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PARENTAL KNOWLEDGE, ACCEPTANCE AND SATISFACTION TOWARD NITROUS-OXIDE IN SAUDI ARABIA: CROSS-SECTIONAL STUDY

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Abstract:

Background: According to the international guidelines, titrated nitrous oxide in oxygen (N2O/O2) is considered a safe and effective dental sedation technique and recommended as a first line option, especially for children. Several published studies have examined the extent of parental knowledge and satisfaction regarding the use of nitrous oxide sedation for treating their children. Other studies have provided evidence supporting the safety of nitrous oxide as well as its effectiveness as an analgesic, anxiolytic, and psycho-sedative. **Objectives**: The aim of this study is to evaluate parental acceptance of nitrous oxide as a behavior management approach, examine the potential influence of parental background on acceptance levels, and evaluate parental knowledge regarding the use of nitrous oxide as a behavior management tool for children. **Methodology**: This cross-sectional study conducted in Saudi Arabia. An online survey distributed among parents who have a child under the age of 15 in Saudi Arabia. The sample consists of parents or caregivers of Pediatric dentistry patients who were recruited from a group of parents accompanying their children to general/pediatric dental practitioners' clinics, whether private or governmental clinic settings, in the Kingdom of Saudi Arabia, all regions, between August and December 2023, respectively. All the collected data then be tabulated and analyzed using "Microsoft Office Excel Software program (2016) for Windows. **Results**: This study evaluated parental acceptance of nitrous oxide as a behavior management technique in pediatric dentistry, highlighting key demographic insights and knowledge levels among 426 participants. Most respondents (68.3%) demonstrated awareness of nitrous oxide, with 62.2% having prior experience using it for their children. Notably, acceptance rates reached 77.7%, despite concerns raised by 74.9% regarding side effects.

Conclusion: In conclusion, this study underscores a promising level of knowledge and acceptance of nitrous oxide among parents in Saudi Arabia as a behavior management strategy in pediatric dentistry.

Keywords: Parents, Nitrous oxide, Dental treatment, Pediatric, Behavior management technique.

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Introduction:

Dental fear and anxiety are one of the most common reactions a dentist can expect from a patient when they present to their office and have previously been shown to be more common in females and younger children [1]. Nitrous oxide sedation is one of the behavior management techniques that is a crucial component of pediatric dental practice to enhance the cooperation of the child patient during dental treatment [2]. According to the international guidelines, titrated nitrous oxide in oxygen (N2O/O2) is considered a safe and effective dental sedation technique and recommended as a first-line option, especially for children [3]. Although the use of nitrous oxide in operating rooms may be declining, its utilization is increasing in the context of sedation for minor procedures, especially for pediatric patients. Due to its ability to eliminate the requirement for intravenous administration. Numerous studies have been conducted to evaluate the effectiveness and safety of nitrous oxide in several medical procedures performed on young patients [4]. The use of nitrous oxide is supported by limited, low quality evidence. Conscious sedation has been recommended based on its established anxiolytic and sedative properties, as well as its quick onset, recovery time, and overall safety. The utilization of this substance as a sedative agent for both pediatric and adult patients has become prevalent in the fields of dentistry and medicine [5].

In 1844, nitrous oxide was discovered by Horace Wells in Connecticut, America. Now known as the father of anesthesia, nitrous oxide (N2O) is considered for painless dental procedures and as a calming relaxation drug, and it is known for its effectiveness as an anxiolytic agent. Clinical examination revealed that nitrous oxide inhalation sedation (N2O) is effective and safe [6]. The concentration of nitrous oxide (N2O) ranges from 30–70%, with a maximum effect duration of 5 minutes, and it has rapid recovery when discontinuation occurs [7]. It is a sedative agent used at various concentrations in pediatric dentistry settings, and the favorable outcomes indicate that a 60% concentration of N2O is more effective [6].

Studies have been published about the knowledge and satisfaction level of parents regarding treating their children under nitrous oxide sedation, and studies have proven that nitrous oxide is safe and acts as an analgesic, anxiolytic and psycho-sedative with the majority having no memory of the curative procedures. In 2022, a study was conducted to assess the effectiveness and acceptability of Nitrous oxide. Out of 40 children, two (5%) remembered the treatment procedure that was done, and 25 (62.5%) had no remembrance regarding the treatment procedure done. All parents and children were satisfied with the treatment, and parents recommend their children and their relatives get treated under N2O sedation [8].

Objectives:

This study aims to assess the knowledge of parents in Saudi Arabia regarding the use of nitrous oxide in dental practice for children. Moreover, to evaluate the satisfaction level regarding the dental treatment under nitrous oxide for their children. Also, to assess parents' attitudes and acceptance of the behavior management strategies employed in the dental practice and to determine whether parental background has an impact on how well behavior modification strategies are accepted.

Materials and Methods:

This study was a prospective cross-sectional questionnaire survey conducted in Saudi Arabia. An online

ISSN:1624-1940
http://magellanes.com/

survey was distributed among parents who have children under 15 years old in Saudi Arabia. Parental knowledge and acceptance about different behavioral management techniques for their children and to assess the satisfaction level if they had an experience using nitrous oxide before.

Study setting: Participants, recruitment, and sampling procedure:

The sample consisted of parents/caregivers of Pediatric dentistry patients who were recruited from a group of parents accompanying their children to general/pediatric dental practitioner clinics, whether private or governmental clinic settings, in the Kingdom of Saudi Arabia, all regions, between August and December 2023, respectively. The techniques and the purpose of the study were explained in the questionnaire, and consent for participation obtained.

Inclusion and Exclusion criteria:

Parents who have children aged 15 or younger and parents living in Saudi Arabia included.

Parents who do not have children or have children older than 15 years and parents living outside Saudi Arabia was excluded.

Sample size:

by using the Qualtrics calculator and a 95% degree of confidence, the size of

the sample was estimated, So the minimum sample size was 384.

The Sample size was estimated by using this formula:

n= P (1-P) * Zα 2 / d 2 with a confidence level of 95%.

n: Calculated sample size

Z: The z-value for the selected level of confidence (1- a) = 1.96.

P: An estimated knowledge

Q: (1 – 0.50) = 50%, i.e., 0.50

D: The maximum acceptable error = 0.05.

So, the calculated minimum sample size was:

n = (1.96)2 X 0.50 X 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 participants' responses to the questions. The questionnaire included demographic features such as age, gender, medical history and Parental education level The participants were asked about Parental acceptance for different behavior management techniques used in Pediatric Specialty Clinics, knowledge of behavior management techniques and if they found the behavior management experience satisfying Also, they asked if the child will need dental treatment in the future and which method they prefer. This tool was developed after consulting relevant studies conducted in Saudi Arabia and elsewhere. The final version of the questionnaire consisted of 18 categories divided into three main sections.

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Analyzes and entry method:

All the collected data was then tabulated and analyzed using "Microsoft office Excel software" program (2016) for windows. The questionnaires were weighed to check the accuracy of the data entry by data cleansing and exploration method in the database.

Results:

Table (1) displays various demographic parameters of the participants with a total number of (426). The average sample age is 32.8 years, the standard deviation is 10.4 The majority of respondents belong to the age category of 31-45 years (34.0%), while respondents from younger (24 years and younger) and older (46 years and older) groups are less presented. Further analysis of the participants is a distinct distribution of gender, where females make a higher percentage (55.2 percent), which makes it possible to consider the gender angle while analyzing trends in the data. Regionally, participants from the Southern region formed the highest proportion, 36.6%, while participants from the Northern region formed the least proportion, 4.7%. Most of the participants are Saudi and young with more emphasis on higher educational level, 69.2% of these participants have a bachelor or above. Also, the family monthly income is almost equally divided among the categories, though; a considerable number of families (31.2%) earn between 6000-10000 SAR.

Table (1): Sociodemographic characteristics of participants (n=426)

Parameter		***No.***	***Percent (%)***
Age (Mean:32.8, STD:10.4)	24 years or less	109	25.6
	25 to 30	120	28.2
	31 to 45	145	34.0
	46 or more	52	12.2
Gender	Female	235	55.2
	Male	191	44.8
Residential region	Northern region	20	4.7
	Southern region	156	36.6
	Central region	74	17.4
	Eastern region	43	10.1
	Western region	133	31.2
Nationality	Saudi	418	98.1
	Non-Saudi	8	1.9
Educational level	Primary or middle school	21	4.9
	High school	102	23.9
	Bachelor's degree or higher	295	69.2
	Uneducated	8	1.9
Family monthly income	Less than 6000 SAR	60	14.1
	6000 to 10000 SAR	133	31.2
	11000 to 16000 SAR	105	24.6
	More than 16000 SAR	128	30.0

ISSN:1624-1940
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Number of children among participants	1 to 2	251	58.9
	3 to 4	95	22.3
	5 or more	80	18.8

As shown in figure 1, Finally, the sample of 426 participants, which has the data regarding children's usual cooperation levels, reveals interesting trends. As 'highly cooperative,' 20.4% (87 children) are reported, far greater than any other category with 46.2% (197 children) falling into the 'cooperative' category. By contrast, the numbers show that 17.8 per cent (76) of children are 'uncooperative' and 15. 5 per cent (66) highly uncooperative. Analysis of the cooperative categories show that collectively, this demographic accounts for 66.6% of the total sample, demonstrating a preponderance of positive interaction skills in this demographic. Instead, the uncooperative categories collectively account for 33.3 % of subjects or a significant minority.

Figure (1): Illustrates child's usual cooperation among participants.

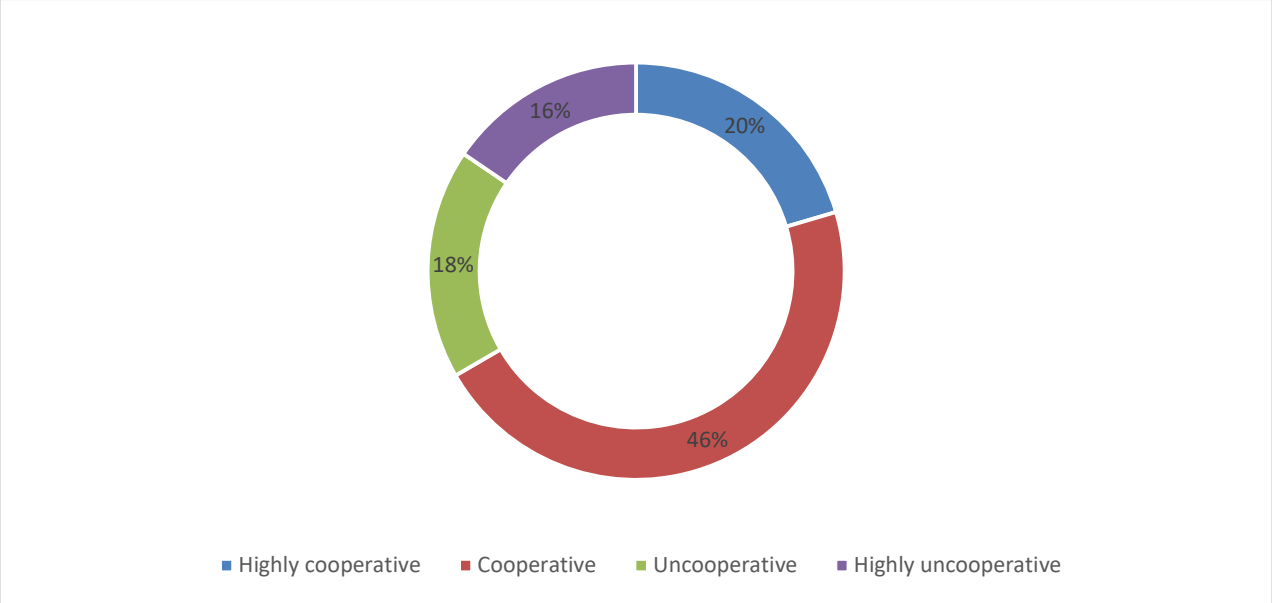

Table 2 provides valuable knowledge about parents' knowledge, acceptance and satisfaction using of N two oxide in pediatric dental treatments with a sample of 426 participants. Significantly, an important majority, 68.3%, are aware of what nitrous oxide is; parents seem to be aware enough. However, an interesting 90.4% with most reporting restorative procedures might suggest a reliance on dental intervention since a young age. Additionally, among those who had children experience nitrous oxide, 62.2 percent had used nitrous oxide and a sizeable portion reported satisfaction with the behavioural experience of use. Concerns about side effects expressed by 74.9% of respondents was associated with a strong preference for nitrous oxide (47.7%) compared to another behavioural management technique(s) or general anaesthesia (77.7%) among respondents with moderate knowledge of nitrous oxide.

ISSN:1624-1940
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Table (2): Parameters related to parents' knowledge, acceptance and satisfaction toward nitrous oxide (n=426).

Parameter		***No.***	***Percent (%)***
Do you know what Nitrous oxide is?	No	135	31.7
	Yes	291	68.3
Did your child receive any dental treatment before?	No	41	9.6
	Yes	385	90.4
If yes; what type of treatment?	Examination or prophy (simple)	70	16.4
	Restoration	168	39.4
	Extraction	100	23.5
	Others	47	11.0
	I answered no	41	9.6
What is your child's usual cooperation?	Highly cooperative	87	20.4
	Cooperative	197	46.2
	Uncooperative	76	17.8
	Highly uncooperative	66	15.5
Did your child/Children received dental treatment using Nitrous oxide?	No	161	37.8
	Yes	265	62.2
If yes; Did you find the behaviour method experience satisfying? (n=265)	Strongly agree	54	20.4
	Agree	96	36.2
	Neutral	82	30.9
	Disagree	24	9.1
	Strongly disagree	9	3.4
If yes; If your child or his siblings needed dental treatment, would you use the same behavior method? (n=265)	No	73	27.5
	Yes	192	72.5
If No; If your child/Childrens needed dental treatment in the future; would you prefer using nitrous oxide? (n=161)	No	30	18.6
	Yes	131	81.4
Do you noticed, heard, or heard/read any side effect of dental treatment under nitrous oxide?	No	107	25.1
	Yes	319	74.9
If yes, do you prefer Nitrous oxide over other behavioral methods? (n=319)	No	104	32.6
	Yes	215	67.4
Do you prefer Nitrous oxide over general anesthesia?	No	95	22.3
	Yes	331	77.7

As shown in figure (2), Analysis of the data concerning the respondents' perception of side effects resulting from dental treatment under nitrous oxide is informative: nearly all respondents disclosed their awareness. Out of a sample size of 426, only 107 respondents (approximately 25.1%) reported not having noticed, heard or read of any side effects. In striking contrast, a large number of 319 respondents or 74.9 percentage were confident of experienced nitrous oxide treatment and also clearly stated of side effects of nitrous oxide treatment.

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Figure (2): Illustrates dealing with side effects of nitrous oxide after dental treatment among participants.

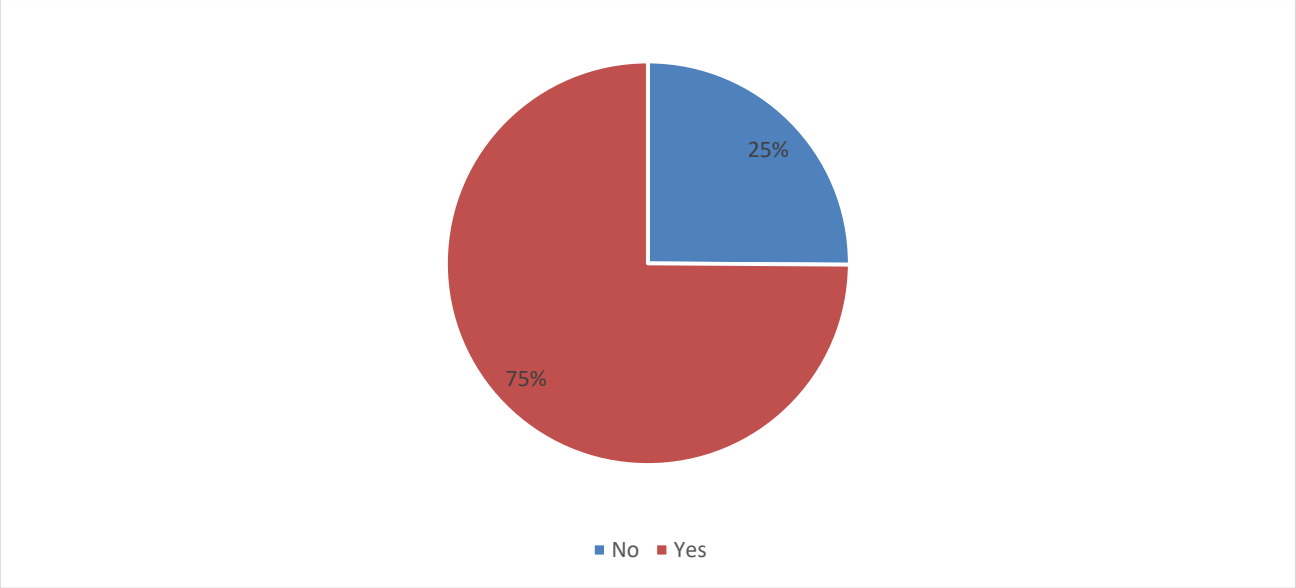

Table 3 contains data which provide a clear and captivating view of the knowledge level that the surveyed Saudi population has towards nitrous oxide. The great majority of participants, namely a substantial 62.7%, possessed a high level of knowledge which would greatly contribute to the informed discussions and the making of policy oriented to environmental and health implications resulting from the use of nitrous oxide. However, only 33.3 percent of respondents were moderate in their knowledge and thus had room to learn more and become more aware. This is notable because as few as 4.0 percent of the population have low knowledge regarding nitrous oxide, indicating positively on the effort to improve public knowledge.

Table (3): Shows knowledge toward nitrous-oxide in Saudi Arabia score results.

	Frequency	**Percent**
High knowledge level	267	62.7
Moderate knowledge	142	33.3
Low knowledge level	17	4.0
Total	426	100.0

Table 4, showing the data of level of satisfaction to using nitrous oxide in Saudi Arabia, shows that there is a significant trend in public opinion. Nearly half, 45.5%, of the respondents are unsatisfied with the substance indicating that the population has some (whether major) concerns regarding the safety, efficacy, and or accessibility of the substance. Less than half (only 35.2%) reported satisfaction while 19.2% remained neutral (i.e. ambivalent or uncertain about whether benefits or drawbacks outweighed those of nitrous oxide).

ISSN:1624-1940
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Table (4): Shows satisfaction toward nitrous-oxide in Saudi Arabia score results.

	Frequency	**Percent**
Satisfied	150	35.2
Neutral	82	19.2
Dissatisfied	194	45.5
Total	426	100.0

Table 5 shows the levels of acceptance to nitrous oxide use in Saudi Arabia as high as 77.7% of respondents that favor the use of nitrous oxide. The responses of 331 people indicate a growing acceptance that there are potential advantages of the use of nitrous oxide, this remaining a predominant acceptance that is reflected in the responses. On the flipside, a minority of 22.3 or 95 respondents revealed a lack of acceptance that underscores a group — albeit small — of people who are skeptical about, or have misgivings about the ramifications, of her becoming the nation's first female president.

Table (5): Shows acceptance toward nitrous-oxide in Saudi Arabia score results.

	Frequency	**Percent**
Accepting	331	77.7
Not accepting	95	22.3
Total	426	100.0

Table (6) shows that knowledge toward nitrous-oxide in Saudi Arabia has statistically significant relation to age (P value=0.0001), residential region (P value=0.001), educational level (P value=0.001), and family monthly income (P value=0.022). It also shows statistically insignificant relation to gender, nationality, and number of children among participants. Participants aged 31 to 45, residing in the southern region, holding a bachelor's degree or higher.

Table (6): Relation between knowledge toward nitrous-oxide in Saudi Arabia and sociodemographic characteristics.

Parameters		***Knowledge level***		***Total (N=426)***	***P value****
		High knowledge level	**Moderate or low knowledge**		
Gender	Female	153	82	235	0.250
		57.3%	51.6%	55.2%	
	Male	114	77	191	
		42.7%	48.4%	44.8%	
Age	24 years or less	56	53	109	0.0001
		21.0%	33.3%	25.6%	
	25 to 30	85	35	120	
		31.8%	22.0%	28.2%	
	31 to 45	103	42	145	
		38.6%	26.4%	34.0%	

ISSN:1624-1940
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	46 or more	23	29	52	
		8.6%	18.2%	12.2%	
Residential region	Northern region	11	9	20	0.001
		4.1%	5.7%	4.7%	
	Southern region	115	41	156	
		43.1%	25.8%	36.6%	
	Central region	39	35	74	
		14.6%	22.0%	17.4%	
	Eastern region	31	12	43	
		11.6%	7.5%	10.1%	
	Western region	71	62	133	
		26.6%	39.0%	31.2%	
Nationality	Saudi	262	156	418	0.992
		98.1%	98.1%	98.1%	
	Non-Saudi	5	3	8	
		1.9%	1.9%	1.9%	
Educational level	Primary or middle school	6	15	21	0.001
		2.2%	9.4%	4.9%	
	High school	60	42	102	
		22.5%	26.4%	23.9%	
	Bachelor's degree or higher	198	97	295	
		74.2%	61.0%	69.2%	
	Uneducated	3	5	8	
		1.1%	3.1%	1.9%	
Family monthly income	Less than 6000 SAR	29	31	60	0.022
		10.9%	19.5%	14.1%	
	6000 to 10000 SAR	91	42	133	
		34.1%	26.4%	31.2%	
	11000 to 16000 SAR	72	33	105	
		27.0%	20.8%	24.6%	
	More than 16000 SAR	75	53	128	
		28.1%	33.3%	30.0%	
Number of children among participants	1 to 2	160	91	251	0.539
		59.9%	57.2%	58.9%	
	3 to 4	55	40	95	
		20.6%	25.2%	22.3%	
	5 or more	52	28	80	
		19.5%	17.6%	18.8%	

P value was considered significant if ≤ 0.05.

Table (7) shows that satisfaction toward nitrous-oxide in Saudi Arabia has statistically significant relation to gender (P value=0.001), age (P value=0.039), residential region (P value=0.017), and educational level (P value=0.002). It also shows statistically insignificant relation to nationality, family

ISSN:1624-1940
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monthly income and number of children among participants. Participants of male gender, residing in southern region, and those graduated of high school were found to be more satisfied with nitrous oxide usage in anesthesia.

Table (7): Satisfaction toward nitrous-oxide in Saudi Arabia in association with sociodemographic characteristics.

Parameters		***Satisfaction level***		***Total (N=426)***	***P value****
		Dissatisfied	**Satisfied or neutral**		
Gender	Female	124	111	235	0.001
		63.9%	47.8%	55.2%	
	Male	70	121	191	
		36.1%	52.2%	44.8%	
Age	24 years or less	48	61	109	0.039
		24.7%	26.3%	25.6%	
	25 to 30	63	57	120	
		32.5%	24.6%	28.2%	
	31 to 45	68	77	145	
		35.1%	33.2%	34.0%	
	46 or more	15	37	52	
		7.7%	15.9%	12.2%	
Residential region	Northern region	15	5	20	0.017
		7.7%	2.2%	4.7%	
	Southern region	65	91	156	
		33.5%	39.2%	36.6%	
	Central region	41	33	74	
		21.1%	14.2%	17.4%	
	Eastern region	18	25	43	
		9.3%	10.8%	10.1%	
	Western region	55	78	133	
		28.4%	33.6%	31.2%	
Nationality	Saudi	191	227	418	0.645
		98.5%	97.8%	98.1%	
	Non-Saudi	3	5	8	
		1.5%	2.2%	1.9%	
Educational level	Primary or middle school	15	6	21	0.002
		7.7%	2.6%	4.9%	
	High school	39	63	102	
		20.1%	27.2%	23.9%	
	Bachelor's degree or higher	140	155	295	
		72.2%	66.8%	69.2%	
	Uneducated	0	8	8	
		0.0%	3.4%	1.9%	
Family monthly	Less than 6000	28	32	60	0.106

ISSN:1624-1940
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income	SAR	14.4%	13.8%	14.1%	
	6000 to 10000 SAR	61	72	133	
		31.4%	31.0%	31.2%	
	11000 to 16000 SAR	38	67	105	
		19.6%	28.9%	24.6%	
	More than 16000 SAR	67	61	128	
		34.5%	26.3%	30.0%	
Number of children among participants	1 to 2	115	136	251	0.095
		59.3%	58.6%	58.9%	
	3 to 4	50	45	95	
		25.8%	19.4%	22.3%	
	5 or more	29	51	80	
		14.9%	22.0%	18.8%	

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

Table (8) shows that Acceptance toward nitrous-oxide usage has statistically significant relation to gender (P value=0.015), age (P value=0.0001), residential region (P value=0.0001), educational level (P value=0.019), and family monthly income (P value=0.001). It also shows statistically insignificant relation to nationality, and number of children among participants. Participants of female gender, aged 31 to 45, residing in southern region, and graduates of high school were found to be more accepting of nitrous oxide usage than others.

Table (8): Acceptance toward nitrous-oxide in Saudi Arabia in association with sociodemographic characteristics.

Parameters		***Acceptance level***		***Total (N=426)***	***P value****
		Accepting	**Not accepting**		
Gender	Female	193	42	235	0.015
		58.3%	44.2%	55.2%	
	Male	138	53	191	
		41.7%	55.8%	44.8%	
Age	24 years or less	70	39	109	0.0001
		21.1%	41.1%	25.6%	
	25 to 30	91	29	120	
		27.5%	30.5%	28.2%	
	31 to 45	120	25	145	
		36.3%	26.3%	34.0%	
	46 or more	50	2	52	
		15.1%	2.1%	12.2%	
Residential region	Northern region	20	0	20	0.0001
		6.0%	0.0%	4.7%	
	Southern region	133	23	156	
		40.2%	24.2%	36.6%	
	Central region	49	25	74	

ISSN:1624-1940
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		14.8%	26.3%	17.4%	
	Eastern region	37	6	43	
		11.2%	6.3%	10.1%	
	Western region	92	41	133	
		27.8%	43.2%	31.2%	
Nationality	Saudi	326	92	418	0.297
		98.5%	96.8%	98.1%	
	Non-Saudi	5	3	8	
		1.5%	3.2%	1.9%	
Educational level	Primary or middle school	21	0	21	0.019
		6.3%	0.0%	4.9%	
	High school	85	17	102	
		25.7%	17.9%	23.9%	
	Bachelor's degree or higher	219	76	295	
		66.2%	80.0%	69.2%	
	Uneducated	6	2	8	
		1.8%	2.1%	1.9%	
Family monthly income	Less than 6000 SAR	58	2	60	0.001
		17.5%	2.1%	14.1%	
	6000 to 10000 SAR	97	36	133	
		29.3%	37.9%	31.2%	
	11000 to 16000 SAR	74	31	105	
		22.4%	32.6%	24.6%	
	More than 16000 SAR	102	26	128	
		30.8%	27.4%	30.0%	
Number of children among participants	1 to 2	194	57	251	0.857
		58.6%	60.0%	58.9%	
	3 to 4	73	22	95	
		22.1%	23.2%	22.3%	
	5 or more	64	16	80	
		19.3%	16.8%	18.8%	

P value was considered significant if ≤ 0.05.

Discussion:

This study aimed to examine the level of parent knowledge regarding the usage of nitrous oxide in pediatric dentistry within Saudi Arabia along with assessment of the level of parent satisfaction, and investigation of how parental backgrounds may affect the acceptance of other behavior management strategies. Findings show that parents are not unaware about the use of nitrous oxide in dental procedures and that 68.3% were aware of this use. This mirrors recent studies which have identified a growing appreciation of the use of nitrous oxide to treat anxiety in young dental patients. For example, nitrous oxide is able to reduce patients levels of anxiety and pain during dental treatment by Gupta et al. [9] which mainly contribute its use in pediatric dentistry as a preferred sedation. According to M., a study with a longitudinal design likewise showed that nitrous oxide sedation is particularly

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advantageous for young children, who are often anxious and uncooperative during dental visits [10].
In fact, an interesting proportion of parents (62.2 percent) were dissatisfied with nitrous oxide use while 74.9 percent expressed the fear of its side effects. This dual perception mirrors other findings, such as those suggested by Zaffina et al. who found that nitrous oxide is useful to reduce anxiety, though parents are not completely at ease of its safety and side effects [11]. Since the parents in the current study expressed apprehension about nitrous oxide and since research has found that parental knowledge plays an important role in acceptance of sedation techniques [12], a site of potential work continues to address a lack of comprehensive education regarding the safety profile of nitrous oxide.
In addition, the study further showed that 77.7 percent of parents preferred using nitrous oxide for pediatric dental care, which is a trend towards the acceptance. This is consistent with the work of Zoubi et al., who found that parental acceptance of sedation techniques also varies greatly amongst cultural contexts, with for example many parents in the Middle East preferring nitrous oxide to general anesthesia [13]. While this 22.3% of parents who opposed nitrous oxide use is an area of critical outreach for future educational efforts, previous studies have demonstrated that provided appropriate information, there should be a substantial increase in parental acceptance of sedation [12].
Demographic analysis of the participants showed that age, educational level and family income are important factors related to knowledge and acceptance of nitrous oxide. This corresponds to the work of Al-Batayneh et al. who established parental education levels is directly related to their knowledge and acceptance of different dental treatment options [14]. The lack of correlation between acceptance and gender and number of children in the current study contrasts with previous studies and indicates other factors may have a larger role in parents' acceptance of Nitrous Oxide.
That makes this study worth continuing despite the positive results, however, we must note that the study is not without limitations. If self-reported data is relied on, the security of that data is also questionable, since parents may over report their own happy feelings. Also, the cross-sectional design prevents inference of causality between parental background and acceptance of nitrous oxide. The parental perceptions described in this study could provide opportunities to learn more about how parental perceptions change over time, in particular after their children have undergone dental treatments using nitrous oxide.

Conclusion:

As a note, this study illustrates a high degree of knowledge and acceptance of nitrous oxide as a behavior modality for pediatric dentistry in Saudi Arabia. Despite this, the concern for side effects and the illogically erratic response from the public to dental care needs further educational efforts aimed at eliminating misconceptions as well as raising the general satisfaction levels with dental care. Improving the knowledge of what nitrous oxide is safe and what it is effective to allow for an increase in parental confidence on the use of this form of sedation will improve the dental experience for the pediatric population.

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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

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Data and materials availability:

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

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