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Understanding poor oral health among older adults in Türkiye: socioeconomic and healthcare access challenges

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Abstract

Background Oral health is an integral part of overall well-being, and older individuals are particularly vulnerable due to age-related changes and barriers to healthcare access. Despite Türkiye's comprehensive public health insurance system, significant disparities in oral health persist, highlighting the need for targeted research and interventions. This study assesses the oral health of people aged 65 and older in Türkiye and explores the factors linked to poor oral health, such as individual characteristics, lifestyle, socioeconomic status, social support, overall health, and access to healthcare services.

Methods A secondary analysis was performed using the cross-sectional 2022 Türkiye Health Survey, which gathered data from 3,144 individuals aged 65 and above. Oral health was self-reported, with poor oral health defined as participants rating their dental and gum condition as 'bad' or 'very bad.' Factors assessed included age, gender, education, social support, healthcare access, and the presence of chronic diseases.

Results Among the participants, 25.8% reported poor oral health. Key factors associated with this included being older, female, having lower levels of education, difficulty communicating in one's mother tongue, experiencing limitations in daily activities, and facing cost-related barriers to dental care. Multivariable analysis found that cost related barriers and limitations in daily activities had the strongest impact on oral health. The study also highlighted the importance of social support in maintaining better oral health.

Conclusions Poor oral health in older adults in Türkiye is strongly influenced by cost-related barriers, limitations in daily activities, and lack of social support. Expanding public dental services, reducing out-of-pocket costs, and integrating oral health into chronic disease programs are critical steps. Providing culturally sensitive and mobile care options can also address mobility challenges and enhance oral health outcomes for the elderly.

Keywords Elderly oral health, Socioeconomic factors, Healthcare access, Social support, Unmet dental care needs, Public dental dervices

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Introduction

The global population is aging, with the number of people aged 60 and over expected to reach 2 billion by 2050 [1, 2]. Although global life expectancy is rising, the number of years lived in full health is decreasing, as reflected by an increase in Disability-Adjusted Life Years (DALYs) [3]. Therefore, it is essential to take steps to improve health services in a manner that effectively addresses the needs and demands of this age group, ensuring the maintenance of comprehensive physical, social, and psychological well-being in older age. Oral health is an integral part of this holistic well-being, and older individuals are at higher risk for oral health problems, as physiological changes associated with aging, combined with the prevalence of non-communicable diseases and medication use, can negatively affect oral health [2, 4–6]. This decline in oral health is associated with systemic morbidity, functional loss, and frailty, which can lead to disability, dependency, and also increased mortality [4, 7, 8]. The association between aging and poor oral health is complex and influenced by a range of factors beyond the physiological changes associated with aging. Sociodemographic determinants such as gender, education level, and income as well as structural determinants, including the organization of the healthcare system and the design of insurance schemes, contribute to disparities in oral health in the elderly population [9–15]. Availability, affordability, and the capacity to navigate healthcare systems significantly shape access to healthcare services, which in turn affects oral health outcomes in older age [12, 16–18].

Türkiye is experiencing a demographic transition similar to the global trend. The proportion of the elderly population in Türkiye is expected to surpass the global average in a short period and reach 20.9% of the total population by 2050 [19]. According to the 2018 Türkiye Oral and Dental Health Profile Survey, 28.8% of individuals aged 65 to 74 perceive their dental condition as "poor" or "very poor." Individuals reporting toothache or dental-related discomfort within the past year comprised 41.0% of the 65 to 74 age group, with women experiencing more discomfort compared to men [20]. Previous studies in Türkiye have found poor oral health to be associated with gender and educational level, and there is evidence indicating inadequate oral hygiene practices among the elderly [21–23]. The findings from the 2018 Türkiye Oral and Dental Health Profile revealed that nearly one in five individuals aged 65 and above did not have a toothbrush, and 77% brushed their teeth less than twice daily [20]. Despite the fact that the vast majority of older adults reported having visited a dentist at least once in their lifetime, the primary reason for their most recent visit (83.4%, $n = 1{,}674$) was due to pain or issues related to teeth, gums, or mouth, while only 6.0% sought dental care for routine check-ups [20]. This is particularly notable considering that Türkiye provides a more comprehensive insurance benefit package than many European countries, and almost the entire population is covered by public health insurance [24].

Dentistry in Türkiye has historically operated under the mechanisms of a free-market economy, with services primarily provided by private offices on an out-of-pocket basis. However, the introduction of the Health Transformation Programme (HTP) in 2003 brought significant changes, shifting dental care provision from a predominantly private system to a public dental clinic network. Despite this shift, the transformation did not result in a fully public system [25]. While the proportion of dentists working in public health institutions rose from 12.6% in 1970 to 47.9% in 2019, private institutions still dominated in 2022, accounting for 79.5% of service providers and 50.6% of dental units [20, 26]. The population per dental unit improved from 61,632 in 2002 to 8,209 in 2022, yet significant regional disparities remain. The rapid expansion of dental faculties in the last two decades has increased the public sector's share, but Türkiye still lags behind Europe, with 2,141 people per dentist compared to the European average of 1,265 [26]. Nonetheless, the lack of sufficient preventive dental care has led to overcrowding in secondary and tertiary care services, forcing many patients to seek treatment in these overburdened systems [20, 27–29].

Considering the demographic transition of Türkiye, the poor oral health status of the individuals aged 65 and over, and the organization of oral healthcare services within the healthcare system, there is a clear need for interventions that effectively address the oral health needs of this population to enhance their quality of life. Therefore, it is important to comprehensively analyze the factors affecting oral health among individuals aged 65 and above in Türkiye to identify key areas for intervention. The contrast between the poor oral health status and the comprehensive public healthcare and insurance systems in Türkiye suggests a contributing impact of other socioeconomic factors which may also be significant for comparisons with nations with analogous health systems.

To the best of our knowledge, this study is the first to evaluate factors associated with poor oral health among individuals aged 65 and over in Türkiye across six domains using the 2022 Türkiye Health Survey, the most recent available dataset. Moreover, existing studies in Türkiye focusing on this age group have predominantly been conducted in nursing homes or other institutionalized settings which constitues only %0.3 of the elderly [30, 31]. This study addresses this gap by providing insights into community-dwelling older adults through a population-based approach. The findings will not only

inform interventions targeting older adults in Türkiye but also provide valuable insights for countries with similar healthcare systems.

Aim

The aim of this study is to evaluate the oral health status of individuals aged 65 and over in Türkiye and to examine the factors associated with poor oral health across six domains including individual characteristics, lifestyle factors, socioeconomic status, social support, general health status, and healthcare access.

Materials and methods

Study design and setting

This study is a secondary analysis of the 2022 Türkiye Health Survey (THS), which is a cross-sectional study conducted between September and December 2022 by the Turkish Statistical Institute (TurkStat). The primary objective of the Türkiye Health Survey is to provide an overview of individuals' health profiles and gather data on health indicators, which are significant components of development indicators that reflect a country's level of development. This study is a targeted survey that facilitates cross-national comparisons and provides insights into the special requirements of each country. The Türkiye Health Survey 2022 includes a total of 29,761 individuals from 11,170 households, which were determined to provide an estimate for the entire country. For national representation, the sampling of surveys utilizes a stratified, two-stage cluster sampling method based on the "Address-Based Registry System". In accordance with the survey's methodology, weighting procedures were applied based on selection probabilities and calibration adjustments using population projections were performed. The THS 2022 is designed to offer sample estimates for Türkiye as a whole and for age groups in increments of ten years. The study methodology excluded individuals residing in dormitories, prisons, hospitals, nursing homes, small villages, or hamlets. The THS 2022 included 3144 individuals with aged 65 years and older across Türkiye [32]. The declaration of the Turkish Statistical Institute regarding metadata and publication as well as Instutional Quality Check Reports can be accessed on the bottom right side of the webpage of the survey [32].

The Türkiye Health Survey is collecting data using the Computer-Assisted Personal Interviewing (CAPI) approach from selected household addresses. The survey comprises modules proposed by the European Statistical Office (Eurostat) and includes health status, health care use, health determinants, and socio-economic background variables.

The microdata set of the 2022 THS was officially requested and obtained from TurkStat to understand the determinants of oral health of individuals aged 65 years and older in our analyses.

We utilized ChatGPT, a Large Language Model, to assist in improving the clarity and readability of the English language in the manuscript.

Ethical approval

We adhered to the principles of the Declaration of Helsinki, publishing the survey results at an aggregate level and fully securing the anonymity of the interviewed individuals and households. Before interpreting the results, the researchers obtained the consent of the Ethical Board from the School of Medicine at Ege University (Decree No. 24-9.1T/25).

Variables

The dependent variable of this study is based on the answer to the question, "How would you describe the condition of your teeth and gums? The answers were categorized on a scale where 1 is very good and 5 is very bad. The answers 'bad' and 'very bad' were considered as self-reported poor oral health, whereas responses 1, 2, and 3 were acknowledged as indicators of good oral health.

The study employed a six-domain approach to analyze independent variables influencing self-reported poor oral health. Individual factors were evaluated by sex, age, marital status, and difficulties in communication with the mother tongue. Lifestyle assessment included the presence of obesity (measured via body mass index) and smoking. Socioeconomic factors comprised education, employment status, and access to public health insurance. The assessment of social support took into account the presence of close individuals in case of serious problems and the ease of obtaining practical help from neighbors if necessary. General health status was evaluated by chronic disease status, and difficulties in daily activities. In this study, chronic disease status was categorized as "No chronic diseases", "1–2 chronic diseases", and "three or more chronic diseases". Healthcare access was measured by the last time the participant visited a dentist or orthodontist on their own behalf. Healthcare service accessibility was assessed by cost-related unmet dental care needs, delays experienced in accessing healthcare within the past 12 months due to lengthy appointment scheduling, and delays encountered in healthcare access within the past year due to transportation or distance constraints.

Statistical analyses

To examine the associations between independent variables and self-reported poor oral health, we initially conducted chi-square analyses. This method allowed us to assess the relationship between categorical variables and the outcome, with results presented as frequencies

(numbers) and percentages. Variables that demonstrated statistical significance in Pearson's chi-square tests were subsequently included as candidates for further analysis in multivariable logistic regression models.

We employed both univariate and multivariable logistic regression models to explore these relationships in greater depth. Specifically, we used the Backward Likelihood Ratio (Backward LR) method to progressively exclude non-significant variables from the multivariable models, thereby refining the model to include only those variables that had a meaningful impact on the outcome. For each variable in the logistic regression models, we calculated the odds ratios (ORs) and their corresponding 95% confidence intervals (CIs). To assess the goodness-of-fit of the final logistic regression model, we applied the Hosmer and Lemeshow test. A p-value greater than 0.05 indicated that the model fits the data well, suggesting no significant difference between the observed and predicted values of the outcome. In all statistical tests, a p-value of less than 0.05 was considered to indicate statistical significance.

All analyses were performed using the Statistical Package for Social Sciences (SPSS) version 26, ensuring robust and reliable statistical calculations throughout the study.

Results

A total of 3144 participants aged 65 and over were included in the study. The mean age of the participants was 72.57 years, with 54.0% being women. The predominant age group was 65–69 years, comprising 43.4% of the sample. A majority of the participants (67.2%) were married, while 8.9% reported difficulties in communication with their mother tongue. Educational attainment was low, with 78.6% having less than five years of education. The vast majority (95.9%) had health insurance (Table 1). Among participants, 86.3% had at least one chronic disease, 52.8% had three or more conditions, and 61.9% faced limitations in daily activities. Poor self-rated oral health was reported by 25.8%. Additionally, 75.2% had not sought dental care in over 12 months, and 9% experienced unmet dental care needs due to cost.

Pearson's chi-square tests were conducted to explore the associations between independent variables and poor oral health. As shown in Table 1 significant associations with poor oral health were found for sex, age, marital status, communication difficulties, education, employment, private health insurance (Table 1).

Chronic disease status, daily activity limitations, dental care utilization, cost-related unmet dental care needs, delay due to lengthy appointment scheduling and delay due to distance or transportation constraints were significantly associated with poor oral health. No significant associations were observed for BMI or smoking (Table 2).

As shown in Table 3, the univariate analysis demonstrated several significant associations between poor oral health and various predictors. Women had 1.2 times higher odds of poor oral health compared to men (OR: 1.2, 95% CI: 1.1–1.5), and this association remained significant in the multivariable analysis with increased odds of 1.4 (95% CI: 1.1–1.8) after adjusting for covariates. Participants aged ≥ 80 years had the highest odds of poor oral health compared to those aged 65–69 (univariate OR: 1.8, 95% CI: 1.4–2.3), though this decreased slightly in the multivariable model (OR: 1.4, 95% CI: 1.0-1.9). Having difficulty communicating in one's mother tongue increased the odds of poor oral health by 3.2 times in the univariate analysis (95% CI: 2.5–4.1), which persisted in the multivariable analysis with an adjusted OR of 1.6 (95% CI: 1.2–2.2).

Lower education levels were strongly associated with poor oral health. Participants with less than five years of education had twice the odds of poor oral health compared to those with nine or more years of education in the univariate analysis (OR: 2.0, 95% CI: 1.7–2.8), which remained significant in the multivariable analysis (OR: 1.5, 95% CI: 1.1–2.1). Employment status was also a significant determinant of poor oral health. Specifically, individuals who had left work due to health problems or age exhibited a significantly higher risk of poor oral health compared to those who were employed in both univariate and multivariate analyses (univariate OR: 3.4, 95% CI: 2.2–5.3; multivariable OR: 1.8, 95% CI: 1.1–3.1). Other employment categories, such as being a housewife or retired, were not significantly associated with poor oral health in the multivariate analysis. Social support also played a role, as those reporting difficulty in obtaining help from neighbors had significantly higher odds of poor oral health (univariate OR: 2.2, 95% CI: 1.7–2.9; multivariable OR: 2.0, 95% CI: 1.5–2.7).

Health-related factors were strongly associated with poor oral health outcomes. Participants with three or more chronic diseases had 4.9 times higher odds of poor oral health compared to those without chronic conditions in the univariate analysis (95% CI: 3.5–6.9). This association remained significant in the multivariable model, where individuals with three or more chronic diseases had adjusted odds of 3.4 (95% CI: 2.1–5.3). Limitations in daily activities due to health were also significant; participants reporting such limitations had nearly three times higher odds in the univariate analysis (OR: 2.8, 95% CI: 2.3–3.5), which reduced to 1.4 (95% CI: 1.1–1.8) after controlling for other factors.

In terms of healthcare accessibility, participants with unmet dental care needs due to cost were significantly more likely to report poor oral health (univariate OR: 3.8, 95% CI: 2.9-5.0), a finding that persisted in the multivariable model (adjusted OR: 2.6, 95% CI: 1.9–3.6). Delays in

Table 1 Descriptive characteristics of participants and their associations with poor oral health status in THS 2022 (*N* = 3144)

Descriptive Characteristics	Total Column *N*(%)*	Good Oral Health Row *N*(%)**	Poor Oral Health Row *N* (%**)	*P*-value
A. Individual characteristics				
Sex (*N* = 3144)				0.010
Men	1445(46.0)	1104(76.4)	341(23.6)	
Women	1699(54.0)	1230(72.4)	469(27.6)	
Age (*N* = 2986)				0.0001
65–69	1296(43.4)	1011(78.0)	285(22.0)	
70–74	887(29.7)	679(76.6)	208(23.4)	
75–79	475(15.9)	330(69.5)	145(30.5)	
>=80	328(11.0)	218(66.5)	110(33.5)	
Marital status (*N* = 3144)				0.0001
Married	2112(67.2)	1617(76.6)	495(23.4)	
Single	1032(32.8)	717(69.5)	315(30.5)	
Difficulty in communication in the mother tongue (*N* = 3144)				0.0001
Have difficulty	279(8.9)	141(50.5)	138(49.5)	
No difficulty	2865(91.1)	2193(76.5)	672(23.5)	
B. Socioeconomic characteristics				
Education (*N* = 3144)				0.0001
< 5 years	2472(78.6)	1776(71.8)	696(28.2)	
5–8 years	201(6.4)	159(79.1)	42(20.9)	
>=9 years	471(15.0)	399(84.7)	72(15.3)	
Employment (*N* = 3138)				0.0001
Employed	160(5.1)	128(80.0)	32(20.0)	
Housewife	1154(36.8)	835(72.4)	319(27.6)	
Retired	1538(49.0)	1212(78.8)	326(21.2)	
Leaving work because of health problems or age	286(9.1)	155(54.2)	131(45.8)	
Public health insurance (*N* = 3144)				0.439
Yes	3015(95.9)	2242(74.4)	773(25.6)	
No	129(4.1)	92(71.3)	37(28.7)	
Private health insurance (*N* = 3144)				0.009
Yes	56(1.8)	50(89.3)	6(10.7)	
No	3088(98.2)	2284(74.0)	804(26.0)	
C. Social support				
Existence of close indivuals in case of serious problems (*N* = 3144)				0.028
No	126(4.0)	83(65.9)	43(34.1)	
Yes	3018(96.0)	2251(74.6)	767(25.4)	
The ease of obtaining practical help from neighbors (*N* = 3144)				0.0001
Very easy and easy	2311(71.5)	1769(76.5)	542(23.5)	
Possible	565(18.0)	406(71.9)	159(28.1)	
Very difficult and difficult	268(8.5)	159(59.3)	109(40.7)	

obtaining appointments (univariate OR: 1.6, 95% CI: 1.3–1.9) and transportation constraints (univariate OR: 2.4, 95% CI: 1.9-3.0) were significant in the univariate analysis but had attenuated significance in the multivariable analysis (adjusted OR: 1.2, 95% CI: 1.0-1.5 and adjusted OR: 1.3, 95% CI: 1.0-1.8, respectively).

The final multivariable logistic regression model demonstrated reasonable fit, with Cox & Snell R^2 of 0.113 and Nagelkerke R^2 of 0.166, explaining 11.3–16.6% of the variance in poor oral health outcomes.

Discussion

According to the results of this study, 25.8% of elderly individuals in Türkiye reported poor oral health, highlighting ongoing disparities despite improvements since the 2018 Türkiye Oral Health Survey [20]. In this study, an examination of individual, socioeconomic, and healthcare accessibilty-related factors identified critical drivers of poor oral health, particularly cost-related unmet dental care needs, chronic disease status, and insufficient social support. Individual factors such as gender, age, marital status, and language barriers were found to be associated

Table 2 Life style assesment, health status and healthcare access and their associations with poor oral health status in THS 2022 (*N* = 3144)

	Total Column *N*(%)*	Good Oral Health Row *N*(%)**	Poor Oral Health Row *N* (%**)	*P*-value
D. Lifestyle assessment				
BMI (*N* = 3143)				0.215
Healthy range and underweight	915(29.1)	693(75.7)	222(24.3)	
Overweight, obese, and morbidly obese	2228(70.9)	1640(73.6)	588(26.4)	
Smoking (*N* = 3144)				0.810
Current smoker	452(14.4)	335(74.1)	117(25.9)	
Never smoked	640(20.4)	469(73.3)	171(26.7)	
Quitted	2052(65.3)	1530(74.6)	522(25.4)	
E. General health status				
Chronic disease status (*N* = 3144)				0.0001
1–2 chronic diseases	1051 (33.4)	846(80.5)	205(19.5)	
Three or more chronic diseases	1661(52.8)	1097(66.0)	564 (34.0)	
No chronic diseases	432 (13.7)	391(90.5)	41 (9.5)	
Limitation in daily activities due to health (*N* = 3144)				< 0.001
Limited	1946(61.9)	1313(67.5)	633(32.5)	
Not limited	1198(38.1)	1021(85.2)	177(14.8)	
F. Access to health care				
Dental care utilisation (*N* = 3144)				0.0001
< 6 months	433(13.8)	299(69.1)	134 (30.9)	
6–12 months	347(11.0)	288 (83.0)	59 (17.0)	
> 12 months	2364(75.2)	1747 (73.9)	617 (26.1)	
Cost-related unmet dental care need (*N* = 2691)				0.0001
Yes	241(9.0)	110(45.6)	131(54.4)	
No	2450(91.0)	1865(76.1)	585(23.9)	
Delay due to lengthy appointment scheduling (previous year) (*N* = 3109)				0.0001
Yes	1062(34.2)	725(68.3)	337(31.7)	
No	2047(65.8)	1582(77.3)	465(22.7)	
Delay due to distance or transportation constraints (previous year) (*N* = 3111)				0.0001
Yes	424(13.6)	246(58.0)	178(42.0)	
No	2687(86.4)	2062(76.7)	625(23.3)	

with poor oral health in the univariate analyses, but the association with marital status lost its significance in the multivariable analysis.

Older women reported worse self-perceived oral health compared to men, which may be attributed to their greater accuracy in recognizing oral health concerns and heightened awareness of their oral health status [9, 10, 33].

The age-related disparities observed in this study are consistent with the literature showing that older individuals, especially those aged 80 and above, experience significantly worse oral health [34, 35]. As more elderly individuals retain their natural teeth, the need for dental care intensifies, particularly for managing complex oral diseases. Age-specific interventions, such as community-based oral healthcare programs and mobile dental clinics, are essential to ensure that elderly populations receive the care they need, especially those who face mobility challenges or live in institutionalized settings.

Difficulty communicating in the mother tongue was found to have a more significant association with poor oral health than variables such as insurance coverage and education level. In Türkiye, the census does not clearly identify racial and ethnic groups. Although the language of instruction is Turkish, a significant part of the population speaks other languages, such as Kurdish and Arabic [36]. In Turkiye, it is noteworthy that certain populations have been shown to face challenges in areas such as access to health information, patient-health worker relationships, time to access health services, treatment compliance, and satisfaction with health services in line with the relevant literature [37–39].

We found socioeconomic characteristics such as education, employment, and private insurance to be significant with poor oral health. The strong relationship between education and oral health is reflective of broader research showing that lower education is associated with poor oral health outcomes [10, 11, 35, 40]. Individuals with limited formal education are less likely to engage in

Table 3 Determinants of poor oral health in elderly in Türkiye ($n = 3144$)

Independent Variables	Univariate regression OR (95% CI)	Multivariable regression Adjusted OR (95% CI)
A. Individual factors		
Sex (Ref: Men)		
Women	1.2 (1.1–1.5)	1.4(1.1–1.8)
Age (Ref: 65–69)		
70–74	1.1(0.9–1.3)	1.0(0.8–1.2)
75–79	1.6(1.2-2.0)	1.3(1.0-1.7)
>=80	1.8(1.4–2.3)	1.4(1.0-1.9)
Marital status (Ref: married)		
Single	1.4(1.2–1.7)	-
Difficulty in communication in mother tongue (Ref: no difficulty)		
Have difficulty	3.2(2.5–4.1)	1.6(1.2–2.2)
B. Lifestyle assessment		
BMI (Ref: Healthy range + underweight)		
Overweight + obese + morbid obese	0.9(0.8–1.1)	-
Smoking (Ref: quitted)		
Current smoker	1.0(0.8–1.3)	-
Never smoked	1.1(0.9–1.3)	-
C. Socioeconomic characteristics		
Education (Ref: >=9 years)		
< 5 years	2.0(1.7–2.8)	1.5(1.1–2.1)
5–8 years	1.5(1.0-2.2)	1.3(0.8–2.1)
Employment (Ref: employed)		
Housewife	1.5(1.1–2.3)	1.2(0.7–2.1)
Retired	1.1(0.7–1.6)	1.0(0.6–1.6)
Leaving work because of health problems or age	3.4(2.2–5.3)	1.8(1.1–3.1)
Public health insurance (Ref: Yes)		
No	1.2(0.8–1.7)	-
Private insurance (Ref: Yes)		
No	2.9(1.3–6.7)	-
D. Social support		
Existence of close individuals in case of serious problems (Ref: Yes)		
No	1.5(1.1–2.2)	-
The ease of obtaining practical help from neighbors (Ref: very easy and easy)		
Possible	1.3(1.1–1.6)	1.1(0.9–1.4)
Very difficult and difficult	2.2(1.7–2.9)	2.0(1.5–2.7)
E. General health status		
Chronic disease status (Ref: "No chronic disease")		
1–2 chronic diseases	2.3(1.6–3.3)	2.0(1.3–3.2)
Three or more chronic diseases	4.9(3.5–6.9)	3.4 (2.1–5.3)
Limitations in daily activities due to health (Ref: not limited)		
Limited	2.8(2.3–3.5)	1.4(1.1–1.8)
F. Access to health care		
Dental care use (Ref: >12 months)		
< 6 months	1.3(1.1–1.6)	-
6–12 months	0.6(0.4–0.8)	-
Cost-related unmet dental care need (Ref: No)		
Yes	3.8(2.9-5,0)	2.6(1.9–3.6)
Delay due to lengthy appointment scheduling (previous year) (Ref: No)		
Yes	1.6(1.3–1.9)	1.2(1.0-1.5)*
Delay due to distance or transportation constraints (previous year) (Ref: No)		
Yes	2.4(1.9-3.0)	1.3(1.0-1.8)*

*not significant

preventive oral health practices and face greater barriers to accessing dental care [2, 41]. Public health efforts should prioritize improving health literacy and expanding access to dental services for individuals with lower educational levels through targeted education campaigns and subsidized dental care programs.

Our study found no significant association between the absence of public insurance and poor oral health, and the initial positive association between private insurance and better outcomes diminished in multivariable analysis. The diminishing effect of private insurance in our analysis is likely attributable to socioeconomic status (SES), as individuals with higher income and education levels tend to have better access to private care. The lack of significance of public insurance in our findings may be explained by a paradox observed in a study from Korea, where the expansion of insurance coverage increased the perception of unmet dental needs, despite improvements in specific health outcomes [42].

High levels of cost-sharing in many European countries restrict dental care spending, with national schemes covering only about 30% of dental costs [43]. In Türkiye, public insurance provides relatively comprehensive coverage for dental health services, but over two-thirds of dental health service providers in 2022 were part of the private sector, which is not included in public health insurance [26, 44, 45]. Additionally, cost-sharing policies under Voluntary Health Insurance (VHI) further limit reimbursement for outpatient services, including dental care, by imposing benefit maximums [45]. Moreover, public insurance might not make a significant difference in oral health outcomes because out-of-pocket expenses remain a significant barrier to public sector dental care access in Türkiye.

In the univariate analysis, individuals who left work due to health problems or age, as well as housewives, showed a significant association with poor oral health, whereas retired individuals do not and in the multivariable analysis, only the association between poor oral health and individuals who left work due to health problems or age remained significant. The significant association between homemakers and poor oral health outcomes in univariate analysis can be understood in light of the gender disparities in Türkiye's labor market and retirement benefits. Women's low participation in the workforce and the persistent gender pay gap contribute to the gender gap in pension incomes [46]. Housewives often don't have the opportunity to accumulate pension benefits due to their absence from formal employment [46]. In 2010, 59% of the elderly living below the poverty line in Türkiye were women, with widows and divorced women facing particularly high risks of poverty [47, 48]. Although the number of beneficiaries for retirement, disability, or survivor pensions has increased over the years, previous studies have shown that more than half of poor elderly individuals experience barriers in accessing tax-financed pensions and social assistance [47, 49]. Considering the widespread informal employment in Türkiye (28.7%), those who left work due to health problems or age may be among the most vulnerable in terms of income security [50].

In the category of lifestyle assessment, no significant association was observed between poor oral health and either smoking or obesity. Regarding smoking, the study did not find a significant association between smoking and poor oral health, contrary to much of the literature [40, 51–54]. It is possible that socioeconomic factors, such as lower income and education levels, which are more common among smokers, may obscure the direct impact of smoking on oral health [55]. Additionally, smokers may underreport the extent of their oral health issues due to lower health awareness or a diminished perception of their symptoms [33].

The association between social support and poor oral health, as found in our study, is supported by the literature indicating a bidirectional relationship [56]. Socially isolated older individuals are more likely to report worse self-rated oral health and experience greater tooth loss, and poor oral health can further contribute to increased social isolation by limiting social participation and communication [57–60]. Loneliness and low life satisfaction exacerbate these outcomes, contributing to both perceived and objective declines in oral health [61]. In Türkiye, 1,632,874 households out of 6,276,433 consist of a single elderly person living alone and living alone is more common among women, those living in poverty, and individuals with higher education [62, 63]. While many elderly individuals prefer to live with their children or receive home care services, only a small percentage consider nursing homes as an option [63, 64]. Moreover, a study from Turkey showed that 32.5% of individuals aged 80 and over have unmet health needs, 46.6% have unmet social needs, and approximately 90% of the met needs were provided by family members [65].

Health status plays a crucial role in influencing oral health. Increasing evidence supports that poor oral health, particularly tooth loss, is associated with chronic diseases [66–69]. The findings align with this literature and also Bomfim et al.'s (2019) work, which linked declining self-reported oral health to worsening geriatric health parameters, an increased risk of death, and institutionalization [70]. Given these findings, integrating oral health assessments into chronic disease screenings, and adopting a lifelong approach to preventive care should be key components of Türkiye's national oral health strategies.

In our study, limitations in daily activities emerged as a significant risk factor for poor oral health, consistent with the literature [71, 72]. Numerous studies demonstrate

that these limitations reduce the ability to engage in routine health maintenance, such as regular dental checkups and oral hygiene practices, increasing the risk of poor outcomes [71, 73, 74]. Alternative strategies, such as telehealth services and mobile dental healthcare services, may facilitate access to oral health guidance and treatment remotely for individuals with limitations.

Adequate access to healthcare is strongly associated with general health status, enabling individuals to receive timely interventions, manage chronic conditions, and engage in preventive care, including oral health services [75]. 25% of the study group had seen a dentist in the preceding year, a level significantly lower than that of European countries. A study examining dental care utilization trends among the elderly across 14 European countries revealed that the highest percentage of participants attending dental appointments within one year was observed in the Scandinavian welfare system (85.7% in 2019/2020), followed by the Bismarckian system (74.8%), Eastern European countries (53%), and Southern countries (38%) [24]. Older persons require more frequent dental screenings due to a heightened risk of age-related oral alterations, but older individuals are less inclined to seek dental care in many countries, as in our country [76, 77]. However, our data revealed that individuals who had visited the dentist within the last six months had worse oral health outcomes than those who hadn't visited in over 12 months. This could be explained by the "inverse care law," where individuals with poorer health are more likely to seek care [78]. Conversely, those who visited the dentist 6–12 months ago demonstrated better oral health, likely due to preventive rather than reactive care. The 2018 Turkish Oral and Dental Health Survey supports this, reporting that 94.9% of individuals aged 65 and older visited a dentist only when they had a problem, while only 6.0% went for preventive check-ups [20].

In multivariable analysis, unmet dental care needs due to cost were an important determinant of poor oral health; those who faced such barriers were 3.8 times more likely to have poor oral health. Factors contributing to this high impact include the private sector's primary provision of oral and dental health services, limited public insurance coverage for the services in private sector, and high co-payments in both public and private sectors [20, 26]. Reducing co-payment rates can help reduce these inequalities in access to care, suggesting that policy reforms to lower the financial burden could improve oral health outcomes, particularly for low-income groups [12]. Additionally, an assessment of the technical efficiency of public dental health centers in Ankara, Istanbul, and Izmir found that these institutions were not operating efficiently [18]. This inefficiency has likely driven patients toward the private sector, contributing to an increase in cost-related unmet healthcare needs.

In our study, lengthy appointment delays were associated with poor oral health, though their significance diminished in the multivariable model. Several factors could contribute to this, including the insufficient number of public dental health institutions, regional disparities, and the predominantly online appointment system. Older adults, especially those with lower health literacy, may struggle to navigate these barriers, impacting their timely access to care [17, 20, 75].

Limitations

The findings of this study should be considered within the scope and methodological limitations of the Turkish Health Survey (THS). Firstly, the cross-sectional nature of the study prevents the establishment of causal relationships between independent variables and oral health. As the data reflect only a specific period, it is not possible to monitor the long-term effects of these relationships. Secondly, although THS 2022 represents the population of Türkiye in general, individuals living in small villages, hamlets, nursing homes and similar institutions were not included in the study. This situation limits the examination of differences in the dental health of elderly individuals in these groups. Thirdly, the dependent variable used in the study is based on self-reported dental health status. Since self-reported health data are based on subjective values, it should not be ignored that there may be differences between individuals' perceptions and actual health status. Especially elderly individuals may not perceive some health problems or may have difficulty in reporting them. The study primarily focuses on the elderly population, where the use of complete and partial dentures is quite common. This could influence the self-reported oral health outcomes. Unfortunately, the THS dataset does not include specific questions about denture use or methods for measuring oral health in individuals who use dentures. Future research should aim to address these gaps by incorporating detailed questions on denture use and its impact on oral health assessments. Fourthly, some variables such as social support, language barriers and transport difficulties may not be fully explained due to limitations in data coverage or measurement errors. A more detailed and in-depth examination of these factors is possible with more specific data collection methods in future studies. Finally, the cost of dental health services varies across different regions in Türkiye. These differences should be addressed in depth through more comprehensive analyses. The limitations emphasize that the results should be interpreted with caution and point to the need for more comprehensive studies.

Conclusion

This study found that oral health is poor among individuals over 65 in Türkiye, with key determinants including age, gender, language barriers, health status, daily activity limitations, and cost-related unmet healthcare needs. While public dental services have expanded in the last decade, the private sector remains dominant, and high out-of-pocket costs limit access, particularly for disadvantaged groups. Expanding public dental services and eliminating out-of-pocket costs for pensioners could improve access. Enhancing health literacy in this low-education group may also yield positive effects.

Language barriers had a stronger impact on poor oral health than insurance coverage or education, highlighting the need for culturally and linguistically appropriate care. Multimorbidity and functional limitations further exacerbate access issues. Integrating oral health screenings into chronic disease management and home healthcare services could help address this. Additionally, ensuring social support for elderly individuals without family members is crucial. Expanding telemedicine, mobile dental clinics, and online interventions for education, early diagnosis, and treatment—particularly for those with mobility limitations—could significantly improve oral health outcomes among Türkiye's elderly population.

Abbreviations

BMI	Body Mass Index
CAPI	Computer-Assisted Personal Interviewing
CI	Confidence Interval
DALY	Disability-Adjusted Life Year
HTP	Health Transformation Programme
OR	Odds Ratio
SES	Socioeconomic Status
SPSS	Statistical Package for the Social Sciences
THS	Türkiye Health Survey
TURKSTAT	Turkish Statistical Institute
VHI	Voluntary Health Insurance
WHO	World Health Organization

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Author contributions

Irem Sevik and Aslı Davas played key roles in the data acquisition and performed the secondary analyses of the national sample. Asli Davas and Irem Sevik contributed to the interpretation of the results and provided critical intellectual input throughout the research process. Both authors were actively involved in drafting and revising the manuscript, ensuring its intellectual content and accuracy. All the authors read and approved the final manuscript.

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Data availability

This study is based on the 2022 Turkey Health Survey microdata provided by the Turkish Statistical Institute (TURKSTAT). In line with national regulations on statistical confidentiality, individual-level microdata cannot be shared or reproduced by third parties. Therefore, the dataset used in this study is not publicly available. Researchers may request access to the data directly from TURKSTAT.

Declarations

Ethics approval and consent to participate

The principles of the Declaration of Helsinki were followed, meaning that the survey results were published at an aggregate level and that the anonymity of the interviewed individuals and households was fully secured. Before interpreting the results, the researchers obtained the informed consent of the Ethical Board of the Faculty of Medicine, Ege University. This study is not an experimental study; it is a secondary analysis of the 2022 Turkey Health Survey (THS), a cross-sectional study conducted by the Turkish Statistical Institute (TurkStat). The consent of the participants was obtained by the Turkish Statistical Institute. The declaration of the Turkish Statistical Institute regarding metadata and publication as well as Instutional Quality Check Reports can be accessed on the bottom right side of the webpage: https://data.tuik.gov.tr/Bulten/Index?p=Turkiye-Saglik-Arastirmasi-2022-49747 [32].

Consent for publication

Not applicable, as this study does not include any identifying images or personal or clinical details of participants that compromise anonymity.

Competing interests

The authors declare no competing interests.

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