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Attitude towards Research among Undergraduate Dental Students in Malaysia
(Sikap Terhadap Penyelidikan dalam kalangan Pelajar Prasiswazah Jurusan Pergigian di Malaysia)

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ABSTRACT

The participation of dentists in dental sciences research within Asian countries is still substantially below the target. Exposure to research may improve the quality of dental education, and potentially increase the participation of dental graduates' in academic dentistry. This study aims to evaluate the attitude of students towards scientific research during their study in the School of Dental Sciences, Universiti Sains Malaysia as well as to identify the barrier that might affect their learning process in research. A cross-sectional, self-administered online questionnaire was distributed to 155 undergraduates among whom a total of 122 response were collected, between June to September 2016. In general, students demonstrated favourable attitudes about research integration in the undergraduate curriculum. The respondents also agreed that research is relevant to dental education (81.9%) and that participation in research activities may facilitate admission to postgraduate programs (77.7%). The effective presence of supervisors is a crucial element that affects student engagement in research, including the ability to provide proper training and guidance (61.7%) and flexibility for academic discussions (57.44%). Current data serve as an important evidence to evaluate the existing practice of delivering the research component to undergraduate dental students in Malaysia, which includes a proper project title, objectives, sampling population, literature review, analytical instrument, methodology and data analysis. In depth knowledge and improved research skills will allow for better participation of undergraduates in various dental sciences research, ranging from laboratory-based experiments to clinical and community-based research projects.

Key Words: Attitude, Barriers, Dental, Undergraduates, Scientific, Research, Curriculum

ABSTRAK

Penglibatan doktor gigi dalam aktiviti penyelidikan sains pergigian di negara-negara Asian masih lagi di tahap yang rendah berbanding sasaran yang ditetapkan. Pendedahan terhadap penyelidikan dipercayai mampu meningkatkan kualiti pengajian dalam bidang pergigian, juga mampu meningkatkan penyertaan graduan pergigian dalam bidang akademik. Soal selidik ini dijalankan untuk menilai sikap pelajar prasiswazah terhadap penyelidikan saintifik semasa mengikuti kursus pergigian di Pusat Pengajian Sains Pergigian, Universiti Sains Malaysia. Kajian juga dijalankan untuk mengenalpasti faktor-faktor yang mempengaruhi proses pembelajaran mereka dalam penyelidikan. Suatu kajian rentas telah dijalankan secara atas talian melibatkan 122 orang pelajar prasiswazah jurusan pergigian (tahun ketiga hingga tahun kelima pengajian) dari Jun hingga September 2016. Secara keseluruhan, pelajar menunjukkan sikap positif terhadap integrasi penyelidikan dalam kurikulum pengajian pascasiswazah. Tinjauan juga mendapati bahawa pelajar bersetuju bahawa penyelidikan adalah penting untuk pengajian pergigian (81.9%) dan penglibatan dalam aktiviti penyelidikan akan memudahkan laluan ke program pengajian pascasiswazah (77.7%). Peranan penyelia dilihat sebagai elemen penting yang mempengaruhi penglibatan pelajar dalam penyelidikan, termasuk kebolehan untuk memberikan latihan dan bimbingan (61.7%) serta ketersediaan untuk mengadakan perbincangan ilmiah (57.44%). Data yang diperolehi ini membentangkan bukti penting yang dapat digunakan untuk menilai keberkesanan praktis sedia ada dalam memperkenalkan komponen penyelidikan, merangkumi tajuk penyelidikan yang sesuai, objektif, populasi sampel, tinjauan literasi, analisis instrumen, kaedah penyelidikan dan juga analisis data. Ilmu dan kemahiran penyelidikan yang mendalam mampu meningkatkan penyertaan pelajar dalam pelbagai bidang penyelidikan sains pergigian, daripada eksperimen di makmal sehingga ke kajian klinikal dan kes komuniti.

Kata Kunci: Sikap; Halangan; Pergigian; Prasiswazah; Saintifik; Penyelidikan; Kurikulum

INTRODUCTION

Scientific research plays an essential role in a systematic investigation of medical or technical problems, which are dedicated on specific disciplines or sub-area within a field of knowledge. Research conducted within dentistry and medicine fields requires in-depth information gathered from various platform, ranging from *in-vitro* and animal studies to clinical trials, as well as public health data. These inter-disciplinary research works are conducted by different cluster of research in dental sciences to provide a comprehensive approach in dealing with decision-making within the dental and clinical practice (Sharma et al. 2014). The introduction of new techniques and recent technologies in clinical practice continues to improve on patient care, which further indicates the necessities to embed scientific research into dental education. Scientific research has long become a part of the dental curriculum in developed countries, such as the United States of America, United Kingdom, Australia, and Canada (Al-Sweleh 2016; DePaola et al. 2002). From there, universities in developing countries, particularly in Asia, have taken similar initiatives to introduce research components in the undergraduate curriculum, such as in Saudi Arabia, South Africa, Turkey, Malaysia, and Pakistan (Jeelani et al. 2014; Grossman & Naidoo 2009; Guven & Uysal 2011; Khan et al. 2016; Ramachandra 2020).

The improvement of techniques in dentistry is driven by growing evidence and rapid development in dental sciences research. The data and valuable knowledge gathered can be utilized to transform the overall outcome of dental treatment and healthcare. Hence, the experience in research methodology and involvement in research activities is regarded as one of the critical components in medical and health sciences curriculum. Nevertheless, the synergistic approaches to sustain scientific research training among dental graduates in developing countries are still lacking. Training in research activities within the developing countries is decreasing, with a smaller number of researchers remaining active (Bilal et al. 2019; Habib et al. 2018). This situation is significantly common in the past decades, which indicate the extreme necessities to identify the root cause and prepare strategic planning to address the issue.

The undergraduate research is a cumulative learning process, beginning with learning the basic knowledge of searching for information to higher complex analytical process, involving methodological planning and data analysis. Along the way, the students not only benefited from gaining new information but also discovering the essential soft skills needed in a professional training through the conduct of research, such as problem-solving, teamworking, communication, networking, and integrity. Establishing a proper integration of research into the dental curriculum may further increase a student's participation in research activities and enabling them to integrate the positive research disciplines into practice. Hence, initial exposure in research activities during the undergraduate dental program plays a significant impact on the graduate research attitude and work ethics.

Therefore, more information is now being collected from various studies to identify the potential underlying barriers which hinder active undergraduate participation in research. Among the critical factor that determines the decline in the number of scientists among dentists is inadequate exposure towards research activities, which particularly stressing on its role towards shaping future career path. A review of the literature further indicates that lack of funding and research support, limited supervisory expertise, inadequate research experience, and insufficient time within the curriculum to conduct research are the factors which hinders student from actively participating in research during their studies (Barton 2008; Emrick & Gullard 2013; Prince et al. 2007).

In Malaysia, the inclusion of research within the dental curriculum is a consensus agreement made by the Dental Dean Caucus of Malaysia (Ramachandra & Muttalib 2020). Universiti Sains Malaysia (USM) is one of the public universities in Malaysia, which has taken the step to include mandatory research activity into the existing dental curriculum since the year 2003. Research components were introduced into the preclinical phase undergraduate students, in the second year of the dental programme, in addition to formal lectures and practical session on biostatistics and research methodology. It is then followed by additional courses which commence during the clinical phase in the third year. Briefly, the research activities was introduced to students through involvement in an outreach community-based project, known as the Community Family Case Study (CFCS) and an individual conduct of elective research work under the supervision of an expert of the field. From these two research activities, students manage to learn more about research elements, including the methodology, literature search and review process, statistical analysis, as well as technical skills on delivering the research output to fulfil the research objectives. Upon completion of the elective project, students are required to present their ideas and research findings in an annual dental student scientific conference, which enable them to network, meet with colleagues and industry peers and expand the current knowledge in advancing dentistry. On top of that, throughout five years of a dental program, students in Universiti Sains Malaysia are also being exposed to evidence-based medicine (EBM), and the practice may relatively improve during clinical placements.

The participation of dentists in dental sciences research within South-East Asian Nations (ASEAN) countries is still substantially below the target. Data gathered from previous study showed that research publications by dental institutes in ASEAN are significantly lower than their Asian counterparts, with Singapore and Thailand being the main active player in dental research among ASEAN countries (Sirisinha et al. 2011). Extensive literature search also indicated that there is a limited number of studies performed on assessing the attitudes of dental and medical students towards scientific research activities during the undergraduate years in higher education. The exposure to research may improve the quality of dental education, and potentially increase the participation of dental graduates' in academic dentistry. Over the years, curriculum implementation on introducing research skills for both dental and medical programmes have focused more on monitoring the output of research activities, rather than focusing on the impact of research activities on students' academic development and personal growth.

Given the relevant evidence on the lack of research components integration in the current dental curriculum, it appears vital to conduct a study to evaluate USM students' attitude towards research. Further analysis is needed to identify the perceived barriers among current undergraduate dental students in USM which may potentially hinder their active participation in research. A better understanding on the relevant factors may assist in the improvement of current practice in conducting research, as part of the students' educational program and long-term career development. Hence, the objectives of this study are as follows:

1. To assess the attitude of undergraduate USM dental students towards scientific research
2. To identify the barriers among undergraduate USM dental students to actively participate in research activities during their studies

Conceptual Framework

Prior to integration of research in higher education, students at the undergraduate level in universities often perceived research-related course as a burden and not as important as the core subjects, particularly within the dental and medical schools. These negative attitudes potentially influence the student's effort in learning about research and develop the essential skills. Attitudes is defined as a person's evaluation of an entity, which could be a person or group, a policy, or an activity, that forms a collective belief system (Brown 2007). Nevertheless, attitude is a rather challenging construct that has not been properly define for research study. A number of studies on attitudes also failed to give details description of attitude constructs (van Aalderen-Smeets et al. 2010). In the present research, attitude is specifically defined as respondents' attitude towards research activities, whereby a positive attitude in learning activities among students has been associated with an increase in intrinsic motivation and behaviour (Li 2012).

To put this into perspective, studies conducted on dental students from various countries, such as Saudi Arabia, Croatia, and Pakistan, Amin et al. (2012), Memarpour et al. (2015) and Vodopivec et al. (2002) recorded a positive attitude of undergraduates towards research. Furthermore, increased years in dental programme is associated with improved attitude among undergraduates, whereas students from the later enrolment years showed a better belief system. Data comparing between previous experience in research and students 'attitude to research also showed a positive correlation (Nel et al. 2014).

Hence, the conceptual framework of this study is constructed and modified based on the Attitudes Towards Research (ATR) Scale, which measures students' attitude towards the field of research, regardless of their research orientation (Papanastasiou 2014). In this regard, all the relevant factors which reflects on students' attitudes towards research was taken into consideration. The factor of "research usefulness in profession" is adapted and modified along with the existing questionnaire taken from established studies (Ismail et al. 2014; Siemens et al. 2010). In short, this research conceptual framework investigated the students' attitude towards research, in relationship to previous research experience as well as their educational background. The assumption is that the students' attitudes towards research is directly related with the different variables in the demographic information, such as prior research experience and educational background.

Methodology

Research Design

This study used cross-sectional survey design. This research design was selected as it allows the collection of data from a large pool of respondents in a short period, at one point in time (Setia 2016). Ethical approval for this study was obtained from the Human Research and Ethics Committee, Universiti Sains Malaysia review board (Ref: USM/JEPEM/16030114). Objectives of the study and assurance of confidentiality were informed to the participants before the conduct of the survey. Given the subject vulnerability, it was made clear to the participants that withdrawal or decline to take part in the study will not affect their marks and credit for any part of the study course.

RESEARCH PARTICIPANTS

The present cross-sectional study was carried out among undergraduate students in the School of Dental Sciences, Universiti Sains Malaysia, between June to September 2016. Students from the third to fifth-year classes of 2016/2017 academic session were invited to participate in this study. This is because these student groups are the group of students who have had the experience of conducting research while undergoing their dental curriculum. Students from the first- and second-year of 2016/2017 academic session were excluded from this study, as well as students from other schools in Health Campus, Universiti Sains Malaysia. Participation was entirely voluntary, and confidentiality was maintained at all times as no identifying information was recorded in the survey results. The sample size was determined based on Krejci and Morgan's (1970) table. For a given population between 150 and 160, a sample size of 108 was estimated. By considering 20% dropout, a total of 138 responses was targeted as the first sampling number.

A total of 122 undergraduate dental students from the third to the fifth-year class had successfully completed the questionnaire within the survey period, which recorded an overall response rate of 81.33% (122/155). The response rate from the third-year class (45/122; 36.9%) was similar to the fourth-year class (45/122; 36.9%), whereas the final year class recorded a much lower response rate at only 26.2% (32/122).

Table 1 illustrates the demographic background of the respondents, which includes gender, year of enrolment as well as the entry qualification into Universiti Sains Malaysia. Demographic background analyses indicate that a high number of respondents who took part in this study are female students, which constitute about 73.8% of the total respondents. The majority of the respondents who took part in this study came from the matriculation program, which represents 76.2% of the total respondents.

TABLE 1. Demographic data of respondents

Variables	Percentage (N=122)
Gender	
Male	26.2%
Female	73.8%
Enrolment years	
Third	36.9%
Fourth	36.9%
Fifth	26.2%
Entry qualifications	
Matriculation	76.2%
STPM	9.0%
A-Level	3.3%
Others	11.5%

TABLE 2. Cronbach' Alpha for each construct

Aspect	Number of Item	Cronbach's Alpha
Attitude	6	0.765
Barriers	9	0.913

DATA COLLECTION METHOD

The questionnaire used in this study was constructed and modified from established works which employed structured items, with further refinements made to confirm that the questionnaire is appropriate to our curriculum and local university (Ismail et al. 2014; Siemens et al. 2010). Briefly, questionnaire validation in the present study was performed in few steps, consisting of the followings; i) understanding constructs, ii) refinement of items from established study, iii) selection of suitable statistical model, iv) piloting the questionnaire, and v) gathering feedback through consultations with experts.

Pilot study was conducted with students recruited from the excluded group before the initial conduct of this study, which particularly assess the exact number of items needed, difficulty level and reliability of the items to adequately measure the construct. Negatively worded items were removed, and the set of items were re-written in a unidimensional way to only measure a single construct. Cronbach's Alpha reliability analysis was used to test the internal consistency between each item in the instruments. The results are shown in Table 2. It was revealed that each factor had a high index of reliability based on Taber (2018).

The questionnaire consisted of three parts. The first part consisted of 7 questions regarding demographic background, i.e. gender, enrolment years, entry qualification and previous research experience. The second part addressed the attitudes of USM undergraduate dental students to conduct scientific research, and the third part focuses on barriers to carry out scientific research among dental students. The total of 15 questions in the second and third part was in a 5-point Likert scale format (1: Strongly Disagree; 2: Disagree; 3: Neutral/Not sure; 4: Agree; 5: Strongly Agree) to assess the level of agreement with several statements as addressed the research objectives. Students were voluntarily invited to take part in the study and the confidentiality of their participations were assured by proper data collection and access. The questionnaire was distributed via Google Forms following their consent and approval to participate in this study. The survey was made available to the participants both in English and Bahasa Melayu. Each survey took about 5 to 10 minutes to be completed.

DATA ANALYSIS METHOD

Descriptive statistics were used to describe demographics and research background of students. The descriptive differences using agreement responses of 4 and 5 were grouped as one, so as the disagreement responses of 1 and 2. Bivariate analysis with Chi-square test was used to determine the statistical significance between different gender and enrolment years and those with or without prior research exposure. Chi-square was used to analyse nominal data which includes the "yes-no" answers in this survey. One-way analysis of variance (ANOVA) was used to compare the mean scores of each component in part two and three of the questionnaire. A significance value of $p<0.05$ was considered statistically significant. The analyses were done using Statistical Package for the Social Sciences (SPSS) version 22.

FINDINGS AND DISCUSSION

DEMOGRAPHIC BACKGROUND ANALYSIS

Improving the current practice in teaching and introducing research components to dental and medical undergraduate students remain as one of the challenging tasks in higher education. This paper has focused on assessing the attitude and barriers towards conducting research activities among undergraduate dental student in the School of Dental Sciences, University Sains Malaysia. Table 3 provides information on students' demographic background and previous research experiences. Of the participants, 73.8% were female, reflecting the underlying demographics of the campus where the female to male ratio is currently at 70:30. There were equal numbers of students from the third and fourth year and much lesser participants from the fifth year. It appears that the differences in gender had no impact on student's interest and participation in research, as reported among the medical students in Egypt (Aboushouk et al. 2016). In a similar note, this study also reported no correlation between gender and the students' attitude towards research.

In terms of prior research experience; 80.3% (98/122) of respondents recorded no research experiences before admission to USM dental school. A further comparison made between enrolment years recorded no statistical differences among group of respondents who reported no or minimal research experience before attending the dental school (Year 3, 37/45; Year 4, 39/45; and year 5, 22/32) with chi-square test of ($p=0.14$) respectively. However, at the time of the study, as much as 34.4% (42/122) of the respondents stated on having no experience in presenting research while studying in dental school, University Sains Malaysia. Meanwhile, 69.6% (85/122) of the respondents, mainly from the fourth- and fifth-year students agreed of no involvement in ongoing research project at the time of study. Pearson Chi-square analysis revealed a statistically significant association between enrolment years and participation in research activities ($p<0.005$), which indicate active participation in research among the third-year students. The significant differences recorded might be potentially because, during that time of the study, students in the third year are at the beginning of conducting their elective research projects, as opposed to two other groups of fourth- and fifth-year students who have completed their research works.

On top of that, as much as 72.9% (89/122) of the respondents admitted with having no experiences in publishing research paper. It was apparent, however, that the involvement in publications of research work is about the same for the fourth- and fifth-year students with both standing at 62.2% and 62.5%, while 91.1% of third-year students agreed that they do not have experience in publication of research work. The data gathered from this study further suggested that lack of research experiences did not correlate with the students' attitudes towards research. This does not correspond with similar study conducted among dental students in the United States, which demonstrated that student with research experience inclined to show much stronger positive response on research activities in dental education and more likely be motivated to participate in research (Holman et al. 2014; Mason Colón 2019). Data from previous study also indicated that research competency among dental students is not directly related with their motivational status but highly associated with students' lack of understanding on translational research (Amin et.al 2012).

ASSESSMENT OF ATTITUDES TOWARD PARTICIPATION IN RESEARCH

Overall, the respondents recorded positive attitudes towards research activities during dental school, as shown in Table 4. The overall mean scores of students' attitude towards research were found to be positive, with the maximum average score points of 4.22 and minimum of 3.40, even though a majority of the students revealed no research experience before admission to dental school. Year 4 students exhibit the most positive attitude towards research activities with the highest mean scores recorded for at least half of the questions given.

However, further analysis indicated that no statistically significant differences were reported between years of enrolment and the questions regarding attitudes. It is also worth noting that when the questionnaire was distributed, these students were at their final stage of completing the elective research project. This finding is in line with the results of several research studies which indicated positive responses

from medical and dental undergraduates towards research activities (Amin et al. 2012; Basudan et al. 2019; Nel et al. 2014; Vodopivec et al. 2002) as well as a positive response from the dental postgraduate students (Anjum et al. 2016). In contrast, studies in Iran and Netherland reported a lack of positive attitude among the respondents towards participating in research, as their knowledge and behaviour towards evidence-based medicine was not up to the mark (Memarpour et al. 2015; Scholten-Peeters 2013). The outcome of this study shows that the strategic planning of the Malaysian government to expose dental students to research activities within the curriculum have indeed increase student awareness and resulted in a welcoming responses from both the students and the educators.

The data also demonstrated that 83% of the respondent agreed that research is relevant to dental education, with an average score of 4.16 when combined from year 3 to year 5. Meanwhile, 77.7% of students agreed that their involvement in research might facilitate future admission into postgraduate programs, as well as 75% of the respondent agreed that research is essential as part of a long-term career goal. Also, 58% of the respondents agree to conduct research associated with their field of interest, and 51.06% of students agreed that a mandatory research time should be allocated in the dental curriculum. On the other hand, a much lower percentage of positive responses were recorded when it comes to these statements; to include research as one of the criteria for acceptance into a postgraduate program (45.2%), with the lowest means score recorded among the fourth-year students.

The key benefit and several implications of engaging dental undergraduate students in research during their program of studies have been thoroughly discussed in various literatures (Al Sweleh 2016; Elangovan 2019; Van der Groen 2018). For example, research exposure during undergraduate years in dental school are associated with increase understanding of medical/academic terms to develop transferable skills, as well as better prospects in both academic and clinical postgraduate careers (Al-Shalawy & Haleem 2015; Mason Colón 2019). Despite of differences in enrolment years, the majority of the respondents agreed that exposure to research activities forms an essential component in dental curriculum, which contributes to a better lifelong career development and personal growth. Hence, the dental curriculum should be designed in a way that can facilitate and support student participation in research by integrating the fundamental aspect of it.

The concept of evidence-based dentistry must be explained in further details so that student can appreciate the rationale of integrating research course in the dental curriculum, which can be highly valuable later during the dental practice years. Through research activities, the students will not only learn about logical reasoning skills (both inductive and deductive reasoning) but also enriching their career pathway, as well giving them more opportunities to build up connections with other researchers in the dental sciences community as they present their research in conferences at the university and national level.

TABLE 3. Comparison of demographic data and research experience for respondents in third-, fourth-, and fifth year USM dental student

Variables	Year 3 (n=42)	Year 4 (n=42)	Year 5 (n=32)	χ^2 (df)	p value
1. No research experiences prior to dental school	82.2% (37)	86.7% (39)	68.6% (22)	3.961 (2)	0.14
2. Never presented research in dental school	91.1% (41)	2.2% (1)	0% (0)	101.53 (2)	<0.005*
3. No current involvement in research project	2.2% (1)	100% (42)	100% (42)	117.76 (2)	<0.005*
4. No experience in publishing research paper	91.1% (41)	62.2% (28)	62.5% (20)	11.92 (2)	<0.005*

* Significance level was calculated using Chi-square test

* assumption for normality of the data is fulfilled

TABLE 4. Comparison of attitudes towards research interest in third, fourth and fifth-year USM dental student

Variables	N	Mean Score (SD)	F statistic (df)	*p*-value*
1. Knowledge in research is relevant to dental education	Year 3 (42)	4.16 (0.928)	0.135 (2)	0.874
	Year 4 (42)	4.11 (0.859)		
	Year 5 (32)	4.22 (0.906)		
2. Involvement in research will facilitate admission to postgraduate program	Year 3 (42)	3.93 (0.915)	1.304 (2)	0.876
	Year 4 (42)	4.20 (0.894)		
	Year 5 (32)	3.91 (0.963)		
3. Research should be included as one of the important criteria for acceptance to postgraduate program	Year 3 (42)	3.51 (0.991)	0.133 (2)	0.275
	Year 4 (42)	3.40 (0.963)		
	Year 5 (32)	3.44 (1.190)		
4. Research is important as part of long-term career goals	Year 3 (42)	3.84 (1.043)	0.416 (2)	0.660
	Year 4 (42)	4.02 (0.892)		
	Year 5 (32)	3.97 (0.861)		
5. The decision to conduct a science research was based on the field of interest	Year 3 (42)	3.73 (1.009)	0.689 (2)	0.504
	Year 4 (42)	3.69 (0.925)		
	Year 5 (32)	3.94 (0.914)		
6. A mandatory research time should be allocated in dental curriculum	Year 3 (42)	3.51 (1.014)	0.135 (2)	0.874
	Year 4 (42)	3.62 (1.072)		
	Year 5 (32)	3.53 (1.135)		

*One way ANOVA
*assumption for normality of the data is fulfilled

IDENTIFIED BARRIERS TOWARDS CONDUCTING RESEARCH

The data gathered from this study suggested few areas of concern that needs to be addressed in future curriculum review. Although this survey was conducted in 2016, no major changes has been implemented within the curriculum, in regard to deliver an effective research course to the undergraduate dental students in USM. Thus, the data provided is considered significant to the current on-going curriculum. The barriers which negatively affects student's participation in research during their undergraduate studies in dental school, were listed in Table 5. In terms of the supervisory aspect, most of the respondents revealed that the research supervisor plays a vital role to support student participation in research.

The ability of a research supervisor to provide proper training and guidance (61.7%) and be readily available for discussions (57.44%) has been identified as the two significant factors associated with student's performance in research work, with the mean score of 3.80 and 3.74. As the data attest, lack of guidance and monitoring from the research supervisor is regarded as the main barrier in conducting research by these undergraduate students. Similar findings have been mentioned in other studies in Iran, Pakistan, and Saudi Arabia although it may not be considered a significant factor (Ashrafi-rizi et al. 2015; Noorelahi et al. 2015; Raza & Niza 2017). As of now, the assessments made on research activities are primarily one-sided with the feedbacks and reviews gathered only to reflect on student’s performance. Lack of attention given in emphasizing the critical role of supervisors to monitor

student's progress may further increase the existing barriers for participating in research. Students who does not receive a proper guidance in conducting a study may eventually get demotivated and loss their interest in research. Thus, it is highly recommended to have an efficient system of collecting immediate response and feedbacks from students to alert on unhelpful supervisors.

However, the most striking finding of this study is the fact that acknowledgement and inadequate training in publications of students' research work has also become another critical issue to be taken into consideration. The data signalled that assistance in the publication of research (54.8%) and the acknowledgement received for their contribution in a research project (53.2%) during the undergraduate program in dental school have been identified as other relevant issues that need to be addressed. In a similar note, students in Brazil also perceived that the lack of institutional incentive represents the primary barrier to their participation in research (de Oliveira et al. 2011). Similarly, in United States, lack of funds to conduct research project has become an issue among their undergraduate dental hygiene students (Mason Colón 2019). The recognition and merit obtained by students from an excellent scientific research project may positively motivate them to pursue research as one of their career options. Although many research works have been conducted on analysing the barriers in research among undergraduate students, only a few have suggested on improving the current method of rewarding the students for their active participation in research activities.

Other pertinent factors that negatively influence student's participation in research activities are insufficient opportunity in the current dental curriculum to pursue the students' research interest (45.7%) and the feasibility of presenting scientific research within the community (45.2%). Meanwhile, a few other potential barriers have been investigated, such as lack of training in research methodology prior conducting the research project (40.4%), inadequate time to participate in research (37.23%) and lack of training in reviewing scientific literature (37.23%). These three barriers recorded the lowest mean scores of 2.82, which primarily associated with respondents from the fourth year during the research conduct may as well hindered the student's participation in research. Nevertheless, no significant differences were recorded between the different enrolment years.

TABLE 5. Comparison of barriers in research practice among third, fourth and fifth-year USM dental student

Variables	N	Mean Score (SD)	F statistic (df)	*p*-value*
1. Adequate time allocated in dental curriculum to conduct research	Year 3 (42)	3.22 (0.951)	0.886 (2)	0.415
	Year 4 (42)	2.93 (1.116)		
	Year 5 (32)	3.03 (1.062)		
2. Adequate training in research methodology in dental school	Year 3 (42)	3.02 (1.055)	0.123 (2)	0.885
	Year 4 (42)	2.91 (1.019)		
	Year 5 (32)	2.94 (1.268)		
3. Adequate training in reviewing scientific literature	Year 3 (42)	3.13 (1.120)	0.955 (2)	0.388
	Year 4 (42)	2.82 (0.984)		
	Year 5 (32)	2.88 (1.314)		
4. Research supervisors are easily available	Year 3 (42)	3.56 (1.056)	1.179 (2)	0.311
	Year 4 (42)	3.87 (0.894)		
	Year 5 (32)	3.78 (1.008)		
5. Research supervisors offer good training and guidance	Year 3 (42)	3.82 (0.886)	0.726 (2)	0.486
	Year 4 (42)	3.67 (0.905)		
	Year 5 (32)	3.91 (0.893)		
6. Feasibility in presenting research in dental school	Year 3 (42)	3.64 (0.957)	0.921 (2)	0.401
	Year 4 (42)	3.53 (0.869)		
	Year 5 (32)	3.78 (0.975)		
7. Feasibility in publishing research in dental school	Year 3 (42)	3.58 (0.988)	0.665 (2)	0.516
	Year 4 (42)	3.38 (0.834)		
	Year 5 (32)	3.66 (1.035)		
8. Acknowledgements received for contributions in research	Year 3 (42)	3.56 (0.918)	0.899 (2)	0.410
	Year 4 (42)	3.56 (0.918)		
	Year 5 (32)	3.81 (0.965)		
9. Adequate room set aside in curriculum to pursue research interest	Year 3 (42)	3.49 (0.869)	0.264 (2)	0.769
	Year 4 (42)	3.38 (1.051)		
	Year 5 (32)	3.53 (1.016)		

*One way ANOVA

* assumption for normality of the data is fulfilled

This study also clarifies that lack of training in research methodology prior to conducting the research project as well as the lack of skills and knowledge in reviewing scientific literature represent another relevant factor which negatively influence students' active participation in research. Nevertheless, lack of time allocated for research was not addressed as the main issue to our respondents, mainly because here in USM, students were given a mandatory time to conduct research within a specific timeframe, under ta proper guideline and research supervision. In contrast, other studies emphasized that lack of time forms one of the main barriers towards scientific research (Osman 2016; Soe et al. 2018). On top of that, lack of skill and knowledge in conducting research has been identified as a significant barrier among undergraduate medical students in Pakistan (Raza et al. 2017), as well as dental postgraduate students in India (Anjum et al. 2016). Knowing the fact that adequate time and proper training has a significant impact on student progress and active involvement in research, immediate measures must be adopted by the relevant institutions to address this issue. Further analysis is needed to assess and review the current teaching and delivery of formal research course, particularly for dental and medical undergraduate students. The next dental curriculum review should give more focus on overcoming the existing barriers to create a stimulative learning environment for the students to participate in research.

CONCLUSION

This study examined the attitude of undergraduate dental students towards scientific research, as well as identifying barriers of conducting research while studying in School of Dental Sciences, Universiti Sains Malaysia. This study provided an appropriate evidence which reflect on students' perspectives towards participating in a research project while completing a degree in dental surgery. The survey revealed positives attitudes among dental undergraduate students to conduct research, with majority of the respondents agree that research is relevant in dental education, which brings high values to career development and clinical practice. A significant role of supervisor, attractive incentives for publishing research and intensive research training course within a structured undergraduate dental curriculum has been identified as the major factors which influenced students' attitude towards research. The data gathered from the present study can be used to facilitate the dental education experts, dental council members, curriculum reviewers and policy makers from the administration of higher education institutions to work together to acknowledge, encourage and foster positive attitudes and higher achievement among students in performing a research work. Despite the growing evidence and concrete findings, this study also possesses few limitations. First, this study was a cross-sectional study, involving only a single cohort in one academic year; therefore, the findings cannot be interpreted to represent any changes over time or inference of causality over the amendment of policy or curriculum review. Second, this study was conducted in a single dental public university in Malaysia; therefore, the result may not apply to other educational institutions with different curriculum and organizational background. Thus, it is highly advisable for future study to include participation from both private and public universities in Malaysia, to find a correlation between students' attitude and research facilities within these two different learning environments. Third, this study does not include other relevant barriers, such as government policy, availability of supporting staff, ethical concerns, insufficient research funding and logistics barriers. These factors may need to be included in a future study to gain a better understanding of these relevant factors on students learning experience, which closely associated with their attitude towards research activities in dental education.

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