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EXPOSURE TO ORAL HEALTH CONTENT ON SOCIAL MEDIA AND ITS ASSOCIATION WITH ORAL HEALTH KNOWLEDGE AND PRACTICES AMONG UNIVERSITY STUDENTS IN PUNJAB, PAKISTAN: A CROSS-SECTIONAL STUDY

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Abstract

Background: *Social media has become a leading source of health information for young adults, yet evidence on how it relates to oral health knowledge and hygiene behaviour among non-dental university students is limited and inconsistent.*
Objective: *To examine the association between exposure to oral health content on social media and oral health knowledge and practices among university students in Punjab, Pakistan.*
Methods: *An analytical cross-sectional study (reported according to STROBE) was conducted among undergraduate and postgraduate students. The minimum sample of 384, calculated with Cochran's formula, was inflated by about 10% to allow for non-response, giving 425 participants selected by stratified random sampling across academic disciplines; dental students were excluded. A structured self-administered questionnaire captured sociodemographic characteristics, social media use, exposure to oral health content, oral health knowledge (13 items) and oral hygiene practices (9 items). Data were analysed in SPSS v26 using t-tests, one-way ANOVA, chi-square tests and Spearman's correlation (α = 0.05).*
Results: *Mean age was 22.4 ± 3.1 years and 243 (57.2%) participants were female. Good knowledge was found in 301 students (70.8%; 95% CI 66.3–74.9), but only 87 (20.5%; 95% CI 16.9–24.6) had good hygiene practices. Twice-daily brushing was*

reported by 283 (66.6%) and daily interdental cleaning by 108 (25.4%). Greater exposure to oral health content correlated with higher knowledge (ρ = 0.496, $p < 0.001$) and practice scores (ρ = 0.373, $p < 0.001$). Scores were higher in female students and in medical/health disciplines. Effects were largest for discipline (knowledge, Cohen's d = 1.10). Heavy social media use (≥3 h/day) was linked to higher knowledge (p = 0.025, d = 0.24) but not to better practice (p = 0.071).

Conclusions: *Exposure to oral health content on social media was positively associated with knowledge and, more modestly, with hygiene practices, while behaviours such as interdental cleaning and routine dental attendance remained suboptimal. Professionally curated, accurate social media content may complement conventional oral health education; longitudinal and interventional studies are needed to establish causality.*

INTRODUCTION

Oral health is an essential part of general health and well-being, influencing eating, speech and social participation [1–3]. Dental caries, periodontal disease and tooth loss are largely preventable, yet the World Health Organization estimates that oral diseases affect around 3.5 billion people worldwide, with the heaviest burden in low- and middle-income countries where preventive care and oral health education are hard to access [4–6]. Prevention rests on consistent daily behaviours—brushing twice a day with fluoride toothpaste, cleaning between the teeth, limiting free sugars and attending the dentist regularly [7,8]—and these behaviours depend not only on knowledge but also on attitudes, socioeconomic circumstances and access to trustworthy information [9–11].

Social media has become one of the main channels through which young adults seek and share health information [12–14]. University students routinely use Instagram, YouTube, TikTok and Facebook for communication, entertainment and learning, which makes these platforms an informal but influential source of oral health messages [15–18]. Systematic and scoping reviews suggest that social media–based education can raise oral health knowledge, although the certainty of this evidence is generally low [15,19,20]. At the same time, content analyses show wide variation in the quality, reliability and readability of online oral health material, and misinformation is common, notably in videos aimed at parents [21–24].

A further concern is the gap between knowing and doing. Students may understand the principles of brushing and flossing without applying them consistently [25,26], and qualitative work indicates that workload, fatigue, irregular routines and peer or social pressures hinder good oral health behaviours even when knowledge is adequate [27–29]. Studies that measure knowledge alone therefore give an incomplete picture; both knowledge and practice should be assessed, together with how exposure to digital content relates to each.

In Pakistan, social media use among university students is widespread, but evidence linking it to oral health knowledge and behaviour is scarce and is largely drawn from dental students or general-population samples that differ in educational exposure and hygiene routines [30,31]. This study therefore aimed to (i) describe oral health knowledge and hygiene practices among non-dental university students in Punjab; (ii) assess the association between exposure to oral health content on social media and both outcomes; and (iii) compare knowledge and practice scores across social media use patterns and demographic and academic characteristics.

2. MATERIALS AND METHODS

2.1 Study design and setting

An analytical cross-sectional study was carried out among university students in Punjab, Pakistan. The report follows the STROBE guidelines for cross-sectional studies.

2.2 Participants and sampling

Eligible participants were undergraduate and postgraduate students aged 18 years or older who were enrolled at the selected universities, used at least one social media platform and consented to take part. Dental students and anyone with formal dental training were excluded because their professional education would confound the outcomes, as were participants who returned incomplete questionnaires. The minimum sample size was calculated with Cochran's formula ($n = Z^2p(1-p)/d^2$) at a 95% confidence level, a 5% margin of error and an expected proportion of 50%, giving 384 participants. Allowing for roughly 10% non-response raised the target to 425, which was achieved. Students were selected by stratified random sampling, with academic discipline defining the strata.

2.3 Study instrument

Data were collected with a structured, self-administered questionnaire developed from the existing literature and reviewed by an expert panel for content validity. It had four sections: (i) sociodemographic characteristics; (ii) social media use (platforms, daily duration, purpose); (iii) exposure to, and trust in, oral health content on social media; and (iv) oral health knowledge and hygiene practices. Knowledge was measured with 13 items on toothbrushing, flossing, dental caries, periodontal disease, oral cancer and preventive care. Each correct answer scored one point (range 0–13), and totals were classified as good (10–13), moderate (7–9) or poor (0–6). Practices were measured with 9 items on brushing frequency and duration, fluoride toothpaste, toothbrush replacement, interdental cleaning, tongue cleaning, sugar intake and dental attendance (range 0–9), classified as good (7–9), fair (5–6) or poor (0–4).

2.4 Variables

The exposure variables were social media use (platforms, daily duration, purpose), frequency of exposure to oral health content (never, rarely, sometimes, often, always) and trust in such content. The outcomes were the oral health knowledge score and the oral hygiene practice score. Covariates were age, gender, residence, degree level, academic discipline, family income, parental education and previous dental visits.

2.5 Statistical analysis

Data were entered and analysed in IBM SPSS Statistics version 26.0. Continuous variables are presented as mean ± standard deviation and categorical variables as frequencies and percentages; 95% confidence intervals for key proportions were calculated by the Wilson method. Knowledge and practice scores were compared between two groups with independent-samples t-tests and among three or more groups with one-way ANOVA. Associations between categorical variables were examined with the chi-square test, and the relationship between exposure frequency and the two scores was assessed with Spearman's rank correlation. Effect sizes were expressed as mean differences with 95% confidence intervals (Welch method), Cohen's d for two-group comparisons and eta-squared (η^2) for the three-group ANOVA; 95% confidence intervals for Spearman's ρ were obtained with the Fisher z-transformation. A two-sided p-value below 0.05 was considered statistically significant.

3. RESULTS

3.1 Participant characteristics

All 425 participants had complete data. Their mean age was 22.4 ± 3.1 years; 243 (57.2%) were female, 175 (41.2%) male and 7 (1.6%) preferred not to disclose their gender. Most were day scholars (265; 62.4%) and 142 (33.4%) lived in university hostels. Undergraduates made up 347 (81.6%) of the sample, master's/MPhil students 63 (14.8%) and PhD students 15 (3.5%). The largest disciplinary groups were engineering/IT (105; 24.7%) and medical/health sciences excluding dentistry (100; 23.5%), followed by social sciences/humanities (71; 16.7%), natural/agricultural sciences (63; 14.8%) and business/management (63; 14.8%) (Table 1).

3.2 Social media use and exposure to oral health content

Most students (273; 64.2%) used social media for three or more hours a day: 178 (41.9%) for 3–4 hours and 95 (22.4%) for five hours or more. Another 125 (29.4%) used it for 1–2 hours and 27 (6.4%) for less than one hour. Exposure to oral health content was "sometimes" for 140 students (32.9%), "often" for 107 (25.2%), "rarely" for 89 (20.9%), "always" for 48 (11.3%) and "never" for 41 (9.6%). Trust in social media oral health information was moderate in 187 students (44.0%) (Table 2).

3.3 Oral health knowledge

The mean knowledge score was 10.36 ± 1.96 out of 13. Knowledge was good in 301 students (70.8%; 95% CI 66.3–74.9), moderate in 106 (24.9%) and poor in 18 (4.2%). The most frequently answered items correctly were twice-daily brushing with fluoride toothpaste (387; 91.1%), the link between tobacco, gutka and betel nut and oral cancer (376; 88.5%) and the effect of frequent sugary foods on caries (370; 87.1%). The bacterial cause of decay was identified by 359 (84.5%) and the fact that mouthwash cannot replace brushing by 353 (83.1%). Awareness that flossing removes interdental plaque was 341 (80.2%). The lowest score was for the safety of daily charcoal whitening, recognised as unsafe by only 262 students (61.6%) (Figures 1 and 2).

3.4 Oral hygiene practices

The mean practice score was 5.04 ± 1.74 out of 9. Only 87 students (20.5%; 95% CI 16.9–24.6) had good practices, 183 (43.1%) had fair practices and 155 (36.5%) had poor practices. Brushing at least twice daily was reported by 283 students (66.6%; 95% CI 62.0–70.9), daily tongue cleaning by 263 (61.9%), daily interdental cleaning by 108 (25.4%; 95% CI 21.5–29.8) and a dental visit in the previous 12 months by 185 (43.5%; 95% CI 38.9–48.3) (Figures 1 and 3).

3.5 Comparison of scores across groups

Students using social media for three or more hours daily had higher knowledge scores than those using it for less than three hours (10.53 ± 1.85 vs 10.07 ± 2.11; $p = 0.025$), whereas practice scores did not differ significantly (4.92 ± 1.76 vs 5.24 ± 1.69; $p = 0.071$). Both outcomes increased with exposure to oral health content: knowledge scores were 9.09 ± 2.11, 10.28 ± 1.73 and 11.50 ± 1.20, and practice scores 4.13 ± 1.67, 5.09 ± 1.67 and 5.75 ± 1.51, among students with never/rare, occasional and frequent exposure respectively ($p < 0.001$ for both). Female students scored higher than male students for knowledge (10.65 ± 1.83 vs 10.00 ± 2.07; $p = 0.001$) and practice (5.47 ± 1.62 vs 4.45 ± 1.75; $p < 0.001$), and students in medical/health disciplines scored higher than those in other disciplines for knowledge (11.85 ± 1.10 vs 9.90 ± 1.94) and practice (5.58 ± 1.75 vs 4.87 ± 1.71) (both $p < 0.001$). Neither score differed by place of residence (Table 3, Figure 4).

3.6 Effect sizes

Standardised differences showed that discipline had by far the largest effect on knowledge (Cohen's $d = 1.10$, 95% CI 0.86–1.33), followed by gender for practice ($d = 0.61$, 0.41–0.81) and discipline for practice ($d = 0.41$, 0.19–0.64). Heavy social media use had only a small positive effect on knowledge ($d = 0.24$, 0.04–0.44) and a small, non-significant negative effect on practice ($d = -0.18$, −0.38 to 0.01), while residence had negligible effects. Exposure to oral health content explained about 25% of the variance in knowledge scores ($\eta^2 = 0.25$) and 15% in practice scores ($\eta^2 = 0.15$) (Table 4, Figure 5).

3.7 Correlation analysis

Exposure frequency showed a moderate positive correlation with knowledge (Spearman's $\rho = 0.496$, 95% CI 0.42–0.57, $p < 0.001$) and a weaker but significant positive correlation with practice ($\rho = 0.373$, 95% CI 0.28–0.46, $p < 0.001$) (Table 5).

Table 1. Demographic and academic characteristics of participants (n = 425)

Variable	n (%) or mean ± SD
Age (years)	22.4 ± 3.1
Gender	
Male	175 (41.2)
Female	243 (57.2)
Other / prefer not to say	7 (1.6)
Residence	
University hostel	142 (33.4)
Home (day scholar)	265 (62.4)
Other	18 (4.2)
Degree level	
Undergraduate	347 (81.6)
Master's / MPhil	63 (14.8)
PhD	15 (3.5)
Academic discipline	
Medical / health sciences (non-dental)	100 (23.5)
Natural / agricultural sciences	63 (14.8)
Engineering / IT	105 (24.7)
Social sciences / humanities	71 (16.7)
Business / management	63 (14.8)
Other	23 (5.4)

Values are n (%) unless stated otherwise; SD, standard deviation.

Table 2. Social media use, exposure to oral health content and trust in the information (n = 425)

Variable	n (%)
Daily social media use	
Less than 1 hour	27 (6.4)
1–2 hours	125 (29.4)
3–4 hours	178 (41.9)
5 hours or more	95 (22.4)
Exposure to oral health content	
Never	41 (9.6)
Rarely	89 (20.9)
Sometimes	140 (32.9)
Often	107 (25.2)
Always	48 (11.3)
Trust in oral health information on social media	
Not at all	25 (5.9)
A little	89 (20.9)

Variable	n (%)
Moderately	187 (44.0)
Mostly	101 (23.8)
Completely	23 (5.4)

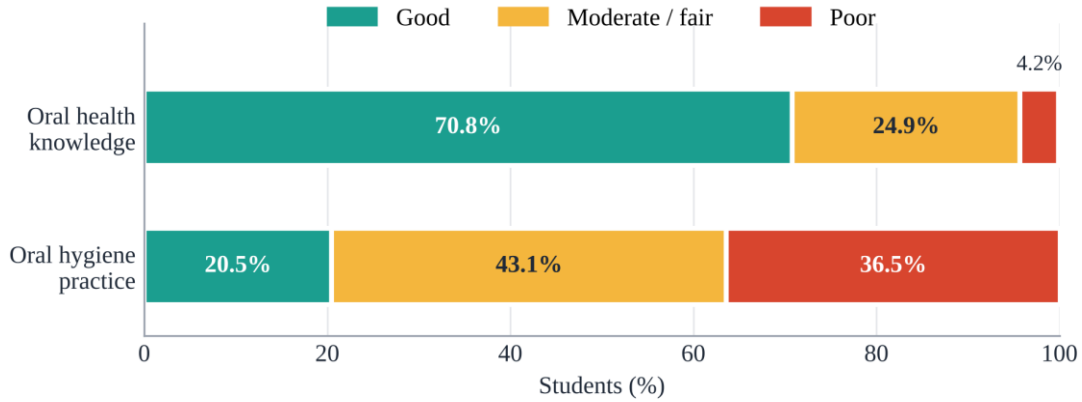


Figure 1. Distribution of oral health knowledge and oral hygiene practice categories among students (n = 425). Mean knowledge score 10.36 ± 1.96 (0–13); mean practice score 5.04 ± 1.74 (0–9).

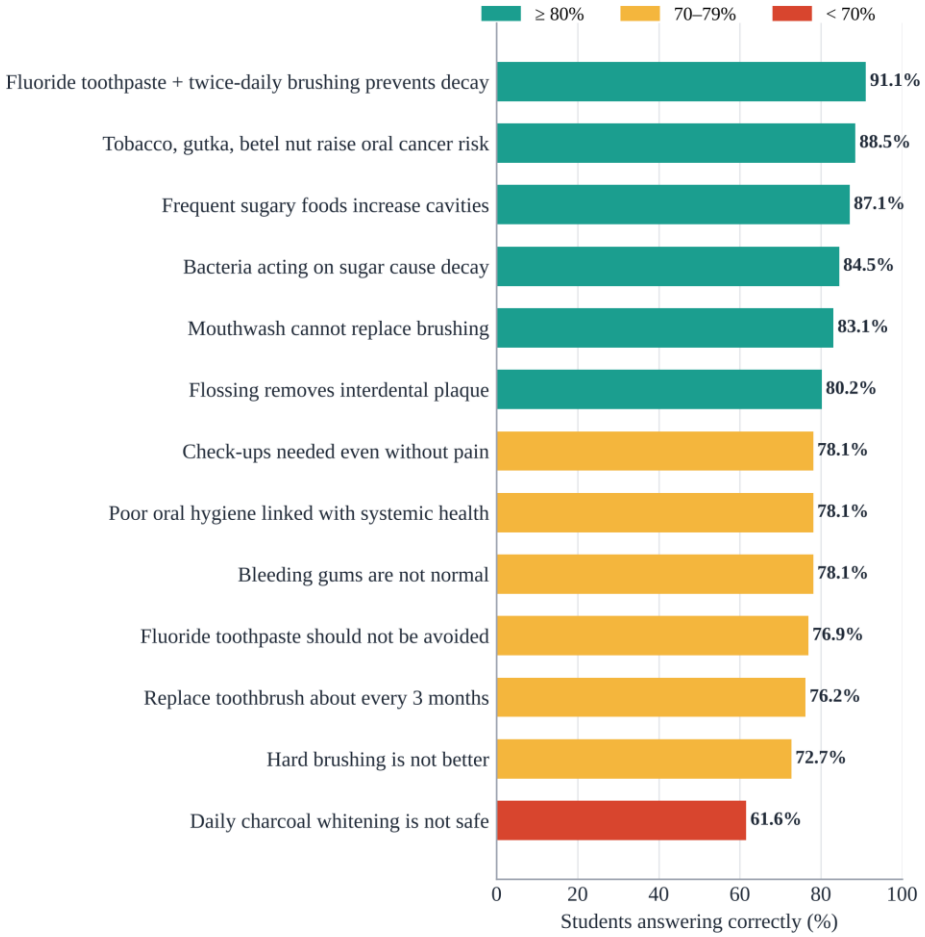


Figure 2. Proportion of students answering each oral health knowledge item correctly (n = 425). Bars are coloured by level: green ≥ 80%, amber 70–79%, red < 70%.

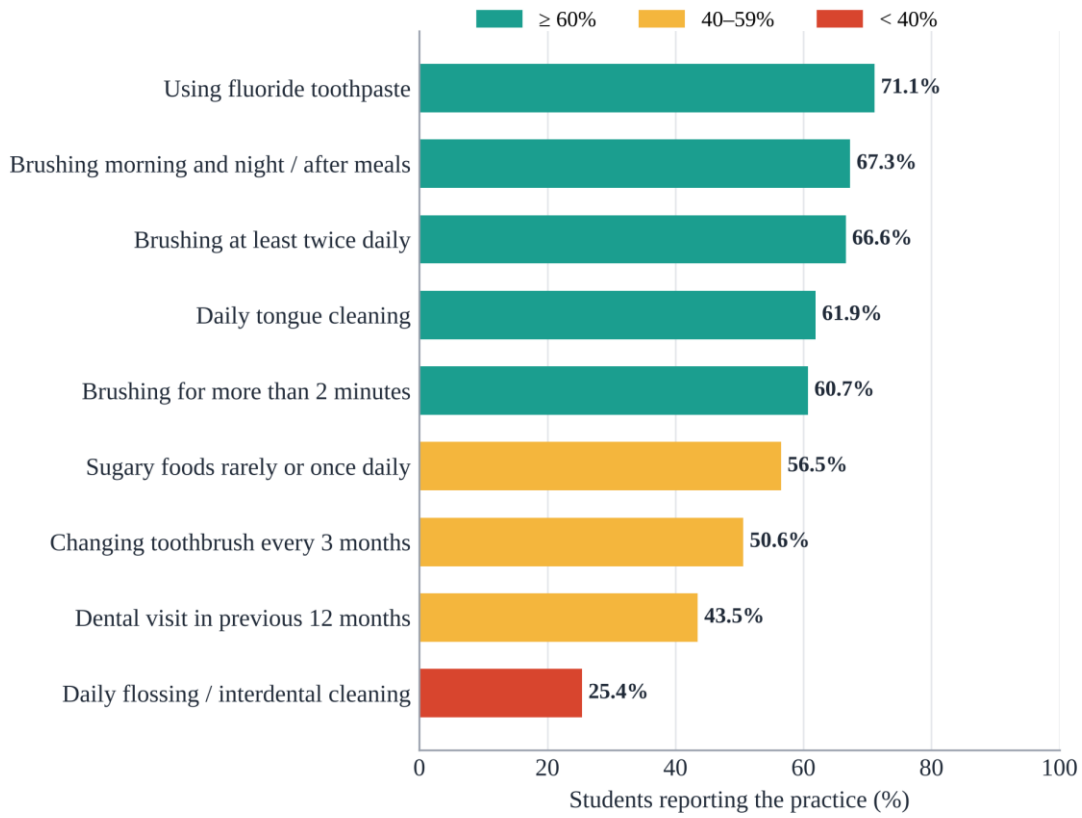


Figure 3. Oral hygiene practices reported by students (n = 425). Bars are coloured by level: green ≥ 60%, amber 40–59%, red < 40%.

Table 3. Knowledge and practice scores by social media use and sociodemographic characteristics

Variable	Knowledge, mean ± SD	p	Practice, mean ± SD	p
Daily social media use				
< 3 hours	10.07 ± 2.11	0.025	5.24 ± 1.69	0.071
≥ 3 hours	10.53 ± 1.85		4.92 ± 1.76	
Exposure to oral health content				
Never / rarely	9.09 ± 2.11	<0.001	4.13 ± 1.67	<0.001
Sometimes	10.28 ± 1.73		5.09 ± 1.67	
Often / always	11.50 ± 1.20		5.75 ± 1.51	
Gender				
Male	10.00 ± 2.07	0.001	4.45 ± 1.75	<0.001
Female	10.65 ± 1.83		5.47 ± 1.62	
Academic discipline				
Medical / health sciences	11.85 ± 1.10	<0.001	5.58 ± 1.75	<0.001
Non-medical	9.90 ± 1.94		4.87 ± 1.71	
Residence				
Hostel	10.26 ± 1.89	0.440	4.99 ± 1.67	0.673
Home / other	10.41 ± 1.99		5.06 ± 1.78	

p-values from independent-samples t-test (two groups) or one-way ANOVA (three groups).

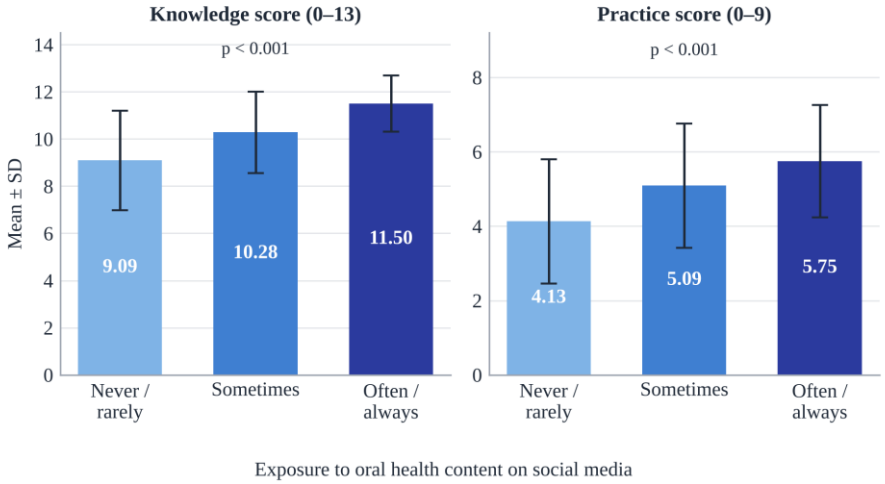


Figure 4. Mean knowledge and practice scores (± SD) by frequency of exposure to oral health content on social media (one-way ANOVA, $p < 0.001$ for both outcomes).

Table 4. Effect sizes for group differences in knowledge and practice scores

Comparison	Knowledge: mean difference (95% CI)	Cohen's d	Practice: mean difference (95% CI)	Cohen's d
Social media use ≥3 h vs <3 h/day	0.46 (0.06 to 0.86)	0.24	−0.32 (−0.66 to 0.02)	−0.18
Female vs male	0.65 (0.27 to 1.03)	0.34	1.02 (0.69 to 1.35)	0.61
Medical/health vs other disciplines	1.95 (1.65 to 2.25)	1.10	0.71 (0.32 to 1.10)	0.41
Hostel vs home/other residence	−0.15 (−0.54 to 0.24)	−0.08	−0.07 (−0.42 to 0.28)	−0.04

Mean differences are the first group minus the second (Welch 95% CI); Cohen's d uses the pooled SD ($|d| \approx 0.2$ small, 0.5 medium, 0.8 large). Derived from group means, SDs and sample sizes. One-way ANOVA across the three exposure levels: knowledge $F(2, 422) = 71.7$, $\eta^2 = 0.25$; practice $F(2, 422) = 35.8$, $\eta^2 = 0.15$ (both $p < 0.001$).

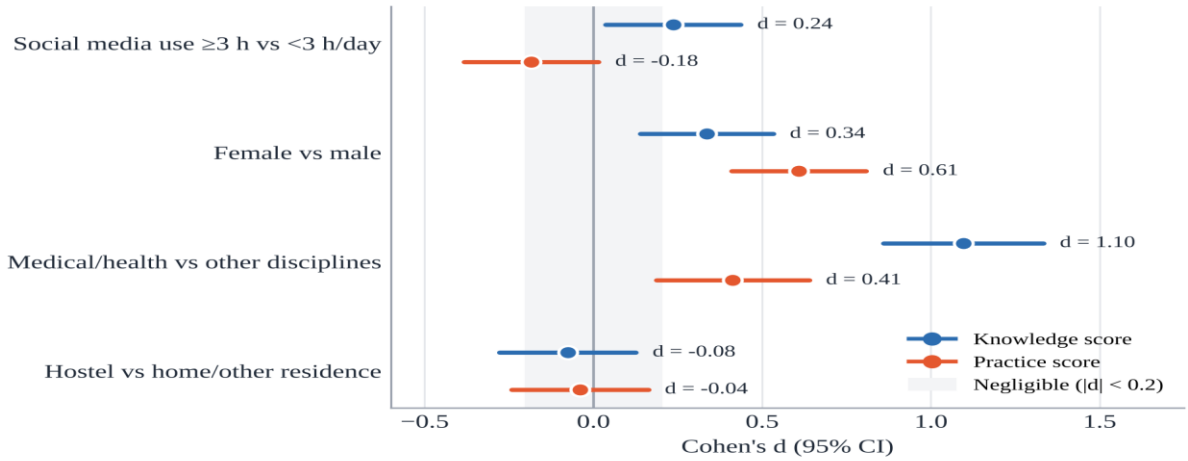


Figure 5. Standardised differences (Cohen's d, 95% CI) in knowledge and practice scores between groups. The grey band marks negligible effects (|d| < 0.2).

Table 5. Spearman's correlation between exposure to oral health content and outcome scores

Variables	Spearman's ρ	95% CI	p
Exposure frequency and knowledge score	0.496	0.42 to 0.57	<0.001
Exposure frequency and practice score	0.373	0.28 to 0.46	<0.001

4. DISCUSSION

4.1 Principal findings

In this sample of non-dental university students from Punjab, knowledge of oral health was generally good, whereas preventive behaviour was considerably weaker, and more frequent exposure to oral health content on social media went hand in hand with higher scores on both measures. The results support the view that social media can serve as a channel for oral health education, but they also show that awareness does not automatically become behaviour [32–34].

4.2 Knowledge and practice

Seven in ten students (70.8%) had good knowledge, while only one in five (20.5%) had good practices. Brushing at least twice daily was reported by two-thirds of students, but daily interdental cleaning (25.4%) and a dental visit in the past year (43.5%) were far less common. The same pattern—routine brushing largely adopted, whereas flossing and professional care are neglected—has been linked in qualitative research to workload, fatigue and disrupted routines among university students [27]. Pakistani studies have examined oral hygiene practices in other student populations [30,31]; our findings add data from university students outside dentistry. Interventions should therefore concentrate on the behaviours that lag most, namely interdental cleaning and regular check-ups, rather than on knowledge that is already adequate.

4.3 Social media exposure

Exposure to oral health content accounted for roughly a quarter of the variance in knowledge ($\eta^2 = 0.25$) and 15% in practice ($\eta^2 = 0.15$). The correlation with knowledge ($\rho = 0.496$, 95% CI 0.42–0.57) was moderate and is in line with evidence that social media–based interventions can improve oral health knowledge [19,34]. The association with practice was weaker ($\rho = 0.373$, 95% CI 0.28–0.46). Moreover, heavy social media use (≥3 h/day) was linked to better knowledge but not to better practice; the practice mean was in fact slightly lower in heavy users, although not significantly. A plausible reading is that the amount of time spent online matters less than whether students actually encounter oral health content, and that content tends to inform rather than change behaviour. This is consistent with the low certainty

of evidence for behavioural outcomes in published reviews [19,20]. Because the design is cross-sectional, the direction of the association cannot be established: students already interested in oral health may simply seek out or notice such content more often.

4.4 Gender, discipline and misinformation

Female students and students in medical and health disciplines scored higher on both outcomes; the discipline effect on knowledge was very large (d = 1.10), whereas the gender effect was largest for practice (d = 0.61). Medical and health students are likely to have greater health literacy and more opportunities to learn about prevention, and they may also be more exposed to oral health content; as exposure, discipline and gender were not examined in a multivariable model, part of the exposure effect may reflect these characteristics. Only 61.6% of students recognised that daily charcoal whitening is unsafe, the weakest knowledge item. Content analyses repeatedly report misinformation, including unverified home remedies and cosmetic trends, on platforms such as YouTube [21–24], and educational models have been proposed to address it [35]. These findings reinforce the need for students to rely on qualified professionals and authoritative institutions rather than on influencers or commercial accounts [36].

4.5 Implications

Universities could embed short, professionally reviewed oral health messages in their existing digital channels and student health services, prioritising interdental cleaning and regular dental attendance. Training health students to communicate accurately on social media is another option [32]. Validated tools such as the Social Media Oral Health Literacy Questionnaire could help institutions assess how students appraise online oral health information [34,37,38].

4.6 Strengths and limitations

Strengths include a sample size calculated a priori, stratified random sampling across disciplines, the inclusion of non-dental students (a group rarely studied), the measurement of both knowledge and behaviour, and adherence to STROBE reporting. Several limitations should be noted. First, the cross-sectional design precludes causal inference. Second, self-reported data are open to recall and social desirability bias, particularly for brushing frequency, diet and dental attendance. Third, the questionnaire's internal consistency was modest (Cronbach's α = 0.60 in the pilot), which may have attenuated the observed associations. Fourth, only social media users were included, limiting comparison with non-users, and the study was restricted to Punjab, which limits generalisability. Fifth, no multivariable adjustment was performed, so residual confounding by discipline, academic level and socioeconomic status cannot be excluded. Finally, no clinical examination was carried out, so oral health status was not objectively verified [19,20,38].

5. CONCLUSIONS

More frequent exposure to oral health content on social media was positively associated with oral health knowledge and, less strongly, with oral hygiene practices among university students in Punjab. Knowledge was generally satisfactory, but preventive behaviours, particularly interdental cleaning and regular dental attendance, were inadequate. Female students and those in medical and health disciplines performed better. Social media shows promise as an adjunct to conventional oral health education, provided that the content is accurate and credible. Longitudinal and interventional studies with objective clinical outcomes, and multivariable analyses, are warranted.

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