

How Mental Health Correlates with Subjective Oral Health Status: A Cross-Sectional Study among a Group of University Students

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ABSTRACT

Aim: This cross-sectional study aimed to assess the association between subjective oral health status and mental illness in a group of university students in Riyadh City of Saudi Arabia. **Materials and Methods:** A self-report questionnaire collected data on demographics, subjective oral health and mental health. The Arabic version of the Patient Health Questionnaire (PHQ-9) and Generalized Anxiety Disorder (GAD-7) scales were administered. Students' participation was voluntary. Data were analysed using the Statistical Package for Social Sciences (SPSS). **Results:** A total of 614 students participated in the study, 45.28% (n = 278) were males and 54.72% (n = 336) were females. Oral health status was assessed, and most participants rated their oral health status as good 53.75% (n = 330). This study also assessed mental health among the participants and found that 50.49% (n = 310) of students were suffering from different degrees of depression. Approximately, 46.74% (n = 247) of students reported experiencing certain degrees of generalized anxiety disorder. Mental disorders were significantly correlated with subjective oral health status, since participants who rated their oral health as poor or very poor tended to have higher PHQ-9 and GAD-7 scores. In conclusion, the findings showed a notable relationship between mental disorders and subjective oral health status among a group of university students. Therefore, the results can be used to help improve service provision, which would ultimately enhance students' mental health.

KEYWORDS: Anxiety, dental students, depression, mental health

INTRODUCTION

Mental health is one of the most highlighted global interests of this century.^[1] In June 2018, the World Health Organization (WHO) announced the latest version of the International Classification of Diseases-11 (ICD-11).^[1] The ICD-11 defines mental and behavioural disorders as 'syndromes characterized by a clinically significant disturbance in an individual's cognition, emotional regulation, or behaviour that reflects a dysfunction in the psychological, biological or developmental processes that underlie mental and behavioural functioning. These disturbances are usually associated with distress or impairment in personal, family, social, educational, occupational or other important areas of functioning'.^[1]

The global estimate of mental illness according to the WHO is 25%, which means that 1 out of 4 people will suffer from an episode of mental disorder during their lifetime.^[2] In 2016, the Saudi national mental health survey interviewed almost 4000 Saudi citizens of both sexes across the kingdom.^[3] The results found that 34.2% of the sampled population had been diagnosed with a mental condition.^[3] Young Saudis have a higher prevalence of mental conditions at 40%.^[3] Additionally, the study found that people

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with more years of education are more likely to have mental health conditions.^[3] The most common mental conditions affecting the sampled Saudi population were separation anxiety disorder, attention deficit hyperactivity disorder, major depressive disorder, social phobia and obsessive-compulsive disorder.^[3] The results also showed that depression and generalized anxiety disorder affect Saudi females almost three times more than their male counterparts.^[3] Studies in the relevant literature have suggested that depression and anxiety are the most common mental disorders affecting university students.^[4-7] Approximately, 49% of university students reported experiencing mental disorders during college.^[4] A study using the Patient Health Questionnaire (PHQ) for anxiety and depression showed that approximately 16% of university students suffer from these disorders to a certain degree.^[5] In Oman, a study aimed to assess depression among students in different majors at Sultan Qaboos University using the PHQ-9 showed that 27.7% of participating students were suffering from various grades of depression.^[6] Another study conducted in Saudi Arabia aimed to validate the Arabic version of the PHQ among a group of medical students and found a high prevalence of such conditions.^[7]

Studies have also suggested that university students behave differently towards their oral health.^[8,9] A study claimed that university students from low- and middle-income countries can neglect some oral behaviours.^[8] However, the overall results reported that 67.2% of the students brushed their teeth twice or more daily, but only 16.3% visited a dentist in the past year.^[8] In Al-Kharj, Saudi Arabia, a study investigated university students who were mostly from health colleges and found that approximately 92.4% of the students cleaned their teeth; however, almost half of them (48.7%) reported that they brushed their teeth only once a day.^[9]

Mental health is highly associated with oral disorders since several studies have proven the negative impact of oral disorders on the functional, social and psychological aspects of an individual disorder.^[10] Oral disorders are also correlated with many systemic diseases, such as coronary heart disease, stroke and respiratory disease.^[11] People with mental illness are more likely to develop oral diseases for several reasons, such as lack of motivation towards oral hygiene or the feeling of fear of dental interventions.^[12] Although evidence suggests a strong interaction between mental health, oral health and ultimately physical well-being, few studies have investigated the prevalence of oral diseases among individuals with mental illness. One of the studies found that oral health neglect among psychiatric populations

was higher than oral health neglect among controls.^[13] The findings revealed that dental caries and periodontal diseases such as gingivitis were the most prevalent oral health problems among people with mental illness.^[13]

Perceived oral health among individuals with mental conditions can be valuable in understanding the way those individuals perceive their oral health and therefore might contribute to their oral health behaviours, such as accessing dental care services. A search of related literature showed that no study has aimed to assess how mental health correlates with self-reported oral health. Therefore, this study aimed to assess the association between subjective oral health status and mental health, defined as depression and anxiety, among a group of university students in Riyadh City of Saudi Arabia.

MATERIALS AND METHODS

Study design and participants

The present study was designed as a prospective cross-sectional study aimed to assess the association between subjective oral health status and mental health, defined as depression and anxiety, among a group of university students in Riyadh City, Saudi Arabia.

Ethical approval

The study obtained ethical approval from the Institutional Review Board Ethics Committee, at King Khalid University Hospital with registration no. E-19-3989. Students' participation was on a voluntary basis. The identities of the participants remained anonymous. The study was conducted between September 2019 and January 2020.

Target population/sample size

To calculate the sample size, authors used the evidence that suggests about 34.2% of the Saudi population, including those at university levels, suffers from mental disorders.^[3] Therefore, the calculated sample size (using this formula $S = Z^2 \times P \times (1 - P)/M^2$; where $Z = 1.960$, $P = 34.2\%$ and $M = 5\%$) was 345 with a 5% margin of error and 95% confidence level. This study included students studying at King Saud University from different academic tracks (Health, Science and Humanity colleges), in Riyadh city of Saudi Arabia. Non-university students, students who did not want to participate and those from universities outside King Saud University were not included in the study. A simple random sampling method was used.

Questionnaires

A questionnaire was used to collect needed information, and it consisted of several sections. The first section was about demographic variables and it included questions

about sex, age, nationality, marital status, employment status, academic track (Health, Science and Humanity colleges) and mothers' and fathers' level of education. The second section had questions on oral health status. The overall rating of oral health was assessed on a 5-point Likert scale ranging from excellent, good, fair, poor and very poor. Some oral health habits such as smoking, teeth brushing and dental visits, along with self-reported teeth loss and teeth decay, were also assessed by both 5-point Likert and binary questions of yes and no answers.

The fourth section was about their mental health status, and it consisted of two scales: 1-Patient Health Questionnaire (PHQ-9) which was used to assess self-reported depression disorder. It consists of 9 questions.^[6] Responses were recorded on 4 scale ranging from not at all to nearly every day. Having more than 10 scores in PHQ-9 indicates self-reported moderate to severe depression.^[6] 2-Generalized Anxiety Disorder (GAD-7) scale which was a 7-items scale to detect generalized anxiety disorder.^[6,14] These seven items are 'nervousness', 'inability to stop worrying', 'excessive worry', 'restlessness', 'difficulty in relaxing', 'easy irritation' and 'fear of something awful happening'.^[6,14] Each item of the GAD-7 scale has a 4-point Likert scale ranging from not at all to nearly every day (score is 0 to 3).^[6,14] Getting more than 10 scores in GAD-7 indicates self-reported moderate to severe anxiety.^[6,14]

Both PHQ-9 and GAD-7 were translated and validated to be used in Arabic.^[7] Before the main data collection, the questionnaire was approved after pilot testing among a group of university students to assess its clarity, comprehensibility, and estimated time to be completed.

A survey was conducted using an online questionnaire link. The link was distributed through emails and different social media channels such as (Twitter and WhatsApp, etc.). Additionally, students from different colleges and departments were approached in person and were asked to answer the questionnaire by sending them the online link.

Statistical analysis plan

All collected data were analyzed using the Statistical Package for Social Sciences (SPSS). Descriptive statistics were presented using frequencies, percentages, means, and standard deviations. *t* tests and ANOVA were used to determine the association and correlation of overall mean PHQ-9 and GAD-7 scores and other variables, such as subjective oral health indicators, sex, academic track, etc.

RESULTS

A total of 614 students participated in the study, including 278 (45.28%) males and 336 (54.72%) females. The mean age was 21.03 (SD + 1.97), and the majority were unmarried (96.72%) and unemployed (88.76%). Most of the participating students were Saudi by nationality (97.72%). The sample comprised students on different academic tracks. Most of the students stated that their parents had a university level of education, with a percentage of 47.56% for mothers and 39.09% for fathers [Table 1].

Participants' subjective oral health status was assessed, and the findings showed that the majority rated their oral health as good (53.75%), 40.07% considered their oral health fair, and only 6.19% rated their oral health status as poor. Most of the participants reported that they brushed their teeth (95.77%), and 43.81% said that they brushed their teeth twice a day. The results also showed that almost two-thirds of the study sample (60.75%) had visited a dentist in the past 12 months. When participants were asked about dental problems, 76.55% of them reported that they had never experienced tooth loss; however, 56.68% reported having a decayed tooth. Regarding smoking habits, the majority were non-smokers (85.18%). Regarding the impact of their oral health status on their

Table 1: Sociodemographic characteristics of the study participants

Demographic variables	n (%)	
Age (Mean and SD)	21.03 (1.97)	
Sex		
Male	278 (45.28)	
Female	336 (54.72)	
Nationality		
Saudi	600 (97.72)	
Non-Saudi	14 (2.28)	
Marital status		
Single	594 (96.74)	
Married	19 (3.09)	
Divorced	1 (0.16)	
Employment		
Employed	69 (11.24)	
Unemployed	545 (88.76)	
Academic track		
Health colleges	258 (42.00)	
Science colleges	179 (29.15)	
Humanities colleges	177 (28.83)	
Parents' education level	Mother	Father
Uneducated	23 (3.75)	12 (1.95)
Elementary school	40 (6.51)	27 (4.40)
Middle school	53 (8.63)	45 (7.33)
High school	167 (27.20)	146 (23.78)
University level	292 (47.56)	240 (39.09)
Postgraduate studies	39 (6.35)	144 (23.45)

social activities, 13.03% reported that they reduced their social participation due to oral health problems [Table 2].

Table 2: Participants' subjective oral health status

Oral health status items	n (%)
In general, how do you rate your oral health (both teeth and gums)?	
Excellent, good	330 (53.75)
Fair	246 (40.07)
Poor, very poor	38 (6.19)
Do you brush your teeth?	
Yes	588 (95.77)
No	26 (4.23)
How many times do you brush your teeth daily?	
Once a day	210 (34.20)
Twice a day	269 (43.81)
Three times a day	60 (9.77)
More than three times a day	13 (2.12)
I don't brush my teeth daily	62 (10.10)
Have you visited the dentist during the past 12 months?	
Yes	373 (60.75)
No	241 (39.25)
Have you lost any of your teeth?	
Yes	144 (23.45)
No	470 (76.55)
Do you think you have a decayed tooth?	
Yes	348 (56.68)
No	266 (43.32)
Do you smoke?	
Yes	91 (14.82)
No	523 (85.18)
Do you take any medications?	
Yes	64 (10.42)
No	550 (89.58)
Have you ever reduced participation in social activities because of oral health problems?	
Yes	80 (13.03)
No	534 (86.97)

The study also assessed the mental health status of participants, examining mainly depression and anxiety. To explore the prevalence of depression among participants, the PHQ-9 was used, and the results showed that half of the participants suffered from mild to severe depression (50.49%) [Table 3].

Table 4 presents the findings on anxiety among the study sample, which was assessed using the Generalized Anxiety Disorder Scale (GAD-7). The results showed that 46.74% of participants experienced certain degrees of anxiety.

The results on the correlation of subjective oral health status and depression showed that people who rated their oral health as poor or very poor had higher PHQ-9 mean scores (8.5 SD ± 7.2) compared to people who had excellent or fair oral health status, and this was statistically significant. Moreover, the results showed that higher PHQ-9 mean scores were statistically correlated with some neglectful oral health behaviours, such as not seeing a dentist in the past 12 months (6.6 SD ± 5.9). Higher PHQ-9 mean scores were also found to be significantly correlated with decayed teeth (6.65 SD ± 5.9) and reduced participation in social activities because of oral health problems (9.5 SD ± 6.6) [Table 5].

Correlations of subjective oral health status and anxiety (GAD-7) were also assessed and are presented in Table 6. Higher mean GAD-7 scores were associated with poor or very poor overall oral health ratings (7 SD ± 6.2). Interestingly, no significant associations were found between GAD-7 mean scores and visiting a dentist, experiencing tooth loss, or having decayed teeth. However, a significant correlation was found between GAD-7 mean scores and social participation.

Table 3: Mental health status of the study sample. Depression expressed by PHQ-9 (major depression disorder), n (%)

Major depression disorder-9 items	Not at all	Several days	More than half of the days	Nearly every day
Little interest or pleasure in doing things	311 (50.65)	218 (35.50)	59 (9.61)	26 (4.23)
Feeling down, depressed or hopeless	286 (46.58)	210 (34.20)	78 (12.70)	40 (6.51)
Trouble falling or staying asleep or sleeping too much	275 (44.79)	182 (29.64)	97 (15.80)	60 (9.77)
Feeling tired or having little energy	239 (38.93)	210 (34.20)	113 (18.40)	52 (8.47)
Poor appetite or overeating	328 (53.42)	155 (25.24)	84 (13.68)	47 (7.65)
Feeling bad about yourself – or that you are a failure or have let yourself or your family down	362 (58.96)	148 (24.10)	64 (10.42)	40 (6.51)
Trouble concentrating on things, such as reading the newspaper or watching television	373 (60.75)	145 (23.62)	58 (9.45)	38 (6.18)
Moving or speaking so slowly that other people could have noticed. Or the opposite – being so fidgety or restless that you have been moving around a lot more than usual	450 (73.29)	108 (17.59)	36 (5.86)	20 (3.26)
Thoughts that you would be better off dead or of hurting yourself in some way	491 (79.97)	85 (13.84)	22 (3.58)	16 (2.61)

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Table 4: Mental health status of the study sample. Anxiety expressed as GAD-7 generalized anxiety disorder, n (%)

Generalized anxiety disorder-7 items	Not at all	Several days	More than half of the days	Nearly everyday
Feeling nervous, anxious, on edge	194 (31.60)	305 (49.67)	52 (8.47)	63 (10.26)
Not being able to stop or control worrying	278 (45.28)	239 (38.93)	36 (5.86)	61 (9.93)
Worrying too much about different things	221 (35.99)	252 (41.04)	79 (12.87)	62 (10.10)
Trouble relaxing	277 (45.11)	257 (41.86)	32 (5.21)	48 (7.82)
Being so restless that it is hard to sit still	439 (71.50)	125 (20.36)	18 (2.93)	32 (5.21)
Becoming easily annoyed or irritable	303 (49.35)	206 (33.55)	63 (10.26)	42 (6.84)
Feeling afraid as something awful might happen	394 (64.17)	156 (25.41)	32 (5.21)	32 (5.21)

Table 5: Association between subjective oral health status and PHQ-9 scores

Oral health status	n	PHQ-9 Mean (SD)	P
Overall rating of oral health			
Excellent, good	330	5.32 (5.6)	0.001**
Fair	246	6.6 (5.8)	
Poor, very poor	38	8.5 (7.2)	
Do you brush your teeth?			
Yes	588	6.1 (5.8)	>0.05*
No	26	5.1 (6.2)	
Have you visited the dentist during the past 12 months?			
Yes	373	5.6 (5.8)	0.02*
No	241	6.6 (5.9)	
Have you lost any of your teeth?			
Yes	144	6.8 (6.1)	>0.05*
No	470	5.9 (5.7)	
Do you think you have a decayed tooth?			
Yes	348	6.6 (5.9)	0.05*
No	266	5.6 (5.8)	
Have you ever reduced participation in social activities because of oral health problems?			
Yes	80	9.5 (6.6)	<0.001*
No	534	5.5 (5.6)	

*T test, **ANOVA Test

Table 6: Association between subjective oral health status and GAD-7

Oral health status	n	GAD-7 Mean (SD)	P
Overall rating of oral health			
Excellent, good	330	4.7 (4.9)	<0.001**
Fair	246	5.4 (5.3)	
Poor, very poor	38	7 (6.2)	
Do you brush your teeth?			
Yes	588	5.2 (5.1)	>0.05*
No	26	5.2 (6.4)	
Have you visited the dentist during the past 12 months?			
Yes	373	5.0 (5.1)	>0.05*
No	241	5.4 (5.3)	
Have you lost any of your teeth?			
Yes	144	5.6 (5.3)	>0.05*
No	470	5.1 (5.1)	
Do you think you have a decayed tooth?			
Yes	348	5.4 (5.2)	>0.05*
No	266	4.9 (5.1)	
Have you ever reduced participation in social activities because of oral health problems?			
Yes	80	6.7 (6.1)	0.01*
No	534	4.9 (5.0)	

*T test, **ANOVA

DISCUSSION

This study aimed to assess the association between subjective oral health status and mental health, defined as depression and anxiety, among a group of university students in Riyadh City, Saudi Arabia by using the validated Arabic versions of the PHQ-9 and GAD-7. The results showed a significant association between depression and anxiety and oral health status. Students who reported poor/very poor oral health tended to have higher mean scores of both depression and anxiety.

Participants' subjective oral health status was assessed, and the findings showed that more than half of the study sample rated their oral health as good. Data regarding self-rated oral health status among Saudi university students are lacking. However, similar results were found among Romanian university students in a study that found the majority of the participants (94.4%) rated their oral health as normal to excellent.^[14] In contrast, several studies conducted among Japanese university students showed that 44.4% and 51.50% of participants rated their oral health status as fair.^[15,16] In regard to dental caries, the findings showed that more than half of participating students reported having a decayed tooth, which is similar to the findings of another study conducted among dental university students, in which 61.45% reported having caries.^[17]

The findings also showed that most of the participants reported that they brushed their teeth, and almost half of them stated that they brushed their teeth twice a day. These findings correspond to the findings of other studies among university students, where the majority of participants reported brushing twice a day.^[17,18]

The impact of oral health status on social activities was assessed in this study, and some participants reported that they reduced their social participation due to oral health problems. However, the literature on issues of self-reported social isolation among university students is lacking at the country level. An exception was a study conducted among Croatian university students that evaluated oral health-related quality of life and found that social disability was significantly impacted.^[19]

The prevalence of mental illnesses in Saudi Arabia is reported to be common,^[3] and this was also found in this study, where the prevalence of depression and anxiety was reported by almost half of the study sample. The results of the current study also showed that depression is highly associated with the self-reported presence of decayed teeth, corresponding to the results of caries prevalence among patients with depression in Brazil. This can be explained by neglect of self-care, which can lead to poor compliance with oral hygiene, which

increases the risk of tooth decay.^[20] Moreover, having poor oral health can negatively affect self-esteem, which could progress to mental illness.^[20]

Abandoning social life due to oral health problems is one of the significant findings in this study since many participants who reported having depression also confirmed a reduction in their social participation. This finding corresponds to the results of the impact of poor oral health on the quality of life of dental patients, which found a marked decline in social interactions.^[21] Other studies, which were conducted among both dental patients and patients attending mental health outpatient clinics, have reported a lower impact on social participation among their participants.^[22,23]

Furthermore, the results revealed that participating students with severe anxiety have poorer oral health status and tend to avoid socializing because of their oral health problems. Nevertheless, this study found several oral health problems that were not significantly correlated with generalized anxiety disorder, such as decayed teeth, tooth loss or even visits to the dentist. In contrast, a study found that people with anxiety disorder have a higher chance of having dental caries since they are more likely to smoke, which leads to an imbalance of the buffer capacity in the saliva.^[24,25] Neglecting dental visits due to fear is also a common finding in many studies conducted among people with anxiety disorders.^[26,27]

The findings of this study might encourage organizations to develop programs aiming to increase awareness of the impact of mental illness on oral health and vice versa. Further studies are also recommended to address the impact of mental illnesses on oral health among wider populations. Although this study showed very interesting results, these results should be interpreted with caution, as such findings cannot be generalized to all university students in the country. Therefore, future studies with larger sample sizes and from multiple universities across the country can be conducted to validate the study findings. Another crucial point to consider is that there is always a possibility of some nonparticipating students with mental illnesses who were not willing to take part in the study for several reasons, such as fear and concerns about confidentiality and/or stigma associated with their mental illnesses and their perception of oral health status could add to the study findings.

CONCLUSIONS

Mental disorders were significantly correlated with subjective oral health status since participants who rated their oral health as poor or very poor tended to

have higher PHQ-9 and GAD-7 scores. In conclusion, findings showed a notable relationship between mental disorders and subjective oral health status among a group of university students. Therefore, the results can be used to help improve service provision, which would ultimately enhance students' well-being and quality of life.

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Conflicts of interest

There are no conflicts of interest.

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