

# Mental Health and Well-Being of Undergraduate Dental Students: A Systematic Review

Lim Shea Lee<sup>1</sup>, Noraini Abu Bakar<sup>2\*</sup>, Nadzirah Ahmad Basri<sup>3</sup> & Salizar Mohamed Ludin<sup>4</sup>

<sup>1</sup>Kulliyah of Nursing, International Islamic University Malaysia, Pahang, Malaysia.

<sup>2</sup>Department of Orthodontics, Kulliyah of Dentistry, International Islamic University Malaysia, Pahang, Malaysia.

<sup>3</sup>Department of Psychiatry, Kulliyah of Medicine, International Islamic University Malaysia, Pahang, Malaysia.

<sup>4</sup>Department of Critical Care Nursing, Kulliyah of Nursing, International Islamic University Malaysia, Pahang, Malaysia.

## ABSTRACT

Mental well-being is the very foundation for emotions, cognition and communication. Mental well-being and mental illness are correlated entities and thus mental well-being should be addressed holistically. Psychological stress, especially chronic stress, can impact one's health and mental well-being. Dentistry in particular is often said to be highly stressful. This paper aimed to discuss the available literature on mental well-being amongst dental undergraduate students including the prevalence of depression, anxiety, stress, sources of stress, coping strategies and intervention programs. Evidence from this review showed that dental students often had high levels of stress, and also a high prevalence of depression and anxiety which contributed to lower mental well-being in this population. The main sources of stress were mostly academic and clinical factors. Dental students had different coping mechanisms. Social support was found to be a significant factor when coping with stress. Initiatives to bring about improvement of mental well-being and to help students manage stress also showed promising results. Although many studies examined mental health among dental students, most of the studies are cross-sectional in design and were mainly focused on assessing students according to the symptoms they display, e.g. depressed or non-depressed, with very few studies giving focus on the mental well-being of the students. Very little attention was given to students who are 'well' but at risk of developing poor mental well-being. Thus, it is recommended that further research focuses on mental well-being and early intervention measures so as to prevent possible mental health deteriorations.

**Keywords:** Dental Students, Mental Well-being, Depression, Anxiety, Stress.

## INTRODUCTION

Mental health is described by World Health Organization (WHO) as 'a state of well-being in which the individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his or her community' (1). The absence of mental illness does not necessarily mean a presence of mental well-being. Mental well-being and mental illness are not opposite ends of a

single sequence, rather they are distinct but correlated entities and this suggests mental well-being should be viewed holistically (2). The National Health and Morbidity Survey 2015 study found that about 4.2 million Malaysians aged 16 and above suffered from various mental health issues and the prevalence of mental health problems among adults showed an increasing trend; from 10.7% in 1996 to 29.2% in 2015 (3).

Mental well-being is the foundation for emotions, cognition, communication, resilience and self-esteem. Mental well-being is also key to relationships, personal and emotional well-being which enables one to contribute to the community and society. In particular, mental well-being is important for dental practitioners as dentistry is a challenging profession. Dentistry is often considered a highly stressful profession mostly due to the nature and working conditions in dental surgery. An online survey conducted in the UK found high levels of stress, burnout and low well-being among practising dentists (4) and are

---

\* Corresponding author:

**Dr. Noraini Abu Bakar**

Department of Orthodontics,  
Kulliyah of Dentistry,  
International Islamic University Malaysia,  
Jalan Sultan Ahmad Shah, Bandar Indera Mahkota,  
25200 Kuantan, Pahang, Malaysia.

Email: nor\_aini@iium.edu.my

potentially at risk of developing mental disorders (5,6). One study found that while dental practice can be stressful, stress can be a positive thing if properly managed as over half the respondents to this study considered themselves healthy and happy (7). A study conducted in Malaysia also concurred with this finding; 60% of the Malaysian dentists that participated in the study considered themselves to have positive mental well-being. Inversely, it is of concern that there is a subset of the participants who considered themselves to have poor mental well-being (8). Poor mental health may lead to increased absenteeism, poorer work performance, poor interpersonal relationship, burnout and unemployment (9). Stress, especially chronic stress increases the risk of the development of mental illness (10). Mental illnesses are associated with distress and problems functioning in social, work or family activities (11). This impairs the ability of an individual to function at full capacity which may affect one's ability to provide proper care as a healthcare professional. Evidence has shown that the dental profession is stressful. Therefore, it is imperative that dental students are mentally prepared to enter this profession by assessing their mental health and well-being and helping them as early as possible to improve their mental well-being and prevent mental illness.

Many studies have been done on levels of depression, anxiety and stress amongst dental students. Fewer studies focused on mental well-being amongst dental students. Recognising the detrimental effects of stress, there are also studies which focused on intervention to help students better cope with stress. With this review, we attempt to summarise the available literature on mental well-being, depression, anxiety and stress amongst dental students to answer the following questions - "What are the states of depression, anxiety and stress and mental well-being amongst dental students, the contributing factors to it and what are the initiatives made to improve their conditions?" and "What are the limitations that exist in the current research and what recommendations can be made?" .

## METHODS

This paper aims to provide a review of available literature on mental well-being, depression, anxiety and stress amongst undergraduate dental students.

### *Search Strategy*

Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) was used as a basis

for reporting this literature review.

### *Identification*

The search for the relevant articles was conducted using PubMed, Science Direct, and Wiley Online Library. The following search terms were used to locate articles pertinent to this study: dental students, mental well-being, depression, anxiety, and stress. Variations of these terms which include dental undergraduates, mental health, psychological well-being were used to ensure exhaustive search results. A total of 474 records were found and a total of 132 duplicates were removed.

### *Screening*

The remaining 342 records were screened. This was done by reading the title, and when considered suitable for our research also the abstract. 207 records were excluded on the basis of not being relevant to our subject of study and 3 records were removed as they were published in a language other than English.

### *Eligibility*

The remaining 135 studies were left to be analysed. 56 studies were removed as the full articles could not be obtained. Of the remaining articles, 29 more were removed based on our inclusion criteria (1. Study population of undergraduate dental students or included undergraduate dental students; 2. Study on depression, stress, anxiety, mental health, relevant intervention and outcome) and exclusion criteria (1. No relevant data; 2. The study population was not undergraduate dental students; 3. Not original studies (such as reviews or editorial letters); 4. Did not report response rate.

### *Included*

Two journal article that were deemed relevant found by manual searching were added for the analysis. A total of 49 papers were reviewed.

DASS-21 = Depression, Anxiety and Stress Scale, GSE = General Self-Efficacy, SWLS = Satisfaction With Life Scale, GHQ-12 = General Health Questionnaire, DES = Dental Environment Stress, CCAPS-34= Counseling Center Assessment of Psychological Symptoms-34, ORS = Outcome Rating Scale, BDI = Beck Depression Inventory, PSM-9 = Psychological Stress Measure, WHOQOL-BREF = World Health Organization Quality of Life, FFMQ-sf= Five Facet Mindfulness Questionnaire-short form, PHQ-9 = Patient Health Questionnaire, MBI = Maslach Burnout

Inventory, PSS = Perceived Stress Scale, DES30-Sp = Spanish adaptation of DES, PHQ-2 = first two questions of PHQ-9, SOC-13 = Orientation to Life Questionnaire, MSPSS = Multidimensional Scale of Perceived Social Support, Brief COPE = Coping Orientation to Problems Experienced Scale, PSQ= Physical Symptoms Questionnaire, SRQ-20 = Self Reporting Questionnaire, SSS = Social Support Scale, AUDIT = Alcohol Use Disorders Identification Test, DREEM = Dundee Ready Education Environment Measure, WCI = Ways of Coping Inventory, RS = Resilience Scale, PWS = Perceived Wellness Survey, MOS = Medical Outcomes Study Social Support Survey , MHI-5 = Mental Health Inventory, EES= Emotional Exhaustion Scale, GAD-7 = Generalized Anxiety Disorder Assessment, WEMWBS = Warwick-Edinburgh Mental Wellbeing Scale, ZDS = Zung Depression Scale, NEO-FFI = NEO five-factor inventory, BSI = Brief Symptom Inventory, FMPS = Frost Multidimensional Perfectionism Scale, HAD = Hospital Anxiety and Depression Scale, STAI = Spielberger State Trait Anxiety Inventory, PGWB = Psychological General Well-being Index, SF-36 = Short Form 36 Health Survey Questionnaire, BFIPT = Big Five Inventory Personality Traits.

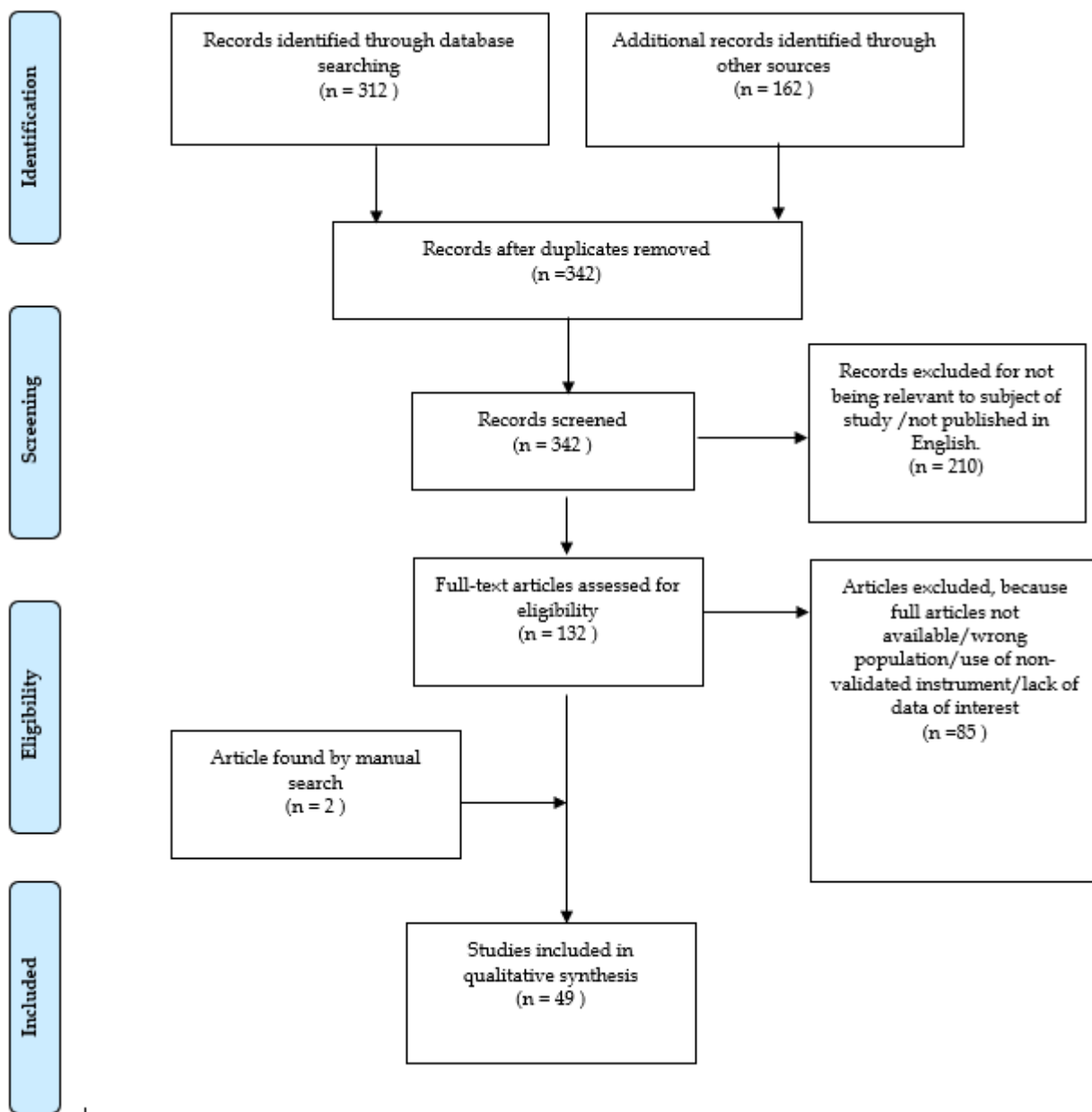


Figure 1 : PRISMA Flow Diagram

Study ID (First Author, Year)	Country	Study Population	Study Design	Outcomes measured	Instruments used
Aboalshamat K, 2015	Saudi Arabia	Medical and dental students	Randomized Controlled Trial	Self-developing coaching program	DASS-21, GSE, SWLS
Abu-Ghazaleh SB, 2016	Jordan	Dental students	Cohort	Psychological stress, sources of stress	GHQ-12, DES
Abu-Ghazaleh SB, 2011	Jordan	Dental students	Cross-sectional	Psychological stress, sources of stress	GHQ-12, DES
Acharya S, 2003	India	Dental students	Cross-sectional	Stress	DES
Adams DF, 2017	USA	Dental students	-	Embedded counselling model	CCAPS-34, ORS
Ahmad MS, 2011	Malaysia	Dental students	Cross-sectional	Stress, Stressors, Stress reliever	DES, Self- developed questionnaire
Alfaris E, 2016	Saudi Arabia	Health profession students	Cross-sectional	Depression	BDI
Alhajj MN, 2018	Multi-country	Dental students	Cross-sectional	Sources of stress	DES
Alzahem AM, 2013	Saudi Arabia	Dental students	Cross-sectional	Stress	DES
Alzahem AM, 2015	Saudi Arabia	Dental students	Quasi- experimental	Effectiveness of Stress Management program	DES , PSM-9
Andre A,	USA	Dental students	Cross-sectional	Quality of life	WHOQOL- BREF
Babar MG, 2015	Malaysia	Dental students	Cross-sectional	Stress	DES
Basudan S, 2017	Saudi Arabia	Dental students	Cross-sectional	Depression, anxiety, stress	DASS-21
Braun SE, 2019	USA	Dental and dental hygiene students	Quasi- experimental	Yoga intervention	FFMQ-sf, PHQ-9, MBI, PSS
Brondani MA, 2014	Canada	Dental students	-	PACS Module	-
Deeb GR, 2018	USA	Dental and dental hygiene students	Cross-sectional	Depression, suicidal ideation, burnout	PHQ-9, MBI
Divaris K, 2014	Columbia	Dental students	Cross-sectional	Stress	DES30-Sp
Galan F, 2014	Spain	Dental students	Cross-sectional	Burnout, depression, suicidal ideation	MBI, PHQ-2
Gambetta- Tessini K, 2013	Multi-country	Dental students	Cross-sectional	Stress, health promoting attributes	PSS, SOC-13, MSPSS, Brief COPE
Gorter R, 2008	Multi-country	Dental students	Cohort	Burnout, physical health, psychological distress, stress	MBI, PSQ, GHQ-9, DES

Study ID (First Author, Year)	Country	Study Population	Study Design	Outcomes measured	Instruments used
Graner KM, 2018	Brazil	Dental students	Cross-sectional	Common mental disorder, alcohol use, perceptions of academic life, social support, resilience	SRQ-20, SSS, AUDIT, DREEM, WCI, RS
Harrison P, 2016	USA	Dental Students	Cross-sectional	Wellness	PWS, MOS, MHI-5
Hayes A, 2017	Canada	Dental students	Cross-sectional	Stress	DES
Heath JR, 1999	UK	Dental students	Cross-sectional	Sources of stress	DES
Humphris G, 2002	Multi-country	Dental students	Cross-sectional	Psychological distress, burnout, stress	GHQ-12, MBI, DES
Jenkins S, 2019	UK	Dental students	Cross-sectional	Factors affecting well-being and academic	Self-developed questionnaire
Jimenez-Ortiz JL, 2019	Mexico	Dental students	Cross-sectional	Emotional exhaustion, burnout, stress	EES, PSS, MBI
Jowkar Z, 2020	Iran	Dental students	Cross-sectional	Depression, anxiety, stress, Sources of stress	DASS-21, DES
Knipe D, 2018	UK	Health sciences students	Cross-sectional	Depression, anxiety, self-harm, alcohol use, well-being	PHQ-9, GAD-7, AUDIT, WEMWBS
Kumar S, 2009	India	Dental students	Cross-sectional	Sources of stress	DES
Laurence B, 2009	USA	Dental students	Cross-sectional	Depression, stress, social support	ZDS, MSPSS, PSS
Lewis EG, 2020	UK	Professional degree program students	Cross-sectional	Personality traits, perfectionism, well-being, psychological distress, depression, suicidal	NEO-FFI, FMPS, WEMWBS, GHQ-12, BDI
Lopez N, 2014	USA	Dental students	Cross-sectional	Effectiveness of peer mentoring program	Questionnaire
Mohd Nayan NA, 2017	Malaysia	Dental students	Cross-sectional	Depression, anxiety, stress	DASS-21
Naidu RS, 2002	Trinidad	Dental students	Cross-sectional	Sources of stress, psychological disturbance	DES, BSI
Newbury-Birch D, 2002	UK	Dental students	Longitudinal cohort	Depression, anxiety	HAD
Peker I, 2008	Turkey	Dental students	Cross-sectional	Stress, depression, anxiety	DES, BDI, STAI
Polychronopoulou A,	Multi-country	Dental students	Cross-sectional	Sources of stress	DES
Polychronopoulou A,	Greece	Dental students	Longitudinal cohort	Sources of stress	DES

Table 1 : Table of Included Studies (In alphabetical order)

## RESULT

Dentistry is often considered mentally challenging due to the high professional demands and stress experienced by the practitioners. In fact, stress often starts early during the undergraduate years and many studies regarding stress have been conducted in dental schools around the world. This literature search found there are many studies conducted especially on stress in dental students with different study designs and methods. Many of the studies are cross-sectional.

### *Comparison of mental health among healthcare students*

Three studies that compared the state of mental well-being among students of different health fields were reviewed. A study conducted in Saudi Arabia found depressive symptoms in almost half the study population which included medical, dental and allied medical sciences students. Dental students reported the highest prevalence of depressive symptoms (51.6%) compared to the others (46.2% in medical students and 45.7% in applied medical sciences students). Female students were found to be more prone to depressive symptoms and third year dental students reported the highest prevalence of depression compared to students in other year of study (12). A similar finding was observed in a study involving 1139 students at a university in the UK where almost a quarter of medical, dental and veterinary students reported moderate to severe levels of depression and anxiety. Dental students had higher prevalence of depression, anxiety and lower levels of mental well-being compared to their medical and veterinary counterparts. When compared to medical students, dental students were found to have higher levels of suicidal ideation and higher odds of depression and anxiety. It was also found that less than a third of the students with severe depression and suicidal thoughts sought help. They were inhibited by fear of documentation, lack of time, fear of unwanted interventions, lack of confidentiality and stigma, while a few reported not knowing where to seek help (13). Another study which compared dental students and dental hygiene students found that there are higher rates of emotional exhaustion (22% of dental hygiene students, 34% of dental students) and burnout (38% of dental hygiene students, 40% of dental students) among the dental students (14).

These studies found that health profession students have high rates of mental health

problems. Dental students were found to have higher prevalence of poor mental well-being and lower mental well-being when compared to other health profession students.

### *Mental health conditions of dental students*

An examination of the literature has shown the following mental health conditions in dental students as the reported outcome; stress, anxiety and depression (31 studies), suicidal rumination (2 studies). Fewer studies address mental well-being amongst dental students (4 studies). One study measured quality of life of the dental students.

### *Mental health disorders amongst dental students*

Mental health disorders include a wide range of mental health conditions that cause changes in emotions, thinking or behaviour and are usually interfering with students' daily lives. The articles that we reviewed have largely focused on stress, anxiety and depression.

Abnormal levels of depression, anxiety and stress were often found in dental students. High prevalence of depression with over one third of the study population having moderate to severe depression was found in one study. Dental students also had high scores for 'suicidal rumination' (15). Dental students were found to have lower psychological well-being than the general population (16) and reported having some psychological disturbances throughout their dental education (17). Alarmingly, a multi-country study showed that first year undergraduate dental students in Europe had higher than expected levels of emotional exhaustion regardless of the education system and syllabus employed by the different universities (18). Prevalence of common mental disorders (depression, anxiety, somatic symptoms that impair functions) was found in almost half the students in a study by Garner et al. (19), which is higher than the general public in Brazil. Factors related to academic performance, health status and confrontive coping strategies were risk factors to students' mental health while resilience appears to be a protective factor. This study found no significant difference in the prevalence of common mental disorders between the genders (19). A study by Stormon et al.(20) agreed with the findings of the study by Graner et al.(19) that dental students suffer abnormal levels of depression, anxiety and stress and there were no significant differences between the genders. Students whose first career choice was dentistry had lower prevalence of depression (20). Contrary to the previous studies, quite a few studies found

that female students had higher levels depression, anxiety and stress (21-26). A study done among dental students by Mohd Nayan et al. (27) however gave contradictory results to the previous studies that were discussed where majority of the students had no depression, anxiety or stress although there was a minority who reported severe levels of depression, anxiety and stress.

Dental students with higher level of stress were found to have higher prevalence of depression. Age, gender, ethnicity, enrolment year or marital status had no significant effect on the prevalence of depressive symptom amongst dental students and it was shown that having social support was associated with lower prevalence of depression despite the level of stress of the students (28). Newbury et al. (22) demonstrated similar findings as well where there was high prevalence of anxiety (47% of the dental student cohort as second year students, and 67% as final year students) and stress (72% as final year students) in dental students. An alarming finding was that a higher number of dental students were consuming alcohol at hazardous level compared to medical students and binge drinking appeared to be related to anxiety (22). Stormon et al. (20) also found no significant differences were noted in this study between pre-clinical and clinical students, although a higher number of pre-clinical students had severe depression and anxiety.

Psychological stress was found to increase along with the years of study. A longitudinal study which involved a cohort of 135 dental students observed 89% of the students had psychological distress when they were in their fifth year compared to just over half the students in first year (29). A similar results was found in another study conducted among Turkish dental students where the clinical students reported poorer psychological well-being than the first or second year students (17). On the contrary, a study by Radeef and Faisal in 2018 noted higher levels of anxiety amongst preclinical students which they reported could be this was due to preclinical students being new to the dental environment and thus being less able to deal with the stressors (23).

Dental Environment Stress (DES) questionnaire is commonly used by researchers to evaluate stress levels for each stressor faced by dental students. The overall DES score has also been used to evaluate stress levels amongst dental students. Some studies reported of an increase in DES scores as students progressed through dental school (30) although there are studies that reported no

difference in the mean DES scores between first and fifth year (16,31). The findings are inconclusive on which year is considered to be most stressful. While some studies found third year students to have the highest level of stress (32-36), others found that final year students had the highest level of stress (37,38). Studies have found that year one and year two students had lower levels of stress when compared to more senior dental students (32-34,37). It can be concluded that there are mixed results as to which student years in dentistry were mostly stressful.

### *Mental well-being amongst dental students*

Mental well-being is more than not having any mental health disorders. Mental well-being can co-exist with mental health disorders. Mental well-being is a state in which one is able to deal with challenges effectively and able to take pleasure and satisfaction from life.

Sugiura et al. (16) found that the dental students in their study had lower mental well-being than the population norm (total score on the PGWB index for this study was 68.6, while the normal values were considered to be in the range of 78-83). They also found that students who exercised regularly had better mental well-being (16). The dental students in the study by Uraz et al. (17) had a higher score on the PGWB index (overall mean score was 75.02) than the students in the study by Sugiura et al. (16). Uraz et al. (17) also found that living accommodation was significantly associated with the depressed mood domain on the PGWB index.

Harrison et al. (39) also found that the majority of dental students in their study reported to be generally happy. These students showed a strong sense of self-worth. Almost 80% of the dental students also reported having good social support although first year students and those who were single were found to have less social support. One study which involved a sample of 384 dental students found that the dental students overall rated their quality of life as good (mean overall quality of life rating was 3.85 on a scale of 1 to 5 on the WHOQOL-BREF, suggesting a rating of good) and they were fairly satisfied with their health. There was no significant decrease in quality of life over the duration of the course. Findings from this study also indicated that social relationships (mean WHOQOL-BREF domain score = 65.46) and physical health (mean WHOQOL-BREF domain score = 69.6) had a bigger impact on quality of life than environmental (mean WHOQOL-BREF domain score = 64.29) or psychological factors

(mean WHOQOL-BREF domain score = 62.77). A higher quality of life was associated with better satisfaction with health (40).

### ***Contributors to stress in dental school***

Stress could be multifactorial, and many studies have been done to identify stressors among dental students worldwide. We identified 11 articles that assessed the sources of stress in dental students. Sources of stress were also mentioned in papers that assessed stress levels in dental students.

#### *Academic related stressors*

A multicentered study in Europe found substantial levels of stress in dental students and despite the different dental education systems, self-efficacy concerns, performance pressure and assigned workload were the main perceived stressors (26). In a larger multi-country study by Alhaji et al. (25) the main stressors amongst dental students were examinations and quizzes, fear of failing a course or the year, lack of time for relaxation, lack of time to do assigned work, and overload feeling due to huge syllabus. Clinical students are more concerned about clinical stressors which include completion of clinical requirements, atmosphere created by the clinical staff, faculty's behavior, accuracy of clinical decisions, patient coming late or not showing up for appointments (36,41-43). An additional stressor for clinical students were seen in a study in Turkey which is risk of infectious diseases like Hepatitis B, Hepatitis C or human immunodeficiency virus (34). A study conducted in Nigeria found stressors that were specific to this region. The most important stressors for the dental students in this study were provision of a well-supported dental education in Nigeria including availability of reading materials, clinical equipment and materials, availability of manpower for clinical supervision. This findings could be due to the depressed economy in Nigeria (38). A longitudinal study found changes in dental students' perceived sources of years throughout the years of study. Mean DES scores for 'workload' and 'clinical training' showed decreasing trends over the years of study, while mean DES score increased over the years for 'faculty and admin'. This is consistent with the transition in the preclinical and clinical phases of the dental curriculum as students progress through their education (44).

#### *Psychological and social adjustment*

First year students reported the highest mean score for the stressor 'living away from

home' (33,43,45). Living at home appears to be beneficial to students as they appeared to be able to better cope with stress when living with family (18). First year students found 'making friends' and 'relationships with members of opposite sex' more stressful than students of other years which showed that first year students faced more challenges in terms of people and environment apart from the workload (45).

#### *Personal factors*

Personality traits is also said to affect perceived stress and mental health. A study which involved dental students in two universities found that the three most dominant traits in dental students were agreeableness, neuroticism, openness (24). While students in both the universities reported feeling stressed, students in NUS where the trait of neuroticism was more prevalent reported higher levels of stress. It was also found that students who are more conscientious and agreeable are less prone to developing high levels of stress. Female students also had higher DES scores than their male counterpart. This study found that gender and neuroticism were significant predictors for perceived stress in dental students (24). Neuroticism has been associated with lower mental well-being in a study conducted on students enrolled in professional degree programmes as well as being a strong predictor for psychological dysfunction in the study population. High levels of neuroticism and low conscientiousness were risk factors for increased psychological morbidities (46). Financial issue was found to be a source of stress for dental students (47) and high debts were associated with higher levels of stress amongst dental students (43).

#### ***Detrimental effects of poor mental health and well-being on dental students***

Poor mental health and well-being were often associated with negative effects on the students' overall well-being. Poor mental health and well-being can interfere with physical health, daily functioning and may have adverse consequences on one's ability to learn and work and subsequently impacts academic performance.

#### *Worsening of mental health and well-being*

Stress is often linked with ill effects on one's physical and mental health. A follow-up on dental students in their fifth year of study in five European dental schools found that students' level of emotional exhaustion and psychological distress increased when compared with first year baseline results. Analysis done showed that stress

plays a role in the development of burnout and burnout levels may further lead to mental or physical health problems (31). There also appears to be a strong association between depression and burnout and between depression and suicidal ideation (48). Uraz et al. (17) found that fourth and fifth year students who were under more stress than first year students generally reported having poorer well-being. One study found that a majority of dental students suffer from high degrees of emotional exhaustion and perceived stress, although the rate of burnout was low (49). Emotional exhaustion is a response to stressful stimuli and usually results from inability to cope with perceived stress. This can lead to detrimental effects on the students' learning.

#### *Effects on physical health*

Students with higher stress scores had a greater number of sickness episodes and cold or flu episodes, more physical symptoms like migraine, stomachache problem, intense fatigue, tachycardia, insomnia, lack of appetite, overeating and psychological symptoms like uncontrollable anger, feeling down or depressed, difficulty concentrating. This suggests that stress has a negative effect on overall well-being (50). A similar finding was seen in a study done in the UK by Jenkins et al. (47). Over two thirds of the students reported to be very stressed about their study and students also had a range of physical and mental health effects. Three-quarters reported experiencing fatigue and over half reported a loss of motivation. Other reported problems included an inability to focus and forgetfulness, emotional distress and feelings of isolation. Students who were able to pursue their hobbies had less stress and reported a better work-life balance (47). A study conducted in Malaysia found that the most common consequences of stress in students were fatigue or tiredness, mood alteration, headache and sleep disturbance (51).

#### *Effects on academic performance*

Stress level was found to have an adverse effect on academic performance. Students with higher stress scores reported lower grade point average (50) and a drop in academic performance (51). Difficulty sleeping was reported by half of the participants in one study whereby lack of sleep was found to adversely affect the participants' ability to study. This sleep problem may be caused by stress experienced by the students (47).

#### *Coping strategies used by dental students*

Students reported different coping methods used by dental students to deal with the stressors they

have to face. In a study conducted in a local university, religion and spiritual activities were reported to be an important coping mechanism for the majority of the dental students (52). Having good interpersonal relationship also appeared to help with stress. Students reported 'talking to friends' as the leading stress reduction technique. Other popular remedies included sleeping, talking to family members, music and watching movies. There is a minority of students who turned to smoking cigarettes and drinking alcohol to cope with stress (51). Gambetta-Tessini et al. (53) found the dental students in their study use more adaptive coping strategies like active coping, planning, positive reframing, acceptance, humor, religion, seeking emotional and instrumental support for dealing with stress than maladaptive coping strategies. Social support has been identified as an important shield between stressful events and psychological effects. Strong social support was often correlated with higher sense of coherence which enabled the dental students to better cope with stress (53).

#### *Intervention programmes to improve mental health and well-being of dental students.*

A total of seven papers on interventions or programs aimed at improving students' mental health and well-being were reviewed. Peer mentoring programs have been introduced in some universities where the mentor is usually a more senior dental student. A majority of dental students found having a mentor helped them tremendously. Having support during transition periods from someone who has gone through the same process was valuable to the dental students. Peer mentoring was found to be an effective tool to help dental students manage stress (54).

An education module called Professionalism and Community Service (PAC) module is employed to tackle stress management, addiction and suicide prevention. It is a four-year longitudinal study using community services as its main pedagogy. Role playing and use of videos on thematic issues like practitioner behavior and professional health, stress management, suicide, substance abuse is used as learning tools. Self-reflection is used to allow students to absorb the significance of what they have learned, question their learning and raise issues that still need to be explored. PAC appears to have sensitized students to the joys and challenges of being a dentist, while employing methods that could positively influence the balance of their lives. Exploring taboo subject like suicide also give better self-awareness and that can help overcome its stigma (55).

The Dental Education Stress Management (DESM) programme was introduced to help dental students cope with stress. It is based on the principle of psychoeducation. Students are taught about stress and its negative consequences and they were also taught a cognitive behavioral technique to cope with stress. Follow-up was done up to two months after following the program. This program demonstrated a reduction in stress levels among students (56). A similar intervention study using cognitive reappraisal technique to reduce stress was done in New Zealand. The technique involved recognizing the negative pattern your thoughts have fallen into and changing that pattern to one that is more effective. Students are taught to downregulate negative feelings to more positive ones. Baseline and follow-up surveys were done at eight weeks apart. Cognitive reappraisal intervention showed small to medium reduction in perceived stress (57).

A self-development coaching programme was introduced to medical and dental students to improve their psychological well-being and academic performance. The intervention group received the self-development program through a two-day workshop while the control group attended a five-hour workshop focused on theoretical information. Follow-up was done up to five weeks after the programme. A short-term improvement in depression was seen in the intervention group, while no significant differences were found for general self-efficacy and satisfaction with life. No effect on students' academic performance was detected (58).

One study employed a more interesting intervention which is yoga, a mindfulness-based intervention. Students are taught yoga with focus on breathing practice, meditation, and awareness of body. Students are also reminded of the importance of returning to breath and the need to have a non-judgmental attitude. It was found that more than half students who participated reported improved mindfulness and those with higher stress had better improvement (59).

Counselling services can be a valuable tool to help improve students' mental well-being. The embedded counselling model is primarily focused on delivering counselling to students who are either self-referred or referred by the faculty at a dental school. Several health promotion programs were also introduced for a group audience. Students showed reduction in psychological distress and increasing overall function with increasing number of counselling sessions. Students who participated in the group intervention reported increased awareness and

knowledge but this did not improve their willingness to seek help (60).

Many of these studies have suggested that steps be taken to improve the mental health among dental students as they are found to be at a higher risk for developing ill mental health. Sugiura et al. (16) deduced that students with regular exercise had lower levels of stress hence students should be encouraged to be more physically active. As many of the stressors appear to be related to the dental curriculum, some has called for the education program to be reviewed to provide a more conducive learning environment (17,23). Students should also be educated to recognize signs of physical distress and taught coping skills like mindfulness. Empowering students with the awareness of signs of physical distress and coping skills, along with the help available to them might encourage them to seek professional help as suggested by Knipe (13).

## DISCUSSION

Studies comparing healthcare students enrolled in different programs have shown that mental health problems are prevalent amongst healthcare students. However, dental students generally had higher levels of depression, anxiety or stress and poorer mental well-being than those in other health sciences programmes (12-14). It is significant to note that a majority of the students in the study done by Knipe et al.(13) were reluctant to seek professional help. Fear of documentation was one of the main reasons students did not seek help (13). This barrier to seeking help may prevent students from getting the professional help that they need. This highlights the importance of providing a suitable pathway to provide help and treatment for students as well as the assurance of confidentiality.

The studies involving dental students concurred that dental students often had high levels of depression, anxiety and stress. Stress levels often increased as students progressed through their dental educational. Third year dental students were often found to have the highest level of stress and this is consistent with their transition to the clinical years (32-36), These students in transition may require more support and preparation when they begin to treat patients. Mixed results as to the stress incurred in the years of study led to inconclusive conclusion as to which years are more stressful. Many sources of stress were identified and the main stressors varied depending on the students' year of study. Academic and clinical factors were mainly the

source of stress for dental students (26,34,36,38,41–44), Personality(24), financial issues (47) and living accommodation (33,43,45) were also found to affect the dental student's mental well-being. Identifying these sources of stress is imperative as it enables universities to address them effectively. This will also enable universities to identify students who are most at risk of developing poor mental well-being and mental health disorders and to implement intervention programs early. High level of stress was found to have a negative effect on the dental student's mental and physical well-being. Students with poorer mental well-being also generally had poorer academic performance. Female students and certain personality traits especially neuroticism were often associated with poorer mental well-being.

Having good social support was found to be an important protective factor against mental disorders(19,28,53) . Social support offers a buffering effect against stress and mental disorders . Dental students with low social support could be at a higher risk for poor mental well-being and mental disorders. Increasing the awareness of sources of social support will be beneficial for the well-being of students. Dental students also employed different coping strategies to help them cope with their stress, from positive ones like reaching out to friends or family and participating in physical activity to negatives ones like turning to alcohol and drugs. Through education and awareness programs, students can be taught to develop positive coping mechanism instead of turning to negative coping methods. Promotion of healthier lifestyle choices should also be done to improve student wellness and their capacity for success.

Some universities have also implemented programmes to improve the dental students' mental well-being and to help them cope better with stress. The studies that we reviewed showed that these intervention programmes were often successful in improving the students' mental well-being(54–59). A limitation in these studies is that they did not include a long-term assessment of post-intervention changes amongst the students. Future research would benefit from including a long-term follow-up on the students after participation in intervention programmes to determine if the changes can be maintained. Counselling was also found to be beneficial in meeting the psychological needs of the students and educating faculty and students alike on mental well-being (60). However, steps should be taken to address barriers to dental students' utilization of these services at their universities.

This review has several limitations. Most of the studies are cross-sectional descriptive studies. The studies also used different instruments. We also included studies that used DES to measure the level of stress although DES was intended to be used to identify the sources of stress amongst dental students.

As this review has shown, dental students are at high risk of developing poor mental well-being especially since they are exposed to high levels of stress. Certain factors like gender, poor mental health and well-being has been shown to have a detrimental effect on the students' overall well-being and academic performance. These findings impart valuable information for the development of effective interventions and prevention strategies for both students and universities. We were not able to locate any studies from Malaysia on intervention or mental well-being promotion for dental students. A few interventions and programs have been introduced. However, the focus of many researches in this review indicated that research is often on students who are already 'diseased'. Very little attention is given to students who are still considered 'well' but may be at risk. Knowing the risk factors and stressors that students face provide an opportunity to intervene early before students develop any mental disorders. Mental well-being is an important foundation to competence and professionalism required of health professionals and healthcare students. Maintaining good well-being is not only essential for the dental students but also in the interest of their patients.

It is thus recommended that future studies shift their attention from studying students with symptoms of mental illnesses such as anxiety and depression to studying the overall mental well-being of students and moving on to assessing the effectiveness of prevention work rather than assessing the effects of intervention on students already displaying symptoms of mental illness. Prevention and mental well-being promotion would benefit the dental students to ensure that they go on to have a healthy professional future. Promotion of mental and emotional health goes a long way to help foster dental students and practitioners with stable emotions, healthy thinking and behavior, helpful for both their personal and professional lives.

## CONCLUSION

From the papers that were reviewed, we can conclude that dental students are at a high risk for developing poor mental health (depression, anxiety, stress, burnout, suicide ideation) which might affect their well-being. High prevalence of

psychological distress was found in most of the studies. Alarming, a minority of dental students reported using alcohol, cigarette smoking or drugs to cope. Contrary to the general consensus that dental students generally have poor mental health, there are studies that found dental students to be generally happy and had fairly good quality of life. The sources of stress among dental students are mainly from academic and clinical factors while factors like age, gender, personality traits may predispose students to developing poor mental health. Poor mental well-being brings about negative impacts on the students' well-being and academic performance. This review has shown that there is a need to help dental students cope better with stress that is unavoidable with any professional education. Preventive efforts should be given more attention to provide dental students with better coping mechanisms and to prevent mental disorders. Further studies, especially studies which focus on the effectiveness of preventive programs for the students will help foster psychological skills needed among dental professionals.

#### ACKNOWLEDGEMENT

We would like to acknowledge IIUM and MoHE for the FRGS-RACER grant. (Reference code : RACER/1/2019/SKK14/UIAM//3).

#### CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

#### REFERENCES

1. World Health Organisation. Promoting mental health: concepts, emerging evidence, practice. France; 2005.
2. Keyes CLM. Mental illness and/or mental health? Investigating axioms of the complete state model of health. *J Consult Clin Psychol*. 2005;73(3):539-48.
3. Institute for Public Health (IPH). National Health and Morbidity Survey 2015 (NHMS 2015). Vol. II: Non-Communicable Diseases, Risk Factors & Other Health Problems. Ministry of Health Malaysia; 2015.
4. Collin V, Toon M, O'selmo E, Reynolds L, Whitehead P. A survey of stress, burnout and well-being in UK dentists. *Br Dent J*. 2019;226(1):40-9.
5. Myers HL, Myers LB. "It's difficult being a dentist": Stress and health in the general dental practitioner. *British Dental Journal*. 2004.
6. Puriene A, Aleksejuniene J, Petrauskiene J, Balciuniene I, Janulyte V. Self-perceived mental health and job satisfaction among Lithuanian dentists. *Ind Health*. 2008;46(3):247-52.
7. Kay EJ, Lowe JC. A survey of stress levels, self-perceived health and health-related behaviours of UK dental practitioners in 2005. *Br Dent J*. 2008;204(11):622-3.
8. b-Murat N, Mason L, Kadir RA, Yusoff N. Self-perceived mental well-being amongst Malaysian dentists. *Int J Occup Saf Ergon*. 2018;24(2):233-9.
9. Harnois G, Gabriel P. Mental Health and Work: Impact, issues and good practices. World Health Organization and International Labour Organization. 2000.
10. Marin MF, Lord C, Andrews J, Juster RP, Sindi S, Arsenault-Lapierre G, et al. Chronic stress, cognitive functioning and mental health. *Neurobiol Learn Mem [Internet]*. 2011;96(4):583-95.
11. Chisholm D, Layard R, Patel V, Saxena S. Mental Illness and Unhappiness. Cent Econ Performance, LSE, CEP Discuss Pap 2013 [Internet]. 2013;(7620).
12. Alfaris E, Irfan F, Qureshi R, Naeem N, Alshomrani A, Ponnampuruma G, et al. Health professions' students have an alarming prevalence of depressive symptoms: Exploration of the associated factors. *BMC Med Educ [Internet]*. 2016;16(1):1-8.
13. Knipe D, Maughan C, Gilbert J, Dymock D, Moran P, Gunnell D. Mental health in medical, dentistry and veterinary students: cross-sectional online survey. *BJPsych Open*. 2018;4(6):441-6.
14. Deeb GR, Braun S, Carrico C, Kinser P, Laskin D, Golob Deeb J. Burnout, depression and suicidal ideation in dental and dental hygiene students. *Eur J Dent Educ*. 2018;22(1):e70-4.
15. Takayama Y, Miura E, Miura K, Ono S, Ohkubo C. Condition of depressive symptoms among Japanese dental students. *Odontology*. 2011;99(2):179-87.

16. Sugiura G, Shinada K, Kawaguchi Y. Psychological well-being and perceptions of stress amongst Japanese dental students. *J Dent Educ*. 2005;9(1):17-25.
17. Uraz A, Tocak YS, Yozgatligil C, Cetiner S, Bal B. Psychological well-being, health, and stress sources in Turkish dental students. *J Dent Educ* [Internet]. 2013;77(10):1345-55.
18. Humphris G, Blinkhorn A, Freeman R, Gorter R, Hoad-Reddick G, Murtomaa H, et al. Psychological stress in undergraduate dental students: Baseline results from seven European dental schools. *Eur J Dent Educ*. 2002;6(1):22-9.
19. Graner KM, De Moraes ABA, Torres AR, Lima MCP, Rolim GS, De Abreu Ramos-Cerqueira AT. Prevalence and correlates of common mental disorders among dental students in Brazil. *PLoS One*. 2018;13(9):1-16.
20. Stormon N, Ford PJ, Kisely S, Bartle E, Eley DS. Depression, anxiety and stress in a cohort of Australian dentistry students. *Eur J Dent Educ*. 2019;23(4):507-14.
21. Basudan S, Binanzan N, Alhassan A. Depression, anxiety and stress in dental students. *Int J Med Educ*. 2017;8:179-86.
22. Newbury-Birch D, Lowry RJ, Kamali F. The changing patterns of drinking, illicit drug use, stress, anxiety and depression in dental students in a UK dental school: A longitudinal study. *Br Dent J*. 2002;192(11):646-9.
23. Radeef AS, Faisal GG. Stressors and Their Association with Symptoms of Depression, Anxiety and Stress in Dental Students. *Makara J Heal Res* [Internet]. 2018 Aug;22(2):58-62.
24. Yusof ZYM, Wan Hassan WN, Razak IA, Hashim SMN, Tahir MKAM, Keng SB. Personality traits and stress levels among senior dental students: Evidence from Malaysia and Singapore. *Southeast Asian J Trop Med Public Health*. 2016;47(6):1353-65.
25. Alhadj MN, Khader Y, Murad AH, Celebic A, Halboub E, Márquez JR, et al. Perceived sources of stress amongst dental students: A multicountry study. *Eur J Dent Educ*. 2018;22(4):258-71.
26. Polychronopoulou A, Divaris K. Dental students' perceived sources of stress: a multi-country study. *J Dent Educ*. 2009;73(5):631-9.
27. Mohd Nayan NA, Che Daud AZ, Tengku Jamaluddin TIB, Talib SS. Perceived Depression, Anxiety and Stress Among UiTM Dental Undergraduates in Clinical Years. *Environ Proc J* [Internet]. 2017;2(6):81.
28. Laurence B, Williams C, Eiland D. Depressive symptoms, stress, and social support among dental students at a historically black college and university. *J Am Coll Heal*. 2009;58(1):56-63.
29. Abu-Ghazaleh SB, Sonbol HN, Rajab LD. A longitudinal study of psychological stress among undergraduate dental students at the University of Jordan. *BMC Med Educ* [Internet]. 2016;16(1):1-6.
30. Divaris K, Polychronopoulou A, Villa-Torres L, Mafla AC, Moya GA, González-Martínez F, et al. Extracurricular factors influence perceived stress in a large cohort of Colombian dental students. *J Dent Educ* [Internet]. 2014;78(2):213-25.
31. Gorter R, Freeman R, Hammen S, Murtomaa H, Blinkhorn A, Humphris G. Psychological stress and health in undergraduate dental students: Fifth year outcomes compared with first year baseline results from five European dental schools. *Eur J Dent Educ*. 2008;12(2):61-8.
32. Alzahem A, van der Molen, de Boer. Effect of year of study on stress levels in male undergraduate dental students. *Adv Med Educ Pract*. 2013;4:217-22.
33. Naidu RS, Adams JS, Simeon D, Persad S. Sources of stress and psychological disturbance among dental students in the West Indies. *J Dent Educ* [Internet]. 2002;66(9):1021-30.
34. Peker İ, Alkurt MT, Usta MG, Turkbay T. The evaluation of perceived sources of stress and stress levels among Turkish dental students. *Int Dent J*. 2008;58(2009):342-8.
35. Babar MG, Hasan SS, Ooi YJ, Ahmed SI, Wong PS, Ahmad SF, et al. Perceived sources of stress among Malaysian dental students. *Int J Med Educ*. 2015;6:56-61.

36. Jowkar Z, Masoumi M, Mahmoodian H. Psychological Stress and Stressors Among Clinical Dental Students at Shiraz School of Dentistry, Iran. *Adv Med Educ Pract.* 2020;11(February):113-20.
37. Abu-Ghazaleh SB, Sonbol HN, Rajab FD. Psychological stress among dental students at the University of Jordan. *J Dent Educ.* 2011;75(8):1107-14.
38. Sofola OO, Jeboda SO. Perceived sources of stress in Nigerian dental students. *Eur J Dent Educ.* 2006;10(1):20-3.
39. Harrison PL, Shaddox LM, Garvan CW, Behar-Horenstein LS. Wellness Among Dental Students: An Institutional Study. *J Dent Educ [Internet].* 2016;80(9):1119-25.
40. Andre A, Pierre G, McAndrew M. Quality of Life Among Dental Students: A Survey Study. *J Dent Educ.* 2017;81(10):1164-70.
41. Acharya S. Factors affecting stress among Indian dental students. *J Dent Educ [Internet].* 2003;67(10):1140-8.
42. Kumar S, Dagli RJ, Mathur A, Jain M, Prabu D, Kulkarni S. Perceived sources of stress amongst Indian dental students. *Eur J Dent Educ.* 2009;13(1):39-45.
43. Hayes A, Hoover JN, Karunanayake CP, Uswak GS. Perceived causes of stress among a group of western Canadian dental students. *BMC Res Notes [Internet].* 2017;10(1):714.
44. Polychronopoulou A, Divaris K. A longitudinal study of Greek dental students' perceived sources of stress. *J Dent Educ [Internet].* 2010;74(5):524-30.
45. Heath JR, Macfarlane TV, Umar MS. Perceived Sources of Stress in Dental Students. *Dent Updat.* 1999;26:94-100.
46. Lewis EG, Cardwell JM. The big five personality traits , perfectionism and their association with mental health among UK students on professional degree programmes. *BMC Psychol.* 2020;8(1):1-10.
47. Jenkins S, Johnson I, Ginley J. Work, Stress and Play: Students' perceptions of factors impacting on their studies and well-being. *Eur J Dent Educ.* 2019;23(3):349-54.
48. Galán F, Ríos-Santos JV, Polo J, Ríos-Carrasco B, Bullón P. Burnout, depression and suicidal ideation in dental students. *Med Oral Patol Oral Cir Bucal.* 2014;19(3).
49. Jiménez-Ortiz JL, Islas-Valle RM, Jiménez-Ortiz JD, Pérez-Lizárraga E, Hernández-García ME, González-Salazar F. Emotional exhaustion, burnout, and perceived stress in dental students. *J Int Med Res.* 2019;47(9):4251-9.
50. Silverstein ST, Kritz-Silverstein D. A longitudinal study of stress in first-year dental students. *J Dent Educ.* 2010;74(8):836-48.
51. Ahmad MS, Yusoff MMM, Razak IA. Stress and Its Relief Among Undergraduate. *Southeast Asian J Trop Med Public Heal.* 2011;42(4):996-1004.
52. Yaacob M, Harun NA, Ramli F, Razak HA, Sajuni NA. Depression, anxiety and stress among dental undergraduate students: Prevalence, stressors and relieving factors. *Int Med J Malaysia.* 2016;17(Specialissue2):123-30.
53. Gambetta-Tessini K, Mariño R, Morgan M, Evans W, Anderson V. Stress and health-promoting attributes in Australian, New Zealand, and Chilean dental students. *J Dent Educ [Internet].* 2013;77(6):801-9.
54. Lopez N, Johnson S, Black N. Does Peer Mentoring Work? Dental Students Assess Its Benefits as an Adaptive Coping Strategy. *J Dent Educ.* 2010;74(November):1197-205.
55. Brondani MA, Ramanula D, Pattanaporn K. Tackling stress management, addiction, and suicide prevention in a predoctoral dental curriculum. *J Dent Educ [Internet].* 2014;78(9):1286-93.
56. Alzahem AM, Van der Molen HT, De Boer BJ. Effectiveness of a Dental Students Stress Management Program. *Heal Prof Educ [Internet].* 2015;1(1):34-42.
57. Smith A, Scott I, Ratnayake J, Newsham-West K, Cathro P. An Intervention Study: Does a Cognitive Reappraisal Technique Reduce the Perceived Stress in Fourth-Year Dental Students in New Zealand? *Int J Dent.* 2019;2019.
58. Aboalshamat K, Hou XY, Strodl E. The impact of a self-development coaching programme on medical and dental students' psychological health and

- academic performance: A randomised controlled trial. BMC Med Educ [Internet]. 2015;15(1):1-13.
59. Braun SE, Deeb G, Carrico C, Kinser PA. Brief Yoga Intervention for Dental and Dental Hygiene Students: A Feasibility and Acceptability Study. J Evidence-Based Integr Med. 2019;24:1-7.
  60. Adams DF. The Embedded Counseling Model: An Application to Dental Students. J Dent Educ. 2017;81(1):29-35.