

ORIGINAL ARTICLE



A program review of a community-based oral health care program for socially vulnerable and underserved citizens in Denmark

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ABSTRACT

Objectives: To describe the oral health and oral health-related quality of life among social vulnerable adults enrolled in a special oral care program, and to evaluate the effect of oral care on their oral health-related quality of life.

Method: Social workers identified social vulnerable persons in social centres and referred them to the program. Dental clinics were arranged including a well-motivated staff to be special responsive to these clients. The participants, ($n = 235$, mean age 43.5 years) with drug abuse, being homeless, permanently unemployed, or with mental problems were offered low-cost treatment services. Data collection was made by clinical registration and questionnaires. Oral health-related quality of life was measured by means of the Oral Health Impact Profile-14 index (OHIP-14).

Results: 94% of the participants had actual decayed teeth (mean 9.5). Forty-four per cent had not visited a dentist within 5 years and less than one-third reported tooth brushing twice a day, 17% even less frequent. One hundred and forty-six completed the dental program within the program period. Mean OHIP-14 score was 28.6 at baseline. Among those who fulfilled the program, the OHIP-14 score was reduced to 9.9 ($p < .001$).

Conclusion: Oral health among the study population was very poor. However, oral problems in this group can be solved, and their oral health-related quality of life can be increased although it requires special arrangements and special clinical environment.

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Introduction

Considerable social inequality in oral health has been found in numerous population studies across countries, and furthermore, the utilization of dental care service is characterized by social 'pro-rich' inequality worldwide [1]. Being among the most socially vulnerable and underserved is often characterized by a need for complex support, substance abuse, mental illness and previous imprisonment, but also by being unemployed for a longer period (with only modest possibilities of becoming employed), low education and immigrant status [2].

The Danish Dental Care System for adults is based on a fee-per-item system. The system offers dental care provided by dentists in private dental practices. Part of the expenses is refunded by the national public health insurance scheme. Moreover, the Danish system is based on patients' demand for dental services, depending on the citizens' own initiative. Under certain circumstances, socially vulnerable individuals are able to obtain additional subsidies for dental services, and thereby reduce the patient's own payment. However, there is still a large group of underprivileged persons, who cannot access the private dental care system due to economic barriers. Consequently, these individuals do not seem to 'fit' into the existing Danish dental care system [3]. The major reason for this is that the opportunity to obtain additional subsidies

for dental services is marked by a substantial bureaucracy. A recent Danish study among such unprivileged persons, who do not use the private dental care system, showed that the oral health situation is very poor and in addition, their oral health-related quality of life seems to be highly impaired when compared with other patient groups [3].

In 2013, the Danish Parliament granted a 3-year public funding for oral health care activities targeting socially vulnerable citizens. The aim of the funding was to establish and test outreach and special oral health care programs for socially underserved citizens at the municipal level. The present study is based on data collected from two municipalities, which were included in the program. Hence, the aim of the present study was to describe the oral health and the oral health-related quality of life in two groups of adult socially vulnerable and underprivileged individuals, and further, to evaluate the effect of the oral health care service on the oral health-related quality of life of these population groups.

Study population and methods

Recruitment of the participants

During the period 1 January 2013–31 December 2015, data were collected from participants in the oral health care

programs in the municipalities of Skive and Svendborg (in the following referred to as municipalities A and B). The municipalities A and B are situated in the western part of Jutland and in the southern part of Funen in Denmark, and the total population in A and B comprises approximately 50,000 and 60,000 citizens, respectively. Participation in the program in A was free of charge, meanwhile in B, the participants were charged an annual fee of approximately 200 EUROS. In addition, applications for special economic support to the participants in B were assisted by the social workers in the municipality centres. All participants in the programs were recruited from local drug treatment centres, centres for homeless people and/or centres for socially underserved citizens in other aspects. To increase the recruitment to the project, a series of information meetings were conducted by the staff from the municipal dental service. Later, referral into the program was mediated by local social workers. Initial inclusion criteria were at least one of the following:

- Long-term drug abuse
- Periodically homelessness or in unstable housing
- Permanently or periodically unemployment
- Considerable mental problems for example major personality disorders
- Poor social interaction skills and lack of initiative

The number of participants and dropouts is illustrated in [Figure 1](#). The social workers identified 136 individuals in A and 195 in B with oral health problems, who fulfilled the initial inclusion criteria, and who were initially referred to the program. All referrals were scrutinized by the dental service staff and the managers of the social centres. After this selection procedure, 110 participants in A and 125 in B were included in the programs. Frequent reasons for exclusion in the selection process were (1) the citizen was included by a mistake and did not meet the criteria for inclusion; (2) the user had died or had moved to another municipality; (3) the user did not want to participate in the program; or (4) the referred person utilized the conventional dental care system in private practice. Finally, some of the referred persons did not meet the criteria of having oral health problems. Moreover, eight persons dropped out from A and 7 from B leaving 102 persons in A and 118 in B in the program. A full treatment and preventive course was completed by 46 and 100 participants in A and B, respectively, while 55 participants in A and 18 in B only completed a partial oral health program. Furthermore, 43 persons in A and 56 persons in B completed the final questionnaire, meaning 42% and 47% of those who received dental services.

Content of the program

All treatments and preventive services of the program were delivered by the dental service staff of the local municipality. The programs in the two municipalities comprised identical elements, and the primary goal was to restore the dentition to a functional and socially acceptable level. This was done by means of 'low cost treatment services' such as

conventional filling therapy, endodontic and periodontal treatment (no surgery), tooth extractions and rehabilitation by means of removable prosthetics. Furthermore, preventive services such as instruction in oral hygiene and fluoride therapy as well as treatment under general anaesthesia were included in the scope of treatments. Through collaboration between the dental staff and the social workers, considerable efforts were made to support the participants in keeping their dental appointments and to complete the course of their dental treatment plan.

Oral health assessment

At baseline, oral status was registered according to DMFT (sum of decayed, missing, and filled teeth), number of teeth with visible crown, number of root remnants, number of teeth with mobility grade 3 [4] and the presence of removable dental prosthetics. At their first visit to the municipality dental service, the participants were escorted by a social worker, and examined by a dentist. Clinical registrations were made according to WHO recommendations [5]. The examination was performed in a dental office with the participants sitting in a dental chair, using artificial light from a permanent dental unit, two plane dental mirrors and a dental probe. Following the examination, the participants were interviewed about their dental visit habits and their tooth brushing habits. Finally, the participants were interviewed about their oral health-related quality of life (OHRQoL) by means of the Oral health Impact Profile 14 index (OHIP-14) [6], which comprises 14 items on perceived dysfunction, discomfort and disabilities due to oral disorders. Each item was measured on a five-point scale: never (score 0), hardly ever (score 1), occasionally (score 2), fairly often (score 3) and very often (score 4). This means that the sum of scores represents the total OHRQoL-score from 0 to 56. OHRQoL scores were only given when all 14 items of the index were completed. If the participant suffered from toothache, acute treatment was offered.

During the program period, all dental services, delivered to the participants were recorded. At the end of the treatment course, each participant was requested to be interviewed once more by means of the same questions as used at baseline, including the questions from OHIP-14. Registrations of OHIP-14 at baseline as well as after finalization of the treatment course were obtained from 43 participants in municipality A, and from 56 participants in municipality B.

Data were analyzed by the software Statistical Program for Social Sciences (SPSS, Chicago, IL) version 23.

Number of teeth, number of DMFT (sum of decayed, missing and filled surfaces), number of treatments and age were considered as continuous variables, and t-tests, alternatively non-parametric statistics were applied (Mann-Whitney test). The OHIP-14 registration was considered as an ordinal-scaled variable and analyzed by non-parametric statistics. For illustrative purposes, OHIP-14 data are reported by their means in the tables. In order to reveal potential selection bias caused by non-compliance and 'drop-outs', an analysis was made ([Table 1](#)); among four participants, data on oral health

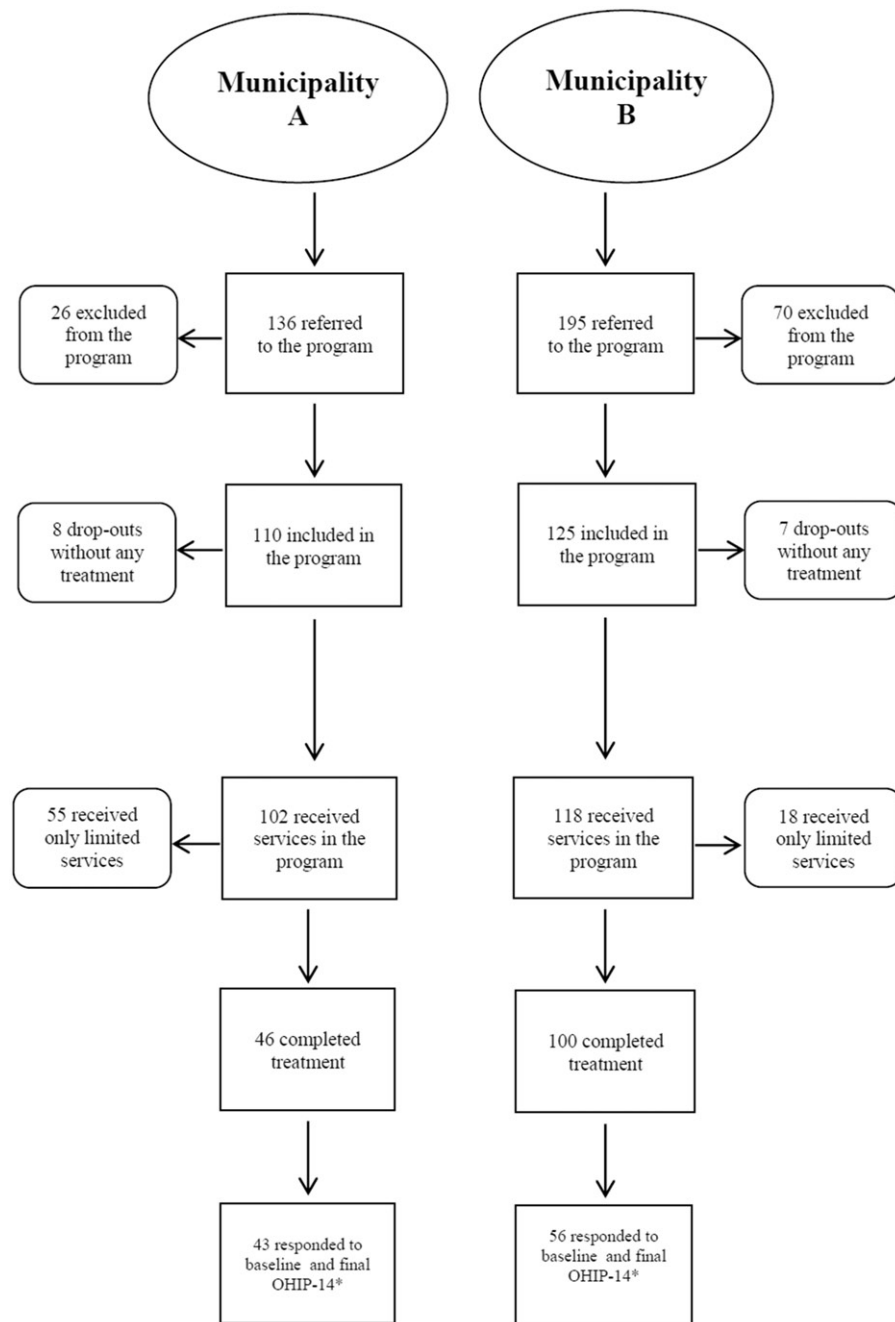


Figure 1. The flow-chart of the participants.

Table 1. The final study population (responding to baseline as well as final OHIP-14) and the respondents to baseline OHIP-14 only.

	Respondents to baseline and final OHIP-14 <i>n</i> = 99	Respondents to baseline OHIP-14 only <i>n</i> = 136*/*** <i>n</i> = 132** <i>n</i> = 135#	Total <i>n</i> = 235*/*** <i>n</i> = 231** <i>n</i> = 234#	<i>p</i>
Mean age*	44.3	43.0	43.5	NS
Gender male/female ratio %***	76/24	72/28	73/27	NS
OHIP-14 at baseline**	27.8	29.1	28.6	NS
Mean number of teeth% (at baseline excl. root remnants)	20.3	19.2	19.7	NS

*and #*t*-test, **Mann-Whitney test, ***Chi-square test.

variables were not available. Participants who completed two OHIP-14 recordings were compared to those who completed OHIP-14 at baseline only, with respect to age, gender, number of teeth and OHIP-14 at baseline. No statistical differences indicating such selection bias were identified. The rate of

participation differs between the two municipalities. Therefore, the analysis was also performed for the two municipalities separately, but revealed no statistically significant differences between participants and 'drop-outs' with respect to age, gender, number of teeth and DMFS. Finally,

logistic regression analyses were performed to reveal any confounding in the bivariate dropout analyses. Participation/drop-out was considered a dichotomic dependent variable and age, gender, number of teeth, and DMFT were considered independent variables. The logistic regression analyses were performed for the total population and in each municipality separately. No statistically significant associations were found.

Results

The final study population, who were offered dental services comprised 110 persons in A (69 males and 41 females) and 125 in B (102 males and 23 females). Age and gender of the participants in the two municipalities are shown in Table 2. With respect to age, statistically significant differences between the two populations could be observed at baseline. The mean age in A was 42.0 and 44.9 in B. The 95% C.I of the difference between the means was 0.42–5.5 (t -test $p < .05$, $F = 0.004$, $DF = 233$). Furthermore, the proportion of females was approximately one-third in A in contrast to one-fifth in B (Table 2). One participant refused to be examined. Thus, oral health status was obtained from 234 participants at baseline, and the data are presented in Table 3. Almost all participants had decayed teeth and the average number of decayed teeth was 9.5. Removable prosthetics were worn by 12% (Table 3). Additional data related to oral health behaviour are presented in Table 4. Less than one-fifth of the participants had visited a dentist within the last year, whereas 44% had not seen a dentist during the last 5 years. Two out of five had paid a visit to the dentist within 1–5 years. As for reasons for the last visit, 63% reported that the visit was motivated by pain or other troubles, and only 6% had visited a dentist in order to receive a dental examination. Concerning the time for the last dental visit or reasons for the visit, statistically significant differences between the two populations were not observed. Tooth-brushing was reported

twice a day by one-third of the participants, once a day, by another third, and 17% stated that they brushed their teeth less than once a week. The number of dental services delivered to the participants is shown in Table 5. Among those who completed a full treatment course, the mean number of fillings and extractions was 5.4 and 5.3, respectively. The corresponding number of services received by those, who only completed part of the course, were somewhat lower (Table 5). The means of OHIP-14 scores at baseline and the means of the final OHIP-14 scores are shown in Table 6. The final average OHIP-14 score in municipality A was 9.5, and 10.2 in B. In the final OHIP-14 scores, no statistically significant differences in any subscore or in total OHIP-14 were observed between the study populations in municipalities A and B, consequently they are presented as one population.

Discussion

It is impossible or at least very difficult to delimit the group of socially vulnerable and underserved citizens. There is a social gradient running through society, and the group of socially vulnerable is best described using a range of risk factors, since a general and distinct definition of this population group does not exist. However, almost identical selection criteria were applied independently in the programs in municipalities A and B, which seem to reflect that these criteria are relevant in a Danish context

It has been widely discussed how to assess oral health needs [7], and it has been argued that estimations based on normative needs have several shortcomings e.g. neglect of psychosocial aspects, quality of life concepts and unrealistic estimates for treatment planning. Furthermore, it makes no sense to measure the number of teeth and DMFT before and after a treatment intervention, due to the irreversible and destructive nature of oral diseases. Hence, Sheiham and Tsakos have recommended the application of Oral Health Related Quality of Life (OHRQoL) indicators in the assessment

Table 2. The study population in relation to age and gender.

	A		B		A + B		Total
	Male	Female	Male	Female	Male	Female	
<35 years	28% (19)	17% (7)	14% (14)	22% (5)	19% (33)	19% (12)	19% (45)
35–44 years	38% (26)	41% (17)	25% (26)	26% (6)	30% (52)	36% (23)	32% (75)
45–54 years	22% (15)	27% (11)	42% (43)	48% (11)	34% (58)	34% (22)	34% (80)
≥55 years	13% (9)	15% (6)	19% (19)	4% (1)	16% (28)	11% (7)	15% (35)
Total	69	41	102	23	171	64	235

Chi-square test of differences between municipalities with respect to age distribution ($p < .01$) and distribution of gender ($p < .01$).

Table 3. Dental status and actual dental disease at baseline (standard deviation in brackets).

	A $n = 110$	B $n = 124$	Total $n = 234$	p
Mean number of teeth* root remnants included	23.4 (7.5)	21.3 (8.0)	22.3 (7.8)	<.05
Proportion of edentulous participants#	2%	3%	3%	NS
Proportion with removable prosthetics#	10%	14%	12%	NS
Mean DMFT (sum of decayed, missing, filled teeth)*	22.0 (7.5)	24.3 (6.4)	23.2 (7.0)	<.05
Mean number of actual decayed teeth*	9.0 (7.0)	10.0 (6.5)	9.5 (6.8)	NS
Mean number of root remnants*	2.3 (3.7)	3.1 (4.1)	2.7 (3.9)	NS
Prevalence of actual decay#	93%	95%	94%	NS
Mean number of teeth with mobility grade 3*	0.6 (2.4)	0.6 (1.6)	0.60 (2.0)	NS

* t -test and #Chi-square test.

Table 4. Baseline-data related to oral health behaviour shown in percentages (absolute figures given in brackets).

When did you last visit a dentist	Less than 6 month	8% (18)
<i>n</i> = 226	6–12 month	9 % (20)
	More than 1 year	14% (32)
	More than 2 years but less than 5 years	25% (56)
	More than 5 years	44% (100)
What was the reason for the visit?	Consultation	6% (14)
<i>n</i> = 228	Pain or other troubles	63% (144)
	Planned treatment	20% (46)
	Regular examination	6% (14)
	Other reason	4% (10)
How often do you brush your teeth?	Never	7 % (15)
<i>n</i> = 227	Once in a while but not every week	10% (23)
	Once a week	3% (7)
	Several times a week, but no every day	12% (28)
	Once a day	34 % (78)
	More than one time a day	34% (76)

Table 5. Mean number of services delivered to the participants in municipalities A and B with a full or limited treatment course.

	A		B		Total		Total number of services
	Limited course	Full course	Limited courses	Full course	Limited courses	Full course	
Fillings	2.6	3.6	4.8	6.2	3.2	5.4	988
Extractions	4.8	4.7	3.7	5.5	4.5	5.3	1060
Endodontics	0.3	0.2	2.0	1.2	0.4	0.5	50
General anaesthesia	0.1	0.0	0.1	0.3	0.1	0.2	29
Periodontics	0.2	0.6	0.8	1.0	0.3	0.9	138
Prosthetics	0.5	0.8	0.2	1.2	0.4	1.1	181

Table 6. Mean OHIP-14 scores at baseline and at the end of the program.

	Score at baseline	Score at the end of the program	<i>p</i>
Speaking	1.2	0.8	NS
Sense of taste	1.2	0.8	<.05
Pain within a year	2.5	0.8	<.001
Chewing	2.6	1.1	<.001
Self-consciousness	3.0	1.0	<.001
Feeling tense	2.5	0.9	<.001
Inadequate diet	2.1	0.9	<.001
Interrupted meals	1.6	0.7	<.001
Relaxation	2.1	0.6	<.001
Feeling embarrassed	3.1	1.0	<.001
Feeling irritable	1.1	0.3	<.001
Working	1.0	0.2	<.001
Life in general	2.5	0.5	<.001
Daily function	1.4	0.2	<.001
Total OHIP-14 score	27.8	9.9	<.001

Mann–Whitney test.

of oral health needs and evaluation of treatment effectiveness [7]. The OHIP-14 index is a widely accepted short-form OHRQoL index, which has been tested for reliability and validity [8] and has been translated to Danish. OHIP-14 is regarded as a valid instrument for measuring aspects of life in individuals with high rates of chronic, physical and mental diseases [9], which is the case in the present study.

There are, however, notable study limitations. The study population could not be considered representative for social vulnerable persons. The present study was conducted as an exploratory study in order to find new ways of approaching a group of citizens, who cannot be reached by traditional dental care systems, and in the given context, it was not the intention to perform a randomized sample procedure to fulfil scientific demands; therefore, a general discussion of the representativeness of the study populations does not make sense.

Bias may be introduced in the study by the considerable number of dropouts in the programs, but the OHIP-14 scores

among the study population at the start and at the end of the program did not seem to reveal selection bias. The drop-out rate illustrates, however, the difficulties of the approach to this population group, and to maintain their contact to an oral health care program. This calls for further development of oral health programs for such population groups and emphasizes the need of realistic treatment plans.

The study showed that it actually was possible to establish an oral care program specially targeted to socially vulnerable people, and in addition, to obtain a relative success with such a program. It seemed possible to find and select those who were social vulnerable, and who had substantial oral health problems. It seemed that the program managed to break down the barriers between the clients and the dental staff, due to a special organization of the dental care and a welcoming and favourable attitude towards the target group. Because of considerable treatment needs and the lengthy treatment-courses, some of the participants did not

complete their treatment course during the program period. However, many of the participants finalized their treatment course after the program had ended. A similar program was made in UK for drug-users based on the same ideas as our program, i.e. breaking down barriers to dental care and creating an environment that was more responsive and appropriate to the clients' dental needs [10]. Corresponding to our results, the program in UK showed positive results of attending such special oral care program [10].

At baseline, the oral health situation for the participants in our study was very poor. The most prominent observation was a high amount of untreated caries and root-remnants found among the clients. In our study, almost all participants had untreated caries with an average of 10 teeth with untreated caries. The level of caries in the present study population is in deep contrast to the findings in the general population; a national survey among 35–44-year olds in Denmark showed an average of 0.5 teeth with untreated caries [11]. The findings of very poor oral health in the present study are in line with earlier findings, for example among homeless people, who represent a vulnerable group in the society; their poor oral health situation has been illustrated in quantitative as well as in qualitative studies [12,13]. A British literature review from 2012 concludes that drug dependence, and especially dependence of opioids causes substantial negative effects on oral health [14]. Already in 1984, Danish drug-abusers' caries level was found to be twice as high as in similar age groups [15]. Moreover, persons with alcohol abuse have been found to be at high risk of oral diseases, regardless of the use of alcohol was combined with drugs or not [16]. Further, in a Danish study the association between alcohol abuse and poor oral health seems to be related to the social sequelae of the alcohol abuse [17].

As for oral health behaviour in terms of earlier dental visits, a very low level was reported by the participants in the present study. The main reason for seeing a dentist was pain, and very few reported dental visits on regular basis. Whether the poor oral health is a consequence of low level of dental visits or vice versa is unknown; however, the situation is self-reinforcing, since large treatment need is costly in our dental care system, and apparently, at a level, which is not realistic for these people.

An infrequent use of dental services among socially vulnerable people was reported in several studies [10,13,14]. The oral health situation in the present study reflects the low level of treatment and dental visits. Our results show that the present population group is aware of the impact of their oral health situation but apparently, they do not seem to have the resources to improve the situation by themselves. Earlier studies among homeless people showed corresponding result; although homeless people seem to give low priority to dental care in drug abuse periods, they associate oral health with human dignity [13]. Furthermore, a British study shows a positive interest among drug users to get access to basic care and advice in clinics that are more responsive to their needs [10]. Dentists' negative attitude

towards homeless and drug users is also reported a barrier for seeking dental care [10,14].

Measuring people's oral health-related quality of life is an important element when assessing their oral health. In a study from 1995 it was concluded that 'health care providers need to pay attention to patient-driven information including perceptions and evaluation of function in order to improve health care delivery' [18]. It has been shown that OHRQoL is associated with number of teeth present and with the level of oral diseases [19]. OHIP-14 index was used in the present study as an outcome to illustrate the participants' OHRQoL at baseline as well as at the end of the program, in order to obtain their own idea of the effect of the dental treatment in the program. A low level of oral health-related quality of life (OHRQoL) was found at baseline in our study group, meaning a high score of OHIP-14 (average = 28.6, indicating a high level of oral health problems). Other studies of OHRQoL among social underprivileged groups found similar scores at high level. For example, a score of 29–32 was found among homeless people in UK [20], whereas a recent Danish study found an OHIP-14 score of 15.5 among socially underserved persons [3]. For comparison, a Swedish study among the general population of adults between 20 and 80 years of age found an average of OHIP-14 score of 6.4 in males and 6.8 in females [21]. Many studies of oral health-related quality of life use other types of measurement than OHIP-14. This makes it difficult to compare the results. Results of our study showed that socially vulnerable persons have many oral problems, and that these problems have significant influence on their quality of life. Furthermore, the attendance rate to the dental care program indicated a great interest in getting dental treatment and to achieve a solution to their dental problems. To our knowledge, no longitudinal studies were made on oral health-related quality of life in a population group as in the present study. The oral health-related quality of life-score (OHIP-14) measured at the end of the program was reduced with more than 100% on average compared to the score measured at baseline. Such an increase in the level of oral health-related quality of life combined with an improved oral health situation (for example less pain) might lead to some optimism and hope for re-entering the labour market and may be even motivate for getting independent of drugs. To reach a level of 9 (OHIP-14 score) may be considered a positive result, although the level in normal populations has been found to be around 6 [21]. Our results indicate that oral health problems among vulnerable and socially underserved population groups can be solved. However, it requires special arrangements in terms of a well-motivated and positive staff, who will understand the importance of the patients' perceived need and demand for dental care. Furthermore, the clinical environment as well as the atmosphere should be kind and responsive.

Disclosure statement

No potential conflict of interest was reported by the authors.

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