Decomposition Analysis of Socioeconomic Inequalities in Utilization of Oral Health Services: A Population-Based Study in Urban and Rural Households of Ahvaz

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Abstract

Background: Inequality in the use of dental services is a primary concern of global health, and few studies have been done in this field in Iran. Therefore, the present study aimed to conduct a decomposition analysis of socioeconomic inequalities in the utilization of oral health services.

Methods: This was a cross-sectional study in which 715 households, including 2680 people living in Ahvaz, were included using a stratified-cluster sampling. Data were collected using a questionnaire. For data analysis and estimating the elasticity of the influencing factors, the logistic model and Stata software were used. The social and economic disparities in oral health variables were broken down into determinant components using the Van Doorslaer and Wagstaff technique.

Results: The key factors determining social and economic inequalities in the utilization of these services were insurance status, education level, income quintile, and occupation. Nearly 31% of utilization inequalities can be attributed to the insurance status of households. In addition, the education level of household members (about 28%) was the second factor of inequality. The variables of income quintile and occupation are also considered as the third factor, and the age of household members had a negative role in the socioeconomic inequality.

Conclusion: The utilization of oral health services can be improved by improving economic and social variables in society. Therefore, including oral health services in insurance plans and primary health care services and supporting people with low-income levels can play an important role in reducing these inequalities.

Keywords: Socioeconomic, Inequality, Concentration Index, Decomposition Analysis

Introduction

Oral diseases are one of the most common chronic diseases. Due to their prevalence and impact on people and the costs of their treatment, they are considered important issues in relation to the public health of society (1, 2). In order to comprehend societal needs, distinguish between individuals' needs and those that are deemed necessary for them, plan oral health services, prepare specialized personnel for training, allocate health resources appropriately, and other related matters, it is imperative to analyze health indicators across various socioeconomic strata (3). Oral and dental diseases such as tooth decay, tooth loss, and periodontal diseases are common in adults and are a significant problem for public health worldwide (4). Therefore, it seems that to increase utilization of these services in all countries, they should be integrated with primary care services to focus more on promoting and maintaining health

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↑*What is "already known" in this topic:*
Inequality in the utilization of dental services is a primary global health concern, and people should receive these services when needed regardless of their socioeconomic status.

→*What this article adds:*
Improving primary healthcare and insurance policies, as well as providing assistance to those with limited financial resources, can all contribute to a decrease in the disparities in the use of oral health services.

(5).

Inequality in the use of dental services is a primary global health concern (6). However, people should receive health care services when they need them regardless of their socioeconomic status, but there is clear evidence that the use of dental services is not equally distributed among different social and economic groups in different countries (7). In 23 European countries, higher dental care coverage was associated with lower income inequality in dental care (8). Also, recently, a study in Norway found that not visiting the dentist for financial reasons was associated with poor oral health (9).

Increasing the utilization of dental care services and routine examinations can lead to better health (10). Studies have shown that socioeconomic status is significantly related to oral health, so poorer people use fewer dental care services than others (11, 12). Empirical evidence from various health systems shows that low income, low education level, and living in rural areas are associated with lower use of dental care services. According to Anderson's model of health service utilization, economic status is the main factor in the utilization of dental services. Still, other factors such as age, sex, education level, attitudes toward oral health, lifestyle, and sociocultural status also affect the use of these services (13, 14).

Some studies have been conducted on the factors that determine the utilization of dental services in different regions of Iran. Still, empirical evidence about social and economic inequality in the utilization of oral health services is scarce (15, 16). Therefore, there is an urgent need to conduct more detailed research and policy-making in oral health, emphasizing the impact of social and economic factors on inequality in the utilization of these services. Therefore, this study aimed to investigate socioeconomic inequalities in the utilization of oral health services and determine the effect of each socioeconomic subindices by using the elasticity of each factor with the concentration index and decomposition analysis in Ahvaz, Iran.

Methods

In this cross-sectional study, the studied population included urban and rural households living in Ahvaz in 2022-2023, which was designed with the stratified-cluster sampling method. Ahvaz is the largest and most populous city in the southwest of the country. Ahvaz metropolis has 8 municipal districts and subordinate villages. In this study, an unequal quota method was used according to the resident population for each class that includes the municipal area and the set of subordinate villages. For rural areas, the entire village was studied based on the sampling method and the spacing number from the starting point of the first household. The amount of P in the sample size formula is equal to the percentage of oral health usage, which was found to be 58% based on a prior study conducted in Iran (15). This formula is used to compute the examined sample. For greater certainty in this study, double the number was taken into consideration. After removing the questionnaires whose information was incorrect, the 715 households, or 2680 members, were studied. The Z statistic was equal to 1.96 and the value of d was also 0.05.

$$n = \frac{z^2_{1-\frac{\alpha}{2}} \cdot p(1-p)}{d^2}$$

In this research, the required data were collected using a questionnaire, which contains 82 questions in 7 sections and is used to examine the socioeconomic factors affecting the utilization of oral health. The data collection method was through face-to-face interviews of interviewers with the household head or other family members who were aware of the data required for the study. The duration of each interview was about 20 minutes. For the face validity of the questionnaire, the opinions of supervisors, consultants, and some health economics experts were used. According to the searches, the Global Health Survey questionnaire's variables—which were designed to evaluate the effectiveness of the health care system—were utilized to determine content validity (17). To calculate the reliability of the questionnaire, first, the questionnaire was administered to a group of 10 people; then, after a short interval, the test was administered to the same group again under the same conditions, and the scores obtained from the 2 tests were analyzed; the correlation coefficient was 0.89. The concentration curve plots the total proportion of participants according to income on the x-axis and the total percentage of oral health needs and utilization on the y-axis. The utilization of oral health services, their relationship with social and economic variables, and other dummy variables—quantitative variables that represent qualitative variables and are typically limited to two values of zero and one—were estimated using a logistic model and Stata software. The elasticity of influencing factors was also estimated. The logistic model for this study was as follows:

$$f(y_i) = \Pi_i^{y_i}(1-\Pi_i)^{1-y_i}$$

Where Yi is an imaginary variable and can take values of 0 or 1 (utilization or nonutilization). In this function, the probability that the household will utilize dental health services was as follows:

$$p(y_i = 1/x_i) = \Pi_i$$
$$E(y/x) = p(y_i = 1/x_i) = \Pi_i = G(x'_i\beta)$$
$$(x'_i\beta) = \beta_1 x_1 + \beta_2 x_2 + ... + \beta_n x_n$$

This model was estimated using the maximum likelihood estimation method(18). This study quantified and analyzed social and economic disparities using the concentration curve and relative concentration index (RC). The usage concentration index was broken down into its component variables in order to ascertain the percentage of each independent variable's influence in the distribution of inequality in the use of oral health services. To break down the concentration index, the regression coefficients were used. In this study, social and economic disparities in health were broken down into their determining elements, or independent variables, using the methodology suggested by Van Doorslaer and Wagstaff. Using this approach, the concentration index was broken down as follows (19):

$$C_Y = \sum_k \left(\frac{\beta_k \bar{x}_k}{\mu}\right) C_{K+} \frac{GC_\varepsilon}{\mu} = C_{\hat{Y}} + \frac{GC_\varepsilon}{\mu}$$

In this relationship, μ is the average of y, $\bar{X}_K$ is the average of X_K, C_K is the concentration index f or X_K, GC_ε is the generalized concentration index for ε_i, which is the remainder of the concentration index that the determinants in the model cannot explain.

According to this study, smoking is considered a high-risk behavior, and engaging in sports-related activities like football, swimming, or morning exercise is considered a sports-related practice.

Results

Table 1 reports the main and basic characteristics of the studied people. As shown in this table, 23.5% of the surveyed people are younger than 10 years, 3.95% are older than 60 years, and the rest are between 10 and 60 years. Also, 50.41% of participants are men. In terms of education variables, 16.04% are illiterate, 16.79% have primary education, 13.95% have middle school education, 19.21% have high school education, and 33.99% have university education.

The following variable investigated is the employment status of people, 25.14% of whom were students, 17.27% homemakers, 15.85% had government jobs, 13.50% had other employment status (for children under 7 years), 10.89% were self-employed, and the rest were in different job categories. Regarding the variable of insurance status, as can be seen, 60.37% had social security insurance, 18.91% had health insurance, 13.02% were uninsured, and the rest were covered by other insurance funds. Also, 3.7% of participants had high-risk behaviors (smoking, tobacco, etc); 62.46% did not do any sports activities during the week; 28.47% exercised less than 3 times a week; and 9.06% exercised more than 3 times a week. Regarding the
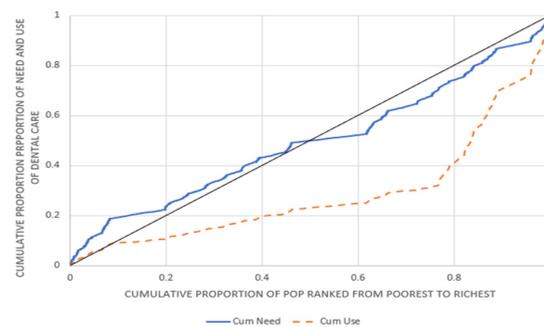

Figure 1. Concentration index of utilization of oral health services

need for oral health services, 47.54% of participants did need and 52.46 did not need these services. Among the people who felt the need for oral health services, 62.87% did not take action to meet their need and only 37.12% took action to meet the need for oral health services.

Figure 1 shows the concentration index of utilizing oral health services.

According to the above diagram, the need concentration index was equal to 0.011, showing that the needs are almost equally distributed in the study sample. With a utilization concentration score of 0.43, the rich have much greater access to necessities than the poor, indicating a comparatively high inequality. Ultimately, the utilization concentration curve was found to be lower than the need concentration curve, and the horizontal inequality index, which favors the rich, was equal to 0.42. The utilization concentration index of oral health services was broken down, and the results are displayed in Table 2.

In this table, the coefficient, elasticity, concentration index, and participation percentage of the concentration index are mentioned separately for each variable. The posi-

Table 1. Baseline Characteristics of the Population

Variable	Domain	Frequency (%)	Variable	Domain	Frequency (%)
Age	0-10	630 (23.5)	Sex	Male	1351 (50.41)
	11-30	836 (31.19)		Female	1329 (49.59)
	31-50	951 (35.48)	Employment	Unemployed	141(5.26)
	51-60	157 (5.85)		Self-Employment	292 (10.89)
	Up To 60	106 (3.95)		Government Job	425 (15.85)
Education	Illiterate	430 (16.4)		Private Job	205 (7.64)
	Elementary	450 (16.79)		Student	674 (25.15)
	Intermediate Education	374 (13.95)		Income Without Work	17 (0.9)
	High School	515 (19.21)		Housewife	463 (17.27)
	University	911 (33.99)		Annuitant	25 (0.9)
Insurance	No Insurance	349 (13.02)		Retired	76 (2.83)
	Social Security	1618 (60.37)		Other	362 (13.5)
	Health Services	507 (18.91)	Risky Behavior	Yes	99 (3.97)
	Relief Foundation	25 (0.9)		No	2581 (96.3)
	Armed Forces	74 (2.76)	Need For Oral	Once	575 (21.46)
	Supplementary	56 (2.08)	Health	Twice	463 (17.27)
	Private	51 (1.9)		Thrice	236 (8.8)
Exercise Per Week	0	1674 (62.46)		No	1406 (52.46)
	Less Than 3 Times	736 (28.47)	Action To Meet The	Yes	801 (62.87)
	More Than 3 Times	243 (9.06)	Need	No	473 (37.12)
Total		2680 (100)			

Table 2. Breakdown of Socioeconomic Inequalities

Variable		Coefficient	Elasticity	Absolute Contribution	% Contribution
Age	0-10	0.36	-0.022	-0.06	-4.65
	11-30	0.15	-0.018	0.09	
	31-50	-0.12	0.013	-0.05	
	51-60	0.05	0.017	-0.08	
	Up To 60	0.67	-0.03	0.08	
Sex	Male	-0.57	-0.03	0.03	4.65
	Female	0.46	0.02	-0.01	
Education	Illiterate	0.74	-0.05	0.09	27.9
	Elementary	0.63	-0.07	0.06	
	Intermediate Education	-0.24	0.03	-0.03	
	High School	-0.15	-0.06	-0.08	
	University	0.52	-0.03	0.08	
Employment	Unemployed	0.85	0.07	0.01	13.95
	Self-Employment	0.12	0.11	-0.09	
	Government Job	-0.28	0.4	0.04	
	Private Job	0.24	-0.02	0.01	
	Student	-0.64	0.08	-0.06	
	Income Without Work	-0.34	0.02	0.01	
	Housewife	-0.18	-0.09	0.01	
	Annuitant	0.11	-0.02	-0.04	
	Retired	-0.1	0.04	0.08	
	Other	0.2	0.05	0.09	
insurance	No Insurance	0.25	0.12	0.16	30.23
	Social Security	0.12	0.08	-0.09	
	Health Services	-0.37	0.04	-0.05	
	Relief Foundation	-0.64	-0.11	0.07	
	Armed Forces	0.24	0.03	0.04	
	Optional	0.57	0.06	0.06	
	Private	0.42	-0.21	0.06	
quintile	1	0.62	0.24	-0.1	13.95
	2	0.47	-0.13	-0.08	
	3	0.11	-0.1	0.02	
	4	-0.26	0.21	0.12	
	5	-0.09	0.14	0.1	
Risky behavior		0.36	0.13	0.01	2.32
Residual				0.05	100

tive value of the contribution of the variable in the concentration index indicates that the relevant variables increase inequality and vice versa. The findings showed that the majority (nearly 31%) of the disparity in utilization was attributed to the insurance status of households. In addition, the education of household members (about 28%) was the second factor of inequality in the utilization of oral health services in Ahvaz. The variables of the income quintile and the occupation of individuals were also jointly considered as the third factor for inequality in the utilization of these services and the member's age had a negative role in the studied socioeconomic disparities.

Discussion

This study was conducted to analyze socioeconomic inequalities in the utilization of oral health services using the concentration index and decomposition analysis in the households of Ahvaz in 2022. Based on previous studies, socioeconomic inequalities significantly impact the use of health services, especially dental services (20, 21). The results of our study's decomposition analysis showed that most inequalities in the use of oral health services can be attributed to the insurance status of households. Furthermore, the age of household members had a negative role in socioeconomic disparities in using these services. The second factor of inequality was the education of household members. The third factor of inequality in the utilization of

these services was the combination of the variables of household income quintile and individual occupation. The study by Rezaei et al demonstrated that the primary factor causing inequality in the use of dental services is the socioeconomic status of families. Their findings also indicated that factors pertaining to the head of the household, such as age, sex, health insurance coverage, level of education, and marital status, were effective in causing inequality in the use of dental care (21). Jang et al also concluded that the probability of having unmet dental needs is higher in people with less than secondary education (22). All the findings of these studies are consistent with those of the present study. Regarding the education variable, it can be concluded that the positive effect of education on the use of dental services can be attributed to the knowledge of oral health and attitude toward the use of dental services. Based on the study by Nouraei Motlagh et al, the employment status of the household head was one of the most critical factors determining the use of dental services (23). Some other studies also showed that employed people seek health services more than unemployed people (24-26). Gholami et al also concluded that occupation is one of the most critical determinants of health (27). Piovesan et al evaluated the use of dental care services in 12-year-old children in Santa Maria, Brazil, and found that children who have a lower socioeconomic status use more inadequate dental services. Additionally, children with higher financial status showed a

stronger propensity to use private sector services and a decreased use of public sector services (28). XU et al, in a study using the decomposition analysis method of concentration index, showed that although most of the inequality in the use of oral health services can be explained by the difference in income level, type of primary insurance, education level, and place of residence, there are differences in the role of these factors in different age groups (29). The study by Moradi et al showed that higher levels of education and awareness of mothers have reduced inequalities in oral health (30). A study in Mexico showed that people with a lower level of education are more at risk of poor oral health status, which is consistent with the findings of the present study (31).

Considering the decisive role of insurance in creating inequality in the utilization of oral health services in the present study, it can be stated that the existence of third-party insurance and payers, especially supplementary insurance, affects the financial resources that people have to pay out of pocket for dental care and thus facilitates the utilization of this care. It can also be concluded that the use of dental services depends on the price elasticity of demand for these services. If a family is very sensitive to changes in the price of services, they will not spend money on these services if the price increases. In families where a third party pays the costs, there is less sensitivity, which can remove the economic obstacles in utilizing these services.

Our study provides valuable and important information about socioeconomic-related inequality in oral health utilization among households in Ahvaz. However, some limitations should be considered when interpreting the findings. Because the study is cross-sectional, we cannot prove a causal relationship between the determinants of oral health and its consumption. Secondly, the use of data on oral health is self-reported, which can lead to inaccuracies like recall bias.

Conclusion

Improving social and economic factors in society encourages the use of oral health services. Thus, assisting those with low income levels and including oral and dental health services within primary health care and insurance policies can be crucial in mitigating these inequalities.

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Authors Contributions

B.H. and Sh.T. had the original idea for this work. S.B. and A.F. designed the study. A.F. Sh.T. collected data; and A.F. performed analysis. A.F. and B.H. analyzed the data; and S.B. wrote the manuscript. All authors critically revised the draft of the manuscript and approved its final version.

Conflict of Interests

The authors declare that they have no competing interests.

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