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ORIGINAL ARTICLE

Dental care attendance and refrainment from dental care among adults

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ABSTRACT

Objective: The aim of this study was to analyse dental care utilization, refrainment from self-perceived needed dental care and the association with socioeconomic indicators among adult individuals.

Materials and methods: This cross-sectional survey included 3500 randomly selected adult individuals. Telephone interviews were conducted and the participants answered a battery of questions regarding dental visiting habits, health, socioeconomic position (SEP), behavioural factors and lifestyle indicators.

Results: The outcome 'dental visits' was significantly correlated with SEP, especially with monetary dimensions, such as income and economic resources for unforeseen expenditures. However, educational level was not a significant predictor in the tested statistical models. Furthermore, other covariates that contributed significantly to the models were ethnicity, dental anxiety and lifestyle factors, albeit with a different pattern of impact on the two outcome dimensions. Important features of the SEP variables were the stepwise gradient relative to the outcomes, implicating that the lower the SEP status, the greater the risk of reporting irregular dental visiting habits and refraining from dental care due to financial problems.

Conclusions: Dental care utilization and refraining from dental care for financial reasons clearly reveal associations with socioeconomic positions among adult individuals.

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Dental care; epidemiology; health services; socioeconomic status; utilization

Introduction

In public health research, the relationship between social determinants and oral health has been well documented during the past 2–3 decades [1–6]. Low socioeconomic status, primarily measured by income and education, has consistently shown strong correlations with poor oral health, either self-perceived oral health or objective indicators, such as the level of periodontitis and caries [1,7]. Moreover, research has also shown pathways between oral health and utilization of dental services [2,8–10]. The literature points towards the role of dental care utilization as a mediator of good oral health [10–12]. However, there are barriers related to dental care, i.e. access to health services. Studies have concluded that the two main barriers concerning dental care are dental anxiety and the cost of treatment [13,14]. Several conceptual models of health services and access to care have been presented. In 1981, Penchansky and Thomas published their concept of access to health care in five dimensions [15]. Availability, accessibility, accommodation, affordability and acceptability define the degree of fit between patients and existing health services. Of these dimensions, affordability is especially targeted in dentistry, as patients are requested to pay for their dental care out of pocket in the majority of countries worldwide, for all or a major portion of the cost of the treatment performed [16]. In order to improve the understanding of socioeconomic status as a barrier of dental care utilization, the importance of different socioeconomic indicators should be investigated [2,10,17,18]. The effects of socioeconomic indicators should also be measured in a gradient fashion to elucidate possible hierarchical structures between socioeconomy and dental care utilization. The aim of this study was to analyse dental care utilization, refrainment from self-perceived needed dental care and the association with socioeconomic indicators among adult individuals.

Materials and methods

The present survey included a national sample of randomly chosen adult individuals in Sweden. A telemarketing company, TNS SIFO, which is a Swedish company that performs public opinion and market surveys, was responsible for the sample selection and the interviews with the individuals by telephone. The participants were randomly selected from the SPAR register in Sweden. The SPAR (Swedish Personal Address Register) includes all individuals who are registered as being resident in Sweden. The exclusion criterion was individuals who did not speak and/or understand Swedish. The number of adults (aged $\geq$19 years) included in the sample was $n = 3500$, giving a participation rate of 49.7%. Due to the non-respondents not answering the questionnaire, data on nonresponse was not available. However, data on age, gender and ethnicity was compared with Swedish national registers (Statistics Sweden, www.scb.se). Individuals in the survey were a little older with mean age 53 vs. 49 years of age, the proportion of women higher, 53.1% vs. 50.5%,

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respectively, and the proportion of foreign born was smaller, 10.1% vs. 18.0%, compared to the Swedish adult population 2013 when the survey was performed. The study was approved by the Regional Ethical Review Board Gothenburg (801-12).

A battery of questions concerning the individuals' dental visiting habits, self-perceived health, socioeconomic position (SEP), behavioural factors and lifestyle measures related to health were included in a questionnaire. The following variables were used in the analysis.

Dental visiting habits were captured by the question 'How often do you attend dental care on a regular basis?' (five response alternatives: every year, once every other year, less than every other year, only for emergency care, never). The scale was dichotomized into once every other year or more often (Regular) vs. less than every other year/only for emergency care/never (Irregular). Another question was related to the cost of treatment (two response alternatives): 'Have you refrained from self-perceived needed dental care during the last five years due to financial problems/high cost of treatment?' (no vs. yes).

Self-perceived health: 'How good is your general health?' (five response alternatives: poor, bad, fair, good, excellent). The scale was dichotomized into poor/bad (Poor) vs. fair/good/excellent (Good); 'How good is your oral health?' (four response alternatives: poor, fair, good, very good). The scale was dichotomized into poor/fair (Poor) vs. good/very good (Good).

SEP variables, such as gender, marital status (married/cohabiting vs. single), income in SEK (<200,000, 201,000–400,000, 401,000–600,000, ≥601,000) for the whole household (SEK 10 ∼ 1 euro), level of education (primary school, high school, university), estimated financial resources for unforeseen expenditures (SEK 15,000 in one week, three response alternatives: yes, always; yes, mostly; no, mostly not/no, never). Ethnicity was categorized as foreign-born or Swedish-born, including the Nordic countries.

Behavioural variables: Dental anxiety: 'Are you anxious about going to the dentist?' (four response alternatives no, a little, yes quite, yes very). The scale was dichotomized into no/a little (No) vs. yes quite/yes very (Yes); Oral pain: 'How often have you experienced oral pain?' (five response alternatives): never, seldom, sometimes, often, very often. The scale was dichotomized into never/seldom/sometimes (Less frequent) vs. often/very often (More frequent).

Lifestyle variables: 'How much do you exercise (physical activity) during your leisure time?' (two response alternatives: no exercise/a little (No) vs. once a week or more (Yes); smoking (yes, previous smoker, no)).

The analysis included frequencies, measure of central tendency (mean) and variability (standard deviation). Bivariate analyses were performed using the *t* test, the chi-square test and logistic regression. Multivariate logistic regression (MLR) analysis included the dependent variables of dental visiting habits and refraining from dental care. In the MLR, several different models were applied to reveal how different aspects on socioeconomic status, self-perceived health, behavioural dimensions and life style factors explain individuals' dental visiting habits and refrainment from dental care. Income and ability to obtain SEK 15,000 in one week (financial resources) were specifically tested in each of the above models since the two variables may capture different dimensions of barriers for dental care. Due to the obvious risk of collinearity, we analysed the above mentioned variables in different models. Covariates in all models were age, gender, marital status, ethnicity, health, dental anxiety and oral pain, and lifestyle factors. Model evaluations were performed using the Hosmer–Lemeshow and Nagelkerke test statistics. The preselected level of significance was $\alpha = 0.05$. Most of the above variables were reclassified into dichotomous or trichotomous categories, because of small number of participants in some of the original categories. Due to some missing responses, the number of observations differs in the analysis. Thus, missing answers in the presented variables range between 0 and 52, except for the variable 'income', where $N = 502$ answers are missing.

Results

Table 1 shows the proportions of the SEP variables for men and women. Typically, women have higher education, but lower income and poorer financial resources. Women attend dental care more regularly, perceive their oral health as good compared with men, but refrain from dental care proportionally more often than men for financial reasons (Table 2). The opposite result for general health is noteworthy, with significantly more men reporting good health. Dental-related symptoms and behaviour, such as pain and dental anxiety, were significantly more often reported by women. The lifestyle factors of physical activity and smoking revealed opposite results, with women having a higher weekly exercise frequency but being smokers less often than men.

Two of the three SEP variables, income and financial resources, showed strong associations with both irregular dental visits and refraining from dental care due to financial problems (Table 3). These variables also displayed a typical stepwise and graded trend per category for the respective variables.

Table 1. Distributions of included age and SEP variables among women and men: proportions, mean and standard deviation.

	Women (53.1%)	Men (46.9%)
Age, mean years	53.9 (SD 17.6)	52.8 (SD 17.4)
	% (*n*)	% (*n*)
Marital status		
Married/cohabiting	70.6 (1310)	75.5 (1238)
Education		
Primary	17.2 (317)	19.1 (311)
High school	36.8 (680)	44.1 (719)
University	46.0 (849)	36.9 (602)
Income (SEK)		
<200,000	20.8 (315)	13.3 (198)
201,000–400,000	31.5 (476)	26.0 (387)
401,000–600,000	25.6 (387)	27.8 (414)
≥601,000	22.0 (333)	32.8 (488)
Financial resources		
No	17.8 (325)	11.2 (182)
Yes, mostly	32.6 (595)	26.4 (429)
Yes, always	49.6 (905)	62.4 (1012)
Ethnicity		
Nordic-born	91.7 (1702)	92.3 (1513)
Foreign-born	8.3 (155)	7.7 (127)

Significant differences for all variables ($p < .05$) except for ethnicity ($p = .51$).

Education did not have such a clear pattern of association. For the following MLR analyses, education was not included as an independent variable since it showed a nonsignificant association with the outcome variables (data not shown). Tables 4 and 5 include irregular dental visits as the dependent variable. The tables differ with regard to the SEP variables (either income or financial resources) in order to reveal the importance of household income vs. more instant resources, reflecting different economic conditions as determinants for decision-making and subsequent health care behaviour. Lacking the ability to obtain SEK 15,000 in one week showed a stronger association with irregular dental care compared with low income levels, irrespective of the other independent variables included. Other important factors predicting individuals' dental attendance patterns in the respective models were primarily high dental anxiety, gender (men), ethnicity (non-Nordic) and physical activity (none). Moreover, self-perceived health (oral and general) was significant factors; poor health had odds ratios between 1.41 and 1.63 in the respective models, thus indicating an association between poor health and irregular dental care.

In Tables 6 and 7, the dependent variable 'Refraining from dental care for financial reasons' was tested in the same manner as in previous models. The risk ratios showed a different pattern compared with the irregular dental visit models. Thus, dental anxiety and gender were not significant. Instead, ethnicity, poor oral health, pain experience and smoking showed strong correlations with the dependent variable. However, the SEP variables revealed results parallel to those of previous models, with the ability to obtain SEK 15,000 in one week having the strongest impact on refraining from dental care, with an OR of 4.09. The model evaluation, as measured by the Nagelkerke test statistics, improved strongly from 0.12–0.15 to 0.18–0.23 for the 'irregular dental visit' and 'refraining from dental care' models, respectively.

Table 2. Descriptive statistics for dental visiting habits, health, and lifestyle variables among women and men (proportions).

	Women % (*n*)	Men % (*n*)
Dental visits		
Irregular	8.3 (154)	10.7 (175)
Regular	91.7 (1702)	89.3 (1466)
Refraining from dental care		
Yes	12.7 (234)	10.2 (167)
No	87.3 (1615)	89.8 (1466)
Oral health		
Poor	25.8 (477)	28.7 (470)
Good	74.2 (1375)	71.3 (1168)
General health		
Poor	17.3 (320)	11.8 (193)
Good	82.7 (1532)	88.2 (1444)
Dental anxiety		
Yes	12.4 (231)	5.6 (92)
No	87.6 (1626)	94.4 (1549)
Oral pain		
More frequent	15.9 (294)	10.5 (172)
Less frequent	84.1 (1559)	89.5 (1467)
Physical activity		
No	22.9 (425)	25.8 (422)
Yes	77.1 (1431)	74.2 (1212)
Smoking		
Yes	9.2 (170)	9.0 (147)
Previous	29.5 (548)	33.8 (554)
No	61.3 (1139)	57.2 (938)

.Significant differences for all variables ($p < .05$) except for oral health ($p = .051$).

Table 3. Irregular dental visits (IDV) and refraining from self-perceived needed dental care for financial reasons (RDC) relative to the SEP variables of education, income and financial resources to obtain SEK 15,000 in one week.

	IDV		RDC	
	OR	CI	OR	CI
Education				
Primary	1.32	0.96–1.80	1.45	1.05–1.99
High school	1.21	0.93–1.56	1.44	1.04–1.98
University	1.0	–	1.0	–
Income				
<200,000	3.56	2.45–5.16	2.24	1.60–3.12
201,000–400,000	1.78	1.23–2.58	1.51	1.10–2.06
401,000–600,000	1.36	0.92–2.01	1.12	0.80–1.57
>600,000	1.0	–	1.0	–
Financial resources				
No	5.10	3.87–6.73	7.40	5.66–9.68
Yes, mostly	1.40	1.05–1.88	2.26	1.73–2.95
Yes, always	1.0	–	1.0	–

OR: odds ratios; CI: 95% confidence intervals.

Discussion

The aim of this study was to analyse the association between dental care attendance and refrainment from self-perceived needed dental care in relation to SEP, while taking into account other important health, behavioural and lifestyle measures. The evaluation showed that dental visits are clearly

Table 4. Irregular dental visits as dependent variable and SEP (income and ethnicity), health, dental anxiety and oral pain, and lifestyle factors as independent variables in a logistic regression model ($N = 2963$).

	Odds ratio	95% CI
Income		
<200,000	2.52	1.60–3.98
201,000–400,000	1.57	1.04–2.35
401,000–600,000	1.12	0.76–1.69
>600,000	1.0	–
Age		
Years	0.98	0.97–0.99
Gender		
Men	1.60	1.22–2.10
Women	1.0	–
Marital status		
Single	1.25	0.91–1.71
Married/cohabiting	1.0	–
Ethnicity		
Non-Nordic	1.78	1.22–2.61
Nordic	1.0	–
Oral health		
Poor	1.53	1.15–2.05
Good	1.0	–
General health		
Poor	1.63	1.14–2.32
Good	1.0	–
Dental anxiety		
Yes	2.28	1.58–3.29
No	1.0	–
Oral pain		
More frequent	1.23	0.87–1.74
Less frequent	1.0	–
Physical activity		
No	1.66	1.25–2.21
Yes	1.0	–
Smoking		
Yes	1.50	1.01–2.24
Previous	1.24	0.92–1.67
No	1.0	–

Nagelkerke's model evaluation = 0.12.

Table 5. Irregular dental visits as dependent variable and SEP (financial resources to obtain SEK 15,000 in one week and ethnicity), health, dental anxiety and oral pain, and lifestyle factors as independent variables in a logistic regression model ($N = 3395$).

	Odds ratio	95% CI
Financial resources		
No	3.22	2.34–4.42
Yes, mostly	1.14	0.84–1.55
Yes, always	1.0	–
Age		
Years	0.98	0.97–0.99
Gender		
Men	1.71	1.32–2.21
Women	1.0	–
Marital status		
Single	1.44	1.11–1.88
Married/cohabiting	1.0	–
Ethnicity		
Non-Nordic	1.58	1.10–2.28
Nordic	1.0	–
Oral health		
Poor	1.41	1.07–1.86
Good	1.0	–
General health		
Poor	1.46	1.04–2.04
Good	1.0	–
Dental anxiety		
Yes	2.06	1.46–2.90
No	1.0	–
Oral pain		
More frequent	1.15	0.82–1.61
Less frequent	1.0	–
Physical activity		
No	1.73	1.33–2.27
Yes	1.0	–
Smoking		
Yes	1.30	0.89–1.86
Previous	1.19	0.89–1.58
No	1.0	–

Nagelkerke's model evaluation = 0.15.

Table 6. Refraining from self-perceived needed dental care for financial reasons as dependent variable and SEP (income and ethnicity), health, dental anxiety and oral pain, and lifestyle factors as independent variables in a logistic regression model ($N = 2963$).

	Odds ratio	95% CI
Income		
<200,000	1.59	1.05–2.43
201,000–400,000	1.23	0.86–1.76
401,000–600,000	0.95	0.67–1.36
>600,000	1.0	–
Age		
Years	0.97	0.96–0.98
Gender		
Men	0.81	0.64–1.04
Women	1.0	–
Marital status		
Single	1.14	0.84–1.55
Married/cohabiting	1.0	–
Ethnicity		
Non-Nordic	2.81	2.01–3.93
Nordic	1.0	–
Oral health		
Poor	2.79	2.15–3.62
Good	1.0	–
General health		
Poor	1.53	1.09–2.15
Good	1.0	–
Dental anxiety		
Yes	1.34	0.94–1.91
No	1.0	–
Oral pain		
More frequent	1.96	1.47–2.64
Less frequent	1.0	–
Physical activity		
No	0.75	0.56–1.01
Yes	1.0	–
Smoking		
Yes	2.06	1.42–2.98
Previous	1.54	1.17–2.02
No	1.0	–

Nagelkerke's model evaluation = 0.18.

correlated with SEP, especially with monetary dimensions; in this survey represented by income and financial resources for unforeseen expenditures. However, educational level was not a significant predictor in the tested statistical models. Moreover, other covariates contributed significantly in the models, specifically ethnicity, dental anxiety and lifestyle factors, albeit with a different pattern of impact on the two outcome dimensions. Important features of the SEP variables were the stepwise gradient fashion relative to the outcomes, indicating that the lower the SEP status, the greater the risk of reporting irregular dental visiting habits and refraining from dental care due to financial problems.

The finding that there is income-related inequality in dental care use among adults has been shown in other studies as well [6,8,19,20]. Listl described significant income-related inequalities related to the use of dental care in different European countries [8]. The results also revealed that access to treatment was significantly higher among richer individuals than among poorer citizens in 12 countries, including Sweden. In the present study, two different outcomes measured the dental visit patterns and these two indicators may capture somewhat different aspects of individuals' dental care attendance. 'Regular dental visits' was based on how often the individuals saw a dentist, and the other measure dealt with refraining from dental care due to lack of financial resources. Assuming different interpretations of the two questions, the results reflect different patterns of significant predictors. In both models, the money-related factors, income and ability to obtain a large amount of cash in one week, were significantly associated with the outcomes. However, the latter factor was considerably stronger for the outcome of refraining from dental care. It may be argued that household income and a cash reserve are two sides of the same coin; thus, despite a fairly high income, the possibility of obtaining cash assets may be quite slim. Costs have been and are associated with barriers to dental care and treatment, irrespective of the type of insurance system and fees [13], as, in most countries, adult patients have to pay out of pocket for treatment, with a more or less substantial amount relative to the total cost. The national dental insurance system in Sweden includes a high-cost protection scheme for individuals older than 21 years of age (for children and adolescents younger than 21, and, in some regions, up to 24 years of age, dental care is free of charge), but up to SEK 3000, the patients pays 100% of the treatment cost. Between SEK 3000 and 15,000, the patient pays 50% and over that amount, the out-of-pocket fee is 15%. Still, individuals with very low income and a small chance of obtaining SEK 15,000 at short notice may have to postpone their dental care, even if it is urgently needed.

Table 7. Refraining from self-perceived needed dental care for financial reasons as dependent variable and SEP (financial resources to obtain SEK 15,000 in one week and ethnicity), health, dental anxiety and oral pain, and lifestyle factors as independent variables in a logistic regression model ($N = 3382$).

	Odds ratio	95% CI
Financial resources		
No	4.09	3.02–5.53
Yes, mostly	1.71	1.29–2.26
Yes, always	1.0	–
Age		
Years	0.97	0.96–0.98
Gender		
Men	0.88	0.69–1.12
Women	1.0	–
Marital status		
Single	1.14	0.88–1.46
Married/cohabiting	1.0	–
Ethnicity		
Non-Nordic	2.40	1.74–3.30
Nordic	1.0	–
Oral health		
Poor	2.71	2.11–3.48
Good	1.0	–
General health		
Poor	1.34	0.98–1.85
Good	1.0	–
Dental anxiety		
Yes	1.27	0.91–1.76
No	1.0	–
Oral pain		
More frequent	1.78	1.34–2.37
Less frequent	1.0	–
Physical activity		
No	0.71	0.54–0.95
Yes	1.0	–
Smoking		
Yes	1.93	1.36–2.73
Previous	1.49	1.15–1.94
No	1.0	–

Nagelkerke's model evaluation = 0.23.

The results of this study further point to other important predictors that influence dental care visits. With regard to regularity of care, gender (male), ethnicity (non-Nordic), dental anxiety (high) and physical activity (none) were the strong factors in the models. Women have shown better compliance with health care in general, and this also goes for dental care [3,19]. Another social indicator in society is ethnicity, which also impacts on health services. The results of the present study may actually be underestimated, as the proportion of foreign-born adults in Sweden (national data) is higher than in this survey. Furthermore, Astrom et al. indicated similar results; however, not such a high risk of irregular dental visits [3]. A behaviour-related factor, dental anxiety, had high risk ratios, which has also been found in other studies [13]. Avoidance of or irregular dental care is usually a common feature among adults with high dental anxiety and the prevalence of high dental anxiety in this survey matches other studies in Scandinavia and other countries [13,21]. In addition, physical activity or, rather, no exercise showed a strong relationship with irregular dental visits. A possible explanation may be that more health-oriented individuals are also aware of the importance of regular health examinations, including dental care.

The model for the outcome 'refraining from dental care due to financial problems' shows a somewhat different pattern of significant predictors, compared with the 'dental visits' outcome. Both income and poorer financial resources (SEK 15,000) revealed the stepwise gradient profile of less cash reserves having the strongest impact on the outcome. Furthermore, having poor oral health and experiencing oral symptoms with pain stood out in this model. This results in individuals being more likely to refrain from treatment, despite obvious problems with oral health, irrespective of the other independent variables included. Thus, the interpretation may be that there is inequity in dental health services access related to socioeconomic disparities, which has also been reported previously [2]. Another variable, smoking, with an OR of about 2, supports such an explanation, as this behaviour is significantly more prevalent among less affluent Swedes.

This survey has some weaknesses, such as the cross-sectional design, allowing no causal inferences to be drawn, and the relatively high non-participation rate. However, one variable, ethnicity, had a significant and important different and lower prevalence compared with the national data. For this reason, it may be reasonable to assume underestimation rather than overestimation of the risk of irregular dental utilization and refrainment from dental care [10]. The positive features of the survey would be the large sample size, the randomly selected individuals nationwide, and the use of variables from dimensions important to the analysis of health care services, with special emphasis on the affordability of dental care, using measures capturing socioeconomic, behavioural and lifestyle aspects of oral health.

The conclusions of this study are that dental care utilization and refraining from self-perceived needed dental care for financial reasons clearly reveal associations with SEPs among adult individuals, with both strong risk ratios and stepwise gradient features. The analysis also shows a different pattern of risk factors dependent upon the outcome: 'irregular dental care' or 'refraining from dental care for financial reasons'.

Disclosure statement

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this article.

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