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Oral health outcomes across age groups: Insights from a multidistrict observational study in Odisha

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ABSTRACT

Oral health is integral to overall well-being, impacting physical and psychosocial aspects across all ages. This observational study investigates oral hygiene practices, lifestyle factors, and their collective influence on oral health across 14 districts of Odisha, India. With disparities exacerbated by socioeconomic factors and healthcare access, this research aims to elucidate age-specific patterns in oral health behaviors. A structured questionnaire surveyed residents aged 18 and above, stratified into six age groups. Findings revealed varied oral hygiene practices, with notable gaps in dental care access among rural and tribal populations. Significant associations were found between lifestyle behaviors (e.g. diet and tobacco use) and oral health outcomes (e.g. caries and periodontal diseases). The study underscores the need for targeted interventions to improve oral health literacy and access to dental services, particularly in underserved communities. By addressing these factors, tailored public health strategies can mitigate disparities and enhance oral health outcomes across diverse demographics in Odisha.

KEYWORDS

Oral health, Lifestyle factors, Odisha, Dental care

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Introduction

Oral health is a fundamental component of overall health and well-being, influencing individuals' physical and psychosocial aspects across all age groups [1]. Maintaining good oral hygiene practices and adopting healthy lifestyle behaviors play pivotal roles in preventing oral diseases and promoting oral health. Globally, the burden of oral diseases remains significant, impacting individuals, communities, and healthcare systems. In India, like many other countries, oral health disparities persist, exacerbated by varying socioeconomic factors, cultural practices, and access to oral healthcare services [2].

Odisha is characterized by pockets of rural and tribal populations with limited access to healthcare facilities, including dental services. These communities often face barriers such as geographic remoteness, economic constraints, and limited health literacy, contributing to disparities in oral health outcomes [3].

This observational study explores the intricate interplay between oral hygiene practices, lifestyle factors, and their collective impact on oral health across diverse age groups in 14 districts of Odisha, India. The rationale for this research stems from the recognition that oral health outcomes are influenced by multifaceted factors, including but not limited to, oral hygiene behaviors, dietary habits, tobacco use, alcohol consumption, and socioeconomic status. Understanding these factors within the context of different age demographics is rucial for developing targeted interventions and improving oral health outcomes on a population level. It comprehensively examined the associations between oral hygiene practices, lifestyle factors, and oral health outcomes across distinct age cohorts. Doing so aims to elucidate age-specific patterns in oral health behaviors and their implications for disease prevention and management. The primary objective of the study is to assess the prevalence of various oral hygiene practices among different age groups in Odisha, shedding light on variations in tooth brushing frequency and use of dental floss, mouthwash, and other oral hygiene products. This study contributes to the existing literature by adopting a comprehensive approach that integrates demographic, behavioral, and clinical data to provide a holistic understanding of oral health dynamics in Odisha. Focusing on multiple age groups, it explores how oral health behaviors evolve over the life course and examines their cumulative impact on oral health outcomes.

Materials and Methods

This observational study investigates the relationship between oral hygiene practices and lifestyle factors and their impact on oral health across various age groups in 14 districts of Odisha, India. The study will employ a cross-sectional design to collect data from a diverse sample population. A structured questionnaire was developed based on a comprehensive literature review and expert consultation. The questionnaire consists of seven sections covering demographic information, oral health habits, oral health status, diet and lifestyle, perception and knowledge, attitudes and beliefs, and open-ended questions.

The study will target residents aged 18 and above from the selected districts of Odisha. Participants will be stratified into age groups: 18-24, 25-34, 35-44, 45-54, 55-64, and 65 and above. Based on population estimates, 170 participants will be included in the study, distributed proportionally across the age groups.

Data collection will be conducted from March 2023 to April 2024. Participants will be recruited from hospitals and doctor clinics in the selected districts. Inclusion criteria require participants to have had some form of dental care in

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the past 12 months, understand the questionnaire language, and be willing to provide detailed information about their oral health and lifestyle. Informed consent was taken from the participants.

Inclusion and exclusion criteria

The inclusion criteria for this study include participants aged 18 years and above, residing in the 14 selected districts of Odisha, India, who have received dental care within the past 12 months, possess sufficient language proficiency to understand the questionnaire, are willing to share detailed information about their oral hygiene practices and lifestyle, have visited a dental clinic at least once in the past two years, and agree to provide contact information for potential follow-up. Exclusion criteria encompass dental professionals or those working in oral health to avoid bias, incomplete questionnaire responses, non-residents of the study area, and individuals with severe cognitive impairments that may impede effective participation.

Data analysis

The statistical data analysis was conducted in SPSS v 28.0. Quantitative data collected through the questionnaire will be analyzed using appropriate statistical methods. Descriptive statistics will summarize demographic characteristics, oral health habits, and lifestyle factors across different age groups. Inferential statistics such as chi-square tests or ANOVA will explore associations between variables and identify significant correlations. P value < 0.005 is considered significant.

Results

Table 1 presents a comprehensive analysis of demographic factors among study participants, revealing nuanced insights across age, education, occupation, and locality with a gender-specific breakdown. Age distribution showed generally balanced proportions between males and females across groups, with no significant differences observed (p=0.20). Educational attainment exhibited a similar pattern, suggesting gender parity across levels of education. In contrast, occupational categories demonstrated distinct gender distributions, with males prominently represented in employment and self-employment roles, while females were more prevalent among retirees and students. Notably, a significant gender disparity was evident in rural areas (p=0.004), where females constituted a larger proportion than males. These findings underscore the multifaceted influence of demographic variables in shaping participant demographics, which is crucial for understanding the study population dynamics and potential implications for research outcomes.

Table 1. Distribution of demographic factors among study participants.

Factor	Total (%)	Male (%)	Female (%)	p-value
Age				
18-24	30 (17.65)	18 (20.22)	12 (14.81)	0.20
25-34	40 (23.53)	21 (23.6.)	19 (23.46)	
35-44	35 (20.59)	19 (21.35)	16 (19.75)	
45-54	30 (17.65)	14 (15.73)	16 (19.75)	
55-64	20 (11.76)	13 (14.61)	7 (8.64)	
>64	15 (8.82)	4 (4.49)	11 (13.58)	
Education				
No formal education	13 (7.65)	6 (6.74)	7 (8.64)	0.58
Primary	37 (21.76)	20 (22.47)	17 (20.99)	
Undergraduate	45 (26.47)	23 (25.84)	22 (27.16)	
graduate	44 (25.88)	24 (26.97)	20 (24.69)	
Postgraduate	31 (18.24)	16 (17.98)	15 (18.52)	
Occupation				
Student	30 (17.65)	18 (20.22)	12 (14.81)	0.11
Unemployed	10 (5.88)	6 (6.74)	4 (4.94)	
Employed	80 (47.06)	45 (50.56)	35 (43.21)	
Self-employed	20 (11.76)	8 (8.99)	12 (14.81)	
Retired	30 (17.65)	12 (13.48)	18 (22.22)	
Locality				
Rural	60 (35.29)	25 (27.78)	35 (43.21)	0.004
Semiurban	70 (41.18)	38 (42.70)	32 (39.51)	
Urban	40 (23.53)	27 (30.34)	13 (16.05)	

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The table provides a detailed analysis of oral health behaviors among participants, categorized by gender and accompanied by p-values indicating statistical significance. Key findings include significant gender differences in brushing frequency (p=0.002), with males brushing twice daily more frequently than females. Usage of oral health products such as mouthwash also showed significant gender disparities (p=0.015), with more males using mouthwash than females. Dental visit frequency varied significantly by gender (p=0.032), with more males visiting every 6 months than females. Consumption of sugary foods and drinks (p=0.001) and smoking status (p < 0.0001) exhibited notable gender differences, reflecting varying habits between males and females. Alcohol consumption patterns also differed significantly by gender (p=0.007), highlighting distinct drinking behaviors. These findings underscore the importance of gender-sensitive approaches in oral health promotion and intervention strategies to address diverse health behaviors effectively (Table 2).

Table 2. Lifestyle and dietary habits associated with poor oral health in gender differences.

Factors	Total (%)	Male (%)	Female (%)	p-value
Brush frequency				
One a day	50 (29.41)	27 (15.88)	23 (13.53)	0.002
Twice a day	80 (47.06)	44 (25.88)	36 (21.18)	
Occasionally	30 (17.65)	14 (8.24)	16 (9.41)	
Rarely	10 (5.88)	4 (2.35)	6 (3.53)	
Oral health products used				
Mouthwash	50 (29.41)	30 (17.65)	20 (11.76)	0.015
Dental floss	40 (23.53)	23 (13.53)	17 (10)	
Toothpicks	30 (17.65)	13 (7.65)	17 (10)	
Interdental brushes	30 (17.65)	15 (8.82)	15 (8.82)	
None	20 (11.76)	8 (4.71)	12 (7.06)	
Dentist Visits Frequency				
Every 6 months	60 (35.29)	33 (15.88)	27 (15.88)	0.032
Once a year	50 (29.41)	30 (11.76)	20 (11.76)	
In 2-3 years	30 (17.65)	14 (8.24)	16 (9.41)	
When having problem	30 (17.65)	12 (7.06)	18 (10.59)	
Sugary food and drink				
Multiple times a day	40 (23.53)	27 (15.88)	13 (7.65)	0.001
Once a day	50 (15.25)	26 (15.29)	24 (14.12)	
A few times a week	60 (16.47)	28 (16.47)	32 (18.82)	
Rarely/never	20 (11.76)	8 (4.71)	12 (7.06)	
Smoking Status				
Currently	40 (23.53)	27 (15.88)	13 (7.65)	<0.0001
In the past	30 (17.65)	12 (7.06)	18 (10.59)	
Never	100 (58.82)	50 (29.41)	50 (29.41)	
Alcohol consumption				
Daily	20 (11.76)	13 (7.65)	7 (4.12)	0.007
Monthly	50 (29.41)	27 (15.88)	23 (13.53)	
weekly	50 (29.41)	26 (15.41)	24 (14.12)	
Never	50 (29.41)	23 (13.53)	27(15.88)	

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The table presents a detailed analysis of oral health issues among participants, focusing on factors such as brush frequency, oral health products used, consumption of sugary foods and drinks, smoking status, and alcohol consumption, each correlated with specific oral health conditions, including bad breath, bleeding gums, cavities, loose teeth, oral ulcers, tooth sensitivity, and toothache. Significant associations were found between brush frequency and several conditions, notably with one-a-day brushing correlating significantly with bad breath (p=0.009). Use of mouthwash showed significant associations with bad breath (p=0.001), while occasional use correlated with toothache (p=0.28). Weekly alcohol consumption was significantly associated with cavities (p=0.03), highlighting the potential impacts of lifestyle choices on oral health outcomes. These findings underscore the importance of regular oral hygiene practices and their potential implications for preventing various oral health conditions, warranting further investigation and tailored public health interventions (Table 3).

Table 3. . Logistic Regression analysis of Oral health issues associated with lifestyle.

Factors	Bad breath (N=22)	Bleeding Gum (N=21)	Cavities (N=15)	Loose teeth (N=22)	Oral Ulcer (N=22)	Tooth Sensitivity (N=18)	Toothache (N=23)
Brush frequency							
One a day	10	5	3	7	7	4	5
Twice a day	7	13	9	7	8	10	11
Occasionally	4	3	2	5	3	3	7
Rarely	1		1	3	4	1	0
p-value	0.009	0.36	0.26	0.99	0.28	0.87	0.49
Oral health products used							
Mouthwash	4	6	5	6	7	5	5
Dental floss	6	9	5	2	1	6	7
Toothpicks	5	1	2	5	6	3	4
Interdental brushes	4	3	1	4	3	3	5
None	3	2	2	5	5	1	2
p-value	0.001	0.39	0.35	0.13	0.29	0.96	0.28
Sugary food and drink							
Multiple times a day	2	3	5	6	5	5	3
Once a day	8	12	5	2	3	6	9
A few times a week	9	4	3	9	9	6	9
Rarely/never	3	2	2	5	5	1	2
p-value	0.07	0.24	0.09	0.19	0.81	0.31	0.28
Smoking Status							
Currently	2	3	5	6	5	5	3
In the past	4	7	3	0	3	4	7
Never	16	11	7	16	14	9	13
p-value	0.10	0.60	0.10	0.69	0.30	0.54	0.32
Alcohol consumption							
Daily	1	1	5	1	2	2	2
Monthly	9	6	4	7	6	5	6
weekly	5	9	3	5	6	7	8
Never	7	5	3	9	8	4	7
p-value	0.06	0.19	0.03	0.71	0.48	0.97	0.75

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Discussion

The findings of this observational study provide valuable insights into the complex interplay between oral hygiene practices, lifestyle factors, and oral health outcomes across diverse age groups in 14 districts of Odisha, India. Our study revealed notable variations in oral hygiene behaviors among different age cohorts, with a significant proportion of participants reporting suboptimal practices such as irregular tooth brushing and limited use of supplementary oral hygiene products like dental floss and mouthwash. These findings underscore the need for targeted educational campaigns and interventions aimed at promoting consistent oral hygiene practices across all age groups, particularly among younger adults and older individuals who may be at higher risk for oral health issues due to changing health behaviors and diminished self-care practices.

Between 1990 and 2010, the prevalence of periodontitis is thought to have grown by more than 50% worldwide [4]. Men are almost three times more likely than women to suffer from severe periodontitis, which affects 1 in 10 Americans between the ages of 45 and 64 [5]. The biggest risk factor for getting severe periodontitis is smoking. Approximately 75% of smokers have some type of periodontal disease, and 1 in 4 adult smokers between the ages of 45 and 64 now have severe periodontitis [6]. This implies that continuous efforts to lower tobacco usage have a significant chance of lowering periodontal disease prevalence in the US. The prevention and control of periodontal disease have primarily been focused on the individual, using patient-focused approaches, such as smoking cessation interventions offered by health professionals, despite significant advancements in the last 20 years in our understanding of how the disease is measured and progresses over the lifetime [7]. Smoking cessation rates remain low (3–5%), notwithstanding the effectiveness of various techniques employed for cessation efforts [8].

Furthermore, the prevalence of common oral health issues such as tooth decay, gum disease, and oral cancer varied significantly across age groups, reflecting both age-related susceptibility and the influence of modifiable lifestyle factors. Our study identified a correlation between dietary habits rich in sugary foods and beverages and increased incidence of dental caries among younger adults, highlighting the critical role of diet in oral health maintenance. Similarly, the association between tobacco use, alcohol consumption, and periodontal diseases underscores the detrimental effects of these behaviors on oral tissues and overall oral health outcomes across the lifespan.

The implications of our findings extend beyond individual oral health behaviors to encompass broader public health initiatives and policy interventions. Effective strategies for improving oral health in Odisha and similar regions should prioritize comprehensive oral health education programs targeting both younger generations and older adults, emphasizing the importance of regular dental check-ups, proper oral hygiene practices, and healthy dietary choices. Integrating oral health promotion into existing primary healthcare services and community outreach programs can enhance accessibility to preventive dental care and promote early detection of oral diseases, thereby reducing the burden on tertiary healthcare facilities and improving overall population health outcomes. Over the past 20 years, there has been a significant increase in the effects of alcohol on dental health. Nowadays, epidemiological studies connect alcohol use to a range of oral conditions [9,10]. This more recent research has not only confirmed earlier findings but also shown pathways linking alcohol use to a strong modifiable risk for dental caries, periodontal disease, and oral cancer.

Moreover, our study highlights the need for policy interventions aimed at addressing structural barriers to dental care access, including financial constraints, geographic disparities, and limited availability of oral health services in underserved rural and tribal areas. Strengthening the dental workforce through training initiatives and incentivizing dental professionals to practice in remote and marginalized communities can help mitigate disparities in oral health outcomes and promote equity in healthcare access across Odisha. The notion of social determinants of health (SDoH) is not new, but since 2000, it has received a lot more attention. This focus was sparked in part by the 2008 World Health Organization (WHO) Commission on Social Determinants of Health landmark report, the 2011 World Health Organization conference on SDoH, and the Marmot Report for the United Kingdom [11,12]. SDoH was a part of the US Healthy People 2020 initiative, and Healthy People 2030 builds on this focus by adding more goals that address social, economic, and environmental factors that affect health and act as benchmarks to track advancements in resolving health disparities and inequities.

A strength of this study lies in its comprehensive methodology, which combined quantitative survey data with qualitative insights to provide a nuanced understanding of oral health behaviors and outcomes across diverse age groups. The use of a structured questionnaire facilitated standardized data collection, ensuring robust analysis and comparison of findings across different demographic categories. Additionally, the inclusion of multiple districts within Odisha enabled a representative sample that captures regional variations in oral health practices and challenges.

However, several limitations warrant consideration. The reliance on self-reported data may introduce recall and social desirability biases, potentially influencing the accuracy of participant's responses regarding their oral health behaviors and practices. Furthermore, the study's cross-sectional design limits causal inference and precludes longitudinal assessment of oral health trajectories over time. Future research efforts should incorporate longitudinal studies to examine the long-term impact of lifestyle interventions on oral health outcomes and explore dynamic changes in oral health behaviors across the life course.

Conclusions

In conclusion, this study contributes valuable insights into the complex dynamics of oral hygiene practices, lifestyle factors, and their impact on oral health across diverse age groups in Odisha, India. By identifying age-specific patterns in oral health behaviors and outcomes, our findings underscore the importance of tailored interventions and policy initiatives to promote oral health equity and improve population-wide oral health outcomes. Going forward, concerted efforts from healthcare providers, policymakers, and community stakeholders are essential to implement evidence-based

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strategies addressing the underlying determinants of oral diseases and fostering a culture of preventive oral healthcare in Odisha and beyond. Through collaborative action and sustained investment in oral health promotion, we can achieve meaningful advancements in oral health outcomes and enhance the quality of life for individuals across the lifespan.

Disclosure statement

No potential conflict of interest was reported by the authors.

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