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ORIGINAL ARTICLE

Oral health of homeless adults in Stockholm, Sweden

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Abstract
The aim of the present study was to record and describe the oral condition of homeless adults in Stockholm, Sweden. There have been no clinical studies of the oral health of the homeless in Sweden since the 1970s. The study population comprised 147 homeless individuals (110 M, 37 F) in the age range 22–77 years. All underwent oral examination, including registration of periodontal status and caries data. The results show that homeless adults in Stockholm have fewer remaining teeth than the general population. Because conservative periodontal treatment is expensive and time-consuming, teeth with doubtful prognoses are usually extracted and only those with optimal periodontal health are retained. Another consequence of inadequate periodontal treatment, including insufficient oral hygiene instruction, is the high percentage of tooth surfaces with plaque accumulation. Heavy plaque accumulation will also have an effect on caries progression, expressed in this study as high DMFT values. Loss of teeth is likely to create dental and chewing problems, possibly resulting in increased dental and medical treatment needs.

Key Words: *Caries, homeless adults, periodontal diseases*

Introduction

Homelessness is an old and complex phenomenon. Social factors are implicated, possibly intertwined with individual features. There is neither a widely accepted explanation, nor any generally applicable solution [1,2].

All individuals in this report complied with the definition of homelessness of the Swedish National Board of Health and Welfare in the 1993 national survey: "A homeless person is one who has no residence, owned or rented, and who is not living under stable dwelling conditions and therefore has to rely on temporary alternatives or rough living. Among the homeless are also included subjects living in institutions or shelters without any dwelling arranged upon discharge" [3]. In population statistics, the number of homeless people is usually only a rough estimate. There are currently about 10,000 homeless people in Sweden, about 0.1% of the population. There are around 3000 homeless in Stockholm and it is estimated that about 10% of these do not have a bed to sleep in [4].

Most studies tend to focus on one or two aspects of homelessness and approach the issue from a specific angle. There is an obvious lack of more comprehensive studies of medical, odontological, and social conditions based on a sample of adequate size [5–7]. Prior to the Stockholm Pilot Study [8], there had been no clinical studies of the homeless in Sweden since the 1970s, and no studies at all of their oral health.

Available dental studies on the homeless in Australia, the United States, Canada, and the United Kingdom confirm that dental problems are common. In some of these countries, attempts addressing the issue of dental care for the homeless report that homeless people are seldom interested in receiving dental treatment and tend to break appointments or fail to complete courses of treatment [9–20]. By contrast, our Pilot Study indicated more positive attitudes to dental care among the homeless in Stockholm.

The Pilot Study reported a remarkably high number of lost teeth and huge unmet dental treatment needs far exceeding those of the general population. The mean interval since the previous dental treatment was around 10.4 years. Since the subjects actually desired

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dental treatment, there were obviously barriers preventing them from seeking care.

The Pilot Study observations were based on only 32 subjects and the results warrant expanded odontological studies; first, a clinical, quantitative investigation of oral status in a larger material of homeless people, and, second, an in-depth qualitative study after completed dental treatment, with special reference to factors discouraging the homeless from seeking dental care.

This article is the first in a series of qualitative and quantitative studies of various aspects of homelessness in Stockholm, with special reference to dental health. The aim of the study, a continuation and extension of the odontological part of the Stockholm Pilot Study [8], was to investigate and describe the oral status of homeless adults in Stockholm.

Material and methods

The material comprised 177 homeless individuals recruited with the assistance of voluntary and/or charity organizations and the medical outreach team in Stockholm in contact with the homeless.

Thirty-two subjects were recruited from the Pilot Study and another 32 among visitors to two "Open House Days for Homeless" at the Institute of Odontology, Karolinska Institutet. These open days were organized only for homeless subjects, all of whom were well known to the assisting charity organization.

Seventy-nine subjects were recruited among patients attending the outpatient care center for the homeless, "Hållpunkt Maria" in Stockholm (HPM). Four additional homeless subjects who learned about the ongoing study were included.

After exclusion of 30 subjects (Table I), 147 were finally enrolled in the study: 32 were examined at St. Göran's Hospital [8] by two of the authors (Lars Frithiof and Lena Persson) and 115 were examined by Patricia De Palma (PDP) at the Institute of Odontology, Karolinska Institutet or at HPM. The study period lasted from September 2000 to February 2003.

After examination, the participants were informed of their oral status and were offered free treatment: 142 had a treatment need of some kind and 137 (96%) accepted and received necessary treatment by PDP. A few patients were referred for evaluation and specialist treatment.

Table I. Reasons for failing to participate ($n=30$)

Could not understand given information because of ill health	12
Influenced by drugs or alcohol during the examination appointment	8
Did not speak Swedish	2
Wanted to come another time	2
Mental illness	2
Refused to participate	4

All subjects were interviewed in accordance with a specially designed structured interview guide [8] covering such topics as attitudes to oral health, oral problems, oral hygiene habits, tobacco habits, and dental treatment fears.

After completion of the Pilot Study, questions about social conditions and drug abuse were added. Medical history was anamnestic or obtained from HPM when considered essential for dental treatment. These results will be published in a separate paper.

Ethical aspects

Before entering the study, each subject received verbal and written information explaining the study design and affirming that participation was voluntary and that the treatment offered was not conditional on continued participation in the investigation.

The study was approved by the local ethics committee of Karolinska Institutet at Huddinge University Hospital.

Recording principles

Pocket depth, gingival bleeding, and presence of plaque were recorded at four sites on each tooth, i.e. mesial, distal, buccal, and lingual sites. Caries and fillings were registered on the mesial, distal, buccal, lingual, and occlusal surfaces of each tooth.

Number of teeth

Complete dentition was defined as 28 teeth. The 3rd molars were excluded from the examination [21].

Pocket depth

The depths of periodontal pockets were measured using a periodontal probe graduated in mm (Hu-Friedy Inc. Chicago, Ill., USA). The tip was inserted to the base of the pocket with a gentle probing force [22].

Gingival bleeding

Gingival bleeding was registered using the same periodontal probe as for the clinical registration of pocket depth. Bleeding was scored as 1 or 0 in accordance with the Gingival Bleeding Index (GBI) by Ainamo & Bay [22].

Plaque and calculus

The presence of visible plaque was recorded and dichotomously scored in accordance with the Visible Plaque Index (PI) [22]. The percentage of tooth surfaces with plaque was calculated. The presence of calculus was recorded for each tooth, and the number of teeth with calculus was calculated.

Table II. Age and gender distribution of subjects

Age group (years)	Total *n* (%)	Males *n* (%)	Females *n* (%)
20–29	6 (4.0)	4 (3.6)	2 (5.4)
30–39	17 (11.6)	14 (12.7)	3 (8.1)
40–49	61 (41.5)	43 (39.1)	18 (48.7)
50–59	50 (34.0)	40 (36.4)	10 (27.0)
60–69	10 (6.8)	8 (7.3)	2 (5.4)
70–79	3 (2.0)	1 (0.90)	2 (5.4)
Total	147 (100)	110 (100)	37 (100)
Age median (IR)	48.0 (43.0–53.0)	48.0 (43.0–54.0)	45.0 (43.0–52.0)

Tooth movability

After application of gentle finger pressure in various directions, tooth mobility was recorded from 0 to 3 in accordance with Lindhe [23].

Furcation involvement

Clinical furcation involvement was recorded for premolars and molars after horizontal probing with a double-ended curved probe in accordance with Lindhe [23].

Dental caries and fillings

Caries was scored after gentle probing with a sharp curved probe along each tooth surface. Both primary and secondary caries were registered. Caries was recorded when the surface was irregular due to loss of hard tissue and soft to the probe. Visible demineralization without clinical surface irregularity was recorded separately [21].

Filled surfaces were recorded in accordance with surface and type of restorative material. A defect filling was defined as a filling in need of replacement due to fracture or partial loss due to mechanical or chemical factors, in the absence of caries. Caries under a filling, visible as a color change, was recorded as caries, not as a defect filling. Decayed, missing, and filled teeth (DMFT) were calculated in accordance with Klein Palmer & Knutsson [24] and the World Health Organization criteria [25].

Prosthetic appliances

Crowns, bridges, pontics, full and partial dentures were recorded as present or absent.

Oral mucosa

The lips, vestibulum, buccae, gingivae, hard and soft palates, the tongue, and the floor of the mouth were inspected and any abnormality was recorded in as much detail as possible, e.g. type of lesion, localization, size in mm, shape, color, consistency, relationship to the surrounding tissue [26]. A preliminary diagnosis was made.

Statistical analysis

The results were analysed using analysis of variance (ANOVA) with two factors (age and gender). Data were expressed as medians and interquartile ranges (IR). Statistical significance was accepted at the probability level $p \geqslant 0.05$.

Results

General data

The study population comprised 147 homeless individuals ranging in age from 22 to 77 years (median (IR) 48.0 (43.0–53.0)); 110 M, age range 25–70 years (median (IR) 48.0 (43.0–54.0)) and 37 F, age range 22–77 years (median (IR) 45.0 (43.0–52.0)). The age distribution is presented in Table II.

The duration of homelessness was median (IR) 5.0 (0.5–30.0) years, ranging from 0.5 to 30 years: in males, 5.0 (2.0–10.0) years, ranging from 0.5 to 30.0, and in females, 5.0 (2.0–8.0) years, ranging from 1.0 to 22.0.

There were 125 smokers, 96 used alcohol more or less daily and 99 were habitual users of amphetamine, opiates, or other pharmaceutical agents. The interval since the previous dental visit varied between 0.5 and 50 years (mean 13.6 years).

The interview data will be reported and discussed in detail in a separate paper.

Clinical data

Number of teeth in relation to age group and gender is presented in Table III. For the total group, the median (IR) number of teeth was 18.0 (9.0–24.0). There was no significant difference in the number of teeth in males and females (median (IR) 18.0 (9.0–24.0) and 16.0 (9.0–24.0), respectively) ($p > 0.05$). Between the age groups, the number of teeth differed significantly ($p < 0.01$), i.e. decreased with increasing age. Furthermore, 8 subjects (5 M, 3 F), predominantly in the oldest age group, were edentulous.

Periodontal status

GBI, PI, and presence of calculus were almost 100% in the whole group. Pocket depth, tooth movability, and furcation involvement in molars are presented in Table III. There were no significant age or gender differences with respect to the number of tooth sites with pocket depths >4 mm, the number of teeth with

Table III. Number of teeth, number of molars with furcation involvement, and number of tooth sites with pocket depth >4 mm. Median and IR according to age group

Age group Years	No. of teeth					
	Total		Males		Females	
	n	Median (IR)	*n*	Median (IR)	*n*	Median (IR)
20–29	6	28.0 (28.0–28.0)	4	28.0 (28.0–28.0)	2	25.5 (23.0–28.0)
30–39	17	25.0 (22.0–27.0)	14	27.0 (22.0–27.0)	3	22.0 (11.0–24.0)
40–49	61	20.0 (13.0–24.0)	43	21.0 (13.0–24.0)	18	19.0 (13.0–26.0)
50–59	50	13.0 (6.0–19.0)	40	12.0 (6.0–18.0)	10	14.5 (5.0–19.0)
60–69	10	7.0 (5.0–16.0)	8	7.0 (5.5–16.5)	2	8.0 (0.0–16.0)
70–79	3	7.0 (0.0–11.0)	1	7.0 (7.0–7.0)	2	5.5 (0.0–11.0)
Total	147	18.0 (9.0–24.0)	110	18.0 (9.0–24.0)	37	16.0 (9.0–24.0)

Age group Years	No. of molars with furcation involvement						Pockets >4 mm		
	Total		Males		Females		Total		
	n	Median (IR)	*n*	Median	*n*	Median	*n*	Median	(%)
20–29	6	8.0 (8.0–8.0)	4	8.0	2	6.0	6	5.5	4.9
30–39	17	7.0 (4.0–7.0)	14	7.0	3	4.0	17	21.0	21.0
40–49	61	4.0 (2.0–6.0)	43	4.0	18	3.5	61	16.0	20.0
50–59	50	2.0 (0.0–2.0)	40	2.0	10	2.0	44	16.0	30.7
60–69	10	0.0 (0.0–1.0)	8	0.5	2	0.0	9	14.0	50.0
70–79	3	0.0 (0.0–2.0)	1	0.0	2	1.0	2	14.0	50.0
Total	147	3.0 (1.0–6.0)	110	3.0	37	2.0	139	16.0	22.2

calculus, tooth mobility, or for molars with furcation involvement scores 1–3. The number of molars decreased significantly with increasing age ($p<0.01$). It was also observed that molars with furcation involvement score 0 and tooth mobility score 0 decreased significantly with increasing age ($p<0.01$ and $p<0.01$, respectively). With respect to GBI and PI, males had significantly less gingival bleeding and plaque accumulation than females ($p=0.02$ and $p=0.03$, respectively).

Caries

The numbers of decayed, missing, and filled teeth (DMFT) are presented in Table IV, including 8 edentulous subjects. The median (IR) DMFT was 27.0 (23.0–29.0): for females 28.0 (26.0–30.0) and for males 26.0 (23.0–29.0). In the age group 20–29, DMFT was significantly higher in females than in males ($p<0.01$).

Crowns, bridges, and full/partial dentures

Fifty-seven (38.7%) of the subjects had fixed prostheses such as bridges with pontics or crowns. Ten (7.5%) had full or partial removable dentures and 6 (95.3%) of the 8 edentulous subjects did not have any prostheses.

Oral mucosa

Tentative clinical diagnoses included hyperkeratosis (36%), ulcerations, Candida infections (12.9%), and unspecified generalized erythema; 21.8% had a geographic tongue. Many subjects exhibited white patches on the buccal mucosa (63.9%). Only one subject with an ulceration of the lateral border of the posterior part of the tongue was referred to an ear, nose, and throat department for examination. Based on clinical appearance, no other lesions were considered to be malignant or premalignant.

Discussion

This is a continuation of the Stockholm Pilot Study [8]. The study material was collected over a period of 2.5 years. A majority of the patients had a substantial treatment need and 96% were treated by the principal author (PDP) during this period. The time available for examination of new patients was therefore limited. However, the examination procedure was the same and the same routines and criteria were followed throughout the study.

The homeless have, by definition, no fixed abode and cannot be contacted by post or telephone. Therefore investigations must rely on subjects who happen to be available or can be located in some way. It follows that it is practically impossible to obtain a randomly selected material from the total homeless population in society.

There may be additional reasons why samples of homeless persons in published studies are based on selected material. For example, it is reasonable to assume that drug addicts or people with severe

Table IV. Number of decayed (D), missing (M), and filled (F) teeth (DMFT). Median and IR according to age and gender

Age (years)	Subjects (*n*)	DMFT Median (IR)	D	M Median	F
20–29	6	17.5 (6.0–38.0)	7.0	0.0	9.0
30–39	17	23.0 (15.0–30.0)	8.0	3.0	11.0
40–49	61	27.0 (25.0–29.0)	9.0	8.0	10.0
50–59	50	28.0 (27.0–31.0)	5.0	15.0	6.0
60–69	10	27.0 (26.0–28.0)	2.0	21.0	4.5
70–79	3	28.0 (17.0–32.0)	0.0	21.0	0.0
Males	110	26 (23–29)	6.0	10.0	8.5
Females	37	28 (26–30)	7.0	12.0	9.0
Total	147	27 (23–29)	7.0	10.0	9.0

psychiatric disorders would not be willing to participate in a voluntary study. Similarly, when presumptive participants realize that they have an opportunity not only for a dental examination but also for free dental treatment, it may be assumed that those with dental problems and a desire for treatment are more likely to accept than those without oral complaints and no wish at all to see a dentist.

When such systematic deficiencies in a study material cannot be circumvented, it is difficult to extrapolate the conclusions to a broader segment of the population than the sample investigated.

The predominance of men in the material (75%) closely reflects the gender distribution among the homeless in Stockholm [4]. A study among homeless individuals in Great Britain reported a similar distribution: 73% of the subjects were men [15].

Seventy-six percent of the homeless adults in our material were in the age range 40 to 59 years. This is in accordance with an Australian study among 162 homeless men [9]. Furthermore, in our survey there was a higher percentage of women in the age range 40 to 49 years than in the other age groups. There were few subjects aged 20 to 39 or 60 to 69 years, whereas the study by Jago et al. [9] reported a high proportion of homeless aged 20 to 29 years among young immigrants in Australia. The small number of subjects in the oldest age group is probably attributable to a high mortality rate among homeless people: few will survive middle age [4]. The few subjects in the youngest adult age group could be an effect of the Social Network System in Sweden, i.e. practical assistance in the form of accommodation and economic support is available through the Social Welfare Bureau [27].

With respect to the oral health of homeless individuals in the present material, the number of teeth in both males and females decreased with increasing age. Although a similar trend is reported in the general population in Sweden [28–31], in each age group the homeless adults had 3 to 4 fewer remaining teeth than in the corresponding age group in the general population. Without treatment, this situation is likely to lead to increasing dental and chewing problems and additional dental treatment needs among the homeless.

Although the homeless adults had relatively few remaining teeth, periodontal health was better than expected considering the oral hygiene status. Despite the furcation involvement in many molars, tooth mobility was not common in the sample: conservative periodontal treatment is expensive and time-consuming, so teeth with doubtful prognoses have been extracted and only those with reasonable prognosis were maintained.

Another consequence of inadequate periodontal treatment and poor oral hygiene is the considerable plaque accumulation, the high frequency of pockets, and gingival bleeding.

The medical consequences of plaque accumulation and oral infections have recently attracted considerable attention. If there is an association between oral infection and the etiology of for example cardiovascular disease [32], the homeless population would certainly qualify as a potential risk group. Heavy plaque accumulation will also have an effect on caries progression, expressed in this study as high DMFT values compared to the population in general.

Considering the fact that the mean latest dental treatment was 8.1 years ago, and usually comprised extractions or temporary fillings, most crown and bridgework present at the initial examination probably predated the homelessness of the subject, and this is supported by the condition of the prosthetic work.

The considerable plaque accumulation in the absence of preventive measures and regular conservative dental treatment, and in many cases, drug and substance abuse, are major factors contributing to the deplorable oral status [33]. The load of bacterial plaque might be regarded as a potential risk factor also in relation to general health.

Dental treatment is expensive and homeless individuals are dependent on the existing social welfare system, which stipulates the least expensive dental treatment: this often comprises extractions and full or partial dentures rather than periodontal and endodontic treatment, and fillings or crowns. This might explain why the homeless adults in this study have fewer remaining teeth than the general Swedish population. Extraction of teeth is likely to create additional

oral problems, eventually resulting in prosthetic and medical treatment needs.

Conclusions

This study confirms the deplorable oral status of a sample of homeless adults in Stockholm compared with the general population, particularly with respect to untreated dental caries and periodontal disease and teeth missing due to extraction. Poor oral status, neglected oral disease, poor chewing ability due to missing teeth, and massive plaque accumulation, probably further exacerbate the frail general health of the homeless, undermined by their homeless state and in many cases by drug and substance abuse.

Although clinical studies on the homeless are time-consuming and cannot be based on ordinary epidemiological principles, compilation of data about the homeless is an essential step in planning appropriate strategies to address their situation.

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