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Impact of educational video intervention to improve oral health knowledge and beliefs among physicians and nurses

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Abstract

Background The most prevalent dental diseases have adverse effects on an individual's general health. To address this public health crisis and oral health disparity, collaborative efforts of health professionals are critical for dental disease prevention and optimal oral health. This study evaluated the effect of an educational video intervention on oral health knowledge, beliefs, and practices of physicians and nurses.

Methods This pre-post interventional study evaluated the immediate effects of a video-based oral health educational intervention given to nurses and physicians in Saudi Arabia. A self-administered questionnaire was distributed to participants to assess their oral health (OH) knowledge, beliefs, and practices of OH care. The study participants (physicians and nurses) were randomly exposed to two intervention groups (video or brochure) after which they responded to a post interventional survey. Means of knowledge and beliefs scores were calculated before and after the intervention. Logistic regression was applied to investigate the factors associated with good knowledge and beliefs after the educational intervention.

Results A total of 213 healthcare providers of whom 56% were physicians participated in this study. Knowledge of OH improved significantly ($p < 0.001$) after the intervention and was higher among females compared to males (16.86 to 19.54). The physicians showed more improvement post intervention compared to nurses (19.76 vs. 19.30, respectively) ($p < 0.001$). The overall belief scores for providing OH education did not change significantly post intervention ($p = 0.545$). Providing OH care to the patients and conducting an OH screening increased moderately after the intervention (44.6–55.4% and 44.6–55.4%, respectively).

Conclusion The video-based intervention was effective in improving the physicians' and nurses' knowledge, beliefs, and likelihood to incorporate OH care in their current practices. Males, Saudis, working in academia and more work experience were significantly associated with greater odds of having good knowledge after the intervention regardless of its type.

Clinical trial number Not Applicable.

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Keywords Oral health, Oral health promotion, Educational interventions, Interprofessional engagement, Health professionals

Introduction

Oral health is an integral part of general health affecting quality of life, social relationships, and self-confidence of individuals [1]. Although oral diseases are preventable, many communities still suffer from various health, social and economic consequences of oral diseases [2]. This highlights the need for collaborative efforts in order to detect and prevent oral diseases. In addition to dentists, other healthcare providers can play a pivotal role in oral and dental care [3, 4]. They can be involved in activities such as screening of oral diseases, emergency care, pain management, and referral of patients to dentists for preventive services and early interventions [5, 6]. Lack of knowledge and education [7, 8] as well as the lack of training [9–11] were the main factors reported by healthcare providers hindering their involvement in dental care. A necessary step in integrating oral health into practice of healthcare providers is providing training to them as well as integrating oral health in medical and nursing curriculum [6, 12].

Health literacy is the capacity to obtain, understand and process health information that enables an individual to make decisions regarding services needed by utilizing their cognitive and social skills [13, 14]. Several studies have reported positive outcomes of oral health education (OHE) interventions in terms of significant changes in oral health behaviors [15]. These improvements have occurred from education provided through a variety of mediums including information booklets, video education, practical demonstrations, and train-the-trainer models [6, 12, 16, 17]. Overall, these education programs proved to be effective in enhancing the knowledge, confidence, and practice of healthcare givers working in different settings [6, 12, 16].

The prevalence of oral diseases is high in Saudi Arabia with a caries prevalence ranging between 59% and 80% and a even higher prevalence of periodontal diseases reaching up to 100% among adults [18]. In Saudi Arabia oral cancer is the third most common cancer after lymphoma and leukemia [19]. Evidence-based research has confirmed the association between oral infectious processes, inflammation, and exacerbation of systemic diseases including diabetes and respiratory diseases, among others [20]. Suboptimal knowledge concerning oral-systemic associations amongst health care providers may place patients at higher risk for poor health outcomes and exacerbation of chronic conditions. Although current studies show that oral health literacy is associated with oral health knowledge and education, the effect of educational intervention on oral health literacy is controversial

[6, 12, 16]. Other studies suggested oral health hands-on training programs for people with lower education and literacy skills knowledge of the effectiveness of educational interventions for oral health facilitates identification of the best strategies to be applied in the context of health practices. It is crucial to understand how this type of intervention can improve oral health knowledge and beliefs among healthcare providers leading eventually to collaborative and interprofessional practices. This study evaluated the effects of a video-based Vs the traditional brochure educational intervention on oral health knowledge, beliefs, and practices of two groups of health professionals.

Methods

Study design and setting

A quasi-experimental design was employed to evaluate the effectiveness of two educational (video and a brochure) interventions on two groups of health professionals (physicians and nurses).

Study participants

Physicians and nurses practicing in both private and public sectors of Eastern Saudi Arabia were recruited for the study using snowball sampling technique [5]. A sample of 200 healthcare providers was determined based on the nature of the sampling technique feasibility and guided by power analysis considerations. Healthcare workers who did not examine the oral cavity, interns, and those who did not consent to participate in the study were excluded. Similarly, participants who completed only one survey, either the pre or the post intervention survey, were also excluded from the analysis. Responses from other healthcare workers (neither physicians nor nurses) were also excluded.

Data collection tool and procedure

We used a structured pre-validated questionnaire (Cronbach's Alpha = 0.816) [5] to collect pre and post data from the participants. The questionnaire consisted of four sections: sociodemographic data, oral health knowledge, beliefs and the last section investigated current participants dental care practices. The questionnaire was uploaded onto separate websites (<https://dentaldiseasebrochure.blog>) with a specific sequence for data collection. The first page of both websites started with a brief introduction of the study and consent of participation; after that participants were transferred automatically to the next page which contained the pre-intervention survey. After the participants had completed and submitted

the pre-survey, they were randomly directed to the next page which included the intervention (an educational video or an educational brochure) with the backward feature disabled. Randomization of the participants to either group was done using a website generator (<https://www.random.org>). After the participants were exposed to the intervention, they were automatically transferred to the post-survey page while maintaining the inability to return to the previous page. Educational materials as well as questionnaires were available in both English and Arabic languages. Questionnaires were pilot tested among 10 individuals from the target population who were excluded from the final analysis.

The intervention

The intervention consisted of two educational methods, a video (<https://files.fm/u/8evbnydracs>) and a brochure. Both educational materials explained the definition, risk factors, etiological factors, clinical presentation, and prevention of dental caries, gingivitis, and periodontitis. The main source of information used in both interventions was the official website of the Ministry of Health in the Kingdom of Saudi Arabia (<https://www.moh.gov.sa/en/AwarenessPlatform/OralHealth/Pages/default.aspx>) which is accessible to all healthcare workers. In addition, literature search was done to explore the content used in similar studies. The scientific content was then reviewed by the research team for coverage of main dental diseases, simplicity, and logical sequence. The content was based on needs assessment of a similar sample that was previously investigated for the level of oral health knowledge, beliefs, and interdisciplinary practices [5]. The educational intervention in this study was based on the principles of Ajzen's Theory of Planned Behavior [21] which predicts behavior/practice and has been used extensively in the healthcare field [22] and describes intention as the combined result of three elements: the individual's beliefs, subjective norms, and perceived behavioral control. Understanding a behavior its benefits, risks, or social implications influences how attitudes and beliefs about that behavior are shaped. Positive beliefs, supportive subjective norms, and a strong sense of perceived behavioral control enhance the intention to perform the behavior [21]. The actual execution of the behavior comes from solid intentions and sufficient perceived behavioral control. While knowledge can influence beliefs, it does not always lead to behavioral changes unless it is combined with strong intentions and a feeling of control, putting in mind that challenges such as lack of infrastructure, time, or resources can hinder converting intentions into actions, even when attitudes and beliefs are positive [21]. The post interventional survey also included an additional questions investigating

participants' satisfaction about the scientific content presented in both interventions.

Statistical analysis

Scoring of knowledge questions: For questions with a single correct answer, a score one was given for each correct answer and zero for wrong or "I do not know" answers. For questions with multiple correct answers, the whole set of correct answers was scored as "one" while choosing one or two correct answers was given "zero". The oral health knowledge section in the questionnaire was divided into three sub-categories, dental caries, gingivitis, and periodontitis. The individual's total knowledge score was the sum of points for all correct answers yielding a maximum score of thirteen. The average was taken as a cut point, anyone scoring below the average was categorized as "poor knowledge" and those scoring above the average were categorized as "good knowledge".

Scoring of beliefs questions: For the items included in the beliefs section, agree and totally agree responses were combined, and disagree and totally disagree responses were also combined. We measured the participants' beliefs by calculating the mean score of belief statements. The categorization into positive and negative was done following the same method implemented in knowledge scoring.

Data was downloaded from Google form in excel sheet, coded, and then transferred to SPSS (IBM Corp. Released 2011. IBM SPSS Statistics for Windows, Version 23.0. Armonk, NY: IBM Corp.) for analysis. Means and standard deviations were calculated for continuous data and frequency and percentages presented the categorical data. The Wilcoxon Signed rank test was used to compare the pre and post educational interventions. Logistic regression was applied to investigate the factors associated with good knowledge and beliefs pre and post educational intervention. *P*-values less than 0.05 were considered statistically significant.

Results

A total of 213 healthcare providers participated in this study. Most of the participants were in their twenties 131 (61%) and thirties 55 (27%), females 127 (59%) and were Saudi nationals 154 (72%). Physicians accounted for 119 (56%) and 94 (44%) were nurses, and the majority 140 (65%) were from the public sector. Overall demographic information is presented in Table 1.

The knowledge scores related to dental caries improved significantly from pre- to postintervention in the video and the brochure groups (9.5 ± 2.3 vs. 10.9 ± 2.2 , respectively) ($p < 0.0001$). Similarly, gingivitis and periodontics related knowledge scores also increased after the intervention (gingivitis; 5.2 vs. 5.6, respectively, periodontitis; 2.2 vs. 3.1, respectively) ($p < 0.005$).

Table 1 Demographical characteristics of participants (N = 213)

Variable	Responses	Frequency (%)
Age	Twenties	131 (61)
	Thirties	55 (27)
	Forties	18 (8)
	Fifty and above	9 (4)
Gender	Female	127 (59)
	Male	86 (41)
Nationality	Saudi	154 (72)
	Non-Saudi	59 (28)
Specialty	Nurse	94 (44)
	Physicians	119 (56)
Affiliation	Public Hospital	140 (65)
	Ministry of Health	16 (8)
	Teaching institute	23 (11)
	Private hospital	26 (12)
	Both private and public	8 (4)
Years practice	Less than 3 years	123 (58)
	3–6 years	33 (15)
	> 6 and less than 10 years	17 (8)
	> than 10 years	40 (19)

Table 2 shows the comparison of knowledge scores by demographic characteristics of the participants using bivariate analysis. Improvement of knowledge scores was greatest among the participants in their twenties (17 vs. 19.7, $p < 0.001$). Improvement of knowledge scores was higher in females after the intervention (16.86 to 19.54) when compared to males, but the change was significant

for both genders between pre and post knowledge scores ($p < 0.001$). Similarly, the physicians showed greater improvement after both interventions compared to the nurses (19.76 vs. 19.30 respectively) and both improvements were statistically significant within the specialty ($p < 0.001$) (Table 2).

The overall belief scores for providing OHE did not change significantly after both interventions (34.4 to 34.01, respectively) ($p = 0.545$). Table 3 shows the belief score variations by the demographic characteristics. The average belief score for age, gender and specialty did not change significantly post intervention. For nurses, the belief score decreased slightly after the intervention (34.84 to 34.45) ($p = 0.644$) but this decrease was not statistically significant. Whereas there was a significant decrease in the belief score among the Saudi nationals after both interventions (34.95 to 33.51, respectively) ($p = 0.041$). Similarly, participants working in private settings also scored less after the intervention (37.62 to 33.08, respectively) ($p = 0.007$).

Figure 1 presents the comparison of current practice regarding OHE before and after the two educational interventions. Providing OHE to the patients and conducting an oral health screening increased slightly after the intervention (44.6–55.4% respectively).

Feedback of the provided educational intervention is shown in Fig. 2. Most participants agreed or strongly agreed that the educational materials were easy to read/understand (83%), the intervention was clear (86%),

Table 2 Bivariate analysis showing the score of OH knowledge comparison pre and post the educational intervention with the participants demographic characteristics

Demographical characteristics		OH knowledge			p-value
		Pre	Post	Mean Difference	
Age	Twenties	17 ± 3.8	19.7 ± 3.9	-2.7	0.001*
	Thirties	16.87 ± 3.99	19.42 ± 4.08	-2.55	0.001*
	Forties	16.11 ± 4.34	18.78 ± 3.84	-2.67	0.024*
	Fifty and above	18.56 ± 3.84	19.78 ± 4.63	-1.22	0.435
Gender	Female	16.86 ± 3.79	19.54 ± 4.12	-2.68	0.001*
	Male	17.05 ± 4.01	19.59 ± 3.65	-2.54	0.001*
Nationality	Saudi	17.14 ± 3.94	20.05 ± 3.76	-2.91	0.001*
	Non-Saudi	16.41 ± 3.67	18.29 ± 4.11	-1.88	0.009*
Specialty	Nurse	16.09 ± 3.9	19.30 ± 4.21	-3.21	0.001*
	Physicians	17.59 ± 3.7	19.76 ± 3.69	-2.16	0.001*
Affiliation	Public Hospital	16.81 ± 3.86	19.53 ± 3.93	-1.5	0.001*
	Ministry of Health	16.94 ± 3.53	18.69 ± 4.16	-4.5	0.061
	Teaching institute	17.87 ± 4.31	21.09 ± 2.41	-2.72	0.001*
	Private hospital	17.15 ± 4	19.92 ± 4.3	-1.75	0.007*
	Both private and public	15.75 ± 3.49	16.38 ± 4.34	-3.22	0.521
Years practice	Less than 3 years	16.79 ± 3.75	19.68 ± 3.85	-2.77	0.001*
	3–6 years	17.58 ± 4.44	19.61 ± 4.21	-0.63	0.017*
	more than 6 and less than 10 years	17.18 ± 3.45	18.41 ± 3.86	-2.89	0.296
	more than 10 years	16.75 ± 4	19.65 ± 4.07	-2.03	0.001*

*Statistically significant at 0.05

Table 3 Bivariate analysis comparing participants' scores of beliefs pre and post educational intervention

Demographical variables		Beliefs			
		Pre	Post	Mean Difference	P-value
Age	Twenties	33.9 ± 8.8	33.6 ± 10.2	0.3	0.774
	Thirties	34.87 ± 9.01	35.38 ± 9.82	-0.51	0.724
	Forties	37 ± 9.49	32.72 ± 7.7	4.28	0.15
	Fifty and above	34.44 ± 4.9	33.67 ± 4.24	0.77	0.604
Gender	Female	34.35 ± 8.32	34.45 ± 9.93	-0.1	0.906
	Male	34.5 ± 9.41	33.3 ± 9.39	1.2	0.308
Nationality	Saudi	34.95 ± 9.24	33.51 ± 9.64	1.44	0.041*
	Non-Saudi	32.98 ± 7.23	35.24 ± 9.87	-2.26	0.187
Specialty	Nurse	34.84 ± 9.8	35.43 ± 11.01	-0.6	0.644
	Physicians	34.07 ± 32.84	32.84 ± 8.40	1.05	0.093
Affiliation	Public Hospital	34.09 ± 8.86	34.56 ± 9.91	1.66	0.619
	Ministry of Health	33 ± 8.59	32 ± 7.15	9.5	0.592
	Teaching institute	33.13 ± 8.49	33.57 ± 7.99	-0.47	0.781
	Private hospital	37.62 ± 9.02	33.08 ± 12.03	1	0.007*
Years practice	Both private and public	36.13 ± 5.77	32.13 ± 7.45	-0.44	0.107
	Less than 3 years	33.97 ± 8.81	33.46 ± 10.28	4.54	0.597
	3–6 years	33.97 ± 8.29	34.03 ± 7.95	4	0.965
	more than 6 and less than 10 years	33.71 ± 7.36	32.24 ± 7.74	0.51	0.484
	more than 10 years	36.43 ± 9.47	36.3 ± 9.88	-0.06	0.946

*Statistically significant at 0.05

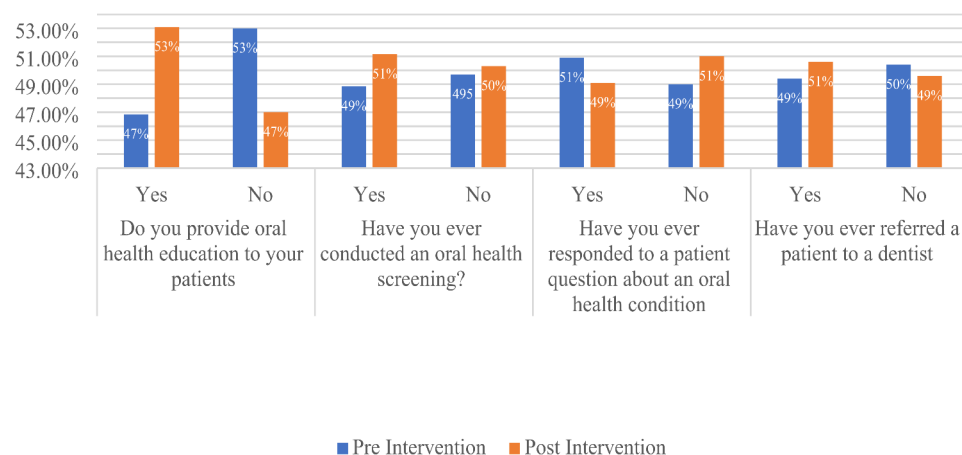
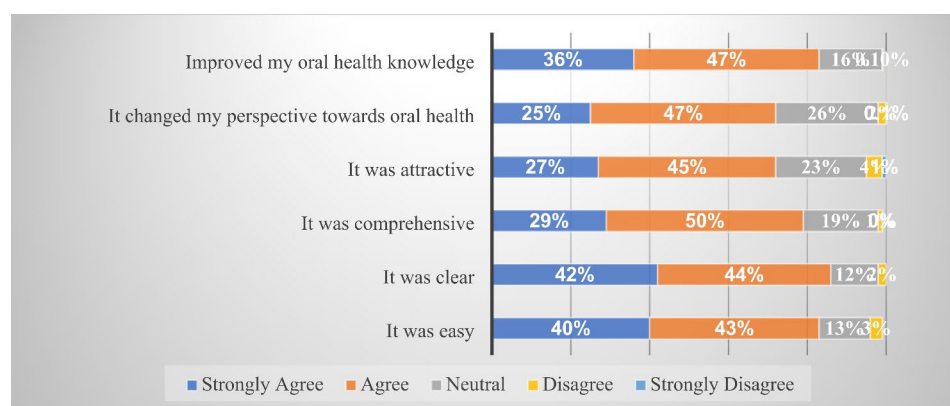
**Fig. 1** Comparison of healthcare providers' practices before and after the educational intervention**Fig. 2** Perception of the study participants about the educational intervention

Table 4 Bivariate analysis comparing changes in OH knowledge, beliefs, and practices after the intervention

Study outcomes			Education Material		p-value
			Brochure	Video	
Knowledge score (mean $\pm$ SD)			18.4($\pm$ 4.2)	20.3($\pm$ 3.6)	0.001*
Beliefs (mean $\pm$ SD)			33.3($\pm$ 10.6)	34.4($\pm$ 9.1)	0.435
Practices	Do you provide oral health education to your patients	Yes	42.2%	57.8%	0.082
		No	31.8%	68.2%	
	Have you ever conducted an oral health screening?	Yes	42.1%	57.9%	0.1
		No	32.6%	67.4%	
	Have you ever responded to a patient question about an oral health condition	Yes	43.0%	57.0%	0.072
		No	32.3%	67.7%	
	Have you ever referred a patient to a dentist	Yes	37.2%	62.8%	0.477
		No	38.6%	61.4%	

Table 5 Logistics regression for the factors associated with good OH knowledge and positive beliefs among the participants

Demographical variables		OHK		Beliefs	
		Pre	Post	Pre	Post
		OR (95%CI)	OR (95%CI)	OR (95%CI)	OR (95%CI)
Age	Twenties	1			
	Thirties	0.57 (0.21–1.56)	0.54 (0.22–1.31)	1.65 (0.7–3.86)	1.242 (0.54–2.858)
	Forties	1.15 (0.18–7.23)	0.36 (0.07–1.79)	1.71 (0.36–8.08)	0.766 (0.163–3.593)
	Fifty and above	1.95 (0.24–15.97)	0.99 (0.14–7.13)	2.49 (1.37–16.91) *	1.29 (0.2–8.31)
Gender	Female	1			
	Male	1.07 (0.53–2.16)	1.16 (1.6–2.27) *	1.08 (0.57–2.02)	1.344 (0.714–2.531)
Nationality	Saudi	1.01 (0.37–2.72)	4.09 (1.69–9.91) *	1.77 (0.77–4.06)	1.128 (0.497–2.561)
	Non-Saudi	1			
Specialty	Nurse	1			
	Physicians	2.36 (1.02–5.46)*	0.77 (0.35–1.68)	0.85 (0.41–1.77)	0.739 (0.361–1.514)
Affiliation	Public Hospital	1			
	Ministry of Health	0.67 (0.19–2.4)	0.41 (0.13–1.26)	0.96 (0.32–2.88)	0.469 (0.147–1.504)
	Teaching institute	2.56 (0.96–6.84)	1.26 (1.46–3.47) *	0.85 (0.33–2.16)	0.745 (0.292–1.904)
	Private hospital	1.18 (0.46–2.99)	0.93 (0.37–2.36)	2.25 (1.88–5.72)*	0.745 (0.31–1.794)
	Both private and public	0.34 (0.04–3.04)	0.24 (0.04–1.34)	1.77 (0.37–8.48)	0.418 (0.076–2.293)
Years practice	Less than 3 years	1			
	3–6 years	3.21 (1.19–8.65) *	1.95 (0.76–4.97)	1.05 (0.43–2.54)	0.99 (0.413–2.375)
	> 6 and less than 10 years	1.59 (0.37–6.87)	0.73 (0.2–2.65)	0.41 (0.11–1.44)	0.606 (0.173–2.12)
	more than 10 years	1.26 (0.25–6.32)	2.36 (1.62–8.92) *	1 (0.28–3.56)	1.118 (1.016–3.959) *

*Statistically significant at 0.05

comprehensive (79%) and it helped to improve their knowledge (83%).

Table 4 shows that the knowledge score was significantly higher among the participants who participated in the video education (20.3 $\pm$ 3.6) compared to those who got the brochure education (18.4 $\pm$ 4.2) (p = 0.001). The belief score did not differ significantly between the two educational groups (video = 34.4 $\pm$ 9.1 vs. brochure = 33.3 $\pm$ 10.6) (p = 0.435).

Table 5 shows the factors associated with good knowledge and beliefs of healthcare professionals before and after the educational intervention. Being a physician (OR = 2.36; 95%CI: 1.02–5.46), and having 3–6 years of practice in the medical field (OR = 3.21; 95%CI: 1.19–8.65) were significantly associated with the greater odds of having good oral health knowledge before the

intervention whereas, male participants (OR = 1.16; 95%CI: 1.6–2.27), Saudi nationals (OR = 4.09; 95%CI: 1.69–9.91), teaching in institutes (OR = 1.26; 95%CI: 1.46–3.47) and having more than 10 years of practice (OR = 2.36; 95%CI: 1.62–8.92) were significantly associated with greater odds of having good knowledge after the intervention.

However, before the intervention, the age of fifty years and above (OR = 2.49; 95%: 1.37–16.91) and working in private hospital (OR = 2.25; 95%CI: 1.88–5.72) were statistically significantly associated with positive beliefs towards OH. Working more than 10 years in dental practice (OR = 1.12; 95%CI: 1.02–3.96) was also significantly associated with the positive beliefs of the participants after educational intervention.

Discussion

This pre and post interventional study showed that oral health education among health professionals was effective to improve OH knowledge significantly. The video education was superior in improving the OH knowledge compared to the traditional brochure education. The physicians showed substantial improvement in OH knowledge after the intervention. Males, Saudis, working in academia and more work experience were significantly associated with greater odds of having good knowledge after the intervention regardless of its type.

Multiple studies have shown inadequate knowledge of oral health among healthcare providers in different countries [6, 12, 16, 17]. The effectiveness of different interventions on improving OH knowledge has also been explored [9, 10]. The current study observed an improvement of OH knowledge after the intervention. In terms of gender, females reported higher knowledge scores than males which is consistent with previous studies [1–8]. A previous study analyzing academic performance among Saudi students found that female students outperformed male students in mathematics and science [23]. National studies evaluating gender differences with regards to knowledge about medical and health conditions have also reported females having better knowledge compared to males [24, 25]. In the current study it was also found that physicians had more knowledge than nurses, in line with a previous study that found that among healthcare providers, physicians showed more OH knowledge than nurses [1]. This could be due to the study of oral cavity and some dental conditions as part of the formal medical education [26]. Furthermore, examination of oral cavity can be part of the routine practice in certain medical specialty education/training [1]. However, oral assessment could be performed as an initial examination by nurses as part of their patient screening. Improving nurses' knowledge regarding oral assessment and referral of the patients is clearly needed; previous studies indicate that nurses can effectively provide OH care for patients complaining from dental issues [6, 11, 12].

Surprisingly there was a significant decrease in the pre- to posttest beliefs regarding OH care among physicians, Saudi nationals and those working in the private sector while positive beliefs increased among nurses' post intervention. The later finding was similar to what was reported by Haber et al. 2020 [27] and Wu et al., 2020 [28]. The impact of knowledge on beliefs is controversial. Some research has found that OH education was less effective in changing the beliefs of the participants when compared to changes in knowledge or practices [29]. Others have reported that OH education is effective in improving the knowledge, beliefs and practice of OH care [30]. The current study evaluated the effects of the intervention immediately after the intervention which

might have not allowed time for the participants to comprehend the information given and reflect on their learning with these two leading to increased confidence about one's knowledge which in turn leads to positive beliefs about one's capabilities. Some theories of belief change propose that the addition of novel information to a belief set can cause a reevaluation of one's knowledge and may lead to an alteration in the structure of an entire concept or set of beliefs [31]. It is also possible that the drop in belief scores after the educational intervention is the result of e.g. cognitive dissonance, resistance to change, social pressures, or the complexity of integrating new knowledge [21]. The observed drop in beliefs may also be influenced by cultural, religious, and contextual factors such as deeply held beliefs, professional hierarchies, gender dynamics, and workplace challenges which different results were reported based on context and target group [31]. Understanding these mechanisms can help design more effective interventions that account for the psychological and social factors influencing belief change.

The literature has often reported that practices may not be affected by increasing knowledge but could affect the level of confidence [32], however increased OH knowledge, high perceived comfort levels, more encounters with OH problems were predictors of performing OH related services in some studies [12]. Nurses practice in a context where it is possible to conduct oral assessments and implement procedures to optimize oral health [33]. Despite this, literature suggests that many nurses still lack confidence in both undertaking structured OH assessments and promoting good OH practice to patients [33]. A recent study reported that nurses who participated in an OH education program showed higher levels of positive OH behaviors and practices, such as explaining toothbrushing techniques and how to prevent cavities to patients and improved levels of dentist referrals [27]. In the current study participants' confidence to perform OH education, oral screening and referral increased after the intervention. Improvement in role of healthcare providers in dental care is possible with education interventions and can result in increased capability to make dental referrals, conduct OH assessments and educate patients on OH care [33]. This is considerably more likely to be successful when implementation factors which provide professional support are present. Education without some form of support to change practice is unlikely to be implemented sustainably as such support from management, mentoring and procedural change are crucial.

Although there was a difference in knowledge score between the two educational methods, no statistically significant difference was observed between the belief scores. Health educational interventions improve health through the gaining of sound knowledge and learning skills, that leads to actions conducive to health [34].

However, pure acquisition of health knowledge does not always lead to correct health behaviors [35]. As such these interventions should be repeated to increase learning retention and encourage the adoption of desirable practices leading to positive beliefs [36]. Videos displayed or streamed to healthcare professionals through mobile applications or office computers can be a viable approach to the acquisition and sustainability of oral health knowledge, beliefs, and practice among healthcare providers over time.

Participants agreed that the provided materials were clear, simple, and helped in improving their knowledge about oral health. Our results indicated that the video education resulted in greater improvement in knowledge than the brochure method, in line with previous studies that found videos to be more effective than brochures [13, 14]. Brochures can be preferred by those who are more traditional in their learning, while videos could be more suitable for educating younger people and for example those who do not have time to read printed materials [37]. Technology efficiently facilitates designing educational materials and providing health-related information by acting as a powerful channel to the targeted audience. In healthcare education, videos with animation can have a significant impact and can be effectively used as an educational resource. This allows the intended audience to access information virtually and remotely, as often as needed, to improve their learning experience [38]. Educational videos have become an important part of higher education, providing an important content-delivery tool in many flipped, blended, and online classes. Effective use of videos as an educational tool is enhanced when instructors consider three elements: how to manage cognitive load of the video; how to maximize student engagement with the video; and how to promote active learning from the video [39]. Every person has a different learning style or characteristic for processing information. Based on differences in learning style, various educational methods can have a role in OH education programs [40]. It has been well recognized that a single mode of health education can never suit all learners. With the advancement in technology there is a need for amalgamation of various newer methods in imparting oral health education. Audiovisual demonstration through illustration clarifies any point better than other techniques, and an educational film makes use of the provided information possible.

The current study has some limitations; the selection method of the participants might have favored health professionals with a positive beliefs towards oral health to take part. In addition, the self-reported information, although being a convenient way to evaluate practices, could introduce socially desirable responses. The survey questions were mostly presented in a 'tick all that apply'

format and the majority of the responses listed in the knowledge questions were correct, leaving little room for participants to make any potential errors or reveal knowledge deficiency in a particular area. Surveys with structured questions may also have some typical shortcomings, such as over and under-reporting. The study population only included practitioners from Eastern Saudi Arabia which did not allow for comparison with healthcare providers practicing in other provinces. The sampling technique used in the current study may inherently favor participants who are more inclined toward oral health education. This might have led to overrepresentation of specific characteristics in the study. Lastly, the short time between the pre- and post-test survey to bring about a substantial change may be considered as another limitation of this study. Future studies addressing the contextual or methodological limitations in the current study (e.g., short time frame, self-report bias, participants re-evaluating their actual knowledge or practice) are therefore needed.

Conclusion

This study analyzed the benefits of video based OH education for healthcare providers and found a significant improvement of oral knowledge among physicians and nurses after the intervention. Understanding the state of research in this area has important implications for medical education and future evaluations of OH curricula for health students. Given the bidirectional relation between oral and general health, maintaining the oral health of patients needs collaborative efforts between health professionals. Improving the knowledge of physicians and nurses about oral health is needed to provide the optimum treatment for patients.

Implications for practice

- Educating healthcare providers about oral health can foster better collaboration between medical and dental professionals, leading to more comprehensive patient care such integration can also help in addressing oral health disparities and reducing the burden of oral diseases.
- Video-based training is a flexible and cost-effective way to provide continuing education to large numbers of healthcare professionals and can be tailored based on needs and demands. As such administrators and policy makers can offer CME credits or other professional development incentives to encourage physicians and nurses to complete video-based oral health training.

Author contributions

BG conceptualization and material development, acquisition of data and writing the first draft of the manuscript. AK material development, acquisition

of data and writing the first draft of the manuscript. TS, RT acquisition of data and writing the first draft of the manuscript. FF and EB data analysis and interpretation, and critical revision of the manuscript. JV design of the study and critical revision of the manuscript. All authors revised and approved the final version of the manuscript.

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Data availability

The data can be provided by the principal investigator upon reasonable request.

Declarations

Ethics approval and consent to participate

The study protocol has been carried out under relevant guidelines and regulations and was approved by the Deanship of Scientific Research, Imam Abdulrahman bin Faisal University (IRB- 2024-02- 324). The online survey was preceded by an introduction about the study objectives, study team and the time needed to complete the survey. Participants were assured of the confidentiality and anonymity of their responses and of their voluntary participation. Informed consents were obtained from participants by ticking on a checkbox stating that they have read and understand the study purpose, their rights and agree to participate in the study. Only participants who agreed to participate could proceed to the survey.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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