ACCULTURATIVE STRESS, SOCIAL SUPPORT AND ORAL HEALTH RELATED QUALITY OF LIFE AMONG INTERNATIONAL GRADUATE STUDENTS IN MALAYSIAN PUBLIC UNIVERSITIES

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ABSTRACT

Background: Oral health related quality of life (OHRQoL) reflects the impact of the oral condition on physical, social, and psychological functioning and well-being from an individual's perspective. It is an important health outcome that is influenced by several factors which together are known as the determinants of health. Psychosocial factors are among many other factors that have a crucial role in shaping oral health. Understanding their role in relation to diminished oral health has gained more interest in recent years since such factors could serve as points of intervention for new oral health promotion strategies. **Aim:** This study aimed to investigate the relationship of acculturative stress and social support with the OHRQoL among international graduate students in Malaysian public universities. **Methods:** A total of 312 international graduate students completed a web-based questionnaire, including measures of acculturative stress (ASSIS-36), perceived stress (PSS-4), social support (MSPSS-12), oral health perceptions (global rating item), and oral health-related quality of life (OHRQoL, OIDP-8). The hypotheses of the conceptual model were tested employing structural equation modelling using partial least squares (SEM-PLS) with the support of SmartPLS. **Results:** Twenty-seven percent **(**27.1 %) of the variance in OHRQoL was explained by acculturative stress, perceived stress, social support, and oral health perceptions. The path coefficients between oral health perception and OHRQoL was the strongest (β = - 0.385, $P < 0.001$). Acculturative stress directly influenced OHRQoL (β=0.20, P=0.009), and indirectly through perceived stress (β=0.05, P=0.019). Social support had a moderating effect (t=1.98) on the psychosocial domain of OHRQoL and mediated the relationship between perceived stress and OHRQoL (β=0.046, P= 0.02). The overall predictive power of the model was 23 %. **Conclusion:** Results indicated that acculturative stress, perceived stress, and social support are among the predictors of OHRQoL. Oral health perceptions and

acculturative stress were the most significant predictors that contributed the largest amount to the model. The findings emphasize the potential role of psychosocial factors in relation to oral health. The empirical evidence of this study could facilitate the planning of targeted strategies by incorporating stress reduction and social support enhancement. Such strategies might be a new promising way to enhance OHRQoL since these elements can be modified and response to interventions.

Keywords: OHRQoL - Acculturative stress – Perceived stress- Social support- International students - Malaysia - Structural Equation Modelling

ABSTRAK

Latar Belakang: Kualiti hidup berkaitan kesihatan mulut (OHRQoL) mencerminkan kesan keadaan mulut terhadap fungsi dan kesejahteraan fizikal, sosial, dan psikologi dari perspektif seseorang individu. Ianya adalah merupakan health outcome yang penting yang dipengaruhi oleh beberapa faktor dikenali sebagai penentu kesihatan. Faktor psikososial adalah antara faktor yang mempunyai peranan penting dalam menentukan kesihatan mulut. Memahami peranannya dalam menentukan kesihatan mulut telah mendapat perhatian beberapa tahun kebelakangan ini kerana faktor-faktor tersebut dapat menjadi titik intervensi untuk strategi promosi kesihatan mulut yang baru. **Matlamat**: Kajian ini bertujuan untuk mengkaji hubungan antara stres akulturatif dan sokongan sosial dengan OHRQoL di kalangan pelajar siswazah antarabangsa di universiti awam Malaysia. **Kaedah**: Seramai 312 pelajar siswazah antarabangsa melengkapkan soal selidik berasaskan web, termasuk ukuran stres akulturatif (ASSIS-36), stres umum (PSS-4), sokongan sosial (MSPSS-12), persepsi kesihatan mulut (item penilaian global) dan OHRQoL (OIDP-8). Hipotesis model konseptual diuji menggunakan pemodelan persamaan struktur dengan menggunakan kuasa dua separa (SEM-PLS) dengan sokongan SmartPLS. **Keputusan:** Dua puluh tujuh peratus (27.1%) varians dalam OHRQoL dijelaskan oleh stres akulturatif, stres umum, sokongan sosial dan persepsi kesihatan mulut. Pekali regresi antara persepsi kesihatan mulut dan OHRQoL adalah yang terkuat (β = - 0,385, P <0,001). Stres akulturatif secara langsung mempengaruhi OHRQoL (β = 0.20, P = 0.009), dan secara tidak langsung melalui stres umum (β = 0.05, P = 0.019). Sokongan sosial mempunyai *moderating effect* (t = 1.98) pada domain psikososial OHRQoL dan memediasi hubungan antara stres umum dan OHRQoL (β = 0.046, P = 0.02). Kuasa ramalan keseluruhan model adalah 23%. **Kesimpulan:** Hasil kajian menunjukkan bahawa stres akulturatif, stres umum, dan sokongan sosial adalah antara peramal OHRQoL. Persepsi kesihatan mulut dan stres akulturatif adalah peramal paling

signifikan dan penyumbang terbesar pada model. Hasil kajian mendapati terdapat perkaitan antara faktor psikososial dengan kesihatan mulut. Bukti empirikal kajian ini dapat membantu di dalam perancangan strategi yang disasarkan dengan memasukkan pengurangan stres dan peningkatan sokongan sosial. Strategi sedemikian merupakan cara yang dapat meningkatkan OHRQoL kerana elemen-elemen ini dapat diubah suai dan bertindak balas terhadap intervensi.

Kata Kunci: OHRQoL – Stres Pembudayaan – Stres Tanggapan – Sokongan sosial – Pelajar antarabangsa - Malaysia – Pemodelan Persamaan Struktur

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LIST OF ABBREVIATIONS

ACS:	Acculturative Stress
ASSIS:	Acculturative Stress Scale for International Students
AVE:	Average Variance Extracted
CMB:	Common Methods Bias
HTMT:	HeteroTrait-MonoTrait ratio of correlations
MGA:	Multi Group Analysis
MOE:	Ministry of Education
MSPSS:	Multidimensional Scale of Perceived Social Support
OHP:	Oral Health Perceptions
OHRQoL:	Oral Health Related Quality of Life
OIDP:	Oral Impact of Daily Performances
PLS-SEM:	Partial Least Square Structural Equation Modelling
PS :	Perceived Stress
PSS:	Perceived Stress Scale
SS:	Social Support
VIF:	Variance Inflation Factor

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CHAPTER 1: INTRODUCTION

1.1. Background

To continue a postgraduate study overseas is a stressful life event in which international students may experience additional stress besides the rigours of postgraduate education that may arise from differences in environment and culture in the host country, e.g., different language, discrimination, culture shocks, loneliness, and lack of social support (Ogunsanya, Bamgbade, Thach, Sudhapalli, & Rascati, 2018). Such stressors experienced by international students could lead to acculturative stress. The concept of acculturative stress refers to "one kind of stress, that in which the stressors are identified as having their source in the process of acculturation" (Berry, Kim, Minde, & Mok, 1987).

Acculturative stress was suggested to be higher in international students compared to permanently settled groups (e.g., immigrants, ethnic minorities). This was mainly owed to the transient nature of their stay, the limit of the resources available compared to their counterpart local students, the absence of social support, in addition to experiencing academic challenges (Berry et al., 1987). Literature indicates that acculturative stress could adversely impact the psychological and the sociocultural adaptation with unclear manifestation that can be displayed in many ways, i.e., it can cause somatic complaints like fatigue, appetite loss, headaches, gastrointestinal problems, and sleep disturbance (Mori, 2000). In addition, many studies reported the acculturative stress impact on the health-related quality of life (HRQoL) (Bhandari, 2012; He, Lopez, & Leigh, 2012; Khawaja & Dempsey, 2008; Mori, 2000; Ogunsanya et al., 2018; Salgado, Castañeda, Talavera, & Lindsay, 2012).

Social support is the other crucial concern for international students due to separation from familiar social networks. The literature provides strong evidence for the social

support role in stress reduction, specifically the acculturative stress (Baba & Hosoda, 2014; Zhang, & Goodson, 2011). Also, in relation to oral health outcomes, many studies reported positive associations with social support (Dahlan, Ghazal, Saltaji, Salami, & Amin, 2019).

Oral health is an integral part of general health and wellbeing. Oral health related quality of life (OHRQoL) has been identified as an essential part of the Global Oral Health Program (WHO, 2003). In addition to being an important health outcome that is determined by multiple factors. OHRQoL was defined by the National Institute of Dental and Craniofacial Research (NIDCR) in the US Surgeon Generals Report (2000) as "a multidimensional construct that reflects (among other things) people's comfort when eating, sleeping, and engaging in social interaction; their self-esteem; and their satisfaction with respect to their oral health." OHRQoL is representing individual's perceptions about important factors' impact on their everyday life, and its multidimensionality implies effects of different factors other than clinical status (Baiju, Peter, Varghese, & Sivaram, 2017; Bennadi & Reddy, 2013).

Many studies on the potential determinants of OHRQoL mainly addressed the clinical, socio-economic, and demographic characteristics, which may explain only part of the variation of the OHRQoL (Alrumyyan, Quwayhis, Meaigel, Almedlej, Alolaiq, Bin Nafesah et al., 2020; Alshammari, Baseer, Ingle, Assery, & Al Khadhari, 2018; Collins, Elías, Brache, Veras, Ogando, Toro et al., 2019; Yamane-Takeuchi, Ekuni, Mizutani, Kataoka, Taniguchi-Tabata, Azuma et al., 2016). However, a growing interest directed towards the roles of psychosocial factors as determinants of OHRQoL.

In this context, the researcher hypothesised that international students might encounter additional stress, i.e., acculturative stress which can affect their OHRQoL, and social support might mitigate such stress. Thus, this research aims to investigate the relationship

of acculturative stress and social support with the OHRQoL among international graduate students in Malaysian public universities.

1.2. Problem Statement

Universities in Malaysia host a considerable number of international students, that make them a valuable financial source to universities in a developed country like Malaysia. In 2007, Malaysia initiated the National Education Strategic Plan (NESP), where one of these strategies is the higher education internationalisation to brand Malaysia as a hub of education. Until March 2019, the enrolment of international students in Malaysia has reached 127,583, of which 30% are from public higher education institutions (MOHE, 2019).

The challenge to continue their education while adjusting to a different environment and culture may expose them to acculturative stress (Smith & Khawaja, 2011). The acculturative stress impact on systemic health has been extensively investigated, but little is known about oral health. Studies throughout the literature reported only the relationships between different oral health outcomes and general perceived stress (Marcenes & Sheiham, 1992; Sabbah, Watt, Sheiham, & Tsakos, 2008; Vasiliou, Shankardass, Nisenbaum, & Quiñonez, 2016). It has been suggested that the cultural changes encountered by individuals in a new country may have either beneficial or deleterious impact on their oral health and oral health-related behaviours. However, the available oral health related literature focused mainly on acculturation rather than acculturative stress, in addition, the majority used unidimensional proxies to measure acculturation, i.e., host language proficiency, age at migration, and length of residency (Dahlan, Badri, Saltaji, & Amin, 2019; Gao & McGrath, 2011).

Besides, acculturation and acculturative stress were suggested to influence health outcomes differently. Some studies demonstrated that low acculturation is often

associated with low acculturative stress and better health outcomes. While other findings revealed that low acculturation is associated with higher stress and poorer health, as noted by Garcia, Wilborn, and Mangold (2017). Hence, it is of great importance to "isolate" the unique effects of acculturative stress from acculturation (Rudmin, 2009a). However, when it is related to the risk of negative health outcomes, the acculturative stress was suggested to be the more proximal and direct measure (Caplan, 2007; Garcia et al., 2017). As the greatest impact on health is owed to the stress of adapting to the new culture rather than the acculturation process itself (Caplan, 2007).

Moreover, the oral health impact of acculturation in international students has been under-reported, while it has been widely discussed in immigrants and ethnic minority groups. Hence, the evidence is fragmented and limited when it comes to the oral health implications of acculturation (Gao & McGrath, 2011).

There is a research scarcity in the field of acculturative stress and oral health in general and OHRQoL in specific. Hence, there is a gap in the literature concerning the combined effects of acculturative stress and social support on oral health outcomes. Moreover, a neglected part of the acculturated groups, international students, is yet to be studied.

The shift from traditional dentistry that focused only on the disease to the current modern dentistry which recognises the psychosocial impact on oral health had led to more recognition of the importance of incorporating OHRQoL in the evaluation of oral health (Santos, Celeste, Hilgert, & Hugo, 2015). Assessing oral health related quality of life in international students is, to some extent, an ignored area in dental research. Furthermore, studies investigating the OHRQoL of any international student group are lacking in Malaysia.

To the best of our knowledge, this is the first study to assess the relationship of acculturative stress and social support with the oral health-related quality of life.

Identifying the relationships between these psychosocial factors and OHRQoL is vital, especially in a multicultural Asian country like Malaysia, with unique characteristics compared to western and eastern cultures.

1.3. Significance of the Study

- The current study will extend the literature and inform future research by shedding light on OHRQoL.
- The findings would help to understand the effect of cultural change as a source of stress i.e. acculturative stress, and its influences on the oral health of international students. Such information would be useful for new approaches to conduct and deliver relevant oral health interventions.
- The gained knowledge is essential to assist higher education authorities to cater to the growing student population by tailoring resources and available services to international students, in addition to organising oral health promotional/ preventive programmes at universities level in collaboration with key persons.
- It would provide further evidence to consider the incorporation of stress reduction techniques in graduate programs to improve health in general and OHRQoL.

1.4.Aim and Objectives

- **Aim**

To investigate the relationship of acculturative stress and social support with the OHRQoL among international graduate students in Malaysian public universities.

- **Specific objectives**

1. To assess OHRQoL among international graduate students in Malaysian public universities.
2. To assess oral health perceptions among international graduate students in Malaysian public universities.

3. To assess acculturative stress among international graduate students in Malaysian public universities.
4. To assess general perceived stress among international graduate students in Malaysian public universities.
5. To assess social support among international graduate students in Malaysian public universities.
6. To examine if any associations exist between individual characteristics and acculturative stress, perceived stress social support, and OHRQoL
7. To investigate relationships between acculturative stress, perceived stress, social support, oral health perceptions and OHRQoL.

1.5.Research Questions

The research questions of this study are as follow:

1- Do the international graduate students in Malaysian public universities have good OHRQoL?
2- Do international graduate students in Malaysian public universities have good perceived oral health?
3- What are the levels of acculturative stress among international graduate students in Malaysian public universities?
4- What are the levels of perceived stress among international graduate students in Malaysian public universities?
5- What are the levels of social support among international graduate students in Malaysian public universities?
6- Are there associations between individual characteristics and acculturative stress, perceived stress, social support, and OHRQoL among international graduate students in Malaysian public universities?

7- Are there relationships between acculturative stress, perceived stress, social support, oral health perceptions and OHRQoL?

1.6. Research Hypotheses

For specific objectives 7, the research hypotheses are listed in Table1.1.

Table 1.1: Research hypotheses

Factors	Hypotheses
Acculturative stress and OHRQoL	H1: Higher acculturative stress is positively related to higher OHRQoL impact (poor OHRQoL).
Social support and OHRQoL	H2: Higher social support is negatively related to higher OHRQoL impact (poor OHRQoL).
Acculturative stress and social support	H3: Acculturative stress is negatively related to social support.
Acculturative stress and oral health perceptions	H4: Acculturative stress is negatively related to oral health perceptions.
Oral health perceptions and OHRQoL	H5: Oral health perception is negatively related to OHRQoL impact.
Social support and oral health perceptions	H6: social support is positively related to oral health perceptions.
social support and perceived stress	H7: social support is negatively related to perceived stress.
Perceived stress and acculturative stress	H8: Perceived stress is positively related to acculturative stress.
Perceived stress and oral health perceptions	H9: Perceived stress is negatively related to oral health perceptions.
Perceived stress and OHRQoL	H10: Perceived stress is positively related to OHRQoL impact.
Social support, acculturative stress, and OHRQoL	H11a: Social support significantly moderates the relationship between Acculturative stress and OHRQoL. H11b: Social support significantly mediates the relationship between Acculturative stress and OHRQoL.
Social support, perceived stress, and OHRQoL	H12a: Social support significantly moderates the relationship between Perceived stress and OHRQoL. H12b: Social support significantly mediates the relationship between Perceived stress and OHRQoL.

1.7.Thesis Structure

This thesis includes five chapters. The first chapter outlined the background of the study, problem statement, study significance, aim and specific objectives of the study, research questions, and hypothesis. Next, the second chapter provided a review of relevant literature and the conceptual framework. Then, the third chapter detailed the methodology, followed by the fourth chapter, which reported the results. The last chapter discussed the findings and highlighted the conclusions and recommendation for further studies.

CHAPTER 2: LITERATURE REVIEW

2.1. International Students in Malaysia

International students are defined as "those who have left their country and moved to another country with an objective of studying" (UNESCO Institute for Statistics (UIS), 2009). This definition has been supported by the Organisation for Economic Co-operation and Development (OECD, 2008), which also differentiated between foreign students and international students by the action of "cross border-mobility".

Internationalisation of higher education is “the process of integrating an international, intercultural, and global dimension into the purpose, functions (teaching, research, service) and delivery of higher education” (Knight, 2004). It has its impact on higher education and has become an essential strategic component of universities all over the world, in addition to being a key contributor to the economic environment (Ayoubi & Massoud, 2007). The internationalisation has led to changes in higher education institutions in terms of enhancing the international students' support systems and providing more favourable, comprehensive curriculum, and highly encouraging environment in an academic setting (Sirat, 2008).

In the last decade, Malaysia has been promoted as a hub for higher education, with Malaysian institutions efforts directed towards attracting international students from all over the world. The dedicated efforts of Ministry of Higher Education (MOHE) have successfully made Malaysia a well-known provider of international higher education and famous regional student hub (Knight & Morshidi, 2011). The government policy aimed at raising international students' enrolment in higher education institutions while providing high-quality education. This aim was achieved through supporting Malaysia's international education brand and cooperating with overseas institutions.

In 2007, Malaysia initiated the National Education Strategic Plan (NESP) for expanding internationalisation of higher education, and by 2025, it is expected to earn RM60 billion and attract 250,000 international students. The country is on track to attain its target, until March 2019, international students' enrolment has reached 127,583, of which 30% are from public universities. Until December 2018, there were 37,353 international students pursuing their postgraduate degrees, of whom 25,654 (68%) are in public universities (MOHE, 2019).

In 2017, Malaysia jumped in the rankings of Universities 21 (U21) from 36th to 25th place out of 50 national systems (MOHE, 2017). Malaysia has climbed seven places in Output since 2012, with being the second-highest improved country (MOHE, 2017).

In Malaysia, there are 20 public universities and 497 Private Higher Education Institutions (PHEI). Students are attracted to pursue their higher education in Malaysia from different cultural backgrounds of 163 countries around the world. Large proportions of international students are from China, Egypt, India, Indonesia, Libya, Iraq, Jordan, Nigeria, Iran, Oman, Pakistan, Yemen, Saudi Arabia, Sudan, and Thailand. (MOHE, 2017). These countries represent three main geographical areas of Asia, Africa, and the Middle East. The top 10 sending countries in 2017 as reported by MOHE, Bangladesh, China, Nigeria, Indonesia, Yemen, Pakistan, Libya, Iraq, Sudan, and Iran.

Recently, the number of Arabic students in Malaysia have been increasing steadily. Although no statistical number of Arab students in Malaysia was officially documented, this growing number is noteworthy especially after the event of "9/11" in 2001 (Al-Zubaidi & Rechards, 2010; Knight & Morshidi, 2011) and more recently due to the Arabic spring with the resultant political & security change. Yusoff (2014) mentioned that "most of the postgraduate international students in Malaysia are From the Middle East and African countries" as cited in Saravanan, Mohamad, & Alias (2019). Many

Arabic student are attracted to public universities around Kuala Lumpur, e.g. Malaysia's International Islamic University, where the medium of instruction is both in Arabic and English.

For the last two years (2018-2019), Kuala Lumper was ranked as the second-best city for students in Asia by QS. According to UNESCO, the main pulling factors are the wide range of offered programmes, learning environment, the quality of education, affordable cost, cultural comforts, and English language as a medium of instruction (UNESCO, 2019). Therefore, Malaysia is turned into a centre of educational excellence which helps to promote the country as an international education hub.

2.2. Oral Health Related Quality of Life (OHRQoL)

2.2.1. Concept, definitions & dimensions

Quality of life (QoL) concept is generally concerned with the degree to which a person enjoys the important possibilities of life. According to WHO Quality of Life group (1994), it was explained in details as "...an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, and standards and concerns".

The recognition of health related quality of life started since 1948 when the WHO extended the definition of health to mean "a complete state of physical, mental, and social wellbeing, and not just the absence of infirmity". That resulted in a significant conceptual change from the biomedical (disease) to a biopsychosocial model (Baiju et al., 2017). The oral health concept as well followed this shift from the biologist concept to the psychosocial concepts, which consider other essential roles of the oral cavity, i.e. self-esteem, and communication. This has led to change the focus from the "downstream approach" to the "upstream approach" that addresses the cause of the cause, i.e. the broader determinants of oral health (Watt, 2007).

Oral health problems are considered major public health problems due to its prevalence, consequences on quality of life and cost burden on society. The clinical indicators of oral problems, e.g. periodontal diseases or dental caries, were not fully reflecting the novel concept of oral health, they only measure the disease presence and severity (Baiju et al., 2017). According to this concept, oral health has social, economic and psychological consequences, which definitely have an impact on the quality of life.

Several theoretical models have been proposed to elucidate this concept. It was David Locker who first developed a conceptual model to describe the pathways through which oral conditions/diseases influence the quality of life, based on WHO International Classification of Impairment, Disability and Handicap (ICIDH) model (Locker, 1988). According to Locker (1988) "concepts of health and quality of life are: 1) difficult to define; 2) multidimensional and complex; 3) predominantly subjective; 4) constantly evolving; and 5) vary according to social, cultural, political and practical contexts", in addition to confirming that oral health and general health are indivisible.

There is no universal definition for the OHRQoL, as several definitions were suggested by different researchers and groups. For instance, Gift, Atchison, and Dayton (1997) defined OHRQoL as "Self-report specifically pertaining to oral health capturing both the functional, social and psychological impacts of oral disease". While Locker, Clarke, and Payne (2000) defined it as "The extent to which oral disorders affect the functioning and psychosocial wellbeing". It was also defined as "Symptoms and functional and psychosocial impacts that emanate from oral diseases and disorders" (Locker, Matear, Stephens, & Jokovic, 2002). One of the existing definitions considers OHRQoL as "An individual's assessment of how the following affect his or her wellbeing: functional factors, psychological factors, social factors and experience of pain/discomfort in relation to orofacial concerns" (Inglehart & Bagramian, 2002). On the other hand, the National Institute of Dental and Craniofacial Research (NIDCR) in US Surgeon Generals Report

(2000) defined OHRQoL as "a multidimensional construct that reflects (among other things) people's comfort when eating, sleeping, and engaging in social interaction; their self-esteem; and their satisfaction with respect to their oral health".

All mentioned definitions are more or less related; however, in the context of this thesis, a more comprehensive and straightforward definition suggested by Locker and Allen (2007) will be adopted. OHRQoL is "the impact of oral disease and disorders on aspects of everyday life that a patient or person values, that are of sufficient magnitude, in terms of frequency, severity or duration to affect their experience and perception of their life overall" (Locker & Allen, 2007). Furthermore, Locker and Allen (2007) defined the difference between OHRQoL and subjective oral health while the latter describes the individual's current oral health status; the former is a subjective evaluation of that status.

The dimensions of OHRQoL that are included in the majority of the measures are relying on conceptual models. Locker's conceptual model for the oral disease included five sequentially related concepts, namely impairment, functional limitation, pain/discomfort, disability and handicap (Figure 2.1).

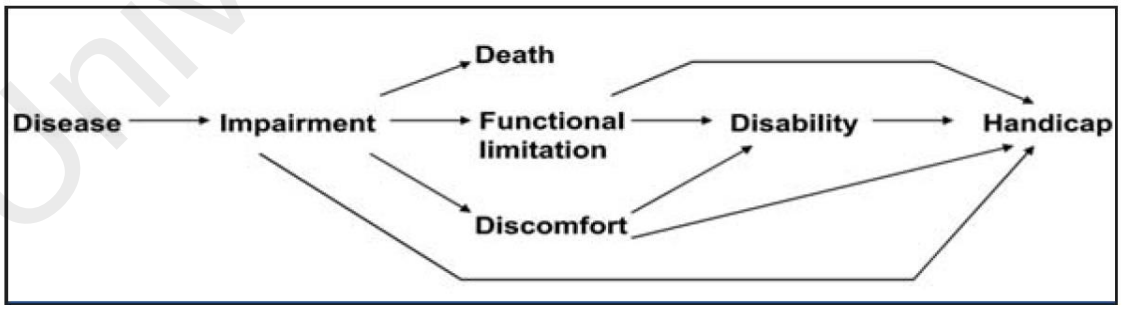


Figure 2.1: Lockers adaptation of WHO ICIDH model – 1988.

The functional status dimension was further categorised into social, psychological and physical. Figure 2.2 shows the dimensions of OHRQoL in commonly used measures with specific examples of items related to each dimension.

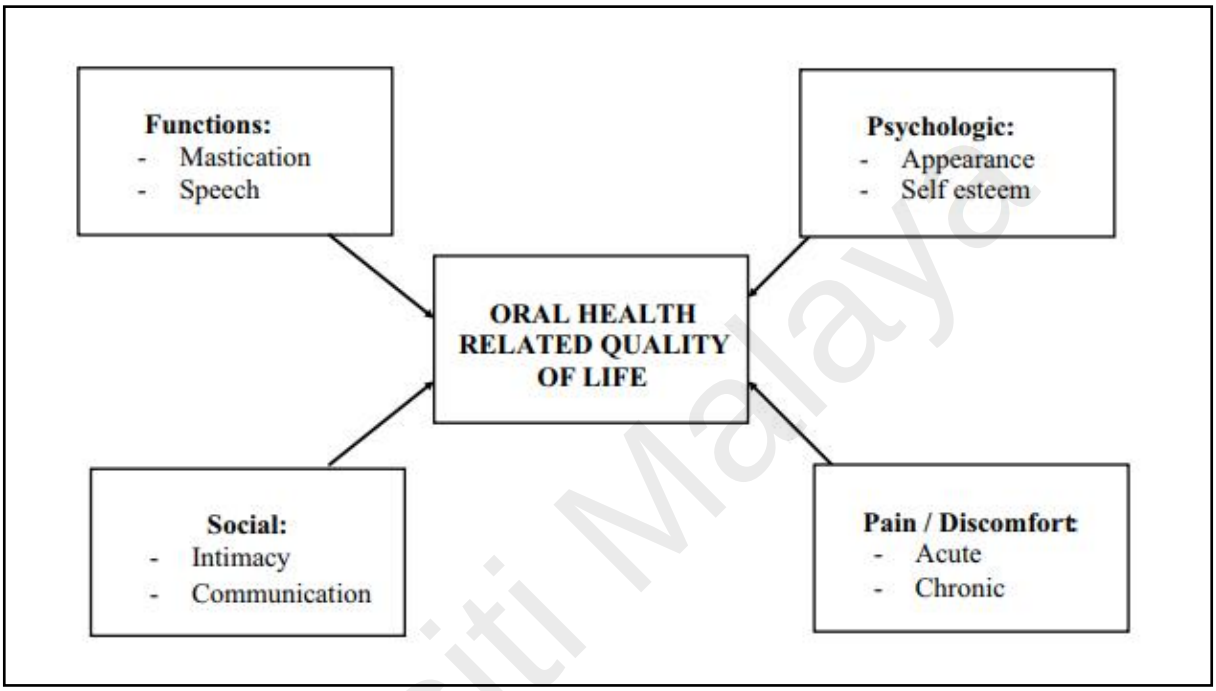


Figure 2.2: Dimensions comprising oral health-related quality of life (OHRQoL)
Source: Bennadi & Reddy (2013)

2.2.2. Determinants of OHRQoL

OHRQoL is an important health outcome that is influenced by several factors. In general, the health determinants include genetic predisposition, personal lifestyles and behaviours, physical environment, psychosocial, cultural and economic factors (Gupta, Robinson, Marya, & Baker, 2015). OHRQoL is representing individual's perceptions about important factors' impact on their everyday life, and its multidimensionality implies effects of different factors other than clinical status (Baiju et al., 2017; Bennadi & Reddy, 2013).

Previous studies on the potential determinants of OHRQoL mainly addressed the clinical, socio-economic and demographic characteristics, which may explain only part of the variation of the OHRQoL. For example, researches relating OHRQoL with the clinical status either did not find or found weak relationships (Agardh, Ahlbom, Andersson, Efendic, Grill, Hallqvist et al., 2003; Baker, Mat, & Robinson, 2010; Gupta et al., 2015; Gururatana, Baker, & Robinson, 2013; Nammontri, Robinson, & Baker, 2012; Weissbecker, Salmon, Studts, Floyd, Dedert, & Sephton, 2002). It was suggested that individual and environmental factors might indirectly intervene in this relationship. For example, socio-economic status, which has been identified as important determinants of OHRQoL, was found to mediate relationships between OHRQoL and clinical status (Nammontri et al. 2013). Such findings further support that clinical status alone cannot explain the effect of the mouth on everyday life.

Recently, a growing interest directed towards the roles of psychosocial factors as determinants of OHRQoL. Among the psychosocial factors that were empirically evident to have effects on OHRQoL are the sense of coherence, self-efficacy, locus of control, stress, and social support (Baker, Mat, & Robinson, 2010; Foster Page, Thomson, Ukra, & Baker, 2013; Gupta et al., 2015; Holde, Baker, & Jönsson, 2018; Jönsson, Holde, & Baker, 2020; Nammontri, Robinson, & Baker, 2013; Pakpour, Lin, Kumar, Fridlund, & Jansson, 2018).

These psychosocial factors were suggested to have a vital role in addressing the upstream or the wider social determinants of health. Such factors could assist in tackling oral health inequalities by identifying what sustains health in adverse and stressful situations (Wallerstein, 1992; Wallerstein, 2002).

2.2.3. Measuring OHRQoL

The last three decades witnessed a remarkable interest in the development and application of patients self-reported tools that may measure the functional, social, and emotional impacts of oral diseases on the quality of life (Baiju et al., 2017). The OHRQoL assessment entails measuring the impact of oral disease and its subsequent treatment from the patient's perspective. Cohen and Jago (1976) advocated and reported the development of self-reported measures for the psychosocial impact of oral health for the first time. Instruments that capture patient's perspective were initially referred to as socio-dental indicators or social impacts of oral diseases or measures of oral health status (Locker, 1988) which were then replaced by the term OHRQoL measures in the late 1990s (Baiju et al., 2017).

Many tools were developed and varied widely in terms of item format (statement/question), the response format (Likert type/ score), items number, the population and the context of its use. These measures broadly categorised into specific and generic. The specific instruments are designed for either specific conditions (e.g. malocclusion) or specific populations (e.g. edentulous). On the other hand, the generic instruments evaluate the impact of oral health in general, e.g. OHIP or OIDP. The obtained results of these tools are usually reported as scores that indicate the severity of the outcome measures.

There are certain criteria for a good OHRQoL instrument. It should be based on a relevant theoretical model, easy to use with a proper scoring system, brief, and short (Sheiham & Spencer, 1997). Besides, these measures must have some properties to be used for assessing the OHRQoL, i.e. validity, reliability, responsiveness to change, interpretability, appropriateness and acceptability (Inglehart & Bagramian, 2002). Table 2.1 presents different OHRQoL measures.

Table 2.1: Different OHRQoL measures.

Instrument/ Authors	Measured dimensions	Items No.	Response format
Socio-dental scale Cushing et al., 1986	Chewing, talking, smiling, laughing, pain, appearance	14	Yes/no
RAND Dental index Gooch et al, 1989	Pain, worry, conversation	3	Four categories; "not at all" to "a great deal."
Sickness Impact Profile Reisine et al., 1989	Rest, home tasks, social interaction, speech, intellectual, work, leisure	73	check items that described the functional status and related to their health status
Geriatric Oral Health Assessment Index (GOHAI) Atchison and Dolan, 1990	Chewing, eating, speech, social contacts, pain, appearance, worry, and self-consciousness.	12	Six categories; "always - never."
Dental Impact Profile (DIP) Strauss and Hunt, 1993	Appearance, eating, speech, confidence, happiness, social life, and relationships.	25	Three categories; good effect, bad effect, no effect
Oral Health Impact Profile (OHIP) Slade and Spencer, 1994	Function, pain, physical disability, psychological disability, social disability, and handicap.	49	Five categories; "very often – never"
Subjective Oral Health Status Indicators (SOHSI) Locker and Miller, 1994	Chewing, speaking, symptoms, eating, communication, and social relations.	42	Various: Yes/no Five categories; "all the time-never."
Oral Health Quality of Life Inventory Saunders et al., 1995	Oral health (15 items), nutrition, self-rated oral health, and overall quality of life.	54	Part A: 4 categories "not at all" to "a great deal" Part B: 4 categories "unhappy-happy."
Dental Impact on Daily Living (DIDL) Leao and Sheiham, 1995	Comfort, appearance, pain, daily activities, eating	36	Various depending on question format
Oral Health-related Quality of Life Kressin et al., 1996	Daily activities, social activities, and conversation.	3	Six categories; "all of the time" to "none of the time."
Oral Impact on Daily Performance (OIDP) Adulyanon & Sheiham, 1996	Performance in eating, speaking, oral hygiene, sleeping, appearance, emotion.	8	A-Frequency: 5 categories never affected-nearly every day B-Severity: 5 categories none -very sever
Oral Health-Related Quality of Life. (OHRQoL-UK). McGrath & Bedi, 2001	Eating, appearance, speech, health, relax/sleep, social, romance, smile/laugh, confidence, carefree, mood, work, finance, personality, comfort, breath.	16	A. Effect: 4 categories bad -good B. Impact: 5 categories None-extreme

Table 2.1: (Continued)

Instrument/ Authors	Measured dimensions	Items No.	Response format
The prosthetic quality of life (PQL) Montero et al., 2011	prosthetic fit, chewing, the sensation of foreign body in the mouth, aesthetics, communication, realism of the prosthesis, noticeability of the prosthesis, hygiene, food impaction, functional comfort and self-confidence	11	Five categories: Yes, a lot (1), Yes, slightly (2), It is more or less the same (3), I think it is worse (4), It is much worse (5).
Quality of Life with Implant-Prostheses' (QoLIP-10) Preciado et al., 2013	Pain, chewing difficulty, worry/concern, communication/social relations, activities of daily living, speaking difficulty, oral hygiene difficulty, and satisfaction (smile, appearance & realism of the prosthesis)	10	Five categories: Never-very often

2.3. Acculturation & Acculturative Stress

2.3.1. Acculturation

The Social Science Research Council (SSRC) defined acculturation as "the acculturative change that is a consequence of direct cultural transmission between two or more cultural systems, which is influenced by ecological as well as demographic factors" (SSRC, 1954). While Berry (2006) defined the term acculturation as "dual process of cultural and psychological change that takes place as a result of contact between two or more cultural groups and their individual members". The most common definition of acculturation is "phenomena which result when groups of individuals having different cultures come into continuous first-hand contact, with subsequent changes in the original culture patterns of either or both groups" (Sam & Berry, 2010).

Acculturating groups are classified into five different groups that include ethnic groups, native people, immigrants, refugees, and sojourners (Berry, Kim, & Boski, 1988). According to this classification, sojourners are persons who are in a situation of temporary cultural contacts such as diplomatic personnel and international students.

Acculturation involves different processes and outcomes; it is affected by the characteristics of both cultures and individual members (Berry, 2006). Which means it is not the same for all; different individuals usually follow different ways to deal with the acculturation, i.e. how they acculturate, and how well they adapt to the changes. As a result, the outcomes in response to their acculturating experiences are also different (Sam & Berry, 2010).

There are four different modes of acculturation as a function of two issues; the degree to which the individual is able to balance the original culture maintenance and the contact with other groups in the larger society. In other words, to what level individuals preserve their home culture identity, and to what extent they participate in the host society. The resultant acculturation modes are integration, assimilation, separation, and marginalisation,

The integration mode occurs when individuals preserve their original culture while engaged in the dominant culture. Assimilation mode occurs when individuals do not wish to preserve their cultural identity and look for close contact/ relations with the dominant culture. On the other hand, the separation mode occurs when individuals place a high value on preserving their home culture and avoid contact with members of the new society. Finally, the marginalisation mode occurs when there is lack of interest in both (cultural maintenance and interaction with host culture), often due to discrimination or exclusion (Berry, Bouvy, Van de Vijver, Boski, & Schmitz, 1994).

2.3.2. Acculturative stress

One of the possible outcomes associated with the process of acculturation that might impact the persons' choice of the acculturation modes/strategies is acculturative stress. The degree of variation in such stress depends on the degree of similarities and differences between the two cultures. The more diverse the host culture compared to the home

culture, the higher is the acculturative stress level, which in turn influences the choice of acculturation strategies (Berry, Kim, Minde, & Mok, 1987; Desa, Yusooff, & Kadir, 2012).

The term "acculturative stress" was first introduced by Berry (1970) as an alternate term to "culture shock" that was appeared in the sixties (Berry, 2006). According to Berry et al. (1987), the term acculturative stress means "one kind of stress in which the stressors are identified as having their source in the process of acculturation". It is also defined as "a reaction to the challenges encountered during the acculturation process" (Berry, 2003). In the International Encyclopedia of the Social & Behavioral Sciences **(**2015) acculturative stress defined as "a stress reaction in response to life events that are rooted in the experience of acculturation".

According to Berry et al. (1987), acculturative stress is a "more specific concept than acculturation and refers to a reduction in health status resulting from the process of acculturation". Acculturation is sometimes used as a proxy for acculturative stress, but the empirical evidence has indicated that it is the stress of adapting to the new life which has the most significant impact on the psychological and physical health rather than the acculturation process itself (Caplan, 2007).

The theoretical conception of acculturation and stress was introduced by Berry et al. (1987). According to this conception, the acculturation process may lead to substantial impact by the collective effect of stressors and result in "acculturative stress". The association between acculturation and stress is moderated by a number of factors (Berry et al., 1987). A framework for acculturative stress understanding is illustrated in Figure 2.3.

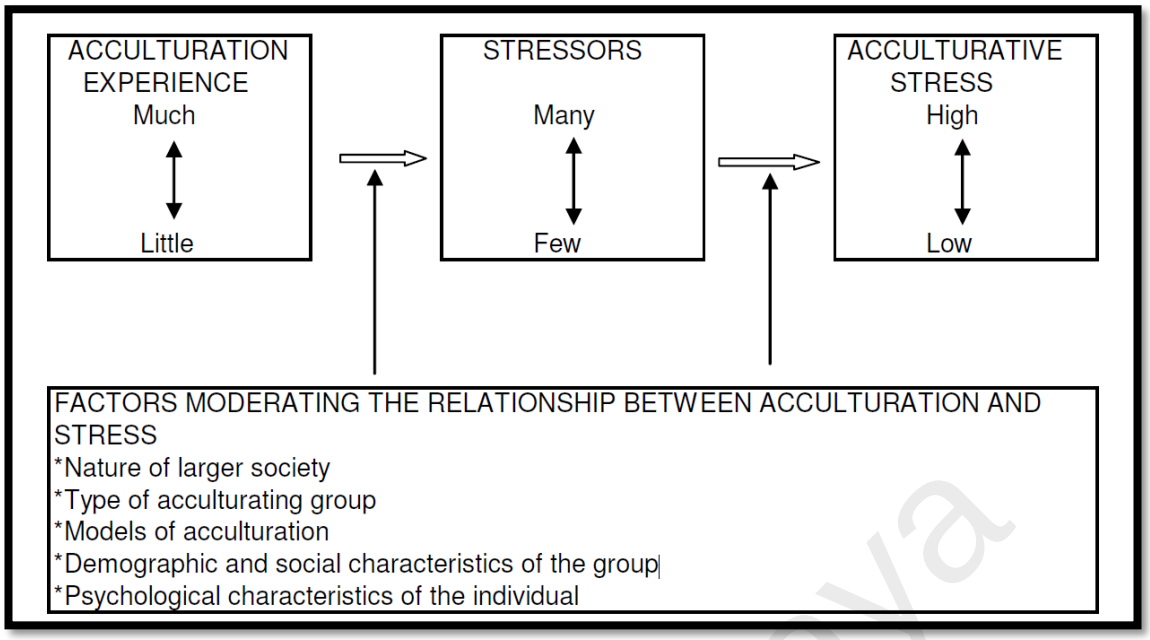


Figure 2.3. Berry's theoretical conception of acculturation and acculturative stress. Source: Berry et al. (1987).

The first box on the left side "acculturation experience" means a particular situation, e.g. migrant communities, or sojourners, in which the degree of participation and experiencing changes is varying from little to much. The second mid box shows the stressors that might be encountered during the experiences of acculturation. These stressors also vary from few to many, depending on how different individuals perceive the acculturative changes. The third box on the right side represents different levels of acculturative stress as an outcome of acculturation experience and stressors.

The association between the main concepts; acculturative experience, stressors and acculturative stress, is moderated by several factors that may be viewed as sources of variation at both group and individual levels. The first factor is the host society nature, e.g. pluralistic society with multicultural ideology or a single cultural standard. The second factor is the acculturating group, e.g. refugees, Immigrants, or sojourners. The third factor is the mode of acculturation adopted by an individual in the new environment, i.e. integration, assimilation, separation, and marginalisation.

Additional moderating factors included the socio-demographic and psychological characteristics of the individuals/ group, e.g. gender, age, socio-economic status, cognitive style, length of stay in the host culture, and prior intercultural experiences (Berry et al., 1987). It is important to note that all these factors can influence the direction and degree of the relationships between the main concepts.

Acculturative stress is always a probable outcome of acculturation, but its possibility of occurrence can be much reduced if maintenance of one's traditional culture and participation in the host society is balanced and encouraged by policy and practice of the larger society (Berry et al., 1994).

2.3.3. Acculturative stress in international students

It is sometimes very difficult for many individuals to adjust to a new culture, especially if it is the first time away from the home country. To continue a postgraduate study overseas is a stressful life event in which international students may experience additional stress besides the rigours of postgraduate education that may arise from environmental and cultural differences of the host country. In addition to academic burdens that may result from the change in academic policies, or different teaching techniques, different educational requirements, new nature of relationships among students and teachers and also new relationships between students, hence leading to academic stress.

Literature indicated that acculturation is a major challenge facing international students. A new culture often challenges international students in many ways; homesickness, loneliness, discrimination, language barriers, adjustment to new weather, religion differences, effects of social adjustment, culture shocks, and separation from social support systems all are common problem may be experienced by newcomers to a host county culturally different from theirs (Ogunsanya et al., 2018). Such experienced stressors can result in a type of stress known as "acculturative stress." (Berry, 1997).

Acculturative stress is well known to be the highest among refugee immigrants; however, findings indicated that international students experienced similar levels of acculturative stress as well (Berry et al., 1988). Although of their academic success, international students were suggested to be highly susceptible to stress due to cross-cultural changes (Akhtar & Kröner-Herwig, 2015). Besides, acculturative stress and mental health problems were found to be higher in international students groups compared to permanently settled groups. This is mainly owed to the transient nature of stay, limited personal resources and absence of social support. In addition to the fact that they are experiencing academic challenges while lacking the resources available to the local students (Sandhu & Asrabadi, 1998). The collective effect of such stressors predisposes the students to the detrimental effects of acculturative stress.

Previous studies indicated that the chance for international students to face psychological and psychiatric problems when experiencing a new situation is around 15 - 25% (Leong & Chou, 2002). Furthermore, it was found that about 60-70 % of international students suffer from acculturative stress which may lead them to become socially isolated from their peers (Rajab, Rahman, Panatik, & Mansor, 2014).

It is imperative to understand the acculturative stress of the international students in universities, in order to offer them the adequate support socially and financially (Nasirudeen, Josephine, Adeline, Seng, & Ling, 2014). Many studies have been conducted in various countries to better understand students' acculturative stress. For example, Hofmann (2010) surveyed 883 international students studying at 11 public universities in the State of Ohio, USA to determine acculturative stress using a self-constructed instrument that consisted of twenty items under four subscales of acculturative stress; namely; social, academic, physical and mental, and cultural. The study revealed that more than nine of ten (99.6%) international students experienced some degree of acculturative stress, with an overall mean score of 31.79 (SD= 16.62).

Another study conducted among 562 German students and 652 international in German university to explore the acculturative stress levels using (ASSIS) revealed that the overall acculturative stress levels are slightly higher (M=95.05, SD=26.69) than international students in the USA as indicated by comparable studies (Akhtar, 2012). In Singapore, a study was carried out among 392 international students using the Acculturative Stress Scale for International Students (ASSIS). It was found that the mean of acculturative stress ranged from 88.07 to 101.14, which was interpreted as moderate to high stress (Nasirudeen et al., 2014).

The findings from several studies conducted in Malaysian universities revealed that international students have experienced moderate to high levels of acculturative stress since they have to adapt to the different environment and may encounter uncertainty. For instance, Rajab et al. (2014) assessed the acculturative stress among international undergraduates in Universiti Teknologi Malaysia (UTM), using the Acculturative Stress Scale for International Students (ASSIS). The results revealed that the majority of students are experiencing overall moderate levels of acculturative stress. Another study by Ismail, Ashur, Jamil, Lee, and Mustafa (2016) carried out among 126 international postgraduate students in University Kebangsaan Malaysia Medical Centre (UKMMC) employing Kessler Psychological Distress scale (K10). This study indicated that the overall prevalence of stress was 54.8%, while the severe stress prevalence was (18.3%).

More recently, a study conducted among 404 international postgraduate students from six faculties in University Putra Malaysia (UPM), results indicated 77.7% had moderate acculturative stress (Ye & Juni, 2017). Another study conducted among 370 Indonesian graduate students in public and private universities in Klang Valley area employing ASSIS, the results revealed that more than half (55.4%) of Indonesian students also had moderate acculturative stress, while 26.8% had high acculturative stress levels (Sabrina, 2014).

2.3.4. Sources of acculturative stress in international students

The factors that mostly contribute to acculturative stress of international students, as reported in the literature are summarised as follows:

1. **Homesickness**

   it captures missing and longing for one's beloved home, family and friends, feeling alone, and coping problems, (Stroebe, Van Vliet, Hewstone, & Willis, 2002). According to Sandhu and Asrabadi (1994), homesickness could be problematic for international students who remember and try to maintain their cultures while in the host country. Homesickness is one of the most frequently reported concerns among international students (Gebregergis, 2018). Besides, students who self-report, missing their family and separation anxiety were found to have greater acculturative difficulties (Gebregergis, 2018).

2. **Discrimination and prejudice**

   International students may experience prejudice and discrimination, which can have an impact on their cultural adjustments and psychological health (Mori, 2000). Both intentional and unintentional racial discrimination have been reported by international students in various countries, e.g. USA, Canada, and New Zealand (Eustace, 2007). It was suggested that discrimination is more likely among students who are culturally distant and different from the host countries, for example, African and Asian in the USA (Eustace, 2007). Discrimination might lead to isolation, loneliness, and loss of interest to socialise with people from the host culture (Klomegah, 2006).

3. **Isolation/alienation**

   Friendships and relationships issues could be a source of stress due to cross-cultural differences; as a result, isolation and loneliness feeling may arise (Rajapaksa & Dundes, 2002). This, in turn, may lead international students to

prefer interaction with students from their home country (co-nationals), in order to feel a sense of belonging (Eustace, 2007).

4. **Culture shock (Stress due to change)**

Another frequent stressor among international students is the culture shock, which is defined as "a psychological reaction to unfamiliar cultural norms encountered in unfamiliar environments" (Furnham & Bochner, 1986) as cited in Akhtar (2012). It also means confusion regarding the practices of the host culture because of incompatibility and cultural distance (Bai, 2012). The culture shock was reported by the majority of international students as a common problem (Yang, Zhang, & Sheldon, 2018).

5. **Hatred, guilt and fear**

According to Sandhu & Asrabadi (1994), hate is one of the possible outcomes of rejection by individuals from the host culture. While fear of unknown may be experienced due to worries and insecurities (Sandhu & Asrabadi, 1994). On the other hand, guilt feeling could arise from the integration with (adopting) the host cultural values (Sandu & Asrabadi, 1994). All three factors could affect the level of acculturative stress.

6. **Miscellaneous**

There are also additional important factors that capture special concerns of international students but do not fall under one particular factor (Sandhu & Asrabadi, 1994). These concerns add to the international students' acculturative stress and include; feeling of inferiority, lack of confidence to communicate in English, lack of sense of belongingness, feeling of intimidation to participate in social events, and doubts whether to stay or go back home after completing the study.

Many studies were conducted to recognise the contributing causes that lead to the feeling of acculturative stress in international students. The top three stated factors among 883 international students studying at 11 public universities in the State of Ohio, USA were loneliness, homesickness, and feeling disconnected, whereas difficulty related to religious differences and mental health issues were the least frequently reported factors (Hofmann, 2010).

Among international students in Germany, homesickness was the most frequently stated stressor, while the least reported was fear of being insecure (Akhtar, 2012). In Singapore were found to be mostly related to financial issues, lack of English language proficiency, and social interactions (Nasirudeen et al., 2014). More recently, a study in China among 506 international university students revealed that the top three leading sources of acculturative stress were homesickness, culture shock and perceived discrimination, whereas perceived hate and fear were reported to be the least stressors (Gebregergis, 2018).

Regarding the sources of acculturative stress in Malaysian universities, one study conducted by Nadzir (2011) to identify the sources of acculturative stress among 169 international students from the Middle East in University Utara Malaysia (UUM). The results revealed that the top three sources were language barriers, academic barriers and racial discrimination. Another study by Desa et al. (2012) conducted among 24 international postgraduate students in University Kebangsaan Malaysia (UKM) revealed that the negative attitude towards the hosting country and the more differences compared to the home culture predicted high acculturative stress. Culture shock, homesickness and perceived hate were the main sources of the acculturative stress in international undergraduates in Universiti Teknologi Malaysia (UTM) (Rajab et al., 2014).

2.3.5. Acculturative stress and socio-demographic characteristics

The levels of acculturative stress influenced by many potential factors in the context of socio-demographic variables. Previous studies in different countries supported the significant role of demographic and sociocultural factors as predictors of acculturative stress (Akhtar & Kröner-Herwig, 2015). The literature reported inconsistencies regarding the socio-demographic characteristics and called for replication studies. Hence, it seems worthwhile to examine socio-demographic characteristics that may influence acculturative stress levels among international students studying in Malaysian universities.

1. **Age**

Age is an important determinant of acculturative stress. It has been postulated that younger people will experience lesser difficulties in the process of cross-culture changes (Berry, 1997). On the other hand, individuals who experience the acculturating process in later life appear to be at higher risk (Berry, 1997). Older international students were found to have more problems in adjusting than younger students (Poyrazli, Kavanaugh, Baker, & Al-Timimi, 2004). This was argued to be due to the fact that younger students are socially more active, more flexible, and more open-minded than their older counterpart; therefore, their transition to the new culture is easier (Akhtar & Kröner-Herwig, 2015).

However, the contrary is also suggested as the older students were argued to be more mature, more able to deal with responsibilities and having acquired more coping skills over time (Mori, 2000). Hence, inconsistent conclusions are reported on the association between age and the acculturation literature of international students. For example, some studies supported the hypothesis that less acculturative stress is experienced by younger international students (Akhtar & Kröner-Herwig, 2015; Gebregergis, 2018; Poyrazli et al., 2004). Other studies supported the contradictory hypothesis (Jamsiah, Taher, & Jamil,

2014; Msengi, 2007; Yeh & Inose, 2003). However, others found no age-related differences (Desa et al., 2012; Mahmood & Beach, 2018; Ye & Juni, 2017; Zhang, 2012).

2. Gender

The findings on the issue of gender and acculturative stress are conflicting with one another. For instance, findings from Berry et al. (1987) study indicated that female students are more susceptible to acculturative stress than males, which was supported by several other studies (Dao, Lee, & Chang, 2007; Kwon, 2009; Rajapaksa & Dundes, 2002; Ye & Juni, 2017). On the contrary, males were found to have higher acculturative stress levels in other studies (Mahmood & Beach, 2018; Yan & Berliner, 2009). In several studies, gender was revealed to have no significant relationship with acculturative stress (Akhtar & Kröner-Herwig, 2015; Desa et al., 2012; Gebregergis, 2018; Nasirudeen et al., 2014; Poyrazli et al., 2004; Yeh & Inose, 2003; Zhang, 2012). This was argued to be due to the fact that, the internal and behavioural changes that happen while adjusting to a new culture will result in the similar impact irrespective to gender or age group (Desa et al., 2012).

3. Marital status

Marital status is one of the individual characteristics that were suggested to affect acculturative stress. The mixed findings suggest that the issue of marital status in relation to acculturative stress is not well-established (Gebregergis, 2018). Some studies found higher levels of acculturative stress among married students compared to their counterparts (Gebregergis, 2018; Yu, Chen, Li, Liu, Jacques-Tiura, & Yan, 2014). It was argued that the possible reason behind that they were likely to spend a considerable time accompanying their spouses/families, meanwhile they lost the social interactions opportunities with other international and domestic students (Zhang, 2012). These findings are contradictory to Poyrazli and Kavanaugh (2006) who reported that unmarried international students face greater problems than married students in the USA, and this

was owed to the social support of a spouse that might reduce the stress. On the other hand Zhang (2012) and Eustace (2007) found no marital status difference in predicting acculturative stress.

4. The length of stay in the host country

Findings from literature suggested lower acculturative stress levels are associated with longer length of stay in the host country, due to the better adjustment to host culture and improvements of the social and networking skills over time (Ayoob, Singh, & Jan, 2011; Berry, 1997; Hofmann, 2010; Msengi, 2007; Wang & Mallinckrodt, 2006; Ward & Kennedy, 1994; Zhang, 2012). This hypothesis was not supported by Akhtar and Kröner-Herwig (2015); instead, the contrary was reported. On the other hand, no significant association was reported between years of stay and acculturative stress in similar studies (Nasirudeen et al., 2014; Zhang, 2012).

5. Cultural distance

Another factor that might add to international students' acculturation stress is the cultural distance that indicates how different two cultures are. It has been postulated that minor cultural differences can significantly impact the emotional wellbeing of international students (Gebhard, 2012). This difference originates from language, climate, religion, values, traditions, and ideologies, i.e. individualism vs collectivism (Berry, 1997).

Literature indicates that the lesser the difference between the two cultures, the lesser is the acculturative stress (Berry et al., 1987; Yeh & Inose, 2003). For example, European students underwent easier and faster adaptation to their new life in Germany with lesser acculturative stress (due to the greater cultural similarity) compared to students from Asia and Africa (Akhtar & Kröner-Herwig, 2015). Another study conducted in the USA found significantly more acculturative stress experienced by African students in comparison with their Asian or Latin American counterparts (Constantine, Okazaki, & Utsey, 2004).

Hofmann (2010) study revealed that Asian students in the USA had the highest mean scores for overall acculturative stress, followed by Middle Eastern and Europen students. This was attributed to the big differences in fundamental cultural values. The same was reported in Singapore, where international students from China and Myanmar had higher acculturative stress compared to those from Malaysia since Malaysia is adjacent to Singapore and both countries sharing the same cultural norms and language (Nasirudeen et al., 2014).

6. Prior inter-culture travelling experience

According to Berry et al. (1987), acculturative stress levels could be influenced by the prior inter-culture experience. This was supported by Akhtar and Kröner-Herwig (2015) who found acculturative stress levels were significantly predicted by the prior inter-culture travelling experience. Gebregergis (2018) as well found that lack of the previous travel experience predicted higher acculturative stress. It was suggested that students who have previous experiences in contact with different cultures are prepared better to stay in a foreign country in terms of expectations and reactions (Akhtar, 2012).

7. Financial resources

Financial resources is another crucial factor in the process of acculturation and one of the sources of stress in international students (Gebregergis, 2018). Higher acculturative stress levels were reported among international students who rely on personal earnings compared to scholarship students (Akhtar & Kröner-Herwig, 2015; Eustace, 2007). What is more, personal earning was revealed to be a substantial explanatory factor for the high acculturative stress levels (Akhtar, 2012). This is because they experienced extra burden to find suitable employment with a good salary and to manage their time to study and work in a new country which exposes them to more stress (Akhtar, 2012; Eustace, 2007).

On the other hand, this finding contradicts the study done by Gebregergis (2018), who revealed that scholarship students reported higher acculturative stress. Those who depend on scholarships have to show proof of good academic records from time to time in order to continue their scholarships (Poyrazli, Arbona, Bullington, & Pisecco, 2001). Additionally, the received amount of fund could be insufficient to cover the expensive nature of living in some countries (Nasirudeen et al., 2014).

2.3.6. Acculturation and oral health

The effect of acculturation on general health has been investigated since the 1960s (Al-Rudainy, 2011). Acculturation has been suggested as a significant determinant of immigrants' health, and acculturative stress was also related to a reduction in the physical, social and psychological health (Mori, 2000). Literature indicates that acculturative stress could adversely impact the psychological and the sociocultural adaptation with unclear manifestation that can be displayed in many ways, i.e., it can cause somatic complaints like fatigue, appetite loss, headaches, gastrointestinal problems, and sleep disturbance (Mori, 2000; Tailakh, Evangelista, Morisky, Mentes, Pike, & Phillips, 2014). Besides, many studies reported the acculturative stress impact on the health-related quality of life (HRQoL) (Bhandari, 2012; He et al., 2012; Khawaja & Dempsey, 2008; Mori, 2000; Ogunsanya et al., 2018; Salgado et al., 2012).

On the other hand, the interest to explore the acculturation impact on oral health started in the 1980s, and it gains more attention since then. Ismail & Szpunar (1990) conducted the first study relating acculturation and oral health behaviours and oral diseases employing the dental data of the Hispanic Health and Nutrition Examination Survey (HHANES, 1982-1984). Findings revealed that individuals with lower acculturation status had a higher mean number of decayed and missing teeth, higher prevalence of gingivitis, and less likely to have visited the dentist as compared to those with high acculturation status (Ismail & Szpunar, 1990).

In recent years, many studies have been conducted to investigate the acculturation impact on the oral health of immigrants, but the evidence tended to be inadequate, fragmented and contradictory. Hence, in response to the need for summarising the existing literature, and synthesising evidence of the acculturation impact on oral health, two systematic reviews were conducted.

Gao and McGrath (2011) reviewed the acculturation impacts on oral health among 27 different studies. Fifteen studies relating acculturation to oral diseases revealed better oral health among highly acculturated individuals. Seventeen studies examined the acculturation impacts on the dental services utilisation; of which sixteen studies found a positive correlation between dental services utilisation and one acculturation indicator at least. However, no evidence was found to support that better oral health was due to improved utilisation of dental services (Gao & McGrath, 2011).

More recently, Dahlan et al. (2019) conducted a systematic review that included 42 quantitative studies to examine the acculturation impact on oral health outcomes among ethnic minorities and immigrants. Dahlan et al. (2019) concluded that a positive relationship between acculturation and oral health status/behaviours was evident, as the better oral health outcomes/ behaviours, dental knowledge, and dental care utilisation were all demonstrated by high-acculturated individuals. For example, less decayed teeth and periodontal disease were related to higher acculturation status (Cruz, Shore, Le Geros, & Tavares, 2004; Luo, Hybels, & Wu, 2018). Furthermore, better oral health-related knowledge, positive behaviour adaptability, and higher dental health services utilisation were directly proportional to high acculturation status (Cruz et al., 2004; Marino, Stuart, Wright, Minas, & Klimidis, 2001). Darshana, Sibyl, Nandita, Mythri, and Bharateesh (2014) in their review, concluded that the positive influence of acculturation among the immigrant and ethnic minorities was mediated by accessibility to restorative and preventive dental services. Cruz et al. (2004) suggested that acculturation may promote

the adoption of bad dietary behaviours (e.g. cariogenic diet) which influence oral health adversely.

Different global acculturation proxy measures used in the dental research were adopted from the medical field, e.g. age at immigration, country of birth, language proficiency/ barriers, and length of stay, either as a single indicator or combination of these indicators (Dahlan et al., 2019; Gao & McGrath, 2011). Few studies only used multidimensional acculturation scales, e.g. Psychological-Behavioural Acculturation Scale (Marino et al., 2001; Maupome, McConnell, Perry, Marino, & Wright, 2016; Otsuru, Ueno, Shinada, Spolsky, Maida, & Kawaguchi, 2006).

However, the non linear effects of acculturation on dental status has been suggested by Marino et al. (2001) where those in the moderately acculturated group tended to have a worse dental caries index/ caries prevention knowledge score compared to lower or higher acculturated groups. Marino et al. (2001) attributed this U shape relationship to be due to the protective effects of original culture and the mainstream culture against dental diseases. They lend support to their argument by the cultural marginality model, according to which the partially acculturated individual, who is separated from their traditional culture, but not yet integrated into the dominant culture, will be the most affected.

The majority of the included studies in the above-mentioned reviews are relating acculturation to periodontal disease, dental caries, oral health knowledge/ behaviours, and dental services utilisation as oral health outcomes. Only two studies investigated the association between acculturation and OHRQoL (Silveira, Dye, Iafolla, Adesanya, Boroumand, Youngblood et al., 2018; Swoboda, Kiyak, Persson, Persson, Yamaguchi, MacEntee et al., 2006).

Swoboda et al. (2006) study conducted among 408 elderly of different ethnic groups and their findings indicated a positive correlation between Geriatric Oral Health Assessment Index (GOHAI) scores and the length of residence as a proxy to acculturation. While Silveira et al. (2018) examined the association between acculturation and OHRQoL using OHIP among 13,172 adults (18-74). Their results revealed an inconsistent conclusion, where association were found between difficulty doing usual jobs, food restriction and higher acculturation, whereas no association was found with the difficulty of chewing/ swallowing and pain. Socio-behavioural characteristics, namely marital status, cigarette smoking, and level of educational attainment were significant effect modifiers (Silveira et al., 2018).

According to Silveira et al. (2018), the association between OHRQoL and acculturation is not straightforward, and they suggested two pathways that might drive the underlying mechanisms. One suggested potential pathway is through better socio-economic position, which leads to better access to dental care services and improved OHRQoL. The other possible pathway that might drive the link between OHRQoL and acculturation is via detrimental lifestyle behaviours, e.g. smoking (a risk factor for periodontal disease). The findings from their study supported the latter pathway, as a longer period of residence was found to be related to more difficulty of chewing/swallowing among current smokers, whereas a protective effect was found among never smokers (Silveira et al., 2018).

What is more, the effect of dietary habits on migrants' oral health were also discussed in a study by Durward & Wright (1989), who suggested that the moderately acculturated individuals may have adopted some aspects of the Western diet (i.e. junk food, sweets, beverages), without full appreciation of its consequences, or the adoption of other preventive aspects of the mainstream diet and Western oral hygiene practices. However, further studies are needed to understand the exact underlying pathways of the relationship between acculturation and oral health, as suggested by Silveira et al. (2018).

The acculturative stress was suggested to be a more proximal and direct measure of the risk for adverse health outcomes associated with the process of acculturation, given that both acculturation and acculturative stress are empirically distinct processes which affect health outcomes differentially as noted by (Garcia et al., 2017). Some studies demonstrated that low acculturation is often associated with low acculturative stress and better health outcomes. While other findings revealed that low acculturation is associated with higher stress and poorer health (Garcia et al., 2017).Therefore, it's of great importance to isolate the "unique effects" of acculturative stress from acculturation (Garcia et al., 2017).

In spite of the several studies that have been conducted to determine the relationship between acculturation and oral health, an important part of the acculturated groups, international students, is yet to be studied. Moreover, there is a research paucity in the field of acculturative stress, and oral health in general and OHRQoL in specific as no previous research on the associations between oral health and acculturative stress were found. In addition, Majority only used the length of stay/ language proficiency as the surrogate for acculturation; and only a few focused on OHRQoL. To conclude, there is a gap in the literature regarding the effect of acculturative stress on the oral health of international students.

2.4. General Perceived Stress and Oral Health

Perceived stress is "the feelings or thoughts that an individual has about how much stress they are under at a given point in time or over a given time period" (Phillips, 2013). Perceived stress entails how persons feel about their life stressfulness in general and the capability to deal with such stress. The impact or severity of same negative life events experienced by different people may be appraised differently depending on many factors, e.g. type of personality, coping styles, and support sources.

Stress is one of the psychological factors that is identified as a common risk factor for both general health and oral health. It is suggested that stress can affect health in general via two different mechanisms. The indirect one proposes that stress can encourage individuals to adopt unhealthy behaviours that worsen oral health (e.g. alcohol and tobacco, poor diet). The direct pathway postulates that stress triggers a specific chain of events that could result in specific diseases development. For example, stress contributes to high allostatic load "a cumulative physiological impact of chronic stress" that can lead to the physiological dysfunction, which in turn influence disease progression (Shankardass, 2012). However, the exact causal mechanisms which link stress to oral health still unclear (Gomaa, Glogauer, Tenenbaum, Siddiqi, & Quiñonez, 2016).

In relation to oral health, positive relationships between oral pain, poor oral health and stress were found (Vasiliou et al., 2016). Furthermore, individuals with high-stress levels have a higher risk to develop oral diseases like periodontitis (Marcenes & Sheiham, 1992; Sabbah et al., 2008) and have low self-rated oral health /poor oral health related behaviours (Sanders & Spencer, 2005). It was proposed that stress make people perceive their oral health more negatively (Locker et al., 2000). Besides, stress was suggested to be a significant predictor of poor oral health and general health in ethnic minorities in the USA (Watson, Logan, & Tomar, 2008).

Furthermore, stress was revealed to have indirect effects on oral health that leads individuals to adopt unhealthy eating habits and hence increasing dental caries development risk (Sisson, 2007) or it might lead to oral hygiene neglect and plaque accumulation (Deinzer, Hilpert, Bach, Schawacht, & Herforth, 2001).

The relationship between perceived stress and OHRQoL was investigated by Sanders and Spencer (2005) among 3678 nationally representative sample aged 18-91 years; results indicated that worse OHQoL was related to high perceived stress levels. Gupta et al.

(2015) also reported that perceived stress demonstrated significant direct influences on OHRQoL.

2.5. Social Support

Theoretically, perceived social support is "the psychological and material resources available from an individual's interpersonal relationships" (Rodriguez & Cohen, 1998). It was also defined as "the information leading the subject to believe that he is cared for and loved, esteemed as a member of a network of a mutual obligation" (Cobb, 1976),. While Cohen and colleagues (2001) defined it as "the social resources that persons perceive to be available or that are actually provided to them by non-professionals in the context of both formal support groups and informal helping relationships".

The favourable effect of social support on physical and mental wellbeing is evident in the literature. Moreover, depression, anxiety and loneliness have been associated with social support loss (Sandhu & Asrabadi, 1994). Social support is a crucial concern in the case of international students, due to disruption of the familiar social networks. Since living in a new country deprives them of their established social support and let them feel, tenser, confused, and less confident (Desa et al., 2012). Social support is considered an instrumental coping resource in times of the cross-cultural transition and related stress, as it could help the students to adapt successfully (Chuah & Singh, 2016).

However, social support and social network are two different terms, as the latter one refers to "set of social connections surrounding an individual" and having such relationships does not necessarily mean getting support from them (Lazarus & Folkman, 1984). Furthermore, social support is appraised from a person's perception of the availability of social resources. These resources originate from the surrounding individuals like family, friends, and special ones who could afford care and assistance.

2.5.1. Social support and acculturative stress

The issue of social support is one of the most prominently tackled issues in the literature of the acculturation (Chuah & Singh, 2016). The literature provides strong evidence for the social support role in stress reduction, specifically the acculturative stress. Many studies confirmed that low levels of social support resulted in higher acculturative stress (Ayoubi & Massoud, 2007; Baba & Hosoda, 2014; Crockett, Iturbide, Torres Stone, McGinley, Raffaelli, & Carlo, 2007; Poyrazli et al., 2004; Yeh & Inose, 2003; Zhang & Goodson, 2011).

What is more, social support was identified as a factor that might "buffer" the degree of acculturative stress, as previously mentioned under the acculturative stress model (Williams & Berry, 1991). Several studies indicated the social support role as a buffer (moderator) that minimise the influence of acculturative stress on psychological symptoms among international students (Chuah & Singh, 2016; Crockett et al., 2007).

Higher adjustment levels and lower acculturative stress levels were found among international students with higher social support compared with those with low social support (Bai, 2012; Kim & Yoo, 2016; Sabrina, 2014; Thomas & Sumathi, 2016). Yeh and Inose (2003) reported that high levels of social support satisfaction and social connectedness predicted lower acculturative stress. However, literature is not consistent when it comes to the exact mechanism, i.e. moderating/ mediating/ direct influence of social support on acculturative stress (Baba & Hosoda, 2014).

According to Baron and Kenny (1986), a mediator is an explanatory variable that accounts for all or part of the relationship between a predictor (independent) and outcome (dependent). While a moderator is an assistant variable that modifies the strength or direction of the relationship between the independent and the dependent variables.

2.5.2. Social support and oral health

The impact of social support on emotional wellbeing is well established. Several studies have been conducted to explore associations between general health and social support. The findings indicated that social support was positively associated with perceived health status, psychological problems, mental health, cancer reoccurrence, and heart attacks (Dahlan et al., 2019).

In relation to oral health, Dahlan et al. (2019) conducted a systematic review of the relationship between oral health outcomes and social support among immigrants and ethnic minorities. The addressed oral health outcomes in the included studies were periodontal disease, dental caries, dental care utilisation, oral health-related knowledge/behaviours, oral health perceptions, and OHRQoL. The review concluded positive relationships between social support and oral health outcomes in general. Several studies reported that immigrants who were socially integrated and received social support had visited the dental office for either treatment or preventive care (Brzoska, Erdsiek, & Waury, 2017; Burr & Lee, 2013; Documet, Troyer, & Macia, 2019; Maupome, McConnell, & Perry, 2016).

A study by Arcury, Chen, Savoca, Anderson, Leng, Bell et al. (2013) examined the influence of social support on oral pain, sore or bleeding gums, dry mouth, and denture problems, found that social integration was positively related to fewer problems.

Several studies investigated the relationship between dental caries and social support reported that lower number of decayed teeth was related to higher social support levels (Duijster, van Loveren, Dusseldorp, & Verrips, 2014; Gao, Chan, Mak, Ng, Kwong, & Kot, 2014; Tellez, Sohn, Burt, & Ismail, 2006; Vered, Soskolne, Zini, Livny, & Sgan-Cohen, 2011). In contrast, Wu, Plassman, Liang, Remle, Bai, and Crout (2011) did not find a significant relationship between social support and the number of carious teeth.

The findings of the relationship between social support and periodontal health were not consistent, while an inverse relationship between attachment loss and social support was reported by Sabbah et al. (2011), Vered et al. (2011) found no significant association between social support and the extent of periodontal disease.

In addition, immigrants and ethnic minorities who had strong social ties reported better oral health-related knowledge scores (Maupome, McConnell, & Perry, 2016; Pullen, Perry, & Maupome, 2018). Furthermore, social support was revealed to have a positive influence on self-rated oral health as reported by Jang, Yoon, Park, Chiriboga, and Kim (2014) and Wu et al. (2011).

The association between social support and OHRQoL was assessed in two studies (Kamimura, Christensen, Tabler, Ashby, & Olson, 2013; Maida, Marcus, Spolsky, Wang, & Liu, 2013). Kamimura et al. (2013) study revealed that social support was positively related to OHRQoL among immigrants who were not born in the USA, while a negative relationship was found among those who were born in the USA. Maida et al. (2013) findings indicated that only financial support was positively associated with OHRQoL scores, but no significant association with emotional support was found.

2.6. Literature Review of Measurement Tools

2.6.1. Acculturative Stress Scale for International Students (ASSIS)

ASSIS by Sandhu and Asrabadi (1994) is one of the widely used measures to assess and quantify the acculturative stress confronted by international students. It was selected because it was specially designed to examine the unique stressors encountered by international students and a sufficient number (over 60) of studies supported its use (Akthar, 2012; Rajab et al., 2014; Nasirudeen et al., 2014; He, Lopez & Leigh, 2012; Constantine et al., 2004;Yeh & Inose, 2003).

It comprises of 36 items; each item is rated on a five-point Likert scale "1=Strongly disagree, 2=Disagree, 3=Not sure, 4=Agree, 5=Strongly agree". It has seven main dimensions, namely, homesickness (4 items), perceived hate (5 items), discrimination (8 items), fear (4 items), guilt (2 items), culture shock/ stress due to change (3 items), and miscellaneous (10 items). The miscellaneous subscale consists of essential factors that do not belong to a specific domain.

The overall score is the add ups of the 36 questions scores, with a range of (36-180), the higher scores reflecting greater acculturative stress. According to the authors who developed ASSIS scores higher than 109, refer to serious levels of acculturative stress that need psychological counselling.

ASSIS reliability (internal consistency) measured by Cronbach's alpha has been reported to range from 0.87 to 0.95 (Constantine et al., 2004; Poyrazli et al., 2004; Rajab et al., 2014; Sandhu & Asrabadi, 1994; Yeh & Inose, 2003). The construct validity of ASSIS was supported by the reverse relationship between the positive adaptation construct and the acculturative stress construct (Bai, 2012) and the positive association with depression (Constantine et al., 2004) among international students.

Excluding the academic stressors, which have been recognised as one of the significant challenges for international students, is the pitfall that ASSIS was criticised for (Mori, 2000). However, it was argued that conceptually the academic stressors must be viewed as different from other stressors that have their roots in the acculturation processes.

International students may not find it easy to participate in a survey using a language other than their mother language. However, the developers of ASSIS, Sandhu and Asrabadi (1998) indicated that a minimum reading level of an eighth-grade is needed for answering the ASSIS, which is believed to be within the ability of international students at university levels.

2.6.2. Perceived Stress Scale (PSS)

Many scales were developed to measure perceived stress. The Perceived Stress Scale by Cohen Sheldon, Kamarck, and Mermelstein (1983) is one of the most commonly used scales in behavioural medicine studies to determine associations between stress and health because of its adequate psychometric properties (Gupta et al., 2015).

PSS aimed to assess the degree to which events in a persons' life are viewed as stressful. According to Cohen et al. (1983), the items were intended to "measure the extent to which one's life is perceived as unpredictable, uncontrollable, and overloading". It has been used to assess stress in diverse groups, e.g. healthy university students, pregnant and postpartum women, drug addicts, and elderly populations (Almadi et al., 2011).

Three versions are available, PSS-14, PSS-10 and PSS-4 with fourteen, ten and four items respectively. Respondents are questioned how often they felt a certain way over the previous month using five-point Likert scale "0=Never, 1 = Almost Never, 2 = Sometimes, 3 =Fairly Often, 4 = Very Often". For scoring, the positively stated items are coded reversely (0 = 4, 1 = 3, 2 = 2, 3 = 1 & 4 = 0), the overall score is calculated by summing all scale items. The overall score ranges from 0 to 54 in PSS-14, 0-40 in PSS-10, and 0-16 in PSS-4, with more scores reflecting greater levels of perceived stress. A short four items scale of PSS-10 scale developed from questions 2, 4, 5 and 10. In which scoring items 2 and 3 require reverse coding. Through several studies, PSS has been shown to have adequate psychometric properties in terms of reliability and validity in different populations, which have made it a tool that is internationally recognized and valid (Ben Loubir, Serhier, Battas, Agoub, & Bennani Othmani, 2014).

All versions demonstrated acceptable psychometric properties. For instance, PSS-14 revealed good internal consistency (α= 0.84 to 0.86) and test-retest reliability (r= 0.85 over a 2-day period, r=0.55 over a 6-week period; Cohen et al., 1983). The exploratory

factor analysis indicated two factors: “perceived helplessness” and “perceived self-efficacy”.

The PSS-4 is a useful measure when a shortened version is needed; however, its internal reliability (α=0.72) and test-retest reliability over two months period (r= 0.55) were lower than that for the longer versions (Cohen et al., 1983; Lee, 2012). The three versions of PSS in adults were compared in a study by Mitchell, Crane, and Kim (2008) and found the Cronbach’s alphas for the 14-item, 10-item, and 4-item as 0.89, 0.91, and 0.82 respectively. The convergent validity of the PSS has been evaluated by assessing correlation of the PSS scores with the measures of anxiety, depression, and helplessness (Lee, 2012, Mills, Azizoddin, Racaza, Wallace, Weisman, & Nicassio, 2017).

The PSS has been translated into 25 different languages, including but not limited to Japanese, Arabic, Chinese, Hungarian, Thai, Turkish, Swedish, Portuguese, and Spanish, with good reported reliability and validity (Lee, 2012). PSS has been used in a variety of cultures; therefore, its application has particular value in cross-cultural studies (Lee, 2012).

The Arabic versions of PSS demonstrated acceptable reliability coefficients and test-retest reliability values that ranged between (0.74 -0.80) and (0.74 -0.90), respectively (Almadi, Cathers, Mansour, & Chow, 2012; Chaaya, Osman, Naassan, & Mahfoud, 2010).

2.6.3. Multidimensional Scale of Perceived Social Support (MSPSS)

MSPSS is a brief instrument developed to measure perceptions of social support from three sources; friends, family and significant Others (Zimet, Dahlem, Zimet, & Farley, 1988). It was selected because it is one of the most extensively translated and validated social support outcome measures (Dambi, Corten, Chiwaridzo, Jack, Mlambo, & Jelsma, 2018).

This tool consisted of twelve items, with four items under each subscale. To rate each item a seven-point Likert scale is used "1= Very Strongly Disagree, 2= Strongly Disagree, 3= Mildly Disagree, 4= Neutral. 5= Mildly Agree, 6= Strongly Agree, 7= Very Strongly Agree". The overall score is the sum of the scores of all items with a range (12 - 84). Greater scores are indicating higher perceived social support. The mean can be calculated by dividing the total score by 12. According to the Zimet et al. (1988) mean scores of (1 -2.9), (3- 5), and (5.1 -7) indicate low, moderate, and high support, respectively.

MSPSS has been reported to have sufficient psychometric properties, and good reliability ranged between 0.85 to 0.94 (Shumaker, Frazier, Moser, & Chung, 2017; Wang, Wan, Huang, Huang, & Kong, 2017). It has been translated into different languages, including Hebrew, Urdu, Tamil, Danish, Farsi (Persian), Italian, Lithuanian, French, Hausa, Norwegian, Chinese, Korean, Malay, Slovak, Spanish, Arabic, Swedish, Thai, Polish, Portuguese, and Romanian (Wang et al., 2017). The Arabic MSPSS version also demonstrated psychometric properties comparable to the original version (English), with reliability coefficients of 0.87 (Merhi & Kazarian, 2012).

2.6.4. Oral Impacts on Daily Performances (OIDP)

Oral Impacts on Daily Performances (OIDP) is one of the most commonly used instruments to measure OHRQoL developed by Adulyanon, Vourapukjaru, and Sheiham (1996). It has a sound theoretical background based on Locker's conceptual framework for measuring oral health, where it focuses on measuring the ultimate oral impacts on the person's ability to perform daily activities. The theoretical framework is presented in Figure 2.4.

The first-level "impairment" represents the direct biophysical outcomes that the majority of clinical indices attempt to measure. The second level "intermediate impacts" represents the initial adverse impacts due to oral health status, i.e. functional limitation, discomfort,

or pain. The third level refers to "ultimate impacts" that affect the capability to execute daily activities that included psychological, social, and physical performances. It is worth mentioning that the dimensions of the second level as well might have an impact on performance ability.

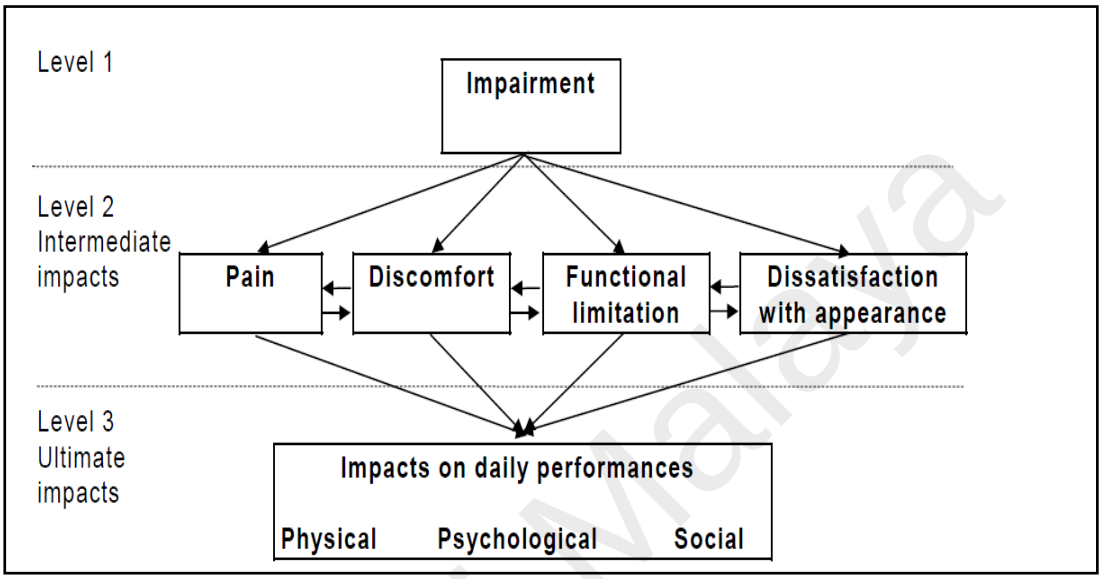


Figure 2.4: Theoretical framework of consequences of oral impacts (Locker, 1988). "Modified from the WHO's International Classification of Impairments, Disabilities and Handicaps"

The OIDP focuses on measuring the third level consequences, which adds to the measure strengths in terms of being concise and covering the main consequences. The OIDP incorporates all level two consequences that impact performing daily activities; therefore, it reduces over scoring originates from repeating impacts at each of the three levels. It also eliminates minor conditions that do not impact the performance of daily activities, so records only the significant impacts. Besides, it is easier to measure the behavioural impacts, in terms of performance of daily activities (e.g., speaking/ eating), rather than measuring the feeling-state dimension (e.g., worry/ discomfort).

OIDP includes eight daily performances classified under physical, psychological and social dimensions, as shown in Table 2.2. OIDP uses the reasonable approach of impact quantification by assessing severity and frequency (Slade, 1997). Respondents are asked

to select how often is the frequency of impact from 5 categories responses "Never affected in past six months (score 0) - Less than once a month (score 1), Once or twice a month (score 2), Once or twice a week (score 3), 3-4 times a week (score 4), every or nearly

Table 2.2: Performances included in the Oral Impacts on Daily Performances (ODIP)

Physical
a. Eating and enjoying food
b. Speaking and pronouncing
c. Cleaning teeth
Psychological
d. Sleeping and relaxing
e. Smiling, laughing and showing teeth without embarrassment
f. Maintain usual emotional state without being irritable
Social
g. Carrying out major work or social role
h. Enjoying contact with people

every day (score 5)". The severity of impacts is obtained by requesting respondents to rate on a five-point scale "None (score 0) to very severe (score 5)" to what extent it is problematic to their daily living.

Multiplying the frequency by severity gives the score of the impact on each performance; thus, the score of each item ranged from 0 to 25. The impact intensity for each performance is therefore classified according to the score obtained as follows "no effect (0); very mild (1 to 5); mild (6 to 10); moderate (11 to 15); severe (16 to 20); very severe (21 to 25)". The overall score is the sum of the eight performance scores, which is divided by the maximum score (200) and multiplied by 100 to give a percentage score. Table 2.3 shows the ODIP scoring method.

To improve simplicity and efficiency, the use of either frequency or severity score alone can be considered. Since there was no significant improvement in the prediction test of OIDP total score when compared to either frequency or severity score alone. In addition, both frequency and severity scores had similar predictive powers. Frequency is the single preferred choice because of its better reproducibility.

Table 2.3: Scoring method for Oral Impact on Daily Performances

OIDP score = [(frequency score* of "Eating" × severity score* of "Eating")+
(frequency of "Speaking" × severity of "Speaking") +
(frequency of "Cleaning teeth" × severity of "Cleaning teeth") +
(frequency of "Sleeping" × severity of "Sleeping") +
(frequency of "Smiling" × severity of "Smiling") +
(frequency of "Emotional stability" × severity of "Emotional stability") +
(frequency of "Major role" × severity of "Major role") +
(frequency of "Contact with people" × severity of "Contact with people")]
100/ 200†

* Scores range from 0 to 5
† Maximum possible score [Sum of 8 performances score × 5 frequency score ×5 severity score] = 200

OIDP has adequate psychometric properties. The scores discriminated clearly between people who had different perceptions of overall oral impacts, and between groups of relatively healthy and those with poor oral status. Test-retest reliability within three weeks interval ranged between 0.95 -1.0 and 0.57 to 1.0 for frequency scoring, and severity scores, respectively. While the reliability coefficient of item scores ranged from 0.91 to 1.0 and the Cronbach alpha of the scale (internal consistency among items of questions) was 0.65.

OIDP is one of the widely used measures that have been tested in a variety of populations including Spanish, Thai, Greek, Arabic, Korean, Persian, Malagasy, Ugandan and Norwegian. The Arabic OIDP version is also demonstrating psychometric properties similar to the original version (English), the internal consistency reliability in terms of Cronbach's alphas of 0.89 (Suliman, Johannessen, Ali, Salman, & Åstrøm, 2012). In conclusion, what distinguishes OIDP is that it provides a significant endpoint outcomes scale for oral conditions within a concise, reliable and valid measurement.

2.7. Relevant Theoretical Frameworks for This Study

2.7.1. Revised Wilson and Cleary Model

The revised Wilson and Cleary model by Ferrans and colleagues (2005) is a multidimensional model that captures the psychosocial and biomedical concepts of health. The model is widely applied both in the medical and dental fields (Baiju et al., 2017; Baker et al., 2010; Baker, Pankhurst, & Robinson, 2007; Gupta et al., 2015; Gururatana et al., 2013; Mohamed, Saddki, Yusoff, & Mat Jelani, 2017; Ojelabi, Graham, Haighton, & Ling, 2017).

The findings from many studies indicated its robustness as a conceptual framework to describe HRQoL predictors through the empirical analysis of individual and environmental influences on the causal framework (Bakas, McLennon, Carpenter, Buelow, Otte, Hanna et al., 2012). Wilson and Cleary's model could provide a comprehensive view of HRQL that exceeds the limits of clinical symptoms and physiological factors. Bakas et al. (2012), systematically reviewed the literature about commonly used HRQoL models; they recommended the revised Wilson and Cleary's model due to its potential ability to "guide research and practice". They further concluded that the model "makes sense" for the real-world setting.

In this model, five levels of health outcomes are included in a linear sequence of causal links that starts with the bio-physiological measures (objective health) and ends with the psychosocial measures (subjective health). As depicted in Figure 2.5, dominant causal links are indicated with arrows, while the possibility of bidirectional and reciprocal relationships is also acknowledged but not explicitly presented.

The five boxes in the centre represent different health outcomes on a continuum from left to right: (a) biological/physiological factors, (b) symptoms status, (c) function status, (d) general health perceptions, and (e) overall quality of life.

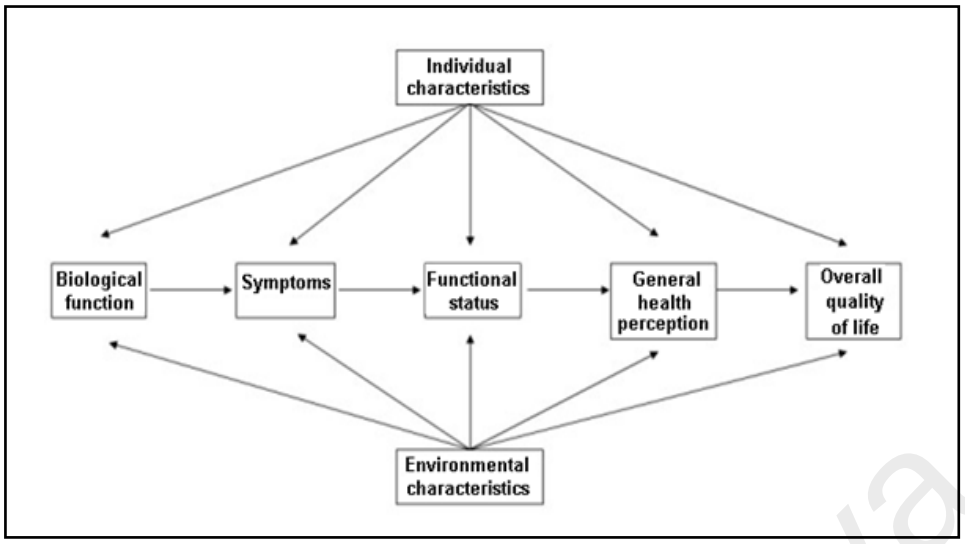


Figure 2.5: Revised Wilson and Cleary model (Ferrans and colleagues, 2005)

The biological function pertains to the function of cells/organs level. Symptoms' status is the individual perceptions of abnormal emotional, cognitive, and physical states. Functional status represents the ability to function (perform tasks) in different domains, including psychological, physical, and social. General health perception is the subjective assessment of general health status, that integrates the preceding health outcomes. The overall quality of life represents the subjective well-being, which entails the levels of happiness and satisfaction with life in general.

Effects of the individual and environmental factors were also acknowledged in this model. Within this model, what defines these factors depended on the ecological model (McLeroy, Bibeau, Steckler, & Glanz, 1988). According to the ecological model, there are five layers of influence on health from broader to narrower: "(a) public policy (local, state, and national laws and policies). (b) community factors (relationships among institutions and informal social networks in a defined area), (c) institutional factors (organizations such as schools and healthcare facilities), (d) interpersonal factors (formal and informal social support systems), and (e) intrapersonal factors (the individual

characteristics)". In the revised Wilson and Cleary model, levels other than the interpersonal level is regarded as of environmental factors. (Ferrans et al., 2005).

The individual characteristics further divided into biological, developmental, psychological, and demographics. Examples of biological factors include family history, skin colour, and body mass index. Demographic factors included age, sex, ethnicity, marital status, and psychological factors like anxiety, fear, stress, and personality traits.

Environmental factors are divided into physical and social. The physical environment refers to positive/negative influences of the surrounding settings like the home, neighbourhood, and workplace, while social factors represent the social (interpersonal) influences like the influence of friends and family (Ferrans et al., 2005).

The revised Wilson and Cleary model was chosen to guide this research because its clear, adequate, and consistent (Bakas et al., 2012). Also, it is useful in all individuals regardless of their age, culture, or their disease and health conditions. Besides, the use of a common model will support the establishment of a consistent body of evidence in the area of OHRQoL.

2.7.2. The Stress-buffering model of social support

The stress-buffering model and the main-effect model are two proposed models by Cohen & Wills (1985) in an attempt to describe the link between social support and wellbeing. The stress-buffering model proposes that social support is related to well-being primarily in individuals exposed to stress. The alternate model postulates that social support has a helpful effect irrespective of stress presence.

The stress-buffering model (Figure 2.6) postulates that social support "buffers" or protects individuals from the adverse effects of stressful situations. Many studies supported this model as the adverse psychological/physical health outcomes as resultants

of stressful situations were found to be "buffered" by the support from friends, families, and available social resources (Chuah & Singh, 2016).

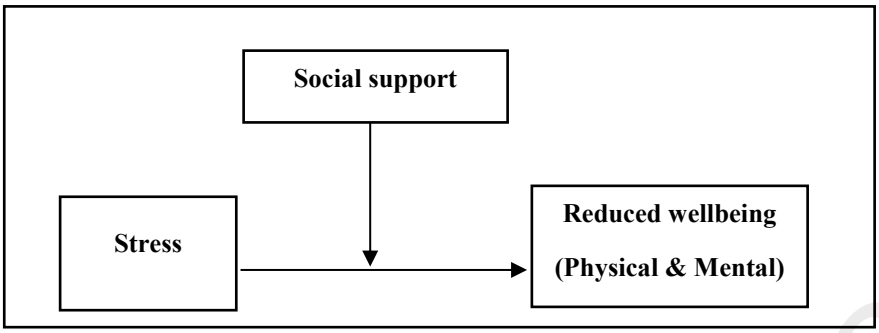


Figure 2.6: Stress buffering model of social support

The mechanism by which social support buffers the negative stress impact on health was explained by Cohen & Wills (1985) as illustrated in Figure 2.7. It was suggested that social support could affect the causal chain linking stress to illness at two different points. At the first point, social support may interfere amid the stressful event and a stress reaction by mitigating/ inhibiting the stress appraisal response, i.e. the harmful potential posed by stress is redefined by the perception that others could afford necessary resources. Hence, the appraisal of a certain situation as being stressful is prevented.

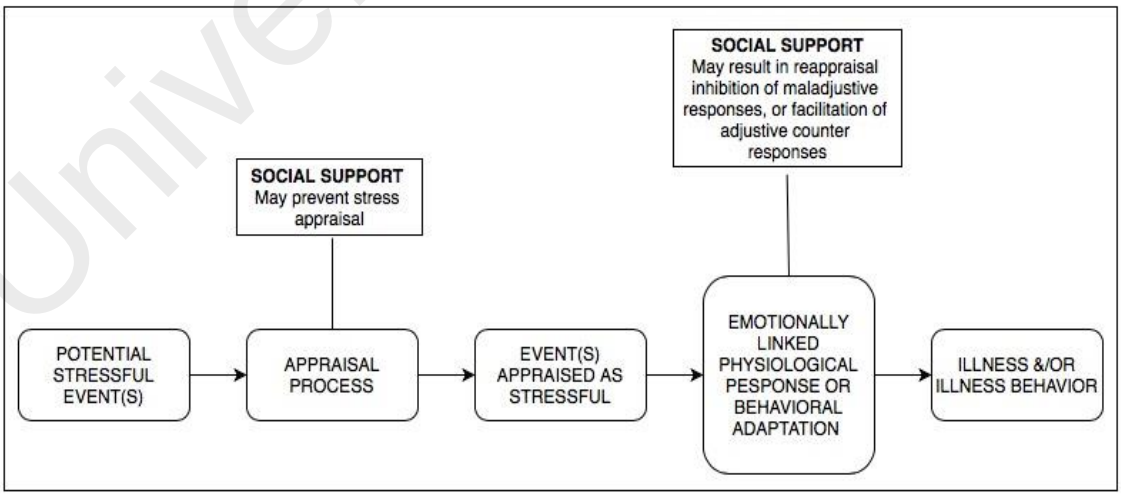


Figure 2.7: Points at which social support may interfere with the hypothesized causal link between stressful events and illness (Cohen & Wills, 1985).

At the second point, adequate support might intervene between the stress experience and the onset of the pathological outcome by reducing/ abolishing the stress reaction, or via direct influence on the physiological processes. Thereby, the impact of stress appraisal is alleviated either by minimizing the perceived importance of the stressful event or by providing a solution to the problem.

2.7.3. Study's conceptual framework

The conceptual framework of this study adapted mainly from the revised Wilson and Cleary model, in addition to the stress-buffering model to determine the relationships among acculturative stress, perceived stress, social support, oral health perceptions, and OHRQoL. Within the Wilson and Cleary model, no explanation of how the interaction between individual and environmental characteristics might influence OHRQoL. Thus, the stress-buffering model was selected to support the primary model and help to explain the relationship between perceived stress, acculturative stress and social support. The biological variable, symptoms, and functional status were not included in this study. The selected measures to operationalize the revised Wilson & Cleary's model are described below and depicted in Figure 2.8.

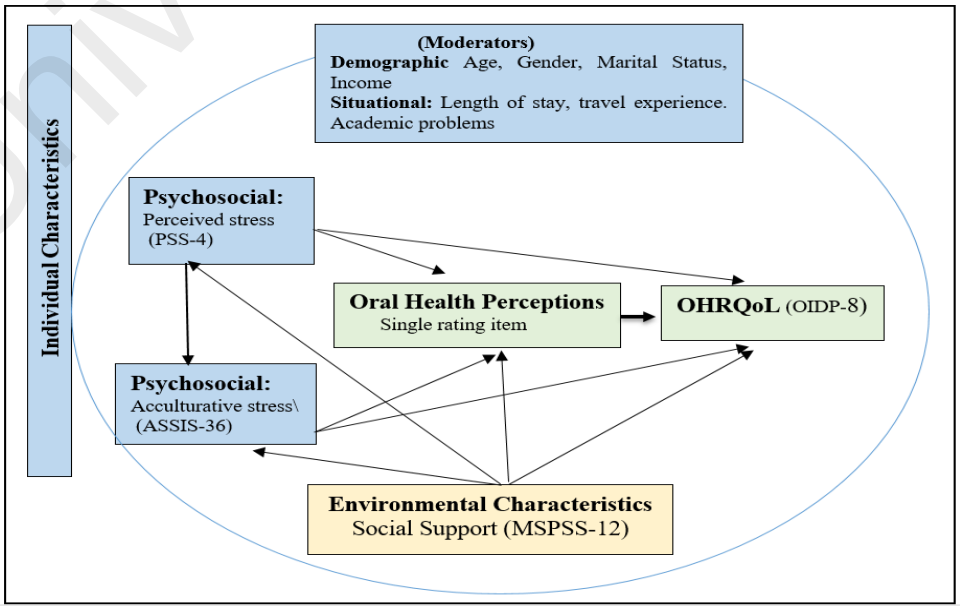


Figure 2.8: Conceptual framework based on the revised Wilson and Cleary model (Ferrans et al., 2005)

1- Oral health outcomes:

(a) Oral health perception: measured using the question: "How would you rate the health of your mouth overall?"

(b) Oral health-related quality of life measured using the Oral Impact on Daily Performance (OIDP-8).

2- Environmental characteristics:

(a) social support: measured using the Multidimensional Scale of Perceived Social Support (MSPSS-12).

3- Individual characteristics :

(a) Demographic factors: age, gender, marital status, source of income.

(b) Situational factors: length of stay, previous travel experience, and academic problems.

Both (a) & (b) obtained using a questionnaire designed by the researcher.

(c) Psychological factors, i.e., acculturative stress and perceived stress measured using the Acculturative Stress Scale for International Students (ASSIS-36) and the Perceived Stress Scale (PSS-4), respectively.

2.8. Partial Least Squares Structural Equation Modelling (PLS-SEM)

PLS-SEM is a second-generation multivariate approach of data analysis which put emphasis on prediction while estimating complex statistical models, "whose structure is designed to provide causal explanations" (Hair, Risher, Sarstedt, & Ringle, 2019). PLS-SEM is one of the appropriate methods for both exploratory and confirmatory research. It also has the advantage of estimating models with several indicator variables, constructs, and structural paths regardless of the normality of data distribution.

It is a nonparametric method, which means if the data is not normally distributed, the t-values will be inflated or deflated leading to Type I error. Therefore, bootstrapping is used to determine the statistical significance of coefficients. In bootstrapping resampling (i.e.,

bootstrap samples) is drawn from the original sample by replacement (random from the sampling population).

Variables in PLS-SEM are categorized into endogenous (dependent) which has one or more paths leading to it, and exogenous (independent) in which the path arrows pointing outwards and none leading to it. PLS-SEM evaluation involves first assessing the measurement models (inner model) weather meets the required criteria or not, and then need to assess the structural model.

As shown in Figure 2.9, PLS-SEM consisted of two submodels: a) the structural (inner) model tests the relationships between the dependent and independent latent variables (known as path coefficients), b) the measurement (outer) model which tests the relationships between the observed indicators and latent constructs.

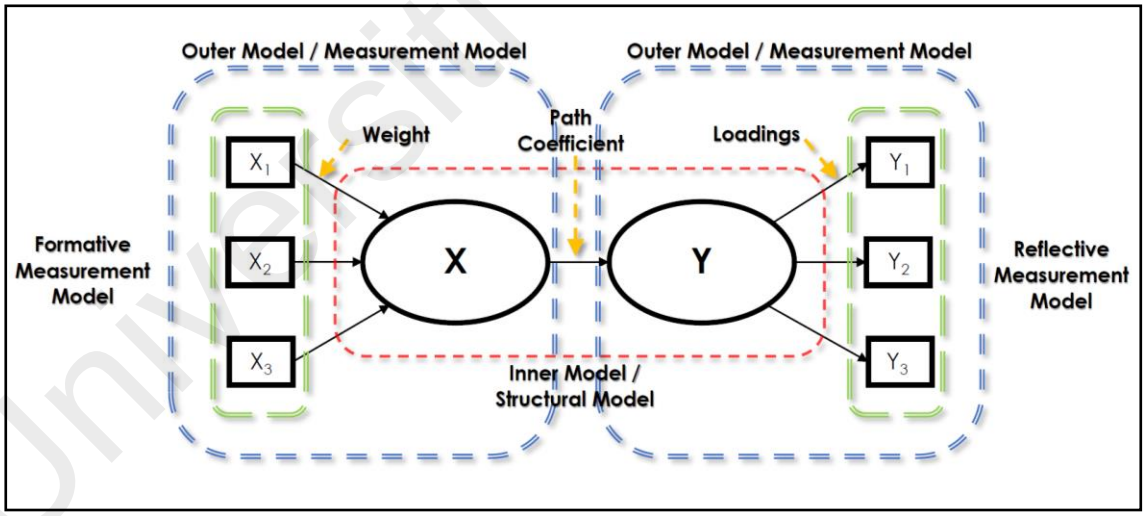


Figure 2.9: Components and terminology of PLS-SEM

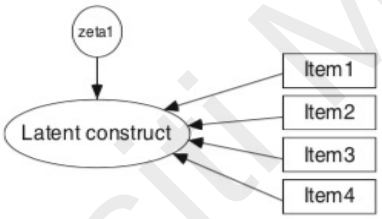
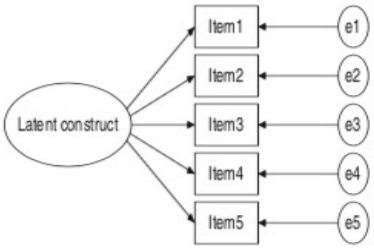
(Source: Dr. Jacky Hwa, Basic PLS Path Modelling using SmartPLS3.0 - workshop notes)

The measurement model is a part of the structural equation model, which is essential for each latent variable included in a model to ensure its validity and reliability. It is analogous to factor analysis since it assesses all included items that "load" onto the latent

variable, their relationships, and variances. The measurement model could be either formative or reflective depending on some criteria of its underlying indicators as outlined in Table 2.4.

The measurement models assessment differs for formative and reflective constructs. The formative measurement models are evaluated based on the statistical significance of the indicator weights, and indicator collinearity (Hair et al., 2019). The reflective measurement model assessment includes examining convergent validity, discriminative validity, and reliability. When measurement model assessment is acceptable, the next step is the assessment of the structural model.

Table 2.4: Formative and reflective models criteria

Description	Formative measurement model	Reflective measurement model
Epistemic relationship		
Criteria		
(1) Direction of causality	Flow from measures to latent construct	Flow from latent construct to measures
	Measures define latent construct	Construct defines measures
(2) Interchange-ability of the measures	Measures should not be interchangeably	Measures should be interchangeably
	Measures need not to have the similar content or common theme	Measures should have the similar content or common theme
	Dropping measures should not change the conceptual meaning of the latent construct	Dropping measures should not change the conceptual meaning of the latent construct
(3) Correlation among the measures	Not necessary for measures to correlate with each other	Measures are expected to correlate with each other
(4) Nomological Network	Nomological net of the measures may differ	Nomological net of the measures should not differ

Source: (Urbach & Ahlemann, 2010).

The structural model analysis includes the assessment of a) path coefficients (β), b) explained variance (coefficient of determination, R^2) which refers to the proportion of variation in the dependent variable(s) that could be explained by one or more predictor

variables, c) the blindfolding redundancy measure (Q^2) which indicates out-of-sample prediction and in-sample explanatory power (Hair et al., 2019). In addition to estimating effect size (f^2) that indicates the relative effect of a particular exogenous latent variable on the endogenous latent variable(s) by means of changes in the R^2 (Chin, 1998). According to Hair et al. (2019), the effect size is somewhat redundant to the path coefficients, i.e. the rank order of the predictor constructs' to explain a dependent construct is similar in terms of the size of the path coefficients and the effect sizes.

The concept of model fit (Goodness-of-fit) in PLS-SEM is much less relevant, in contrast to CB-SEM that relies on the model fit measures to validate the overall model. The reason behind this is the employed algorithm in PLS-SEM, which "is not based on minimizing the divergence between observed and estimated covariance matrices" (Hair et al., 2019). Therefore, Chi-square-based model fit and its extension measures are not applicable as used in CB-SEM. As a result, some scholars mistakenly claimed that PLS-SEM is not suitable for testing and confirmation of theories.

Henseler et al. (2016) as cited in (Hair et al., 2019) made an effort to develop model fit measures for PLS-SEM. However, the researchers who consider the application of these measures should be "very cautious" since such newly developed measures still need a comprehensive evaluation, and the advocated guidelines /thresholds "should be considered as very tentative" (Hair et al., 2019).

CHAPTER 3: METHODS

3.1. Study Design

This study was a descriptive cross-sectional study.

3.2. Study Population and Sampling

- **Study population**

The study population was international graduate students attending public universities in Malaysia.

- **Sampling design**

Universal sampling was employed in this study. The sampling frame consisted of six public universities in Kuala Lumpur and Selangor. The selection was based on the highest number of international postgraduate students enrollment in these univesities according to Statistics Department MOHE (2017), in addition to the large number of offerd programs in these universities. Those who fulfilled the inclusion criteria were invited to participate in this study.

- **Inclusion criteria**
    - Non- Malaysian
    - Resident temporarily in Malaysia for study purposes
    - The minimum duration of stay in Malaysia was six months.
    - Pursuing postgraduate study in Malaysian public university.
- **Sample size**

The sample size was calculated so that we have a minimum number of sample to ensure 80% of statistical power of the study. The sample size was calculated based on two approaches:

1. **Prevalence of acculturative stress and social support:**

Through two formula:

$$\text{“}S = X^2 NP(1-P)/ [d^2 (N- 1) + X^2 P (1-P)]\text{”}$$

In addition to the following formula:

$$\text{“}S= (X)^2 SD (1-SD) / (CI)^2\text{ ”}$$

(Krejcie & Morgan, 1970)

Where:

- S= required sample size,
- X = table value of Chi-square for 1 degree of freedom at the desired confidence level (1.96)
- N= given population size (21,000)
- P= prevalence (given in table 3.1 from literature)
- d= degree of accuracy expressed as a proportion (0.05)
- SD= standard deviation (given in table 3.1 from literature)
- CI= Confidence Interval (0.05)

Krejcie and Morgan formula is applied to cross-sectional studies with known population, that is the case of the current study group “international postgraduate students in public universities”, who are around 21,170 in 2017 as estimated by the Ministry of Higher Education (MOHE, 2017).

The estimated sample size was based on prevalence determined by previous similar research in Malaysia for the acculturative stress and social support (Ye & Juni, 2017; Yusof et al., 2010). The power of this study was set at 80%, a=0.05, design effect =1.0. (Table 3.1).

Table 3.1: Sample size calculation according to the prevalence of acculturative stress and social support

Variable	Prevalence (%) / MEAN (SD)	Estimated sample size
Acculturative stress[1]	77.7%=0.8	**$S = X^2 NP (1-P)/ [d^2 (N- 1) + X^2 P (1-P)]$.** $S= (1.96)^2 21,000(0.8)(1-0.8) / [(0.05)^2$ 21,000+ (1.96)2 0.8(1-0.8)] = 243+20% =243+49= 292
Social support[2]	3.82 (0.96)	**$S= (X)^2 SD (1-SD) / (CI)^2$** $S= (1.96)^2(0.96)(1-0.96)/(0.05)^2$ = 60 + 20% 60+12= 72

Data adapted from ([1] Ye & Juni, 2017, [2] Yusof et al., 2010)

2. Based on the requirement of the analysis using structural equation modelling (PLS-SEM):

To ensure the sample size is adequate to be able to apply the multiple regression of the PLS-SEM model. According to Hair, Hult, Ringle, and Sarstedt (2016) "The required sample size should be determined by means of power analyses based on the part of the model with the largest number of predictors".

Table 3.2 shows the minimum sample size requirements for detection of minimum R^2 values for a given significance level, with the commonly used level of statistical power of 80% and a certain level of complexity of the path model (i.e., the maximum number of arrows pointing at a construct). In this study, the maximum number of arrows is four, by applying this rule, we need a minimum of 137 observations to achieve a statistical power of 80% for detecting R^2 values of at least 0.10 with 5% significance level.

Based on the results of the two approaches, the largest sample size estimated were used, plus 20% of the minimal sample size required to cater to the non-respondents (292). As a result, the final sample size of 300 was determined, which was also able to detect minimum R^2 values at 1% significance level.

Table 3.2: Sample Size Recommendations in PLS-SEM for a Statistical Power (80%)

Maximum Number of Arrows Pointing at a Construct	Significance Level											
	1%				5%				10%			
	Minimum R^2				Minimum R^2				Minimum R^2			
	0.10	0.25	0.50	0.75	0.10	0.25	0.50	0.75	0.10	0.25	0.50	0.75
2	158	75	47	38	110	52	33	26	88	41	26	21
3	176	84	53	42	124	59	38	30	100	48	30	25
4	191	91	58	46	137	65	42	33	111	53	34	27
5	205	98	62	50	147	70	45	36	120	58	37	30
6	217	103	66	53	157	75	48	39	128	62	40	32
7	228	109	69	56	166	80	51	41	136	66	42	35
8	238	114	73	59	174	84	54	44	143	69	45	37
9	247	119	76	62	181	88	57	46	150	73	47	39
10	256	123	79	64	189	91	59	48	156	76	49	41

Source: Cohen, 1992, as cited in Hair et al. (2016) "A Primer on Partial Least Squares Structural Equation Modelling (PLS-SEM)"

3.3. Study Variables and Study Instrument

These variables were collected based on the objectives of the study:

i. Students' demographic and socioeconomic variables

ii. OHRQoL

iii. Oral health perception

iv. Acculturative stress

v. Perceived stress

vi. Social support

Table 3.3 shows the study variables and the scale of measurement.

Table 3.3: The study variables and the scale of measurement.

Variable	Conceptual Definition	Type of variable	Scale of measurement
1-Sociodemographic: Age	Last birthday	continuous	years
Gender	Male /Female	Categorical/ Nominal	1=Male 2=Female
Marital status	the civil status of each individual in relation to the marriage laws	Categorical/ nominal	1=Single 2=Married 3=divorced/widowed
Country of origin	Home country	Categorical/ nominal	1=Arabic ` 2=Asian 3=African
Current study Degree	Level of Programme enrolled	Categorical/ ordinal	1=Diploma 2=Master 3=PhD
Financial source:	Main source of money	Categorical/ nominal	1=Scholarship /Funding 2=parents/Family 3= Personal earning/saving 4=Others (more than one source)
Length of stay in Malaysia	Time Period spent in Malaysia	Continuous	1=less than 6 months 2= 6 months-1 year 3=1-3 years 4= >3 years
Previous travel experience	Study/work/live In a foreign country other than Malaysia	Categorical/Nominal	1=yes 2=No
Academic problems/concerns	Having any problems relating to academic performance	Categorical/Nominal	1=yes 2=No
2-Acculturative stress	ASSIS	Continuous	1= Strongly disagree, 2= disagree, 3= not sure, 4 = agree, 5 = strongly agree
3- Perceived stress	PSS	Continuous	0 = never, 1 = almost never, 2 =sometimes, 3 = fairly often, 4 = very often
4- Perceived Social Support (MSPSS)	MSPSS	Continuous	1= Very strongly disagree 2=Strongly disagree 3 =Mildly disagree 4=Neutral 5= Mildly agree 6= Strongly agree 7=very Strongly agree
5--Oral health perception	Global rating question	Categorical-ordinal	1= poor, 2=fair, 3=good, 4=very good, 5=excellent
6- Oral Impact of Daily Performance (OIDP)	OIDP	Continuous	Frequency: 0= Never 1= Less than once a month 2 = 1 or 2 times a month 3= 1 or 2 times a week 4= 3 or 4 times a week 5= Every day Severity: 0= Never 1=Very little 2=Moderate 3=Sever

The instrument used to measure the study variables was a questionnaire. The questionnaire consisted of seven sections:

Section 1: Students' demographic and socio-economic variables; there were 11 questions. The questions were developed based on related literature. The variables included age, gender, country of origin, marital status, financial source, university's name, degree (e.g., Master, PhD), study discipline, academic concerns/problems, length of stay in Malaysia, and previous experience staying in another country.

Section 2: Acculturative stress was measured using the Acculturative Stress Scale for International Students (ASSIS-36) by Sandhu and Asrabadi (1994). It comprises of 36 items; each item is rated on a five-point Likert scale "1=Strongly disagree, 2=Disagree, 3=Not sure, 4=Agree, 5=Strongly agree". It has seven main dimensions, namely, homesickness (4 items), perceived hate (5 items), discrimination (8 items), fear (4 items), guilt (2 items), culture shock/ stress due to change (3 items), and miscellaneous (10 items). The miscellaneous subscale consists of essential factors that do not belong to a specific domain. The overall score is the add ups of the 36 questions scores, with a range of (36-180), the higher scores reflecting greater acculturative stress.

Section 3: Perceived stress was measured using the Perceived Stress Scale (PSS-4) by Cohen et al. (1983). PSS-4 consists 4 items with a five-point scale "0 = never, 1 = almost never, 2 =sometimes, 3 = fairly often, 4 = very often". the overall score is calculated by summing all scale items. The overall score ranges from 0 to 16, with higher scores indicating higher levels of perceived stress.

Section 4: Social support was measured using the Multidimensional Scale of Perceived Social Support (MSPSS) by Zimet et al. (1988). This tool consisted of twelve items, with four items under each subscale. To rate each item a seven-point Likert scale is used "1= Very Strongly Disagree, 2= Strongly Disagree, 3= Mildly Disagree, 4= Neutral. 5=

Mildly Agree, 6= Strongly Agree, 7= Very Strongly Agree". The overall score is the sum of the scores of all items with a range (12 - 84). Greater scores are indicating higher perceived social support.

Section 5: Oral health related quality of life was measured using the Oral Impact on Daily Performance (OIDP) developed by Adulyanon and Sheiham (1997). This is an eight items index with three dimensions namely physical, psychological and social. The OIDP assesses the difficulty of performing eight activities of daily life due to oral problems that could affect eating, speaking, cleaning the mouth, sleeping, smiling, emotions, carrying out activities and maintaining social contact.

Each item was evaluated by the component's presence, frequency and severity. To measure frequency, six choices with different scores "never affected (0); less than once a month (1); once or twice a month (2); once or twice a week (3); three or four times a week (4); nearly every day (5)". While severity was measured as "none (0); very little (1); little (2); moderate (3); severe (4); very severe (5)". The score for each item was obtained by multiplying the frequency by severity; thus, the score ranged from 0 to 25. The total score (additive score=ADD) calculated by the sum of the scores of the eight items and ranged from 0 to 200. This total or additive score (ADD) was used to represent OIDP (OHRQoL) in bivariate and multivariate analysis. While for data description (e.g. prevalence) the simple count (SC) score was used, in which the frequency items dichotomised into 1 = affected (original scores 1–5), and 0 = unaffected (original score 0).

Section 6: A global rating question was used to measure oral health perception. Participants were asked to assess their oral health status on a five-point scale "1= Excellent, 2= Very good, 3= Good, 4= Fair and 5= Poor".

The questionnaire was available in English and Arabic languages. The Arabic version was also developed since the Arab students in Malaysia constitute a large proportion of international students.

Sections 1 (Sociodemographic) and 2 (ASSIS) of the questionnaire were translated into the Arabic language. A forward translation was performed by an independent, fluent in both English and Arabic language, a native Arabic speaker. The Arabic translation was checked and verified by an experienced professional translator. While sections 3,4, and 5 the existing validated Arabic versions of PSS-4 (Almadi et al., 2012), MSPSS-12 (Merhi & Kazarian, 2012), OIDP-8 (Suliman et al. (2012) were used. The online questionnaire was made using Online Google Forms (Appendices I and II).

3.3.1. Pretesting of the questionnaire

The questionnaire was pretested. The main aim of the pretesting was to assess face validity in terms of the wording, clarity, appropriateness of the items, identifying/reporting any ambiguous items, difficulties with language, technical jargon, instructions used, and the required duration to complete the questionnaire. Twenty international postgraduate students were approached by the investigator at Visa Unit, UM. They were invited to answer the questionnaires (Arabic & English versions). The nature and purpose of this invitation were explained. Participants were administered the paper-pencil version of the survey and allowed to write comments /suggestions near the items for ease of reference. Amendments based on the feedback were made accordingly.

3.3.2. Reliability of the questionnaire

The reliability of the questionnaires was assessed among 60 international students (30 participants for Arabic & 30 participants for English version) who were recruited through a personal network. In terms of test-retest reliability, the participants were instructed to fill the questionnaire twice within 14 days interval. A time interval ranging from 2 days to 2 weeks is sufficient (Marx, Menezes, Horovitz, Jones, & Warren, 2003). Intra-Class

Correlation (ICC) was used, which is an index of concordance that indicates the degree of agreement beyond that expected by chance alone. ICC <0.4 is poor, 0.4-0.6 is moderate, 0.6-0.8 is good, and ICC >0.8 is excellent (Fleiss, Levin, & Paik, 2003).

The reliability of the scale was also assessed by testing the internal consistency through the calculation of Cronbach's alpha reliability coefficients of all used scales, i.e. ASSIS, PSS-4, MSPSS, OIDP. According to Cortina (1993), an alpha coefficient more than 0.65 ($\geq$ 0.65) means that items are considered to measure the same concept and can be combined into a single index.

3.4. Data Collection

The protocol of the current study was reviewed and approved by the Medical Ethics Committee, Faculty of Dentistry, University of Malaya (Appendix III).

Permission letters (Appendix IV) were sent to the postgraduate institute/centre of six public universities (UM, UPM, UKM, UiTM, IIUM, USIM). After follow-ups in the form of emails, phone contacts, and repeated reminders over a period of six weeks, five public universities (UM, UPM, UKM, UiTM, USIM) responded by either providing the lists or distributing an email with a URL link of the questionnaire via their system. The yielded lists were used to send emails with a URL link of the questionnaire to all postgraduate international students.

All participants who did not fulfil the inclusion criteria (as listed in section 3.2) were excluded by screening their responses to specific personal information question (country of origin, degree type, and length of stay in the country), The survey link was made available to the participants over a period of six months (February - July 2019). Follow-up reminders were sent over the course of data collection as needed.

3.5. Data Management

Data from the google forms were downloaded into the Excel worksheets form. Then the source data were given an identification number and given numerical codes depending on selected-response categories. The coded data in the Excel file were then imported to Statistical Package for Social Science software (IBM SPSS ver. 23.0) for data analysis. Before data analysis, data cleaning was carried out manually by eyeballing every 20 data entered, in addition to running a frequency distributions of the responses for each item, followed by verification for patterns of data. Should errors found, the data source (original questionnaire) was referred to, and errors were then corrected. To handle the missing data issue, answering all questions were set to be required/compulsory.

3.6. Data Analysis

Data from the survey were analyzed using SPSS (V. 23) and SmartPLS software (V.3.2.8.) developed by Ringle et al. (2015). Normality of the data was checked, values for skewness and kurtosis were analyzed. Both descriptive and inferential statistics were performed. Descriptive statistics, including means, standard deviations, medians, interquartile range, and frequencies, were assessed for all variables appropriately.

Independent T-test, ANOVA, Mann Whitney test, and independent sample Kruskal-Wallis test were all used when appropriate to test the association of study variables with sociodemographic characteristics. A preliminary assessment of bivariate correlations between the main study variables was made using Spearman's Correlation.

Structural equation modelling (SEM) was performed to assess the relationships between the main variables. Research hypotheses were tested according to the conceptual framework. Bootstrapping technique (5000 subsamples) was used to calculate the t-value for statistical significance of the paths. All statistical tests were assessed at 0.05 level of significance. PLS-SEM has rules of thumb that serve as guidelines to evaluate model results; the applied cut-off values as outlined in Table 3.4.

Table 3.4: Cut off Points for PLS Assessment criteria

A. **Measurement model**			
Assessment	**Criterion**	**Note**	**Reference**
Item reliability	Item loading on parent factor.	Min. of 0.50	Hair et al. (2010)
Convergent validity	1. indicator loading on parent factor, and Loadings with sig. *p*-value	Min. of .050 *p* <0 .05	Hair et al. (2010)
	2.Composite reliability	> 0.70	Hair et al. (2010)
	3.Average variance extracted (AVE)	> 0.50	Hair et al. (2010)
Discriminant validity	Heterotrait-monotrait ratio (HTMT)	< 0.85	Henseler et al. (2015)
Reliability	Cronbach's alpha	>0 .70	Hair et al. (2010)
Multi- collinearity	Variance inflation factor (VIF)	< 3	Kock (2015)
B. **Structural model**			
Bootstrapping	T value	>1.96	Hair et al. (2019).
	Coefficient of determination ($R^{2)}$	R^2 value of 0.10 as a minimum acceptable level >0.26 substantial >0.13 moderate 0.02-0.12 weak	Falk and Miller (1992) Cohen (1988)
	Path coefficient β)	Magnitude Sign p-value	Hair et al. (2010)
	Effect size (f^2)	0.02 small 0.15 medium 0.35 large	Cohen et al. (2013)
	Predictive relevance (Q^2)	>0 0.02 weak 0.15 moderate 0.35 strong	Cohen et al. (2013)

3.7. Ethical Consideration

A cover letter was attached to the questionnaire briefing the purpose and significance of the study, in addition to gaining respondents informed consent. It was also communicated in the covering letter that all their information was confidential and anonymous. The contact details of the researcher, i.e. name, email address and phone number were included as well in case that the respondents had any questions.

CHAPTER 4: RESULTS

4.1.Results of Questionnaire Pretesting

4.1.1. Questionnaire validation

Face validity was determined by administering the questionnaires (Arabic & English versions) to 20 international postgraduate students. The participants mean age was 31 years old, 65% were females. The mean duration for completing the Arabic version and the English version was 12 and 10.5 minutes, respectively. The participants' characteristics are presented in (Appendix V).

Overall, all participants felt the format, instructions and options used were clear and easy to understand when completing the questionnaire. One participant suggested defining the term "acculturative stress" which was already explained in brief at the beginning of ASSIS section, in response to this suggestion, the definition was clearly introduced in the cover letter. Also, some participants were not sure of the exact meaning of a few words in the English version; two translators were consulted to suggest easier alternatives without affecting the actual meaning. Amendments in the English version based on the feedback and suggestions are shown in (Table 4.1).

Table 4.1: Amendments of questionnaire items

Item before	Item After
ASSIS	
Item 4 – "I feel rejected when people are sarcastic toward my cultural values."	"I feel rejected when people do not respect my cultural values."
Item 8 – "I feel intimidated to participate in social activities."	"I feel scared to participate in social activities."
Item 31- "I generally keep a low profile due to fear from other"	"I generally feel unconfident due to fear from others."

Table 4.1: (Continued)

Item before	Item After
PSS-4 "Item 4 - In the last month, how often have you felt difficulties were piling up so high that you could not overcome them."	"In the last month, how often have you felt difficulties were piling up (gathered) so high that you could not overcome them."

4.1.2. Questionnaire reliability

The sample of the pilot study included 60 postgraduate students. The students mean age was 33 (SD=4.6) years. The majority of participants (63.3%) were females. The details of the participant's characteristics who completed the test-retest questionnaires presented in (Appendix VI).

The Cronbach's alpha coefficients ranged from a low of 0.53 to a high of 0.95. Results indicated that 25 out of 28 subscales had Cronbach's alpha above the test threshold (0.70). The remaining three are considered in the acceptable range. The Cronbach's alpha coefficients results are summarised in Table 4.2.

Table 4.2: Internal consistency (Cronbach's Alpha reliability) for all scales (Arabic & English versions)

Variables	Measures	Cronbach's reliability coefficient	
		English Version	Arabic Version
Acculturative stress	ASSI- 36	0.95	0.82
	Subscales:		
	1-Perceived Discrimination	0.82	0.73
	2-Perceived Hate	0.76	0.74
	3-Homesickness	0.53	0.63
	4-Stress Due to Change /Culture Shock	0.76	0.69
	5-Fear	0.89	0.75
	6-Guilt	0.59	0.67
	7-Miscellaneous	0.85	0.74

Table 4.2: (Continued)

Variables	Measures	Cronbach's reliability coefficient	
		English Version	Arabic Version
Perceived stress	PSS-4	0.67	0.72
	Subscales		
	1- perceived helplessness	0.85	0.71
	2- perceived self-efficacy	0.84	0.77
Social Support	MSPSS-12	0.72	0.86
	Subscales:		
	1-Significant other	0.89	0.82
	2-Friends	0.90	0.85
	3-Family	0.66	0.82
Oral Health Related Quality of Life	OIDP-8	0.85	0.78
	1--Frequency	0.76	0.74
	2-Severity	0.77	0.76

Test-retest intra-class correlation coefficients of the overall questionnaire ranged between 0.55 and 0.96 for an interval of two weeks between test administrations. The results for the Intra-class correlation coefficient for all subscales are detailed in (Appendix VII).

4.2.Results of Survey

A total of 325 completed web-based questionnaires received, of which 13 excluded because their length of stay was less than six months. As a result, a total of 312 questionnaires included in the analysis, of which responses to Arabic and English versions constituted 140 (44.9%) and 172 (55.1%) respectively. Female's responses constituted 111 (35.6%), and male's responses constituted 201 (64.4%).

Table 4.3 presents the sample characteristics of the participating international students. The students mean age was 33.6 (SD= 7.1). The majority of students (64.7%) were from Arabic countries. Forty percent of the students had stayed in Malaysia for more than three years. Majority of international students (80.4%) reported they had prior travelling experience before coming to Malaysia. Around one third (35.6%) depended on their

parents/family as a financial source. More than half of students (57.4%) were pursuing their PhD.

Table 4.3: Sample characteristics

Sociodemographic Characteristics	n (%)	Mean(SD)
Age (years)		33.6 (7.1)
<29 yrs	97 (31.0)	
30-40 yrs	169 (54.1)	
>40 yrs	46 (14.7)	
Gender		
Male	201 (64.4)	
Female	111 (35.6)	
Marital status		
Single	119 (38.1)	
Married	191 (61.2)	
Divorced/Widowed	2 (0.6)	
Origin country[1]		
Arabic countries	202 (64.7)	
Asian countries	77 (24.6)	
African countries	32 (10.2)	
USA	1 (0.3)	
Financial source		
Scholarship /Funding	94 (30.1)	
parents/Family	111 (35.6)	
Personal earning/saving	88 (28.2)	
Others (more than one source)	19 (6.1)	
Duration of stay		
6 months -1 year[2]	76 (24.4)	
1-3 years[2]	110 (35.3)	
>3 years	126 (40.4)	
Prior travelling experience		
Yes	251 (80.4)	
No	61 (19.6)	
University		
UPM	87 (27.9)	
UM	78 (25.0)	
UKM	72 (23.1)	
UITM	39 (12.1)	
USIM	36 (11.5)	
Degree		
Diploma	4 (1.3)	
Master	129 (41.3)	
PhD	179 (57.4)	

Table 4.3: (Continued)

Sociodemographic Characteristics	n (%)
Study Discipline	
Applied science	119 (38.1)
Formal science	33 (10.6)
Humanities	54 (17.3)
Natural science	28 (9.0)
Social science	78 (25.0)
Experiencing Academic difficulties	
Yes	201 (64.4)
No	111 (35.6)

[1]Detailed profile of countries in Appendix VIII, [2]Recoded into one group (Less than 3 Years)

4.2.1. Normality of data distribution:

Test of normality showed that acculturative stress was normally distributed ($P > 0.05$). While OHRQoL, perceived stress, and social support were not normally distributed ($P < 0.05$). Skewness and kurtosis values were within the normal range (+1, -1), except for OHRQoL data which was skewed to the right (2.55) and outside of acceptable ranges for kurtosis (6.95) (Table 4.4).

Table 4.4: Test of normality, Skewness, & Kurtosis for study variables

Variables	Skewness	kurtosis	Test of Normality Statistics	Sig
OHRQoL	2.55	6.95	0.27	0.001
Acculturative stress	0.27	-0.15	0.04	0.200
Perceived stress	0.10	0.05	0.10	0.001
Social support	-0.77	0.48	0.89	0.001

4.2.2. OHRQoL

The median for OIDP score was one and interquartile range =7.7 (Table 4.5).

Table 4.5: Alpha coefficient, score range, mean, and median of OHRQoL

	Alpha coefficient	Min-Max	Mean (SD)	95% CI	Median (IQR)
OHRQoL	0.92	0 - 48	5.5 (9.1)	4.2 - 6.1	1 (7.7)

4.2.2.1. Prevalence of OHRQoL

The prevalence of OHRQoL impact was 65.7% (Table 4.6). The physical dimension was the most commonly reported dimension to be impacted in 58.7% of students. The most frequently reported impacts were on eating (52.2%) followed by the impact on cleaning teeth (33.7%). The intensity of impacts showed that all performances were very mildly to moderately affected, and no performance was severely affected (Table 4.6). Among the participants with impacts, the extent of impacts varied from 1 to 8 performances with impacts (PWI); 16.3% had 1 PWI, 10.6 % had 2 PWI, 10.9 % had 8 PWI, and fewer percentage of participants had 3 to 7 PWIs (Figure 4.1).

Table 4.6: Prevalence and intensity of OIDP

OIDP items/dimensions	**Prevalence n (%)**	**Impact Intensity (Frequency*Severity) n (%)**					
Total	205 (65.7)	No Effect (0)	Very Mild (1-5)	Mild (5-10)	Moderate (11-15)	Severe (16-20)	Very severe (21-25)
Physical	183 (58.7)						
1. Eating and enjoying food	163 (52.2)	186 (59.6)	106 (34)	18 (5.8)	2 (0.6)	0 (0)	0 (0)
2. Speaking and pronouncing correctly	83 (26.6)	248 (79.5)	59 (18.9)	5 (1.6)	0 (0)	0 (0)	0 (0)
3. Cleaning your teeth	105 (33.7)	227 (72.8)	77 (24.7)	8 (2.6)	0 (0)	0 (0)	0 (0)
Psychological	134 (42.9)						
4. Sleeping and relaxing	99 (31.7)	217 (69.6)	82 (26.3)	11 (3.5)	2 (0.6)	0 (0)	0 (0)
5.Smiling/laughing and showing your teeth without embarrassment	80 (25.6)	243 (77.9)	57 (18.3)	10 (3.2)	2 (0.6)	0 (0)	0 (0)

Table 4.6: (Continued)

OIDP items/dimensions	Prevalence n (%)	Impact Intensity (Frequency*Severity) n (%)					
		No Effect (0)	Very Mild (1-5)	Mild (5-10)	Moderate (11-15)	Severe (16-20)	Very severe (21-25)
6. Keeping a normal emotional state, without becoming upset	86 (27.6)	230 (73.7)	71 (22.8)	7 (2.2)	4 (1.3)	0 (0)	0 (0)
Social	109 (34.9)						
7. Doing all your work	100 (32.1)	231 (74.0)	72 (23.1)	9 (2.9)	0 (0)	0 (0)	0 (0)
8. Enjoying contact with other people	69 (22.1)	251 (80.4)	54 (17.3)	6 (1.9)	1 (0.3)	0 (0)	0 (0)

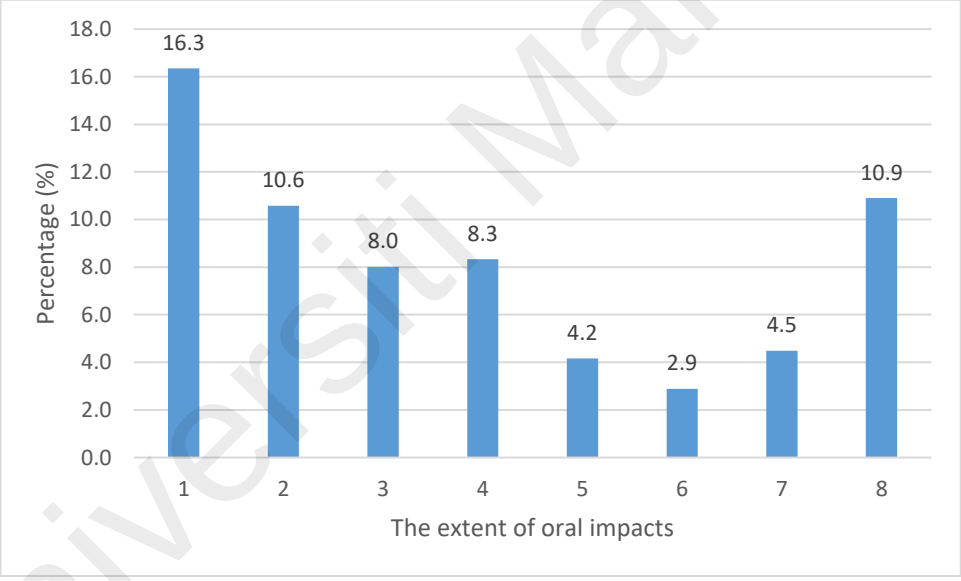


Figure 4.1. Percentage distribution of the number of OIDP performances affected among individuals with any impact.

4.2.2.2. Association between OHRQoL and individual characteristics

Mann-Whitney results revealed that there were non-statistically significant differences ($P > 0.05$) of OHRQoL mean rank scores among different students groups in terms of gender, marital status, degree, academic difficulties, and previous travel experience (Table 4.7).

Kruskal-Wallis test showed that there was a statistically significant difference ($P < 0.05$) in the OHRQoL score among the country of origin groups. Students from Arabic countries origin had higher OHRQoL impact scores (Median = 2.0) compared to students from Asian (Median = 1.0) and African origin (Median = 0). Non-significant statistical differences ($P > 0.05$) were found among the other sociodemographic categories in terms of the source of funding, length of stay and discipline of study (Table 4.7).

Table 4.7: Association between OHRQoL and individual characteristics

Characteristics	Median (IQR)	*P* value
Gender[*]		
Male (N=201)	1 (8)	0.787
Female (N=111)	1 (7)	
Marital status[*]		
Single (N=119)	2 (8)	0.761
Married (N=191)	1 (6)	
Degree[*]		
Master (N=129)	1 (8)	0.321
PhD (N=179)	1 (6)	
Academic difficulties[*]		
Yes (N=201)	2 (7.5)	0.283
No (N=111)	1 (8)	
Previous travel experience[*]		
No (N=81)	1 (8)	0.885
yes (N=251)	2 (7)	
Length of stay[**]		
6 months- 1 year (N=76)	1 (7)	0.413
1-3 years (N=110)	1 (6)	
More than 3 years (N=126)	2 (8.2)	
Source of funding[**]		0.979
Scholarship/Funding[1](N=94)	1 (7)	
parents/Family[2] (N=111)	2 (8)	
Personal earning/saving[3] (N=88)	1.5 (8)	
Study discipline[**]		0.216
Applied science (N=119)	1 (6)	
Formal science (N=33)	6 (8)	
Humanities (N=54)	2 (6.25)	
Natural science (N=28)	2.5 (13)	
Social science (N=78)	1 (6.25)	
Country of origin[**,***]		**0.003**
Arabic (N=202)	2 (8)	
Asian (N=77)	1 (8)	
Africans (N=33)	0 (1.8)	

[*] Mann-Whitney test, [**] Kruskal-Wallis test, [***]Pair wise comparison (Arabic and African P=0.006, Asian and African P=0.001)

Spearman correlation results revealed no correlation between age and OIDP scores (r=0.05, *P* >0.05, Table 4.8).

Table 4.8: Correlation of OIDP score with age

Variables	Correlation Coefficient (Spearman's rho)	Sig. (2-tailed)
Age		
OHRQOL	0.053	0.366

4.2.3. Oral Health Perceptions

Based on the results, the majority of the participants (78.8%) perceived their oral health status as good (Tables 4.9). Table 4.10 presents the prevalence of oral health perception by individual characteristics.

Table 4.9: Prevalence of oral health perception

Oral health perception	n (%)
Poor[1]	10 (3.2)
Fair[1]	56 (17.9)
Good[2]	110 (35.3)
Very good[2]	102 (32.7)
Excellent[2]	34 (10.9)
Recoded	
Poor	66 (21.2)
Good	246 (78.8)

[1] Recoded to Poor, [2] Recoded to Good

Table 4.10: Prevalence of oral health perception by individual characteristics

Characteristics	Poor OHP n (%)	Good OHP n (%)
Gender		
Male (N=201)	38 (18.9)	168 (83.6)
Female (N=111)	28 (25.2)	83 (74.8)
Age (Years)		
≤35 (N=197)	39 (19.8)	159 (80.7)
>35 (N=115)	27 (23.5)	88 (76.5)

Table 4.10: (Continued)

Characteristics	Poor OHP n (%)	Good OHP n (%)
Marital status	26 (21.8)	93 (78.2)
Single (N=119)	40 (20.9)	151 (79.1)
Married (N=191)	00 (00.0)	2 (100)
Divorced/widowed (N=2)		
Degree		
Master (N=129)	29 (22.5)	100 (77.5)
PhD (N=179)	37 (20.7)	142 (79.3)
Academic difficulties		
Yes (N=201)	51 (25.4)	150 (74.4)
No (N=111)	15 (13.5)	96 (86.5)
Previous travel experience		
No (N=81)	12 (14.8)	49 (60.5)
yes (N=251)	54 (21.5)	197 (78.5)
Length of stay		
6 months- 1 yearr (N=76)	12 (15.8)	64 (84.2)
1-3 years (N=110)	25 (22.7)	85 (77.3)
More than 3 years (N=126)	29 (23.0)	97 (77.0)
Source of funding		
Scholarship/Funding (N=94)	17 (18.1)	77 (81.9)
parents/Family (N=111)	23 (20.7)	88 (79.3)
Personal earning/saving (N=88)	20 (22.7)	68 (77.3)
Others (more than one source)(N=19)	6 (31.6)	13 (68.4)
Study discipline		
Humanities (N=54)	16 (29.6)	38 (70.4)
Social science (N=78)	10 (12.8)	68 (87.2)
Natural science (N=28)	7 (25.0)	21 (75.0)
Formal science (N=33)	9 (27.3)	24 (72.7)
Applied science (N=119)	24 (20.2)	95 (79.8)
Country of origin		
Arabic (N=202)	48 (23.8)	154 (76.2)
Asian (N=77)	15 (19.5)	62 (80.5)
Africans (N=33)	3 (9.1)	29 (90.9)

4.2.4. Acculturative stress

The overall mean for acculturative stress score was 95.1(26.1), with scores range between 36 and 174 (Table 4.11).

Table 4.11: Alpha coefficient, score range, mean, and median of Acculturative stress

	Alpha coefficient	Min-Max	Mean (SD)	95% CI	Median (IQR)
Acculturative stress	0.94	36-174	95.1 (26.1)	92.2 - 98.0	95.5 (37.7)

4.2.4.1. Prevalence of acculturative stress

More than half of the participants (54.2%) reported high acculturative stress levels. This study revealed that 29.5 % of the participants scored higher than 109, which refers to serious acculturative stress levels (Table 4.12).

Table 4.12: Prevalence of acculturative stress

Stress levels	Prevalence n (%)
Low levels (<84)	116 (37.2)
Moderate levels (85-133)	27 (8.6)
High levels (>134)	169 (54.2)
Total	312 (100%)
Cut-off point for serious level (score ≥109)[1]	
Stress score<109	220 (70.5)
Stress score≥109	92 (29.5)
Total	312 (100%)

[1] According to ASSIS developers (Sandhu & Asrabadi, 1994)

4.2.4.2. Sources of acculturative stress

Results in Table 4.13 demonstrate the sources of acculturative stress, where homesickness and culture shock were the most reported stressors, while the least reported stressors were the guilt and fear.

Table 4.13: Ranking of sources of acculturative stress

Rank	Stressor	Mean (SD)
1	Homesickness	3.22 (0.92)
2	Cultural Shock (Stress due to change)	2.95 (0.94)
3	Discrimination	2.64 (0.91)
4	Non specific	2.62 (0.76)
5	Hate	2.47 (1.0)
6	Guilt	2.38 (1.0)
7	Fear	2.23 (0.91)

4.2.4.3. Association between acculturative stress and individual characteristics

Independent t-test indicated a statistically significant difference in gender ($P < 0.05$), as males were found to have higher acculturative stress (Mean= 97.7, SD=23.1) compared to females (Mean= 90.5, SD=30.4). Students who have academic difficulties/concerns (Mean= 99.5, SD=25.0) had significantly higher acculturative stress compared to those with no academic difficulties (Mean= 87.3, SD=26.3).

ANOVA results revealed that country of origin groups had a statistically significant difference ($P < 0.05$). Students of African countries origin had higher acculturative stress scores (Mean= 105.3, SD=20.7) compared to students of Arabic origin (Mean= 92.1, SD=26.0) (Table 4.14). Non-significant statistical differences ($P > 0.05$) were found between acculturative stress scores among different student groups in terms of marital status, source of funding, length of stay, previous travel experience, degree and discipline of study (Table 4.14).

Table 4.14: Association between acculturative stress and individual characteristics

Characteristics	Mean(SD)	*P* value
Gender*		
Male (N=201)	97.7 (23.1)	**0.03**
Female (N=111)	90.5 (30.4)	
Marital status*		
Single (N=119)	93.6 (27.5)	0.501
Married (N=191)	95.7 (25.0)	
Degree*		
Master (N=129)	96.0 (27.2)	0.611
PhD (N=179)	94.4 (25.5)	
Academic difficulties*		
Yes (N=201)	99.5 (25.0)	**0.001**
No (N=111)	87.3 (26.3)	
Previous travel experience*		
No (N=81)	100.8 (26.2)	0.056
Yes (N=251)	93.7 (25.9)	
Length of stay**		
6 months- 1 year (N=76)	90.0 (23.0)	0.129
1-3 years (N=110)	97.8 (25.4)	
more than 3 years (N=126)	95.9 (28.2)	

Table 4.14: (Continued)

Characteristics	Mean(SD)	*P* value
Source of funding**		
Scholarship/Funding[1](N=94)	94.4 (23.5)	0.649
parents/Family[2] (N=111)	97.4 (28.5)	
Personal earning/saving[3] (N=88)	92.8 (25.5)	
Study discipline**		
Applied science (N=119)	96.5 (28.4)	0.796
Formal science (N=33)	93.5 (24.1)	
Humanities (N=54)	91.4 (24.8)	
Natural science (N=28)	96.1 (27.6)	
Social science (N=78)	96.0 (23.8)	
Country of origin, ***		
Arabic (N=202)	92.1 (26.0)	**0.010**
Asian (N=77)	98.7 (27.4)	
Africans (N=33)	105.3 (20.7)	

*t-test, ** ANOVA test, ***Pair wise comparison (Arabic and African *P*=0.019,)

To test the association with age, the Spearman correlation was used. Results indicated no correlation between acculturative stress scores and age (r=-0.03, *P*>0.05, Table 4.15).

Table 4.15: Correlation of acculturative stress with age

Variables	Correlation Coefficient (Spearman's rho)	Sig. (2-tailed)
Age	-0.037	0.509
Acculturative stress		

4.2.5. Perceived stress

The median for perceived stress score was 7.0 (IQR=4.0) with scores range between 0 and 16 (Table 4.16).

Table 4.16: Alpha coefficient, score range, mean, and median of perceived stress

	Alpha coefficient	Score range	Mean (SD)	Median (Q1-Q3)	95% CI
Perceived stress	0.61	0-16	7.26 (3.0)	7.0 (4.0)	6.9 - 7.6

4.2.5.1. Prevalence of perceived stress

Based on the results, 13.4 % of participant reported high levels of perceived stress, while half of the participants (51.0 %) reported moderate perceived stress levels (Table 4.17).

Table 4.17: Prevalence of perceived stress

Stress Levels	Prevalence n (%)
Low levels (1-5)	86 (24.5)
Moderate levels(6-10)	179 (51.0)
High levels (11-16)	47 (13.4)

4.2.5.2. Association between perceived stress and individual characteristics

Mann-Whitney results indicated that perceived stress was significantly higher ($P = 0.004$) in master students (Median =8) compared to PhD students (Median= 7). Perceived stress was found to have highly significant difference ($P < 0.001$) between students who have academic difficulties (Median =8) and those with no academic difficulties (Median =6, Table 4.18).

Kruskal-Wallis test indicated a statistically significant difference ($P = 0.03$) in perceived stress score among the different funding sources. The pairwise comparison revealed that significant difference ($P= 0.004$) between students who depend on scholarship/funding (Median=6) and students who depend on parents (Median =8). Kruskal-Wallis test also indicated that country of origin groups had a significant difference ($P < 0.05$). Students of Asian countries origin had higher perceived stress scores (Median =8) compared to students of African origin (Median =6) and Arabic origin (Median=7). Non-significant statistical differences ($P>0.05$) were found among the other groups (Table 4.18). Results revealed that age was negatively correlated with perceived stress scores (r=-0.14, $P>0.05$, Table 4.19).

Table 4.18: Association between perceived stress and individual characteristics

Characteristics	Median (IQR)	*P* value
Gender*		
Male (N=201)	7 (4)	0.181
Female (N=111)	7 (3)	
Marital status*		
Single (N=119)	8 (4)	0.228
Married(N=191)	7 (4)	
Degree*		
Master (N=129)	8 (4)	**0.004**
PhD (N=179)	7 (3)	
Academic difficulties*		
Yes (N=201)	8 (4)	**0.001**
No (N=111)	6 (4)	
Previous travel experience*		
No (N=81)	8 (4)	0.519
yes (N=251)	7 (4)	
Length of stay**		
6 months- 1 year (N=76)	7 (4)	0.661
1-3 years (N=110)	7 (4)	
More than 3 years (N=126)	7 (4.2)	
Source of funding, ***		
Scholarship/Funding[1] (N=94)	6 (3)	**0.03**
parents/Family[2] (N=111)	8 (4)	
Personal earning/saving[3] (N=88)	7.5 (4.7)	
Study discipline**		
Applied science (N=119)	8 (5)	
Formal science (N=33)	7 (2.5)	0.062
Humanities (N=54)	7 (4)	
Natural science (N=28)	6 (2)	
Social science (N=78)	7.5 (3)	
Country of origin, ***		
Arabic (N=202)	7 (4.0)	**0.027**
Asian (N=77)	8 (3.5)	
Africans (N=33)	6 (3.7)	

* Mann-Whitney test, ** Kruskal-Wallis test, ***Pair wise comparison (Scholarship and parents/family *P*=0.004, Asian and African *P*=0.009)

Table 4.19: Correlation of perceived stress and age

Variables	Correlation Coefficient (Spearman's rho)	Sig. (2-tailed)
Age	-0.141	**0.013**
Perceived stress		

4.2.6. Social support

The overall mean for social support score was 64.3 (13.3) with scores range between 12 and 84 (Table 4.20).

Table 4.20: Alpha coefficient, score range, mean, and median of social support

	Alpha coefficient	Score range	Mean (SD)	95% CI	Median (IQR)
Social support	0.89	12-84	64.3 (13.3)	62.8 -65.7	66 (19.7)
Family subscale		1-7	5.8 (1.16)	5.65-5.91	6 (1.5)
Friends subscale		1-7	4.9 (1.49)	4.72-5.05	5 (2)
Significant others subscale		1-7	5.4 (1.49)	5.23-5.56	5.7 (2)

4.2.6.1. Prevalence of social support

Table 4.21 presents the levels of social support. Based on the results, the majority of the participants (96.7 %) reported either moderate (31.4%) or high (65.3%) social support levels. The highest reported social support was from family (Median=6) (Tables 4.20 - 4.21).

Table 4.21: Social support levels

Social support Levels	Prevalence n (%)
Low 12-36 (1-2.9)	10 (3.2%)
Moderate 37-60 (3-5)	98 (31.4%)
High 61-84 (5.1-7)	204 (65.3%)

4.2.6.2. Association between social support and individual characteristics

Mann-Whitney results indicated that social support was significantly higher (P=0.04) in married students (Median =68) compared to single students (Median =64). Non-significant statistical differences (P>0.05) were found among the other sociodemographic

categories of students (Table 4.22). Results revealed that age was not correlated with social support scores (r=0.04, P>0.05, Table 4.23).

Table 4.22: Association between social support and individual characteristics

Characteristics	Median (IQR)	P-value
Gender*		
Male (N=201)	66 (18.5)	0.392
Female (N=111)	70.0 (21.0)	
Marital status*		
Single (N=119)	64 (23.0)	**0.041**
Married(N=191)	68 (18.0)	
Degree*		
Master (N=129)	66 (19.0)	0.896
PhD (N=179)	67 (20)	
Academic difficulties*		
Yes (N=201)	66 (19)	0.172
No (N=111)	68 (18)	
Previous travel experience*		
No (N=81)	64 (22.0)	0.202
yes (N=251)	67 (18)	
Length of stay**		
6months- 1 year (N=76)	63.5 (21.5)	0.065
1-3 years (N=110)	69 (19)	
More than 3 years (N=126)	67 (21)	
Source of funding**		
Scholarship/Funding[1](N=94)	68.0 (16)	
parents/Family (N=111)	66 (18)	0.797
Personal earning/saving[3] (N=88)	66 (20)	
Study discipline**		
Applied science (N=119)	66 (20)	
Formal science (N=33)	69 (12)	0.525
Humanities (N=54)	67.5 (20.5)	
Natural science (N=28)	61.5 (19.7)	
Social science (N=78)	65.5 (17.2)	
Country of origin**		0.216
Arabic (N=202)	67 (19)	
Asian (N=77)	64 (20.5)	
Africans (N=33)	64.5 (16.5)	

* Mann-Whitney test, ** Kruskal-Wallis test

Table 4.23: Correlation of social support and age

Variables	Correlation Coefficient (Spearman's rho)	Sig. (2-tailed)
Age **Social support**	0.041	0.473

4.2.7. Bivariate analysis

A preliminary assessment of correlations matrix between the main study variables was made using Spearman's Correlation (Table 4.24). The bivariate correlation results showed that 9 out of 10 correlations were statistically significant ($r \leq 0.4$, $P < 0.05$).

Table 4.24: Correlation matrix of main variables

Study Variables	OHRQL	Acculturative Stress	Perceived Stress	Social Support	OH Perception
OHRQoL	1.000				
Acculturative Stress	0.200**	1.000			
Perceived Stress	0.218**	0.383**	1.000		
Social Support	-0.134*	-0.155**	-0.256**	1.000	
OH Perception	-0.483**	-0.094	-0.170**	0.128*	1.000

**. Spearman's Correlation is significant at the 0.001 level (2-tailed).
*. Spearman's Correlation is significant at the 0.05 level (2-tailed).

4.2.8. Structural Equation Model Results

4.2.8.1. Results of measurement model (Outer model)

In this study, two measurement models were included (Arabic & English versions of the study instrument), which were assessed separately. Acculturative stress, perceived stress and OHRQoL were second-order formative constructs while social support was a second-order reflective construct.

A. Results of the formative measurement models:

Bootstrapping procedure results showed that the weights of all items were significant (t >1.96, P <0.05), signifying sufficient item (indicator) validity had been achieved for both Arabic and English versions (Appendix IX). The indicator weights ranged between 0.2 and 0.9 (Figures 4.2 and 4.3).

In this study, all VIF values were found to be less than 3, which means there is no multi co-linearity and indicating sufficient construct validity of the formative indicators (Appendix IX).

B. Results of the reflective measurement model:

Results showed that all the indicator loadings are above 0.70, except for loading of item seven in the English version (0.67) which is still considered as acceptable (AVE above 0.50). (Figures 4.2 and 4.3, Appendix X).

All reflective constructs in this model exceeded the recommended threshold (0.70) of the reliability and ranged between (0.81 - 0.88). AVE range in this study was above the recommended threshold (0.52 - 0.66). HTMT values for social support construct were acceptable and ranged between 0.42 and 0.66 (Appendix X).

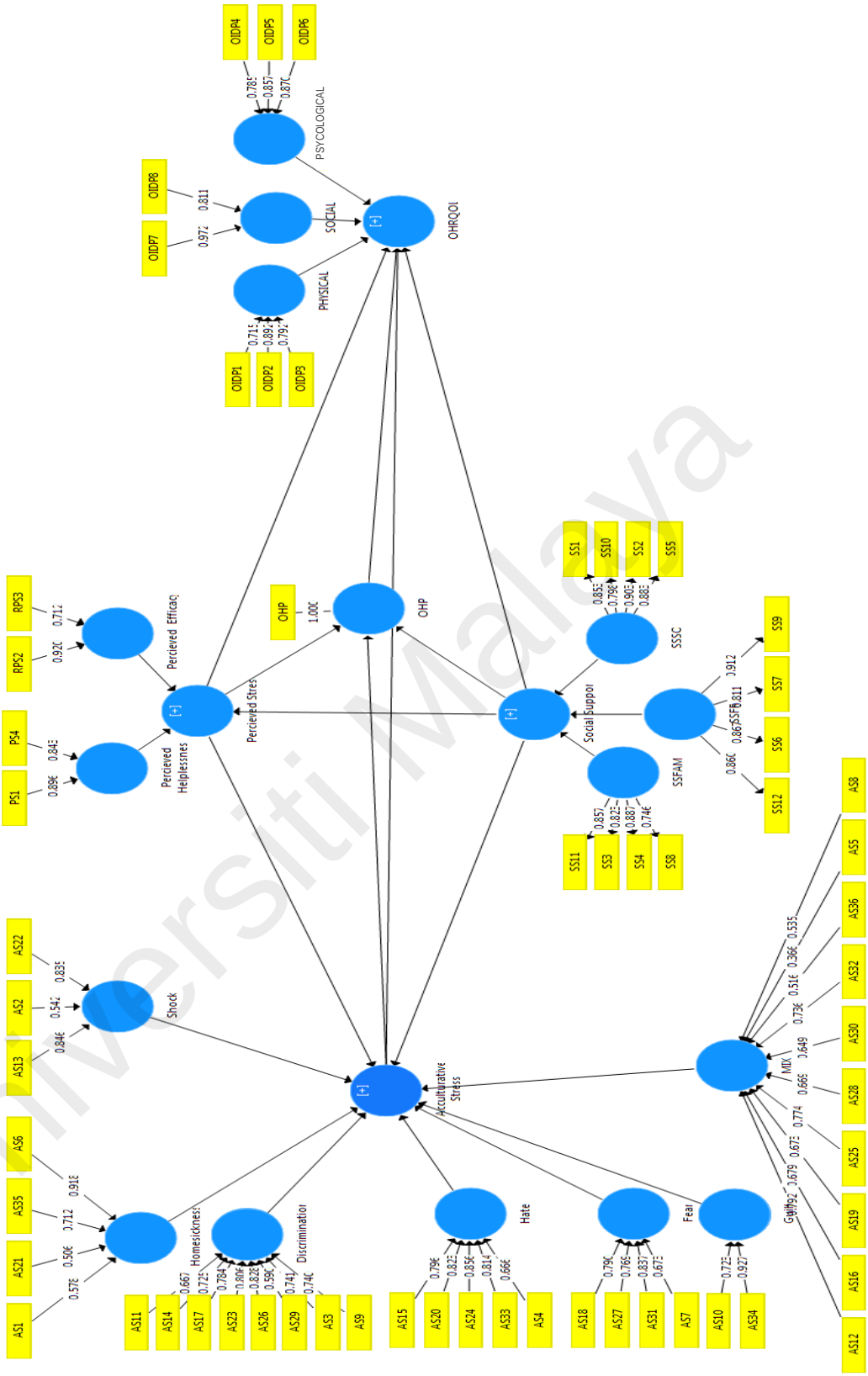


Figure 4.2: Items (Indictors) loadings/weights (English)

Note:OHP=oral Health Perceptions

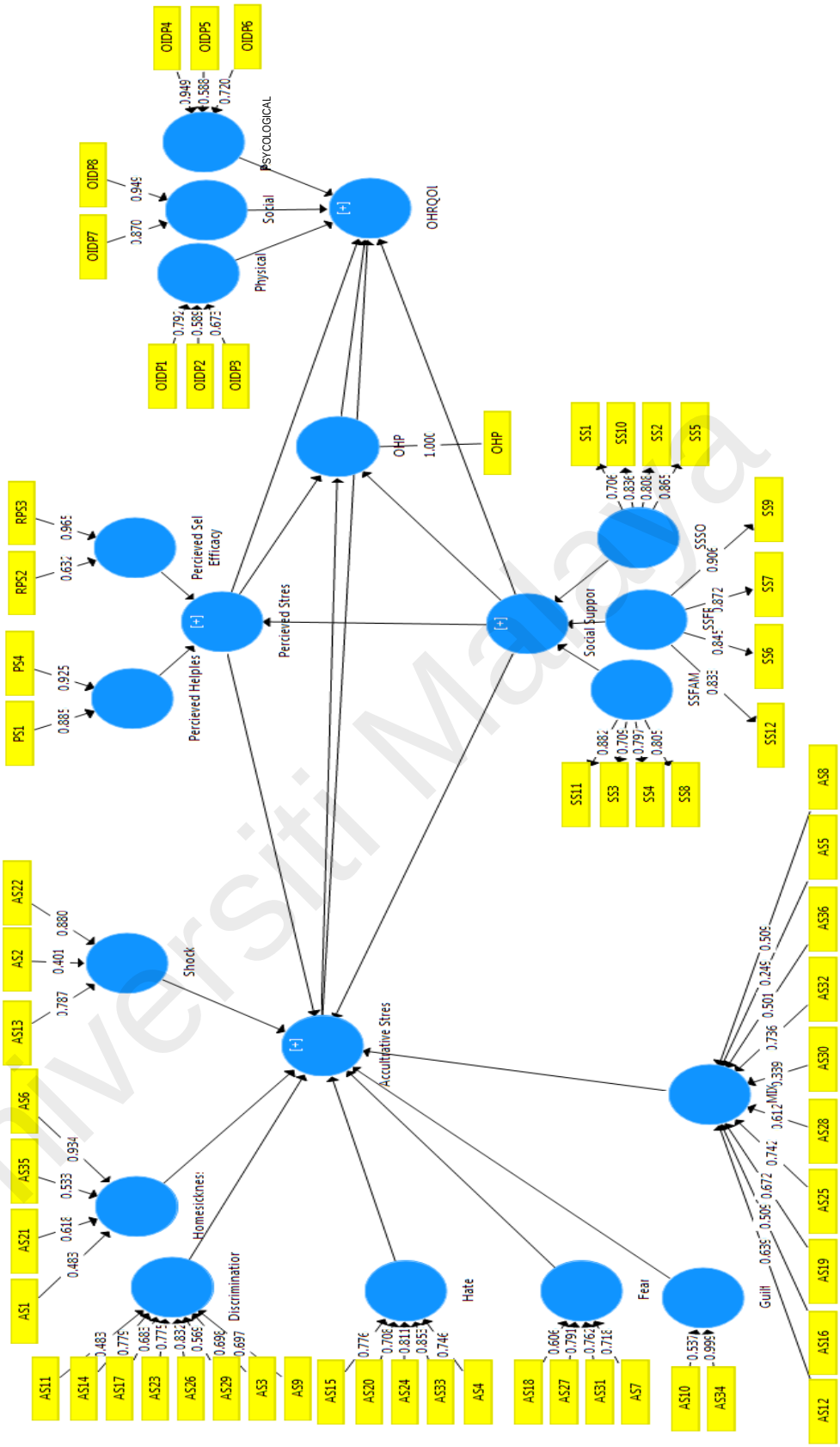


Figure 4.3: Items (Indictors) loading /weights (Arabic)

Note: OHP=oral Health Perceptions

4.2.8.2. Results of structural model (Inner model)

Figure 4.4 shows the results of the structural model (Inner model), including path coefficients (β) and the coefficient of determination (explained variance R^2).

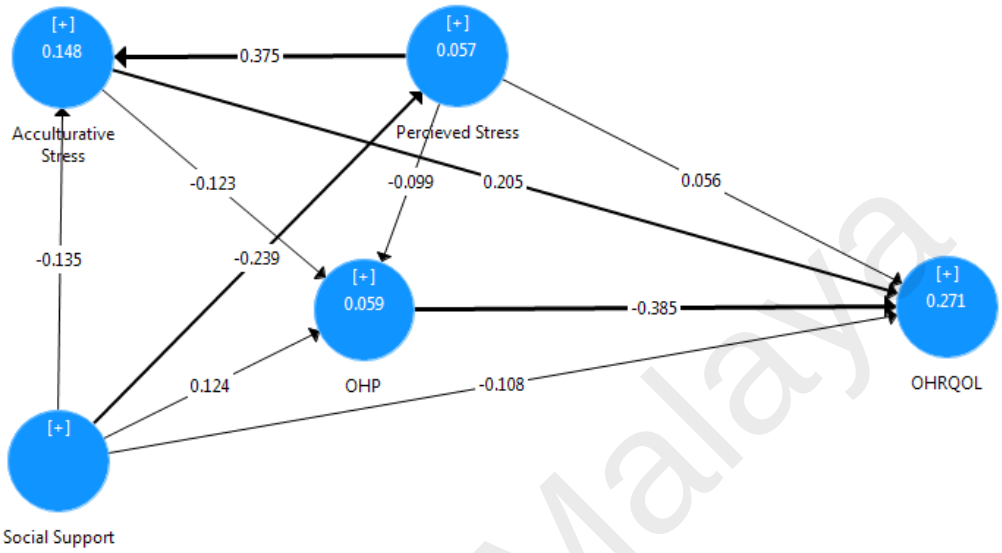


Figure 4.4: Structural model results

Notes:
1. Numbers in the circle (R^2): indicate the explained variance of the latent variable
2. Numbers on the arrow (β): the path coefficients that show how strong the effect of one variable is on another. 3. The thickness of the arrow indicates the weight of different path coefficients which enables us to rank their relative statistical importance.

The coefficient of determination (R^2) was 0.271 (substantial) for the OHRQoL, indicating that 27.1 % of the variance in OHRQoL was explained by the exogenous variables (OHP, perceived stress, acculturative stress, and social support) in this model (Table 4.25).

Table 4.25: The coefficient of determination (R^2) of the study variables

Endogenous Variable	R^2	T value	P value
Acculturative Stress	0.148	2.173	0.03
OHP	0.059	1.274	0.203
OHRQOL	0.271	4.237	0.001
Perceived Stress	0.057	1.313	0.189

Note: R^2 value of 0.10 as a minimum acceptable level (Falk and Miller, 1992). R^2 >0.26 is substantial, R^2 >0.13 is moderate, R^2 (0.02-0.12) is weak (Cohen, 1988)

Results indicated that oral health perceptions have a medium effect size on OHRQoL (f^2= 0.19), and acculturative stress has a small effect size (f^2=0.05). The effect size of both social support (f^2= 0.10) and perceived stress (f^2= 0.003) were less than 0.02 and considered with no effect size (Table 4.26).

The coefficient of determination (R^2) was 0.148 (Moderate) for the acculturative stress (as an endogenous latent variable), indicating that 14.8 % of the variance in acculturative stress was explained by the exogenous variables (perceived stress and social support) in this model.

Results also showed a small effect size of social support (f^2= 0.03) on acculturative stress, and medium effect size of perceived stress (f^2= 0.155) on acculturative stress (Table 4.26). The coefficient of determination (R^2) for both oral health perceptions and perceived stress were not statistically significant (P>0.05) (Table 4.25).

Table 4.26: Effect Size (f^2) of exogenous variables

Exogenous variables / Endogenous Variable	OHP	OHRQOL	Acculturative Stress	Perceived Stress
OHP		0.191		
OHRQOL				
Acculturative Stress	0.014	0.048		
Perceived Stress	0.008	0.003	0.155	
Social Support	0.015	0.015	0.03	0.061

Note: results to be read by columns

The Blindfolding procedure was used to test the model's out-of-sample predictive power (predictive relevance, Q^2). Results showed that the overall model's predictive power ranged between 2% and 23 % (Table 4.27).

Table 4.27: Predictive power ($Q^{2)}$) of endogenous variables

Variables	Q2	Interpretation
Acculturative Stress	0.02	Weak
Perceived Stress	0.04	Weak
OHP	0.04	Weak
OHRQOL	0.23	Moderate

4.2.8.3. Individual hypotheses testing

This section summarises the results of the study hypothesis. T-value was used as evaluation criteria to confirm each hypothesis for the statistical significance of the paths. The cut-off point used was t-value ≥ 1.96 (Hair et al. 2019). Table 4.28 presents the path coefficient sizes and significance of all research hypotheses.

Table 4.28: Path coefficient and significance of the research hypotheses

Hypo	Relationship	Std Beta (β)	Std Error	T value	P value	Decision
H1	ACS -> OHRQoL	0.205	0.078	2.63**	0.009	Supported
H2	SS -> OHRQ0L	-0.108	0.08	1.352	0.176	Not supported
H3	SS -> ACS	-0.135	0.081	2.502**	0.007	Supported
H4	ACS -> OHP	-0.123	0.085	1.441	0.15	Not supported
H5	OHP -> OHRQOL	-0.385	0.069	5.55***	0.001	Supported
H6	SS -> OHP	0.124	0.095	1.312	0.19	Not supported
H7	SS -> PS	-0.239	0.09	2.642**	0.008	Supported
H8	PS -> ACS	0.375	0.088	4.27***	0.001	Supported
H19	PS -> OHP	-0.099	0.109	0.911	0.362	Not supported
H10	PS -> OHRQoL	0.056	0.085	0.656	0.512	Not supported

ACS= Acculturative stress, PS= Perceived stress, SS= Social support, OHP= Oral health perceptions.

* Significant at 0.05 level ** Significant at 0.01 level *** Significant at 0.001 level

Hypothesis H1 states that "**Higher acculturative stress is positively related to higher OHRQoL impact",** results showed that the hypothesised path for H1 was positive and statistically significant (β = 0.205, $P < 0.01$). Thus hypothesis H1was supported.

Hypothesis H2 states that "**Higher social support is negatively related to higher OHRQoL impact",** results showed that the hypothesised path for H2 was negative but not statistically significant (β = -0.108, *P* >0.05). Thus hypothesis H2 was not supported.

Hypothesis H3 states that "**Aacculturative stress is negatively related to social support",** results showed that the hypothesised path for H3 was negative and statistically significant (β = -0.135, *P* < 0.01). Thus hypothesis H3 was supported.

Hypothesis H4 states that "**Aacculturative stress is negatively related to oral health perceptions",** results showed that the hypothesised path for H4 was negative but not statistically significant (β = -0.123, *P* >0.05). Thus hypothesis H4 was not supported.

Hypothesis H5 states that "**Oral health perception is negatively related OHRQoL impact",** results showed that the hypothesised path for H5 was negative with high statistical significant (β = -0.385, *P* < 0.001). Thus hypothesis H5 was supported.

Hypothesis H6 states that "**social support is positively related to oral health perceptions",** results showed that the hypothesised path for H6 was positive but not statistically significant (β = 0.124, *P* >0.05). Thus hypothesis H6 was not supported.

Hypothesis H7 states that "**social support is negatively related to perceived stress",** results showed that the hypothesised path for H7 was negative and statistically significant (β = -0.239, *P* < 0.001). Thus hypothesis H7 was supported.

Hypothesis H8 states that "**Perceived stress is positively related to acculturative stress",** results showed that the hypothesised path for H8 was positive with high statistical significant (β = 0.375, *P* < 0.001). Thus hypothesis H8 was supported.

Hypothesis H9 states that "**Perceived stress is negatively related to oral health perceptions",** results showed that the hypothesised path for H9 was negative but not statistically significant (β = -0.099, *P* >0.05). Thus hypothesis H9 was not supported.

Hypothesis H10 states that "**Perceived stress is positively related to OHRQoL impact",** results showed that the hypothesised path for H10 was positive but not statistically significant (β = 0.056, *P* >0.05). Thus hypothesis H10 was not supported.

4.2.8.4. Mediation effect of social support

The bootstrapping analysis (Table 4.29) showed that the indirect effect of social support on acculturative stress and OHRQoL was not significant (β=0.03, *P*>0.05). Hence, H11b "Social support significantly mediates the relationship between acculturative stress and OHRQoL" was not supported.

However, the bootstrapping analysis indicated that the indirect effect of social support on perceived stress and OHRQoL was statistically significant (β=0.04, *P*<0.05). Also, the 95% Bootstrap Confidence Interval (CI) does not straddle 0 in between which indicates that there is a mediation (Table 4.29). Hence, H12b Social support significantly mediates the relationship between Perceived stress and OHRQoL was supported.

Table 4.29: The bootstrapping analysis of social support's indirect effect (Mediating effect)

Path	(β)	T value	P value	IV-> Mediator (Path a)	Mediator -> DV (Path b)	SD	Bootstrapped CI 95% LL - UL	
ACS -> SS -> OHRQoL	0.032	1.78	0.075	-	-	-	-	
PS-> SS -> OHRQoL	0.046	2.23	**0.026**	-0.247	-0.186	0.021	0.004	0.087

ACS= Acculturative stress, PS= Perceived stress, SS= Social support, OHP= Oral health perceptions. T >1.96 at p < 0.05

4.2.8.5. Other indirect (mediating effects) paths

Results showed significant indirect effects of both the acculturative stress (β=0.05, *P*=<0.05) and perceived stress (β=0.12, *P*<0.05) on OHRQoL. While the indirect effects on oral health perceptions were not significant (*P*> 0.05) (Table 4.30).

Table 4.30: The bootstrapping analysis of indirect effects (Mediating effects)

Path	(β)	T value	P value	IV-> Mediator (Path a)	Mediator -> DV (Path b)	SD	Bootstrapped CI 95% LL - UL	
ACS -> SS -> OHP	-0.024	1.67	0.095	-	-	-	-	
PS -> SS -> OHP	-0.034	1.82	0.069	-	-	-	-	
ACS -> PS -> OHRQoL	0.05	2.35	**0.019**	0.414	0.126	0.022	0.009	0.095
PS-> ACS -> OHRQoL	0.12	2.50	**0.012**	0.383	0.308	0.047	0.025	0.210

ACS= Acculturative stress, PS= Perceived stress, SS= Social support, OHP= Oral health perceptions. T >1.96 at *P* < 0.05

4.2.8.6. Moderation effects of social support

Results indicated that no moderating effect of social support on the relationship between acculturative stress and OHRQoL T statistic of the moderating effect was less than 1.96. (Figure 4.5).

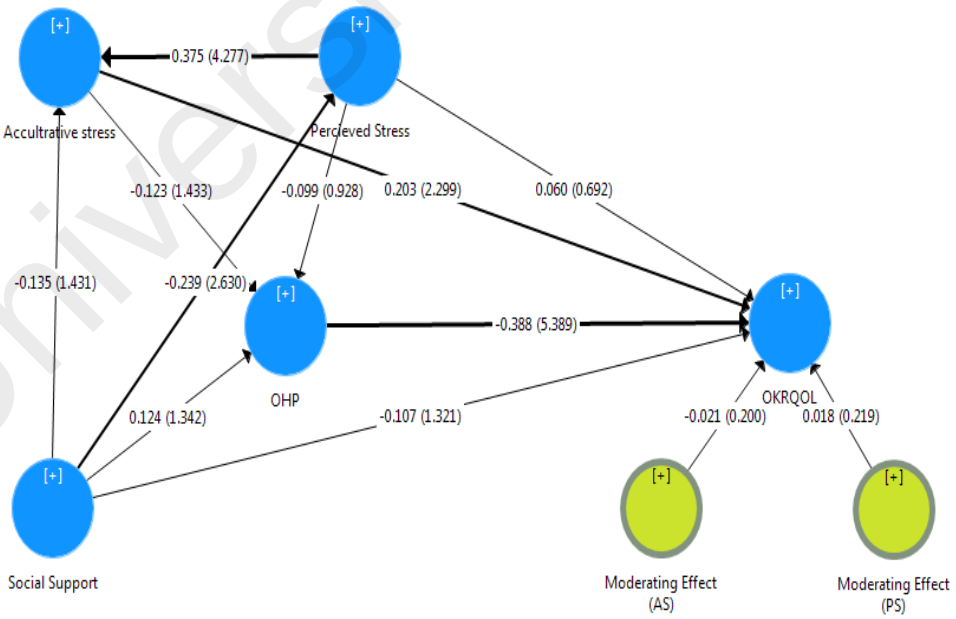


Figure 4.5: Moderation effects of social support on relationships between acculturative stress, perceived stress, and OHRQoL

Note: Numbers on the line represent β (t value)

However, when the moderation effect of social support was tested on the OHRQoL domains rather than OHRQoL as one construct, results showed that social support had a moderating effect on the psychological domain (t=1.98) as shown in Figure 4.6. Hence, H11a that states "Social support significantly moderates the relationship between Acculturative stress and OHRQoL" was partially supported.

Results indicated that no moderating effect of social support on the relationship between perceived stress and OHRQoL, as T value of the moderating effect was less than 1.96 (Figure 4.6).

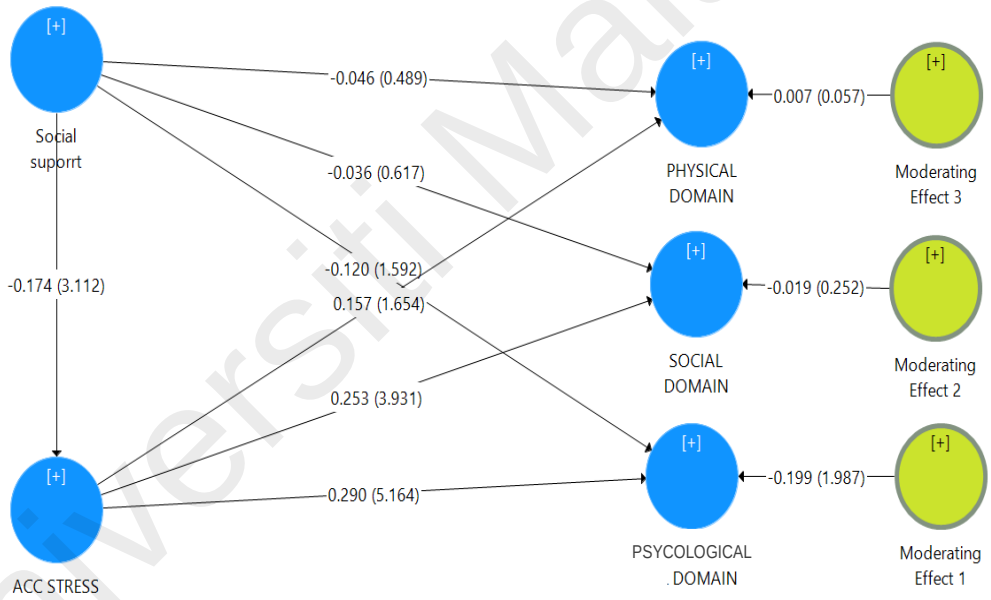


Figure 4.6: Moderation effects of social support on relationships between Acculturative stress and OHRQoL domains
Note: Numbers on line represent β (t value)

when the moderation effect of social support was tested on the OHRQoL domains, results showed that social support had no moderating effect on any of the three-domain (t<1.96) as shown in (Figure 4.7). Hence, H12a "Social support significantly moderates the relationship between Perceived stress and OHRQoL" was not supported.

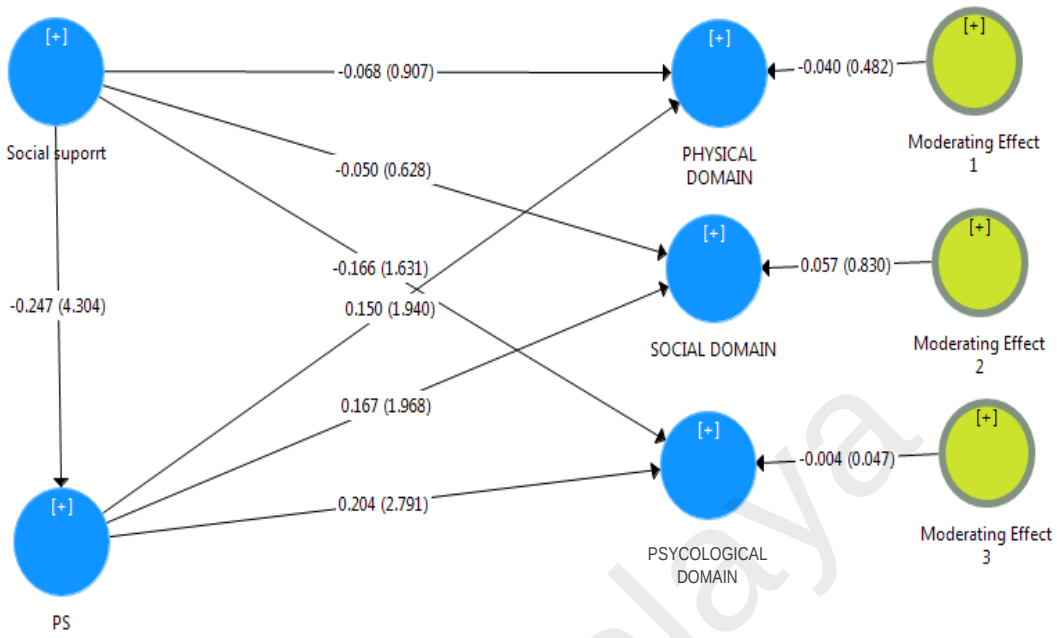


Figure 4.7: Moderation effects of social support on relationships between Perceived stress and OHRQoL domains
Note: Numbers on the line represent β (t value)

4.2.8.7. Results of moderating effects of individual characteristics on the model

- **Gender**

Results revealed that there were only one significant path differences between males and females groups (Table 4.31). Social Support -> OHP (*P*=0.964), which was positively insignificant in overall sample model (β=0.124, *P*=0.19) and males model (β=0.013, *P*=0.864), but was positively significant in females model (β=0.244, *P*=0.037). Gender moderated the relationship between social support and oral health perceptions.

Table 4.31: Moderation analysis for gender (MGA)

Relationship	Total sample n=312			Male N=201			Female N=111			MGA	
	(β)	P	R^2	(β)	P	R^2	(β)	P	R^2	Path Coeff -diff	P
ACS-> OHP	-0.12	0.15	0.059	-0.06	0.367	0.045	-0.05	0.616	0.110	0.013	0.54
SS-> OHP	0.12	0.19		0.01	0.864		**0.24**	**0.037**		0.238	**0.96**
PS -> OHP	-0.09	0.36		-0.18	0.044		-0.13	0.242		0.045	0.62
ACS-> OHRQoL	0.20	0.009	0.271	0.11	0.111	0.230	0.18	0.058	0.226	0.074	0.73
SS-> OHRQoL	-0.10	0.176		-0.11	0.111		-0.10	0.319		0.01	0.53
OHP -> OHRQoL	-0.39	0.001		-0.39	0.001		-0.39	0.001		0.00	0.50
PS -> OHRQoL	0.05	0.512		0.08	0.201		0.06	0.582		0.02	0.12
SS-> ACS	-0.13	0.007	0.148	-0.10	0.091	0.254	-0.04	0.693	0.120	0.065	0.72
PS-> ACS	0.38	0.001		0.48	0.001		0.33	0.001		0.143	0.09
SS-> PS	-0.24	0.008	0.057	-0.18	0.017	0.032	-0.36	0.001	0.126	0.176	0.06

ACS= Acculturative stress, PS= Perceived stress, SS= Social support, OHP= Oral health perceptions

- **Age**

The sample was divided into two groups based on the overall mean of age (33.6=34) as a cut-off point. Younger-age group (≤ 34, n=184) and older-age group (>34, n=128). Results indicated that there were one highly significant path differences between the age groups (Table 4.32). Social Support -> OHP (*P*=0.009), which was positively insignificant in the overall sample (β=0.124, *P*=0.19) and older-age model (β=0.108, *P*=0.225), but was positively significant in younger-age model (β=0.191, *P*=0.028). Age moderated the relationship between social support and oral health perceptions.

Table 4.32: Moderation analysis for age (MGA)

Relationship	Total sample n=312			Younger group (≤ 34) N=184			Older group (>34) N=128			MGA	
	(β)	P	R^2	(β)	P	R^2	(β)	P	R^2	Path Coeff diff	P
ACS-> OHP	-0.12	0.15	0.059	-0.007	0.933	0.079	-0.17	0.05	0.090	0.17	0.067
SS-> OHP	0.12	0.19		**0.19**	**0.028**		0.11	0.22		0.08	**0.009**
PS -> OHP	-0.09	0.362		-0.16	0.085		-0.20	0.04		0.034	0.396
ACS-> OHRQoL	0.20	0.009	0.271	0.16	0.04	0.199	0.11	0.14	0.279	0.044	0.342
SS-> OHRQoL	-0.10	0.176		-0.15	0.06		-0.07	0.418		0.083	0.769
OHP -> OHRQoL	-0.39	0.001		-0.33	0.001		-0.46	0.001		0.132	0.096
PS -> OHRQoL	0.05	0.512		0.006	0.935		0.06	0.474		0.05	0.679
SS-> ACS	-0.13	0.007	0.148	-0.03	0.68	0.190	-0.15	0.045	0.165	0.13	0.115
PS-> ACS	0.38	0.001		0.43	0.001		0.35	0.001		0.08	0.22
SS-> PS	-0.24	0.008	0.057	-0.28	0.001	0.076	-0.20	0.054	0.039	0.08	0.74

ACS= Acculturative stress, PS= Perceived stress, SS= Social support, OHP= Oral health perception

- **Marital Status**

The sample was divided into two groups, single (n=119) married (n=191). Divorced/widowed category was not included due to the low number of the respondents (n=2). Results indicated that no significant path differences between the single and married groups (Table 4.33). Marital status was not a moderating variable in this study model.

Table 4.33: Moderation analysis for marital status (MGA)

Relationship	Total sample n=312			Single N=119			Married N=191			MGA	
	(β)	P	R^2	(β)	P	R^2	(β)	P	R^2	Path Coeff -diff	P
ACS-> OHP	-0.12	0.15	0.059	-0.09	0.36	0.070	-0.03	0.73	0.055	0.06	0.71
SS -> OHP	0.12	0.19		0.14	0.229		0.05	0.55		0.09	0.25
PS -> OHP	-0.09	0.362		-0.13	0.25		-0.21	0.02		0.08	0.29
ACS-> OHRQoL	0.20	0.009	0.271	0.20	0.035	0.234	0.11	0.09	0.220	0.09	0.21
SS-> OHRQoL	-0.10	0.176		-0.06	0.496		-0.13	0.10		0.06	0.30
OHP -> OHRQoL	-0.39	0.001		-0.37	0.001		-0.4	0.001		0.03	0.39
PS -> OHRQoL	0.05	0.512		0.03	0.73		0.02	0.72		0.001	0.47
SS-> ACS	-0.13	0.007	0.148	-0.08	0.367	0.180	-0.08	0.21	0.175	0.00	0.49
PS-> ACS	0.38	0.001		0.40	0.001		0.39	0.001		0.001	0.48
SS-> PS	-0.24	0.008	0.057	-0.27	0.002	0.072	-0.22	0.003	0.048	0.05	0.66

ACS= Acculturative stress, PS= Perceived stress, SS= Social support, OHP= Oral health perceptions

- **Source of funding**

Originally there were four categories under this variable, Scholarship/Funding (n=94), parents/Family (n=111) Personal earning/saving (n=88), others (n=19). For moderation analysis, the sample was split to only two groups based on the presence of Scholarship/Funding or not; the others group was not included due to the low number of the respondents (n=19). Hence, a total of 94 were in the scholarship/funding group, and 199 in non-scholarship/funding groups.

Results indicated that no significant differences between the two different groups (Table 4.34). The source of income was not a moderating variable in this model.

Table 4.34: Moderation analysis for source of income (MGA)

Relationship	Total sample n=312			scholarship/ funding N=94			Non-scholarship/ Funding N=199			MGA	
	(β)	P	R^2	(β)	P	R^2	(β)	P	R^2	Path Coeff-diff	P
ACS-> OHP	-0.12	0.15	0.06	-0.05	0.966	0.010	-0.07	0.468	0.154	0.02	0.332
SS -> OHP	0.12	0.19		0.06	0.572		0.24	0.033		0.18	0.875
PS -> OHP	-0.09	0.36		-0.07	0.582		-0.20	0.087		0.13	0.219
ACS-> OHRQoL	0.20	0.009	0.271	0.03	0.688	0.267	0.19	0.047	0.175	0.16	0.901
SS-> OHRQoL	-0.10	0.17		-0.09	0.299		-0.13	0.223		0.04	0.384
OHP -> OHRQoL	-0.39	0.001		-0.50	0.001		-0.23	0.008		0.27	0.92
PS -> OHRQoL	0.05	0.512		0.05	0.659		0.06	0.561		0.01	0.765
SS-> ACS	-0.13	0.007	0.148	-0.16	0.069	0.109	-0.02	0.819	0.157	0.14	0.925
PS-> ACS	0.38	0.001		0.26	0.003		0.40	0.001		0.14	0.869
SS-> PS	-0.24	0.008	0.057	-0.17	0.103	0.029	-0.35	0.001	0.124	0.18	0.095

ACS= Acculturative stress, PS= Perceived stress, SS= Social support, OHP= Oral health perceptions

- **Length of stay**

Originally there were three categories under this variable, 6 months- 1year (n=76), 1-3 years (n=110), more than 3 years (n=126). For moderation analysis, the sample was split to 2 groups, less than 3 years (n=186), and more than 3 years (n=126).

Results indicated that there were one significant path differences between the two different groups (Table 4.35). Perceived Stress -> Acculturative Stress which was positively significant in all models, but (<3 years) model showed the highest effect (β=0.49, *P*=0.001) compared with overall model (β=0.38, *P*=0.001) and (>3 years) model (β=0.28, *P*=0.001). The length of stay moderated the relationship between the perceived stress and the acculturative stress in this study model.

Table 4.35: Moderation analysis for length of stay (MGA)

Relationship	Total sample n=312			<3 yrs N=186			> 3 yrs N=126			MGA	
	(β)	P	R^2	(β)	P	R^2	(β)	P	R^2	Path Coeff diff	P
ACS-> OHP	-0.12	0.15	0.059	-0.06	0.449	0.078	-0.03	0.745	0.032	0.03	0.593
SS-> OHP	0.12	0.19		0.12	0.143		0.04	0.708		0.08	0.28
PS -> OHP	-0.09	0.36		-0.19	0.068		-0.15	0.106		0.04	0.595
ACS-> OHRQoL	0.20	0.009	0.271	0.11	0.178	0.191	0.17	0.014	0.280	0.06	0.73
SS-> OHRQoL	-0.10	0.176		-0.05	0.544		-0.16	0.059		0.11	0.153
OHP -> OHRQoL	-0.39	0.001		-0.36	0.001		-0.44	0.001		0.08	0.212
PS -> OHRQoL	0.05	0.512		0.07	0.367		0.01	0.892		0.06	0.229
SS-> ACS	-0.13	0.007	0.148	-0.04	0.56	0.252	-0.11	0.136	0.108	0.07	0.237
PS-> ACS	0.38	0.001		**0.49**	**0.001**		0.28	0.001		0.21	**0.022**
SS-> PS	-0.24	0.008	0.057	-0.26	0.001	0.066	-0.23	0.009	0.054	0.03	0.58

ACS= Acculturative stress, PS= Perceived stress, SS= Social support, OHP= Oral health perceptions

- **Previous Travel Experience**

Results indicated that the effect of social support on acculturative stress was negatively significant in overall model models (β= -0.14, *P*=0.007), but was significantly stronger in the group with no previous travel experience (β= -0.24, *P*=0.01) compared to the group with previous travel experience (β= -0.016, *P*=0.77) (Table 4.36). Previous travel experience moderated the relationship between social support and acculturative stress.

Table 4.36: Moderation analysis for previous travel experience (MGA)

Relationship	Total sample n=312			No Previous travel experience N=61			Previous travel experience N=251			MGA	
	(β)	P	R^2	(β)	P	R^2	(β)	P	R^2	Path Coeff diff	P
ACS-> OHP	-0.12	0.15	0.059	-0.04	0.786	0.194	-0.05	0.492	0.038	0.01	0.525
SS-> OHP	0.12	0.19		0.20	0.174		0.06	0.442		0.14	0.814
PS -> OHP	-0.09	0.362		-0.32	0.036		-0.15	0.05		0.17	0.162
ACS-> OHRQoL	0.20	0.009	0.271	0.2	0.182	0.371	0.13	0.023	0.192	0.07	0.687
SS-> OHRQoL	-0.10	0.176		-0.16	0.254		-0.07	0.227		0.08	0.275
OHP -> OHRQoL	-0.39	0.001		-0.48	0.001		-0.37	0.001		0.11	0.217
PS - OHRQoL	0.05	0.512		0.07	0.651		0.05	0.446		0.02	0.233
SS-> ACS	-0.13	0.007	0.148	**-0.25**	**0.016**	0.288	-0.02	0.778	0.159	0.23	**0.028**
PS-> ACS	0.38	0.001		0.42	0.001		0.40	0.001		0.02	0.582
SS-> PS	-0.24	0.008	0.057	-0.27	0.01	0.074	-0.24	0.001	0.058	0.03	0.397

ACS= Acculturative stress, PS= Perceived stress, SS= Social support, OHP= Oral health perceptions

- **Study Level**

Results indicated that there were one significant path differences (Table 4.37). Perceived Stress -> Acculturative Stress which was positively significant in all models, but master students model showed the highest effect (β=0.54, *P*=0.001) compared with the overall model (β=0.38, *P*=0.001) and PhD student model (β=0.27, *P*=0.001). The level of study moderated the relationship between the perceived stress and the acculturative stress in this study model.

Table4.37: Moderation analysis for study level (MGA)

Relationship	Total sample n=312			Master N= 133			PhD N=179			MGA	
	(β)	P	R^2	(β)	P	R^2	(β)	P	R^2	Path Coeff diff	P
ACS-> OHP	-0.12	0.15	0.059	-0.08	0.433	0.109	-0.04	0.612	0.038	0.04	0.617
SS-> OHP	0.12	0.19		0.21	0.068		0.01	0.881		0.20	0.058
PS -> OHP	-0.09	0.36		-0.15	0.145		-0.18	0.053		0.03	0.417
ACS-> OHRQoL	0.20	0.009	0.271	0.12	0.179	0.198	0.16	0.029	0.251	0.04	0.622
SS-> OHRQoL	-0.10	0.176		-0.06	0.545		-0.14	0.057		0.08	0.245
OHP -> OHRQoL	-0.39	0.001		-0.37	0.001		-0.42	0.001		0.05	0.315
PS -> OHRQoL	0.05	0.512		0.03	0.791		0.02	0.789		0.01	0.471
SS-> ACS	-0.13	0.007	0.148	-0.005	0.94	0.289	-0.13	0.051	0.106	0.13	0.084
PS-> ACS	0.38	0.001		**0.54**	**0.001**		0.27	0.001		0.27	**0.004**
SS-> PS	-0.24	0.008	0.057	- 0.3	0.001	0.088	-0.20	0.009	0.043	0.09	0.786

ACS= Acculturative stress, PS= Perceived stress, SS= Social support, OHP= Oral health perceptions

- **Academic difficulties/concerns**

Results indicated three significant path differences between the two groups (Table 4.38). First, Social Support -> OHRQoL, which was negatively insignificant in the overall sample (β=-0.10, *P*=1.76) and no academic difficulties model (β=-0.07, *P*=0.386), but was negatively significant in academic difficulties model (β=-0.19, *P*=0.04). Academic difficulties moderated the relationship between social support and OHRQoL.

Second, the effect of social support on acculturative stress was significantly stronger in the group with no academic difficulties (β= -0.20, *P*=0.002). Academic difficulties moderated the relationship between social support and acculturative stress.

Third, the effect of perceived stress on OHRQoL was significant in the group with academic difficulties (β=0.22. *P*=0.006), compared with the overall model (β=0.05. *P*=0.51), and the no academic difficulties model (β=0.05. P=0.40). Academic difficulties moderated the relationship between perceived stress and OHRQoL.

Table 4.38: Moderation analysis for academic difficulties/concerns (MGA)

Relationship	Total sample n=312			No academic difficulties N=111			Academic difficulties N=201			MGA	
	(β)	P	R^2	(β)	P	R^2	(β)	P	R^2	Path Coeff diff	P
ACS-> OHP	-0.12	0.15	0.059	-0.05	0.599	0.033	-0.09	0.24	0.064	0.04	0.124
SS-> OHP	0.12	0.19		0.04	0.742		0.14	0.081		0.10	0.901
PS -> OHP	-0.09	0.362		-0.20	0.06		-0.13	0.137		0.07	0.696
ACS-> OHRQoL	0.20	0.009	0.271	0.08	0.311	0.243	0.23	0.001	0.275	0.15	0.926
SS-> OHRQoL	-0.10	0.176		-0.08	0.386		**-0.19**	**0.004**		0.11	**0.009**
OHP -> OHRQoL	-0.39	0.001		-0.39	0.001		-0.38	0.001		0.01	0.566
PS -> OHRQoL	0.05	0.512		0.05	0.404		**0.22**	**0.006**		0.17	**0.004**
SS-> ACS	-0.13	0.007	0.148	**-0.20**	**0.022**	0.163	-0.01	0.842	0.154	0.19	**0.954**
PS-> ACS	0.38	0.001		0.29	0.003		0.39	0.001		0.10	0.794
SS-> PS	-0.24	0.008	0.057	-0.31	0.001	0.095	-0.20	0.007	0.039	0.11	0.826

ACS= Acculturative stress, PS= Perceived stress, SS= Social support, OHP= Oral health perceptions

CHAPTER FIVE: DISCUSSION

5.1. Introduction

This study investigated the relationship of acculturative stress and social support with the OHRQoL among international graduate students in Malaysian public universities. The findings confirmed the hypothesis that students who experienced higher acculturative stress levels had greater effects on their OHRQoL. On the other hand, the findings partially supported the hypothesis that suggesting international students with higher social support will have better OHRQoL. While the direct effect of social support on OHRQoL was not significant, it moderated the relationship between acculturative stress and the psychological domain of OHRQoL and mediated the relationship between perceived stress and OHRQoL. This chapter discussed the key findings (5.2-5.5), followed by a discussion of the methodological considerations (5.6), the limitation of the study with suggestions for future studies (5.7), then, the strengths of the study (5.8) and conclusions (5.9). Lastly, the implications that were drawn from the findings with related recommendations to policy and research are highlighted.

5.2. Prevalence of Main Studied Variables and Associations with Individual Characteristics

5.2.1. OHRQoL

- **Prevalence**

In this study, approximately two thirds of the participants experienced at least one oral impact that affected their daily life in the past six months. This relatively high prevalence was comparable with what reported in studies used OIDP in Ugandan, Persian, and Malagasy adults where the prevalence was 62%, 64.9%, and 74% respectively (Astrøm & Okullo, 2003; Dorri, Sheiham, & Tsakos, 2007; Razanamihaja & Ranivoharilanto, 2017). The eight impact prevalence rates ranged from 22.1% to 52.2 %, which was closely

similar to another study conducted on Malaysian students in India, where the eight impact prevalence rates ranged from 21.4% to 50% (Harsh, Arunima, & Manoj, 2012).

However, the direct comparability with this study is somehow limited because, in the other studies, the targeted population are culturally homogenous, in contrast to international students who come from different cultural backgrounds. As in many studies, the variety in the perceived oral impacts attributed to being cultural in origin.

Although the prevalence seemed to be high in this study population, the impact reported by the participants was relatively very low (median=1, IQR=7.75). In addition, by looking at the intensity of impacts, it is evident that no performance was severely affected and all performances were very mildly to moderately affected with the highest proportion (34.9%) reported 1-3 performances with impact (PWI). The present study indicates that oral conditions have an impact but not severely affecting international students' daily performance. This is further supported by the fact that the majority of participants perceived their overall oral health status as good. A possible explanation for such findings could be the high expectations of oral health which could lead people with overall good oral health to perceive a significant impact on OHRQoL from a relatively minor oral problem as how individuals perceive oral disorders are highly subjective and complex, and it is not necessarily reflecting the objective clinical status. For example, the prevalence of oral impacts was found to be high in low caries (DMFT mean= 2.7) Thai adults (Adulyanon et al., 1996). Nevertheless, confirming such explanation is limited by the fact that no clinical data were collected in the present study.

The most frequently reported impacts were on eating followed by the impact on cleaning teeth, which is a consistent and common finding in previous studies using OIDP among different populations (Astrøm, Haugejorden, Skaret, Trovik, & Klock, 2006; Astrøm & Okullo, 2003; Dorri et al., 2007; Harsh et al., 2012; Masalu & Astrom, 2002;

Razanamihaja & Ranivoharilanto, 2017). Such common reported impact could be attributed to pain from untreated dental diseases which lead to difficulties in chewing and affecting teeth brushings as was suggested by Masalu, Kikwilu, Kahabuka, Mtaya, and Senkoro (2012).

- **Associations with individual characteristics**

Among the individual characteristics included in this study are the demographic factors of which gender, age, and ethnicity are the most commonly linked factors to disease incidence. Although these factors are unchangeable, they are useful for targeting specific subgroups in interventions. However, in this study, the only significant difference was between the country of origin groups, while a non-significant association between OIDP scores, and main demographic factors, i.e. gender, age, marital status. These results are in agreement with previous studies (Makhija, Gilbert, Boykin, Litaker, Allman, Baker et al., 2006; Ostberg, Andersson, & Hakeberg, 2008; Pereira, de Lacerda, & Traebert, 2009; Razanamihaja & Ranivoharilanto, 2017).

Evidence for age-related differences in OHRQoL is mixed. While many studies have reported that no such differences are existent (Makhija et al., 2006; Ostberg et al., 2008; Pereira et al., 2009; Razanamihaja & Ranivoharilanto, 2017). Other studies found that as the age increase a higher impact on oral health is reported and the older individuals having more impacts than the younger ones due to the cumulative nature of dental caries which represent their dental status rather than age per se (Bekes, John, Schaller, & Hirsch, 2009). Participants in the current study are within a very close age range (30 to 40 years) which makes it difficult to see any age-related differences.

The majority of literature related to gender differences is in accordance with the current]\ study findings as no significant association was found between OHRQoL and gender (Makhija et al., 2006; Marya, Grover, Tandon, Taneja, Gupta, & Marya, 2020; Ostberg

et al., 2008; Pereira et al., 2009; Razanamihaja & Ranivoharilanto, 2017; Saub & Locker, 2006). This result suggests that gender did not influence how oral health is perceived among the study population. At the same time, other studies support that females had worse OHRQoL (Mc Grath & Bedi, 2000; Montero, Bravo, & Albaladejo, 2008; Sanders, 2010), as women were tended to perceive more impact on their OHRQoL than men under the same clinical conditions. However, such variations in findings related to gender differences were suggested to be due to distinct and different populations (Marya et al., 2020).

As mentioned above, the only significant difference was between the country of origin groups, whereby, students from Arabic countries origin had higher OHRQoL impact scores compared to students from Asian and African origin. This would be due to the discrepancies in oral health status and cultural values of oral health among different populations as its evident in the literature (Montero et al., 2008). This finding concurs with other studies that have found that race and cultural differences are among the influential factors on the perception of impacts and hence determining OHRQoL (Makhija et al., 2006; Sanders, 2010; Steele et al., 2004; Tsakos, Marcenes, & Sheiham, 2001). Such differences in oral impact scores are indicating that cultural factors related to the country of origin are influential in determining responses to oral health status. However, the way how culture affects oral health is not straightforward and complicated. It was suggested that cultural influences overlap with personal experience, socioeconomic status, and dental health literacy, and there might be certain common cultural beliefs/practices that influence the oral health status (Butani, Weintraub, & Barker, 2008).

Nevertheless, it is worth mentioning that the international students in this study are from 31 different countries and their grouping (i.e. Arabic, African, Asian) was based more on the regional origin. Although these groups have values and traditions in common, each has its distinctive characteristics. Hence, there is considerable heterogeneity within the

same group by race/ethnicity, nationality, and socioeconomic status. However, it was argued by Mariño, Stuart, Winning, Morgan, Thomson, Marshall et al. (2004) that acknowledging cultural differences is important, but attributing these differences based on race or ethnicity might be incorrect. Therefore, future similar studies might consider the inclusion of more homogenous groups to be able to confirm such differences.

In this study, the individual situational characteristics, i.e. source of funding, degree, the discipline of study, academic difficulties, previous travel experience, and length of stay did not show any significant differences with OHRQoL scores. These factors could not be compared with other studies due to the paucity of documented literature. However, these characteristics are of less interest in relation to OHRQoL research, and they were included because they are among the vital determinants in the acculturation literature. Nevertheless, the length of residence was suggested by Sanders (2010) to be considered in future research as one of the factors that might contribute to the Latino advantage in oral health-related quality of life for immigrants and its loss in subsequent generations.

5.2.2. Acculturative stress

- **Prevalence**

In this study, more than half of the international students in Malaysia demonstrated high acculturative stress levels. Several studies conducted in Malaysian universities supported the same findings, as international students were found to experience moderate to high levels of acculturative stress (Ismail et al., 2016; Rajab et al., 2014; Sabrina, 2014; Ye & Juni, 2017). For instance, the findings of a study conducted among 370 Indonesian graduate students in public and private universities in Klang Valley revealed that more than half of the students had a medium level of acculturative stress, while slightly more than a quarter had high acculturative stress levels (Sabrina, 2014).

The current results are also comparable with international students in other countries, for example, in Germany, a study conducted by Akhtar (2012) among 652 international

students to explore the acculturative stress levels using ASSIS revealed similar acculturative stress levels reported in the current study. Another study conducted in Singapore among 392 international students using ASSIS found that the mean of acculturative stress ranged from 88.07 to 101.14, which is interpreted as a medium to high (Nasirudeen et al., 2014). This study also revealed that a considerable proportion of the participants scored higher than 109, which refers to serious acculturative stress levels that need psychological counselling as recommended by the ASSIS developers.

It is possible that international students either did not adjust to the different environment or might have experienced uncertainty, as even small cultural differences could have an influential impact on international students. Another potential explanation for the reported high levels here could be that they did not develop social networks with the locals to build connectedness, and hence lacked the successful transition to Malaysian culture. The latter explanation is further supported by our findings on social support, in which the least reported social support source was friends while the family was the highest reported source. It was argued that with the lack of social interactions with the locals, international students are less likely to acquire or develop the culture-specific social skills that would assist effective cross-cultural interactions (Chapdelaine & Alexitch, 2004).

The present study results indicated that homesickness and culture shock (stress due to change) are the most frequently reported stressors. These findings are similar to what was reported by international university students in China, Germany, and Malaysia (Akhtar, 2012; Desa et al., 2012; Gebregergis, 2018; Rajab et al., 2014; Sabrina, 2014). Given this finding, it is reasonable to speculate that homesickness could be due to the fact that students had stayed in Malaysia for at least six months before participating in this study. On the other hand, the stress due to change which is a very common stressor could be owed to the cultural distance and incompatibility experienced by the students who come

from Arabic and African countries who together constituted 74.9 % of overall participants. The geographical, climatic, and cultural dissimilarities between the host country and the country of origin are among the factors that contribute to acculturative stress.

- **Associations with individual characteristics**

In the current study, among the studied individual characteristics, statistically significant differences were only found in gender, country of origin, and groups of students who had academic difficulties/concerns.

The finding regarding the gender differences revealed that males had higher acculturative stress score compared to females. This difference indicates that males may perceive facing more difficulties and challenges compared to females, which is consistent with previous similar studies (Mahmood & Beach, 2018; Yan & Berliner, 2009). However, our finding contradicts with studies supported that female international students encountered higher levels of acculturative stress than males as they are more susceptible to anxiety and stress due to problems socially and academically when compared to male students (Dao et al., 2007; Kwon, 2009; Rajapaksa & Dundes, 2002; Ye & Juni, 2017).

However, it should be kept in mind that such variability in results are common, and it could be attributed to variation in samples and measures used. The different analytic approaches as well could be another possible reason, as it was proved to influence results even when the same dataset is used (Silberzahn, Uhlmann, Martin, Anselmi, Aust, Awtrey et al., 2018).

Among all the groups, students from the African countries' origin had the highest acculturative stress levels, followed by students from Asian and Arabic countries. This was similar to findings of a study conducted among international students attending universities in China using ASSIS in which higher levels of acculturative stress were

reported by students from Africa followed by those from Asia (Yu et al., 2014). The same findings were reported about high acculturative stress levels of African students compared to others in German (Akhtar & Kröner-Herwig, 2015) and American (Constantine et al., 2004) universities. As mentioned earlier, the cultural distance is the potential reason behind it, as the big differences in fundamental cultural values result in greater acculturative stress as evident in acculturation literature. Another possible explanation is the huge geographical distance between the African countries with Malaysia. As obvious on the world map, Malaysia is located in Southeast Asia that is nearer to the Middle Eastern and Asian countries than the African countries. Hence, it is logical to expect that the more distant the original country with Malaysia, the more differences (i.e. cultural, social, and educational) they would face in Malaysia.

The students from Arabic origin reported the least acculturative stress levels, it is possible that Malaysia affords a friendly, and culturally comfort environment for Arabs of whom the majority are Muslims. As in Malaysia, Muslim practices and values are well understood, widely accepted and respected. This finding is indirectly supported by a recent study conducted in Malaysia among 1186 international postgraduates which reported that Arab and Middle Eastern students revealed more cultural empathy with the host country (i.e. Malaysia) than the African students (Shafaei, Nejati, & Abd Razak, 2019). In an attempt to justify their findings Shafaei et al. (2019) stated that "Malaysia is a Muslim country, and this feature of Malaysia could create more cultural understanding for the Middle Eastern and Arab students compared to the African student".

Another possible reason for the lower levels of acculturative stress among Arabic students might be that a considerable proportion of the international students in Malaysia came from Arabic countries. They might offer social support to each other, which assist in mitigating acculturative stress. It is worth mentioning that the levels of social support in

this study were slightly higher in students of Arabic origin compared to others, which lend some support to the latter explanation.

The students who reported having academic difficulties/concerns revealed significantly higher acculturative stress mean scores compared to those who do not have. These results are parallel to previous reports indicating that acculturative stress was positively associated with academic difficulties among international students (Akhtar, 2012). It could be explained that international students who reported facing academic difficulties are overwhelmed with the demands of the student life, and experienced challenges of the new educational environment to which they need to adjust and cope with. These academic difficulties included but not limited to difficulties in obtaining good marks, assignments overload, oral presentations and discussions in the class, office bureaucracy (e.g., forms and documentation, long waiting lines), insufficient academic instructions, and poor relationship with the advisor. Therefore, it is reasonable to speculate that stress is expected in such situations.

The mean scores of acculturative stress in married students were slightly higher than the single students, but this difference did not reach statistical significance. In studies supporting that married students experienced a higher level of acculturative stress, it was explained that they were likely to spend a considerable time accompanying their spouses/families. Meanwhile, they lost the social interactions opportunities with other international and domestic students (Gebregergis, 2018; Yu et al., 2014; Zhang, 2012).

Although no statistically significant differences were found, the students with no previous travel experience scored higher acculturative stress means compared to those who had a previous travel experience, as the latter is assumed to be better prepared in terms of expectations and reactions (Akhtar, 2012).

Other individual characteristics such as age, source of funding, length of stay, degree and discipline of study as well failed to show any significant differences with acculturative stress. This finding implies that with regard to these characteristics, international students have similar levels of acculturative stress as they are confronted with the challenge of studying in Malaysia. As it was suggested by Desa et al. (2012), the behavioural and other internal changes that happen while adjusting to a new culture will give the same impact irrespective to specific characteristics.

5.2.3 Perceived stress

- **Prevalence**

The perceived stress was quite prevalent among international students in this study, as the majority either reported high or moderate perceived stress levels. This prevalence was very close with what reported in a similar study population in Malaysia using the same perceived stress scale, in which only 15% reported low levels of perceived stress (Par, Hassan, Uba, & Baba, 2015). Also, the stress prevalence was high among postgraduate international students in UKM, with more than two-thirds were either moderately or severely stressed (Jamsiah et al., 2014). The similarity might be due to the similar academic environment and challenges faced by international students in Malaysia. Such results confirm the considerable stress levels among international postgraduates. The Student Mental Health Committee (2006) reported that being an international or postgraduate student, both are among the high-risk students' populations.

It is possible the high prevalence of perceived stress reported here having its sources from the academic demands and performance pressure which influence the stress level of postgraduate students. This assumption is supported by the fact that the same proportion of international students (64.4%) reported facing academic difficulties and concerns in the present study. For instance, time limits, too much content to be learnt, examinations, supervisor assessment and the familiarity with the required tasks are among the most

reported sources of stress as perceived by the postgraduate students in previous studies (Mahmud, Amat, Rahman, & Ishak, 2010; Par et al., 2015; Yusoff & Fuad, 2010). In addition, a positive correlation between the academic workload and the perceived stress levels was empirically evident (Kausar, 2010). Nevertheless, other constraints related to financial pressures, language barriers, and personal life issues are all expected to contribute to the high prevalence of perceived stress as well.

The high prevalence of distressed postgraduate students is alarming and indicating a sense of growing pressure among international postgraduate students. Hence, empowering them to manage their perceived stress and reduce detrimental health effects should be a priority of their hosting universities. The interventions that could be offered by universities ranged from a stress management courses to mind-body-stress-reduction (MBSR) techniques, e.g. mindfulness and yoga; such interventions were evident in perceived stress reduction among graduate students as concluded by Stillwell, Vermeesch, and Scott (2017).

- **Associations with individual characteristics**

In the present study, among the studied individual characteristics, statistically significant differences were found for age, study level, academic difficulties/concerns, and source of funding.

In terms of age, it was found to be negatively correlated with perceived stress scores ($r=-0.14$, $P>0.05$). This result is indicating that the younger the student, the higher is the perceived stress, which is in agreement with previous research (Hamarat, Thompson, Zabrucky, Steele, Matheny, & Aysan, 2001; Jamsiah et al., 2014; Warttig, Forshaw, South, & White, 2013). A possible explanation for such a finding could be due to a lesser experience of younger students to cope with the new responsibilities compared to older students. Another explanation could be the way the older students appraise stressful situations is less problematic (being more mature) which might assist them to manage

stress better than the younger students. Nevertheless, the relationship between age and stress remains contradictory. While some studies reported that it increases with age (Elo, Leppänen, & Jahkola, 2003; Trouillet, Gana, Lourel, & Fort, 2009), others found no significant differences (Par et al., 2015; Shete & Garkal, 2015).

Concerning gender, the finding did not reveal any gender differences, which indicates that both males and females perceive stress similarly. This finding is consistent with Par et al. (2015) findings, in which no significant gender difference in the stress levels among international postgraduate students in UPM was found using the same perceived stress scale. Other studies also supported the same findings among the student population (Garsman, 2017). However, mixed results are reported in this regard, suggesting that women and men manage stress differently. For instance, females were suggested to perceive more stress compared to males under the same circumstances, which was attributed to their emotional nature (Sarkar, Gupta, & Menon, 2018; Warttig et al., 2013).

The students who reported having academic difficulties/concerns revealed significantly higher perceived stress compared to those who did not. These results are in line with previous studies that reported perceived stress was positively associated with academic difficulties and workloads among postgraduate students (Kausar, 2010). As discussed in the previous sections, a student's life is overwhelmed with the academic demands and challenges of the educational process; therefore, such life usually entails stress.

Results also indicated that perceived stress was significantly higher in master students compared to PhD students. A possible reason might be the mode of the study, as most master programmes are coursework/mixed modes which entail greater academic workload within a limited semester period, compared to the PhD research mode. Another explanation could be the lack of experience of master students compared to PhD students who already gained the skills and developed coping strategies to meet their stressful

educational requirements. It is also reasonable to attribute this difference to the age (master students are expected to be the younger group), as discussed above the way the older students appraise stressful situations could be less problematic and more mature.

The perceived stress levels were significantly higher in students who depended on parents/family as their source of funding compared to those who depended on scholarship/funding. It is undoubtedly a more challenging experience that adds extra burden when a student has to handle the bills payment. Nevertheless, international students who depend on scholarships from either their home country or host country, in order to continue their scholarships, they have to show proof of good academic records from time to time. Moreover, it was argued that the received amount of fund could be insufficient to cover the expensive nature of living in some countries (Nasirudeen et al., 2014).

5.2.4. Social support

- **Prevalence**

The current sample revealed that majority of the participants (96.7.%) reported either moderate or high social support levels and the highest reported social support was from their families. The same finding was reported by Yusliza and Othman (2011) and Thomas and Sumathi (2016) using the MSPSS scale among international students in Malaysia and India, respectively. This finding might indicate that international students were more likely or willing to seek support from their families rather than friends, as they could find it difficult to obtain social support from people other than their families.

However, social support from friends is also essential for international students as they are away from their home country, and they are more likely to feel lonely (Chuah & Singh, 2016). It seems quite reasonable to consider that international postgraduate students in this study joined demanding academic programs and have a limited time for interaction and socialising with friends. Another possible reason could be that they do not

feel the need to extend their relationships and satisfy their needs for social support from their spouses or family members.

- **Associations with individual characteristics**

Findings revealed that among the tested individual characteristics, only the marital status showed a statistically significant difference. Social support was significantly higher in married students compared to single students. This finding supported previous research in which married individuals reported significantly higher social support than unmarried ones (Adamczyk, 2016; Prezza & Giuseppina Pacilli, 2002). It is logical to speculate that married students who are accompanied by their spouse and/or children spend their free time with them, and therefore perceive more social support compared with single students.

Also noteworthy, the findings concerning non-significant differences of different individual characteristics e,g., age, gender, level of study were consistent with previous studies (Abdullah, Adebayo, & Talib, 2015; Sabrina, 2014; Sarah, 2015; Thomas & Sumathi, 2016). Nevertheless, the lack of significance could indicate that such factors appeared less critical to social support.

5.3. Predictors of OHRQoL

Overall, the included variables explained 27.1% of the variance in OHRQoL, which is considered substantial according to the cut off points set by Cohen (1988). The use of SEM-PLS allows us to evaluate and rank the relative statistical importance of each variable. Oral health perceptions and acculturative stress were the most significant predictors that contributed the largest amount to the model. This finding reflects their potential role in explaining OHRQoL, specifically in the international student population. Perceived stress and social support contributed less to the overall explanatory power of the model, and both had significant indirect effects on OHRQoL. However, it's believed

that the concept of OHRQoL is broad, and the role of other relevant and interrelated factors, e.g. personality traits, such as stress resilience, trait anxiety, and coping potential might better explain the variance in this construct.

Results also revealed that the predictive power of the OHRQoL construct was medium (Q^2 =23%) (Cohen J., 1988). The Q^2 values represent an evaluation criterion for the cross-validated predictive relevance of the model out-of-sample (Hair et al., 2016). The result refers to the adequate ability of the current model to predict out of the sample, which further adds to the current model validity.

5.3.1. Acculturative stress and general perceived stress

The results of the SEM indicated that acculturative stress significantly predicted OHRQoL. The acculturative stress in the current study not only directly affects OHRQoL but also indirectly affects it through the perceived stress.

For the direct effect, it can be interpreted that as one's acculturative stress increases, the OHRQoL becomes poor. While determining the underlying causal mechanisms which link acculturative stress to OHRQoL beyond the scope of this study. Nevertheless, one of the possible pathways through which the acculturative stress might affect OHRQOL is via the adoption of unhealthy behaviours, e.g., diet and smoking. This assumption is supported by findings of studies linking different kinds of stressors with the deterioration of oral health outcomes (Deinzer, Granrath, Spahl, Linz, Waschul, & Herforth, 2005; Genco, Ho, Kopman, Grossi, Dunford, & Tedesco, 1998; Peruzzo, Benatti, Ambrosano, Nogueira-Filho, Sallum, Casati et al., 2007; Sheiham & Nicolau, 2005; Tikhonova, Booij, D'Souza, Crosara, Siqueira, & Emami, 2018). For example, the stress influence on periodontal disease has been hypothesised to be through affecting health behaviours, such as poor oral hygiene and smoking (Genco et al., 1998). While the stress was suggested to influence dental caries through excessive consumption of sugary diet (Deinzer et al.,

2005). The assessment of such risky health behaviours that were not included in the present model may have added more clarity to the results and provided a complete picture.

This model indicated another possible pathway to better understand the relationship between OHRQoL and acculturative stress, which is through the perceived stress. Given the lack of evidence relating to acculturative stress and oral health, studies in the general health literature could be used to lend support. For example, studies among different ethnic minorities indicated that the acculturative stress influence on smoking and depression was through influencing their overall perceived stress, which in turn might affect their health (Cervantes, Fisher, Córdova Jr, & Napper, 2012; Flores, Tschann, Dimas, Bachen, Pasch, & de Groat, 2008; Lorenzo-Blanco & Unger, 2015). Consistent with this notion, the study findings also support that perceived stress might be one pathway through which acculturative stress contributes to the impact on OHRQoL. However, other factors, e.g., type of personality, coping ability, and support sources, have a key role in appraising the impact or severity of the same stressful event experienced by different individuals (Afshar, Roohafza, Keshteli, Mazaheri, Feizi, & Adibi, 2015).

5.3.2. Social support

The findings from the current model partially supported the hypothesis that suggesting international students with higher social support will have better OHRQoL. In contrast to what was expected, the direct impact of social support on OHRQoL was not significant. This result was inconsistent with Brennan and Spencer (2009) findings in which worse OHRQoL was related to lower social support levels in a representative sample of Australian adults. However, Brennan and Spencer (2009) explained this relationship with a mediating (indirect) effect of social support through mechanisms such as coping and self-efficacy.

The evidence gathered from the literature points out inconclusive findings regarding the basis for testing social support as a moderator or mediator. It was argued that the research design loses explanatory power if potential mediators in a model are not acknowledged. While failure in the model's power to represent reality is expected when a potential moderator is not included. (Mackinnon, 2011). Hence, within the scope of the study questions to understand the relationship between social support and OHRQoL, both analyses (mediation and moderation) were included.

Regarding the mediation role of social support, the indirect path analysis in this study revealed social support as a mediator between OHRQoL and perceived stress, but this mediation was not significant in the case of acculturative stress. On the other hand, the findings regarding the moderating effects revealed that social support only moderates the relationship between acculturative stress and the psychological domain of OHRQoL. International students who reported acculturative stress but had a high level of social support demonstrated less impact on the psychological domain compared to those with low levels of social support.

The current findings support that the effects of social support might be through reducing the stress and indirectly affecting OHRQoL. These results are in accordance with previous studies that have reported the indirect role of social support on OHRQoL (Dahlan et al., 2019; Gupta et al., 2015). The literature suggests two mechanisms by which social support buffers the stress. The first mechanism is the direct route that promotes recovery from crisis experiences or stress. Second, an indirect role by buffering the effects of stress. The protective role of social support on oral health was argued to be either by mediating the sense of coherence (SOC) or indirectly by influencing SOC in coping with stress (Gupta et al., 2015).

The findings suggest that social support might indirectly influence OHRQoL through stress. Social support had a mediation role in the case of the perceived stress that is more general and encountered on an everyday basis. At the same time, it is moderating and buffering the specific acculturative stress effects on the psychological rather than the physical or social domains. It seems reasonable to assume that social support offers mitigating effects on the psychological domains of OHRQoL which is more relevant to be affected by social support (e,g., keeping a normal emotional state, without becoming upset).

The current findings regarding the role of social support in relation to OHRQoL could lend support from reported evidence in social support literature which identified social support lack as one of the potential predictors of psychological problems related to anxiety, depression, and lower self-esteem (Sandhu & Asrabadi, 1994). Moreover, social support was found not only impacts life stressors but also acts as a buffer (moderator) against the impact of acculturative stress on psychological symptoms among international students and found to lessen the negative outcomes of stress and result in a positive outcome (Chuah & Singh, 2016; Crockett et al., 2007). However, no similar previous research on OHRQoL was found to compare with the current study findings.

5.3.3. Oral health perceptions

Oral health perceptions revealed itself as a construct with a great deal of effect on OHRQoL. The path coefficients between oral health perception and OHRQoL was the strongest ($\beta = 0.385$), which lend it to be the most important predictor in our model. Results indicated that students who rated their oral health favourably had better OHRQoL than those who rated their oral health unfavourably. Our finding was consistent with other studies that revealed individuals who reported being dissatisfied with their oral health were those who had high OIDP/OHIP scores (Locker, Mscn, & Jokovic, 2005; Vale, Mendes, & Moreira, 2013; Yamane-Takeuchi et al., 2016). At the bivariate level, the

findings as well showed a significant moderate correlation (r=- 0.48) between oral health perceptions and OHRQoL, which is in line with Gift and Redford (1992) hypothesis regarding the high correlation between self-reported variables.

This finding confirms what has been recommended by Locker and Allen (2007) to use the global oral health rating concurrently with OHRQoL measures to better assess "the broader meaning and significance of the functional and psychosocial impacts". The current model demonstrated that oral health perceptions had the most substantial influence on OHRQoL, suggesting that oral health perceptions contribute to OHRQoL since both reflect the individuals' perception of oral health. This finding also supports the use of single-item rating score as a valid measure of oral health in epidemiological studies, being relatively simple and easy assessment that makes it useful to collect in surveys as suggested previously (Locker et al., 2005; Yamane-Takeuchi et al., 2016).

5.4. Other Relationships between Study Variables

5.4.1. Perceived general stress and acculturative stress

Since students who experience acculturative stress are undergoing general life stress like any others. A measure of general perceived stress was included in this model to better distinguish the specific effects of acculturative stress.

A positive correlation between acculturative stress and general perceived stress was found, and high levels of perceived stress significantly predicted higher acculturative stress with a medium effect size. This can be interpreted as high perceived stress levels leads to high acculturative stress levels, while low perceived stress subsequently leads to low acculturative stress levels. That was in accordance with previous studies that reported high perceived stress consequently leads to high acculturative stress, and hence both can be termed as correlated (Joiner & Walker, 2002; Lee, 2014; Malhotra & Seifu, 2020; Rudmin, 2009b).

A possible reason for this correlation lies behind the individual's coping ability. According to Lazarus and Folkman, an individual's degree of confidence regarding their ability to deal with stressful events is determined by their perceived stress (Lazarus & Folkman, 1984). As one perceives a situation as positively challenging and controllable, he/she would become more confident in his/her ability to handle the challenges of the environmental stimuli. Given that acculturation stressors are among these environmental stimuli, and the ability to control them is depended on perceived stress levels. Based on this, it can be argued that individuals with low perceived stress levels are more able to control and cope with such stressors and hence experiences less acculturative stress.

5.4.2. Perceived general stress, acculturative stress, and social support

Social support is one of the relevant factors that have been prominently addressed in the literature and implicated as a resource for reducing stress. According to the gathered evidence, social support was revealed as a key player in maintaining health and reducing the detrimental effects of stress. In the current study social support was inversely correlated with each of perceived stress and acculturative stress, and high social support predicted lower perceived stress and acculturative stress. These findings are in line with the established body of knowledge about the relationship of social support with stress (Bai, 2012; Crockett et al., 2007; Kim & Yoo, 2016; Malhotra & Seifu, 2020; Poyrazli et al., 2004; Sabrina, 2014; Thomas & Sumathi, 2016; Yeh & Inose, 2003).

The reason behind such relationships is well known, as social support is a crucial concern in the case of international students, due to disruption of the familiar social networks. Since living in a different country deprives them of their established support system and makes them feel tenser, less confident and confused (Desa et al., 2012). Hence, whenever social support is perceived as available, it will facilitate international students' socio-cultural adjustment process. Social support is considered a powerful coping resource

during the cross-cultural transition, and in times of stress may lead to students' successful adaptations (Chuah & Singh, 2016).

5.4.3. Acculturative stress, perceived general stress, and social support in relation to oral health perceptions

Surprisingly, in the present model, neither acculturative stress, perceived stress, nor social support, had any significant effect on oral health perceptions. Although, the direction of relationships generally supports other research demonstrating the negative relationships between stress and favourable self-rating oral health (Arman, Petruninaitė, Grigalauskienė, & Slabšinskienė, 2016; Finlayson, Williams, Siefert, Jackson, & Nowjack-Raymer, 2010; Sanders & Spencer, 2005; Vasiliou et al., 2016) and the positive association with social support (Arcury et al., 2013; Wu et al., 2011). Nevertheless, the lack of significance could indicate that such factors appeared less critical to self-rated oral health status compared to OHRQoL, which in turn provides a possible answer to why a lot of the variation in the oral health perceptions left unexplained. Nevertheless, it would be wise not to over-interpret the findings until similar research conducted and further explored these relationships.

5.5. Individual Characteristics as Moderators

In the present study, individual characteristics (sociodemographic and situational characteristics) were modelled as moderators of the relationships. According to Baron and Kenny (1986), moderators are variables that modify the strength or direction of the relationship between the independent and the dependent variables. A moderator may directly have an influence on the dependent variable, or it may interact with the independent variable in a way that influences the relationship between the two variables. A moderator either strengthen/ weaken a relationship, or change (reverse) a relationship.

The moderating effects of individual characteristics on the entire model relationships were assessed by multi-group analysis (MGA), which compares the effect of every structural path across different groups. Multi-group analysis (MGA) was the method of choice in this study to test the moderating effects of individual characteristics for the following reasons: a) it is used when the moderation effect is expected to exert its effect on the entire model, as it allows us to assess and compares the effect of every structural path across different groups (Memon, Hwa, Ramayah, Ting, Chuah, & Cham, 2019), b) It helps to test whether two or more variables have the same/different relation across groups (Mackinnon, 2011), c) it is the preferred analytical technique when the moderator variable is categorical, e.g., males vs females as in the case of all individual characteristics in this study. However, it is worth mentioning that MGA is different from t-test or ANOVA as the latter represents univariate analysis (Memon et al., 2019).

The results related to gender and age as moderators indicated that both moderates the relationship between social support and oral health perceptions, which was insignificant in the overall sample. This relationship was positively significant in females model and younger-age model. Moreover, the coefficient of determination (R^2) of oral health perceptions was better explained in females and younger-age compared to the overall sample, which indicates that social support predicted better oral health perception among these groups. These results suggest that social support has a stronger influence among females and younger students compared to their counterparts. One possible explanation could be the higher levels of perceived social support in females and younger age students compared to their counterparts, such differences in social support perception could contribute to the differences in self-rated oral health. This explanation is further supported by the findings of bivariate analysis which revealed that social support is positively correlated to better oral health perceptions which are in line with previous related work (Arcury et al., 2013; Wu et al., 2011).

In the current model, study level and the length of stay moderated the relationship between perceived stress and acculturative stress. This relationship was positively significant in all models, but the master students model and (<3 years) model showed the highest effects. Also, the coefficient of determination (R^2) of acculturative stress was better explained in master students, and (<3 years) model compared to the overall sample, which indicates that perceived stress predicted higher acculturative stress among these groups. Perceived stress levels were also found to be significantly higher in master students as discussed in section 5.1.3. Again, such differences in stress perception could contribute to the differences in acculturative stress. It is possible that master students and those who stayed for a period less than three years experienced more challenges and difficulties either in their academic life or everyday life. This, in turn, made them perceived higher stress levels, and might be less able to control and cope with such stressors, and hence experienced more acculturative stress as discussed in more details in section 5.3.1.

In this model, previous travel experience was revealed as a moderator for the relationship between social support and acculturative stress. The effect of social support on acculturative stress was negatively significant in overall model models, but it was significantly stronger in the group with no previous travel experience. This finding indicates that the effect of social support on acculturative stress is more influential among this group of students. A possible explanation could be that, for the students who travel for the first time, social support is more crucial in their case, so they might tend to develop new social networks to know more about the host country, or they might receive more support from their familiar social networks. In both cases, the perceived social support helps them to mitigate the effects of acculturative stress.

Regarding the role of academic difficulties/ concerns as a moderator, the findings revealed that it has a strong influence where it moderated the relationship between each

of a) social support and OHRQoL, b) social support and acculturative stress, c) perceived stress and OHRQoL. In the overall model, the relationships of social support and perceived stress with OHRQoL were not significant. However, in the academic difficulties model, the direct effect of social support on OHRQoL was significant while not significant in the model with no academic difficulties. This result confirms the suggested assumption about the beneficial/positive effect of social support on general wellbeing in individuals exposed to stress (Cohen & Wills, 1985). The academic difficulties were suggested to be a significant predictor of stress in international students, which was further supported in this study where students who reported academic difficulties had higher perceived stress, as discussed in section 5.2.3.

Also, it was revealed that academic difficulties moderated the relationship between perceived stress and OHRQoL. The direct effect of perceived stress on OHRQoL was only significant in the group with academic difficulties. This result suggested that the impact of perceived stress on OHRQoL is stronger in the presence of academic stress. It is possible that academic difficulties serve as a synergetic factor along with the perceived stress and thereby influence OHRQoL.

The effect of social support on acculturative stress was negatively significant in overall model models, but it was significantly stronger in the group with no academic problems. This finding suggested that social support effect on reducing acculturative stress is greater when the academic difficulties are not an issue. Which in turn, might partially explain why the effect of social support on acculturative stress is more influential among this group of students.

Last, in the current study, marital status, and the source of funding did not show any moderating effects. However, there was sufficient power to detect the moderating effects; therefore, the chance for moderating effects to be undetected is minimised.

5.6. Methodological Issues

5.6.1. Response rate

In the current study, 325 completed questionnaires were received with 140 (44.9%) responses from the Arabic version and 172 (55.1%) responses from the English version. However, the exact response rate calculation was difficult due to the following reasons:

1- Only two out of five universities provided the email list of their postgraduate student (UM=2451, UKM=661).
2- The quality of the provided email address database was limited as many of the email addresses were not valid (bounce-backs).
3- The other three universities which distributed the questionnaire link via their system did not provide any feedback concerning the estimated number of students who received the link, despite the several requests of the same.

In an attempt to calculate the response rate based on available figures (Appendix XI), it was revealed that the response rate from the five different universities ranged between 3% to 11%. However, some of the included figures in this calculation are only approximate estimates.

Although of this low percentage, it does not seem to be a threat to the validity of the study, in terms of estimating the target population values. However, a sufficient response rate is essential in minimising the possibility of a biased sample in terms of non-response bias (Davern, 2013). Nevertheless, Davern (2013) concluded that the association between response rate and bias is very weak.

5.6.2. Non-response bias

To ensure non-response bias does not affect the validity of the current findings, a non-response bias analysis was carried out using the wave analysis method. Such analysis examines the difference between early wave respondents and late wave respondents. As

it has been assumed that non-respondents and the late respondents behave in a similar way, i.e. those who respond less readily are more like non-respondents as if the study stopped earlier, they would not respond (Dillman, 2011).

The early and late respondents were defined by the time of their response (answered before/after the first three months). It was analysed by comparing early and late responses based on scores of the main study variables employing the independent samples t-test, Mann Whitney and Chi-square test when appropriate. Results did not indicate any significant difference between the two respondent groups (Appendix XII); therefore, the non-response bias may not be an issue or of particular influence in the current study. The sample might be only biased in terms of representing students who are interested in this topic or who have more difficulties or problems in the acculturation process, and thus, are more willing to participate.

5.6.3. Common method bias (CMB)

In this study, both the endogenous (Dependent) variables and the exogenous (Independent) variables were collected at the same time and using the same instrument. Common method bias (CMB) is a potential problem that describes the measurement error that is compounded by the sociability of respondents who want to provide positive answers. It is commonly assumed that the relationships between variables of self-reported measures are affected by common method bias (CMB). Common method bias is the relationships inflation by shared method variance, i.e. the type of deviation caused by the similarity in methods used to obtain the data. The reliability and validity of a latent construct and the estimates of the empirical relationships between constructs are all affected by CMB.

To minimise its effects, the researcher addressed this concern before data collection (ex-ante), through the careful design of the study's instrument, where the anonymity and

confidentiality of the participants were insured, and they were informed that there is no preferred or correct answer, and their honest appraisal of the item is highly desired. To draw the participants attention and to read the items carefully, different Likert scale options were used, for example, 4,5,7 option scales.

After collecting the data (ex-post), the effects of method biases were statistically tested to determine to what degree any such biases exist. To identify the common method bias, Harman' Single Factor test (SPSS), which is exploratory factor analysis. All items (measuring latent variables) are loaded into one single factor. According to Podsakoff, MacKenzie, & Podsakoff (2012), if the newly introduced common latent factor explains more than 50% of the variance, then common method bias may be present. By running this test, the results showed that the largest variance explained by the single factor was 21.11% (Appendix XIII). Thus, the results indicate that common method bias is not a significant problem for the current study.

5.6.4. Generalizability and sample representation

Although the participants were drawn from five different public universities that constitute the largest public recognised universities in Malaysia, however, because of the employed sampling method, it is questionable whether or not the participants are proportionately representative of students attending higher education institutions in Malaysia.

In terms of gender distribution, the majority of the study population was male subjects (64.4%), with approximate male to female ratio of 2:1. This ratio was similar to the reported distribution of the included public universities where the numbers of males are almost double of females (MOHE, 2017). This finding is further supported by a recent representative study of 1186 international students studying at a postgraduate level from six public universities in Malaysia in which 68% of participants were males (Shafaei et al., 2019).

Participants of this study as well had much in common with the latter mentioned representative study in terms of the following: the majority were married, doctoral students, from the field of Applied Science, in addition to comparable proportions of different age groups (Shafaei et al., 2019).

Concerning the country of origin, students from Arab countries constituted two thirds (64.7 %) of the study's sample, which is a relatively high proportion. However, this percentage nearly matches those reported in the previous studies. In a similar study conducted by Jamsiah et al. (2014) among 119 medical postgraduate international students in UKM (one of the included universities), the Arab students constituted more than half of participants (52.4%) while the proportion of students from Asian countries was 19.8%. Another study that included 404 postgraduate international students in UPM (one of the included universities) using multistage random sampling also revealed that 42.3% were from the Middle East region, i.e., Yemen, Iraq, and Saudi Arabia (Ye & Juni, 2017). While Shafaei et al. (2019) reported that participants came mainly from Asia (44%), Middle East (31%), and Africa (25%).

It is worth mentioning that Most Middle Eastern countries (13 out of 18) are Arabic in origin (Middle East, n.d). In addition, in both studies by Shafaei et al. (2019) and Ye & Juni (2017), Arabic countries like Libya, Morocco, Algeria and Tunisia were classified under the African countries, which also constituted a considerable proportion 25 % and 37.1% respectively. Hence, the researcher assumes that the percentage of the participant from Arabic origin would at least constituted 50% if the same classification of countries was used. This assumption is further supported by Yusoff (2014) who mentioned that “most of the postgraduate international students in Malaysia are From the Middle East and African countries" as cited in Saravanan et al. (2019). However, the exact data about the proportions of current postgraduate international students in Malaysia based on their country of origin could not be officially obtained.

In addition, there might be an introduced bias towards Arabic origin student groups in the current study as a result of translating/using validated Arabic versions of the questionnaire. The translation was based on their high percentage as observed by the researcher and reported by studies as mentioned above. Besides the fact that in Malaysia, many universities offer postgraduate courses (e.g. MBA, Islamic studies) in the Arabic language; hence, English language proficiency is not a requirement. This, in turn, could lead those students to hesitate in participation due to language barriers.

On the other hand, it would not be practical or feasible to administer the questionnaire in all mother tongue languages of the students. Besides, for the majority of other multilingual international students, the academic admission to postgraduate studies requires specific standard levels of English proficiency.

In summary, given that the sample size (n = 312) was adequate, and the estimates obtained in this study are approximately equivalent with what reported by previous studies, there is no reason to believe its different from what would have been derived from a comparable national sample. However, further research is required to confirm or contradict the findings reported here.

5.6.5. OIDP as a measure of OHRQoL

The OIDP was selected to operationalise the OHRQoL because it is concise, comprehensive (covering the main consequences), short, and easy to use. Besides its one of widely used measures that have been tested in a variety of populations including Spanish, Thai, Greek, Arabic, Korean, Persian, Malagasy, Ugandan and Norwegian. More importantly, OIDP is supported by a relevant theoretical model and matched the main criteria for measurement of OHRQoL (Sheiham & Spencer, 1997). OIDP also has

the advantage of quantifying the relative burden of impacts among those affected, as both intensity and extent of oral impacts can be determined.

The time frame in OIDP is the last six months, which is considered applicable for frequent occurrences of oral conditions. Concurrently, within the context of this research, international students who stayed in Malaysia less than six months were excluded. This exclusion is to ensure that the OIDP impact is within the period of their stay in Malaysia. Besides, ensuring that students had stayed enough to experience acculturative stress, as it was suggested that a stay of fewer than six months is a honeymoon period for acculturative stress (Kim & Yoo, 2016).

5.7. Limitations and Suggestion for Further Studies

The findings should be interpreted within the limitation of the current study. First, the self-reported measures, which could be subjected to social desirability or random responses. However, to minimise the social desirability, the participants were informed that there is no correct or preferred answer, the confidentiality and anonymity of the participants were also guaranteed. To minimise the random responses, the researcher addressed this concern before data collection (ex-ante), through the careful design of the study instrument. Also, to draw the participants' attention to read the items carefully, and lessen perceived similarity, different scale response options, and anchor labels were used.

Second, the cross-sectional design of data collection scientifically less rigorous than the longitudinal studies. Ideally, the latter is better for linking the psychological factors to oral health and understanding the mechanisms linking psychological stress to oral health, as suggested by Vasiliou et al. (2016). It would be more suitable in future studies to identify causal relationships and to explore the stability of the findings over time using longitudinal data.

Third, OHRQoL is affected by many other factors, and only some of these factors were included in this study. For instance, unhealthy behaviours (e.g. smoking) that are strongly related to stress and acculturation were not included in the present model. Although the association between smoking and oral health is well established, Nevertheless, assessment of such risky health behaviour may have added more clarity to the results and provided a complete picture. Hence, future related studies might consider involving other relevant variables using the existing framework.

Finally, the generalizability of the findings was limited in a way or another, as discussed in section 5.6.4. The sampling frame in this study included international postgraduate students from five Malaysian public universities. It is suggested in future research to include students from private universities and to extend to undergraduates as well in a step to have more broad-based studies with more considerable implications. That is, it's recommended to apply sampling methods that ensure target population representation, e.g., stratified random sampling.

5.8. Strength of the Study

The strength of this study lies in the integration of psychosocial predictors with an important oral health outcome (OHRQoL) using SEM. It is a type of second-generation multivariate statistical analysis that is suggested to be suitable for predicting key target constructs and exploring theory extension (Hair, Ringle, & Sarstedt, 2011). SEM is able to assess a network of complex relationships between predictors and outcome variables simultaneously, which is not possible with traditional regression analysis (Foster Page et al., 2013). In addition, the reality is "multi variated" world, and each phenomenon is interrelated and interacted with other phenomena. Hence, SEM helps to find a better simulation of reality which is the ultimate goal of data analysis. That can further add to our understanding of the interaction between different factors.

This study is the first that specifically examined the relationship between acculturative stress measured by a multidimensional scale and OHRQoL among international students population. The vast majority of previous studies are relating acculturation to different oral health outcomes among immigrants and ethnic minority groups (Dahlan et al., 2019; Gao & McGrath, 2011). Besides, most of the research on oral health was based on unidimensional acculturation proxies.

All the measures used in the present study are multidimensional measures that already established and widely used. The results of the measurement model analysis further yielded acceptable levels that contribute to the evidence of their construct validity and reliability, in addition to strengthening the internal validity of our findings.

The sample size was sufficient enough as it was determined by means of power analyses based on the construct with the largest number of predictors (Hair et al., 2016). Our sample size was able to achieve 80% statistical power to detect R^2 values of at least 0.10, with a 1% significance level.

5.9. Conclusions

- High prevalence of OHRQoL impact (65.7%); however, this impact was very mildly to moderately affecting international students' daily performance. The most frequently reported impact was on eating (52.2%). Students from Arabic countries origin had higher OHRQoL impact scores compared to students from Asian and African origin.

- The majority of the participants perceived their oral health status as good.

- More than half of the participants scored high acculturative stress levels. Homesickness, culture shock, and discrimination are the top three most reported stressors. Males, students who have academic problems/difficulties, and students of African countries origin were found to have higher acculturative stress means.

- Half of the participants scored moderate perceived stress levels. Perceived stress was significantly higher in master students, students who have academic problems, students who depend on scholarship/funding, and students of Asian countries origin. Age was negatively correlated with perceived stress scores.

- More than half of the participants reported high social support levels. The highest reported social support was from family. Social support was significantly higher in married students compared to single students.

- Oral health perceptions, acculturative stress, perceived stress, and social support are among the predictors of OHRQoL. Oral health perceptions and acculturative stress were the most significant predictors that contributed the highest amount of variance to the model.

- This study confirmed the hypothesis that individuals who experienced higher acculturative stress levels had greater effects on their OHRQoL. The acculturative

stress in the current study not only directly affects OHRQoL but also indirectly affects it through the perceived stress.

- The findings from the current model partially supported the hypothesis that suggesting international students with higher social support will have better OHRQoL. The direct impact of social support on OHRQoL was not significant.

- The findings regarding the moderating effects revealed that social support only moderates the relationship between acculturative stress and the psychological domain of OHRQoL, On the other hand, this study revealed social support as a mediator between OHRQoL and perceived stress.

- The findings from the current model confirmed the hypothesis of the inverse relationship between social support and each of acculturative stress and perceived stress.

5.10. Implication and Recommendations

5.10.1. For academic research

a. Implications:

- This model is useful in terms of encouraging research linking psychological and social pathways with oral health since the current findings emphasise the potential role of included psychosocial factors (i.e. Acculturative stress, perceived stress, and social support).

- Integrating psychosocial factors in a framework for promoting oral health warrant further research as such framework tackle the upstream factors, i.e. the broader social determinants rather than focusing on behaviours modification.

- The empirical evidence of this study could facilitate the planning of targeted strategies by incorporating stress reduction and social support enhancement. Such strategies might be a new promising way to enhance OHRQoL among

international students since these elements can be modified and response to interventions.

- Social support as a health enabling resource might be a potential point in future oral health promotion strategies through its direct influence on stress levels that impact subjective oral health outcomes. As health promotion is also shared responsibility of friends, families and communities through offering a familiarity, sense of belonging and empowering individuals to be more competent.

b. Recommendations:

- This research should be duplicated among undergraduates and postgraduates student populations to recognise group differences in the current results.

- This study should be duplicated using student population from public and private universities (nationally representative samples) to generalise the findings by employing sampling methods that ensure target population representation, e.g., stratified random sampling.

- Further research is required to validate the findings in this study; there is a need for longitudinal studies to test the same hypotheses, in addition, to involving more components within the same framework as suggested in section 5.7.

5.10.2. For higher education policymakers:

a. Implication

- The findings of the current study could provide data to the higher education institution/Malaysian Ministry of Higher Education (MOHE) to promote and realise its plans for the current internationalisation policy. The Malaysian Education Blueprint for Higher Education (2015-2025) aims to attract 250,000 international students by 2025. International students constitute a considerable

proportion in Malaysian universities which make them a valuable financial source to universities in a developing country like Malaysia.

- The findings could be used by MOHE to strengthen its aim to become a global education destination by 2025, especially in terms of a conducive environment in which a friendly and supportive environment must be facilitated by universities for international students.

- The finding of this study could provide useful information about the high prevalence of acculturative stress and perceived stress and their effects on international students oral health related quality of life. This might help higher education policymakers in providing proper support and counselling services to assist international students with their transition to higher education in Malaysia.

- Individuals like international students who are experiencing stressful lives may differentially need vigilant maintenance of their oral health more than which is needed in less stressed individuals.

b. Recommendations

- Promoting international students oral health might better target psychological/social wellbeing. For instance, stress reduction, which becomes an integral element of systemic healthcare promotion approaches, i.e., the common risk factor strategy.

- To design intervention programmes that promote acculturative stress reduction among international students, e.g. training sessions to add more knowledge about the Malaysian culture and help students feel more confident and lessen their acculturative stress (culture shock, stress due to change).

- To emphasise social support by improving the quality of social support and networks via encouraging national students to interact with international students, e.g. organising social events that aim to bring local and international students together. This will assist the international students in developing social networks and overcoming their acculturative stressors (e.g. loneliness, homesickness) and adjusting better to the local culture.

- Such interventions could be supported by university cultural centres/ international student centres with students ownership, e.g. establishment of health wellness teams from amongst the students who integrate health goals (including oral health) of the students with the other goals of these centres. Such initiatives aim to improve the social support of the students, especially from their local counterpart, consequently reducing the acculturative stress.

- Additionally, training workshops should be conducted among university staffs. This will assist them to be more aware of the cultural diversity of the students as well as the acculturative stress experienced by international students.

- To improve OHRQoL in international students, it is necessary to provide the early prevention of dental diseases through the professional dental health care service in the university health centres.

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