

Determinants of Demand for Dental Services at Household Level

Sayyed Dariush Mousavi ¹, Sayyed-Morteza Hosseini-Shokouh ^{2*}, Mojtaba Sepandi ³, Elahe Tahmasebi ⁴, Rouhollah Zaboli ²

¹ Students' Research Committee, Faculty of Health, Baqiyatallah University of Medical Sciences, Tehran, Iran

² Health Management Research Center, Baqiyatallah University of Medical Sciences, Tehran, Iran

³ Health Research Center, Life Style Institute, Baqiyatallah University of Medical Sciences, Tehran, Iran

⁴ Research Center for Prevention of Oral and Dental Diseases, Baqiyatallah University of Medical Sciences, Tehran, Iran

Corresponding Author: Sayyed-Morteza Hosseini-Shokouh, Nosrati Alley, South Sheykhbahaee Ave., Mollasadra Ave., Vanak Square, Tehran, IR. Iran. Tel: +98 2187555524, Email: hosainysh.morteza@gmail.com

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Abstract

Introduction: Dental health is one of the primary requisites of life which the World Health Organization (WHO) emphasizes on its continuous improvement during the 21st century. This review aimed at identifying the factors affecting household dental demand in order to establish a comprehensive oral and dental health plan.

Method: This study has reviewed the literature on demand determinants of household dental services published in English and Persian languages following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses PRISMA protocol. Critical appraisal of the selected articles have been performed using CASP and PRISMA checklists. Data analysis have been carried out and presented as a narrative synthesis.

Results: Among 2016 retrieved articles, 1786 were excluded from this study. From the 230 remained articles, only 16 full-text articles were included and assessed for their contents. The main determinants of dental services demand were classified into three groups; demographic, classic, and complementary.

Conclusion: It is necessary to consider the socio-demographic, classical, and complementary factors for estimating household dental demand. Identifying the affecting factors of household dental service demand is helpful in obtaining an accurate empirical estimation through analyzing consumers' behaviors by calculating demand elasticity. Drawing policymakers' attention to these factors will lead to provision of dental services according to the households expectations.

Keywords: Demand, Dental Services, Household, Systematic Review

Introduction

Oral and dental health is considered as an inseparable part of general health, primary requisite of a decent life,¹ and one of the community health indicators.² Dental health is among the most essential 11 health issues in the 21st century which concern people in any society.³ Hence, oral and dental health problems can constrain individuals' activity, participation in the labor force, quality of life, and mental health.^{4,5} Dental problems are also related to chronic diseases,⁶ functional, social, and mental adverse consequences.⁷

Unlike many other diseases, tooth decay or periodontal disease cannot be cured without professional treatment. Since oral and dental diseases progress slowly and usually do not have primary symptoms, regular periodical checkups help in detecting problems and treating them efficiently.⁸ Delayed treatment usually burdens people with more costs,⁹ therefore, people's efficiency is affected by oral health. Malaise caused by dental problems can lead to an increase in an absenteeism rate at workplace. According to the national health interview in 1996, about 1.9 working days have been lost due to dental

problems or linked treatments in every 100 workers of more than 18 years old.¹⁰ Poor dental health does not only account for sickness and expensive treatment, but also for a severe risk for general health. Dental and oral health reports from the USA and many other recent studies have suggested a relationship between dental and oral diseases, and cardiovascular diseases, respiratory infections, and pregnancy-related problems such as premature childbirth, and the newborn low weight at the time of birth caused by bacterial infection.¹¹ It should be noted that studies in this regard have focused on the number of people who used to visit dentistry clinics regularly as they value oral health.⁹ Preventive procedures and effective treatments for caring oral and dental health are available, however, associated diseases still exist, especially among low-income households.¹¹ Therefore, establishing and executing interventional programs in the community can lead to significant improvements in oral and dental status.¹

For both macro and micro levels in economics studies, demand is one of the pivotal concepts and main pillars of economic analyses which describes the relationship between the quantity of received good or

service on one hand, and other factors such as price of the good or service itself, income, price of other goods, consumers' interests and preferences, etc.¹² Accordingly, one of the goals in health care is demand analysis for determining the factors that might affect utilization of health services. These factors especially affecting health demand include quality and price of provided services, treatment and travel costs, patients' information and preferences, incidence of diseases, in addition to socioeconomic determinants like gender, age, race, urbanization, insurance, and income.¹³

Recognition of the quantity and variation of community demand with respect to dental services is remarkable in formulating a detailed and comprehensive plan for oral and dental health care. Concerning the effect of oral and dental health on physical and mental status, crucial actions have been implemented for preventing these diseases in developed countries. By emphasizing this fact and by determining the dental needs in a community, policymakers can move on towards proposing a universal health plan. Therefore, this study aimed to identify factors affecting household demand of dental services by a precise review of related empirical studies in the field of health economics.

Method

A systematic review study was conducted using Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) protocol.

Databases and Search Strategy

The research was carried out to extract the factors affecting household demand for dental services from the articles published in both Persian and English languages up to January 30th, 2018. Four scientific databases have been searched, two international and two national. The international databases included PubMed and Science Direct using a combination of keywords and functional keys (OR, AND), while the national databases encompassed SID and Magiran. The PICOS strategy was used for data extraction considering the keywords: demand function (title) OR utilization (title) OR need (title) OR consumption (title) OR want (title) and dental care (title) OR dental service (title) OR oral health (title), in the international databases, and their Persian equivalents in the national databases.

Studies Selection

After the preliminary search, articles were firstly reviewed according to their titles for removing

irrelevant articles and duplication as well. Secondly, the selected articles were reviewed based on their abstracts and then through a brief assessment of full texts; after which, articles were selected considering the inclusion and exclusion criteria. Finally, the quality of the extracted articles were evaluated using CASP and PRISMA checklists, and the results have been presented as a narrative synthesis. To ensure the process, two of the authors performed the searching stage independently, while cases of disagreement were resolved by holding meetings with the supervisor and advisors.

It is noteworthy that a manual search was also carried out by referring to the libraries in the related faculties at the Universities of Medical Sciences in Tehran.

Inclusion and Exclusion Criteria

Articles about household demand were included in this study which were published in English or Persian, and lied within the study timeline, from 1980 up to the end of January 2018. Whereas, irrelevant articles in terms of aim and subject were excluded, in addition to those ones that were published in other languages other than English and Persian, or outside the time limits of the study. The exclusion criteria included lack of access to the full text of the article, the irrelevance of the subject and level, and published

Data Analysis

In the initial search, keywords were used and all relevant articles were included by title. Afterwards, all these articles were entered to the Endnote for removing duplication. Data extraction was performed according to the author's checklist entailing the title, author name, country, publication's year, type of study, methodology, and variables. Then, screening was done based on the inclusion and exclusion criteria. Finally, all factors affecting the demand for dental services at household-level were identified and presented accompanied by the author's opinion.

Results

Descriptive Findings

As illustrated in Figure 1, 2016 articles were retrieved in total. From among these articles, 1781 articles were excluded in the screening stage as a result of duplication and overlap (405), irrelevant topic (1038), out of the timeline (199), and unavailable full text (139). After studying the full texts of the 35 remaining articles, only 16 articles were selected for data extraction (Table 1).

Table 1. Title, author, study type, country, environment, samples, and studied variables in the selected articles

Title	Author (year)	Country, environment, and study sample	Type of study	variables	Association between the variables with dental services
Trends in annual dental visits among US dentate adults with and without self-reported diabetes and prediabetes, 2004-2014 (14)	Luo et al. (2018)	Adults with dental conditions in the USA with and without self-reported diabetes (2004-2014) by disease prevention and control center	Retrospective, cross-sectional study	Age, gender, race, ethnicity, education level, income, medical insurance	Dental visits for white persons were regularly more than other diabetes, pre-diabetics, and people without diabetes during the study period. Married women and adults were more probable of dental visits compared with other groups. The results of this study suggested that income has played an important role in dental visits in recent years. Age, income, and health insurance lower the relationship between diabetes status and dental visits.
Effects of income and dental Insurance coverage on need for dental care in Canada (15)	Duncan et al (2014)	The population of this study includes 5604 Canadians of 6 to 79 years old from early 2007 until early 2009	Prospective, cross-sectional study	Income and health insurance coverage	Insured people showed less demand on dental care than uninsured people. People with a high income had less use for dental care.
Demographic and rural urban variations in dental service utilization in Taiwan (16)	Wen et al (2017)	A million applicants of dental care in Taiwan from 2005 until 2010 (research database)	Cohort retrospective observational study	Age, gender, urbanization	Women had more preventive and treatment services than men. Except for the teenagers of more than 15 years and the ages of 35-44, the ages of more than 65 years old had a high rate of using dentistry services. Using dental services increased with the raised level of urbanization.
Wealth effect and dental care utilization in the United States (17)	Manski et al (2012)	17217 elderly \geq 51 years old selected by the recent data of HRS (health and retirement studies)	Cross-sectional observational study	Wealth, income, age, insurance	Using dental care continuously decreases with the decrease in income and wealth. People > 80 years old use dental services less frequently than younger people. There is a significant relationship between dental visits and insurance.
Influence of sociodemographic variables on dental service utilization and oral health among the children included in the year 2001 Spanish National Health Survey admission (18)	Tapias-Ledesma et al (2005)	Spanish children between 3-15 years old in 2001, at the participants' homes	Cross-sectional descriptive study	Gender, age, parents' education level, monthly household income	Dental visits are mostly done in the age group of 7-9 years (fewer visits for the children of 3-6 years old), and this rate significantly increased with the raised level of parents' education and household income.
Socio-economic determinants of the need for dental care in adults (19)	Trohel et al (2016)	997,2 adult people from Paris, data of 2010	Cohort cross-sectional study	Education level, income	Demand of dental care in low-income people is two times more than wealthy people. The need for dental care in people with lower education was increased by 55%.
Demographic and socioeconomic predictors of dental care utilization (20)	Manski et al (1998)	68749 participants of 18-64 years old including black-skinned, Spanish, or white-skinned people residing in America in 1989	Retrospective cross-sectional study	Employment status, insurance status, gender, health status (background of disease), education level, marital status, age, and race	There was a significant relationship between the studied variables and dental visits (except for employment status).
The demand for dental care: evidence from a randomized trial in health insurance (21)	Manning, et al. (1985)	A random sample of non-profitable urban citizen population and six urban and rural regions of America during the years 1974 to 1982	Interventional study	Insurance, income	Insurance coverage and increased income lead to a significant increase in number of dental visits.

Title	Author (year)	Country, environment, and study sample	Type of study	variables	Association between the variables with dental services
Disparities in dental care associated with disability and race and ethnicity (22)	Horner-Johnson et al (2015)	208548 people of the adult or working-age selected groups (18-64 years old) from the panel data of medical expenses collected during the years 2002 to 2012 in the USA	Retrospective cross-sectional study	Paralysis, race, ethnicity	Disabled people are significantly more probable to delay or cancel their needed dental care. In comparison with non-Spanish and white people, other races and ethnicities receive less annual examinations and dental care.
Regular dental visits and dental anxiety in an adult dentate population (23)	Sohn et al (2005)	630 adults of 18-69 years old in 368 households residing in Detroit tri-county region of USA, from August 2000 to August 2001	A descriptive-analytical cross-sectional study	Insurance status, anxiety, fear of dentistry, age, gender, race, education level, household income	Regular dental visits in adult population have a significant relationship with demographic factors such as age, gender, race, education level, and household income. Lack of insurance coverage and high levels of anxiety in dentistry clinics decreased the regular dental visits.
Behavioral and socioeconomic correlates of dental problem experience and patterns of healthcare-seeking (24)	Cohen, L. A et al (2011)	A random sample from among 27002 households of Maryland of different social classes (with different income levels, races, and ethnicities) in 2009	Observational cross-sectional study	Age, gender, race, income level	There is a relationship between age, race, gender, income level, dental visits, and dental problems.
Community factors predicting dental care utilization among older adults (25)	Lee et al (2014)	A sample including 166,2 adults of more than 65 years old residing in Ohio (the data of queries done in American society), five-year evaluation of the years 2006-2010, and the files of health resource in 2010	Retrospective cross-sectional study	Gender, marital status, income, education level, access to the number of dentists, insurance coverage	Female, married, wealthy, well-educated, urban residents, high ratio of dentists to the population, and private insurance of dentistry have led to a relatively higher use of dental services.
The impact of Medicaid insurance coverage on dental service use (26)	Choi et al (2011)	More than 350,000 adults in the selected states of the USA in 2002 and 2004	A descriptive-analytical cross-sectional study	Insurance coverage, income, age, gender, race, education level	Insurance coverage, income, age, gender, race, and education level have affected the use of dentistry services.
Factors influencing dental care access in Jordanian adults (27)	Obeidat et al (2014)	650 Jordanian adults from the Hospital of Shah Abdollah University, Jordan Center of dentistry sciences and technologies, Yermuk health clinics, and UNO	A descriptive-analytical cross-sectional study	Lack of time, treatment cost, fear of dentistry	There is a relationship between the studied variables and the reasons for avoiding regular dental care visits.
Evaluation of urban households dental care demand function, Sabzevar, Iran (28)	Ghorbani et al (2006)	520 households of Sabzevar city with the record of at least six months of consecutive residence in 2006	A descriptive-analytical cross-sectional study	Gender, education level, employment, household income	There was a significant relationship between gender, education level, job, and household income and people's visits for receiving dentistry services.
Comparative study of patients' demand and need to receive restorative dentistry services (29)	Jafari et al (2014)	1040 patients referring to Farhangiyani dentistry clinic in summer 2012	Descriptive cross-sectional study	Age, gender	Middle-aged women reported more dental visits than others.

Demand Determinants for Dental Services at Household Level

Based on reviewing the full text of the selected articles, the determinants of dental services demand

were classified into three categories based on the variables mentioned in the articles as well as the authors' opinions: demographic, classic and complementary factors (Table 2).

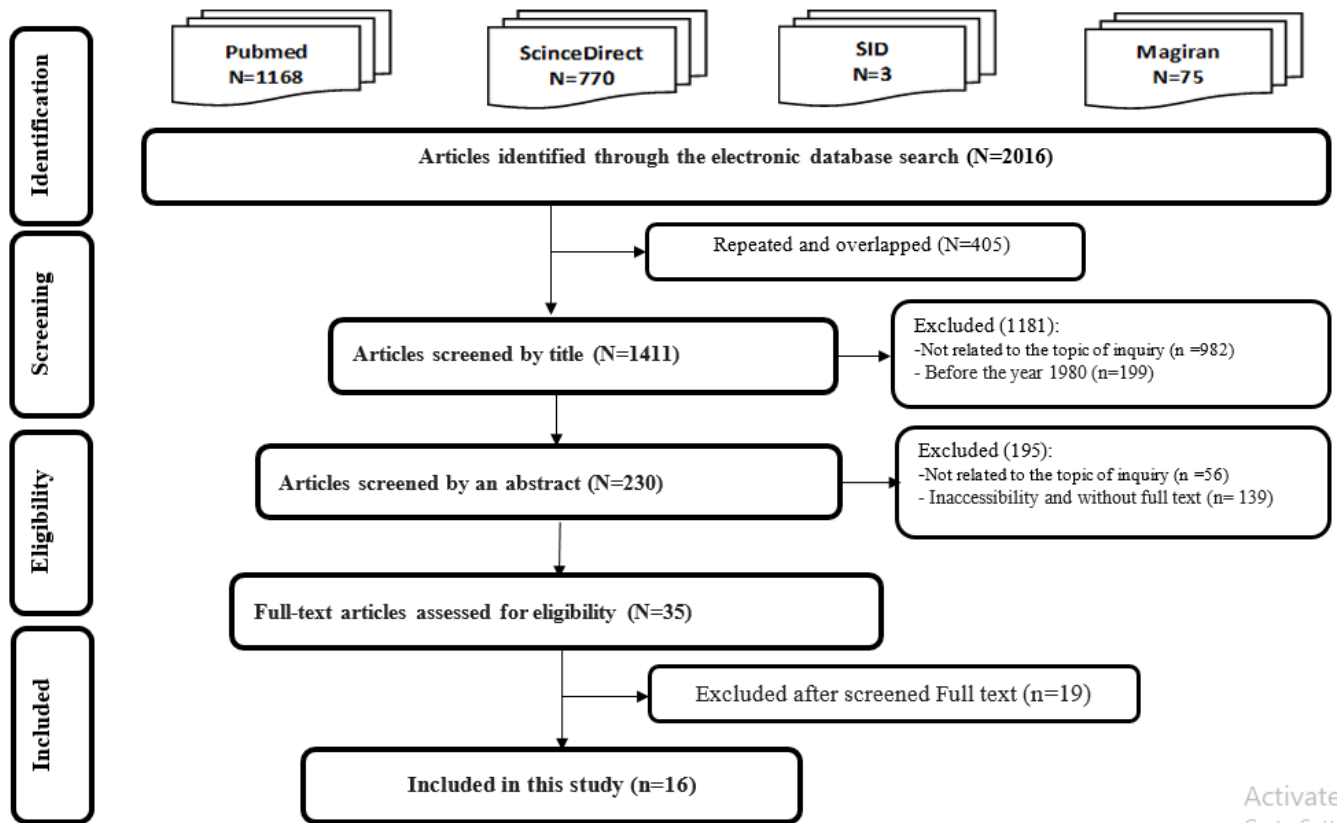


Figure 1. Study Flowchart of the Systematic Review Process

Table 2. Demand Determinants for Dental Services at Household Level

Main category	Demographic factors	Classic factors	Complementary factors
Variables	Age(14, 16, 17, 18, 20, 23, 24, 26, 29)	Employment status (20, 28)	Fear and anxiety (23, 27)
	Gender(14, 16, 18, 20, 23, 24, 25, 26, 28, 29)	Income level (14, 15, 17, 18, 19, 21, 23, 24, 25, 26, 28)	Disease background (20, 22)
	Household size(28)	Education level (14, 18, 19, 20, 23, 25, 26, 28)	Lack of time (27)
	Marital status(20, 25)		Access (16, 25)
	Race or ethnicity (14, 20, 22, 23, 24, 26)		Insurance coverage (14, 15, 17, 20, 21, 23, 25, 26)
			Number of dentists (25)

Discussion

This systematic review aimed to identify factors affecting household demand of dental services by a precise review of related empirical studies in the field of health economics. The evidence extracted from the 16 included articles in this review showed that the most critical factors which might influence the household demand of dental services can be classified into three general categories; demographic, classic, and complementary factors. This classification has been adopted from Hosseini-Shokouh et al. study.³⁰ In this section, we will shed light with some details on the variables of interest.

Fear and Anxiety: In addition to socioeconomic factors, some individual factors such as dentistry clinic-borne fear can also affect the utilization of dental health services.³¹ Furthermore, anxiety accounts for one fifth of the stress experienced among 6-15% of people when visiting dentistry

clinics.^{32,33} Regardless of fear and anxiety *per se*, these emotions might have some negative consequences on both patients and dentists. Anxiety may limit the periodic visits to dentistry clinic and then negligence of oral health.³¹ Some other problems can take place such as pain, abscess, losing deciduous or permanent teeth, and occlusion disorder, which in turn leads to irregular visits and intermittent treatment plan.³⁴ In the same vein, fear is also common among dental care customers and has unfavorable effects worthy to be considered by researchers for its implications.³⁵⁻³⁷

Age and Gender: People demonstrate significant differences in terms of their age and gender when using dental care services. For example, men and the elderly show less tendency to visit dentists than women and younger adults.^{38,39} Brow et al.,⁴⁰ found that the utilization rate of dental care services among women is more than men, and this rate decreases by increase in age.

Race or Ethnicity: According to our findings, racial and ethnic diversity has yielded in a significant difference among residents who sought dental care.¹⁴ One study has revealed that 45%, 46%, and 59% of black, Spanish, and white people, respectively, had approached dentistry clinics over a period of year.²⁰

Access: Access to dental care facilities such as public health centers in the society can raise the usage rate among residents.⁴¹ The findings suggest that policies recommending dentists to provide their service in deprived regions were more necessary than interventions undertaken for economic development, hence, the availability of dental care services is going to rise in both rural and urban areas.²⁵

Income: Consumers purchasing power is usually determined in the light of income and insurance coverage.⁴² Low-income people and vulnerable groups have relatively experienced more dental diseases than others. By virtue of the accounting office report on oral and dental health in the USA (2000), about 48% of low-income inhabitants with annual income is less than 10,000 USD were suffering from untreated tooth decay, whilst, this had happened among only 18% of high-income people (35,000 USD or more annually).²⁶ Tooth decay has significantly reduced over the last 30 years, nevertheless, dental diseases still stand out as a serious health issue for many low-income people.^{43,44} In a study conducted by Manning et al.,²¹ the increase in income had prominently raised the number of visits to dentistry clinics. Manski et al.,¹⁷ found that low income and wealth limited the utilization of dental services.

Insurance: A review of a national query in 1971 done by the Research Institute of the National Center of Studies in the health department of Chicago University, showed that dentistry insurance increases the demand on dental care, and decreases the sensitivity of demand to market price.⁴² In 2012, Manski et al.,¹⁷ analyzed dental care utilization rate and related personal factors among elderly (≥ 51 years) by using the data of the National Institute of Health and Retirement (2008). They discovered that the elderly enrollees in the dentistry insurance plan reported dental visits 2.3 times more than other patients over two years.¹⁷ The findings indicated that the use of dentistry medical aid has an advantage in raising dental visits one time more in 12 months by 16.4-22%. Cost-benefit analysis suggested that such privileges led to a significant increase in preventive dental care. Thus, improvement of dental health care among low-income people, and the decrease of specialized costs in the dentistry sector will be achievable in the long-run plan.²⁶

Disease History: There is a growing evidence suggesting that poor oral and dental health are associated with other health problems such as in the case of chronically-ill patients.⁴⁵⁻⁴⁷ In one study performed by Luo et al.,¹⁴ the data from BRFSS for the years 2004-2014 have reflected the weak willingness

among diabetic patients to visit dentists. In another study conducted by Johnson et al. on a selected population of American adults during the years 2002-2012, they alluded that disabled people showed more inclination to delay or cancel their needed visits to receive dental care.²²

Education: Some studies have reported that promoted education and knowledge about oral and dental health resulted in improvement of people's health status in this regard.⁴⁸ Education level is one of the axial variables which plays a role in demonstrating the need for dental care.¹⁹ It is indicated that higher education level is correlated to higher probability of dentistry services usage.²⁵

Employment Status: The findings show that economic situation in any society is also related to dental care demand. One study stated that every increase in unemployment by 10,000 residents minimizes the utilization rate of preventive dental services by 1.2 percent among insured people in Seattle region, USA.⁴⁹

Marital Status: Marital status is one of the demographic variables which is significantly associated with the use of dental care according to previous studies. In their study, Manski et al.,²⁰ reported that visits to dentistry clinics among married respondents was more compared to single ones.

Number of Dentists: The number of dentists is one of the variables that can affect the use of oral and dental health services. In cities, dentists had independently influenced the use of dental care among elderly population.²⁵ As recommended by our review, estimating the utilization rate of dental care accurately is essential in depicting the oral and dental health status, and identifying the factors affecting people's access to health care, since regular dental visits is fundamental in the prevention and treatment of oral and dental diseases.

Finally, it should be mentioned that the number of patients who visit a dentist to receive oral and dental services has increased over the last two decades. More generally, use of dental services has increased in terms of educational, racial, and economic levels. There are considerable financial obstacles to dental care access, so it has become a constant problem, especially in low-income families.

Therefore, improvement of both access and insurance coverage for dental health services is necessary. Accordingly, effective reforms and practical interventions should be implemented, otherwise, many people will be left uninsured and will definitely face financial hardship to access dental services. Preventive dentistry care and regular checkups are among those notable solutions. Physicians in primary health care, dentists in different specialties, and public health professionals should collaborate together and with others to promote oral and dental health, encourage dental care, and support dentistry insurance coverage. The viability of this fact rests on launching a comprehensive approach for

improving access to these services, and make it available for all people to commit a regular follow-up at least on annual basis.

One of the limitations in this study was the inaccessibility to ISI when searching for articles. In addition, identifying more factors affecting dental service demand requires overarching search including more databases as well as considering opinions of stakeholders which necessitates designing a mixed-method study.

On the other hand, this systematic review sounds a robust evidence in determining the factors influencing dental service demand as it presented a useful conceptual classification.

Conclusion

Estimation of household demand for dental services from the perspective of health economics requires a special attention to socio-demographic factors such as age, gender, marital status, ethnicity and race, family size, disease history, fear and anxiety, place of residence, time and access, as well as complementary factors such as income, wealth, employment, education, insurance and treatment costs.

Identifying and explaining the factors affecting household dental service makes it possible to obtain an accurate empirical estimation for the demand function of these services. Therefore, we can analyze the behavior of consumers in accordance to any change in the related factors by calculating the elasticity. Elasticity can play a substantial role in planning and policy interventions in this part of the health system. Policymakers and providers should focus on the factors which shape the demand, coordinate efforts, and align plans to provide dental services based on the expectations of households. Further research is recommended in this area through designing a mixed-method study to probe some other details about this needful topic.

Ethical Statement

This study was part of a Master's Thesis in Health Services Management at Baqiyatallah University of Medical Sciences (BMSU) and was approved by the BMSU's Ethics Committee.

Conflict of interest

The authors declare that there is no conflict of interest.

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Availability of data and materials

The datasets used and analyzed during the current study are available from the corresponding author on reasonable request.

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