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RESIN-BONDED BRIDGES KNOWLEDGE, ATTITUDE, AND PRACTICE ASSESSMENT AMONG DENTAL PRACTITIONERS IN SAUDI ARABIA

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Abstract

Introduction: Rochette introduced resin-bonded bridges as perforated metal periodontal splint in the 1970s. Since then, various conservative techniques for RBBs have been developed as alternatives to traditional bridges for tooth replacement. The primary benefit is their minimally invasive tooth preparation, which is particularly advantageous for patients with severe periodontal disease. Other benefits include minimal soft tissue interaction, low risk of catastrophic failure and abutment loss, treatment reversibility when used for provisional restorations, and preservation of pulp vitality. RBBs are made from zirconia and other ceramics. **Objectives:** This study aimed to assess Knowledge, Attitudes, and Practice of resin-bonded bridges in Clinical Practice among dental practitioners in KSA . **Methodology:** This cross-sectional study based on a structured questionnaire was conducted in Saudi Arabia from July to December 2024 and included dental students, interns, general practitioners and dental specialists. The study involved a sample size of 400 participants to account for potential non-responses, exceeding the required 350 for statistical analysis. The questionnaire consisted of 31 questions divided into four main sections: brief descriptions of our study and consent questions, sociodemographic questions, knowledge questions about RBBs, and questions on RBB attitude and practice. **Results**: The study included a total of 1016 participants. Only 1.4% of participants demonstrated a high level of knowledge about RBBs, while the majority (83.7%) exhibited low knowledge. While 38.2% exhibited a low level of positive attitude and practice toward RBBs, just 25.2% demonstrating high levels. While 62.6% feel confident offering RBBs, a notable 37.4% express concerns over their education, with only 1.4% demonstrating high knowledge levels. The study highlights that 66.3% consider RBBs for replacing single missing teeth, yet only 57.5% have

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implemented them. Awareness of RBB utility is strong, but inadequate training (59.6%). **Conclusion**: This study's findings reemphasize the need for such additional educational efforts to enhance dental practitioners' knowledge and feeling of confidence regarding resin bonded bridges in Saudi Arabia.

Keywords: Knowledge, Attitude, Clinical Practice, Resin-bonded bridges, Saudi Arabia.

Introduction:

There are several choices for the replacement of anterior lost teeth, such as resin-bonded fixed dental prosthesis, fixed dental prosthesis, and prosthesis supported by an implant [1]. Specific clinical circumstances presented resin-bonded bridges (RBBs) as an alternative to traditional bridges for tooth replacement. The main worry of the physicians has been its permanence, as it was intended to be a temporary restoration that can be reversed [2]. Minimally invasive tooth preparation significantly benefits these restorations, particularly for teeth with periodontal disease [3]. Using a resin-bonded bridge makes it possible to provide a fixed replacement for missing teeth that is reversible and does not compromise the abutment tooth. This is especially important for young patients who may be more likely to experience endodontic complications due to extensive tooth preparation [4]. Zirconia and other ceramic materials create resin-bonded bridges [5]. RBBs provide the following benefits: minimum soft tissue interaction, minimal catastrophic failure and abutment loss, treatment reversibility (when RBBs are used as a provisional restoration), and preservation of pulp vitality [6]. The most frequent cause of RBBs is failure owing to deboned caused by subpar bridge design and cementation method. If opaque cement is not utilized, RBBs, which are technique-sensitive and esthetically degraded, may induce incisal shine-through of metal [7].

It is believed that the Rochette bridge is where the history of RBFDPs began [8]. Since then, other techniques for creating this kind of conservative restorative treatment paradigm have been documented in the literature [9]. His application was to splint teeth that were periodontally impaired [10]. Howe and Denehy (1977) reported a method involving the use of composite resin and acid-etched enamel to fabricate and affix an anterior fixed partial denture (FPD) on the lingual surface of abutment teeth without requiring any tooth preparation [11]. After nickel-chromium alloys were electro-etched, resin cement could be micromechanically bonded to metal surfaces, and the Maryland bridge was brought to the market in 1980 [12].

A study was conducted in Saudi Arabia among dental students and general dentists aimed to assess the knowledge, attitude, and practice regarding the resin-bonded bridge. The outcome indicates that in both groups, less than half of the participants thought that RBB was an effective conservative method of replacing missing teeth, more than 50% of both groups showed fixed-fixed as the most effective RBB design, and only half of the participants showed confidence in providing RBB to their patients [13]. In 2023, research was published on the knowledge, attitude, and practice of Pakistani dentists regarding resin-bonded bridges, and the results have shown that a total of 63.1% (128) females and 78% (162) males had adequate knowledge. In total, 75.2% (303) individuals were inclined toward utilizing the

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RBBs, whereas just 24.8% (100) participants were against using this treatment [10]. A cross-sectional study was conducted in 2014 in Saudi Arabia to assess dentists' attitudes toward and awareness of resin-bonded bridges. Fahim Ahmed. Al-Qahtani reported that RBBs were used in less than 10% of the patients' prosthodontic cases, according to the majority of participants (65.3%), and the most common reason for the restricted clinical application of RBBs was perceived low retention; furthermore, SPs considered surface treatment, cement type, number of pontics, enamel structure, and RBB design to be very significant factors [6].

No published data on the current status of resin-bonded bridges in KSA are significant. Therefore, the present study aims to assess the knowledge, attitude, and practice of Saudi dental practitioners toward resin-bonded bridges.

Methodology:

Study Design and Setting:

This is cross-sectional study based on a structured questionnaire. The study population comprises dental students, interns, general practitioners, and specialists. A sample recruiting approach will rely on social media platforms (such as X, Snapchat, Instagram, WhatsApp, Facebook, etc.).

sample size:

Sample size calculations were made to determine the bare minimum of responses required to create a representative sample for the entire population. A Rao soft sample size calculator was used to calculate the sample size. The determined sample size was 384, with an indicator percentage of 0.50, a margin of error of 5%, and a confidence interval (CI) of 95%.

Inclusion and Exclusion Criteria:

The inclusion criteria were as follows: Dental students, interns, and dentists who live in Saudi Arabia and agree to participate in this study. Exclusion criteria are any non-dental practitioner.

Method for data collection, instrument and score system:

An organized survey was employed as a research instrument. This instrument was created after reviewing pertinent research from Saudi Arabia and other countries. The final version of the questionnaire consisted of 26 questions classified into four main sections. Section one starts with briefly describing the study and the consent question. The second section contained sociodemographic questions about age, gender, and education level. The third section includes knowledge questions regarding the RBBs, while the fourth section includes questions on RBB awareness. With the author's permission, some survey questions were relied upon from their questionnaire form [13].

Scoring system:

In all, 31 statements assessed the participants' attitudes, practice, and degree of knowledge. There were six statements for demographics, 13 for knowledge, and 12 for attitude and practice. One point is given

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for correct answers, and zero points are given for incorrect answers or "I don't know". We used Likert scales (Dichotomous, Three-Point, and Quality Scales) for scoring. The maximum score was 26 and divided as follows: The original Bloom's cut-off points were 80.0%-100.0%, 60.0%-79%, and 59.0%; the participants will be divided into three groups based on their scores.
Knowledge scores varied from 0 to 13 points available. They were classified into three levels as follows: those with a score of 7 or below (≤ 7) were classified as having a **low level of knowledge**, those with scores between 8 and 10 as having a **moderate level of knowledge**, and those with scores 11 or above (≥ 11) as a **high level of knowledge.**
Attitude and practice scores varied from 0 to 13 points available. They were classified into three levels as follows: those with a score of 7 or below (≤ 7) were classified as having a **low level of attitude and practice**, those with scores between 8 and 10 as having a **moderate level of attitude and practice**, and those with scores 11 or above (≥ 11) as having a **high level of attitude and practice**.

Pilot test:
Twenty people were given the questionnaire and asked to complete it. This was done to assess the study's viability and the ease of use of the questionnaire. The pilot study's results were not included in the study's final analysis.

Analyzes and entry method:
The computer was used to enter data using the "Microsoft Office Excel Software" (2016) Windows software. Then, the data was loaded into the IBM SPSS Statistics for Windows, Version 20.0 (Armonk, NY: IBM Corp.) statistical analysis application, version 20 of the Statistical Package of Social Science Software (SPSS).

Results:
The presented table (1) illustrates demographic and professional characteristics of a dental practice population. A significant majority (62.6%) are under 25 years of age, indicating a predominantly younger practitioner cohort. The data reveals a high percentage of Saudi nationals (94.7%) in this sample, primarily located in the Southern area (44.1%). Educational attainment is notably high, with 67.3% identified as pre-graduate, while experience in practice shows that 56% have been practicing for less than five years. Gender distribution is equal, with a balanced 50% representation of both females and males.

Table (1): Sociodemographic characteristics of participants (n=1016)

Parameter		**No.**	**percent**
Age group	25-30 years old	276	27.2
	older than 30	104	10.2
	younger than 25	636	62.6
Nationality	Non-Saudi	54	5.3

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	Saudi	962	94.7
Location	Central area	170	16.7
	Eastern area	128	12.6
	Northern area	110	10.8
	Southern area	448	44.1
	Western area	160	15.7
Education qualification	Pre-graduate	684	67.3
	Post-graduate	332	32.7
How long have you been practising dentistry?	Nil	224	22.0
	Less than five years	572	56.
	6-10 years	198	19.5
	11-15 years	10	1.0
	More than 15 years	12	1.2
Gender	Female	508	50.0
	Male	508	50.0

Figure (1) indicates a strong consensus among dental practitioners in Saudi Arabia regarding the importance of enamel structure in the success of resin bonded bridges (RBBs). With 900 participants affirming its significance, this reflects a well-informed understanding of dental restoration principles. Conversely, only 116 practitioners disagreed, highlighting a potential area for further education.

Figure (1): show what participants think if the amount of enamel structure play an essential role in the success of RBBs?

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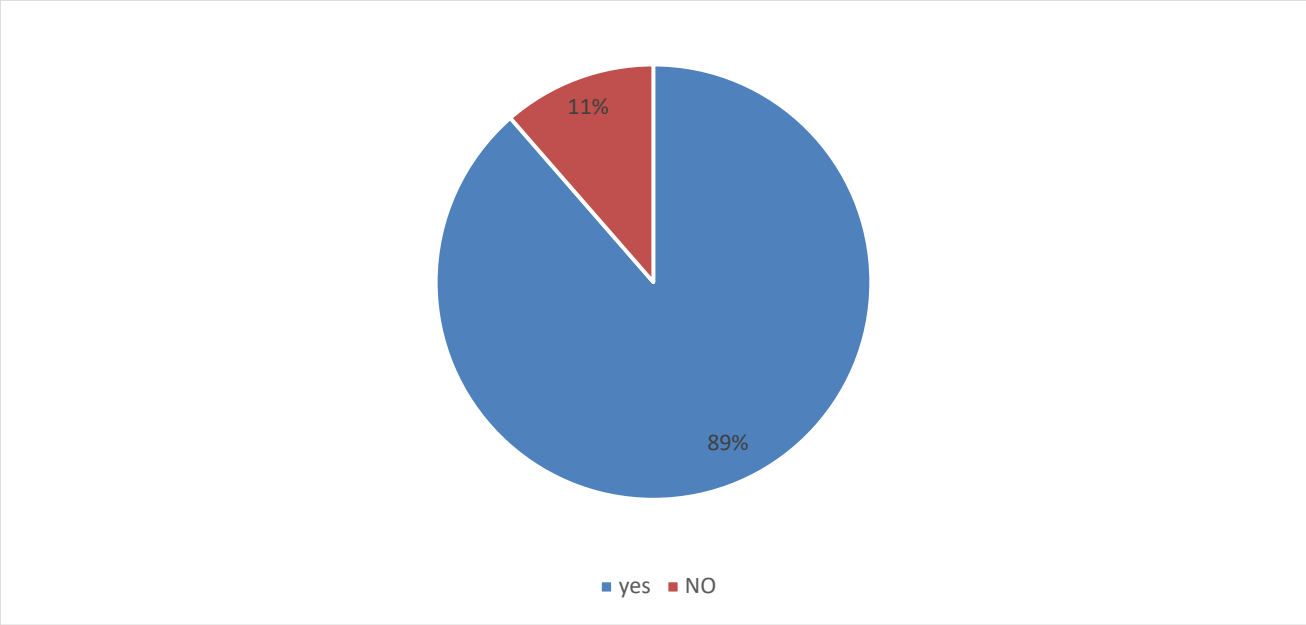

This table (2) presents key insights into the factors influencing the success and longevity of resin-bonded bridges (RBBs). A significant majority (88.6%) maintain that the enamel structure is crucial for RBB success. Additionally, the data suggest that both retainer fitting surface treatment (88.2%) and tooth preparation for retentive features (79.1%) positively impact bonding and longevity, respectively. Preferred retainer thickness appears varied, with 0.5 mm being the most accepted minimum, and the optimal design for longevity favors fixed-fixed configurations (66.5%). Cement choice reinforces this, with resin cement being the most favored (64.8%). Furthermore, a substantial portion of respondents reported a survival rate of RBBs between 51-80% over five years. Common complications are predominantly biological (58.7%), highlighting the importance of maintaining abutment health. Despite a divided opinion on cost-effectiveness, this data provides a clear framework for clinical decision-making regarding RBB utilization.

Table (2): Parameters related to knowledge regarding resin bonded bridges in Clinical Practice among dental practitioners in Saudi Arabia. (n=1016)

Parameter		No.	Percent
Does the amount of enamel structure play an essential role in the success of RBBs?	No	116	11.4
	Yes	900	88.6
What is the minimum thickness of the RBB retainer?	0.5 mm	396	39.0
	0.7 mm	340	33.5
	1 mm	262	25.8
	1.2 mm	18	1.8

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Does retainer fitting surface treatment enhance RBB bonding?	No	120	11.8
	Yes	896	88.2
What type of restoration do RBBs provide?	Both	622	61.2
	Permanent	252	24.8
	Temporary	142	14.0
Does preparing teeth for retentive features improve longevity?	No	212	20.9
	Yes	804	79.1
Does tooth isolation enhance bonding?	No	244	24.0
	Yes	772	76.0
Which RBB design provides maximum longevity?	Cantilever	214	21.1
	Fixed-fixed	676	66.5
	No significant difference	126	12.4
In which areas of the mouth are RBBs the most successful?	Anterior mandibular teeth	124	12.2
	Anterior maxillary teeth	388	38.2
	Posterior mandibular teeth	158	15.6
	Posterior maxillary teeth	346	34.1
What is the minimum height for the RBB connector?	1 mm	414	40.7
	2 mm	406	40.0
	3 mm	168	16.5
	4 mm	28	2.8
What is the best cement type to be used?	Does not affect	64	6.3
	Glass ionomer cement	238	23.4
	Resin cement	658	64.8
	Zinc oxide eugenol cement	56	5.5
What is the survival rate of RBBs in 5 years?	Less than 50%	156	15.4
	51-80%	504	49.6
	More than 80%	356	35.0
What is the most common complication reported in the literature?	Biological complications include caries and endodontic and periodontal diseases related to the abutment teeth.	596	58.7
	De-bonding of the retainer	222	21.9
	Mechanical complications such as ceramic fracture and chipping.	198	19.5

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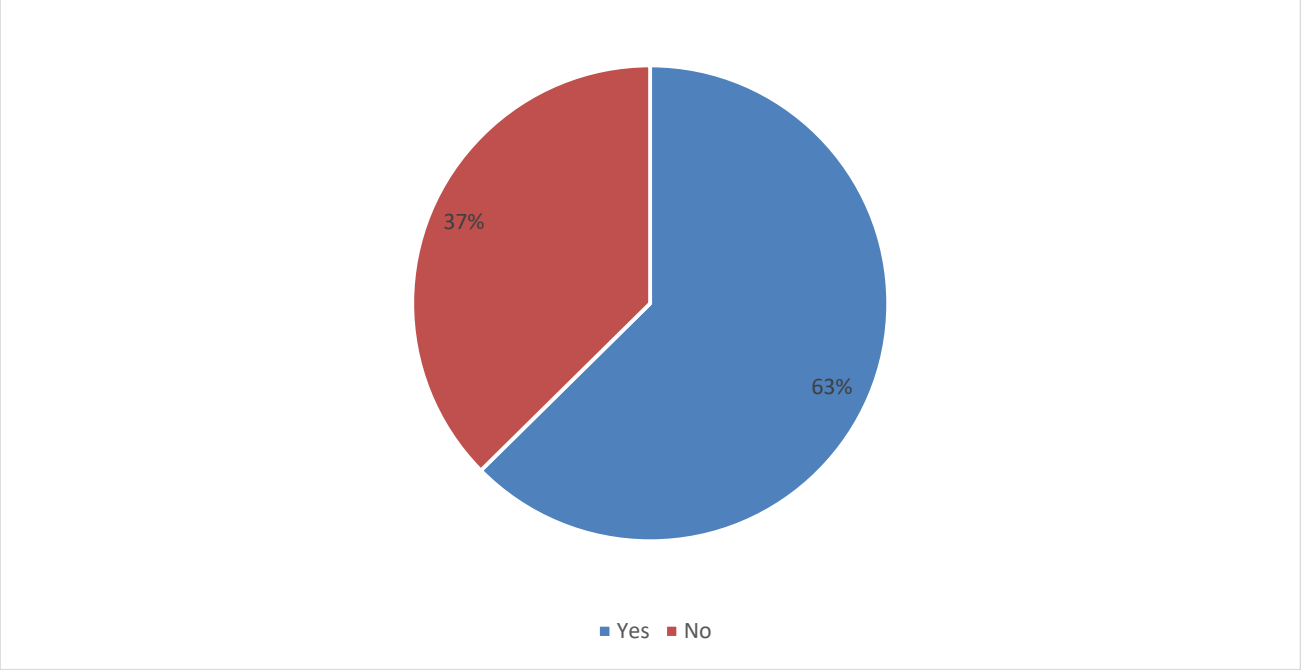
Is RBB cost-effective?	No	346	34.1
	Not sure	362	35.6
	Yes	308	30.3

Figure (2) indicates that a majority of participants (63%) expressed confidence in their ability to offer RBBs to patients when indicated, reflecting a positive attitude towards this dental treatment. However, a significant portion (37%) of respondents reported lacking confidence, highlighting a potential area for improvement in education and training regarding RBBs.

Figure (2): show if participants are confident that they can offer RBBs to their patient when they are indicated (n=1016)



The results presented in Table (3) reflect a significant awareness and interest among dental practitioners in Saudi Arabia regarding resin bonded bridges (RBBs). A majority (62.6%) feel confident in offering RBBs when indicated, yet a notable portion (37.4%) lacks confidence, primarily due to perceived shortcomings in education and training (16.3%). While 66.3% consider RBBs as a treatment option for replacing single missing teeth, actual implementation is lower, with 57.5% having provided RBBs in clinical practice. The varied usage percentages suggest a tendency to use RBBs selectively, with only 9.4% utilizing them in more than 75% of cases. Notably, 70.5% are convinced RBBs could serve as a first-line treatment in selected cases, indicating a positive attitude toward their potential. However, a

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significant number (59.6%) feel inadequately trained in their application, highlighting the need for enhanced educational opportunities. The willingness to attend workshops (66.5%) suggests that further professional development could bridge these gaps in knowledge and confidence regarding RBBs.

Table (3): Questions illustrating attitude and practice regarding resin bonded bridges among dental practitioners in Saudi Arabia (n=1016).

Parameter		No.	percent
Are you confident you can offer RBBs to your patient when they are indicated	No	380	37.4
	Yes	636	62.6
If no, why? (N=380)	**Not enough education and training**	166	16.3
	Other	18	1.8
	RBB is only a short-term replacement	30	3.0
	Technique-sensitive procedure	112	11.0
	The patient may not like it	54	5.3
Do you usually consider RBBs as one of your treatment options for replacing a single missing tooth?	No	342	33.7
	Yes	674	66.3
Have you ever provided RBBs as a replacement for missing teeth in your clinic?	No	432	42.5
	Yes	584	57.5
In what percentage of tooth replacement cases have you used RBBs?	Nil	232	22.8
	Less than 5%	166	16.3
	5-25%	112	11.0

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	25-50%	232	22.8
	50-75%	178	17.5
	More than 75%	96	9.4
Are you convinced that RBBs could be the first line of permanent treatment in some selected cases?	No	300	29.5
	Yes	716	70.5
Do you consider RBB a successful conservative approach for restoring missing teeth?	No	280	27.6
	Not sure	306	30.1
	Yes	430	42.3
Have you ever been involved in or observed any clinical procedure involving RBBs?	No	438	43.1
	Yes	578	56.9
Have you not been given enough education/practice of RBBs while studying for your undergraduate degree?	No	410	40.4
	Yes	606	59.6
If you hear about a lecture/ workshop regarding organizing RBBs, would you be willing to attend?	No	340	33.5
	Yes	676	66.5

The data presented indicates a significant skew in knowledge levels among the surveyed population. Only 1.4% of participants demonstrate a high level of knowledge, while a substantial majority (83.7%) exhibit a low level of knowledge. Furthermore, 15.0% possess a moderate level of knowledge. This disparity suggests a critical need for targeted educational interventions to enhance knowledge across the population, potentially improving health outcomes.

Table (4): Illustrates knowledge score results among the participants.

	Frequency	**Percent**
High level of knowledge	14	1.4
Low level of knowledge	850	83.7
Moderate level	152	15.0
Total	1016	100.0

The table 5 presents a distribution of attitudes and practices among the surveyed population, indicating a considerable variation in levels. Notably, a low level of attitude and practice was reported by 38.2%

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of participants, while those exhibiting a high level constituted only 25.2%. The majority (36.6%) fell into the moderate category. This distribution suggests potential areas for improvement in health education and community engagement strategies to enhance positive attitudes and practices.

Table (5): Shows attitude and practice score results among the participants.

	Frequency	Percent
-High level of attitude and practice	256	25.2
-Low level of attitude and practice	388	38.2
-Moderate level of attitude and practice	372	36.6
-Total	1016	100.0

Table 6 shows that attitude and practice of the participants towards RBB was significantly related to age group, gender, nationality, location, and educational qualification.

Table (6): **Illuminates the relation between sociodemographic parameters of the participants and their attitude and practice score results (n=1016).**

		Attitude and practice level			Total	P
		High	**low**	**moderate**	**(N=1016)**	**value**
Age group	25-30 years old	24	132	118	274	**0.0001**
		9.4%	34.0%	31.7%	27.0%	
	older than 30	78	16	12	106	
		30.5%	4.1%	3.2%	10.4%	
	younger than 25	154	240	242	636	
		60.2%	61.9%	65.1%	62.6%	
Gender	Female	102	236	170	508	**0.0001**
		39.8%	60.8%	45.7%	50.0%	
	Male	154	152	202	508	
		60.2%	39.2%	54.3%	50.0%	
Nationality	Non-Saudi	40	10	4	54	**0.0001**
		15.6%	2.6%	1.1%	5.3%	
	Saudi	216	378	368	962	
		84.4%	97.4%	98.9%	94.7%	
Location	Central area	12	42	116	170	**0.0001**
		4.7%	10.8%	31.2%	16.7%	
	Eastern area	6	104	18	128	
		2.3%	26.8%	4.8%	12.6%	
		34	56	20	110	

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	Northern area	13.3%	14.4%	5.4%	10.8%	
	Southern area	126	150	172	448	
		49.2%	38.7%	46.2%	44.1%	
	Western area	78	36	46	160	
		30.5%	9.3%	12.4%	15.7%	
Education qualification	Post-graduate	102	122	108	332	**0.014**
		39.8%	31.4%	29.0%	32.7%	
	Pre-graduate	154	266	264	684	
		60.2%	68.6%	71.0%	67.3%	

Table 7 shows that attitude and practice of the participants towards RBB was significantly related to age group, gender, location, and educational qualification, and duration of practicing dentistry.

Table (7): Illuminates the relation between sociodemographic parameters of the participants and their knowledge score results (n=1016).

		knowledge score		Total (N=1016)	P value
		low	**High or moderate**		
Age group	25-30 years old	188	86	274	0.001
		22.1%	51.8%	27.0%	
	older than 30	94	12	106	
		11.1%	7.2%	10.4%	
	younger than 25	568	68	636	
		66.8%	41.0%	62.6%	
gender	Female	408	100	508	0.004
		48.0%	60.2%	50.0%	
	Male	442	66	508	
		52.0%	39.8%	50.0%	
Nationality	Non-Saudi	48	6	54	0286
		5.6%	3.6%	5.3%	
	Saudi	802	160	962	
		94.4%	96.4%	94.7%	
Location	Central area	140	30	170	0.001
		16.5%	18.1%	16.7%	
	Eastern area	116	12	128	
		13.6%	7.2%	12.6%	

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	Northern area	100	10	110	
		11.8%	6.0%	10.8%	
	Southern area	352	96	448	
		41.4%	57.8%	44.1%	
	Western area	142	18	160	
		16.7%	10.8%	15.7%	
Education qualification	Post-graduate	254	78	332	0.001
		29.9%	47.0%	32.7%	
	Pre-graduate	596	88	684	
		70.1%	53.0%	67.3%	
Duration of practicing dentistry	11-15 years	6	4	10	0.001
		0.7%	2.4%	1.0%	
	6-10 years	172	26	198	
		20.2%	15.7%	19.5%	
	Less than five years	450	122	572	
		52.9%	73.5%	56.3%	
	More than 15 years	8	4	12	
		0.9%	2.4%	1.2%	
	Nil	214	10	224	
		25.2%	6.0%	22.0%	

Discussion:

The aim of the present study was to evaluate the knowledge, attitude and practice of Saudi dental practitioners towards resin bonded bridges (RBBs). Indeed, the findings indicate large gaps in what practitioners know and what they are willing to stand behind based on age, years of experience, and a wide range of other characteristics. To aid understanding of these findings, this discussion will demonstrate similarities and differences to the existing literature on RBBs across various population types. Additionally, the limitations of the present study will be elaborated upon in order to offer a full picture of the implications of these findings.

The demographic data of this study points to a dominantly young practitioner population; and with a majority of respondent in the pre- graduate phase of their education. This is consistent with Almulhim's [14] findings about a similar demographic distribution among dental practitioners in Saudi Arabia. The practitioner population is very young, potentially indicating a lack of knowledge and confidence in these advanced restorative technologies, including RBBs, and this may explain the low level of knowledge and confidence relating to their use. were studies in more experienced populations, such as Alraheam studies, which show retention of greater familiarity and use of RBBs, suggesting that experience is important in the adoption of such techniques [15].

The present study revealed that very few participants (1.4%) had a high knowledge and a high majority (73.8%) had low knowledge of RBBs. The study finding is in line with findings from a similar study in

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Pakistan in which a large part of dentists felt unintelligent on RBB [16]. They also highlight the need for educationally targeted interventions to understand and apply RBBs in a better way by dental practitioners in various regions across the world. Additionally, 66.5 percent of respondents' willingness to attend workshops suggests there is an apparent readiness for more training potential to help close a knowledge gap identified in this study.

In the present study, a large majority of practitioners identified enamel structure and retainer fitting surface treatment as keys to the success of RBBs, yet there was less confidence in regulating these techniques. In line with Al-Safadi et al. [17], who reported a lack of confidence in clinical skills amongst dental interns, this is echoed. Additionally, the present study's finding that 37.4% of people felt that they were not confident in offering RBB because of lack of education and training on their part reinforces the point that we cannot achieve comprehensive educational programmes to fill these gaps.

The five-year survival rates reported here (51–80%, adjusted DP) are comparable to survival rates reported in systematised reviews of RBBs of 74–87.7% [18,19]. Although these survival rates suggest the potential effectiveness of RBBs as a treatment modality, application rates remain low because of a perceived divide between what clinicians know and what they practice. Previous studies have attributed this discrepancy to the perceived complexity and technique sensitivity of RBBs [20].

The study added that 66.3 percent of practitioners thought that RBBs could be a viable alternative to single missing teeth, but that only 57.5 percent actually did so. These practices also parallel Gresnigt's experience [21] in which the practitioners tend to avoid the use of RBBs, although they concede to their benefits. Concerns may be the main reason why people don't utilize RBBs, for example, 58.7% of respondents stated that biological complications are a common problem. Literature supports this concern by reminding us how important is properly selected cases and the correct treatment plan to mitigate risks of RBBs [22,23].

As should be noted, the present study also has its limitations. However, there may be bias in reliance on self-reported data which may allow practitioners to overstate their knowledge and skills. Finally, use of social media to recruit participants may yield a less representative sample, because those using social media may not be participants that represent all perspectives. Additionally, as the study was cross-sectional, causal inferences regarding the association between knowledge, attitude and practice for RBBs are not possible.

Conclusion:

Finally, this study's findings reemphasize the need for such additional educational efforts to enhance dental practitioners' knowledge and feeling of confidence regarding resin bonded bridges in Saudi Arabia. Gaps in knowledge and practice were identified that can be addressed so as to improve clinical application of RBBs in bettering patient outcomes. Future research should look at studying practitioners longitudinally in order to see if these educational interventions lead to change in practitioners' knowledge or in practitioners' clinical practice decisions about RBBs.

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Ethical approval
An informed consent was obtained from each participant after explaining the study in full and clarifying that participation is voluntary. Data collected were securely saved and used for research purposes only.

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Conflict of interests
The authors declare no conflict of interest.

Informed consent:
Written informed consent was acquired from each individual study participant.

Data and materials availability
All data associated with this study are present in the paper.

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