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Original Article

Awareness of professional fluoride application and its caries prevention role among women in KSA

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الملخص

أهداف البحث: تقييم مستوى وعي النساء في المملكة العربية السعودية بشأن تطبيق الفلورايد المركّز ودوره في الوقاية من تسوّس الأسنان.

طرق البحث: تم توزيع استبانة إلكتروني على النساء في المدينة المنورة بالمملكة العربية السعودية بواسطة مواقع التواصل الاجتماعي. تكوّنت الاستبانة من 4 أقسام وهي: معلومات عن التاريخ المرضي لتسوّس الأسنان، مدى معرفة المشاركات بدور الفلورايد في الوقاية من تسوس الأسنان، وأخيرا أهمية تطبيق الفلورايد المركّز ودوره في الوقاية من تسوّس الأسنان. للتحليل الإحصائي، تم حساب الإحصاء الوصفي البسيط كمتوسط وتوزيعات التردد؛ بينما تم إجراء المقارنات باستخدام اختبار مربع كاي.

النتائج: شارك في الدراسة 405 امرأة. كانت المشاركات في الغالب من النساء السعوديات المتزوجات غير العاملات التي تتراوح أعمارهن بين 18 و55 سنة. كما أن المستوى التعليمي لغالبية المشاركات حاصلات على درجة البكالوريوس وأعلى. أفادت معظم المشاركات بوجود دلائل عالية على إصابتهن بالتسوّس، من خلال وجود تجاويف سنية (69.1٪)، حشوات (87.2٪) وأسنان مفقودة بسبب تسوس الأسنان (64.7٪). فيما يتعلق بأسئلة الفلورايد المركّز، 34.8٪ عرفن دوره في الوقاية من تسوس الأسنان و 35.6٪ أجبن بشكلٍ صحيح على أسئلة أشكال الفلورايد المركّز المتوفرة. أجابت 14.5٪ فقط من المشاركات بأنه قد سبق لهن وضع الفلورايد المركّز، بينما 57.3٪ لم يعرفن عدد المرات التي ينصح بها لتلقي الفلورايد المركّز. تم العثور على علاقة ذات دلالة إحصائية بين نقص المعرفة فيما يتعلق بدور تطبيق الفلورايد المركّز ووجود التجاويف السنيّة. وأفادت 30.4٪ فقط من المشاركات بأنهن تلقين نصائح ومعلومات من أطباء الأسنان عن أهمية وضع الفلورايد المركّز للحماية من التسوس.

الاستنتاجات: معظم الإناث البالغات في المدينة المنورة، المملكة العربية السعودية لديهن معرفة محدودة فيما يتعلق بأهمية الفلورايد المركّز في الوقاية من تسوس الأسنان، مما قد يساهم في زيادة تعرضهن للتسوّس.

الكلمات المفتاحية: الوعي؛ تسوس الأسنان؛ الفلوريد الموضعي؛ صحة الفم؛ السعودية؛ صحة المرأة

Abstract

Objectives: Considering the high caries prevalence among Saudi females, spreading knowledge on caries prevention modalities such as high-concentration professional fluoride (PF) applications could decrease their risk of dental caries. However, little is known about the current level of female awareness on the important caries prevention role of PF applications. Therefore, this study assessed the level of awareness of female adults in the KSA regarding PF application and its role in caries prevention.

Methods: An electronic self-administered anonymous questionnaire was distributed among women in Almadinah Almunawwarah, KSA using social media groups. It consisted of four sections: demographic data, caries experience, knowledge regarding fluoride and caries prevention, and knowledge regarding PF application and caries prevention. For the statistical analyses, simple descriptive statistics as means and frequency distributions were calculated, whereas comparisons were performed using the chi-squared test.

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Results: A total of 405 females participated in the study. Participants were mostly married non-working Saudi women aged between 18 and 55 years. The education level of the majority of participants was at least a bachelor's degree. Most of the participants reported a high caries experience indicated by the presence of cavities (69.1%), fillings (87.2%), and missing teeth due to cavities (64.7%). Regarding PF questions, 34.8% knew the role of PF in caries prevention and 35.6% responded correctly to forms of PF. Only 14.5% reported receiving PF, whereas 57.3% did not know the frequency of PF application. A significant relationship was found between a lack of knowledge regarding the role of PF application and the presence of cavities ($p = 0.003$). Only 30.4% of participants reported receiving advice from their dentists regarding PF application.

Conclusion: Most female adults in Almadinah Almunawwarah, KSA have limited knowledge of the importance of PF application in caries prevention, which could contribute to their caries experience.

Keywords: Awareness; Dental caries; KSA; Oral health; Topical fluoride; Women's health

Introduction

Dental caries is a multifactorial disease and one of the major oral health problems. Although its prevalence has declined in most developed countries, it has markedly increased in the Middle East as discussed by AlHabdan et al.[1] A study by Al-Ansari[2] demonstrated a significant increase in caries among children and adults in KSA with percentages approaching 89% in adults. Parveen and Al-Khuraif[3] showed that Saudi females have high rates of caries due to poor oral hygiene.

Fluoride is a potent anticaries agent that has been used in dentistry for more than 100 years to prevent dental caries.[4] The application methods of topical fluoride are divided into self-applied over the counter and professionally applied formulas.[5] Self-applied topical fluorides such as fluoridated toothpaste and mouth rinses can be used at home but professionally applied fluoride such as fluoride gels, varnishes, and paint-on solutions requires the dentist to apply it in the clinic.[5] Fluoride promotes the remineralization of dental hard tissues and inhibits demineralization, thereby interfering with caries formation.[5]

Public health programs efforts are shifting toward the use of high fluoride components such as gels, varnishes, and prescribed toothpastes targeting high caries risk populations.[6] Fluoride varnishes combine a high fluoride concentration (5% sodium fluoride, 22,600 ppm) with 2–4 professional fluoride (PF) applications annually, to prolong the contact time between fluoride and dental enamel in order to prevent dental caries in primary and permanent teeth.[6] In addition, 1.23% acidulated phosphate fluoride gels are being used effectively to prevent caries initiation and progression.[7] Different dental organizations, including the American Dental Association (ADA), recommend professionally applied fluorides for caries prevention in moderate- to high-risk patients of all ages due to their efficacy and safety.[8]

Many studies have demonstrated the lack of knowledge in different populations regarding fluoride, which is considered the most efficient factor for caries prevention.[9,10] AlSadhan et al.[11] reported that few individuals have received topical fluoride at dental clinics in KSA. Sociodemographic factors including age, sex, level of education, occupation, family income, marital status, and language spoken are suggested to influence an individual's level of awareness regarding dental and oral health.[12] For instance, maternal educational level is related to mothers' awareness of preventive dental care, and consequently, a child's oral and dental health.[13] Similarly, family income, parents' socioeconomic status, and maternal profession significantly impact children's dental caries prevalence.[14]

The occurrence of dental caries among Saudis has increased in the past few years, while the use of dental aids that prevent dental caries has been declining.[11] Parveen and Al-Khuraif[3] stated that Saudi females have a high prevalence of caries, which is associated with poor oral hygiene. The first step is to enhance caries prevention knowledge in this population, to improve attitudes toward preventative dental care.[11,15]

Therefore, the aim of this study was to measure the level of awareness of female adults in Almadinah Almunawwarah, KSA regarding the importance of PF applications for caries prevention.

Materials and Methods

Study design

This was a cross-sectional observational study that utilized an anonymous self-administered questionnaire. Inclusion criteria were adult females 18 years or older living in Almadinah Almunawwarah, KSA, ability to read, and willingness to provide written informed consent for participation in the study. A pilot study among 10 female patients was conducted to determine if the questionnaire had face validity and to assess the feasibility and clarity of the questionnaire. Patients who participated in the pilot study were excluded from the final sample. The questionnaire was distributed electronically using different social media groups to reach women from all socioeconomic statuses. WhatsApp, Snapchat, and Instagram applications were utilized to target different groups and individuals living in Almadinah Almunawwarah. First, the questionnaire was sent via WhatsApp to patients who visited the dental clinics of the College of Dentistry at Taibah University, asking them to send it to other women from their families and friends. Then it was sent to some female influencers in Almadinah Almunawwarah to distribute widely among women using Snapchat and Instagram applications.

The questionnaire was written in Arabic language. The first page described the purpose of the study, items on the

consent form, and eligibility criteria (e.g., adult females living in Almadinah Almunawwarah). Before proceeding to the questionnaire sections, participants provided written informed consent to participate in the study. The questionnaire contained four sections. Section I: demographic data (age, education level, social status, occupation, number of family members, and family monthly income); Section II: caries experience (dental visits, presence of cavities, fillings, missing teeth due to cavities, dry mouth); Section III: knowledge regarding fluoride and caries prevention; and Section IV: knowledge regarding PF application and caries prevention.

Statistical analyses

Descriptive statistics were used to analyze data for categorical variables, and the weighted average (mean ± standard deviation) was calculated for the opinion questions in the form of Likert's three-point scale to obtain the sample attitudes. The relationship of demographic factors with fluoride application awareness and caries experience was assessed using the chi-squared test with 95% confidence interval ($p < 0.05$). Statistical analyses were performed using Microsoft Office Excel and the Statistical Package for Social Sciences (SPSS).

Results

Our sample included 405 women, including Saudi (81%) and non-Saudi (19%) women mainly within the age range of 18–55 years. Employed women represented only 33% of the participants, whereas the non-employed represented 67%. Most of the participants had at least a bachelor's degree (60.5%), 30.4% had high school or less, 6.7% had a diploma, and 2.5% were illiterate. Nearly half of the participants had 5–7 family members (48.1%) and a monthly income of ≤7000 Saudi Riyal (40.2%) (Table 1).

Questions on dental history revealed that 69.1%, 87.2%, and 64.7% of the participants had decayed, filled, and missing teeth due to caries, respectively (Table 2). In addition, 20% were suffering from dry mouth symptoms. Only 8.9% had regular visits every 3–6 months, whereas the majority visited the dentist when in pain (86.2%), followed by those who needed scaling and polishing (22.5%). A minimal number of participants visited the dentist for aesthetic issues (15.1%). Regarding oral hygiene practice, the majority used a brush and toothpaste (98.5%), whereas 35.1% and 34.3% of the participants used dental floss and mouth rinses, respectively. The frequency of tooth brushing was 43.7% twice/day, 34.1% once/day, and 18.5% more than twice/day; 3.7% did not brush their teeth. Most of the participants agreed to the statement regarding the main role of fluoride in caries prevention (66.7%), 28.6% had no knowledge, and 4.7% disagreed. Regarding toothpaste selection criteria, half of the participants used toothpaste with fluoride (Figure 1).

Regarding PF awareness, 34.8% responded correctly about the role of PF in caries prevention. Similarly, 35.6% accurately identified the different types of fluoride application methods, while the majority (56.5%) was ignorant. In addition, 57.3% had no knowledge about the regularity of fluoride application and 28.1% had never received fluoride. The remaining participants (14.5%) received different frequencies of PF. Regarding the dentist's role in PF awareness, 30.4% were advised by their dentists to have fluoride varnish applied in the clinic, whereas 24.7% did not receive any advice and 44.9% were not aware. Most subjects responded

Table 1: Distribution of participants according to demographic data and characteristics ($n = 405$).

Demographic variable		*n*	%
Age	18–25	137	33.8
	26–35	109	26.9
	36–45	95	23.5
	46–55	57	14.1
	>55	7	1.7
Marital status	Divorced	5	1.2
	Married	240	59.3
	Single	156	38.5
	Widow	4	1.0
Nationality	Non-Saudi	76	18.8
	Saudi	329	81.2
Level of education	Did not attend school	10	2.5
	High school or less	123	30.4
	Diploma	27	6.7
	Bachelor's degree or above	245	60.5
Occupation	Non-working	272	67.2
	Working	133	32.8
Number of family members including the study participant	≤4	91	22.5
	5–7	195	48.1
	≥8	119	29.4
Approximate family monthly income	12001–14000 SR	48	11.9
	≤7000 SR	163	40.2
	7001–12000 SR	89	22.0
	>14000 SR	105	25.9
	Total	405	100.0

SR, Saudi Riyal.

Table 2: Distribution of participants according to responses to dental caries experience indicators.

Caries indicator	No		I don't know		Yes	
	n	%	*n*	%	*n*	%
Presence of cavities	97	24.0	28	6.9	280	69.1
Presence of fillings	51	12.6	1	0.2	353	87.2
Missing teeth due to cavities	130	32.1	13	3.2	262	64.7
Dry mouth	283	69.9	38	9.4	84	20.7
PF statements	**Disagree**		**I don't know**		**Agree**	
Fluoride in toothpaste is more effective than in varnish	59	14.6	248	61.2	98	24.2
Fluoride varnish and gels are used only for kids	151	37.3	222	54.8	32	7.9
I should stop having professional fluorides during pregnancy	35	8.6	282	69.6	88	21.7

PF, professional fluoride.

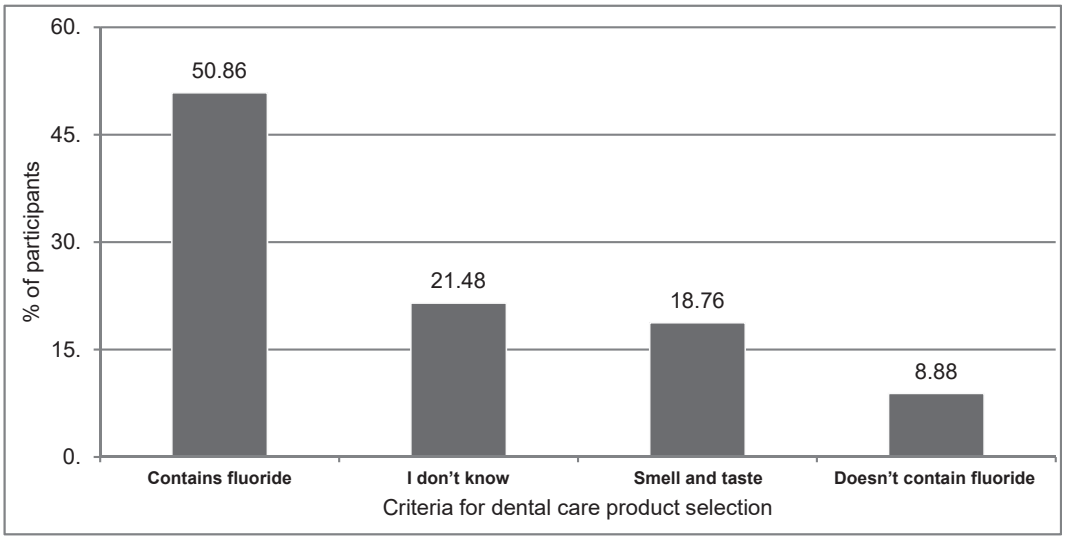

Figure 1: Distribution of participants according to preferred selection criteria for dental care products.

Table 3: Relationship of caries experience indicators with professional fluoride knowledge.

	PF role in caries prevention χ^2 (p value)	Forms of PF χ^2 (p value)	Frequency of receiving PF/year χ^2 (p value)
Presence of cavities	19.50 (0.003)	23.10 (0.001)	16.40 (0.008)
Presence of fillings	5.20 (0.51)	10.60 (0.103)	4.10 (0.943)
Missing teeth due to cavities	13.20 (0.04)	4.40 (0.628)	8.09 (0.916)

PF, professional fluoride.

"I don't know" regarding fluoride application safety, whether it is used for adults or only children, and the difference between PF and fluoride in toothpaste.

The relationship between participants' caries experience and PF knowledge is presented in Table 3. A statistically significant relationship was found among the presence of cavities, missing teeth due to cavities, and PF role in caries prevention. Furthermore, the latter showed a significant relationship with age, occupation, level of education, and number of family members. A significant relationship was also found between participants' occupation and frequency of receiving PF per year.

Discussion

This study evaluated the level of knowledge and perception of female adults in Almadinah Almunawwarah, KSA regarding the role of PF application in caries prevention. Approximately two-thirds of the subjects did not respond correctly to the role of PF or in what form it is provided. Only 14.5% reported receiving fluoride applications, which is less than that previously reported (34%) by Al-Sadhan et al.[11] This difference may be explained by disparities in oral health knowledge and accessibility to dental health practice in different geographic areas.[16] Living in a capital city could result in better exposure to oral health education programs and accessibility to dental health compared to smaller cities such as Almadinah Almunawwarah.

Our results showed that most participants experienced previous caries, represented by the presence of cavities, filled teeth, and tooth loss due to caries. A high prevalence of dental caries in KSA was found in previous studies conducted by Al-Ansari[2] and Parveen and Al-Khuraif,[3] especially among women. Moreover, a significant relationship was found between high caries experience and lack of knowledge regarding PF. Dental caries is a multifactorial disease in which dietary, salivary, and bacterial factors can contribute to its occurrence. Low level of topical fluoride exposure is an essential risk factor for caries initiation and progression. There is general agreement among different evidence-based clinical guidelines for caries management, including the ADA, Caries Management by Risk Assessment, and International Caries Classification and Management System, regarding PF application for caries prevention and management.[17–19] Therefore, a lack of fluoride application could lead to caries, which was experienced by our participants. This emphasizes the need for more research and educational programs among women on caries prevention methods in KSA.

Women were targeted in this study due to their essential role in the dental health community as mothers and caregivers, as well as their unique dental health concerns. Hormone levels fluctuate in women during the menstrual cycle, pregnancy, and menopause, which may impact their risk of dental caries.[20] Most of our sample were non-working married Saudi women, aged 18–35 years, with an education level of a bachelor's degree or higher. A total of 59.3% of our participants were married women; thus a lack of knowledge regarding fluoride may affect the dental health of their

children as well. Maternal perception about oral health has been associated with the dental health of their children.[21] For example, Banihani et al.[14] stated that there is a relationship between mothers with poor knowledge regarding caries prevention and oral health and the occurrence of early childhood caries (ECC). Mothers' knowledge, attitudes, and beliefs of ECC risk factors and barriers to accessing oral healthcare are important factors contributing to ECC. Therefore, improving maternal perception and awareness toward the oral health of their children through counseling programs would provide an effective strategy to prevent ECC.[22] Additionally, dental schools could play an essential role in increasing women's awareness regarding caries prevention, including PF application. This could be achieved by implementing public health education activities into dental degree programs, such as prenatal oral health and caries prevention education for pregnant women.[22]

Despite the overall lack of knowledge regarding PFs, the participants had more accurate knowledge about the role of fluoride in toothpaste as an effective caries preventive measure (66.7%). In addition, they preferred purchasing toothpaste containing fluoride (51%) and practicing dental hygiene at home by brushing at least once/day using fluoridated toothpaste. Such observations were expected due to the high level of education of many participants, in accordance with a previous study by Zakirulla et al.[15] regarding education level and oral health knowledge.

In our study, the difference in knowledge level regarding fluoride in toothpaste compared to PF was evident. This could be explained by the impact of toothpaste advertisements through media, which may enhance the public's knowledge of fluoride in toothpastes as a "cavity fighter." Alternatively, dentists could be responsible for individuals' awareness regarding PF application. Most of our participants responded that "they don't know if they've ever received fluoride application by their dentists," while some responded that "they have never received it." However, only one-third of the participants revealed that dentists advised them to apply fluoride varnish. This may indicate the dentists' failure to practice preventive and non-restorative management of dental caries. Lack of knowledge, inadequate participation in continuous learning activities, and product labeling issues may deter some dentists from practicing fluoride application and caries preventive measures.[23] Therefore, there is a compelling need for effective scientific meetings and lectures on PF application and other caries prevention methods. Furthermore, dental health facilities should encourage dental health practitioners to attend and participate in such activities to enhance their knowledge and awareness. Bonetti and Clarkson[7] stated that undergraduate and postgraduate dental education should implement fluoride application in the curricula to help emphasize this practice in future dentists.

This study had some limitations. First, the participants were from only one city (Almadinah Almunawwarah), so the results may not be applicable to women from different areas of KSA. Second, with online surveys, there is minimal control in who is answering the questionnaire. Hence, the eligibility criteria for participation were clarified before starting the questionnaire to minimize the possibility of sample contamination. Finally, although the internet is accessible in a wide range of areas and the questionnaire was distributed using social media, it may not have reached all women living in certain areas due to a lack of internet coverage. Thus, the results from this study should be considered with caution, and a more generalized cross-sectional study targeting women from all regions should be conducted in the future.

Conclusion

We conclude that there is a lack of knowledge among women in Almadinah Almunawwarah regarding PF application and its role in caries prevention. Therefore, the findings from this study underscore the need for more effective public education programs not only for home caries preventive care but also professional methods for caries prevention including fluoride application.

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Conflict of interest

The authors have no conflict of interest to declare.

Ethical approval

Ethical approval for this study was granted from the Research Ethical Committee at Taibah University College of Dentistry (TUCD-REC) (Reference No. TUCDREC/20200312/SAMSaleh, March 15, 2020).

Authors contributions

AAA: Conceptualization, methodology, validation, writing - original draft preparation, review and editing. MAA: Data curation and manuscript drafting. SAM: Methodology, data curation, and manuscript drafting. ROA: Data curation and manuscript drafting. BHZ: Data curation and manuscript drafting. All authors have critically reviewed and approved the final draft and are responsible for the content and similarity index of the manuscript.

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