Original Article

THE PERCEPTION OF UTILIZING THE IMPLANT TREATMENT IN FULL MOUTH REHABILITATION IN SAUDI ARABIA

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ABSTRACT

This article discusses various aspects of prosthodontics, a branch of dentistry focused on tooth replacement. It covers topics like the importance of teeth, causes of tooth loss, different types of treatments, including removable and fixed prosthetics, and awareness of dental implants as an option. The study aimed to assess patient awareness, knowledge, and attitude of Implant-Supported dentures in Saudi Arabia. This study is cross-sectional research conducted in Saudi Arabia. The study plans to recruit participants through social media platforms like Twitter, Snapchat, Instagram, WhatsApp, and Facebook. The inclusion criteria are Saudi citizens, both males and females, from all provinces of Saudi Arabia, with or without knowledge of different treatment options, who agree to participate and complete questionnaires. Dental practitioners and individuals under 18 years old are excluded. The distribution of individuals across different knowledge levels was defined as low, moderate, and high knowledge levels, with 67 individuals (5.0%) falling into the low knowledge level category, 917 individuals (67.9%) falling into the moderate knowledge level category, and 367 individuals (27.2%) falling into the high knowledge level category. The largest percentage of individuals falls into the moderate awareness level category, at 47.2%. A statistically significant association exists between age and knowledge score (p=0.001). It also indicates a statistically significant association between gender and knowledge score (p=0.023). In conclusion, the perception of utilizing implant treatment in full-mouth rehabilitation in Saudi Arabia is a multifaceted topic that requires a comprehensive and nuanced approach. Fortunately, participants showed acceptable levels of knowledge and awareness scores.

Key words: Knowledge, Awareness, Attitude, Implant-supported dentures, Saudi Arabia.

Introduction

Prosthodontics, commonly known as dental prosthetics, is the discipline of dentistry that includes diagnosis and treatment [1]. Teeth have a major role in supporting a healthy personality [2]. Dental loss is a common problem that can be caused by dental decay, periodontal disease, or facial trauma [3]. It may lead to problems with mastication, facial support, communication, and aesthetics [4]. Patients from various educational or socioeconomic backgrounds may have diverse reasons for failing to replace teeth following extraction, such as financial constraints or a lack of time [5].

There are numerous reasons for tooth loss [6]. Implant-supported overdentures can benefit the population significantly over regular dentures [7]. Dental implants' clinical success can be affected by many factors, including oral hygiene, the systemic condition of patients (including diseases like diabetes and osteoporosis), as well as patient habits (smoking) [8]. Brenmark first proposed implants in 1965 [9]. In a study published in 2019, only 31% of patients knew about dental implants as an alternative tooth option [10].

In Peshawar, Pakistan's Khyber College of Dentistry conducted a countrywide study on partially dentate patients' attitudes and awareness of tooth replacement in 2019. The average age that was noted was 42.18 years. In all, 10% of people were unaware that they were missing teeth, and 32% did not believe that missing teeth needed to be replaced. Financial concerns were the most frequent barrier to tooth r eplacement (49%). Removable dentures were the most widely used form of treatment for lost teeth (33%). Age, socioeconomic status, educational attainment, and pattern of missing all had statistically significant effects on knowledge of replacing missing teeth [11].

The National Dental College and Hospital, Derabassi, did a study in 2022. Of 5000 patients, 75% had heard of dental implants through a variety of sources (the dentist, friends and family, and social media like television, radio,

newspapers, or magazines). According to the survey's findings, a sizable proportion of patients were knowledgeable about and open to the idea of using dental implants to replace missing teeth [12]. In 2023, research on FPD and an implant-rehabilitated missing tooth was undertaken among a subgroup of the Saudi population. Only 68.3% of the respondents were aware of the many prosthodontic replacement alternatives; 348 of the respondents believed the cost aspect was the biggest drawback for replacement. FPD or dental implants were deemed to have advantages in aesthetics (41.1%) and the feel of one's teeth [13]. The majority of the 271 participants in different research conducted in Riyadh, Saudi Arabia, in 2022 (94%) were aware that missing teeth may be repaired in some fashion. The most well-known procedure was Bridge 101 (35%), followed by RPD 95 (33%) and Implant 75 (26%). Out of these 75 patients who were told about implants, 41 (55%) were men and 34 (45%) were women [14].

People's perceptions and experiences are mostly neglected, from having teeth to being partially or entirely edentulous and accepting dentures. Hence, the primary outcomes of this study could be used to define a patient's treatment strategy based on their input and justifications. The purpose of this study is to assess patients' degree of treatment preferences, their awareness of the various dental prosthetic rehabilitation therapies available in Saudi Arabia, acceptance rate for the use of dental implants as a treatment option as a replacement for missing teeth, and the factors influencing their choice to receive dental prosthetic rehabilitation. This study examines Saudi Arabian patients' understanding of, comfort with, and acceptance of prosthodontic procedures.

Objectives

The study set out to assess the knowledge, awareness, and attitude of Implant-Supported full mouth rehabilitation among patients in Saudi Arabia.

Materials and Methods

Study design

A cross-sectional study conducted in 2023, based on a structured questionnaire developed by the authors, evaluates Saudi Arabian citizens' awareness and perception regarding their prosthodontic treatment demands.

Study setting

Participants, recruitment, and sampling procedure

To acquire individuals from around Saudi Arabia, a sample recruiting approach will rely on social media platforms (such as Twitter, Snapchat, Instagram, WhatsApp, Facebook, etc.).

Inclusion and exclusion criteria

The inclusion criteria were Saudi population, males and females, ages ranging from 18 or above, from all provinces of the Kingdom of Saudi Arabia, KSA general population subjects who have or do not have knowledge of different treatment options, and subjects who would agree to participate in this study and complete questionnaires. Exclusion criteria were dental practitioners, males, and females under 18 years old.

Sample size

Data collection involved a target sample of 384 patients (confidence level: 95%; margin of error: 5%). The sample size was estimated using the formula:

$$n = P(1-P) \times Z\alpha\ 2 / d\ 2 \text{ with a 95\% confidence level.} \quad (1)$$

n: Calculated sample size.
Z: The z-value for the selected level of confidence (1- a) = 1.96.
P: An estimated prevalence of knowledge.
Q: (1-0.50) = 50%, i.e., 0.50.
D: The maximum acceptable error = 0.05.

Therefore, the calculated minimum sample size was n = (1.96)2 × 0.50 × 0.50/(0.05) 2 = 384.

Method for data collection and instrument (Data collection technique and tools)

Data collection was done in the form of the participant's answers to the survey questions. The questionnaire consists of four parts. Part 1 starts with a brief description of the study and the consent question. Part 2 includes demographic features such as age, gender, residential area, educational qualifications, and income. In part 3, the participants will be asked about their knowledge, awareness, and attitude toward prosthodontic treatments, sources of information, causes of tooth loss, and reasons for tooth replacement. Also, they will be questioned about their perception of implants and their success rate. Part 4, asks about different implant-supported prosthesis, their properties, and their preferences.

With the author's permission, some of the survey questions were relied upon from their questionnaire form [13].

Scoring system

In all, 39 statements assessed the participants' degree of knowledge, awareness, and attitudes. 5 statements for demographics, 17 questions for knowledge, 9 for awareness and 8 for attitude.

One point is given for correct answers, and zero points are given for incorrect answers or "I don't know." For scoring, we utilized Likert scales (Dichotomous, Three-Point, and Quality Scales). The maximum score was 59 and divided as follows: The original Bloom's cut-off points, 80.0%-100.0%, 60.0%-70%, and 59.0%, The participants will be divided into three groups based on their scores.

Knowledge question scores varied from 0 to 30 points and were classified into three levels as follows: those with a score of 18 or below (≤ 18) were classified as having a low level of knowledge, those with scores between 19 and 23 as having a moderate level of knowledge, and those with scores 24 or above (≥ 24) as a high level of knowledge.

Awareness question scores varied from 1 to 29 points and were classified into three levels as follows: those with a score of 17 or below (≤ 17) were classified as having a low level of awareness, those with scores between 18 and 22 as having a moderate level of awareness, and those with scores 23 or above (≥ 23) as having a high level of awareness.

Analysis and entry method

The data was entered into the device using the "Microsoft Office Excel Software" Windows (2021). The collected data was subsequently transmitted to the Statistical Package of Social Science Software (SPSS) application, version 20 (IBM SPSS Statistics for Microsoft Windows, Version 21.0.) for statistical analysis.

Results and Discussion

Table 1 showed that in terms of age, the majority of respondents fall within the 29-38 age range, accounting for 33.7% of the total respondents. This is followed by the 18-28 age range, which accounts for 31.6% of the total respondents. In terms of gender, the majority of respondents are female, accounting for 75.3% of the total respondents. Regarding location, most respondents are from the South region, accounting for 42% of the total respondents. This is followed by the West region, which accounts for 25.4% of the total respondents. The Middle, East, and North regions account for 15.2%, 11.8%, and 5.6% of the respondents, respectively. In terms of education level, the majority of respondents have a Bachelor's degree, accounting for 45.7% of the total respondents. This is followed by high school graduates, accounting for 25% of the total respondents. College students and diploma holders account for 13.9% and 9.6% of the total respondents, respectively. Lastly, regarding income, most respondents earn less than 1000 Saudi Riyals, accounting for 42.7% of the total respondents. Respondents earning between 1000-5000 Riyals account for 28.9% of the total respondents. Those earning between 6000-10000 Riyals and 11000-15000 Riyals account for 14.8% and 8.2% of the total respondents, respectively.

Table 1. Sociodemographic characteristics of participants (n=1351)

Parameter		No.	%
Age	18 - 28	427	31.6
	29 - 38	455	33.7
	39 - 48	341	25.2
	49 - 58	98	7.3
	59 - 68	26	1.9
	More than 68 years	4	.3
Gender	Male	334	24.7
	Female	1017	75.3
Location	East	159	11.8
	Middle	206	15.2
	North	76	5.6
	South	567	42.0
	West	343	25.4
Education Level	None	46	3.4
	High school	338	25.0
	Diploma	130	9.6
	College student	188	13.9
	Master	25	1.9
	Bachelor	617	45.7
	Doctorate	7	.5
Monthly Income (in Saudi Riyals)	Less than 1000 Riyal	577	42.7
	1000 - 5000	391	28.9
	6000 - 10000	200	14.8
	11000 - 15000	111	8.2
	More than 15000 Riyal	72	5.3

Table 2 shows that a majority of respondents (71.3%) are aware of the options for dental replacement by implants. Among those aware, the most recognized dental replacement options include implants (51.8%), crowns (45.2%), implants-supported dentures (23.2%), complete dentures (25.6%), and parietal dentures (18.2%). This demonstrates a diverse understanding of available dental replacement solutions. Moreover, the reasons for compensating for missing teeth are multifaceted, with functional needs such as chewing (66.2%) and maintaining gum and tissue health (65.1%) being the most prominent. Additionally, respondents recognize the importance of phonetic (speech need) and cosmetic (aesthetic need) considerations in tooth replacement, with 47.3% and 50.6% acknowledging these factors, respectively. The causes of tooth loss are varied, with tooth decay (64.5%), gum diseases (30.1%), and trauma (16.7%) being the primary contributors. Notably, the survey also sheds light on the challenges and concerns individuals may face when considering dental implants. Financial cost emerges as a significant obstacle, with 63.4% of respondents acknowledging it as a potential barrier to seeking dental prosthetic treatment. The most common description of dental implants is as a "Screw-like metal post" (44.4%), while some respondents have heard of it as a "Metal piece" (7.3%) or have only heard of it without specific details (32.6%). The majority of respondents believe dental implants are placed "In the bone" (65.7%), while a significant portion also thinks they are placed "In the gums" (26.1%). A large percentage of respondents (48.6%) are unsure about the survival rate of dental implants, but those who are aware believe it to be "More than 95%" (16.6%). The factors perceived to affect the survival rate of implants include "Maintenance and periodic review" (59.4%) and "Doctor's experience" (55.1%). A significant portion of

respondents (49.9%) are unsure whether the teeth adjacent to the missing tooth are used when replacing the loss with dental implants. Most respondents would prefer dental implants placed by a "Consultant" (68.2%). Most respondents believe that dental implants require "Much more care than natural teeth" (55.8%) or the "Same care as natural teeth" (36.0%). A considerable number of respondents (29.2%) are unsure about their knowledge regarding the benefits of dental prosthetic treatment and dental implants. The most common sources of information about prosthodontic replacement of missing teeth are "Social media" (43.9%) and "Surfing the Internet" (38.9%), while a significant portion does not know of it (22.6%).

Table 2. Knowledge of participants on utilizing the implant treatment in full mouth rehabilitation (n=1351).

Parameter		No.	%
Are you aware of the options for dental replacement by implants?	Yes	963	71.3
	No	388	28.7
If the answer is yes, what are the dental replacement options that you are aware of, including the following? :(More than 1 choice)	Implants	700	51.8
	Crowns	611	45.2
	Implants-supported dentures	313	23.2
	Complete denture	346	25.6
	Parietal dentures	246	18.2
	(Fixed dental prosthesis) Bridges	117	8.7
	(Fixed dental prosthesis) Bridges	322	23.8
	Parietal dentures	26	1.9
	I have no knowledge of it	361	26.7
What type of teeth are you keen on replacing when a particular tooth is damaged?	Front teeth	296	21.9
	Back teeth	103	7.6
	Both	952	70.5
Why should a missing tooth be compensated? (More than 1 choice)	Functional (The need to chew)	894	66.2
	Maintaining the health of the gums and surrounding tissues	879	65.1
	Phonetic (Speech need)	639	47.3
	Cosmetic (An aesthetic need)	683	50.6
	Cosmetic (An aesthetic need)	155	11.5
	It is not necessary to replace it	42	3.1
If you lose one or more teeth, what is the reason for your teeth loss?	Tooth decay	871	64.5
	Trauma	226	16.7
	Gum diseases	406	30.1
	Malnutrition	194	14.4
	Chronic diseases (heart disease, diabetes, etc.)	99	7.3
	Chronic diseases (heart disease, diabetes, etc.)	19	1.4
	I didn't lose any tooth	297	22.0
How many teeth are left?	All teeth are present	492	36.4
	1 - 4	86	6.4
	5 - 7	50	3.7
	8 - 10	134	9.9
	More than 10 teeth	581	43.0
	I lost all my teeth	8	.6
If your teeth were replaced, how long has it been since they were replaced?	I did not replace missing teeth	656	48.6
	I didn't lose any tooth	56	4.1
	lLess than 1 month	124	9.2
	Less than 6 months	101	7.5
	From 6 months to 1 year	132	9.8
	From 1 to 5 years	152	11.3
	From 5 to 10 years	69	5.1
	More than 10 years	61	4.5
Who of the following people replaced your teeth?	specialist	321	23.8
	Consultant	189	14.0
	General Dentist	104	7.7
	I did not replace missing teeth	682	50.5

	I didn't lose any tooth	55	4.1
Did you encounter any problems after replacing missing teeth?	Yes	274	20.3
	No	346	25.6
	I did not replace missing teeth	677	50.1
	I didn't lose any tooth	54	4.0
If you answered "yes," what problems did you encounter? (more than one option)	Implant instability	21	1.6
	gum irritation (gingivitis)	103	7.6
	I did not replace missing teeth	625	46.3
	Dental decay	145	10.7
	Sensitivity and discomfort	122	9.0
	Bleeding	57	4.2
	Denture instability	65	4.8
	Nerve issues	26	1.9
	Infection around the implant	32	2.4
	Detachment or breakage of the crown	68	5.0
	Crown instability	63	4.7
	I didn't encounter any problems	332	24.6
	I didn't lose any tooth	57	4.2
What are the obstacles you may face when replacing teeth?	Possibility of tooth decay under the crown or Denture	93	6.9
	Color differs from the color of the natural tooth	71	5.3
	Financial cost	857	63.4
	Difficulty eating and speaking	62	4.6
	There are no obstacles	268	19.8
How do you describe Dental Implants?	Screw-like metal post	600	44.4
	Metal piece	98	7.3
	I just heard it	441	32.6
	Never Heard	212	15.7
Where do you think dental implants are placed?	Within neighboring teeth	111	8.2
	In the bone	888	65.7
	In the gums	352	26.1
What is the survival rate of the implant?	0.7	101	7.5
	0.8	173	12.8
	0.9	197	14.6
	More than 95%	224	16.6
	Not sure	656	48.6
What is the factor that affects the Survival rate of the implant? (More than 1 choice)	Patient's general health	701	51.9
	Maintenance and periodic review	802	59.4
	Bone type and density	595	44.0
	Doctor's experience	744	55.1
When replacing the loss with dental implants, are the teeth adjacent to the missing tooth used	Yes	361	26.7
	No	316	23.4
	I don't know	674	49.9
Who would you like to place dental implants?	Specialist	342	25.3
	Consultant	921	68.2
	General Dentist	88	6.5
Do you think dental implants need special care and hygiene compared with natural teeth?	Very little care is required	42	3.1
	Much more than natural teeth	754	55.8
	Same as natural teeth	487	36.0
	No special care is required	68	5.0
What materials are dental implants made from?	Bronze	25	1.9
	Titanium	258	19.1
	Lead	66	4.9
	Steel	81	6.0
	I don't know	921	68.2
How would you rate your knowledge about the benefits of dental prosthetic treatment and dental implants?	weak	85	6.3
	Acceptable	146	10.8
	Good	242	17.9

	Very good	226	16.7
	Excellent	257	19.0
	I don't know	395	29.2
What was your source of information about Prosthodontic replacement of missing teeth? (More than 1 choice)	Surf the Internet	525	38.9
	Social media	593	43.9
	Relatives and friends	512	37.9
	I have no knowledge of it	306	22.6
	Billboards	134	9.9

Table 3 shows that a significant portion of the respondents (45.8%) do not have knowledge about dentures supported by dental implants, while 23.5% do have knowledge, and 30.7% are uncertain. When considering the number of dental implants typically used for an implant-supported overdenture, the majority of respondents (78.2%) indicated that it depends on the individual case. Furthermore, the benefits of implant-supported overdentures were explored, with improved speech and chewing efficiency being the most recognized benefit (50.3%), followed by the need for maintenance or cleaning (11.6%), and the jaw bone not needing to be healthy (15.0%). In terms of candidacy for implant-supported overdentures, a notable proportion of respondents (41.3%) believed that there are no specific criteria and that anyone can get them. The success rates of implant-supported overdentures were found to be influenced by various factors, with the majority of respondents (67.1%) acknowledging that daily brushing and flossing habits, the number of implants placed, patient's age, and the choice of denture material all play a role.

Additionally, the familiarity with different types of implant-supported dentures varied among respondents, with a significant portion (42.8%) indicating that they did not know about these options. The survey also delved into the preferred treatment for individuals who have lost all their teeth, with a notable majority (58.3%) opting for fixed implant-supported dentures. Finally, the survey addressed the need for public awareness campaigns regarding dental prosthetic treatment and dental implants in Saudi Arabia, with a resounding majority (91.0%) expressing the belief that such campaigns are necessary. Additionally, a significant proportion of respondents (92.5%) indicated that they would recommend prosthodontic treatment and dental implants to their friends and relatives when needed.

Table 3. Awareness of participants on utilizing the implant treatment in full mouth rehabilitation (n=1351).

Parameter		**No.**	**%**
Do you have knowledge about dentures supported by dental implants?	Yes	317	23.5
	No	619	45.8
	Maybe	415	30.7
How many dental implants are typically used for an implant-supported overdenture?	1	99	7.3
	4	142	10.5
	6	53	3.9
	Depends on the individual case	1057	78.2
Which of the following is a benefit of implant-supported overdentures?	Lower cost compared to traditional dentures	312	23.1
	Improved speech and chewing efficiency	679	50.3
	No need for maintenance or cleaning	157	11.6
	The jawbone does not have to be healthy	203	15.0
Candidates for implant-supported overdentures typically have:	Healthy natural teeth	173	12.8
	Severe gum disease	243	18.0
	Sufficient bone volume and density	377	27.9
	No specific criteria; anyone can get them	558	41.3
Success rates of implant-supported overdentures are influenced by:	Daily brushing and flossing habits	30	2.2
	Number of implants placed	87	6.4
	Patient's age	230	17.0
	Choice of denture material	98	7.3
	all of the above	906	67.1
Select the types of implant-supported dentures you are familiar with from the options:	Removable implant-supported denture	359	26.6
	Just heard of it	246	18.2
	Fixed implant-supported denture	299	22.1
	Implant-supported bridge	214	15.8
	Hybrid implant-supported denture	249	18.4

	I don't know	578	42.8
If you lose all your teeth, what is the best treatment for you?	Leave it as it is	199	14.7
	Traditional denture	53	3.9
	Fixed implant-supported denture	787	58.3
	Removable implant-supported denture	116	8.6
	Hybrid implant-supported denture	196	14.5
If you choose a "fixed implant-supported denture," what is the reason for choosing it? (More than 1 choice)	Bone Preservation	401	29.7
	Longevity	444	32.9
	Enhanced Aesthetics	569	42.1
	Stability and Functionality	739	54.7
	Choose other options	358	26.5
If you choose a "Hybrid implant-retained denture", what is the reason for choosing it?	Interchangeable and repairable	204	15.1
	Less care and attention than the removable denture	183	13.5
	Cheaper than fixed	248	18.4
	Look, function, and feel like natural teeth	266	19.7
	More convenient than other options	199	14.7
	I Choose other options	682	50.5
If you choose a "Removable implant-retained denture", what is the reason for choosing it?	Easy to clean	372	27.5
	Bone Preservation	172	12.7
	Cheapest	223	16.5
	Easy to replace and repair	221	16.4
	Requires fewer implants	106	7.8
	Requires fewer implants	52	3.8
	I Choose other options	731	54.1
Do you believe there is a need for a more public awareness campaign regarding dental prosthetic treatment and dental implants in Saudi Arabia?	Yes	1230	91.0
	No	121	9.0
Will you suggest prosthodontic treatment and dental implants to your friends and relatives when they need them?	Yes	1249	92.5
	No	102	7.5

The data presented in **Figure 1** represents the distribution of individuals across different knowledge levels. The categories are defined as low, moderate, and high knowledge levels, with 67 individuals (5.0%) falling into the low knowledge level category, 917 individuals (67.9%) falling into the moderate knowledge level category, and 367 individuals (27.2%) falling into the high knowledge level category.

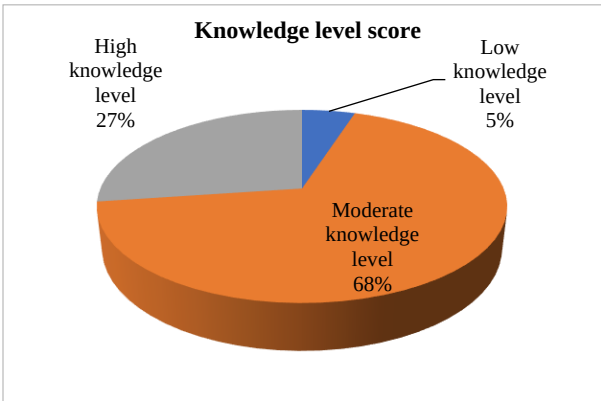

Figure 1. Knowledge score of participants on utilizing the implant treatment in full mouth rehabilitation

According to the data in **Figure 2**, the largest percentage of individuals falls into the moderate awareness level category, at 47.2%. The second largest percentage of individuals falls into the high awareness level category, at 32.1%. The smallest percentage of individuals falls into the low awareness level category, at 20.7%.

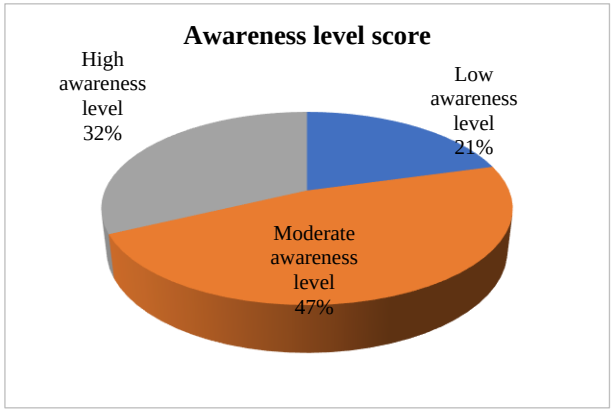

Figure 2. Awareness score of participants on utilizing the implant treatment in full mouth rehabilitation

Table 4 shows that there is a statistically significant association between age and knowledge score (p=0.001). For age groups, 18-28 and 29-38 exhibited higher knowledge. In terms of gender, the table indicates that there

is a statistically significant association between gender and knowledge score (p=0.023). Among male participants, 25 had low knowledge, 212 had moderate knowledge, and 97 had high knowledge, with corresponding percentages of 1.9%, 15.7%, and 7.2%. Female participants exhibited higher knowledge, the numbers being 3.1%, 52.2%, and 20.0% for low, moderate, and high knowledge levels, respectively. The location of participants also showed significant associations (p-value=0.045) with knowledge scores. Education level and annual income were also analyzed in relation to knowledge score. The table indicates that there were no statistically significant associations between education level and knowledge score (p=0.522). Similarly, for annual income, no statistically significant associations were found (p=0.108).

Table 4. Association between sociodemographic characteristics and knowledge score of participants on utilizing the implant treatment in full mouth rehabilitation (n=1351).

Parameter		Knowledge score			Total (N=1351)	P value
		Low knowledge level	Moderate knowledge level	High knowledge level		
Age	18 - 28	25	321	81	427	0.001
		1.9%	23.8%	6.0%	31.6%	
	29 - 38	25	295	135	455	
		1.9%	21.8%	10.0%	33.7%	
	39 - 48	10	232	99	341	
		0.7%	17.2%	7.3%	25.2%	
	49 - 58	5	51	42	98	
		0.4%	3.8%	3.1%	7.3%	
	59 - 68	1	15	10	26	
		0.1%	1.1%	0.7%	1.9%	
	More than 68 years	1	3	0	4	
		0.1%	0.2%	0.0%	0.3%	
Gender	Male	25	212	97	334	0.023
		1.9%	15.7%	7.2%	24.7%	
	Female	42	705	270	1017	
		3.1%	52.2%	20.0%	75.3%	
Location	East	16	112	31	159	0.045
		1.2%	8.3%	2.3%	11.8%	
	Middle	7	140	59	206	
		0.5%	10.4%	4.4%	15.2%	
	North	5	49	22	76	
		0.4%	3.6%	1.6%	5.6%	
	South	22	390	155	567	
		1.6%	28.9%	11.5%	42.0%	
	West	17	226	100	343	
		1.3%	16.7%	7.4%	25.4%	
Education Level	None	3	33	10	46	0.522
		0.2%	2.4%	0.7%	3.4%	
	High school	17	230	91	338	
		1.3%	17.0%	6.7%	25.0%	
	Diploma	6	88	36	130	
		0.4%	6.5%	2.7%	9.6%	
	College student	8	144	36	188	
		0.6%	10.7%	2.7%	13.9%	
	Bachelor	31	401	185	617	
		2.3%	29.7%	13.7%	45.7%	
	Master	2	16	7	25	

		0.1%	1.2%	0.5%	1.9%	
	Doctorate	0	5	2	7	
		0.0%	0.4%	0.1%	0.5%	
Monthly Income (in Saudi Riyals)	Less than 1000 Riyal	27	415	135	577	**0.108**
		2.0%	30.7%	10.0%	42.7%	
	1000 - 5000	17	259	115	391	
		1.3%	19.2%	8.5%	28.9%	
	6000 - 10000	12	128	60	200	
		0.9%	9.5%	4.4%	14.8%	
	11000 - 15000	4	70	37	111	
		0.3%	5.2%	2.7%	8.2%	
	More than 15000 Riyal	7	45	20	72	
		0.5%	3.3%	1.5%	5.3%	

The results in **Table 5** showed that age is significantly associated with awareness scores, as indicated by the P-value= 0.001. For instance, the 18-28 age group shows 7.8% high awareness, 15.5% moderate awareness, and 8.2% low awareness. Moreover, the 29-38 age group demonstrates 11.2% high awareness, 14.8% moderate awareness, and 7.7% low awareness; those two age groups exhibit awareness scores higher than the other age groups. Gender also seems to have an impact, although the association is not statistically significant. The table shows that females generally have higher awareness scores compared to males across all categories. The location of the participants also plays a role in their awareness scores. For instance, the South region demonstrates the highest awareness scores, with 14.0% high awareness, 20.7% moderate awareness, and 7.3% low awareness. The location was significantly associated with awareness scores, as indicated by the P-value= 0.010. People living in the south exhibited a higher awareness than others. Education level and annual income also exhibit varying degrees of association with awareness scores but were not significant. For example, participants with a bachelor's degree show the highest awareness scores, with 16.1% high awareness and 20.5% moderate awareness. Similarly, participants with an annual income of less than 1000 Riyal display higher awareness scores than other income brackets.

Table 5. Association between sociodemographic characteristics and awareness score of participants on utilizing the implant treatment in full mouth rehabilitation (n=1351).

Parameter		**Awareness score**			**Total (N=1351)**	**P value**
		High awareness score	**Moderate awareness score**	**Low awareness score**		
Age	18 - 28	106	210	111	427	0.001
		7.8%	15.5%	8.2%	31.6%	
	29 - 38	151	200	104	455	
		11.2%	14.8%	7.7%	33.7%	
	39 - 48	116	180	45	341	
		8.6%	13.3%	3.3%	25.2%	
	49 - 58	50	34	14	98	
		3.7%	2.5%	1.0%	7.3%	
	59 - 68	10	13	3	26	
		0.7%	1.0%	0.2%	1.9%	
	More than 68 years	1	1	2	4	
		0.1%	0.1%	0.1%	0.3%	
Gender	Male	108	149	77	334	0.389
		8.0%	11.0%	5.7%	24.7%	
	Female	326	489	202	1017	
		24.1%	36.2%	15.0%	75.3%	
Location	East	39	71	49	159	0.010
		2.9%	5.3%	3.6%	11.8%	
	Middle	71	85	50	206	
		5.3%	6.3%	3.7%	15.2%	

	North	23	34	19	76	
		1.7%	2.5%	1.4%	5.6%	
	South	189	279	99	567	
		14.0%	20.7%	7.3%	42.0%	
	West	112	169	62	343	
		8.3%	12.5%	4.6%	25.4%	
Education Level	None	10	26	10	46	0.121
		0.7%	1.9%	0.7%	3.4%	
	High school	111	163	64	338	
		8.2%	12.1%	4.7%	25.0%	
	Diploma	39	68	23	130	
		2.9%	5.0%	1.7%	9.6%	
	College student	47	89	52	188	
		3.5%	6.6%	3.8%	13.9%	
	Bachelor	217	277	123	617	
		16.1%	20.5%	9.1%	45.7%	
	Master	8	10	7	25	
		0.6%	0.7%	0.5%	1.9%	
	Doctorate	2	5	0	7	
		0.1%	0.4%	0.0%	0.5%	
Monthly Income (in Saudi Riyals)	Less than 1000 Riyal	163	291	123	577	0.260
		12.1%	21.5%	9.1%	42.7%	
	1000 - 5000	138	173	80	391	
		10.2%	12.8%	5.9%	28.9%	
	6000 - 10000	69	92	39	200	
		5.1%	6.8%	2.9%	14.8%	
	11000 - 15000	41	52	18	111	
		3.0%	3.8%	1.3%	8.2%	
	More than 15000 Riyal	23	30	19	72	
		1.7%	2.2%	1.4%	5.3%	

The perception of utilizing implant treatment in full-mouth rehabilitation in Saudi Arabia is an important topic that reflects the attitudes, beliefs, and understanding of both the general population and healthcare professionals in the country. Full mouth rehabilitation, which often involves the replacement of multiple missing or damaged teeth, can significantly impact an individual's oral health, function, and aesthetics. Dental implants have become a popular and effective option for such rehabilitation, offering a long-term solution for restoring oral health and function. Understanding the perception of utilizing implant treatment in full-mouth rehabilitation in Saudi Arabia is crucial for identifying potential barriers, improving access to care, and enhancing patient education [2-5].

One aspect to consider in the discussion is the cultural and societal factors that may influence the perception of dental implants in Saudi Arabia. Cultural attitudes towards oral health and dental care and religious and traditional beliefs can significantly shape perceptions of dental treatments, including implants. Understanding these cultural nuances is essential for developing tailored educational and awareness initiatives that address any misconceptions or concerns about implant treatment [7].

The discussion should also encompass the awareness and knowledge of dental professionals in Saudi Arabia regarding implant treatment in full-mouth rehabilitation. Dental professionals are critical in educating patients, recommending treatment options, and providing comprehensive care. Assessing their perception of dental implants, their training in implant dentistry, and their attitudes toward incorporating implants into full-mouth rehabilitation can provide valuable insights into the current state of implant utilization in the country [1-3].

Furthermore, exploring the general population's perception of dental implants and full-mouth rehabilitation is essential. This includes understanding the level of awareness, attitudes toward seeking implant treatment, perceived barriers to accessing care, and the overall acceptance of implant-based rehabilitation as a viable treatment option. Factors such as cost, availability of specialized providers, and the influence of social and digital media on shaping public opinion should be considered in this context.

Our study showed that 71.3% of participants are aware of the implants, similar to a study in Saudi Arabia, which discovered that 82.5% of respondents were aware of dental

implants [15], but in a study conducted by Chowdhary *et al*. 23.24% of individuals residing in metropolitan areas were familiar with dental implants [16]. A recent study by Suprakash *et al*. showed that just 33% of the participants were aware of dental implants [17]. Tomruk *et al*. conducted a survey on the Turkish population and discovered a significant proportion of individuals who lacked awareness regarding dental implants [18].

In our study, 63.4% of participants said that financial cost was from the obstacles they face when replacing teeth, consistent with a study that noted several downsides of implant therapy, including the high cost (64.2%), longer treatment duration (16.2%), and the need for surgical procedures (12.6%) [15]. This is consistent with earlier investigations conducted by Narby *et al*. [19] and Bhat *et al*. [20]. In contrast, the findings of a multicenter study conducted by Ellis *et al*. identified fear of pain related to surgery as the primary obstacle to receiving dental implant therapy [21]. The cost associated with implant therapy was identified as a significant obstacle for individuals considering dental implant treatment in various trials, including our study. This can mainly be due to the monetary conditions of a certain geographic area, which differ from the experiments undertaken in the Western half of the world.

Regarding knowledge scores, our study revealed acceptable scores, as participants exhibited moderate and high knowledge scores of 67.9% and 27.2%, respectively. Similarly, a study in Saudi Arabia showed that most participants possessed a moderate knowledge of dental implants [22]. This discovery also aligns with the corresponding outcome of a prior investigation conducted in India. Furthermore, most participants said they possessed a reasonable level of knowledge and awareness regarding the potential issues linked to dental implants [23].

Awareness scores in our studies were also acceptable; 47.2% and 32.1% had moderate and high awareness levels, respectively. Similarly, previous studies conducted by Al-Johany *et al*. [14] and Al-Rafee *et al*. [24] in Riyadh, Saudi Arabia, revealed a greater level of awareness among participants, with percentages of 56% and 66%, respectively. Another survey found that just 40.2% of participants were aware of dental implants as a therapeutic option [9].

When participants were asked what materials dental implants are made from, 68.2% said they didn't know, 19.1% said titanium and 6% said steel. Consistently, a study conducted in Riyadh, Saudi Arabia, showed that a substantial proportion of participants (63.4%) acknowledged a deficiency in knowledge, while 15.1% responded such as ceramics (7.4%), stainless steel (9.6%), and porcelain (4.5%) [9].

Our study showed statistical significance between age, gender, location, and knowledge score, with p-values of 0.001, 0.023, and 0.045, respectively. Also, age, location, and awareness scores were significant, with p-values of 0.001 and 0.010, respectively. People residing in the south, aged 39-48, exhibited higher knowledge and awareness scores than alternates. In our study, females exhibited higher knowledge scores than males, inconsistent with the study done in Jeddah, Saudi Arabia, which showed that males and individuals employed in the private sector, as well as interns and specialist/consultants, exhibited higher scores in overall knowledge regarding dental implants [25].

It is also important to discuss the potential impact of government policies, healthcare infrastructure, and insurance coverage on the utilization of implant treatment in full-mouth rehabilitation. Access to affordable and high-quality dental care, including implant procedures, is crucial for ensuring that patients have the opportunity to benefit from these advanced treatment options.

The study has several limitations that should be taken into consideration. Firstly, the study's sample size may be limited, which could affect the generalizability of the findings. Additionally, the study may be subject to selection bias, as participants who have had negative experiences with implant treatment may be less likely to participate. Furthermore, the study may also be limited by the potential for recall bias, as participants may have difficulty accurately recalling their experiences with implant treatment. These limitations should be considered when interpreting the results of the study.

This study's findings can potentially influence how dental professionals approach full-mouth rehabilitation using implant treatment in Saudi Arabia. It can also provide insights into patients' and practitioners' attitudes and perceptions towards this specific treatment modality. Additionally, the study may contribute to the development of guidelines and best practices for implant treatment in full-mouth rehabilitation, ultimately leading to improved patient outcomes and satisfaction. Furthermore, the results of this study may also pave the way for further research and innovation in the field of dental implantology in Saudi Arabia, ultimately benefiting the overall oral health of the population.

Conclusion

In conclusion, the perception of utilizing implant treatment in full-mouth rehabilitation in Saudi Arabia is a multifaceted topic that requires a comprehensive and nuanced approach. Fortunately, participants showed acceptable levels of knowledge and awareness scores. By understanding the cultural, professional, and societal factors that influence perceptions, stakeholders can work towards addressing any barriers, improving education and awareness, and ultimately enhancing the utilization of implant treatment for full mouth rehabilitation in the country. This discussion can serve as a starting point for further research, policy development, and

initiatives aimed at promoting optimal oral health outcomes for individuals in Saudi Arabia.

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Written informed consent was obtained from all individual participants included in the study.

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