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Evaluation of Oral Hygiene Knowledge Practices and Clinical Status among Medical Students at the University of Dongola, Sudan: A Cross-Sectional Study (July–December 2025)

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Abstract

Medical students are future healthcare leaders whose personal health behaviors influence their clinical advocacy. This study assessed oral hygiene knowledge, practices, and clinical status among medical students at the University of Dongola, Sudan, and explored barriers to maintaining optimal oral health. A cross-sectional survey was conducted between July and December 2024 among 208 students in Years 2 and 6, using a validated questionnaire and clinical examinations. Data included demographics, brushing habits, awareness of systemic links, and perceived barriers. Statistical analysis employed Pearson's Chi-square test ($P < 0.05$). Most participants were female (66.0%) and aged 20–24 years. A significant knowledge–practice gap was observed: although 78.0% acknowledged oral health importance, only 41.0% brushed twice daily. Caries prevalence was 54.0%, and 67.3% were categorized as having poor oral hygiene. No significant associations were found between hygiene status and gender ($P = 0.556$) or academic level ($P = 0.995$). Academic workload was the most cited barrier (70.2%). Awareness of oral health links with diabetes (44.2%) and heart disease (30.8%) was limited. Findings reveal poor oral hygiene practices and high caries prevalence among medical students, highlighting the need for curriculum integration of oral health modules and preventive screening programs to foster healthier behaviors and effective health advocacy.

Keywords: Oral hygiene, medical students, Sudan, Dental caries, Knowledge-Practice Gap, Academic workload.

INTRODUCTION

Oral health is a fundamental pillar of general health and well-being. According to the World Health Organization (WHO), oral health is not merely the absence of disease but a state where an individual can speak, smile, chew, and swallow without pain or discomfort [1]. Despite significant advancements in global medicine, oral diseases remain one of the most common non-communicable diseases (NCDs) worldwide, affecting an estimated 3.5 billion people [2]. In many developing nations, including Sudan, the burden of dental caries and periodontal disease is rising due to shifting dietary patterns, increased sugar consumption, and inadequate access to preventive services [3].

The medical community plays a pivotal role in the early detection and prevention of oral diseases. Medical students, as future healthcare providers, are expected to be the primary advocates for healthy lifestyles. Their knowledge, attitudes, and personal hygiene practices are critical because they serve as role models for their patients and the community at large [4]. However, existing literature suggests a "knowledge-practice gap" among medical trainees. While they may possess theoretical knowledge of the link between oral hygiene and systemic health, their personal adherence to preventive measures—such as twice-daily brushing and regular dental visits—is often compromised by academic stress and heavy workloads [5].

The literature consistently highlights that oral hygiene is a lifelong commitment requiring the early adoption of healthy habits. Studies in international contexts, such as those conducted in Lithuania and India, have demonstrated that gender often plays a role in oral

health behavior, with female students generally reporting more frequent brushing habits than their male counterparts [6]. However, these studies also indicate that higher educational levels do not always correlate with better clinical oral status [7].

In the Middle East and Africa, the prevalence of dental caries among university students remains a concern. Research has shown that a significant portion of the population seeks dental care only when experiencing acute pain (symptomatic treatment) rather than attending regular preventive checkups [8]. Furthermore, the systemic link between oral health and conditions such as diabetes mellitus and cardiovascular disease is well-documented. Poor oral hygiene facilitates the entry of periodontal bacteria into the bloodstream, which can exacerbate systemic inflammation and complicate the management of chronic diseases [9]. Despite this, many medical students do not prioritize their own oral health, frequently citing a lack of time due to the rigorous medical curriculum [10].

In Sudan, the oral health infrastructure faces challenges related to resource distribution and public awareness. Within the Northern State and specifically at the University of Dongola, there is a lack of empirical data regarding the oral health status of medical students. As these students transition into clinical practice, their ability to diagnose oral manifestations of systemic diseases (such as HIV-related lesions or diabetic periodontitis) depends on their own foundational understanding and value of oral health [11].

Previous studies have indicated that nearly 60% to 90% of school-aged children and a vast majority of adults in various regions suffer from dental cavities [1]. Without intervention, these issues progress to tooth loss, which significantly impacts the quality of life. By evaluating the awareness and practices of medical students at the University of Dongola, this study addresses a critical gap in local data and provides a baseline for potential curricular reforms.

This study was conducted to assess oral hygiene knowledge, practices, and clinical status among medical students at the University of Dongola, with the aim of identifying gaps in awareness and behavior, and examining the relationship between knowledge, self-care practices, and oral health outcomes.

MATERIALS AND METHODS

Study design and setting

A descriptive, cross-sectional, community-based study was conducted to evaluate oral hygiene awareness and practices among medical students. The study was carried out at the Faculty of Medicine and Health Sciences, University of Dongola, Sudan. Data collection took place over a six-month period from July to December 2025.

Participants and sampling

The study population comprised undergraduate medical students. A convenience sampling technique was employed to recruit participants from the second and sixth academic years. Based on a total student population of 433, a sample size of 208 was determined using a 5% margin of error and a 95% confidence interval. Participation was voluntary, and students from other academic levels or those who declined to provide consent were excluded.

Data collection and instrumentation

Primary data were collected using a structured, pre-tested questionnaire adapted from validated instruments in existing literature. The questionnaire was designed to assess demographic characteristics (age, gender, academic level), oral health knowledge, and self-reported hygiene practices (frequency of brushing, use of fluoridated toothpaste, and dental visit patterns). Due to the academic schedule of the participants, the survey was administered electronically via an online platform (Google Forms).

Statistical analysis

Data were cleaned and coded in Microsoft Excel before being exported to the Statistical Package for Social Sciences (SPSS) Version 22 for analysis. Descriptive statistics, including frequencies and percentages, were used to summarize the data. To investigate the association between categorical variables—specifically the relationship between oral hygiene status and demographic factors such as gender and academic seniority—the Pearson Chi-Square test was utilized. A P value of < 0.05 was considered statistically significant.

Ethical considerations

The study was conducted in accordance with the Declaration of Helsinki. Ethical approval was granted by the Faculty of Medicine Administration and the Department of Community Medicine at the University of Dongola. Formal permission was also obtained from the Ministry of Health, Northern State. Prior to participation, all students were informed of the study's objectives, the voluntary nature of their participation, and the confidentiality of their data. Written informed consent was obtained from all participants before they accessed the survey.

RESULTS

Participant Characteristics

A total of 208 medical students participated in the study. The demographic distribution is detailed in Table 1. The cohort was predominantly female (66.0%) and aged between 20–24 years (56.7%). The sample was nearly equally divided between the second year (51.0%) and sixth year (49.0%) of the medical curriculum.

Knowledge and Awareness of Oral Hygiene

The assessment of theoretical knowledge highlighted several discrepancies in the understanding of dental care standards (Table 2). While awareness of the link between tobacco use and oral health was high (88.0%), only 49.5% of students correctly identified the recommendation for twice-daily brushing. Furthermore, less than one-third (30.3%) were aware that the ideal brushing duration is three minutes.

Regarding the etiology of oral diseases, 50.6% of participants attributed dental caries to sugar consumption, while 40.4% identified bacterial plaque as the primary cause (Table 5). Awareness of systemic health links was notably lower; only 44.2% and 30.8% of students recognized the associations between oral health and diabetes or heart disease, respectively (Table 5).

Oral Hygiene Practices and Clinical Status

Reported behaviors often deviated from established guidelines (Table 3). Only 41.0% of students adhered to twice-daily brushing, while 47.0% reported brushing only once per day. Utilization of dental services was largely reactive, with 69.2% of participants visiting a dentist only when symptomatic (in pain), compared to 31.0% who attended for preventive check-ups.

Clinical observations indicated that 54.0% of the participants had dental caries (Table 3). When asked about barriers to maintaining hygiene, a significant majority (70.2%) identified heavy academic workloads and a lack of time as the primary obstacles (Table 6).

Statistical Analysis of Demographic Factors

Inferential analysis was performed to determine if gender or academic seniority influenced oral health outcomes (Table 4). The results of the Pearson Chi-Square test indicated that gender had no significant association with oral hygiene status ($P = 0.556$). Specifically, 70.0% of males and 65.9% of females were categorized as having poor oral hygiene status.

Similarly, no significant difference was observed between academic levels (Table 4). The prevalence of poor oral hygiene status remained constant at 67.3% for both second-year and sixth-year students ($P = 0.995$), suggesting that increased medical training did not correlate with improved personal oral health practices.

Table 1: Socio-demographic characteristics of medical students at the University of Dongola included in the study (n = 208)

Variable	Category	Frequency (n)	Percentage (%)
Age Group (Years)	< 20	39	18.8
	20–24	118	56.7
	25–29	48	23.1
	> 30	3	1.4
Gender	Male	71	34.0
	Female	137	66.0
Academic Level	Second Year	106	51.0
	Sixth Year	102	49.0

Table 2: Theoretical knowledge of professional oral hygiene guidelines and recommendations among participants (n = 208)

Knowledge Parameter	Response Category	Frequency (n)	Percentage (%)
Recommended Brushing Frequency	Twice daily	103	49.5
	Once daily	98	47.1
	Three times/After meals	7	3.4
Ideal Brushing Duration	3 Minutes	63	30.3
	2 Minutes	85	40.9
	< 2 Minutes	60	28.8
Importance of Oral Hygiene	High/Very High	162	78.0
	Moderate	38	18.3
	Low	8	3.7

Table 3: Self-reported oral hygiene practices, clinical status, and impact of academic constraints (n = 208).

Practice/Status Variable	Category	Frequency (n)	Percentage (%)
Actual Brushing Frequency	Twice daily	85	41.0
	Once daily	98	47.0
	Irregular	25	12.0
Dental Visit Pattern	Symptomatic (Only in pain)	144	69.2
	Preventive (Regular check-up)	64	31.0

Practice/Status Variable	Category	Frequency (n)	Percentage (%)
Clinical Status (Caries)	Present	112	54.0
	Absent	96	46.0
Academic Barrier	Workload affects hygiene	146	70.2
	No effect	62	29.8

Table 4: Bivariate analysis of oral hygiene status in relation to participant gender and academic seniority (n = 208)

Variable	Satisfactory Status (n, %)	Unsatisfactory Status (n, %)	P-value
Gender			
Male	21 (30.0%)	50 (70.0%)	0.556*
Female	47 (34.1%)	90 (65.9%)	
Academic Level			
Second Year	35 (32.7%)	71 (67.3%)	0.995*
Sixth Year	33 (32.7%)	69 (67.3%)	

**Note: P-values calculated using Pearson's Chi-square test (P < 0.05 considered significant).*

Table 5: Awareness of oral disease etiology, risk factors, and systemic health associations among medical students (n = 208)

Awareness Parameter	Correct Identification (n)	Percentage (%)
Tobacco as Oral Risk Factor	183	88.0
Sugar as Cause of Caries	105	50.6
Bacterial Plaque as Cause	84	40.4
Link to Diabetes Mellitus	92	44.2
Link to Heart Disease	64	30.8

Table 6: Perceived barriers to maintaining consistent daily oral hygiene practices (n = 208).

Rank	Perceived Barrier	Frequency (n)	Percentage (%)
1	Academic workload and lack of time	146	70.2
2	Forgetfulness	32	15.4
3	Lack of interest or motivation	18	8.6
4	Cost of dental products/services	12	5.8
	Total	**208**	**100.0**

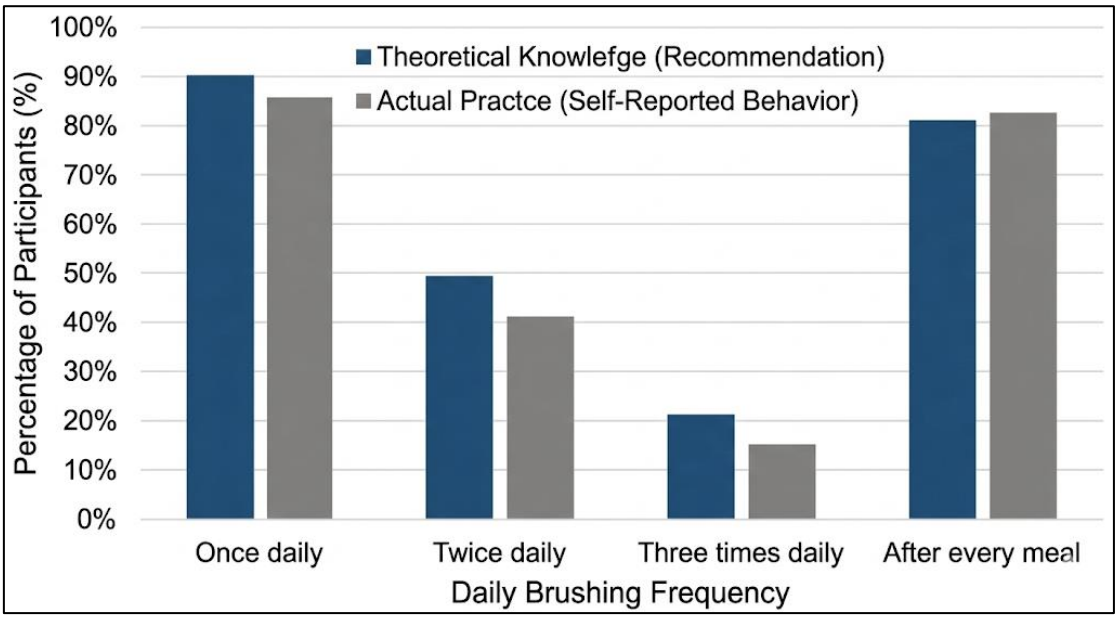

Fig. 1: Comparison of theoretical knowledge regarding recommended daily brushing frequency versus actual self-reported practices among medical students (n=208)

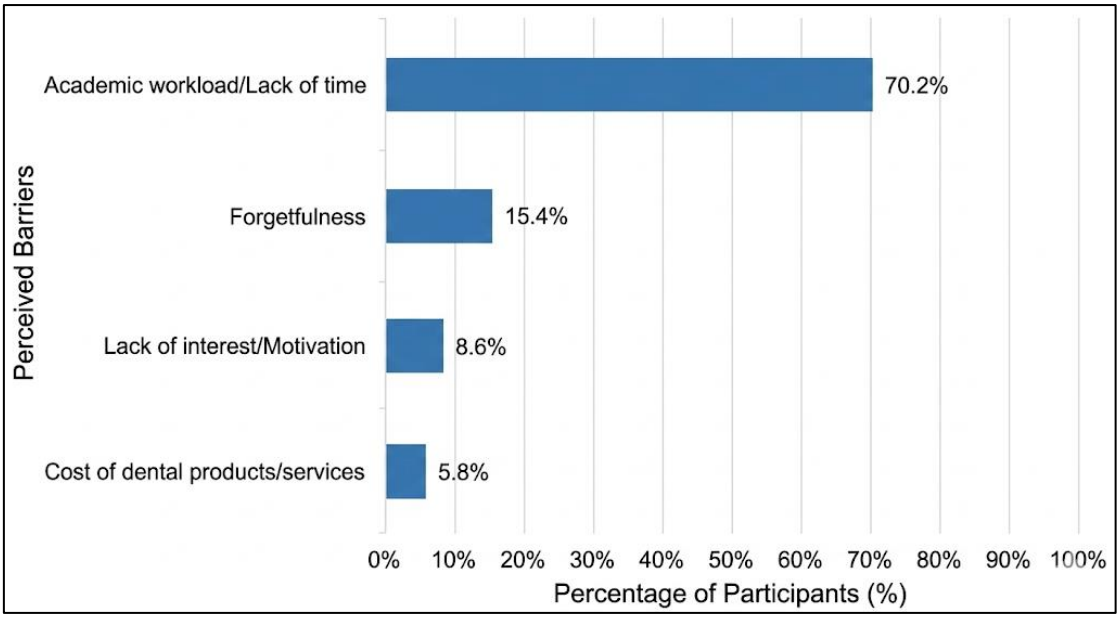

Fig. 2: Distribution of perceived barriers preventing consistent oral hygiene practices among medical students at the University of Dongola (n=208). Values are expressed as percentages

DISCUSSION

This study assessed the oral hygiene awareness, practices, and clinical status of medical students at the University of Dongola. Our findings reveal a troubling "knowledge-practice gap." While a significant majority (78.0%) of participants acknowledged the importance of oral health, nearly half (47.0%) reported brushing only once daily, and the prevalence of dental caries was high at 54.0%. This paradox suggests that theoretical medical knowledge does not intrinsically dictate personal health-protective behavior among medical trainees [12].

Brushing Frequency and Misperceptions

The low adherence to standard brushing recommendations is a critical finding. Professional guidelines generally advocate for twice-daily brushing for at least two minutes [1,13]. However, only 41.0% of participants in this cohort reported brushing twice daily. This finding is inferior to studies among dental students—who often exceed 90% adherence—but aligns with reports on general population samples in similar socio-economic contexts [8,14]. This suggests that medical students' daily hygiene behaviors do not significantly reflect their advanced professional health education. This discrepancy may stem from early-life habits that persist despite subsequent medical training, a theory supported by the 15.4% of students who cited "forgetfulness" as a primary barrier.

Furthermore, a critical lack of awareness regarding correct brushing parameters was evident. Although nearly half (49.5%) knew they should brush twice daily, less than one-third (30.3%) correctly identified the three-minute duration recommended for thorough mechanical plaque removal [4]. Such misunderstandings likely result in suboptimal plaque control even among those who do brush, directly contributing to the high caries prevalence observed.

Patterns of Dental Service Utilization

The patterns of dental care utilization reflect a reactive, rather than preventive, approach. While regular preventive check-ups are fundamental to modern dental care [15], only 31.0% of students attended routine appointments. Instead, a strong majority (69.2%) sought dental services only when symptomatic (i.e., pain or visible problems).

This symptomatic visit pattern is consistent with trends documented in other emerging economies and resource-limited settings [7, 16], but it is particularly concerning in a medical student cohort. If future physicians—the expected advocates for health promotion—do not prioritize preventive care for themselves, they are unlikely to possess the commitment to effectively counsel future patients. This behavior may also reflect structural barriers, such as the perceived high costs for dental services (cited by 5.8%) or a lack of emphasis on oral health within the broader medical curriculum.

Academic Workload and Demographic Variables

A key barrier identified was the relationship between academic pressure and self-care. A substantial 70.2% of participants explicitly reported that their academic workload negatively impacted their oral hygiene habits. The rigorous medical curriculum at the University of Dongola appears to lead to the prioritization of academic pursuits over basic personal health maintenance, a finding consistent with global literature describing high stress and neglect of self-care among medical trainees [10, 17].

Interestingly, no statistically significant associations were found between hygiene status and gender (P = 0.556) or academic level (P = 0.995). While some global studies suggest that females demonstrate superior habits [6], this study found a remarkably similar prevalence of poor hygiene across both groups (70.0% in males vs. 65.9% in females). Notably, the lack of difference between second-year and final-year students suggests that four additional years of medical training did not correlate with improved behaviors.

Proposed Multi-level Interventions

To address the identified gaps, the following strategic interventions are recommended for the University of Dongola

Faculty of Medicine:

Curricular Integration: Prioritize holistic care training that highlights the bi-directional links between oral inflammation and systemic conditions like diabetes (only 44.2% awareness) and heart disease (30.8%).

Student Wellness Programs: Implement "Self-Care" initiatives to provide time-management strategies, framing personal hygiene as a non-negotiable component of professional medical conduct.

Preventive Screening Protocols: Establish annual mandatory dental screenings upon registration, supported by subsidized university-affiliated services to shift from reactive to preventive care.

Practical Hygiene Workshops: Conduct hands-on workshops during orientation weeks to demonstrate effective mechanical plaque removal techniques (e.g., the modified Bass method).

Digital Behavioral "Nudges": Utilize student platforms for regular peer-led health reminders to combat forgetfulness and normalize self-care during high-stress examination periods.

DECLARATIONS

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Conflicts of Interest/Competing Interests: The authors declare that they have no competing interests.

Ethics Approval: The study was conducted in accordance with the Declaration of Helsinki. Ethical approval was obtained from the Faculty of Medicine Administration and the Department of Community Medicine, University of Dongola. Formal permission was also granted by the Ministry of Health, Northern State.

Consent to Participate: Written informed consent was obtained from all participants prior to data collection.

Consent for Publication: Not applicable.

Availability of Data and Materials: The datasets generated and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Author Contributions:

All authors contributed equally. Data collection and fieldwork: All authors participated equally. Data analysis and interpretation: All authors contributed equally. Drafting and revising the manuscript: All authors contributed equally. Final approval of the version to be published: All authors approved the manuscript.

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