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Oral Health Literacy, Self-Care Practices, Salivary Parameters and Caries Status of Undergraduate Students in IMU University

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Introduction: Dental caries is a preventable chronic disease whereby identification of risk factors will facilitate preventive measures. This study aims to determine the level of oral health literacy (OHL), self-care practices (SCP), salivary parameters and ascertain its assocation with caries status amongst the undergraduates in IMU University.

Methods: Levels of OHL (Knowledge-OHL, dental services utilisation, and label reading habit) and SCP were assessed through a self-administered questionnaire. Chairside saliva kits were used to measure the salivary parameters whilst clinical examination was performed to assess caries status. Independent T-test and Analysis of Variance (ANOVA) was used to compare differences between sex and courses respectively for measures of interest (OHL, SCP, salivary parameters, and caries status) whereas bivariate correlation with Pearsons's coefficient was performed to examine their association with caries status.

Results: The participants (n=132) had a mean Knowledge-OHL score of 23.75±8.09 with no significant difference between sex (females, 24.01±8.51; males, 23.48 ± 7.69; p=0.15). Dentistry students had significantly higher Knowledge-OHL score than students of all other courses (p=0.01). The mean SCP score was 20.19±3.16 whereas mean DMFT was 2.32 ±3.14. All participants had healthy saliva parameters. Caries status was significantly correlated with Knowledge-OHL score (p=0.02, r= -0.18), dental services utilisation (p=0.04, r= -0.15) but not with label reading habit (p=0.78, r= 0.03), SCP (p=0.30, r=-0.05) and all salivary parameters.

Conclusion: Knowledge-OHL and oral health services utilisation are significantly associated with oral health status.

Keywords: *dental caries, health literacy, oral health, saliva, self-care*

INTRODUCTION

Dental caries persists as the most common chronic infectious disease and has become a costly burden to health care services.[1] Identifying risk factors such as oral health literacy, behavioral and biological factors are fundamental to a targeted preventive approach to dental caries.[1] Risk assessment allows personalised care as patients are educated on their individual risk factors and appropriate actions to minimise them.[1] A consistent combination of risk factors that provide a good predictor to caries risk when applied to different populations across different age groups is unavailable currently.[2]

Oral health literacy is defined as the ability to gather, process, and understand oral health information and services available to make suitable health decisions.[3] It is a bridge between having knowledge and applying that knowledge for better oral health.[4] A higher level of health literacy skill is required with the growing availability and complexity of oral health information.[3] Poor oral health literacy is a possible barrier to preventive and health promoting approaches with increased dental neglect.[5] However, educational level alone cannot predict functional oral health literacy although it is highly correlated with reading level.[6]

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The most common oral self-care practices are dental flossing and toothbrushing.[7] Females are more likely to practise better self-care behaviors than males because of greater interest in health and greater social pressures to be physically attractive.[7] They are also more receptive to oral health education interventions.[7] Moreover, individuals with higher health literacy are better able to comprehend the information provided in the health care setting leading to adherence to instructions of self-care compared to those with low health literacy.[8] The practice of good self-care is vital among health professionals as patients perceive them as role models.[9]

Biological factors such as saliva determine caries susceptibility. Teeth start to decalcify when the pH drops to or below 5 and saliva of individuals with active caries have increased *Streptococcus mutans* count.[10] Better salivary buffering capacity and an increased saliva flow rate promoting sugar clearance are protective against dental caries.[10] The objective of this study is to identify the level of oral health literacy, self-care practices, salivary parameters, and caries status of undergraduates in a private Malaysian university. Also, we aim to determine correlations between oral health literacy, self-care practices, and salivary parameters with caries status.

METHODS

Study design and sample size calculation

This cross-sectional study was conducted at IMU University after gaining approval from the institutional ethics committee (BDS 11/08(04)201). The study population consisted of all 295 students registered in Medical, Dentistry, Chiropractic, Chinese Medicine and Psychology courses in February 2011. The calculated sample size required for statistical significance was 129 with 95% confidence level and 5% margin of error. Assuming a non-response rate of 20%, 170 participants were randomly selected based on proportionate stratified random sampling. Consent for participation was obtained prior to enrollment to the study. Each participant was required to complete a self-administered questionnaire, undergo salivary investigations with chair side kits and a clinical examination to determine their caries status.

Questionnaire

The questionnaire consisted of three sections. Section A contained questions regarding socio-demographic details of the participants such as sex, race, course of study, and medical status. Meanwhile, the level of oral health literacy was gauged by the ability of the participants to answer questions regarding general dental knowledge, recommended oral health practices, field-specific terminology, dental services utilisation, and reading of labels in section B. Five multiple choice questions were constructed to test the general dental knowledge of which one mark was awarded for each correct answer whereas nine extended matching questions were created to assess knowledge of recommended oral health practices of which two marks were awarded for each correct answer. Furthermore, four short answer questions were made to gauge the understanding of field-specific terminology (gingivitis, periodontitis, plaque and calculus) with the need for each participant to elaborate on its prevention, treatment and risk factors. Two marks were allocated for each correct answer with a maximum score of 24 marks. Higher marks were given to more accurate answers that

closely match the marking scheme. These were marked independently by two examiners. The marks were then compared, and in cases of disagreement, the markings were reviewed, and a consensus was reached. The sum of marks of the general dental knowledge, recommended oral health practices and field-specific terminology questions was the score of Knowledge-OHL with a maximum score of 47. The participants' self-care practices (SCP) were assessed in section C which comprises of eleven questions relating to oral hygiene practices and utilisation of dental services. More marks were awarded for better self-care practices and a maximum score of 30 was allocated for this section. The questionnaire was pre-tested on ten students of various courses from different semesters at IMU University with exclusion of the study population to assess the reliability and validity of the instrument prior to data collection. No major changes to the questionnaire were needed after the pre-test.

Salivary chair-side kits

GC Asia Saliva Check Buffer Kit and GC Asia Saliva Check Mutans Kit were used to measure the salivary parameters (GC Asia Dental Pte Ltd, Japan). Each participant was informed not to smoke, consume any food or drink, brush their teeth, or use a mouth wash for at least one hour before the test. The parameters of resting saliva (hydration rate, viscosity, and pH) and stimulated saliva (quantity, buffering and *Streptococcus mutans* count) were obtained according to the manufacturer's instructions.

Clinical examination

A clinical examination to assess caries status was done by one examiner according to the World Health Organization (WHO) criteria 1997.[11] Intra-examiner reliability was assessed by randomly selecting 5% of total participants (n=7) and reexamining their caries status a fortnight after the first examination.

Statistical analysis

Descriptive statistics were used to explore the demographic distribution, oral health literacy, self-care practices, salivary parameters, and caries status characteristics of the participants. Differences between means of measures of interest among different groups such as sex and course of study was carried out using statistical tests appropriate for the type of data being analysed (Independent T-test and Analysis of Variance (ANOVA) to compare differences in means of variables between two or more groups respectively, and chi square test of association for categorical variables). Association between two measures of interest was done with bivariate correlation with Pearsons's coefficient. Subsequently, cross tabulations were used for analysing the relationship between two or more variables. The reproducibility of the clinical examination was calculated using Kappa statistic. SPSS 18.0 (SPSS, Inc, Chicago, IL, USA) was used for data analysis. Reported p values were two-tailed and p values less than 0.05 were considered to indicate statistical significance.

RESULTS

Participants' demographics

132 semester two students of which 106 were non-dental students participated in this study giving a response rate of 78% (Table I). There was equal sex distribution (males; n=65, females; n=67) and the mean age of the participants was 20.3 ± 3.6 years.

Majority of the participants were Chinese (80%, n=106), followed by Indians (10%, n=13), Malay (5%, n=6) and others (5%, n=7). All respondents were healthy with no significant medical condition that would increase their susceptibility to dental caries.

Table I: Socio-demographic Characteristics of Participants

CHARACTERISTICS	NUMBER OF PARTICIPANTS (%)
Course of study	
Medical	85 (64.4)
Dentistry	26 (19.7)
Chiropractic	13 (9.8)
Chinese Medicine	5 (3.8)
Psychology	3 (2.3)
Sex	
Male	65 (49.2)
Female	67 (50.8)
Race	
Chinese	106 (80.3)
Indian	13 (9.8)
Malay	6 (4.6)
Others	7 (5.3)

Oral health literacy

Knowledge-OHL scores ranged from 9 to 42 with a mean of 23.75±8.09. Females (24.01±8.51) had better Knowledge-OHL mean scores than males (23.48 ± 7.69) but the difference was not statistically significant (p=0.15). Mean Knowledge-OHL scores of dentistry students (31.04 ± 7.23) were significantly higher (p=0.01) than Knowledge-OHL mean scores of non-dental participants (21.96± 7.27). The mean scores of Knowledge-OHL of each course are shown in Table II. Generally, the participants have limited knowledge on oral diseases. They were unable to clearly define, ascertain the causes and risk of oral diseases. However, they understood that good oral hygiene and dental visits are important for prevention and treatment. Half of the participants (52%, n=69) read labels sometimes whereas 22% (n=29) of them never read labels when purchasing or using dental products. 58% (n=77) of the participants utilised dental services appropriately.

Table II: Knowledge-OHL, SCP Scores and DMFT of Participants

Characteristics	Knowledge-OHL	p-value	SCP	p-value	DMFT	p-value
	Mean score ± SD		Mean score ± SD		Mean score ± SD	
Course of study						
Medical	22.65 ± 7.62	0.010*	19.89 ± 3.16	0.018*	2.16 ± 2.66	0.020*
Dentistry	31.04 ± 7.23		22.00 ± 2.81		1.35 ± 2.08	
Chiropractic	20.23 ± 4.87		19.23 ± 3.32		3.38 ± 4.99	
Chinese Medicine	15.80 ± 1.30		19.20 ± 1.92		5.60 ± 5.18	
Psychology	20.33 ± 7.23		18.67 ± 1.53		5.00 ± 5.57	
Sex						
Male	23.48 ± 7.69	0.150	19.92 ± 3.44	0.191	1.95 ± 3.1	0.240
Female	24.01 ± 8.51		20.45 ± 2.85		2.67 ± 3.1	

* p <0.05 statistically significant.

Self-care practices

Females (20.45±2.85) have higher SCP score than males (19.92 ± 3.44) but the difference was not statistically significant (p=0.19). Meanwhile, dentistry students had a significantly higher SCP score than non-dental students (p=0.02). The SCP mean scores of each course of study are shown in Table II. SCP score was significantly correlated to OHL score (p=0.00, r=0.38).

Salivary parameters

The salivary parameters of the participants are healthy when compared to the values given by the manufacturer (Table III). Most participants have frothy saliva (71%, n=94) followed by watery (24%, n=31) and sticky saliva (5%, n=7). All participants showed negative *Streptococcus mutans* count in their saliva.

Table III: Salivary Parameters of Participants

	Mean score ± SD			
	Overall (n=132)	Females (n=67)	Males (n=65)	Manufacturer (Low caries risk)
Resting saliva				
a. Hydration rate (seconds)	25.8 ± 10.8	26.8 ± 9.7	24.9 ± 11.9	<30 seconds
b. Resting saliva pH	7.2 ± 0.4	7.1 ± 0.5	7.2 ± 0.4	pH 6.8 - 7.8
Stimulated saliva				
a. Quantity (ml)	7.96 ± 3.51	7.5 ± 3.1	8.5 ± 3.8	>5
b. Buffering (points)	10.28 ± 1.84	10 ± 1.8	10 ± 1.8	10 - 12

Caries status and its association with OHL, SCP and salivary parameters

The Kappa for rater's agreement of the clinical examination was 0.872. The Decayed, Missing and Filled Teeth (DMFT) index of the participants ranged 0 to 18 with a mean of 2.32 ±3.14. Females had a higher mean DMFT index (2.67 ±3.1) than males (1.95 ± 3.1) but the difference was not statistically significant (p=0.24). Dentistry students had the lowest mean DMFT and there was a significant difference between course of study (p=0.02) (Table II). The caries status was significantly correlated with Knowledge-OHL score (p=0.02, r=-0.18) and dental services utilization (p=0.04, r=-0.15) but not with reading of labels (p=0.78, r=0.03), self-care practices (p=0.30, r=-0.05) and all salivary parameters.

DISCUSSION

The key findings of this study showed that the participants have adequate oral health literacy, acceptable self-care practices, healthy salivary parameters, and low caries status. The mean DMFT of the participants is lower (2.3) than the mean DMFT of the national population of 20-24 years old (3.4).[12] Individuals of this age group are no longer under the incremental dental care programme and it is up to one's own initiative to visit the dentist. Identifying the caries status of university students allows prediction for demand and need of health care services which are essential determinants of future healthcare costs.[13]

Dentistry students have significantly higher (p=0.01) Knowledge-OHL scores than students of all other courses because dental knowledge is a strong predictor of oral health literacy.[14] However, undergraduates should have better health literacy skills as compared to those who do not have higher education. It has been shown that undergraduates still have difficulty understanding and utilising some medical information.[15] Therefore, unsuprisingly, the participants scored only 50% of the maximum score of 47 (23.75±8.09) for Knowledge-OHL despite being in the healthcare field. This finding substantiates a need to address the existing oral health literacy gap because adequate level of oral health literacy is needed to allow active engagement in treatment option discussions.[16] Hence, more efforts are required to improve oral health knowledge even among dental students and other university students.[17] Use of medical jargons such as "enamel, periodontitis, gingivitis" in the questionnaire can attribute to the low Knowledge-OHL scores of which this finding clearly shows the need for health care professionals to avoid using such terms to improve communication with their patients.[16] Furthermore, accurate general dental knowledge in students who are future health care providers is essential because they are involved in promoting health education.[18] It has been reported that medical professionals received little oral health content in their curriculum leading to low knowledge levels of oral health and confidence of its application.[18] This is worrying especially since the first contact with the healthcare provider is usually a medical doctor.[18] Dental knowledge, awareness and attitudes of medical practitioners in India has been shown to be satisfactory because a dental posting was included in their curriculum.[18]

The type of information provided on labels and its readability are related to behavior reading in adults.[19] The level of reading labels in this study is similar

to other studies which suggest that the average undergraduate reads labels sometimes.[19] Dentistry students have significantly higher (p=0.02) self-care practices scores than other students indicating high awareness of oral self-care. This is a similar finding to that of a study by Ying and colleagues, in which students at a public university in Malaysia who are future oral health care providers exhibit good oral health behaviors.[20] SCP is not correlated with DMFT which is also consistent with previous research.[21] Good self-care practices do not necessarily mean effective plaque removal in preventing dental caries. Meanwhile, all the salivary parameters showed no correlation with caries status which supports the findings from another study.[22] This is because healthy salivary parameters exhibit large biological variation and crossing individual "threshold level" rapidly would matter more in developing dental caries.[22]

Our findings are consistent with those of a study in Japanese adults where oral health literacy is associated with differences in oral health behaviors and clinical oral health status.[8] However, a limitation of the study is that there may be a certain amount of measurement error connected to self administered questionnaires due to social desirability.[23] Additionally, for the SCP section, photographs of interdental aids should be included to help clarify terminology such as 'single tuft toothbrush' and 'irrigation devices,' ensuring the accuracy of responses. Furthermore, DMFT index measures dental professionals' behavior and treatment thresholds relating to past signs of dental caries and may not be a good indicator of active caries.[24] Since the DMFT index tends to underestimate the presence of caries, future studies should consider using the International Caries Detection and Assessment System (ICDAS), which can detect dental caries at an earlier stage, providing a higher sensitivity score.[25] Within the limitations of our study, our findings indicate that there is a significant association between oral health literacy and caries status. Additionally, the levels of OHL, SCP and caries status were significantly different between course of study. Therefore, efforts to impart knowledge and skills to access care by developing effective educational programs tailored to the field of study and increase "inter-professional learning" opportunities between courses to heighten oral health literacy skills.[26] Future studies could assess the effectiveness of the changes made to the curriculum by reevaluating the OHL scores.

CONCLUSION

The participants were found to have adequate oral health literacy, acceptable self-care practices and low caries status. There is a significant association between oral health literacy and caries status. This is suggestive that efforts to impart knowledge and skills to access care should thus be part of the "OHL imperative for better oral health".

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