CAHIERS MAGELLANES-NS
Volume 06 Issue 2
2024

ISSN:1624-1940
DOI 10.6084/m9.figshare.2632574
http://magellanes.com/

KNOWLEDGE, ATTITUDE AND BEHAVIOR ABOUT HALL TECHNIQUE AMONG DENTAL PRACTITIONER: A GLOBAL CROSS-SECTIONAL STUDY.

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Abstract:

Background: The Hall technique is one of the methods used nowadays for sealing in caries in primary molars. The Hall technique using preformed metal crowns (PMCs) was first introduced in the literature in 2006 by Dr. Norna Hall, a general dentist from Scotland. Using the Hall technique, the crown is placed without local anesthesia, caries removal, or tooth preparation. An appropriate size of PMC should be chosen and filled with glass ionomer cement. Then, the crown is fitted over the carious primary molar by either the dentist's finger pressure, or the child's biting force. The primary objective was to assess the knowledge, Attitude and Behavior about Hall technique among dental practitioners globally.

Methods: A cross-sectional survey that was designed and developed by the authors and validated via 5 consultants in the field of pediatric dentistry. The survey instrument was a self-administered anonymous electronically generated questionnaire in English format, including demographic features such as age, gender, and specialty. It is divided into three sections regarding the HT in pediatric dentistry, including dental professionals' Knowledge of the technique definition, advantages, onset/level of practice/training, and any concerns.

Results: the total sample size of 405 dental practitioners were surveyed, most individuals scored at low levels of knowledge and awareness (59.3%), followed by those at moderate levels (33.3%), with a smaller percentage achieving high levels (7.4%). However, the behavior score about hall technique

ISSN:1624-1940
DOI 10.6084/m9.figshare.2632574
http://magellanes.com/

revealed that the majority, constituting 66.7%, exhibited a low behavior level in implementing the hall technique. In contrast, only 29.6% of the respondents were categorized under the good behavior level, and a mere 3.7% fell under the fair level category. Concerning their attitude score about hall technique, a significant majority of the respondents displayed a less proficient attitude, constituting 59.3% another 18.5% considered proficient and 22.2% at a fair level.

Conclusion: In conclusion, this research article highlighted a significant gap in knowledge, attitude, and behavior among dental practitioners globally regarding the Hall technique for managing caries in primary molars. The majority of surveyed practitioners demonstrated low levels of knowledge and awareness, along with suboptimal behavior and attitude towards implementing the Hall technique. The findings suggest a need for increased education and training to enhance the adoption of this minimally invasive approach in pediatric dentistry.

Keywords: Hall technique, use, primary molars, carious, pediatric dentistry

Introduction:

The Hall technique has been acknowledged as the most significant advancement in pediatric dental research over the past decade, poised to revolutionize the field [1]. This technique involves restoring children's carious primary molars using a prefabricated stainless-steel crown (SSC), which is cemented without the need for tooth preparation, local anesthesia, or caries excision. SSCs are known to be the most durable fillings for primary teeth [2]. Dental professionals can now treat carious primary molars using the minimally invasive Hall technique (HT), which is both painless and effective, offering a stark contrast to standard primary molar crown preparations [3].

Dental caries is a highly prevalent condition among children, affecting up to 90% of kids worldwide. It is especially common among children from low-income families [4]. Developed in 2006 by Dr. Hall, the Hall technique has been a breakthrough in pediatric dental research over the past ten years. It is now widely used in many countries, including the United Kingdom, the United States, and Europe [5]. The HT is particularly recommended for treating asymptomatic decayed primary molars in anxious and fearful pediatric patients. This treatment, which involves encapsulating the primary molars in SSCs and isolating them from the oral environment, aims to halt the progression of caries by reducing the bacterial population, as the bacteria can no longer utilize carbohydrates in the oral environment [6]. For primary molars with two-surface and more extensive carious lesions, stainless steel crowns (SSCs), also known as "pre-formed metal crowns," have demonstrated significant clinical success in treating primary teeth [7]. HT has emerged as a preferred non-invasive procedure, receiving positive responses from 77% of children, 81% of dentists, and 83% of parents [8].HT can be used in proximal and occlusal caries, cavitated or non-cavitated lesions. However, a clear dentin band must be seen on the radiograph without signs or symptoms of irreversible pulpitis and/ or dental infection indicated [9].

Many studies conducted in the literature show that the use of performed metal crowns had a similar success rate either by the conventional method or by using HT [10]. In Saudi Arabia, few studies have been published limited to the knowledge of general dental practitioners (GDPs) [11] or limited to the knowledge of dental professionals in one region out of 13 Saudi provinces [12]. However, they revealed a convenient knowledge of the technique definition and low practice level. Conversely, a study in the

ISSN:1624-1940
DOI 10.6084/m9.figshare.2632574
http://magellanes.com/

USA assessed the application of the Hall technique among pediatric dentists, revealing that only 39% implemented it [13]. There is a need to bridge the gap by providing detailed insights into the specific reasons for this limited practice level and exploring the potential for enhancing the practice level as part of an effective management strategy for pediatric caries, in line with the latest evidence-based data. Research on the use of the Hall technique, particularly in Saudi Arabia among dental students, interns, and pediatric dentists, has been limited, covering only a small portion of the country. The sample sizes in other studies have also been inadequate.

The Hall technique is recognized as a method that helps reduce anxiety and improve cooperation in children during dental treatments. It is also considered a minimally invasive procedure that aligns with modern dentistry practices. Dental students, interns, and pediatric dentists who are knowledgeable about this technique tend to work more cooperatively and provide superior treatment. Our study aims to explore the extent of HT practice and awareness among dental professionals. By broadening our research to include all dental professionals globally, and to address any shortcomings in previous studies. Our study aims to assess the knowledge, Attitude and Behavior about Hall technique among dental practitioners globally.

Materials &Method

This is a cross-sectional survey that was designed and developed by the authors and validated via 5 consultants in the field of pediatric dentistry. The study included all dental practitioners globally. It excluded any other health specialty and general society.

The survey instrument was a self-administered anonymous electronically generated questionnaire in English format, including demographic features such as age, gender, and specialty. It is divided into three sections regarding the HT in pediatric dentistry, including dental professionals' Knowledge of the technique definition, advantages, onset/level of practice/training, and any concerns. Ethical approval was obtained from the research ethics committee of King Abdulaziz University, Jeddah with Application number (19-01-24).

Scoring system

Part 1: Demographic data.

This section had four questions concerning the participant's age, gender, qualifications, the regions of Saudi Arabia that they belong to, type of practice, years of experience and country of practice.

Part 2: Knowledge on Hall technique practice

There were 12 questions in this section that probed candidates' familiarity with the Hall technique's application to pediatric dentistry patients.

A total of 12 points were awarded; multiple question types and response options were employed. The right answer received 1 point, while the incorrect answer received 0. Scores over 10 are seen as being at a high level, those between 6 and 10 as being moderate, and those under 6 as being at a low level. (Table 2)

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DOI 10.6084/m9.figshare.2632574
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Part 3: Behavior towards of Hall technique practice
There were 6 questions typically included. Every question has a supportive comment. The evaluation was based on the following criteria: a statement with a right response scoring 1 and a wrong response scoring 0. (Table 3)
The total score should be 6. Scores above 4 were seen as being at a good level, those between 3 and 2 were regarded as being fair, and those below 2 are regarded as being at a low level of proficiency.
Part 4: Attitude on Hall technique practice
In general, five questions were asked. A remark is provided for each question. A statement with a correct response scoring 1 and an incorrect response scoring 0 will be the basis for evaluation. Table 4
There should be a total score of 5. With a score of more than 4, one was considered proficient; with a score of three to two, one was considered fair; and with a score of less than two, one was considered less proficient.

Pilot test
5 expert consultants in the field of pediatric dentistry received the questionnaire, which they must complete. This was to evaluate the study's validity and the questionnaire accuracy. The final questionnaire does not include data from the pilot investigations.

Sample size
Sample size was calculated to the 95% Confidence Interval's and standard deviation (=1.96) with the permitted maximum margin of error (=0.05). Therefore, the estimated minimal sample size needed for the current study is n=(1.96)2X 0.50X 0.50/ (0.50)2= 384 subjects.

Analyzes and entry method
Data was entered on the computer using the "Microsoft Office Excel Software" program. Then was transferred to the Statistical Package of Social Science Software (SPSS) program, version 25 (IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp.) to be analyzed statistically.

Confirmation of the Data confidentiality
By filling in this questionnaire google form the participant is giving his/her consent to be enrolled in this study.

Results:

Table (1) displays various demographic parameters of a group of people with a total number of (405). The majority of participants, 89.0%, were aged 30 or younger, with only small percentages falling into the 31-40, 41-50, and over 50 age brackets. In terms of gender distribution, 69.6% were female and 30.4% were male. Regarding the type of healthcare facility, most participants, 63.0%, were affiliated with private institutions, while 14.8% were associated with public facilities and 22.2% with universities. When asked about years of practice, 81.5% reported having less than 5 years of experience, with smaller percentages having 5-10, 11-20, or over 21 years of practice. Participants were predominantly from the

ISSN:1624-1940
DOI 10.6084/m9.figshare.2632574
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Southern region of Saudi Arabia (56.0%), followed by the Western region (14.8%). The most common degree level among participants was BDS/DDS (92.6%). Most participants were practicing in the Pedodontics department (29.6%), followed by Restorative/Endodontic/Prosthodontics (44.4%). In terms of the need for more information on the hall technique, participants expressed interest in aspects such as Diagnosis/Uses (74.1%) and Effectiveness in treating/controlling caries (62.9%). To obtain this information, participants suggested sources including Journals (25.9%), Continuing education (29.6%), and the Internet (22.2%). Notably, most participants practiced in Saudi Arabia (96.3%), with only a small percentage from Europe (3.7%). Additional analysis and interpretation of this comprehensive data set could provide valuable insights into the characteristics and preferences of healthcare professionals in the dental field.

Table (1): Sociodemographic characteristics of participants (n=405)

Parameter		***No.***	***Percent (%)***
Age	Less or equal 30	363	89.0
	31-40	15	3.7
	41-50	15	3.7
	More than 50	15	3.7
Gender	Female	282	69.6
	Male	123	30.4
Type of healthcare facility	Private	255	63.0
	Public	60	14.8
	University	90	22.2
Years of practice?	Less than 5	330	81.5
	5-10	45	11.1
	11-20	15	3.7
	More than 21	15	3.7
In which region of Saudi Arabia do you belong?	Northern region	45	11.1
	Southern region	227	56.0
	Central region	43	10.6
	Eastern region	30	7.4
	Western region	60	14.8
Degree level	Diploma	15	3.7
	Board/doctorate	15	3.7
	BDS/DDS	375	92.6
Which department are practicing?	Diagnostic dentistry	45	11.1
	Orthodontics	60	14.8
	Pedodontics	120	29.6
	Restorative/endodontic/prosthodontics	180	44.4
	Diagnosis/Uses	300	74.1

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Where do you think more information is necessary about hall-technique? (select more than one)	Effectiveness in treating/ controlling caries	255	62.9
	Effect on the occlusion/ development	135	33.3
	Longevity	120	29.6
Where do you think you can obtain the information?	Journals	105	25.9
	Continuing education	120	29.6
	Brochures	15	3.7
	Internet	90	22.2
	Books	45	11.1
	Others	30	7.4
Country of practice	Europe	15	3.7
	KSA	390	96.3

As shown in figure 1, The data presented in the figure demonstrates the responses obtained regarding the applicability of the Hall technique in permanent teeth. The figures reveal that out of the total respondents, 195 individuals expressed a negative stance towards using the Hall technique in permanent teeth, whereas 45 respondents shared a positive affirmation towards its use. Interestingly, a significant proportion of 165 individuals responded with uncertainty, stating they do not know whether the Hall technique can be used in permanent teeth

Figure (1): Illustrates if hall technique can be used in permanent teeth among participants.

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ISSN:1624-1940
DOI 10.6084/m9.figshare.2632574
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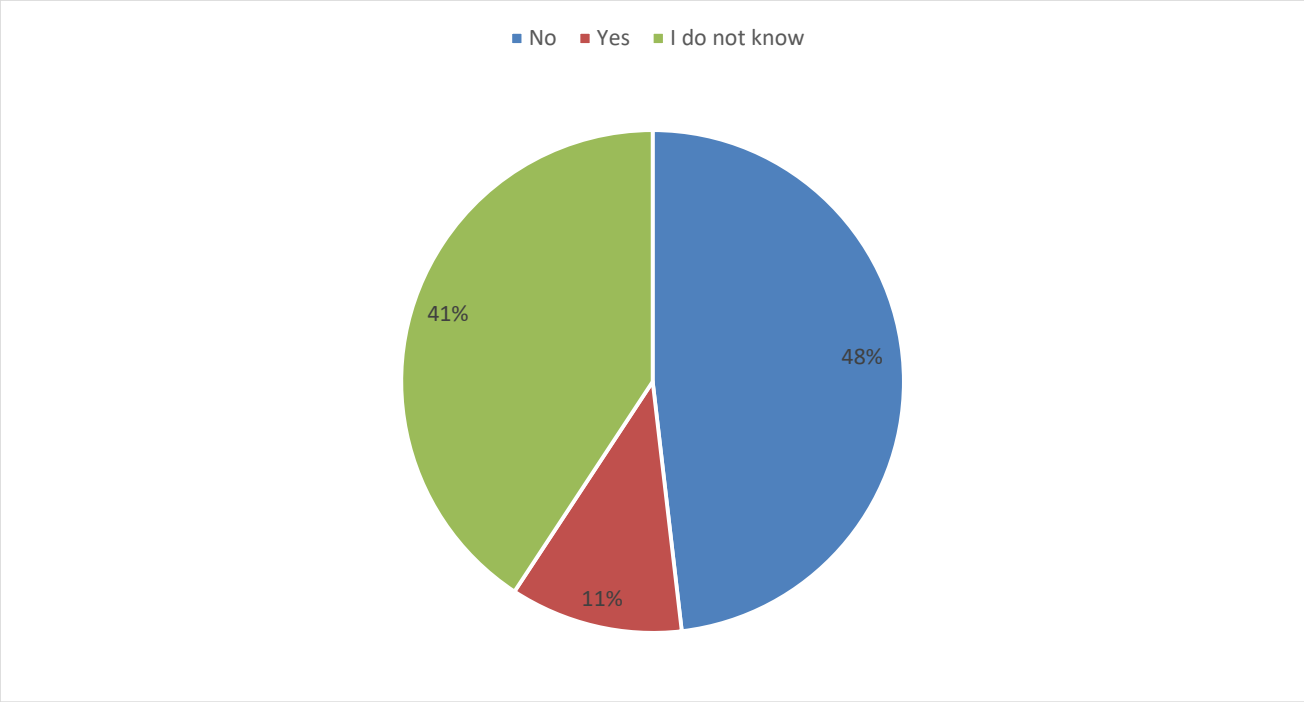

As illustrated in table (2), The results indicate a balanced familiarity level with the Hall technique among the participants, with 51.9% being familiar with it while 48.1% are not. Furthermore, the data reveals a significant knowledge gap regarding the applicability of the Hall technique in permanent teeth, as only 11.1% affirmed its usage compared to 48.1% who negated its feasibility. The findings also shed light on perceptions regarding the effectiveness of the Hall technique, with a majority (51.9%) acknowledging its potential to reduce the need for general anesthesia/sedation in pediatric patients. Notably, a considerable proportion (40.7%) expressed willingness to utilize the Hall technique in the future, indicating a positive outlook towards this approach. However, there seems to be uncertainty regarding certain aspects of the Hall technique, such as its impact on pulp tissue and the necessity for future replacements.

Table (2): Parameters related to knowledge on hall technique practice (n=405).

Parameter		***No.***	***Percent (%)***
Are you familiar with hall technique (HT)?	No	210	51.9
	Yes	195	48.1
Can we use Hall technique in permanent teeth?	No	195	48.1
	Yes	45	11.1
	I do not know	165	40.7
Is covering carious lesion without removing them considered as a definitive treatment?	No	135	33.3
	Yes	210	51.9
	I do not know	60	14.8
	No	75	18.5

ISSN:1624-1940
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Does Hall technique reduce the need of GA/Sedation in pediatric patients?	Yes	210	51.9
	I do not know	120	29.6
Perception of parents or legal guardian regarding Hall technique?	Accepting	210	51.9
	Not accepting	30	7.4
	I never use it	165	40.7
Would you use Hall technique in future?	No	30	7.4
	Yes	165	40.7
	May be	210	51.9
Are you aware of Hall technique do not affect the pulp?	No	45	11.1
	Yes	210	51.9
	I do not know	150	37.0
Are you aware of Hall technique are minimally invasive, painless and no irritation in pulp tissue?	No	75	18.5
	Yes	195	48.1
	I do not know	135	33.3
Do Hall technique need to be replaced in the future?	No	105	25.9
	Yes	165	40.7
	I do not know	135	33.3
Which surface require preparation?	Occlusal	45	11.1
	Proximal	90	22.2
	I do not know	150	37.0
	None	120	29.6
Can we cement a band for space maintainer over a molar with hall technique?	No	30	7.4
	Yes	195	48.1
	I do not know	180	44.4

As shown in figure (2), it is evident that a significant portion of the respondents, amounting to 300 individuals, have not utilized the Hall technique in their professional practice. Conversely, 105 respondents have confirmed that they have employed the Hall technique in their practice. This discrepancy in responses highlights a notable disparity in the adoption of the Hall technique within the professional community.

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ISSN:1624-1940
DOI 10.6084/m9.figshare.2632574
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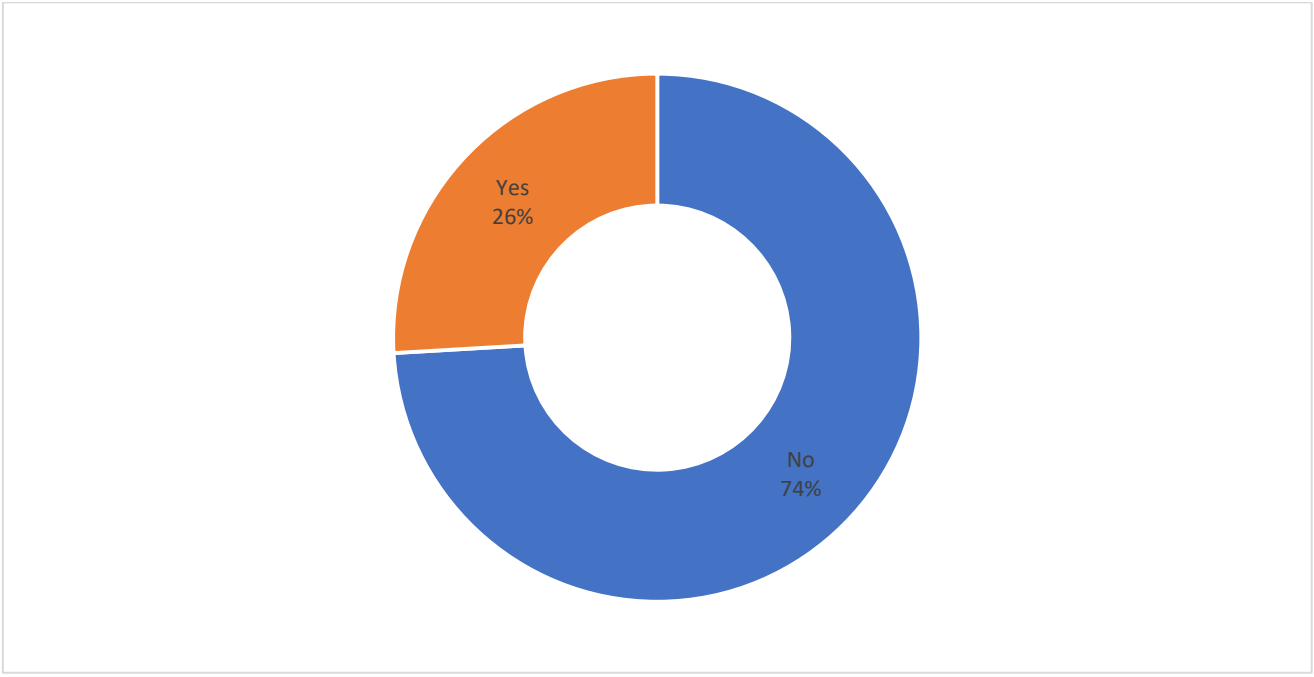
Figure (2): Illustrates if hall technique was ever used among participants.



The data presented in Table (3) provides valuable insights into the participants' behavior towards the practice of the Hall technique. With a sample size of n=405, the participants' responses shed light on various aspects of their engagement with the Hall technique. The majority of respondents (74.1%) indicated that they have never used the Hall technique in their practice, while 25.9% reported having utilized it. Furthermore, the duration of usage varied, with 25.9% using it for 1 year or less, 3.7% for 2 years, and another 3.7% for over 3 years, while a substantial 66.7% admitted to never using it. When asked about the frequency of practicing the Hall technique, 74.1% claimed to never do so, while smaller percentages reported practicing it monthly (3.7%) or weekly (18.5%). Additionally, the respondents were surveyed about the applicability of the Hall technique on primary molars, with varying percentages indicating uncertainty about its use on two opposing (51.9%) or neighboring (40.7%) primary molars. Moreover, the timeline of adoption revealed that 66.7% of participants reported never using the Hall technique, while 22.2% started using it at dental school, 7.4% after graduation, and 3.7% during their intern year.

Table (3): participants' behavior towards of hall technique practice (n=405).

Parameter		***No.***	***Percent (%)***
Have you ever used Hall technique in practice?	No	300	74.1
	Yes	105	25.9
How long have you been using the Hall technique?	1 year or less	105	25.9
	2 years	15	3.7
	Over 3 years	15	3.7

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DOI 10.6084/m9.figshare.2632574
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	I never use it	270	66.7
How often do you practice Hall-technique?	Monthly	15	3.7
	Weekly	75	18.5
	Yearly	15	3.7
	Never	300	74.1
Can we perform Hall-technique on two opposing primary molars?	No	60	14.8
	Yes	135	33.3
	I do not know	210	51.9
Can we perform Hall-technique on two neighboring primary molars?	No	45	11.1
	Yes	195	48.1
	I do not know	165	40.7
When did you start using Hall-technique?	Intern year	15	3.7
	After graduation	30	7.4
	At dental school	90	22.2
	I never use it	270	66.7

In analyzing the data presented in Table (4) regarding participants' attitudes toward Hall technique practice with a sample size of n=405, several observations can be made. Firstly, a significant portion, 51.8%, of participants either strongly agree or agree on preferring the use of Hall technique to manage caries, indicating a positive leaning towards this method. However, it is noteworthy that 26.6% of participants are neutral or disagree with this preference. Regarding the ease of application of the Hall technique, it is notable that 59.6% of participants find it either easy or strongly agree on its ease of application. This suggests a general sentiment of feasibility and user-friendliness associated with the Hall technique among the participants. In terms of effectiveness as a definitive treatment for primary molars, a substantial 55.5% of participants either strongly agree or agree on its efficacy, while a smaller proportion, 29.6%, either express neutrality or disagreement on this aspect. Furthermore, when it comes to confidence levels in selecting teeth that require the Hall technique and in performing the technique itself, the data indicates varying degrees of confidence among participants, with 33.3% and 54.4% expressing varying levels of confidence in these respective areas.

Table (4): Participants' attitude towards Hall technique practice (n=405).

Parameter	*Strongly Agree*	*Agree*	*Neutral Agree*	*Disagree*	*Strongly Disagree*
Do you prefer using HT to manage caries?	90 22.2%	120 29.6%	90 22.2%	15 3.7%	90 22.2%

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DOI 10.6084/m9.figshare.2632574
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Is Hall technique easy to apply?	75 18.5%	90 22.2%	150 37.0%	15 3.7%	75 18.5%
Do you think Hall technique is an effective definite treatment for primary molars?	60 14.8%	60 14.8%	165 40.7%	15 3.7%	105 25.9%
How confident do you feel in selecting teeth that needs Hall technique?	30 7.4%	105 25.9%	150 37.0%	15 3.7%	105 25.9%
How confident do you feel when preforming Hall-technique?	30 7.4%	60 14.8%	165 40.7%	45 11.1%	105 25.9%

The data presented in Table 5 provides a comprehensive overview of the knowledge and awareness levels regarding the Hall technique among dental practitioners. The table includes frequency and percentage distributions of scores categorized as high level, moderate level, and low level. Among the total sample size of 405 dental practitioners surveyed, it is evident that most individuals scored at low levels of knowledge and awareness (59.3%), followed by those at moderate levels (33.3%), with a smaller percentage achieving high levels (7.4%). This distribution indicates a concerning gap in understanding and familiarity with the Hall technique within the practitioner community. The disparity in scores suggests a need for targeted educational interventions and training programs to enhance awareness and proficiency in utilizing this technique effectively.

Table (5): Knowledge and awareness about hall technique among dental practitioner score results.

	Frequency	**Percent**
High level	30	7.4
Moderate level	135	33.3
Low level	240	59.3
Total	405	100.0

Upon reviewing Table 6 which provides insights into the behavior level regarding the hall technique among dental practitioners, several key observations can be made. The data illustrates that out of the total sample of 405 respondents, the majority, constituting 66.7%, exhibited a low behavior level in implementing the hall technique. In contrast, only 29.6% of the respondents were categorized under the good behavior level, and a mere 3.7% fell under the fair level category. This distribution sheds light on a concerning trend where a significant portion of dental practitioners are operating at a suboptimal level in terms of implementing the hall technique.

ISSN:1624-1940
DOI 10.6084/m9.figshare.2632574
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Table (6): Bhavior level about hall technique among dental practitioner score results.

	Frequency	Percent
Good level	120	29.6
Fair level	15	3.7
Low level	270	66.7
Total	405	100.0

Upon examining Table 7, which outlines the attitudes of dental practitioners toward the Hall technique, it is apparent that a significant majority of the respondents displayed a less proficient attitude, constituting 59.3% of the total sample size of 405. This finding suggests that there may be widespread gaps in knowledge, or skills related to the Hall technique among dental practitioners. However, it is encouraging to note that there are still practitioners who demonstrated proficiency, with 18.5% considered proficient and 22.2% at a fair level.

Table (7): Attitude level about hall technique among dental practitioner score results.

	Frequency	Percent
Proficient	75	18.5
Fair level	90	22.2
Less proficient	240	59.3
Total	405	100.0

Table (8) shows that the knowledge level about hall technique among dental practitioner has statistically significant relation to type of health care facilities (p value=0.002). It also shows statistically insignificant relation to gender.

Table (8): Relation between knowledge level about hall technique among dental practitioner and sociodemographic characteristics.

Parameters		***Knowledge level***		***Total (N=405)***	***P value****
		High or moderate	**Low level**		
Gender	Female	123	159	282	0.074
		74.5%	66.3%	69.6%	
	Male	42	81	123	
		25.5%	33.8%	30.4%	
Age	≤30	165	195	360	N/A
		100.0%	81.3%	88.9%	
	31-40	0	15	15	
		0.0%	6.3%	3.7%	

ISSN:1624-1940
DOI 10.6084/m9.figshare.2632574
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	41-50	0	15	15	
		0.0%	6.3%	3.7%	
	≥51	0	15	15	
		0.0%	6.3%	3.7%	
Type of healthcare facility	Private	120	135	255	0.002
		72.7%	56.3%	63.0%	
	Public	15	45	60	
		9.1%	18.8%	14.8%	
	University	30	60	90	
		18.2%	25.0%	22.2%	
Years of practice	Less than 5	135	195	330	N/A
		81.8%	81.3%	81.5%	
	5-10	30	15	45	
		18.2%	6.3%	11.1%	
	11-20	0	15	15	
		0.0%	6.3%	3.7%	
	More than 21	0	15	15	
		0.0%	6.3%	3.7%	
In which region of Saudi Arabia do you belong?	Northern region	0	45	45	N/A
		0.0%	18.8%	11.1%	
	Southern region	92	135	227	
		55.8%	56.3%	56.0%	
	Central region	30	13	43	
		18.2%	5.4%	10.6%	
	Eastern region	15	15	30	
		9.1%	6.3%	7.4%	
	Western region	28	32	60	
		17.0%	13.3%	14.8%	
Degree level	Diploma	0	15	15	N/A
		0.0%	6.3%	3.7%	
	Board/doctorate	0	15	15	
		0.0%	6.3%	3.7%	
	BDS/DDS	165	210	375	
		100.0%	87.5%	92.6%	
Which department are practicing	Diagnostic dentistry	0	45	45	N/A
		0.0%	18.8%	11.1%	
	Orthodontics	15	45	60	
		9.1%	18.8%	14.8%	
	Pedodontics	75	45	120	

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		45.5%	18.8%	29.6%	
	Restorative/endodontic/prosthodontics	75	105	180	
		45.5%	43.8%	44.4%	
Where do you think you can obtain the information?	Books	30	15	45	N/A
		18.2%	6.3%	11.1%	
	Brochures	0	15	15	
		0.0%	6.3%	3.7%	
	Continuing education	60	60	120	
		36.4%	25.0%	29.6%	
	Internet	45	45	90	
		27.3%	18.8%	22.2%	
	Journals	30	75	105	
		18.2%	31.3%	25.9%	
	Others	0	30	30	
		0.0%	12.5%	7.4%	
Country of practice	Europe	0	15	15	N/A
		0.0%	6.3%	3.7%	
	KSA	165	225	390	
		100.0%	93.8%	96.3%	

P value was considered significant if ≤ 0.05.

Table (9) shows that the behavior level about hall technique among dental practitioner has statistically significant relation to type of health care facilities (p value=0.0001).It also shows statistically insignificant relation to gender.

Table (9): Relation between behavior level about hall technique among dental practitioner and sociodemographic characteristics.

Parameters		***Behavior level***		***Total (N=405)***	***P value****
		Good or fair	**Low level**		
Gender	Female	86	196	282	0.067
		63.7%	72.6%	69.6%	
	Male	49	74	123	
		36.3%	27.4%	30.4%	
Age	≤30	120	240	360	N/A
		88.9%	88.9%	88.9%	
	31-40	15	0	15	
		11.1%	0.0%	3.7%	

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	41-50	0	15	15	
		0.0%	5.6%	3.7%	
	≥51	0	15	15	
		0.0%	5.6%	3.7%	
Type of healthcare facility	Private	60	195	255	0.0001
		44.4%	72.2%	63.0%	
	Public	45	15	60	
		33.3%	5.6%	14.8%	
	University	30	60	90	
		22.2%	22.2%	22.2%	
Years of practice?	Less than 5	105	225	330	N/A
		77.8%	83.3%	81.5%	
	5-10	30	15	45	
		22.2%	5.6%	11.1%	
	11-20	0	15	15	
		0.0%	5.6%	3.7%	
	More than 21	0	15	15	
		0.0%	5.6%	3.7%	
In which region of Saudi Arabia do you belong?	Northern region	15	30	45	N/A
		11.1%	11.1%	11.1%	
	Southern region	68	159	227	
		50.4%	58.9%	56.0%	
	Central region	28	15	43	
		20.7%	5.6%	10.6%	
	Eastern region	0	30	30	
		0.0%	11.1%	7.4%	
	Western region	24	36	60	
		17.8%	13.3%	14.8%	
Degree level	Diploma	15	0	15	N/A
		11.1%	0.0%	3.7%	
	Board/doctorate	0	15	15	
		0.0%	5.6%	3.7%	
	BDS/DDS	120	255	375	
		88.9%	94.4%	92.6%	
Which department are practicing	Diagnostic dentistry	0	45	45	N/A
		0.0%	16.7%	11.1%	
	Orthodontics	15	45	60	
		11.1%	16.7%	14.8%	
	Pedodontics	90	30	120	

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		66.7%	11.1%	29.6%	
	Restorative/endodontic/prosthodontics	30	150	180	
		22.2%	55.6%	44.4%	
Where do you think you can obtain the information?	Books	15	30	45	N/A
		11.1%	11.1%	11.1%	
	Brochures	0	15	15	
		0.0%	5.6%	3.7%	
	Continuing education	45	75	120	
		33.3%	27.8%	29.6%	
	Internet	45	45	90	
		33.3%	16.7%	22.2%	
	Journals	15	90	105	
		11.1%	33.3%	25.9%	
	Others	15	15	30	
		11.1%	5.6%	7.4%	
Country of practice	Europe	15	0	15	N/A
		11.1%	0.0%	3.7%	
	KSA	120	270	390	
		88.9%	100.0%	96.3%	

P value was considered significant if ≤ 0.05.

Table (10) shows that the knowledge level about hall technique among dental practitioner has statistically significant relation to type of health care facilities (p value=0.009) and gender of dental practitioners (p value=0.0001)

Table (10): Relation between attitude level towards hall technique among dental practitioner and sociodemographic characteristics.

Parameters		***Attitude level***		***Total (N=405)***	***P value****
		Proficient or fair	**Less proficient**		
Gender	Female	133	149	282	0.0001
		80.6%	62.1%	69.6%	
	Male	32	91	123	
		19.4%	37.9%	30.4%	
Age	≤30	165	195	360	N/A
		100.0%	81.3%	88.9%	
	31-40	0	15	15	
		0.0%	6.3%	3.7%	
		0	15	15	

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	41-50	0.0%	6.3%	3.7%	
	≥51	0	15	15	
		0.0%	6.3%	3.7%	
Type of healthcare facility	Private	105	150	255	0.009
		63.6%	62.5%	63.0%	
	Public	15	45	60	
		9.1%	18.8%	14.8%	
	University	45	45	90	
		27.3%	18.8%	22.2%	
Years of practice?	Less than 5	135	195	330	N/A
		81.8%	81.3%	81.5%	
	5-10	30	15	45	
		18.2%	6.3%	11.1%	
	11-20	0	15	15	
		0.0%	6.3%	3.7%	
	More than 21	0	15	15	
		0.0%	6.3%	3.7%	
In which region of Saudi Arabia do you belong?	Northern region	15	30	45	N/A
		9.1%	12.5%	11.1%	
	Southern region	97	130	227	
		58.8%	54.2%	56.0%	
	Central region	26	17	43	
		15.8%	7.1%	10.6%	
	Eastern region	0	30	30	
		0.0%	12.5%	7.4%	
	Western region	27	33	60	
		16.4%	13.8%	14.8%	
Degree level	Diploma	0	15	15	N/A
		0.0%	6.3%	3.7%	
	Board/doctorate	0	15	15	
		0.0%	6.3%	3.7%	
	BDS/DDS	165	210	375	
		100.0%	87.5%	92.6%	
Which department are practicing	Diagnostic dentistry	0	45	45	N/A
		0.0%	18.8%	11.1%	
	Orthodontics	15	45	60	
		9.1%	18.8%	14.8%	
	Pedodontics	75	45	120	

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DOI 10.6084/m9.figshare.2632574
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		45.5%	18.8%	29.6%	
	Restorative/endodontic/prosthodontics	75	105	180	
		45.5%	43.8%	44.4%	
Where do you think you can obtain the information?	Books	30	15	45	N/A
		18.2%	6.3%	11.1%	
	Brouchures	0	15	15	
		0.0%	6.3%	3.7%	
	Continuing eduction	60	60	120	
		36.4%	25.0%	29.6%	
	Internet	30	60	90	
		18.2%	25.0%	22.2%	
	Journals	45	60	105	
		27.3%	25.0%	25.9%	
	Others	0	30	30	
		0.0%	12.5%	7.4%	
Country of practice	Europe	0	15	15	N/A
		0.0%	6.3%	3.7%	
	KSA	165	225	390	
		100.0%	93.8%	96.3%	

****P value was considered significant if ≤ 0.05.***

Discussion:

Dental caries in baby teeth is recognized as the most common oral health issue in children and has been researched in various countries globally. The occurrence rate of early childhood caries (ECC) varies between 1% and 12% in many developed nations [14]. However, in less developed countries, the prevalence is much higher, climbing to 70% [15]. Conventional approaches to treating decay in primary molars in children involve using materials like amalgam, composite resin, compomer, glass ionomer, and stainless-steel crowns (SSCs) through standard tooth preparation methods or tooth extraction [16]. The Hall technique, currently employed for sealing caries in primary molars, is founded on simple biological principles. It has the ability to halt decay and safeguard the primary tooth until it naturally falls out. Through the Hall technique, the top layer of plaque, which is crucial for the advancement of decay in biofilms, is preserved and sealed alongside the decayed area. Consequently, the composition of plaque biofilms can shift towards a less cavity-causing flora. As a result, this method can arrest or at least slow down the progression of decay in primary teeth [18]. Thus, we aimed in this study to assess the knowledge, Attitude and Behavior about Hall technique among dental practitioners globally.

As regard knowledge and awareness score about hall technique among dental practitioner, we have found that among the total sample size of 405 dental practitioners surveyed, most individuals scored at low levels of knowledge and awareness (59.3%), followed by those at moderate levels (33.3%), with a smaller percentage achieving high levels (7.4%). However, the behavior scores about hall technique revealed that the majority, constituting 66.7%, exhibited a low behavior level in implementing the hall technique. In contrast, only 29.6% of the respondents were categorized under the good behavior level,

ISSN:1624-1940
DOI 10.6084/m9.figshare.2632574
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and a mere 3.7% fell under the fair level category. Concerning their attitude score about hall technique, a significant majority of the respondents displayed a less proficient attitude, constituting 59.3%, another 18.5% considered proficient and 22.2% at a fair level. On the other hand, a study conducted by Gupta et al. (2018) [19] surveyed 200 dental practitioners across India and found that only 30% of them were aware of the Hall Technique. Among those who were aware, only 15% had used the technique in their practice. This study highlighted the lack of knowledge and utilization of the Hall Technique among dental practitioners in Saudi Arabia which is consistent with another results from India. Another study by Verma et al. (2019) [20] assessed the attitude of dental practitioners towards the Hall Technique. The study reported that 70% of dental practitioners had a positive attitude towards the technique, with 80% expressing interest in learning more about it. However, only 40% of practitioners felt confident in performing the technique themselves. In contrast to our results, a study conducted by Al-Khateeb et al. (2020) [21] focused on assessing the knowledge of dental practitioners in Saudi Arabia regarding the Hall Technique. The study involved a survey of 200 dental practitioners, and the results showed that 65% of the participants had good knowledge of the Hall Technique. Another study by Al-Madi et al. (2018) [22] examined the attitudes of dental practitioners in Saudi Arabia towards the Hall Technique. The study surveyed 150 dental practitioners and found that 70% of them had a positive attitude towards the Hall Technique. Furthermore, Singh et al. (2020) [23] found a 10% acceptance rate of the Hall Technique among Indian dental practitioners, citing training and equipment inadequacies. Our findings showed a 26% adoption rate, with considerable non-adoption. Brown et al. (2019) [24] discovered a 38% adoption rate among US pediatric dentists, with 60% blaming insufficient training. These studies together demonstrate the global obstacles of implementing the Hall Technique in dental offices, highlighting constant limitations linked to training and resource availability.

Conclusion:

In conclusion, this research article highlighted a significant gap in knowledge, attitude, and behavior among dental practitioners globally regarding the Hall technique for managing caries in primary molars. Surveyed practitioners demonstrated insufficient knowledge, awareness, and unsatisfactory conduct in applying the Hall technique to pediatric dentistry. The study emphasizes the importance of increased education and training to encourage broader use of this minimally invasive approach. The findings are consistent with previous studies indicating global inequalities in Hall technique familiarity and application among dental practitioners. Further efforts should concentrate on raising awareness, behavior, and attitudes toward the Hall technique in order to successfully fight early childhood caries. These efforts are critical for improving children's dental health outcomes by more effectively treating early childhood caries.

Acknowledgement:

We thank the participants who all contributed samples to the study.

Ethical approval

Ethical approval was obtained from the research ethics committee of King Abdulaziz University,

ISSN:1624-1940
DOI 10.6084/m9.figshare.2632574
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Jeddah with Application number: [19-01-24]. 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.

Funding

The study did not receive any external funding.

Conflict of interests

The authors declare that there are no conflicts of interest.

Informed consent:

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

Data and materials availability

All data associated with this study are present in the paper.

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