Periodontal Conditions and Service Utilization Behaviors in a Low Income Adult Population

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Purpose: Dental services utilization varies and access to periodontal therapy is not uniform. The objectives were to study an adult population of Medicaid eligible subjects in the Kitsap County, State of Washington, USA: (1) to assess their oral health status, specifically periodontal conditions, and (2) to assess their use of dental services and behavioral beliefs in relation to dental diseases.

Materials and Methods: 1500 randomly selected eligible households were invited to a cost-free dental examination. The Periodontal Screening and Recording (PSR) index and six bitewing x-ray films were obtained. Subjects responded to a service utilization questionnaire. A telephone interview was performed with 100 randomly selected eligible subjects to assess their behavioral beliefs about dentistry.

Results: 132 (8.8%) of the contacted subjects responded while only 4.5% came to the clinical examination. The mean age of the subjects was 35.0 years (S.D. ± 13.6, range 18 to 78 years) and 73.4% were women. Bleeding on probing was found in 82.8%, and 7.8% of the subjects had teeth with suppurating gingival conditions. Supra, or sub-gingival calculus could be identified in 95.3% of the subjects. Probing depths > 5.5 mm (not accounting for surfaces of third molars) were found in 11.3%, and radiographic evidence of vertical defects ≥ 3 mm in 47% of the subjects. Tooth decay in need of urgent dental care was found in 75% of the subjects. Cost (63.2%) and lack of dental insurance (51.3%) were primary factors for not seeking care but 48.7% had no desire to enroll in a "no cost" dental therapy program. Dental fear was an obstacle to care in only 2.6% of the subjects.

Conclusion: Primary barriers to the utilization of dental services in low income, uninsured populations were: (1) a pre-occupation with other daily issues, financial being the greatest, (2) an attitude of waiting for a problem to occur before seeking dental care, (3) that tooth extraction is the solution or only available treatment option.

Key words: adult, periodontitis, tooth decay, Medicaid, low income, tooth loss, self-perception, self-efficacy, oral radiographs, alveolar bone loss

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In the 1950s epidemiological studies demonstrated that the prevalence of periodontitis in the US and elsewhere was high (Marshall-Day et al, 1955). Data from the early 1970s obtained through the Nutrition Evaluation Survey also indicated that the prevalence of periodontitis was high and that treatment needs were large in adults 18 – 64 years of age (unanimous 1979). The national survey of employed adults during 1985 and 1986 (NHANES III) showed a lower than expected prevalence of periodontitis suggesting that periodontal treatments and better access to care had been effective (Miller et al, 1987; Brown et al, 1990). However, amongst others, one of the problems with the national surveys was the

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fact that predominantly working and insured subjects were examined. Analysis of data derived from radiographs of new patients (many without dental insurance) at the University of Washington, School of Dentistry showed that 15% had generalized alveolar bone loss and at least 30% had localized alveolar bone loss ≥ 3 mm as visible from intra-oral radiographs (Persson et al, 1998).

Perceptions of dental health and treatment needs differ greatly and this is also true in countries with highly-developed disease prevention programs (Steele et al, 1996). A lower utilization of dental services can be found in older subjects (Kiyak and Miller, 1982). Studies on self-efficacy (the individual's own perception of being able to control his/her well-being and ability to perform specific types of health behaviors to effect changes in overall health) have shown that oral health behavior is dependent on reasoned actions based on positive perceptions of the utility for such procedures. This explains, in part, why subjects with poor self-efficacy perceptions would have more evidence of disease (Lee and Kiyak, 1991; Tedesco et al, 1991, 1992).

A large volume of studies attempting to assess the outcome of periodontal therapies exists (for review see; Palcanis et al, 1996). Successful periodontal therapy requires patient compliance and often treatment and supportive care over long periods of time. Such treatments can be both expensive and time-consuming. Subject based data on the efficacy of periodontal therapies are limited. In view of the difficulties in assessing the prognostic value of clinical periodontal measures, the use of 'tooth loss' seems appropriate in separating diseased and non-diseased individuals (Hujoel et al, 1999). Therefore it would be important to assess how patients regard tooth loss and the need to prevent tooth loss.

Failures in periodontal therapy have been associated with the re-establishment of a pathogenic sub-gingival microflora (Magnusson et al, 1984). Successful treatment of patients with periodontitis has also been associated with non-smoking, and reduction/elimination of pathogens (Söder et al, 1999; Cugini et al, 2000). Contributory factors to periodontitis include smoking, oral hygiene, plaque and calculus, caries and dental restorations, psychosocial stress, socioeconomic and demographic factors (Linden et al, 1994; Albandar et al, 1995; Genco et al, 1999; Shiloah et al, 2000).

Dental services utilization behaviors vary by age, gender, ethnicity, income, education level, and access to dental insurance coverage (Grembowski et al, 1989; Newman and Gift, 1992). Attitudes toward dental care services and beliefs regarding the value of maintaining teeth and oral health tend to influence the utilization of dental services with dental fears and psychosocial stress as a significant co-factor (Milgrom et al, 1988; Newman and Gift, 1992; Axtelius et al, 1998). A dental access survey in 1992 of Medicaid (DSHS) households living in Kitsap County Washington revealed that 42% of the subjects eligible for dental care insurance through DSHS reported that they had been refused dental treatment because their DSHS coupons were unacceptable to dentists (unpublished data). Since 1987 the county's Medicaid eligible population has witnessed a clear decline in the number of dentists willing to accept Medicaid coupons mainly because the reimbursement rate may only be approximately 45% of the customary fees charged by dentists.

The purposes of the present study were to examine Medicaid eligible subjects in the Kitsap County, State of Washington (1) to assess their oral health status, specifically periodontal conditions, and (2) to assess their use of dental services and behavioral beliefs in relation to dental diseases.

MATERIALS AND METHODS

This cross-sectional descriptive study was designed to assess periodontal conditions and services utilization beliefs limited to a population of Medicaid eligible subjects. The study was approved by the Institutional Review Board (IRB) at the University of Washington. The registry from the Dental Access Program in Kitsap County was utilized and 1500 randomly selected Medicaid eligible adults received a letter and were invited to a cost free dental examination. If the subjects who agreed to participate could not arrange for transportation to the dental office such transportation was provided at no cost to the study subject. Non-responding subjects were contacted again as allowed by the IRB.

The clinical examination was performed in a dental office by one of the investigators (WLH). The assessment utilized a standardized protocol to evaluate the extent of caries and periodontitis. The clinical examination for periodontal disease severity utilized the Periodontal Screening and Recording (PSR) system which is an adaptation of the Community Periodontal Index of Treatment Needs (CPITN) endorsed by the World Health Organization (WHO) (Beigeri et al, 2000). Disposable pressure calibrat-

ed "sensor-probes" by Pro-Dentec Type E (Batesville AR) with 3.5 and 5.5 mm markings and a ball end was used.

Intra-oral data for alveolar bone loss were obtained from the analysis of dental radiographs (six intra-oral radiographs). Two posterior vertical bitewing films for each side, two peri-apical films of the anterior maxillary teeth (right lateral/central incisors and left lateral/central incisors) and one peri-apical film for the lower anterior teeth were studied. The distance between the cement-enamel junction (CEJ) to the alveolar bone level was assessed with the computer-supported "Periovision" software program (Univ. of Alabama, provided by Dr. M. Jeffcoat). Measurements were recorded to the nearest 0.1 mm at the mesial and distal aspect of all teeth from which measurements could be made. A distance between CEJ to alveolar bone of 2.0 mm was considered as a normal value. The amount of alveolar bone loss for anterior teeth was also determined as <1/3 of the root length, between 1/3 and $^1/_2$, and > $^1/_2$ of the root length. The presence of intra-radicular radiolucencies being suggestive of furcation invasions was also recorded. All radiographs were read by one examiner (WLH) and had been calibrated by independent reassessment of distance CEJ to bone from a set of 40 films with an intra-class correlation coefficient (ICC) =0.98.

Given the low response rate the IRB approved a telephone survey of subjects with known and active telephone numbers and who were randomly drawn from the Kitsap County's Medicaid eligible households that were computer selected for a six-month "eligibility review" by the DSHS Community Office in Bremerton WA. All telephone interviews were performed by one of the investigators (WLH) and made from the Bremerton DSHS Community Service Office. Examples of questions asked are provided in Tables 1 and 2.

Statistical Analysis

Descriptive statistics including frequency distributions, means, and standard deviations were calculated to describe the study population.

RESULTS

Only 132 (8.8%) of the subjects responded to the invitation to receive a cost free examination and care through the Dental Access Program. After attending an enrollment appointment 55 of the 68 dentate subjects who actually came to the clinic completed the dental examination. The mean age of these subjects was 35.0 years (S.D. ± 13.6, range 18 to 78 years). They were predominantly of European origin (75%). The age distribution is presented in Fig 1. At the time, 10.9% of the women reported that they were pregnant and therefore did not have radiographs taken. A total of 1,358 teeth were analyzed and bone loss was assessed using the computer supported method.

Demographic Data

Study subjects' characteristics are presented in Table 3. A majority of the subjects claimed that they were non-smokers (79.9%). There were more smokers among subjects in the age group between 35 – 44 years (33.3%) than among younger or older subjects (22.2%). Smoking was more common in men (65%) than women (15%).

Oral Conditions

The proportional distribution of maxillary and mandibular teeth is presented in Fig 2. The overall mean number of remaining teeth was 21.4 (S.D. ± 8.4, range: 7 – 28). The youngest age group (18 – 24) had, on average, 27.6 (S.D. ± 6.1) teeth present whilst the oldest age group (75 – 85) had 15.5 teeth. Untreated dental caries was diagnosed in 75% of the subjects with approximately 66% requiring urgent dental treatment or would most likely need emergency dental treatment within 12 months. At the time of the examination 8% of the subjects required emergency dental treatment for pain or acute infection.

The PSR data revealed that 33.9% of the subjects had no probing depths > 3 .4 mm (PSR score ≤ 2). Probing depths in the 3.5 to 5.5 mm in any sextant affected 53.2% of the subjects (PSR score 3). Probing depths greater than 5.5 mm (not accounting for surfaces of third molars) were found in 11.3% of the subjects (PSR score 4) with molar furcation invasions in 28.1% of the subjects. Furthermore, 7.8% presented with suppuration and supra, or sub-gingival calculus was identified in 95.3% of the subjects.

Table 1 Dental Services Utilization Survey – examples of questions asked

Has there been anything that has prevented you from getting treatment for a dental problem?	Cannot find a dentist. Cannot afford to pay for dental care No family dental problems now Embarrassed with my (child's, spouse's) mouth Too many other problems Fear of dentist (pain) Dentist does not accept Medicaid Dentist's hours are inconvenient Refused
About how long has it been since you had your last dental examination, by that I mean when did you last have your mouth checked, or visited a dentist?	Within last 6 months Within 7 to 12 months ago Within the last 5 years More than 5 years ago
Do you have a dentist you can go to if you have a dental problem?	Yes No
How is your overall dental health (meaning your mouth and teeth) now? Would you say your dental health is...?	Excellent Very good Good Fair Poor Do not know Refused to answer
What was the purpose of your last dental visit (do not read but ask for response?	Frequent responses: Routine scheduled visit for checkup/cleaning To fix cavity or broken filling Emergency for pain Gum treatment Denture (full/partial) Extraction
How much of the recommended treatment did you receive at that time or later?	All Some None Do not know Refused
Over the past 12 months was there anything other than cost that kept you or anyone in your household from getting the necessary dental care?	No, no problems I cannot find a dentist who will take me Dentist does not accept Medicaid Fear Dentist's hour inconvenient No insurance Do dentist nearby No transportation Don't know Refused

Radiographic Analysis

Findings from the analysis of the radiographs are presented in Table 4. Bone loss greater than 50% of the root length was found in 12.7% of the subjects. The frequency distribution of subjects with bone loss in proportion to root length is presented in Fig 3 and the proportions of measurable defects between CEJ and bone level are presented in Fig 4. Vertical alveolar bone defects ≥ 3 mm were found in 47% of the subjects and more prevalent on mesial than on distal surfaces ($F=24.6$, $p<0.01$). Ver-

Table 2 Examples of issues related to beliefs (five graded response scale)

Examples of issues related to beliefs about dentists: Dentists do not treat Medicaid dental patients fairly Dentists have negative attitudes about low income people Dentists are more concerned about money than taking care of people Dentists always treat their patients with respect Dentists do not think I deserve to be treated like their regular patients Dentists should do more to keep people from having problems with their teeth
Examples of issues related to beliefs about dental care: Having problems with teeth is a natural part of getting older and eventually the teeth will fall out or be pulled out There is a good chance of avoiding dental problems by having regular checkups It is not necessary to go to a dentist until a problem occurs Dentists can fix most dental problems that people have
Examples of issues related to dentistry in general: Searching for a dentist who accepts Medicaid is a waste of time There is a good chance that flossing can prevent dental disease Going to a dentist when not having a problem is a waste of time I am not afraid of pain when I go to a dentist

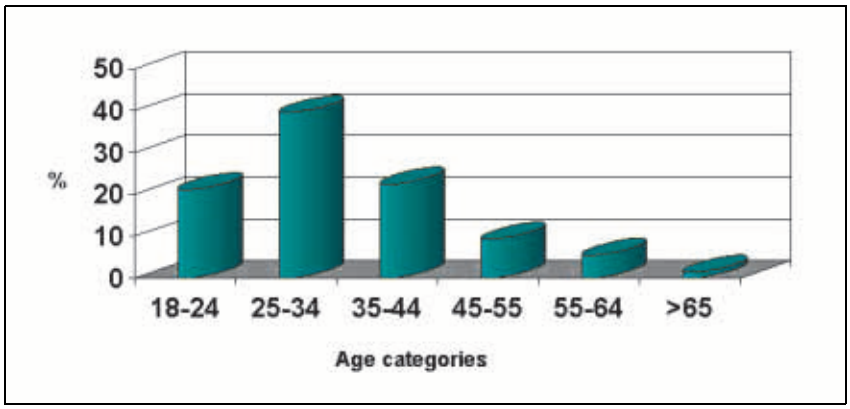

Fig 1 Age distribution of subjects who received the clinical examination.

tical defects were more common among maxillary molars and incisors with approximately 50% of the mandibular central incisors exhibiting bone defect ≥ 3 mm. The distribution of vertical defects ≥ 3 mm by tooth type is presented in Fig 5.

Beliefs and Attitudes

The poor response rate provided the impetus to conduct the telephone survey among 100 subjects randomly selected from the population of 1500. The telephone survey demonstrated that the invitation to participate may only have reached 53% of the subjects initially invited.

In the telephone survey 100 subjects were approached but only 79 of them participated in the survey. In the telephone survey population, the subjects were again predominantly of European origin (73.7%) and had a mean age of 33.4 years (S.D. ± 10.7, range: 18 – 66 years). The majority was female (89.5%) with more than 75% having completed a high school education. A majority of them were unemployed (76.3%). When asked to provide a self-rating of their own dental health, nearly one-half (46.1%) responded that their oral health was either fair or poor with only 6.6% of the subjects reporting their dental health as excellent. A belief that "losing teeth was unavoidable and getting dentures inevitable" was expressed by 22.4% of the subjects.

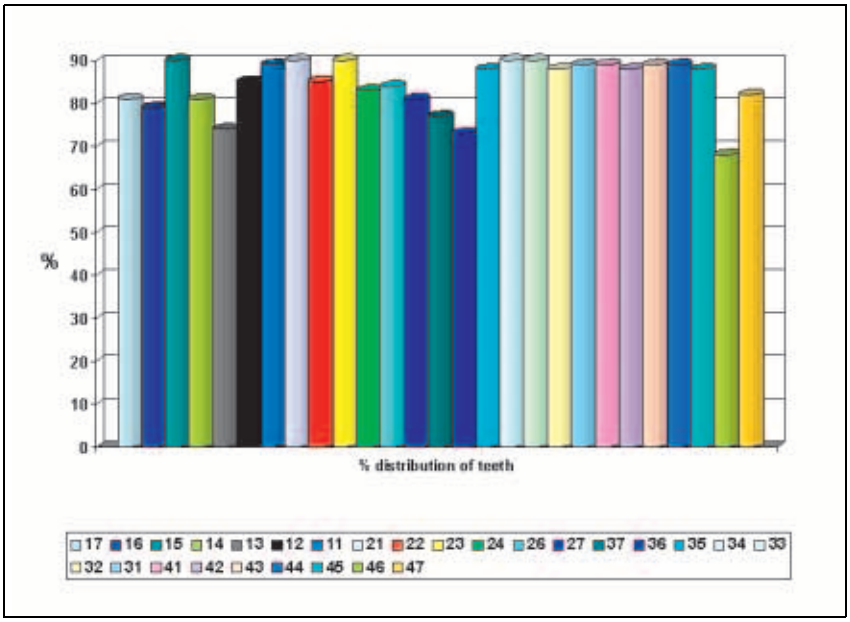

Fig 2 Proportions of remaining teeth by tooth number.

Table 3 Demographics

Ethnicity:	
European origin	75.0%
Asian origin	17.2%
Hispanic origin	6.3%
Native American origin	1.6%
African American origin	0.0%
Gender:	
Female	73.4%
Male	26.6%
Educational background:	
Less than high school diploma	21.0%
High school diploma	35.5%
Two year college	36.8%
Four year college	6.6%
Employment:	
Unemployed	57.6%
Student	21.0%
Unable to work	17.0%
Retiree	2.6%

The responses to key questions from the telephone survey of dental service utilization behaviors are presented in Table 5, and beliefs and attitudes to dental care in Table 6. Dental fear was a factor in not seeking care for 48.7% of the subjects interviewed. Reasons for not being interested in a no cost dental program were that they had their own dentist (25%), "busy with other household problems" (19.7%), "Medicaid people being unwanted as patients" (7.9%), "not having any problems now" (9.2%), and finally being "too embarrassed" (1.3%). The greatest psychosocial stress factor affecting 65.8% of the telephone surveyed subjects was financial strain. A summary of significant findings are presented in Table 7.

DISCUSSION

Access to dental insurance varies greatly from country to country. In many countries there might be compulsory and comprehensive dental insurance while in other countries only voluntary dental insurance policies exist. In "third world countries" both access to dental care and insurance may be lacking. Voluntary dental insurance is usually provided as an employment benefit or via self-insurance. Dental services covered under the Medicaid program in the United States are limited and not designed to insure routine dental care. The Medicaid plan provides funds for dental treatments of low-income individuals and persons with disabilities at usual and customary fees, or the Medicaid fees schedule rate, whichever, is lower. The current norm is that 47% of customary fees are covered by Medicaid insurance (Stoltenberg et al, 1993). Thus the likelihood that Medicaid covered subjects would re-

Table 4 Means, standard deviation (S.D.) and range for mesial and distal bone length values (mm) by age group

Age group	Mesial			Distal		
	Means	S.D.	Range	Means	S.D.	Range
18 – 24	1.5	0.7	0.0 – 3.8	1.7	1.1	0.1 – 8.1
25 – 34	2.1	1.1	0.1 – 7.2	2.2	1.2	0.2 – 8.0
35 – 44	2.8	1.7	0.3 – 9.4	2.9	1.6	0.4 – 9.0
45 – 54	2.8	1.4	0.5 – 7.8	2.9	1.3	0.8 – 8.2
55 – 64	3.2	1.0	1.8 – 5.0	2.9	1.2	1.0 – 5.0
65 >	3.5	1.3	1.5 – 6.7	3.3	1.9	1.1 – 6.2

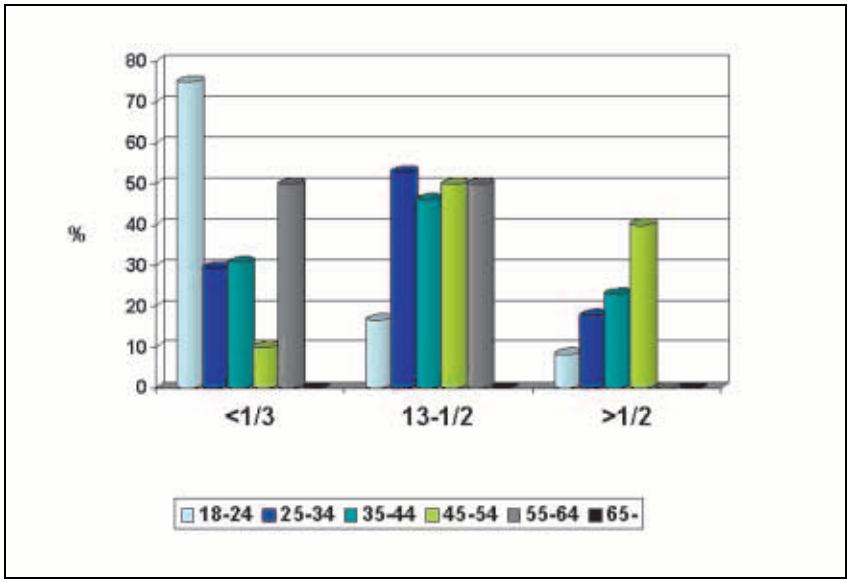

Fig 3 Age group and alveolar bone height scores.

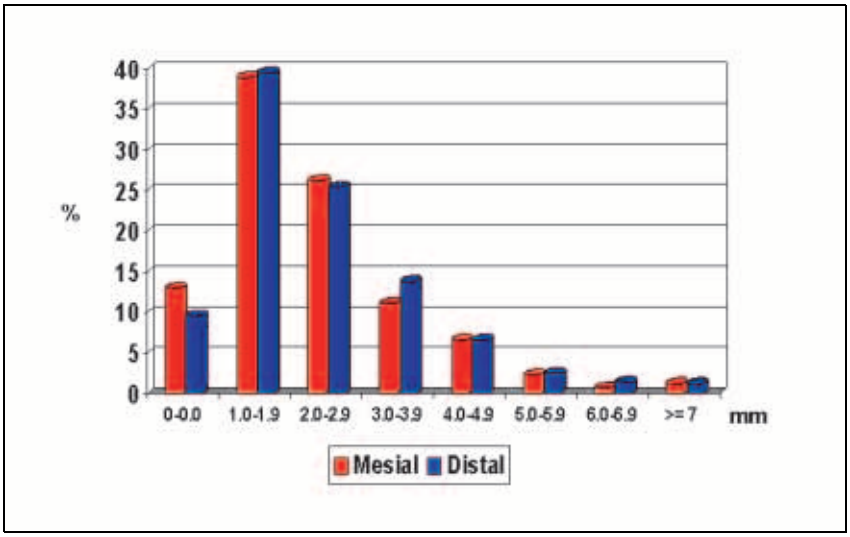

Fig 4 Distribution of horizontal alveolar bone values (mm) at mesial and distal surfaces from analysis of selected intra-oral radiographs.

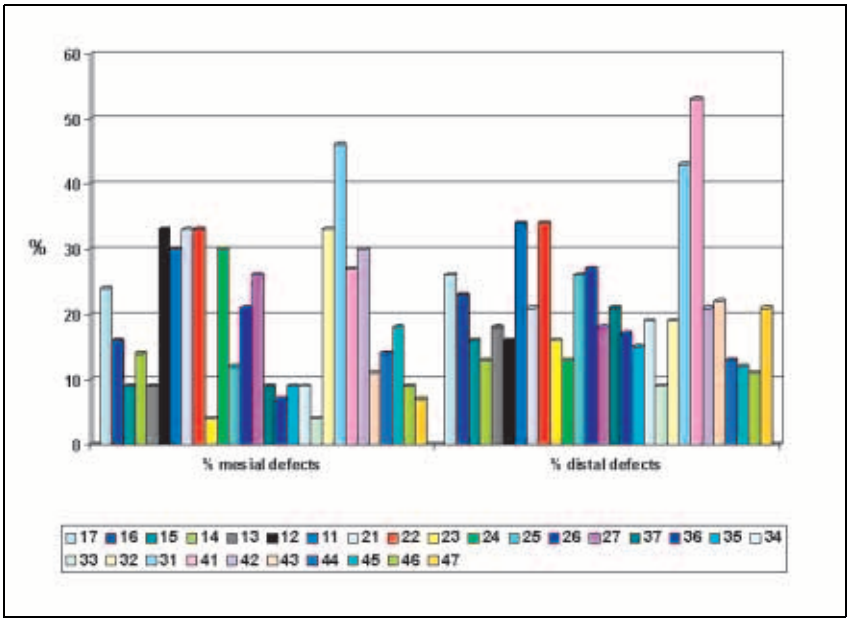

Fig 5 Percent distribution of mesial and distal defects ≥ 3 mm as defined from analysis of selected intra-oral radiographs.

Table 5 Assessment of service utilization behaviors (telephone interview)

Dental Service (%)	
Within 6 months	13.2%
7 months – 1 year	14.5%
13 months – 5 years	57.9%
> 5 years	14.5%
Purpose of last visit	
Checkup/cleaning	40.8%
Cavity/broken tooth	11.8%
Emergency/pain	35.5%
Denture/repair	9.2%
Tooth extraction	1.3%
No answer	1.4%
Barriers to seek care:	
No perceived problem	27.6%
Cannot find a dentist	3.9%
Medicaid not accepted	43.4%
Fear	2.6%
No insurance	7.9%
No transportation	3.9%
Prevented by cost	63.2%

Table 6 Beliefs and attitudes to dental care

Loosing teeth is unavoidable:	
Overall agree	22.4%
< High school	31.3%
High school graduate	29.6%
> High school	12.1%
Finding a dentist accepting Medicaid is a waste of time:	
Agree	38.2%
Dental fear as a reason to put off care:	
Never	51.3%
A few times	30.3%
Often	18.4%
Self rating of dental fear:	
Not afraid	22.4%
A little afraid	34.2%
Somewhat afraid	26.3%
Very afraid	11.8%
Terrified	3.9%
Issues that interfere with daily life:	
Finances	65.8%
Medical care	46.1%
No work	26.3%
Physical health	21.1%
Dental care	14.5%

ceive comprehensive care or be referred to periodontal specialist care is probably very low.

This study was designed to assess dental service utilization beliefs and the severity of specifically periodontal disease in a care disadvantaged group of adults including low income, or unemployed subjects receiving DSHS/Medicaid benefits.

Table 7 Significant findings from the telephone survey

Loosing teeth is unavoidable and getting dentures inevitable	22.4%
More likely to seek emergency care than having a dental examination	65.8%
Lack of dental insurance as cause for not seeking care	51.3%
Perceived costs primary reason for not seeking care	63.2%
Dental fear as a cause for not seeking care	48.7%
Recent past history of emergency dental care associated with pain	35.0%
Other emergency dental care	57.8%
No interest to enroll in a no cost dental program	48.7%

In spite of promised dental services the response rate was very low in spite of extensive efforts to entice subjects to participate in the study. A reassessment of the low response to the mailed postcard announcements was possible through the telephone survey suggesting that only 52.6% had received the notification. In public health research, mail surveys to Medicaid clients using a single mailing have been reported to achieve response rates of 15 – 40% (Gibson et al, 1999).

The ability, or lack thereof in the present study, to reach the target population was consistent with previously reported experiences from medical studies. In fact, the primary explanation might be that many of the subjects may not have a permanent or known address. Nevertheless, the fact that approximately only 5% of the 1500 subjects invited consented to participate suggest that there are major obstacles in providing information about oral health and dental care to the targeted population. This gives cause for concern in that in comparison with the NHANES III study the prevalence and severity of oral disease in the present study was higher (Brown et al, 1990). Surveys such as the NHANES III may therefore provide an erroneous perception of lower overall dental treatment needs than is actually the case.

There is a large volume of dental studies demonstrating the benefits and needs of regular dental care in order to maintain oral and specifically periodontal health. Thus, it has been demonstrated that in order to prevent the progression of periodontal diseases it is necessary to educate and support patients at risk (i.e. Axelsson and Lindhe, 1981; Tonetti et al, 1998). The data from the telephone survey revealed that 46.1% of the subjects rated their dental health as either fair or poor. The fact that 22% of the subject anticipated inevitable edentulousness is consistent with the overall rate of complete tooth loss as reported in the Surgeon General's report on oral health in the USA in that 18% of poor adults have no remaining teeth (Satcher, 2000). Thus the likelihood that a large proportion of the subjects in the present study will become more or less edentulous is very high. The likelihood that they would have the opportunities to benefit from titanium dental implant therapy most likely approaches zero due to cost and lack of access to care.

The present study revealed that the mean values of horizontal alveolar bone loss increases with age. However, the fact that 25% of 18 – 25 year old subjects and approximately 70% of subjects older than 34 years were affected by bone loss exceeding 1/3 of the root length is remarkable and higher than reported in a 10 year prospective Swedish study of subjects with comprehensive dental insurance (Papapanou et al, 1989).

The predominant stress factor and reason for not seeking care was financial strain and this was consistent with findings by others (Genco et al, 1998). Thus it is highly unlikely that information about health and specifically oral health alone would in itself induce an interest in seeking dental and specifically periodontal care. Stress may also be a factor making periodontal therapy less effective (Axtelius et al, 1998).

In public health research strong associations have been reported between oral health self-assessment and dental decay as assessed by clinical examination and correlated with periodontal status (Kiyak, 1996). Self-reported perceptions of oral health and ability to perform oral health behaviors have also been demonstrated to be a good predictor of periodontal disease progression (Persson et

al, 1998). The telephone survey clearly supported the findings made from those who received the dental examination indicating significant oral health problems also among this group of subjects. The fact that many of the examined subjects in the present study were young adults further adds concerns of a predictable increase of periodontitis prevalence in older low income groups.

The assumption that periodontal disease can be associated with, or possibly serve as a risk factor for systemic diseases such as cardiovascular diseases, diabetes mellitus, or osteoporosis showed that subjects represented by the present study population would also be at an increased risk for such medical conditions (Wu et al, 2000; Tezal et al, 2002; Persson et al, 2002a, 2002b). This would also be the case for women of child-bearing age who might be at risk of miscarriage, or pre-term delivery (Jeffcoat et al, 2002). This would be of significance in the present study population because many of the women were young and pregnant. Thus the oral health conditions of subjects with low incomes may have significant systemic health consequences and/or serve as early warning signs of future medical treatment needs.

For the fiscal year of 1999 the Health Care Financing Administration (HCFA) reported that 42,061,552 persons in the United States and 895,148 persons in the State of Washington were Medicaid eligible. Studies of utilization of medical health care in Medicaid eligible elders compared to those with supplemental insurance from health maintenance organizations (HMO) reveal that Medicaid enrollees are under-served for their medical treatment needs (Carrasciollo et al, 2001). Thus it is likely that subjects studied here also represent a population who neither receive medical or dental care and who would therefore be at significant risk for otherwise preventable diseases.

The response rate to the clinical examination was low. Therefore, conclusions from the present study must be made cautiously. The telephone survey was added to the study once the low response rate was noticed. The rationale for this survey was to identify reasons why eligible subjects might have minimal to no interest in participating in the study or for seeking dental care. The telephone survey was conducted with Medicaid eligible adults who were randomly identified in order to obtain a representative sample. Thus some of the interviewed subjects might have been part of the clinical examination. Due to IRB restrictions it was not possible to link telephone survey data with clinical data obtained previously. It seems logical that the subjects examined belonged to a subset of Medicaid subjects who at least were somewhat concerned about their oral conditions. Taking into account the combination of overall poor oral health status among examined subjects and the responses to the telephone survey it seems reasonable to assume that subjects rejecting the examination would have been more negative or indifferent to oral health, and that they might also have worse oral conditions than those examined.

The experiences from the present study demonstrate that it might be very difficult to perform a representative study on oral health in low income Medicaid supported subjects. A low degree of appreciation of dentistry, significant problems in reaching subjects, and subject concerns about other daily problems are only a few reasons why the present study could only include a very small number of subjects.

CONCLUSION

The present study demonstrated a high prevalence of dental caries and periodontitis in subjects dependent on public support such as the Medicaid program. The greatest barriers to the utilization of dental services in the study population were: (1) a pre-occupation with other daily issues (financial being the greatest), (2) an attitude of waiting for a problem to occur before seeking dental care, (3) that tooth extraction is the solution or only available treatment option.

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