Socioeconomic Inequalities in the Utilization of Dental Services Among Adults in Saudi Arabia

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Abstract

Background

This study used the Anderson Behavioral Model to assess the socioeconomic inequalities in dental services utilization among adults in Saudi Arabia, along with other predictors of utilization, to inform future planning of dental care services.

Methods

In this cross-sectional study, we conducted secondary analysis using national data from the 2019 Kingdom of Saudi Arabia World Health Survey (KSAWHS). The survey consisted of two interviewer-administered questionnaires, one for the household and one individual interview. The questionnaires included questions covering predisposing factors (age, gender, marital status, nationality, education, employment), enabling factors (income, household wealth, area-based socioeconomic class, health insurance, eligibility for free governmental health care, transportation and region of residence) and self-reported need for dental treatment. The main outcome was dental utilization. The independent variables were the predisposing, enabling and need factors. Hierarchical logistic regression analyses identified significant predictors of dental utilization, applying survey weights to adjust for the complex survey design. Adjusted odds ratios with 95% confidence intervals and p values were reported in the final model.

Results

The final dataset included 8,535 adults (response rate = 95.4%). Twenty percent of adults visited the dentist at least once in the past year (95%CI: 18% -21%). The socioeconomic factors associated with the higher likelihood of dental service utilization in the final fully adjusted model were high household income (OR = 1.43, p = 0.043), second and middle household wealth status (OR = 1.51, p = 0.003 and OR = 1.57, p = 0.006) and access to free governmental health care (OR = 2.05, p = 0.004). In addition to self-reported oral problems (OR= 52.09, p < 0.001).

Conclusion

Socioeconomic inequalities in the utilization of dental services exist in Saudi Arabia. The main driver of dental services utilization in adults was the need for treatment suggesting predominantly symptomatic attendance. Increasing awareness about the importance of preventive dental visits rather than symptomatic attendance could be an important policy implication to improve oral health and optimize dental care expenditure. Further research should explore the drivers for adults to seek preventive care in the absence of any recognized dental problems.

Background

Oral diseases are the most prevalent noncommunicable diseases around the world and have substantial impact on health, societies, and economies [1]. The World Dental Federation (FDI) Vision 2030 report aims to improve oral health and diminish oral health inequalities over the next decade [2]. FDI identified access to dental care and universal dental coverage as key pillars and global health priorities [3]. Improved dental healthcare services promote better work output (in education and employment) and help to alleviate impoverishment. Early detection of oral diseases reduces the expenditure on their treatment. Both having a direct positive impact on the overall quality of life [4].

Increasing access to dental healthcare services and promoting prevention is also a priority in Saudi Arabia reflected by the National Transformation Program, designed to fulfil the Saudi Arabia Vision 2030 [5]. Dental services in Saudi Arabia are provided by the public and private sectors; all Saudi citizens have the right to free dental care in primary, secondary and tertiary government facilities [6]. Non-Saudi residents are guaranteed access to dental care by mandatory health insurance provided through their employers [7]. Yet, utilization of dental services is still relatively low [8]. Other countries that also have free access for specific groups or varying coverage across populations still demonstrate inequalities in dental utilization [8–10]. However, little is known about the socioeconomic inequalities in utilization of dental services in Saudi Arabia. Few studies have investigated the predictors of dental utilization in Saudi Arabia. Most of these studies were localized to limited regions and targeted specific populations [8]. Assessing the extent of inequalities in use of dental services and the factors associated with them will help to identify approaches to reduce these inequalities and ultimately improve oral health [9].

The Anderson model of health care has been used as a theoretical framework to explore dental utilization [10]. This model suggests that predisposing characteristics, enabling resources and need factors shape the utilization of dental services [11, 12]. Predisposing characteristics comprise demographic factors such as age and gender [13], and social factors (e.g., education, ethnicity, and health beliefs) [14]. Predisposing characteristics affect the likelihood of using dental services through the natural history of oral diseases, genetic factors, health beliefs and social or cultural influences [15]. Enabling resources facilitate the use of dental services; income or wealth determines a person's ability to pay for services, while insurance and cost-sharing rules define the actual price of the service and the amount that a patient pays out of pocket [16]. Need factors can be perceived need or evaluated need. Perceived need is how an individual evaluates their own health status, while evaluated need is an objective measurement of an individual's health status often assessed clinically by health professionals [16].

Previous studies that have used the Andersen model to assess socioeconomic disparities in the utilization of dental services have shown that enabling factors are key predictors [9, 15, 17]. These significant predictors included out of pocket payment and history of receiving welfare [15], health insurance coverage [9], wealth [17, 18], education and income [9, 17]. Only one study in Saudi Arabia, to our knowledge has used the Andersen model to investigate the utilization of dental services among

children. The study found that parental education was a significant predictor of dental use among young children [19].

Studies have used a range of socioeconomic indicators at the individual, area-based or contextual levels including education, occupation, income and indices of deprivation and material assets (e.g., home ownership) either as single measures or composite indices [9, 18, 20]. Income and education have been the main indicators used in previous Saudi Arabian research to explore dental utilization. Choosing the most appropriate socioeconomic indicator depends on the relevance of those indicators to the outcome and context of the study [21]. Income data can be an insensitive measure due to high nonresponse rates compared to other socioeconomic status measures [22]. Income is also an age dependent, less stable measure that does not provide a full picture of socioeconomic status in Saudi Arabia because as it does not take into account other resources such as wealth, inheritance or insurance coverage [21–23]. Education affects health by non-economic pathways such as health-related knowledge, lifestyle, and behavior. Measures of education are easier to collect and are more stable than income [21, 23]. However, an increase in the education level does not consistently equate with an increase in socioeconomic status. The limitations of using education and income as socioeconomic indicators in Saudi Arabia suggest a need to use multiple measures of socioeconomic status that are relevant in the local context [23]. Relevant contextual socioeconomic indicators include employment status, household wealth and an area-based measure of socioeconomic class specific for Saudi Arabia [24].

Assessing the socioeconomic inequalities in utilization of dental services among adults in Saudi Arabia will provide an evidence basis for effective planning of dental services to increase utilization and ultimately improve oral health. The study aimed to use the Andersen model to identify socioeconomic inequalities in dental services utilization, along with other predictors of utilization, for the Saudi Arabian context to inform future planning of dental services.

Methods

Study design

In this cross-sectional study, we conducted secondary analysis using national data from the 2019 Kingdom of Saudi Arabia World Health Survey (KSAWHS) [25]. The 2019 KSAWHS was a national household survey led by the Ministry of Health to provide up-to-date estimates of priority health-related indicators. The survey gathered information from a nationally representative sample of 10,000 households covering several population health indicators including socio-demographic characteristics, use of dental services, self-reported oral health status, health insurance and access to health care services [25]. The data was collected between May-August 2019. Ethical approval for the survey was obtained from the General Directorate for Research and Studies in the Saudi Arabian Ministry of Health.

Sample selection and interview procedure

The survey followed a stratified three-stage sample design with a probability proportional to population size to obtain a representative sample of households and adults. The primary sampling units (PSUs) were census enumeration areas (EAs); geographic areas defined by the General Authority of Statistics (GASTAT) as part of the sampling process for collecting census data. In the second stage, a fixed number of eight households were systematically sampled from each PSU. Household heads completed the household interviews. The third stage then randomly selected a household member aged 15 years or older to complete the individual interview. For this study, only adults aged 18 years and above with complete outcome data were included in the analysis.

The survey consisted of two questionnaires (household and individual). All interviews were conducted at the respondents' houses, by trained physicians or nurses. Data was collected by face-to-face interviews through Computer Assisted Personal Interview (CAPI) software using tablets.

Measures

The survey included questions about socio-demographic characteristics, work history, household insurance coverage, household assets and income as well as health care utilization. These variables were mapped to the factors in the Andersen Model of Health Services Utilization [10]. Predisposing variables included age, gender, marital status, nationality, education and employment. Nationality was dichotomized into Saudi and Non-Saudi. Respondents were asked about their highest level of education and their current employment status. Enabling variables were household income, region of residence (urban/rural), transportation, access to free governmental health care, health insurance coverage, household wealth index and an area-based measure of socioeconomic class. The area-based socioeconomic class indicator was adopted from a previous study that used Latent Class Analysis (LCA) to develop a categorical socioeconomic index using national census data and several household indicators mapped to an area: educational status, employment status, type of housing, tenure of housing, car ownership and material ownership [24]. The index classifies enumeration areas or governorates into four socioeconomic classes (1 = affluent class, 2 = upper middle class, 3 = lower middle class and 4 = deprived class) [24]. Index scores calculated from the study by Alomar et al were assigned to the survey respondents in the KSAWHS sample. The household income was the monthly income of all household members in Saudi Riyals. Monthly household income was categorized into four groups following previous studies [26], high household income (more than 15,000 SAR), upper-middle household income (10,000 to 15,000 SAR), lower-middle household income (5,000 to 10,000 SAR) and low income (less than 5,000 SAR). The region of residence was labelled as rural or urban regions based on the General Authority of Statistics (GASTAT) classification of their corresponding enumeration area. Transportation indicated if the household owned a car (Yes/No). Insurance coverage was determined if all household members were covered by mandatory, voluntary and/or free governmental health care. The wealth index is a composite measure developed by the Demographic and Health Surveys (DHS) program to evaluate a household's overall living standard [27]. The scale developers used Principal Component Analysis (PCA) to generate a continuous scale of household wealth using a collection of household indicators such as house building materials, water and sanitation facilities and household ownership of assets (e.g., televisions and

refrigerators). The scale was then divided into five wealth quintiles ranging from the 1st quintile (lowest-poorest) to the 5th quintile (highest-wealthiest) [27]. Perceived need was assessed by self-reported oral health when the respondents were asked if they had any oral health problems in the past year.

Dental utilization was the primary outcome measure defined as the respondents seeing a dentist at least once in the previous year (Yes/No).

Data analysis

Survey weights were calculated and applied to ensure representativeness of the data. This took into account the probability of selection at each sampling stage and were also adjusted for non-response rates at the three sampling stages [28]. The dataset had missing data on income, area-based socioeconomic class and self-reported oral problems, which is an inherent trait in most survey data [29]. Multiple imputation was used to replace missing values using chained equations and sensitivity analysis was conducted to determine the best approach (e.g., listwise deletion or complete case analysis). The sensitivity analysis showed similar results regardless of the method of imputation. All analyses were performed using the Stata survey design software package to take into account the complex sampling design and weighting. A hierarchical logistic regression was used to identify significant predictors of dental utilization outcomes based on the Andersen model. This involved first analysing the variables in a horizontal level separately by grouping the predisposing factors and enabling factors. The significant factors from each horizontal level analysis were identified using a 0.05 significance level. The significant variables from each level were then added to a final logistic regression model to adjust for all predictors. Adjusted odds ratios with 95% confidence intervals and p-values were reported for the variables in the final model. The software used for all statistical analyses was Stata/SE for Mac (version 15.1, StataCorp LLC, College Station, TX, USA).

Results

Description of the sample

Out of the 10,000 sampled households, 9,652 were occupied, and 9,339 completed the household interviews (household response rate = 96.8%). A total of 8,912 respondents then completed the individual interviews (individual response rate of 95.4%). The final dataset excluded respondents who had missing outcome data and data from participants aged under 18 years leading to a final sample of 8,464 respondents (Figure 1).

Table 1 shows the demographic characteristics for the sample. Weighted data showed that 47% of the sample were female and 79% were under the age of 45 years, which mimics the Saudi population distribution [30]. Most participants were Saudi nationals (87%) who were currently married (70%), reflecting cultural and societal norms. The unemployment rate in the sample was 47%. Most of the participants resided in urban areas (86%), and almost half of them lived in affluent areas (48%). Eighty-eight percent of the respondents were eligible for free governmental health care and 23% were covered by

health insurance. Only twenty percent of the respondents had visited the dentist at least once in the past year. Sixteen percent reported having problems with their oral health.

Table 1
Sociodemographic characteristics of survey respondents ($n = 8,464$)

	Number of respondents	Percentage (unweighted)	Percentage (weighted)
Gender			
Male	4,526	53.5	52.8
Female	3,938	46.5	47.2
Age			
18 to 24 years	1,278	15.1	16.6
25 to 34 years	3,267	38.6	38.6
35 to 44 years	2,097	24.8	23.6
45 to 54 years	952	11.3	11.1
55 to 64 years	505	6.0	6.1
65+ years	365	4.3	3.9
Marital status			
Never married	1,658	19.6	21.9
Currently married	6,200	73.3	70.1
Divorced/separated	290	3.4	4.0
Widowed	316	3.7	4.0
Nationality			
Saudi	7,428	87.8	87.1
Non-Saudi	1,036	12.2	12.9
Education completed			
No formal education	574	6.8	5.7
Less than secondary	1,143	13.5	12.2
Secondary	2,933	34.7	34.2
Diploma or formation	499	5.9	5.3
* Variable has missing data that was managed using multiple imputation			
† Composite measure calculated using data about ownership of consumer material such television and cars, household characteristics such as building material, source of drinking water, toilet facilities and other characteristics relevant to wealth status.			

	Number of respondents	Percentage (unweighted)	Percentage (weighted)
University	3,054	36.1	39.1
Postgraduate	261	3.1	3.6
Employment status			
Not employed	3,986	47.1	47.1
Employed	4,478	52.9	52.9
Household income*			
Low income	1,941	23.5	23.3
Lower-middle income	2,811	34.0	32.1
Upper-middle income	1,894	22.9	22.8
High income	1,626	19.7	21.7
Household Wealth index†			
Lowest quintile	2,080	24.6	24.6
Second quintile	1,815	21.4	21.8
Middle quintile	1,622	19.2	19.1
Fourth quintile	1,636	19.3	17.9
Highest quintile	1,311	15.5	16.6
Area-based socioeconomic status*			
Deprived	115	1.4	1.2
Lower middle class	1,067	13.2	10.3
Upper middle class	3,994	49.3	41.1
Affluent	2,928	36.1	47.5
Place of residence			
Rural	1,414	16.7	13.9

* Variable has missing data that was managed using multiple imputation

† Composite measure calculated using data about ownership of consumer material such television and cars, household characteristics such as building material, source of drinking water, toilet facilities and other characteristics relevant to wealth status.

	Number of respondents	Percentage (unweighted)	Percentage (weighted)
Urban	7,050	83.3	86.1
Transportation (car ownership)			
Yes	7,664	90.5	90.4
No	800	9.5	9.6
Eligibility for free governmental health care			
Yes	7,564	89.4	88.0
No	900	10.6	12.0
Health insurance coverage			
Yes	1,746	20.6	22.9
No	6,718	79.4	77.1
* Variable has missing data that was managed using multiple imputation			
† Composite measure calculated using data about ownership of consumer material such television and cars, household characteristics such as building material, source of drinking water, toilet facilities and other characteristics relevant to wealth status.			

Predictors of dental utilization: Predisposing factors

Adults aged between 35 and 44 years (OR = 1.42, $p = 0.006$) were more likely to have visited the dentist in the past year compared to adults who were younger than 25 years (Table 2). Non-Saudi residents were less likely to have had a dental visit compared to Saudi residents (OR = 0.62, $p < 0.001$) (Table 2). And currently employed individuals had less chances of visiting the dentist in the past year compared to currently unemployed individuals (OR = 0.82, $p = 0.042$) (Table 2). Gender, marital status, and level of education were not significantly associated with dental utilization (Table 2).

Table 2. Horizontal logistic regression analysis for visiting the dentist in the past year

	Adjusted OR [95% CI]	<i>p</i> -value
<u>Predisposing factors</u>		
Gender		
Male	1.00 (ref)	-
Female	1.13 [0.94, 1.35]	0.199
Age		
18 to 24 years	1.00 (ref)	-
25 to 34 years	1.10 [0.88, 1.39]	0.399
35 to 44 years	1.42 [1.10, 1.83]	0.006
45 to 54 years	1.27 [0.93, 1.74]	0.133
55 to 64 years	1.39 [0.93, 2.07]	0.108
65+ years	1.41 [0.87, 2.29]	0.160
Marital status		
Never married	1.00 (ref)	-
Currently married	0.87 [0.71, 1.07]	0.178
Divorced/Separated	1.31 [0.90, 1.90]	0.154
Widowed	0.96 [0.63, 1.46]	0.857
Nationality		
Saudi	1.00 (ref)	-
Non-Saudi	0.62 [0.47, 0.83]	0.001
Education completed		
No formal education	1.00 (ref)	-
Less than secondary	1.18 [0.78, 1.80]	0.433
Secondary	1.18 [0.78, 1.79]	0.422
Diploma or formation	1.22 [0.75, 2.01]	0.424
University	1.53 [1.00, 2.34]	0.051
Postgraduate	1.64 [0.95, 2.85]	0.077
Employment status		
Not employed	1.00 (ref)	-

Employed	0.82 [0.68, 0.99]	0.042
<u>Enabling factors</u>		
Household income		
Low income	1.00 (ref)	-

	Adjusted OR [95% CI]	p-value
Lower-middle income	1.07 [0.87, 1.32]	0.527
Upper-middle income	1.11 [0.87, 1.43]	0.399
High income	1.53 [1.18, 1.97]	0.001
Household Wealth index[†]		
Lowest quintile	1.00 (ref)	-
Second quintile	1.52 [1.22, 1.89]	0.000
Middle quintile	1.40 [1.10, 1.77]	0.005
Fourth quintile	1.25 [0.96, 1.64]	0.099
Highest quintile	1.63 [1.23, 2.16]	0.001
Area-based socioeconomic class indicator		
Deprived	1.00 (ref)	-
Lower middle class	1.57 [0.29, 8.56]	0.604
Upper middle class	0.98 [0.18, 5.21]	0.981
Affluent	1.10 [0.21, 5.90]	0.907
Place of residence		
Urban	1.00 (ref)	-
Rural	1.25 [0.94, 1.67]	0.118
Transportation (car ownership)		
No	1.00 (ref)	-
Yes	1.16 [0.85, 1.58]	0.349
Eligibility for free governmental health care		
No	1.00 (ref)	-
Yes	1.78 [1.29, 2.46]	0.000
Health insurance coverage		
No	1.00 (ref)	-
Yes	1.50 [1.24, 1.82]	0.000
<u>Need factors</u>		
Perceived need for dental treatment		

No	1.00 (ref)	-
Yes	52.03 [40.83, 66.29]	0.000

OR = Odds ratio, CI = confidence intervals

† Composite measure calculated using data about ownership of consumer material such television and cars, household characteristics such as building material, source of drinking water, toilet facilities and other characteristics relevant to wealth status.

Predictors of dental utilization: Enabling factors

Adults from households with a high monthly income were over 50% more likely to have visited the dentist in the past year compared to those from households with low monthly income (OR = 1.53, $p < 0.001$) (Table 2). Adults from households with the highest wealth status had the highest odds of seeing the dentist in the past year compared to adults coming from households in the lowest wealth quintile (OR = 1.63, $p < 0.001$) (Table 2). Adults who had access to free governmental health care (OR = 1.78, $p < 0.001$) or had health insurance (OR = 1.50, $p < 0.001$) were more likely to visit the dentist during the last year compared to those who did not have access to free governmental care or health insurance (Table 2). There was no association between area-based socioeconomic status and dental utilization (Table 2).

Predictors of dental utilization: Need factors

Perceived need for dental treatment was a significant predictor in the horizontal level analysis (OR = 52.03, $p < 0.00$) (Table 2).

Predictor of dental utilization: Final model

Eight variables were identified from the horizontal regression analyses as the most significant predictors of dental utilization and were included in the final (vertical) regression model. These variables were age, nationality, employment status, household wealth, household income, eligibility for free governmental health care, health insurance coverage and perceived need for dental treatment.

Table 3 shows the final regression model where perceived need for dental treatment remained the most significant predictor of dental utilization in the past year among adults in Saudi Arabia adjusting for predisposing and enabling factors (OR = 52.45, $p < 0.001$). The odds ratio for household wealth was attenuated in the final model but remained a significant predictor. Adults living in households categorised in the second and middle household wealth index quintiles were more likely to have had a dental visit compared to adults from the lowest wealth quintiles (OR = 1.51, $p = 0.003$ and OR = 1.57 $p = 0.006$; respectively) (Table 3). Adults living in high income households had a higher probability of visiting the dentist compared to those living in households with low income (OR = 1.43, $p = 0.043$) (Table 3). Individuals who were eligible for free governmental health care (OR = 2.02, $p = 0.004$) had twice the odds of visiting the dentist in the past year as compared to those with no eligibility for free health care. Age, nationality (Saudi/non-Saudi) and insurance were no longer significant predictors in the final model adjusting for need and enabling factors (Table 3).

Table 3
Final logistic regression analysis for visiting the dentist in the past year

	Adjusted OR [95% CI]	p-value
Predisposing factors		
Age		
18 to 24 years	1.00 (ref)	-
25 to 34 years	1.07 [0.77, 1.49]	0.669
35 to 44 years	1.31 [0.92, 1.86]	0.138
45 to 54 years	0.95 [0.65, 1.41]	0.810
55 to 64 years	1.07 [0.61, 1.88]	0.802
65+ years	0.69 [0.36, 1.33]	0.267
Nationality		
Saudi	1.00 (ref)	-
Non-Saudi	1.06 [0.70, 1.60]	0.786
Employment status		
Not employed	1.00 (ref)	-
Employed	0.82 [0.67, 1.00]	0.045
Enabling factors		
Household income		
Low income	1.00 (ref)	-
Lower-middle income	1.10 [0.84, 1.46]	0.483
Upper-middle income	1.11 [0.80, 1.55]	0.531
High income	1.43 [1.01, 2.02]	0.043
Household Wealth index[†]		

OR = Odds ratio, CI = confidence intervals

[†] Composite measure calculated using data about ownership of consumer material such television and cars,

household characteristics such as building material, source of drinking water, toilet facilities and other characteristics relevant to wealth status.

	Adjusted OR [95% CI]	p-value
Lowest quintile	1.00 (ref)	-
Second quintile	1.51 [1.16, 1.97]	0.003
Middle quintile	1.57 [1.14, 2.16]	0.006
Fourth quintile	1.34 [0.96, 1.87]	0.086
Highest quintile	1.36 [0.94, 1.96]	0.098
Eligibility for free governmental health care		
No	1.00 (ref)	-
Yes	2.02 [1.25, 3.27]	0.004
Health insurance coverage		
No	1.00 (ref)	-
Yes	1.24 [0.94, 1.64]	0.121
Need factors		
Perceived need for dental treatment		
No	1.00 (ref)	-
Yes	52.45 [41.26, 66.69]	0.000
OR = Odds ratio, CI = confidence intervals		
† Composite measure calculated using data about ownership of consumer material such television and cars,		
household characteristics such as building material, source of drinking water, toilet facilities and other characteristics relevant to wealth status.		

Discussion

This is only the second study to explore the utilization of dental services among adults in Saudi Arabia using a national representative survey including both Saudi and non-Saudi residents [31]. It showed low dental utilization despite the availability of dental services provided by the governmental and private sectors. Only 20% of adults above the age of 18 years visited the dentist within the past year. This current study contributes to the existing literature by identifying recognized predisposing and enabling predictors of dental utilization while focusing on socioeconomic disparities in dental utilization among adults.

The findings showed that household wealth, household monthly income, eligibility for free governmental services and perceived need for dental treatment were significant predictors of dental services utilization in Saudi Arabia. The study used household wealth as a socioeconomic indicator, in addition to income and education, which is relevant to the Saudi Arabian context. The household wealth index measures aspects of socioeconomic status that are not captured by income but are as critical for health outcomes. Several studies have showed that different social groups with similar incomes had significantly different wealth indices [21, 23]. Furthermore, material asset based indicators such as the household wealth index are more relevant in developing countries such as Saudi Arabia [27, 32].

Adults living in households with middle categories of wealth index were more likely to visit the dentist in the past year compared to adults in the lowest wealth index category even after adjusting for need. This conflicts with previous studies from other countries that reported socioeconomic inequalities in dental utilization in favor of individuals from wealthier households [18, 33]. This could reflect the conceptual nature of the wealth measure. Socioeconomic indicators that are based on the ownership of material assets vary depending on the context in which they were developed thus making it difficult to compare their results across studies [32]. The influence of material resources on the use of dental services may have been affected by the free dental coverage available to the vast majority.

Adults coming from high-income households were more likely to have a dental visit in the past year compared to those coming from low-income households. This finding is consistent with national and international literature [8, 9]. Interestingly, Meisha et al stated that adults with higher income were less inclined to seek routine dental care during the COVID-19 pandemic [34].

Perceived need assessed by self-reported oral problems was the most significant predictor of dental utilization after adjusting for predisposing and enabling factors and despite only 16% of respondents reporting that they had an oral health problem. This underscores the importance of measuring need for treatment when assessing socioeconomic inequities health care utilization and the saliency of perceived need for treatment on health service utilization. Individuals with a perceived need for dental treatment were more than 50 times more likely to visit the dentist in the past year. Perceived need was previously reported as a predictor of symptomatic use of dental services [15, 19]. This is in line with Zola's triggers that surmised that the nature and quality of symptoms was one of the five triggers that prompt individuals to use health services [35]. Perceived needs evaluated by patients can often differ from normative needs, which are objectively measured by clinicians [16]. Studies have also shown that individuals with perceived need were less likely to have regular dental care [15, 36]. Normative need is negatively correlated with dental utilization, affirming the "Paradox of Need" which suggests that those who had a clinically determined need for dental treatment were less likely to visit the dentist than those who needed preventive dental care [37]. This study raises questions about likelihood of adults in Saudi Arabia visiting the dentist for preventive or maintenance care when they do not have a perceived need. In a situation where perceived need is the predominant need predictor, interventions should aim to improve oral health awareness about the importance of regular dental visits in the absence of oral problems [37]. Additionally, in the context of Saudi Arabia where dental care services are provided under universal health

coverage [38], the financial burden of dental care adds to the importance of preventive dental care for its proven cost saving effect, both on the individual and provider level [39, 40].

The data used for this study was collected before the COVID-19 pandemic. Studies investigating the utilization of dental services during the pandemic highlight its impact on the utilization [34, 41–43]. Patients reported willingness to only seek urgent care [34, 42] and being uncomfortable continuing regular dental care after lockdown [41]. In addition to a decrease in perceived need for dental treatment [43]. This is expected to exacerbate the issue of symptomatic use of dental services and indicates the need to explore the impact of the COVID-19 pandemic on dental services utilization and its associated factors.

The study has multiple strengths. Being one of the only two studies exploring dental utilization on a national scale, this study provides a vital update as the other study used dental utilization data collected on 2013 [31]. This is the first study to apply the Andersen Behavioral Model of Health Services Use to assess dental services utilization by adults in Saudi Arabia. It also contributes to the existing literature by focusing on socioeconomic disparities in dental utilization among adults.

The study had some limitations. This study did not assess other known factors that may affect the utilization of dental services such as dental health beliefs and dental fear [44–46], and contextual factors such as community factors and amount and distribution of health care services [16, 17]. The study used a crude outcome measure to assess the utilization of dental services (Yes/No) with no regard for the reason of seeking dental care. Previous studies reported that the predictors of routine dental visits differ from predictors of visiting the dentist only when there is a dental complaint that needs treatment [15, 31, 47]. Hence, a clear distinction between symptomatic and preventive utilization would be more effective for identifying policy implications to alleviate inequalities in utilization of dental services and boost prevention and early detection of oral problems, especially that our results showed a high predilection of treatment-driven utilization among the adults in Saudi Arabia.

Conclusion

This study confirmed the existence of socioeconomic disparities in the utilization of dental services among adults in Saudi Arabia. Adults with high monthly income, middle socioeconomic status and access to free governmental dental services were more likely to visit the dentist. However, the main driver of dental services utilization among adults was the need for treatment, indicating that adults' utilization of dental services is mainly symptomatic, despite the availability of free dental care for the majority of adults in over 2,000 primary health care facilities across the country [48]. Increasing the awareness of the importance of regular preventive dental visits as opposed to the symptomatic use of dental services is an important policy implication [2]. The study highlighted the need for future research to explore the drivers for adults to seek preventive care in the absence of any recognized dental problems. This would help guide future policy interventions aimed at enhancing the preventive use of dental services, diminishing oral health inequalities and optimizing dental care expenditure.

Abbreviations

KSAWHS: Kingdom of Saudi Arabia World Health Survey

FDI: Fédération Dentaire Internationale (World Dental Federation)

PSU: Primary Sampling Unit

EA: Enumeration Area

GASTAT: General Authority of Statistics

CAPI: Computer Assisted Personal Interview

LCA: Latent Class Analysis

PCA: Principal Component Analysis

DHS: Demographic and Health Surveys

SAR: Saudi Arabian Riyal

Declarations

Ethics approval and consent to participate

Ethical approval for this study was obtained from the Central institutional Review Board in the Saudi Arabian Ministry of Health, Riyadh (No. 20 - 186E).

Consent for publication

Not applicable.

Availability of data and materials

The data that support the findings of this study are available from the Saudi Arabian Ministry of Health, but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are however available from the authors upon reasonable request and with permission of the Saudi Arabian Ministry of Health.

Competing interests

No, I declare that the authors have no competing interests as defined by BMC, or other interests that might be perceived to influence the results and/or discussion reported in this paper.

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Authors' contributions

DS analyzed and interpreted the data and wrote the bulk of the manuscript. VM supervised the analysis and interpretation of data and contributed to the writing of the manuscript. All authors reviewed the drafts and approved the final submission.

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Figures

Figure 1

Number of completed household and individual interviews included in the analysis 1 Excluded based on the following interview result categories: household absent for extended period of time; Dwelling vacant; Address not a dwelling; Dwelling destroyed; Dwelling under construction; Dwelling status unknown. 2 Excluded for the following reasons: 377 completed interviews were excluded because they were completed by individuals under the age of 18 years.