

ORIGINAL ARTICLE

Knowledge of Dental Implants Among Adults Attending Hospital Universiti Sains Malaysia

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ABSTRACT

Introduction: Losing natural teeth can have significant emotional and social impacts on individuals. One available treatment option is dental implants, which are popular in developed countries due to their high success rates and the improvements they bring to quality of life. However, limited knowledge about dental implants can influence both demand and outcomes. Research on this subject within the Malaysian population is scarce. Therefore, this study aims to assess the knowledge of dental implants and the factors associated with it among adults attending Hospital Universiti Sains Malaysia (USM). **Materials and methods:** This cross-sectional study used a validated self-administered questionnaire adapted from previous studies. A total of 104 adults attending Klinik Rawatan Keluarga (KRK) Hospital USM participated in the study. The data were analysed using IBM SPSS version 26.0. **Results:** The mean age was 43.2 years (SD =15.34), with 52.9% male and 47.1% female respondents. Respondents exhibited a moderate score of knowledge about dental implants, with an average score of 4.9 (SD =1.20). Females (95% CI: -1.062, -0.151) and individuals with high education levels (95% CI: -0.961, -0.032) demonstrated significantly greater knowledge of dental implants compared to their counterparts ($p < 0.05$). **Conclusion:** This study concludes that the respondents possess a moderate knowledge score regarding dental implants. Notably, females and those with a high education level exhibit superior knowledge. Therefore, disseminating information dental implants and their benefits is essential to the public is essential to improve understanding and facilitate informed decision-making regarding tooth replacement.

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INTRODUCTION

Losing teeth has been shown to impact individuals in various aspects of life, including emotional, social, and performing daily tasks [1]. Therefore, oral rehabilitation is crucial in addressing these concerns and improving affected individuals' overall quality of life [2]. There is a wide range of dental replacement options, from conventional treatment, such as dentures and bridges, to high-technology treatment, such as dental implant-supported prostheses.

In developed countries, dental implants have become increasingly popular among patients with missing teeth. The study by Elani et al. (2018) reported an expected increase in demand for dental implants in the United States, with a rise in prevalence from 6% in 2016 to 23% in 2026 among the adult population [3]. However,

inadequate knowledge and misconceptions about dental implants can affect the demand for dental implant treatment [4]. Misinformation or unrealistic expectations regarding dental implants' nature, performance, and longevity can lead to hesitancy or inaccurate perceptions about the treatment [5].

The previous study by Kohli et al. (2014) provided valuable insights into the public's awareness, knowledge, and attitudes toward dental implants in Malaysia [6]. The study also revealed a possible correlation between the knowledge of dental implants among younger age groups and higher levels of education; however, this association was not supported by statistical analysis. Over the past eight years, significant developments have occurred within the field of dental implants, including advancements in implant technology, changes in treatment protocols, shifts in patient preferences and expectations, and an increase in exposure to information about oral health. Thus, an updated assessment of the knowledge regarding dental implants among Malaysians is warranted to address current gaps in understanding and to tailor educational initiatives effectively.

MATERIALS AND METHODS

Study design

This cross-sectional study was conducted among 104 adults attending the Medical Outpatient Clinic, Klinik Rawatan Keluarga, Hospital USM. This study's primary aim was to assess dental implant knowledge within a sample of Malaysian population.

Sample

Convenience sampling was used to select the samples including both patients and accompanying person. This study included Malaysian citizens aged 18 and above who were proficient in reading and writing Malay, as well as those familiar with dental implants. Familiarity with dental implants was determined based on a preliminary screening question included in the survey instrument. Respondents were asked whether they had heard of dental implants before participating in the study. Only those who answered affirmatively were included in the analysis. This criterion was chosen to ensure that respondents had at least a basic understanding of dental implants, allowing us to focus on assessing and understanding their knowledge levels rather than introducing factors related to lack of awareness or exposure to the topic. We acknowledge the potential for bias introduced by recruiting individuals who were already familiar with the topic. However, our focus was not solely on assessing basic awareness but rather on evaluating the depth of knowledge and understanding among respondents. We believe that even among those familiar with dental implants, there may be variations in knowledge levels that warrant investigation. To minimise potential bias, we excluded individuals who had undergone dental implant treatment and any dental healthcare personnel, including all professionals and supporting staff with a dental background. This study used an online statistical calculator (Statulator) to determine the sample size. The confidence level was set at 0.1% and power at 80%, resulting in a total sample of 87 respondents. Considering a dropout rate of 20%, the final sample size was 104 respondents.

Study instruments and data collection

In this study, a validated self-administered questionnaire was used. The questionnaire was adapted from the study by Kohli et al. (2014), Kohli et al. (2015), and Rashidi Maybodi and Shayeghi (2022) [6–8]. The questionnaire combines selected questions from the three original studies mentioned above, focusing on the knowledge domain of dental implants. Some questions from the original questionnaire were excluded due to ambiguity and confusion. In total, the questionnaire comprised 8 items (Table III), encompassing several technical questions, forming the knowledge domain. Including technical questions about implant materials is crucial as they directly influence patients' perception of safety and biocompatibility, which are key factors in treatment acceptance, ensuring patients are well-informed for

effective treatment decisions. To analyse and summarise respondents' knowledge of dental implants, a scoring system was used. Each answer option was assigned a code for data entry. For instance, responses to question 2 were coded as follows: "Do not know" = 0, "In the gum" = 1, and "In the jawbone" = 2. The total score represented the mean knowledge score. Scores were categorised into three ranges: low (0–3.0), moderate (3.1–6.0), and high (6.1–8.0), as determined by the research team.

The questionnaire has undergone two processes. First was the translation process, which included a forward and backward translation, adapted from Beaton et al., 2000 [9]. Briefly, the questionnaire was forward-translated by four translators: two bilingual individuals who were unaware of the study's objective and two translators who were informed of the study's aims. They worked independently to translate the questionnaire into Malay, and any discrepancies were discussed among researchers for accuracy. Following this, the initial translation was independently back translated into English by two laypersons fluent in Malay and English, who were unaware of the questionnaire's concept, to ensure accuracy and minimise bias.

Second, the content validity and face validity scores were calculated. The Content Validity Index (CVI) (0.94) and Face Validity Index (FVI) (0.99) scores exceeded the average scores suggested by Davis (1992) [10] and Marzuki et al. (2018) [11]. The CVI scoring system ensures a satisfactory level of content validity while the FVI ensures the items and content of the questionnaire are clear, understandable, and relevant to the respondents.

The final version of the questionnaire consisted of two sections: (1) socio-demographic and (2) knowledge of dental implants. The demographic information includes age, sex, ethnicity, education level, occupation, and monthly income. Education level denotes the highest formal education attained. It includes low education level ("No formal education," Primary Education (standard 1 to 6), Secondary Education (form 1 to 5) and Vocational Training/Certificate), and high education level (diploma, degree, master's, or PhD). Occupational statuses are categorized as unemployed, pensioner, private sector (including self-employed), and government sector. Income levels are categorised into below poverty line (below RM2208.00), above poverty line up to middle class income (RM2208.00–RM4851.00), middle class income and above (>RM4851.00), following the 2019 poverty line income by the Department of Statistics Malaysia [12].

A total of 104 respondents were recruited at the waiting area of the Medical Outpatient Clinic, Klinik Rawatan Keluarga, Hospital Universiti Sains Malaysia (USM), and the data collection period lasted for two months, from April to May 2023. All adults attending the study

area were screened to ensure that only those who met the inclusion criteria were invited to participate in this survey.

When inviting the respondents to participate, the respondents were informed about the purpose of the study. Only those who agreed to participate received the participant information sheet, consent form, and the self-administered questionnaire. The respondents took approximately 5 to 10 minutes to complete the questionnaire.

Data analysis

Data collected in this study was analysed using IBM Corp. Released 2019. IBM SPSS Statistics for Windows, Version 26.0. Armonk, NY: IBM Corp. A descriptive statistical analysis was used to summarise the socio-demographic characteristics of the subjects. Numerical variables were generated as mean and standard deviation (SD) based on their normality distribution, and categorical variables were presented as frequency and percentage. Each respondent's total score of knowledge was calculated and presented as the mean and standard deviation (SD). An association analysis between knowledge score and social demographics was examined using regression analysis, independent T-tests, and one-way ANOVA.

Ethical considerations

The ethical approval for this study was obtained from the Human Research Ethics Committee (JEPeM) of Universiti Sains Malaysia, JEPeM Code: USM/JEPeM/KK/23010091. This study was registered with the National Medical Research Register (NMRR) of the Ministry of Health under Research ID: RSCH ID-23-00321-DCR NMRR.

RESULTS

The socio-demographic profile of the respondents is presented in Table I. The respondents' ages ranged from a minimum of 18 years to a maximum of 73 years. The mean age of the respondents was 43.2 (SD = 15.34). Most were male (52.9%) and of Malay ethnicity (96.2%). More than half of the respondents (56.7%) had a high education level, while 51% were below the poverty line (earning less than RM2208.00). The results indicate that the respondents had a moderate knowledge score regarding dental implants, with a mean score of 4.9 (SD = 1.20) (Table II).

Table I: Socio-demographic characteristics of the respondents (n=104)

Profile	Respondents	
	Mean (SD)	Frequency (%)
Age	43.17 (15.34)	
Sex		
Male		55 (52.9)

CONTINUE

Table I: Socio-demographic characteristics of the respondents (n=104) (CONT.)

Profile	Respondents	
	Mean (SD)	Frequency (%)
Sex		
Female		49 (47.1)
Ethnic Group		
Malay		100 (96.2)
Chinese		3 (2.9)
Others		1 (1.0)
Education Level		
Low education		45 (43.3)
High education		59 (56.7)
Occupational Status		
Unemployed		25 (24.0)
Pensioner		17 (16.3)
Private Sector		37 (35.6)
Government Sector		25 (24.0)
Individual Income level		
Below poverty line		53 (51.0)
Above poverty line up to middle class income		31 (29.8)
Middle class income and above		20 (19.2)

Table II: Knowledge score of adults on dental implants (n=104)

Knowledge Level	Mean (SD) knowledge
Low (Score 0-3.0)	2.9 (0.33)
Moderate (Score 3.1-6.0)	4.9 (0.82)
High (Score 6.1-8.0)	7.2 (0.42)
Total	4.90 (1.20)

Table III summarizes the participants' knowledge about dental implants. Among the respondents, 99.0% were aware that dental implants can be used for the replacement of missing teeth, while 24.0% correctly identified that implants are placed in the jawbone. Interestingly, 51.9% believed implants are placed in the gum, highlighting a common misconception. Additionally, 39.4% correctly identified titanium as the material used for the body of implants, while a majority (52.9%) admitted to not knowing. Most participants (97.1%) know that dental implants can function as well as natural teeth, and 90.4% know dental implant treatment is aesthetic as permanent teeth. Furthermore, only a minority (14.4%) have a misconception that a complete dental implant procedure could be completed in a single visit. Only 23.1% correctly answered about the types of implant-based treatments available, which include both fixed and removable options. Regarding potential complications, 31.7% of respondents correctly identified infection, while 50.0% were uncertain. These

findings underscore the varying levels of understanding among respondents regarding dental implants.

Table III: General knowledge of respondents on dental implants (n=104)

Items	Respond	n (%)
Do you know that implants can be used for replacement of missing teeth?	Yes	103 (99.0)
	No	1 (1.0)
Where do you think dental implants are placed?	In the jawbone	25 (24.0)
	In the gum	54 (51.9)
	Don't know	25 (24.0)
Material used for body of implants	Copper	0 (0.0)
	Silver	6 (5.8)
	Titanium	41 (39.4)
	Gold	2 (1.9)
	I do not know	55 (52.9)
Dental implants can be as good as own teeth during function	Yes	101 (97.1)
	No	3 (2.9)
Dental implant treatment is not as aesthetic as permanent teeth	Yes	10 (9.6)
	No	94 (90.4)
A complete dental implant (e.g., implant and crown) can be done in just one visit	Yes	15 (14.4)
	No	89 (85.6)
Types of implants-based treatment	Fixed	44 (42.3)
	Removable	7 (6.7)
	Both	24 (23.1)
	I do not know	29 (27.9)
Complications may be occurring due to dental implants treatment	Sensitivity to its metal	18 (17.3)
	Infection	33 (31.7)
	Malignancy	1 (1.0)
	I do not know	52 (50.0)

In Table IV, the factors associated with knowledge of dental implants among the participants are detailed. In terms of age, the simple linear regression analysis did not reveal any significant association with knowledge scores ($\beta = -0.008$, 95% CI [-0.023, 0.008], $p=0.33$). However, male participants exhibited a lower mean knowledge score (Mean = 4.6, SD = 1.24) compared to females (Mean = 5.2, SD = 1.09), with a statistically significant mean difference of -0.606 (95% CI [-1.062, -0.151], $p=0.01$). Similarly, respondents with a higher education level (Mean = 5.1, SD = 1.30) demonstrated a significantly higher mean knowledge score compared to those with a lower education level (Mean = 4.6, SD = 1.01), with a mean difference of -0.496 (95% CI [-0.961, -0.032], $p=0.04$).

Table IV: Factors associated with the knowledge of dental implants (age, sex, education level, occupation, and income level) (n=104)

Variables	Mean (SD)	Mean difference	(95% CI)	p-value
Age		-0.008*	(-0.023, 0.008)	0.33 ^c
Sex				
Male	4.6 (1.24)	-0.606	(-1.062, -0.151)	0.01 ^a
Female	5.2 (1.09)			
Education Level				
Low Education	4.6 (1.01)	-0.496	(-0.961, -0.032)	0.04 ^a
High Education	5.1 (1.30)			
Occupation				
Unemployed	5.2 (1.07)			0.17 ^b
Pensioner	4.5 (1.07)			
Private Sector	4.8 (1.30)			
Government Sector	5.2 (1.21)			

^aIndependent T-Test
^bOne-Way Anova
^cRegression Coefficient
^dRegression Coefficient

DISCUSSION

The high cost of dental implants, as evidenced by a median price of RM6000 (approximately USD1300) in Kuala Lumpur [13], poses a significant financial barrier for individuals seeking tooth replacement options, especially considering the average willingness to pay of RM2833.30 (SD = RM1505.10) reported in Malaysia [14]. Despite this challenge, dental implants offer substantial benefits, including improved quality of life, as demonstrated by studies showing positive effects on denture retention, mucosal irritation reduction, and patient satisfaction [15, 16]. Therefore, studies assessing the knowledge level for dental implants among the population can provide evidence to encourage government initiatives to provide help and subsidies, ultimately contributing to improved access to dental implant services for underserved populations.

The mean knowledge score for dental implants in this study is moderate. This indicates that, on average, respondents have a decent level of knowledge regarding dental implants. However, it is essential to acknowledge that there are still knowledge gaps among

some individuals, which could potentially serve as barriers in accessing dental implant treatment. Research has suggested that insufficient knowledge about dental implants can hinder individuals from seeking or undergoing implant treatment by fostering fear, misconceptions, and uncertainty about the procedure and its outcomes [17, 18]. Specifically, our findings align with previous studies that have identified education level as a significant factor associated with knowledge about dental implants, with higher education levels correlating with greater awareness and understanding [7, 19].

This study also found that almost all respondents were aware of dental implants as a treatment for missing teeth, which was higher than in the previous study in Malaysia [6] and studies in other regions, such as India, 44.9% [20] and Nigeria (55.7%) [21]. However, it's worth noting that this conclusion may be influenced by the study population, which consisted exclusively of individuals already familiar with dental implants.

About 97.1% of the respondents were aware that dental implants could function as well as natural teeth. This finding aligns with prior studies, which consistently found no difference in patients' chewing abilities between dental implants and natural teeth [22, 23]. Beyond functionality, the aesthetic aspect holds considerable importance in dental implants. In this study, respondents with prior knowledge of dental implants also acknowledged the aesthetic resemblance of dental implants to natural teeth. Recognising implant restorations' success in achieving natural-looking results is crucial for enhancing patients' confidence and overall quality of life. The aesthetic similarity between dental implants and natural teeth promotes a sense of normalcy and self-assurance, improving psychosocial well-being and reinforcing positive acceptance of implants among informed individuals.

Despite the generally moderate score of dental implant knowledge among the Malaysian population, a notable gap remains in understanding the precise positioning of dental implants. This study found that approximately three-quarters of the respondents lacked knowledge about the exact positioning of implants, with nearly half under the misconception that implants were placed in the gum rather than the jawbone. This indicates a decline in knowledge about the precise positioning of dental implants among the respondents compared to a previous study conducted among the Malaysian population, where 34.6% of the respondents answered correctly [6]. Discrepancies in knowledge levels regarding dental implants between this study and previous research can be attributed to differences in research methodologies, specifically in sample size and geographic locations.

Additionally, this study discovered that over half of the

respondents needed more understanding regarding the materials used to construct dental implants and were unfamiliar with the presence of removable implant-supported prostheses. Moreover, a notable portion of respondents remained unaware of complications associated with dental implant treatment, such as infections, highlighting the need for increased awareness.

These findings highlight a specific area of misconception and misunderstanding among the respondents, suggesting that while individuals may have a general knowledge of dental implants, there is a clear need for a more comprehensive understanding of the procedure's specifics. This knowledge gap may be attributed to socio-demographic factors within the population studied in Kelantan. Consequently, this study emphasises the need for increased education and awareness among patients regarding the in-depth details of dental implants, such as the treatment procedure, pre-treatment assessment, types of dental implants and prostheses available, potential complications and risks, long-term maintenance requirements, and expected outcomes.

This study revealed that females (95% CI: -1.062, -0.151) and respondents with higher education levels (95% CI: -0.961, -0.032) had significantly greater knowledge of dental implants compared to their counterparts ($p < 0.05$). This contrasts with the previous studies conducted in Middle Eastern countries such as Syria and Saudi Arabia [24, 25], which showed higher knowledge among males regarding dental implants. The observed disparity in dental implant knowledge levels among these diverse populations may be attributed to societal and cultural changes among females, particularly in Malaysia, where factors such as enhanced female education and an increased focus on women's health could be contributing factors. For example, the Malaysian government announced several initiatives on International Women's Day 2023 to promote women's health and gender equality. These include RM5 million allocated for data collection, research, and promotion of women's health programs by the Women, Family and Community Development Ministry. These efforts reflect a commitment to addressing health disparities and promoting women's health across Malaysia [26].

Furthermore, the more excellent knowledge demonstrated by females may be linked to their interest in dental aesthetics, appearance concerns, and responsibility for family health. Previous research has shown that women often place significant importance on their dental appearance and its impact on their self-esteem and social interactions [27]. A previous study also suggests that females tend to be more inclined to seek assistance and gather information about various health concerns, including dental health [28]. Additionally, women's responsibility for family health may motivate

them to acquire more knowledge about oral health topics, including dental implants, to ensure the well-being of their family members.

Conversely, a previous study by Sfeatcu *et al.* (2022) reported a lower tendency for males to utilise dental services, potentially leading to lower dental literacy and hindrance in developing good oral health habits [29]. This reduced frequency of interaction with dental professionals can result in missed opportunities for vital oral health education, preventive measures, and early detection of oral diseases. Additionally, men may perceive limited availability or need help to allocate time for dental appointments due to work commitments and other responsibilities. Understanding the impact of work schedules, time constraints, and other responsibilities can offer valuable insights into why males may prioritize dental care less [29].

This study also revealed that education level significantly impacted the knowledge score, indicating that higher education levels exhibited superior knowledge compared to those with lower education backgrounds. This finding is consistent with research conducted in Saudi Arabia and Iran [7, 19], where higher education levels were similarly associated with enhanced knowledge. This relationship may be attributed to the potential of higher education to enhance cognitive and social skills, enabling better access to and comprehension of health-related information [30].

Furthermore, the prevalence of internet access and smartphone ownership may play a role in influencing dental implant awareness and knowledge. In developing nations, internet access and smartphone ownership rates are typically higher among well-educated individuals aged 18 to 34 who have grown up during significant technological advancement. Consequently, they are more inclined to use the internet to gather information on various topics, including oral health [31].

In this study, age was not significantly associated with knowledge of dental implants. Conversely, other studies have indicated that younger individuals are more knowledgeable about dental implants [25, 32]. One possible explanation for this observation in this study is that the younger generation is inclined to seek modern treatments for their convenience and higher quality and more older individuals may have access to alternative sources of information, such as the internet, to educate themselves about dental implants [33].

This study is subject to limitations, primarily from convenience sampling due to time constraints. As such, the association observed in this study should be considered as preliminary findings, warranting further investigation. Thus, there is a need for more extensive confirmatory studies to validate the findings and substantiate these initial results.

CONCLUSION

In conclusion, this study found that respondents possessed a moderate understanding of dental implants, with females and individuals with higher education levels demonstrating notably higher levels of knowledge. Therefore, there is a pressing need to improve public awareness and information dissemination regarding dental implants, along with ensuring adequate training in dental implant procedures for undergraduate students. Such initiatives have the potential to empower individuals to seek information from dental specialists as well as general practitioners and make well-informed decisions about addressing missing teeth.

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