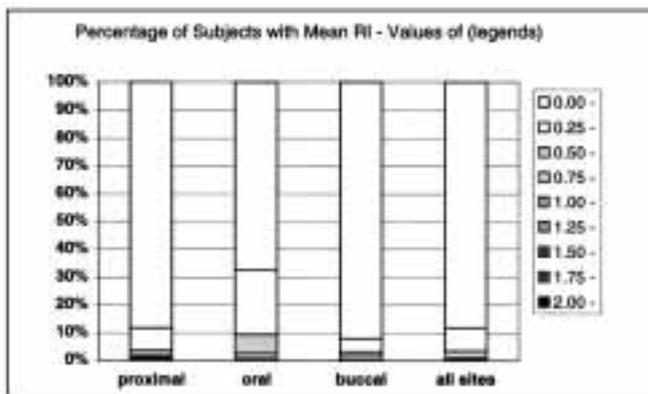
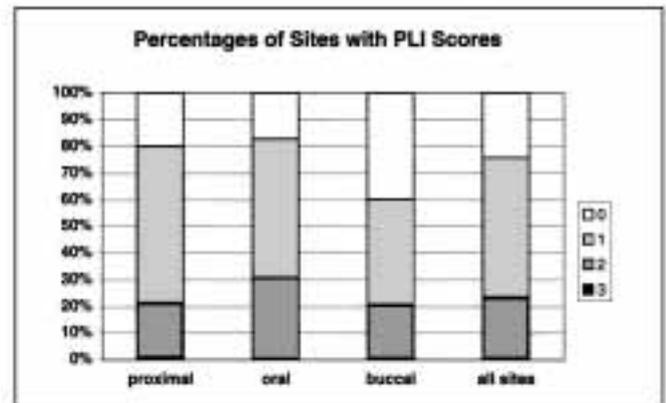
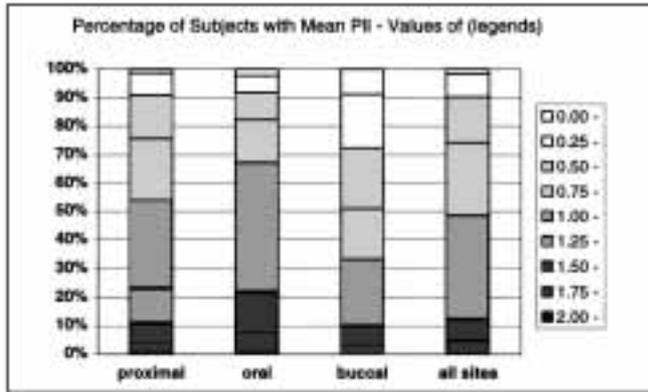


Fig. 2 Percentages of subjects with mean clinical index values stratified for all surfaces and the proximal, oral and buccal surfaces, respectively. Plaque Index (PII), Gingival Index (GI) and Retention Index (RI) values are depicted for 9 different categories of mean values.

Fig. 3 Percentages of different clinical sites scoring either 0, 1, 2 or 3, stratified for all surfaces and the proximal, oral and buccal surfaces, respectively

the teeth. While the anterior and premolar regions had mean PII between 0.84 and 1.0, the molar surfaces yielded a mean PII=1.27. The highest mean PII means were found on the proximal and oral surfaces of the molars (PII(p) =1.29 and PII(o) =1.34). The mean RI was low for most of the buccal and proximal surfaces. However, the oral surfaces of the anterior teeth had significantly increased mean RI, reaching RI = 0.38. The mean GI was again highest adjacent to the molars and especially to their oral and proximal aspects (GI(o) =1.18 and GI(p) =1.03).

The mean PPD and PAL values are presented in Fig. 6. On the average, the recruits showed a mean PPD =2.25 (SD =0.81) and a mean PAL=0.47 (SD=0.73). The proximal surfaces had slightly higher values of PPD=2.75 and PAL=0.93, and buccal surfaces showed a mean of PPD=1.61 and a mean PAL=0.0, and oral surfaces had PPD=1.89 and PAL=0.04. 19 out of the 419 recruits (4.5%) contributed with at least one site of PPD ≥ 5 mm (24 sites total). Only 3 subjects (0.7%) had PPD ≥ 5 mm at 2 or 3 sites. The deepest pockets (PPD=5 or 6 mm) were found at the distal aspects of second molars (10 of 24 sites).

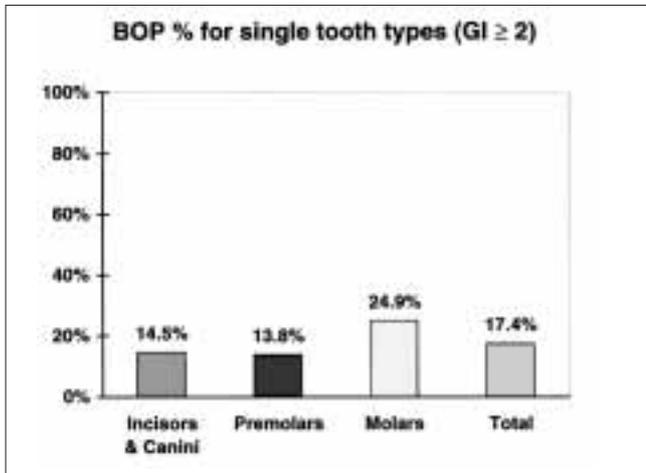


Fig. 4 Conversion of the Gingival Index (GI) into Bleeding on Probing (BOP) percentages. GI ≥ 2 was converted to a positive score of BOP.

Discussion

The present survey was the third evaluation of a young Swiss male population performed at a military base during the course of 26 years (CURIOVIC et al. 1972, GERMAN et al. 1973, JOSS et al. 1992). While all the previous and the present surveys attempted to represent the demographic situation of the young male Swiss adults at the end of school and adolescent dentistry services, substantial differences exist in the evaluation protocols of the three surveys. The first study performed in 1970 (CURIOVIC et al. 1972, GERMAN et al. 1973, SAXER et al. 1972) evaluated 522 recruits. In the second examination at the Army base at Thun in 1985, 753 recruits were examined. In the present study, 419 subjects were evaluated. Nevertheless, the comparison of the socioeconomic and geographical background of the 1985 and 1996 surveys yielded great similarities and hence, the present study may be considered as truly representative for the young adult male Swiss population in 1996. On the other hand, the fact that the clinical parameters assessed in 1970 differed substantially from those used in the evaluation of the 1985 and the 1996 recruits renders a direct comparison of the results in the three surveys difficult. In 1970 and in 1985, the Sulcus Bleeding Index (SBI) (MÜHLEMANN & SON 1971) was used as a leading index for the assessment of gingivitis, while in the present study, the criteria of the Gingival Index (LÖE & SILNESS 1963) were used. The latter also allowed direct conversion of GI scores of 2 or 3 into Bleeding on Probing (BOP) positive sites. However, in converting the SBI into BOP%, the values of SBI ≥ 1 have to be scored as BOP positive. When comparing the 3 surveys with converted SBI scores for BOP in 1970 and 1985 to the BOP% in 1996, a dramatic decrease from 94% to 38% in 1985 followed by another significant 50% reduction to 17.4% BOP in 1996 could be demonstrated (Fig. 7). This, in turn, means that the preventive efforts made both by the dental profession and tooth paste and tooth brush industry in Switzerland within the last quarter of a century have substantially reduced the prevalence of gingivitis in the adolescent male population. It is obvious that a part of the dramatic reduction of gingivitis prevalence of 94% in 1970 by 60% in the year 1985 may also be attributed to intra-examiner variability, since the examiner was identical at both ex-

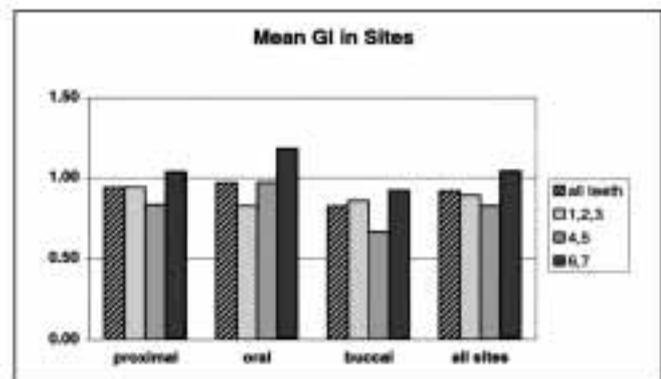
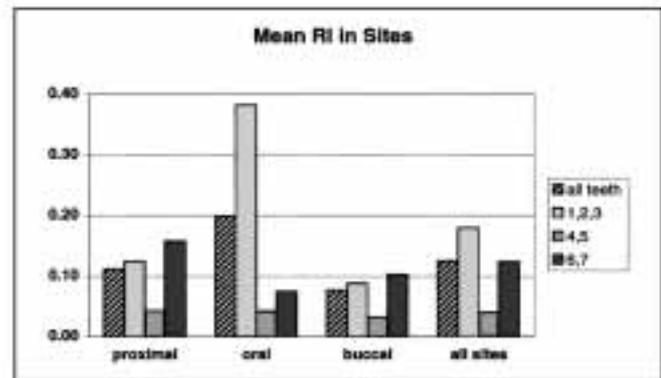
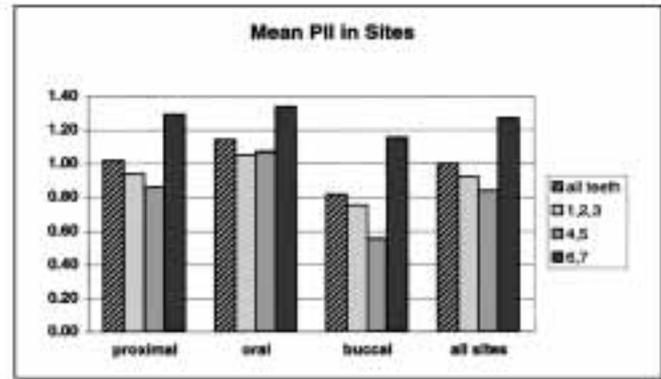


Fig. 5 Mean clinical indices for the anterior (1, 2, 3), the premolar (4, 5) and the molar teeth (6, 7) stratified for all surfaces and proximal, oral and buccal surfaces, respectively

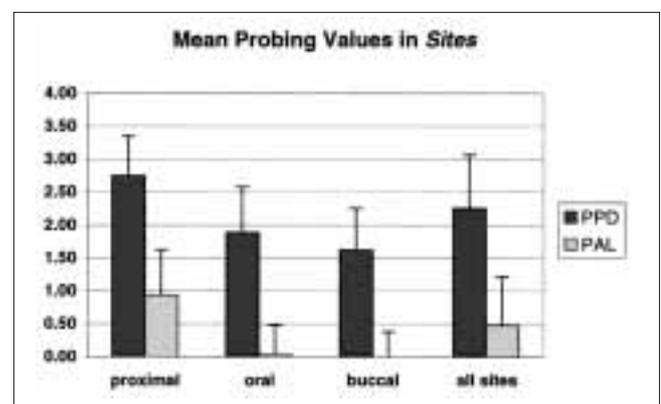


Fig. 6 Mean Pocket Probing Depth (PPD) and Probing Attachment Loss (PAL) in mm for all surfaces and proximal, oral and buccal surfaces, respectively

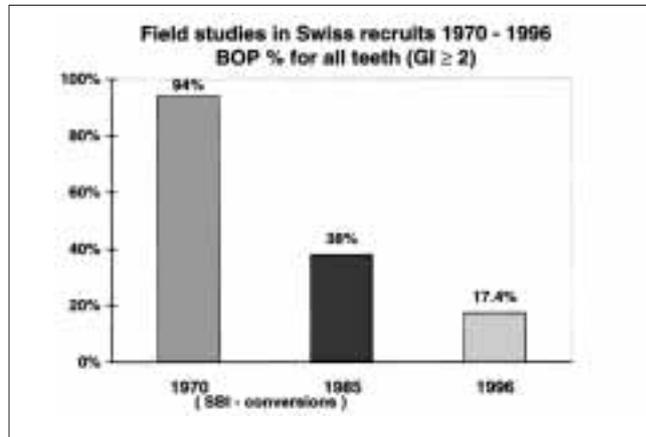


Fig. 7 Comparison of the gingival results of Swiss Army recruits in the survey of 1970, 1985 and 1996. Data from 1970 and 1985 were converted from Sulcus Bleeding Index (SBI) scores (SBI ≥ 1) into BOP percentages. Data from 1996 were converted from GI (≥ 2) into BOP%.

minations. Likewise, the reduction to 17.4% BOP positive sites in 1996 may also partly be attributed to interexaminer variability and the use of a different scoring system. Nevertheless, the very high reproducibility of the gingivitis examinations in 1996 suggests that the data of the present study reflect reliably the status of gingival health in the population examined. In comparison with recently performed cross-sectional examinations of randomly selected populations in various regions of Switzerland, the youngest population group of 20–29 years yielded a mean GI = 0.99 in the French speaking cantons (TRAM 1997) and GI = 1.16 in a large area of the German speaking Switzerland (SCHÜRCH et al. 1991).

In a recently performed survey of the German Bundeswehr 29.3% of the sites bled on probing in a group of 1186 recruits with a mean age of 21.3 years (WILLERSHAUSEN et al. 1997). This percentage corresponds to the values of the Swiss recruits 11 years ago, but is substantially higher than the results of the present survey.

In 1970, Pocket Probing Depth (PPD) and Probing Attachment Loss (PAL) were not yet evaluated, and the registration system of the Periodontal Disease Index (PDI) (RAMFJORD 1967) which evaluated only 6 preselected teeth was applied (CURILOVIC et al. 1972). However, in the survey of 1985, like in the present study, PPD and PAL were assessed to the nearest mm which renders these two studies comparable with respect to the periodontal destruction. While 15% of the recruits of 1985 yielded at least 1 site with PPD ≥ 5 mm (Joss et al. 1992), only 4.5% of the recruits showed such a condition in the present study (Fig. 8). Also, 3.3% of the recruits demonstrated multiple sites with PPD ≥ 5 mm in 1985 (Joss et al. 1992), while only 0.7% of the recruits (3 out of 419) showed such a condition in 1996. Furthermore, 1 recruit in 757 was diagnosed as having "Juvenile Periodontitis" in 1985 and none of the recruits in 1996 was diagnosed for "Early Onset Periodontitis". These figures also support the notion, that beginning periodontitis, together with a sustained increase in the gingivitis prevalence, only affect a small proportion of the young adult male population in Switzerland. The Retention Index (RI), although generally quite low (< 0.15) was significantly elevated in the area of the anterior teeth on the oral aspects. It is obvious, that these elevated scores (mean RI = 0.38) reflect the presence of supragingival calculus predomi-

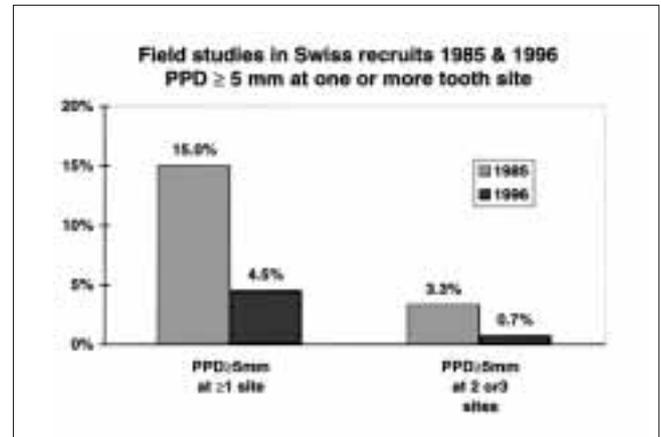


Fig. 8 Comparison of Pocket Probing Depths (PPD) of 5 mm or more prevalence in the surveys of 1985 and 1996

nantly and typically located on the lingual aspects of the lower anterior teeth. The second highest RI was encountered at proximal sites of the molar teeth (RI = 0.16) indicating that overhanging filling margins may have contributed to these scores. However, these aspects will be covered in a separate report.

In summary, the results of the present survey have documented that the Swiss young adult male population has experienced a dramatic improvement in the periodontal condition within the last decade as revealed in significantly lower BOP% and fewer individuals being affected by early signs of periodontitis when compared to 1985. The relatively low prevalence of BOP = 17.4% indicates that this population may be at a relatively low risk for developing periodontitis provided that these standards are maintained over the years.

Conversely, it may be assumed that the Swiss Army recruits evaluated in the present study reflect an improved oral health status of the younger generation. Since females consistently scored with lower prevalences for gingivitis and increased pocket probing depth than the males in cross-sectional studies (SCHÜRCH et al. 1991), the results of the present study most likely represent a more pessimistic view than what would be encountered from a mixed young Swiss population.

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Zusammenfassung

Die vorliegende Studie hatte zum Ziel, die parodontalen Verhältnisse von Schweizer Rekruten im Jahr 1996 mit einer früheren Erhebung von 1985 zu vergleichen. Damit konnten an einer für junge Schweizer Männer repräsentativen Gruppe die Erfolge der

prophylaxeorientierten Zahnmedizin evaluiert werden, die in den letzten zwei Jahrzehnten in der Schweiz praktiziert wurde. Bei 419 Rekruten der Schweizer Armee wurden folgende Parameter erhoben: Plaque Index (PII), Retentionsindex (RI), Gingivalindex (GI), sondierbare Taschentiefe (PPD) und Verlust an klinischem Attachment (PAL). Letztere zwei Parameter wurden nur im 1. und 3. Quadranten, die anderen Parameter in allen 4 Quadranten an allen Zähnen an je 4 Stellen erhoben. 1,8% der Zähne fehlten, vor allem wegen der Extraktion der ersten Prämolaren (85%) aus orthodontischen Gründen. Die Mittelwerte der Indizes waren $PII=0,99$, $RI=0,13$ und $GI=0,91$. Im Durchschnitt bluteten 17,4% der Stellen auf Sondieren (BOP). Die sondierbaren Tiefen waren im Mittel $PPD=2,25$ mm bei einem mittleren $PAL=0,47$ mm. Nur 4,5% der Rekruten hatten an mindestens einer Stelle im Mund eine Stelle mit $PPD \geq 5$ mm. Dasselbe an mehr als einer Stelle hatten nur 0,7%. Im Vergleich zu den Resultaten der vergleichbaren Studie von 1985 waren wesentliche Reduktionen im mittleren BOP von 38% auf 17,4% zu verzeichnen. Zudem war bei den parodontalen Taschen von 5 mm und mehr eine Abnahme von etwa 70% zu verzeichnen. Diese Resultate erlauben die Feststellung, dass die Anstrengungen in oraler Präventivmedizin der Schweizer Zahnärzte eindeutige Erfolge in der parodontalen Gesundheit zur Folge hatten, die sich bei der jungen männlichen Schweizerbevölkerung manifestierten.

Résumé

Le but de la présente étude était de comparer les conditions parodontales de recrues de l'armée suisse en 1996 avec une étude similaire faites en 1985. Ceci permit d'évaluer le résultat d'une médecine-dentaire orientée vers la prophylaxie, mise en œuvre depuis une vingtaine d'années en Suisse, sur un groupe représentatif de jeunes adultes masculins suisses.

Chez 419 recrues de l'armée suisse les paramètres suivants ont été enregistrés: indice de plaque (PII), indice de rétention (RI), indice gingival (GI), valeur au sondage (PPD), et perte d'attache clinique (PAL). Les deux derniers paramètres ont été mesurés dans les quadrants 1 et 3 au niveau de 4 sites par dent, tandis que les autres paramètres ont été enregistrés au niveau de 4 sites de toutes les dents.

1,8 % des dents étaient manquantes, principalement les premières prémolaires (85%) extraites pour des raisons orthodontiques. Les valeurs moyennes des indices étaient les suivantes: $PII=0,99$, $RI=0,13$ et $GI=0,91$. En moyenne, 17,4% des sites saignaient au sondage (BOP). Les valeurs au sondage étaient en moyenne de 2,25 mm (PPD) pour une perte d'attache moyenne de 0,47 mm (PAL). Seulement 4,5% des recrues avaient au moins un site dont la valeur au sondage était ≥ 5 mm (PPD) et 0,7% avec plus d'un site ≥ 5 mm (PPD).

En comparaison avec les résultats de l'étude similaire de 1985, l'étude de 1996 montrait une réduction du BOP de 38% à 17,4%, ainsi qu'une diminution de 70% de la prévalence des poches parodontales supérieures ou égales à 5 mm.

Ces résultats montrent clairement que les efforts déployés par les médecins-dentistes suisses en matière de prophylaxie orale durant ces dernières décennies ont permis d'améliorer nettement la santé parodontale chez les jeunes adultes.

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