Factors associated with the use of dental services in diabetic people

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ABSTRACT

The use of dental services prevents oral diseases where its prevalence is associated with chronic diseases such as diabetes mellitus (DM) that also has increased risks with age. Therefore, this observational, analytical and cross-sectional study was conducted among 3,882 people. Data used for analysis in this research was collected from the Demographic and Family Health Survey of Peru (ENDES) from 2019 to 2021. Results from poisson regression analysis showed female gender had 1.02 times the probability of going to the dental service; likewise, people who were 91 to 100 years old had 12% more, the probability, like those with secondary education, had 8% more and those with the highest average, richest and richest wealth index had 20% more, 29% more and 29% more, respectively, the probability of going to the dental health service, as opposed to those who were very poor. The study concluded that there are several sociodemographic factors (such as being female, age progressed, natural region, those with high school, wealth index, type of residence) and personal factors (history of hypertension (HTN), physical disability) associated with a lack of access to dental services in people over 60 years old.

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1. INTRODUCTION

The use of dental services has an impact in many aspects of human development. It aids people on their daily routines through speech, smile, chew, food taste, reduce and prevent dental discomfort, and supports human interaction [1], [2]. The use of dental services prevents oral diseases where its prevalence is associated with chronic diseases such as diabetes mellitus (DM) that also has increased risks with age [3]. For this reason, it is important to study the interaction of chronic illnesses with oral diseases and thereby help improve the quality of life of people affected by them [4].

Elderly population is the least to use dental services among the worldwide population due to limited or unequal access to providers and resources [5]. However, it has been re-ported an increase in the population over 60 years of age in the last three years, reaching up to 17.04% in developed countries such as the United States [6]. In Peru, this population has increased from 5.7% in 1950 to 13.3% in 2022 [7]. A large percentage of this demographic has never used a dental service as they experience mobility issues and barriers at education, socioeconomic, cultural and social level [8], [9].

On the other hand, diabetes is one of the most prevalent pathologies in elderly popu-lation which is linked to the appearance of periodontal diseases [10]. The most common oral health conditions in patients

with diabetes mellitus are dental caries, gingivitis, and periodontitis [11], [12]. Several studies have identified the relationship between diabetes and periodontal diseases by observing advanced periodontitis in patients with type 2 diabetes mellitus (DM2) and high levels of glycosylated hemoglobin (HbA1c) [13]–[15].

The literature suggests this group of patients do not frequently access the aforemen-tioned services [16], [17]. Promoting a greater number of complications in oral health. Therefore, the objective of this study is to determine the factors associated with the use of dental services in diabetics over 60 years of age in Peru.

2. METHOD

2.1. Study design

The present study had an observational, analytical and cross-sectional design. Data used for analysis in this research was collected from the Demographic and Family Health Survey of Peru (ENDES) from 2019 to 2021 [18]. The ENDES is a comprehensive survey that collects data on a wide range of health indicators, including access to healthcare services, prevalence of chronic diseases, and health behaviors among the Peruvian population.

2.2. Population and sample

Body of individuals under study consists of elderly residents of Peru who are spread across the entire country. This data was collected during the ensus perios from 2019 to 2021. The information was gathered from statistical data available from nationwide demographic tallies. The data gathering approach adopted a balanced, layered, and independent two-stage probabilistic technique. This method was applied at the provincial level and included both metropolitan and non-metropolitan zones.

In the present study, we utilized data from the ENDES conducted between 2019 and 2021. The analysis included both male and female participants who met the specific criteria for the study, specifically individuals who are in their 60s or older, identified as diabetic, who have thoroughly filled out the oral health and diabetes sections of the survey. Subjects were excluded from the study if they were unable to complete the oral health or diabetes section.

2.3. Variable

2.3.1. Response variable

The outcome mesure in this study was the reachability of dental services. This was measured by using the demographic survey question: "At some time in your life, have you been treated/or in a dental service or by a dentist", the responses were categorized as 'yes', 'no', or 'do not know/do not remember'. These additional measures provided a more comprehensive understanding of the accessibility and utilization of dental services among the elderly population in Peru.

2.3.2. Exposure variables

The analysis incorporated several variables. These included the gender of the participants, categorized as either male or female, and their age, grouped into distinct age groups: 60 to 74 years, 75 to 90 years, and 91 to 100 years. Besides, the geopraphical location of the participants was also taken into account, with participants coming from the Lima urban region, or the Coast, Highlands, and Jungle regions of Peru.

The educational attainment of the participants was another variable, with participants classified as unschooled, having completed elementary, secondary or highschool, or possessing post-secondary education. The wealth index also taken itno account, with categories including poorest, poor, average, wealthy, and wealthiest. The type of residence, whether metropolitan and non-metropolitan zones, was factored in as well. Additionally, the study considered whether particpants had a history of arterial hypertension (yes or no), and whether they had a physical disability (yes or no). The census data was collected by trained personnel from ENDES. They surveyed a group of residents in their homes to gather information. This process took place from February to December over the course of three years, from 2019 to 2021. The primary method of data collection was through individual inquiries.

2.4. Procedures

Individuals in the Household survey classified themselves as either the Head of Household, Spouse, or a Household member aged 18 or above. For the single-respondent questionnaire, participants were those who were 60 years or older. The primary parameters for this study were derived from the inquiries related to Oral Health (QS311) and diabetes mellitus (M19), which were found in module 69 on the files (REC94) and (REC41) respectively [18].

2.5. Statistical analysis

The statistical analysis for this research study was conducted using STATA v17 software. Various tools from the Microsoft Office suite played a crucial role in the development of this study. Excel was utilized to consolidate data insights and create visual representations in the form of charts, while Microsoft Word was employed to scrutinize results and document the findings.

In the univariate analysis, each variable was examined individually, with frequencies and percentages calculated for each. For numerical variables, the mean and standard deviation were determined. A bivariate analysis was also conducted on all categorical variables. For the multivariate analysis, a Poisson regression formula with robust variance was utilized, allowing for the calculation of both raw and adjusted prevalence ratios (PR). These were calculated with a 95% confidence level, providing 95% confidence intervals (95% CI).

2.6. Ethical considerations

The data for this study was obtained from the ENDES Census. Inquirers provided each participant with detailed information from the consent forms. Data was only collected from those who agreed to participate in the study. To ensure the confidentiality of each participant, no personal information was collected in this survey.

3.   RESULTS AND DISCUSSION
3.1. Results

The ENDES survey participants were filtered based on the inclusion and exclusion criteria to determine the study sample. This research incorporated 2,000 residents of Peru as part of the study sample. The findings from this research could be instrumental in shaping future health policies and interventions for this demographic.

Female participants represented 56.17% of the sample. Regarding age, less than 1% of participants were people between 91 and 100 years (0.81%), and only 8.41% from this population lived in the Jungle region. Unschooled participants were only 0.16%. These findings highlight the diversity of the sample, with a majority of female participants and a wide age range. The data also reveals the geographical distribution of the participants, with a smaller percentage residing in the Jungle region.

Alternatively, the study population included over a thousand participants who were at the top of the wealth index, accounting for nearly 36.5% of the total. Hence, people living in a urban residence represented 91.2% contrarily to 91.2% living in a rural residence. The prevalence of hypertension was 52.69% and 8.14% reported to have a physical disability. Only 336 people (8.65%) from this study did not have access to dental services. More details can be seen in Table 1.

Table 1. General characteristics of the ENDES study population

Characteristics	n (% Wighted)	Characteristics	n (% Wighted)
Gender		Type of residence	
Male	1,701 (43.83)	Urban	3,536 (91.08)
Female	2,181 (56.17)	Rural	346 (8.92)
Categorized age		History of hypertension	
60-74 years old	2,922 (75.28)	No	1,836 (47.31)
75-90 years old	928 (23.91)	Yes	2,044 (52.69)
91-100 years old	31 (0.81)		
Region		Physical disability	
Lima-metropolitan area	1,984 (51.10)	No	3,566 (91.86)
Coast	969 (24.95)	Yes	316 (8.14)
Highlands	603 (15.53)		
Jungle	327 (8.41)		
Educational level		Access to dental services	
Without education	6 (0.16)	No	336 (8.65)
Primary	1,349 (37.78)	Yes	3,546 (91.35)
Secondary	1,175 (32.90)		
Post-secondary	1,042 (29.16)		
Wealth index			
Poorest	267 (6.68)		
Poor	529 (13.62)		
Average	698 (17.99)		
Wealthy	969 (24.96)		
Wealthiest	1,419 (36.5)		

Table 2 presents a bivariate analysis conducted on all the characteristics of interest. All variables (gender, categorized age, natural region, educational level, wealth index, type of residence, history of HTN, physical disabilit) had a statistically significant association in respect to going to the dental service ($p<0.001$).

Table 2. Bivariate analysis of association between variables of interest from ENDES survey population and people who visited a dental service

Characteristics	Went to dental service		p
	Yes n (%)	No n (%)	
Gender			
Male	165 (9.69)	1,536 (90.31)	<0.001
Female	171 (7.84)	2,010 (92.16)	
Categorized age			
60-74 years old	255 (8.71)	2,668 (91.29)	<0.001
75-90 years old	81 (8.71)	847 (91.29)	
91-100 years old	1 (1.38)	31 (98.62)	
Natural region			
Lima-metropolitan area	89 (4.50)	1,895 (95.59)	<0.001
Coast	98 (10.09)	871 (89.91)	
Highlands	91 (15.19)	511 (84.81)	
Jungle	57 (17.57)	269 (82.43)	
Educational level			
Without education	0 (0)	5 (100)	< 0.001
Primary	151 (11.21)	1,198 (88.78)	
Secondary	82 (6.96)	1,093 (93.04)	
Post-secondary	42 (4.02)	1,000 (95.98)	
Wealth index			
Poorest	77 (28.96)	190 (71.04)	<0.001
Poor	86 (16.22)	443 (83.78)	
Average	89 (12.22)	609 (87.29)	
Wealthy	41 (4.23)	928 (95.77)	
Wealthiest	43 (3.03)	1,376 (96.97)	
Type of residence			
Urban	2,56.21 (7.25)	3,289 (92.75)	<0.001
Rural	80 (23.01)	267 (76.99)	
History of HTN			
No	175 (9.55)	1,660 (90.45)	<0.001
Yes	160 (7.83)	1,884 (92.17)	
Physical disability			
No	288 (8.07)	3,278 (91.93)	<0.001
Yes	48 (15.20)	268 (84.80)	

In Table 3 (see Appendix), a poisson regression analysis was performed including a weight sample. The purpose of a multivariate regression analysis was to find the probability of visiting an oral health service and its factors associated. The characteristics of this demographic consisted of females (PR=1.04, 95% CI 1.01–1.09); aged from 91 to 100 years old (1.12; 95% CI 1.03–1.21) with secondary education level (PR=0.92; 95% CI 0.91–1.06); and a wealth index of average, wealthy and wealthiest (PR=1.20, 95% CI 1.01–1.41).

3.2. Discussion
3.2.1. Main findings
The results of this study indicate the majority of patients with DM2 aged 65 years old or above are less likely to have equal access to an oral health service or provider. Therefore, the most important variables related to this issue are gender, age, level of education, and wealth index.

3.2.2. Comparison with other studies
According to gender, it was entered that women presented a greater association of having access to dental services. This was consistent with the research carried out by Duque et al. [19]. where women were more concerned about the impact that their oral health status can have on their quality of life. The same was found in the Azañedo et al. [20]. where 514 elderly women in the study used dental services in the last six months, unlike the elderly men who were 446. On this same side, according to Meisha et al. [21]. mentions that the use of dental services is more affected by women, while men go to solve pain problems. Regarding this variable, we could assume that women use the dental service more due to the cultural role that demands greater self-care due to the responsibility of family care, unlike men who are influenced by their historical role that predominantly covers the support of their home. that your self care [22].

According to age, in this investigation it was evidenced that as age progressed there was a greater probability of having a dental check-up. These results are similar to those of Atuaje and Causo [23] who found that older people had a positive correlation with quality of life related to oral health. Likewise, in the study of Gómez [24] shows similar evidence, since, according to their study, 60.7% of people over 65 years

of age or older had healthy teeth at the time of the self-assessment of the oral condition. This evidence may be due to the fact that the greater the age, the greater the self-care to avoid complications and lose teeth.

Regarding the region, in our study there was no association between its types and access to dental services. In contrast to our study, Meneses [25]. he pointed out that the decrease in oral diseases and the use of prostheses will depend on the education of the population and how the government applies measures in each region to dictate prevention measures.

Regarding education, it was found that those with high school were more likely to have a dental check-up. These results differ from those of Barrios *et al*. [26]. where it was evidenced that there was a greater impact of oral health on the quality of life in older adults with a complete primary school level.

Regarding the wealth index, people with greater economic resources were more likely to have a dental check-up. Our results agree with many others, for example, elaborated by Azañedo *et al*. [20]. mention in their study that most people were cared for in the private sector, which means that people with greater economic resources are more likely to have a dental check-up and have a better quality of life in relation to their oral health. Regarding the type of residence, in our study there was no association between its types and access to dental service. In contrast to our study, Ha *et al*. [27] observed that the prevalence of caries in rural and peri-urban areas had a very high rate, which could mean that people do not request dental care and even despite having a health center with dental service, they do not attend.

Regarding the history of AHT, in our study there was no association between its types and access to dental services. Otherwise with our study, Kim *et al.* [28] showed that people with multiple dental caries was related to the risk of cardiovascular disease in hypertensive patients. Better oral hygiene may decrease the risk of cardiovascular events in hypertensive patients. Under the same circumstances, in the study by Janto *et al.* [29] emphasize that older adults with a systemic disease such as diabetes, hypertension, osteoarthritis, osteoporosis, cardiovascular and cerebrovascular disease, should receive special dental care, since oral diseases are strongly associated with systemic diseases and having a poor Oral health can worsen the impact of the systemic disease you are carrying. Regarding physical disability, in our study there was no association between its types and access to dental services. Our results differ from those of Kotronia *et al.* [30] who showed that disability was related to a high incidence of caries and thus to a great loss of teeth compared to the general population. Therefore, preventive oral care in people with a disability should be reinforced since it is part of their quality of life and healthy aging.

3.2.3. Study limitations

This investigation possesses both merits and constraints. Initially, given its cross-sectional nature, the probability cannot be ascertained; nonetheless, it could provide an initial insight into the behavior of these variables concerning access to dental services. Furthermore, this study constitutes a secondary analysis of a dataset initially gathered for a different objective. Consequently, future research should validate these findings and undertake primary data collection.

4. CONCLUSION

There are sociodemographic factors (female gender, age progressed, natural region, those with high school, wealth index, type of residence) and personal factors (history of HTN, physical disability) associated with a lack of access to dental services in people over 60 years old. If these results are confirmed, these characteristics should be considered in or-der to change the intervention strategies that are currently in place and make greater pro-motion that is beneficial for people and communities in having greater access to dental services and thus reduce their complications in the long term.

APPENDIX

Table 3. Crude Poisson regression analysis adjusted for dental service use

Características	Access to dental service					
	PR	CI 95%	p	PR	CI 95%	p
Gender						
Male	Ref.			Ref.		
Female	1.02	0.98 – 1.06	0.294	1.04	1.01 – 1.09	0.045
Categorized age						
60 - 74 years old	Ref.			Ref.		
75 - 90 years old	0.99	0.96 – 1.04	0.999	1.01	0.96 – 1.06	0.690
91 - 100 years old	1.08	1.04 – 1.12	<0.001	1.12	1.03 – 1.21	0.006

Table 3. Crude Poisson regression analysis adjusted for dental service use (*continue*)

| Características | Access to dental service | | | | | |
	PR	CI 95%	p	PR	CI 95%	p
Natural region						
Lima-metropolitan area	Ref.			Ref.		
Coast	0.94	0.90–0.97	0.001	0.97	0.94–1.01	0.205
Highlands	0.89	0.82–0.95	0.001	0.98	0.92–1.06	0.683
Jungle	0.86	0.81–0.92	<0.001	0.94	0.88–1.01	0.073
Educational level						
Without education	Ref.			Ref.		
Primary	0.89	0.86–0.92	<0.001	0.89	0.83–0.97	0.05
Secondary	0.93	0.90–0.95	<0.001	0.92	0.91–1.06	0.019
Post-Secondary	0.93–0.98		0.002	0.93	0.86–1.01	0.08
Wealth index						
Poorest	Ref.			Ref.		
Poor	1.18	1.04–1.33	0.008	1.17	0.96–1.38	0.074
Average	1.23	1.11–1.37	<0.001	1.20	1.01–1.41	0.034
Wealthy	1.34	1.22–1.48	<0.001	1.29	1.10–1.51	0.02
Wealthiest	1.37	1.24 – 1.50	<0.001	1.29	1.10–1.52	0.02
Type of residence						
Urban	Ref.			Ref.		
Rural	0.83	0.77–0.89	<0.001	1.02	0.90–1.17	0.678
History of HTN						
No	Ref.			Ref.		
Yes	1.02	0.98–1.06	0.312	1.01	0.97–1.04	0.471
Physical disability						
No	Ref.			Ref.		
Yes	0.92	0.84–1.02	0.104	0.92	0.84–1.01	0.077

*Adjusted for sex, categorized age, natural region, education level, wealth index, type of residence, history of htn, physical disability.
**Significant p-value <0.05; PR: Prevalence ratio 95% CI: confidence interval at 95%. Source: own elaboration.

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