

Original Research Article

Beliefs in oral cancer in an adult population in Medellín, Colombia: a cross-sectional study

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Abstract – Background: Oral cancer ranks 16th among the most frequent malignant neoplasms worldwide, with a mortality rate of 54% within the first 5 years after diagnosis. It is crucial to develop strategies to improve cure and survival rates. **Objective:** To develop, validate, and apply an instrument on beliefs about oral cancer to guide future educational, promotional, and preventive activities for this disease. **Methods:** Cross-sectional study in 318 adults. Content was validated using Lawshe's criteria, and Confirmatory Factor Analysis was used to assess structural validity. Internal consistency was calculated with Cronbach's Alpha. Mann-Whitney *U* tests were used to compare medians of dimensions based on demographic variables. **Results:** The final instrument included 18 items across three dimensions (threat, benefits, and cues to action), with adequate fit indicators: RMSEA: 0.051 (95% CI: 0.038–0.063), CFI: 0.93, TLI: 0.916, SRM: 0.063. Internal consistency was good (Alpha between 0.65 and 0.85). 67.3% of participants were women. Significant differences were observed between men and women ($p=0.040$) and between participants over and under 40 years old ($p < 0.001$), in perceived threat as well as in cues to action ($p < 0.001$). **Conclusion:** The Oral Cancer Belief Instrument demonstrated adequate validity and consistency, making it a reliable tool for promoting health prevention strategies.

Introduction

Oral cancer ranks 16th among the most common malignant neoplasms in the world [1], and squamous cell carcinoma (SCC) accounts for 91% of these cases. Nearly 50% of individuals diagnosed with this condition die within five years [2], and those who survive experience a negative impact on their quality of life, as their functions, aesthetic appearance, and psychological well-being are compromised [3]. It is necessary to develop strategies for the prevention, identification, and reduction of individual and collective risks, early detection of the disease, and the implementation of health education plans to increase cure and survival rates [4,5].

For the development of any health strategy, factors related to the individual must be considered including their beliefs, [6], as the perceptions or convictions that individuals have about the likelihood of an event occurring and the consequences of that event. In health, the Health Belief

Model (HBM) addresses this need by including a cognitive/perceptual component. The HBM seeks to explain behaviours such as individual responses to symptoms, adherence to medical treatments, self-examination practices, and individuals' participation in promotion and prevention programs [7,8]. The main value of the model lies in its applicability to large population groups, serving as a quantitative instrument, and after validation, it allows for method replication in other populations, associating beliefs with the cultural environment [8,9].

The model focuses on four dimensions: (1) **Perceived Threat:** assesses how individuals perceive their vulnerability to disease, as well as their beliefs about the severity of contracting it, the consequences of not treating it, and the social impact of suffering from it. (2) **Evaluation of Behaviours-Barriers:** assesses how individuals perceive the obstacles or barriers they face when attempting to change behaviour. (3) **Evaluation of Behaviours-Benefits:** assesses the importance an individual places on committing to a behaviour that reduces the disease risk. (4) **Cues to Action:** identifies the types of stimuli necessary

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to trigger health-related decision-making, whether internal (symptoms) or external (recommendations from others or information from the media). Some versions include the dimension of self-efficacy as a key component in the self-management of healthy behaviours [8].

One strategy to understand health beliefs is to apply instruments, as it is a low-cost technique that allows for reaching more participants and facilitates data analysis [10]. Additionally, if the instrument is validated, it provides better insight into the behaviour of people facing or experiencing an event, enabling more accurate intervention planning. In this regard, the number of studies and validated instruments related to the HBM in oral cancer is limited. However, it is effective in characterizing a population and designing educational strategies that positively impact early detection and reduce morbidity and mortality from this cause in our setting [10].

Oral health beliefs have been explored in some studies; however, beliefs regarding oral cancer have been less explored, possibly due to a professional-focused approach or the lack of instruments for measuring them [11–13]. Additionally, studies addressing beliefs about oral cancer tend to focus on healthcare professionals, where moderate knowledge and screening practices are reported [12]. However, from the patient's perspective, the topic is underexplored. Previous studies in Asia with immigrants identified a general lack of knowledge about the risk of oral cancer (43–76%), and more than 50% of people with one or more risk behaviours for oral cancer, such as smoking [13]. Nevertheless, the subject is rarely studied in Colombia and Latin America.

For all these reasons, it was considered necessary to develop, validate, and apply an instrument on beliefs about oral cancer that could be used and implemented to guide future educational, promotional, and preventive activities for this disease in Colombia.

Methodology

Design and population

A cross-sectional study was conducted and an instrument on beliefs about oral cancer was validated. The general population treated in the clinics of the School of Dentistry at the University of Antioquia participated, using non-probabilistic sampling according to the clinic's schedule.

Design phase and content validity

Seven experts and two regular patients from the clinics participated in the evaluation process, with the aim of achieving a Content Validity Index (CVI) of 0.58 or higher [14–16]. The experts were dentists with a postgraduate degree and with at least two years of clinical experience.

Application phase and validity of structure and internal consistency

A sample of no fewer than five participants per item was calculated to reach adequate validity levels [16]. The original

version of the instrument consisted of 62 items, which were reduced to 48 items after the first round of development for application to the population. Based on this number of items, a sample of 240 individuals was required. The final sample consisted of 318 individuals.

Instruments

The Survey of Beliefs about Oral Cancer (SBOC) is a 48-item, self-administered scale from the first phase of this study. Each item was rated on a six-point Likert scale, where 1 = strongly disagree, 2 = moderately disagree, 3 = somewhat disagree, 4 = somewhat agree, 5 = moderately agree, and 6 = strongly agree. Scores were calculated by dimension and for the total scale, corresponding to the sum of the responses to each item.

The SBOC was built on the theoretical foundation of the Health Belief Model, which is based on the construct of beliefs, attitudes, and practices, with four dimensions: 1. Perceived threat: consists of 18 items. 2. Evaluation of behavioral barriers: consists of 9 items. 3. Evaluation of Behaviors-Benefits: consists of 7 items, and 4. Cues for Action: consists of 14 items.

Procedure and analysis

Design phase and content validity

In the initial phase, the first version of the survey with 62 items was developed based on the literature. Subsequently, the appearance and content of the survey was evaluated by six experts and two patients, resulting in a revised version with 49 items. After a second round with seven experts (four from the first round and three new participants), two items were added, three items were removed, and a final version of 48 items was approved for administration to patients. The process used the Delphi method, supported by an instruction manual and an Excel template which was used by the experts to assess the sufficiency, clarity, coherence, and relevance of each item. Items were rated on a scale of 1 to 4, with responses categorised as "essential" (ratings of 3 and 4) or "non-essential" (ratings of 1 and 2).

For the essential/non-essential options, the content validity index (CVI) proposed by Lawshe [14] was calculated as the average of the acceptable items. The minimum acceptable CVI was 0.58 [11,12]. In addition, Fleiss' [14] kappa was used to assess inter-expert agreement, with kappa values considered fair (0.40 to 0.60), good (0.60 to 0.75), and excellent (greater than 0.75).

Application phase and validation of structure and internal consistency

In order to assess the structural validity of the survey, a confirmatory factor analysis (CFA) was conducted using a structural equation modelling approach. The Weighted least squares (WLS) method and oblique geomin rotation were used. Model fit was assessed using the Comparative Fit Index (CFI)

Table I. Sociodemographic characteristics of participants.

Characteristic	<i>n</i>	Percentage
Sex		
Male	85	26.7
Female	214	67.3
Other	8	2.5
No answer	11	3.5
Education level		
No studies	1	0.3
Elementary	40	12.6
High school	119	37.4
Technical	67	21.1
Technological	32	10.1
Professional	43	13.5
Postgraduate	12	3.8
No answer	4	1.3
Marital status		
Single	127	39.9
Married	93	29.2
Divorced	23	7.2
Widow	7	2.2
Common-law union	56	17.6
No answer	11	3.5
Residence area		
Rural	23	7.2
Urban	287	90.3
No answer	8	2.5
Socioeconomic level		
Low	146	45.9
Medium	149	46.9
High	9	2.8
Does not respond	14	4.4
Occupation		
Student	47	14.8
Employed	86	27.0
Self-employed	84	26.4
Housework	59	18.6
Unemployed	19	6.0
Retired/Pensioned	16	5.0
Other	5	1.6
No answer	2	0.6
Ethnicity		
White	90	28.3
Mestizo	169	53.1
Indigenous	1	0.3
Other	6	1.9
No answer	52	16.4
Type of insurance		
Contributory	174	54.7
Subsidized	75	23.6
Linked	24	7.5

Table I. (continued).

Characteristic	<i>n</i>	Percentage
Special regimen	4	1.3
Exception regimen	1	0.3
No answer	40	12.6
Sample size	318	

and the Tucker-Lewis Index (TLI), with values close to 0.90 indicating good fit, and the Root Mean Square Error of Approximation (RMSEA), with acceptable values ranging between 0.04 and 0.08 [17]. The internal consistency of the survey and its dimensions was assessed using Cronbach's alpha, with values between 0.7 and 0.9 considered acceptable [14,15,16].

Additionally, differences in SBOC scores by socio-economic variables were examined. Due to the non-normal distribution of the scores and their dimensions, non-parametric tests (Mann-Whitney *U* and Kruskal-Wallis) were used. A significance level of 0.05 and a confidence level of 95.0% were accepted for the tests. Analyses were performed using STATA version 14.

Results

Of the 318 participants in the study, 214 were women (67.3%) and 85 were men (26.7%), ranging in age from 18 to 83 years, with a mean age of 42 years (SD 15.1). Of the participants, 37.4% had completed high school and 21.1% had a technical education. The majority of participants belonged to the middle (46.9%) and lower socioeconomic classes (45.9%) (Tab. I).

Face validity and expert judgment

Two rounds of Delphi were conducted. In the first round, 62 items were validated, resulting in 49 items. In the second round, the 49-item scale was evaluated, resulting in the elimination of 3 items: "Healthy food is more expensive", "I have more important things to think about than mouth cancer", and "I never talk about mouth cancer with my friends or family". Two new items were added, resulting in a final version of 48 items to be administered to the population. Coherence and clarity indicators showed adequate CVI and kappa values; relevance indicators showed moderate results, with kappa values close to 0.6 (Tab. II).

Structural validity and internal consistency

The 48-item version, resulting from the content validation process with experts, was subjected to Confirmatory Factor Analysis (CFA) to assess whether the theoretical four-dimensional model fit the empirical data. During the CFA process, the model was reduced from 48 to 18 items. This final

Table II. Indicators of content validity and agreement of the SBOC.

Dimension	Final items (Round 2)	Coherence		Relevance		Clarity	
		CVI	K	CVI	K	CVI	K
Perceived threat	Oral cancer exists	0.9	0.8	0.9	0.8	0.9	0.8
	Oral cancer can cause death	0.9	0.8	1.0	1.0	0.9	0.8
	Someone in my family could develop oral cancer	1.0	1.0	0.6	0.4	1.0	1.0
	Frequent sun exposure can cause oral cancer	0.9	0.8	0.6	0.4	0.9	0.8
	If I practice oral sex, I am at risk of developing oral cancer	0.9	0.8	0.6	0.4	0.9	0.8
	Adults are at higher risk for oral cancer	1.0	1.0	0.6	0.4	1.0	1.0
	A lump in the mouth may indicate the presence of cancer	0.9	0.8	0.7	0.7	0.9	0.8
	The mouth can reflect my general health status	1.0	1.0	0.6	0.4	1.0	1.0
	I can develop cancer in my mouth	0.9	0.8	0.7	0.7	0.9	0.8
	Oral cancer can be inherited	0.9	0.8	0.9	0.8	0.9	0.8
	Oral cancer can be contagious	0.9	0.8	0.7	0.7	0.9	0.8
	It's normal for a mouth sore to last more than two weeks	0.9	0.8	0.9	0.8	0.7	0.6
	A mouth sore may indicate the presence of cancer	1.0	1.0	0.9	0.8	1.0	1.0
	Oral cancer can cause pain	0.7	0.7	0.9	0.8	0.9	0.8
	Frequent alcohol consumption can cause oral cancer	0.9	0.8	1.0	1.0	0.9	0.8
	Smoking can cause mouth cancer	0.9	0.8	1.0	1.0	0.9	0.8
	A poor diet can cause oral cancer	0.9	0.8	0.7	0.7	1.0	1.0
	A change of color in the mouth could be a sign of oral cancer	0.9	0.8	1.0	1.0	0.9	0.8
Barriers	I am afraid to go to the dentist	0.9	0.8	0.9	0.8	0.9	0.8
	I don't consult because I am afraid they tell me I got cancer	0.7	0.7	0.7	0.7	0.9	0.8
	<i>Healthy foods are more expensive*</i>	0.6	0.4	0.3	0.1	0.9	0.8
	A disability decreases my income	0.9	0.8	0.4	0.2	0.9	0.8
	I don't have money to see a doctor or dentist	1.0	1.0	0.7	0.7	1.0	1.0
	I don't have time to see a doctor or dentist	0.9	0.8	0.6	0.4	1.0	1.0
	I don't consult because I don't have social security	1.0	1.0	0.6	0.4	1.0	1.0
	It's very difficult for me to get transport to the health center	0.9	0.8	0.6	0.4	0.9	0.8
	<i>I have more important issues than thinking about mouth cancer*</i>	0.7	0.7	0.4	0.2	0.7	0.6
	Oral cancer can be cured	0.9	0.8	1.0	1.0	0.9	0.8
Benefits	<i>I never talk about oral cancer with my friends or family*</i>	0.4	0.2	0.3	0.1	0.6	0.1
	Oral cancer can make it difficult for me to communicate or eat	0.7	0.7	0.6	0.4	1.0	1.0
	It's worth investing money to prevent oral cancer	0.7	0.7	0.7	0.7	0.9	0.8
	It's worth being informed about oral cancer	0.9	0.8	1.0	1.0	0.9	0.8

Table II. (continued).

Dimension	Final items (Round 2)	Coherence		Relevance		Clarity	
		CVI	K	CVI	K	CVI	K
Cues for action	It is better to invest first in health rather than other things	0.9	0.8	0.6	0.4	0.9	0.8
	Early consultation can help to detect oral cancer	0.9	0.8	1.0	1.0	0.9	0.8
	Modifying lifestyle habits can reduce the risk of developing oral cancer	0.9	0.8	1.0	1.0	0.9	0.8
	I talk to other people about healthy lifestyle habits.	0.9	0.8	0.7	0.7	0.7	0.6
	I check my mouth regularly to identify changes.	0.9	0.8	1.0	1.0	0.9	0.8
	Newspapers and magazines are good sources for reading about oral cancer.	1.0	1.0	0.7	0.7	1.0	1.0
	There are TV programs that provide information about oral cancer.	0.9	0.8	0.7	0.7	0.9	0.8
	There are health campaigns to prevent and detect oral cancer.	0.9	0.8	0.9	0.8	0.9	0.8
	I believe there are radio programs that talk about oral cancer.	0.9	0.8	0.9	0.8	0.9	0.8
	Social media and the internet are good tools for learning about oral cancer.	0.9	0.8	1.0	1.0	0.9	0.8
	The social security entities have prevention programs for oral cancer.	0.9	0.8	1.0	1.0	0.7	0.6
	Health professional recommendations help prevent oral cancer.	0.9	0.8	1.0	1.0	0.9	0.8
	I feel capable of recognizing a change in my mouth.	0.9	0.8	0.7	0.7	0.9	0.8
	If I see or feel something different in my mouth, I make an appointment with the dentist.	0.7	0.7	0.9	0.8	0.7	0.6
	If I see or feel something different in my mouth, I make an appointment with the physician.	0.7	0.7	0.9	0.8	0.7	0.6
	Medicinal herbs can cure oral cancer.	0.6	0.4	0.7	0.7	0.7	0.6
	I know how to reduce the risks of developing oral cancer.	0.7	0.7	0.9	0.8	0.6	0.1
	<i>I consider the opinions of friends or family when making health-related decision**.</i>						
	<i>I consider my religion when making health-related decisions**.</i>						

Note: * items eliminated. ** items incorporated. CVI: content validity index. K: Fleiss' kappa.

version of 18 items with three dimensions (perceived threat, benefits, and cues to action) showed the best fit to the theoretical model (Fig. 1). The CFI and TLI indicators were approximately 0.92, and the RMSEA was 0.051 (95% CI: 0.038–0.063) with an SRMR of 0.063.

The SBOC, with 18 items validated by experts and confirmed through CFA, showed an internal consistency of 0.82 (95% CI: 0.78–0.85) for the entire scale. Among its dimensions, the highest Cronbach's alpha was found in the perceived threat dimension (0.75, 95% CI: 0.71–0.80). For the Benefits

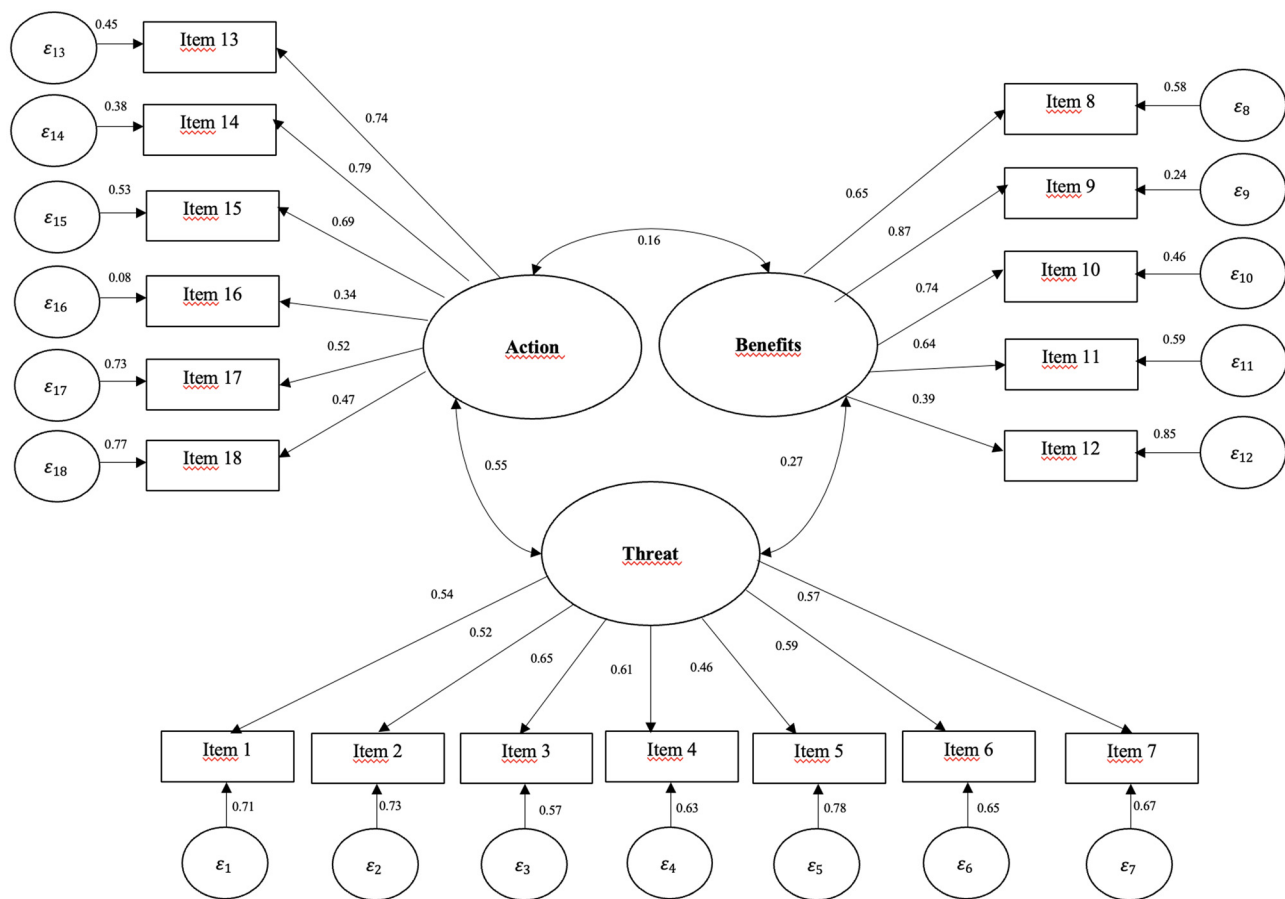


Fig. 1. SBOC model with three dimensions and 18 Items. Note: χ^2 : 210.873, p -value = 0.000. RMSEA: 0.051, 95% CI: 0.038–0.063. AIC: 6781.21. CFI: 0.93. TLI: 0.916. CD: 0.99. SRMR: 0.063.

dimension, it was 0.65 (95% CI: 0.59–0.71), and for Cues to Action, it was 0.85 (95% CI: 0.82–0.88). The final list of items can be found in Supplement 1.

After determining the factorial structure, scores were calculated for each dimension and the total score of the survey. All scores were between 1 and 3 for all dimensions. The highest average score was observed in the Cues to Action dimension, with a mean of 2.02 (SD 0.48), while the lowest score was for Benefits (median = 1.09, SD 0.26). Differences in the SBOC scores were found by gender, age and marital status. A higher median score was observed for women in the perceived threat dimension (1.86, p -value = 0.040) and in common law union (2.00, p -value = 0.016). Statistically significant differences were found, with higher medians (above 2.0) in participants under 40 years of age for the Perceived threat and Cues to Action dimensions (p -value < 0.05). No statistically significant differences were found for the other variables analysed (Tab. III).

Table IV shows the proportions of participants according to the response options. In dimension 1 (perceived threat), 75.6% of participants agreed with the statement that they could get cancer; another significant proportion (43.5%) also agreed that a sore mouth could be a sign of cancer. In Dimension 2, more than 80% of participants agreed with each of the five statements. In the Cues to Action dimension,

a significant proportion of participants indicated that they did not know how to respond to certain concerns.

Discussion

Based on the Health Belief Model, this study presents the structural and content validation of an 18-item questionnaire with adequate content validity (CVI > 0.58), good and excellent inter-rated agreement among the participating experts (kappa 0.6), and acceptable and good internal consistency values (Cronbach's alpha 0.82). It also showed a good factorial structure (RMSEA: 0.051; CFI and TLI 0.92). In this sense, the study aims to propose an instrument to assess beliefs related to oral cancer, applying the theoretical foundation of the HBM [7,8] taking into account dimensions such as perceived threat, behaviours-benefits, and cues to action, since the evaluation of behaviours-barriers dimension did not show an adequate CFA.

Using the validated survey, results showed that the majority of the study population believed they could develop oral cancer and had a clear understanding of the benefits. Women, common law union and those under the age of 40 had the clearest beliefs about the threats. The latter group also provided the impetus and direction for educational campaigns,

Table III. Summary measures of SBOC scores by dimension and sex.

	Median (RIQ)			Mean (DE)		
	Threat	Benefit	Action	Threat	Benefit	Action
Sex						
Man	1.71 (0.98)	1.00 (0.00)	1.86 (0.64)	1.80 (0.57)	1.07 (0.19)	1.93 (0.47)
Woman	1.86 (0.71)	1.00 (0.00)	2.00 (0.71)	1.93 (0.52)	1.08 (0.25)	2.06 (0.46)
<i>p</i> -value*	0.040	0.802	0.061			
Educational level						
Elementary	1.86 (1.14)	1.00 (0.40)	1.86 (1.00)	1.85 (0.67)	1.23 (0.46)	1.88 (0.59)
High school	1.86 (0.86)	1.00 (0.20)	1.86 (0.71)	1.89 (0.55)	1.16 (0.35)	2.01 (0.50)
Technical	1.83 (0.71)	1.00 (0.20)	2.14 (0.65)	1.91 (0.52)	1.14 (0.23)	2.13 (0.65)
Technological	1.85 (0.68)	1.00 (0.40)	1.93 (0.57)	1.91 (0.53)	1.14 (0.21)	1.96 (0.39)
Professional	1.86 (0.86)	1.00 (0.40)	2.00 (0.69)	1.96 (0.49)	1.12 (0.18)	1.99 (0.46)
Posgraduate	2.0 (1.1)	1.00 (0.35)	2.00 (0.14)	1.85 (0.57)	1.12 (0.18)	2.06 (0.32)
<i>p</i> -value*	0.922	0.432	0.224			
Age						
Younger than 40	2.00 (0.75)	1.00 (0.0)	2.14 (0.44)	2.03 (0.54)	1.10 (0.30)	2.09 (0.44)
40 or older	1.71 (0.81)	1.00 (0.0)	1.86 (0.57)	1.76 (0.52)	1.07 (0.27)	1.94 (0.49)
<i>p</i> -value*	0.000	0.345	0.000			
Residence area						
Rural	2.00 (0.98)	1.00 (0.40)	2.00 (0.71)	1.93 (0.55)	1.23 (0.35)	2.05 (0.54)
Urban	1.86 (0.80)	1.00 (0.21)	2.00 (0.71)	1.89 (0.54)	1.16 (0.31)	2.02 (0.47)
<i>p</i> -value*	0.692	0.378	0.791			
Socioeconomic level						
Low	1.86 (0.86)	1.00 (0.0)	2.00 (0.70)	1.95 (0.59)	1.12 (0.30)	2.03 (0.48)
Middle	1.86 (0.80)	1.00 (0.0)	2.00 (0.70)	1.87 (0.50)	1.06 (0.22)	2.03 (0.45)
High	1.57 (0.85)	1.00 (0.0)	1.79 (0.48)	1.73 (0.48)	1.03 (0.07)	1.74 (0.33)
<i>p</i> -value*	0.452	0.052	0.478			
Marital status						
Single	1.85 (0.73)	1.00 (0.20)	2.00 (0.71)	1.85 (0.52)	1.14 (0.29)	2.03 (0.48)
Married	1.86 (0.85)	1.00 (0.20)	1.86 (0.68)	1.89 (0.55)	1.15 (0.28)	1.96 (0.50)
Divorced	1.64 (1.0)	1.00 (0.25)	1.86 (0.64)	1.78 (0.63)	1.12 (0.22)	1.97 (0.45)
Widow	1.71 (1.18)	1.20 (0.61)	2.07 (0.61)	1.88 (0.67)	1.34 (0.49)	2.09 (0.61)
Common-law union	2.00 (0.83)	1.00 (0.40)	2.14 (0.61)	2.06 (0.54)	1.20 (0.37)	2.15 (0.42)
<i>p</i> -value*	0.016	0.357	0.121			
Ethnicity						
White	1.71 (0.82)	1.00 (0.20)	1.86 (0.75)	1.82 (0.60)	1.19 (0.41)	1.93 (0.75)
Mestizo	1.86 (0.71)	1.00 (0.20)	2.00 (0.69)	1.89 (0.50)	1.13 (0.25)	2.03 (0.45)
Indigenous	1.86 (0.75)			1.93 (0.51)		
<i>p</i> -value*	0.800	0.353	0.400			
Occupation						
Student	1.86 (0.62)	1.00 (0.00)	2.00 (0.62)	1.92 (0.45)	1.06 (0.19)	2.05 (0.41)
Employed	1.86 (0.71)	1.00 (0.20)	2.07 (0.71)	1.92 (0.52)	1.13 (0.22)	2.09 (0.39)
Self-employed	1.80 (0.88)	1.00 (0.40)	2.00 (0.75)	1.87 (0.55)	1.20 (0.36)	2.04 (0.52)
Housework	1.86 (1.00)	1.00 (0.40)	1.86 (0.57)	1.90 (0.59)	1.22 (0.32)	1.92 (0.53)
Unemployed	2.00 (1.14)	1.00 (0.40)	2.00 (0.70)	1.88 (0.68)	1.19 (0.35)	2.01 (0.45)
Retired/Pensioned	1.69 (0.86)	1.00 (0.15)	1.79 (0.96)	1.81 (0.58)	1.06 (0.12)	1.76 (0.59)
<i>p</i> -value*	0.225	0.314	0.066			
Type of insurance						
Contributory	1.86 (0.76)	1.00 (0.40)	2.00 (0.71)	1.92 (0.53)	1.15 (0.26)	2.01 (0.48)
Subsidized	1.71 (0.86)	1.00 (0.00)	2.00 (0.57)	1.78 (0.58)	1.14 (0.31)	1.99 (0.46)
Linked	1.64 (0.90)	1.00 (0.20)	2.00 (0.71)	1.77 (0.52)	1.12 (0.21)	2.13 (0.44)
Special regimen	1.86 (0.50)	1.00 (0.00)	1.86 (0.71)	1.86 (0.26)	1.00 (0.00)	1.79 (0.38)
<i>p</i> -value*	0.857	0.159	0.400			
Total score	1.86 (0.79)	1.00 (0.0)	2.00 (0.71)	1.89 (0.54)	1.09 (0.26)	2.02 (0.48)

Note: *Mann–Whitney U test. DE: standard deviation. RIQ: interquartile range.

Table IV. Distribution of participants by each item.

Dimension	Items	Agree		Disagree		Does not know		No response	
		<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Perceived threat	1. Frequent sun exposure can cause oral cancer.	64	20.9	75	24.5	150	49.0	17	5.6
	2. If I practice oral sex, I am at risk of developing oral cancer.	112	36.6	57	18.6	120	39.2	17	5.6
	3. Adults are at higher risk of developing oral cancer.	120	39.2	76	24.8	100	32.7	10	3.3
	4. A lump in the mouth may indicate the presence of cancer.	173	56.5	47	15.4	74	24.2	12	3.9
	5. I can develop oral cancer.	232	75.8	14	4.6	54	17.6	6	2.0
	6. A sore in the mouth may indicate the presence of cancer.	133	43.5	65	21.2	97	31.7	11	3.6
	7. A poor diet can cause oral cancer.	101	33.0	83	27.1	118	38.6	4	1.3
Benefits	8. It is worth investing money to prevent oral cancer.	288	94.1	3	1.0	10	3.3	5	1.6
	9. It is worth being informed about oral cancer.	298	97.4	4	1.3	3	1.0	1	0.3
	10. It is better to invest in health before other things.	289	94.4	10	3.3	5	1.6	2	0.7
	11. A timely consultation can help detect oral cancer.	292	95.4	1	0.3	10	3.3	3	1.0
	12. Changing lifestyle habits can reduce the risk of developing oral cancer.	268	87.6	11	3.6	25	8.2	2	0.7
Cues for action	13. There are TV programs that inform about oral cancer.	59	19.3	145	47.4	94	30.7	8	2.6
	14. There are health campaigns to prevent and detect oral cancer.	84	27.5	103	33.7	114	37.3	5	1.6
	15. I believe there are radio programs that talk about oral cancer.	52	17.0	114	37.3	135	44.1	5	1.6
	16. Social media and the internet are good tools to learn about oral cancer.	199	65.0	53	17.3	45	14.7	9	2.9
	17. The social security entities have prevention programs for oral cancer.	41	13.4	100	32.7	162	52.9	3	1.0
	18. I know how to reduce the risks of developing oral cancer.	58	19.0	118	38.6	121	39.5	9	2.9

although there was still a lack of clarity about how to reduce the risks.

The study was facilitated by the fact that most of the study population was a captive audience from the school clinics. However, a limitation is that this population, as clinic attendees, may receive more information and education than the general population, and the results cannot be extrapolated to the Colombian population.

HBM has been widely used in the literature for various diseases, including oral health [18]. However, there is a paucity of studies on oral cancer. Topics such as public knowledge, awareness of oral cancer, risk factors and manifestations have been studied [19], as well as attitudes and practices in different populations. These studies conclude that knowledge is generally

low, especially in lower socioeconomic groups [20]. Self-examination habits are lacking, risk factors are not well understood, and certain populations are strongly influenced by religious beliefs [20]. However, few studies have used the HBM. Those that have used it have demonstrated the effectiveness of educational interventions in changing beliefs about various diseases and habits, such as smoking and oral hygiene, and their influence on oral cancer [21].

According to socio-demographic data, this study had a higher participation of women than men, which is consistent with other studies showing that women are more likely to seek health services and participate in survey-based studies.

Although there is limited literature on the use of HBM in oral cancer, an important finding of this study is that a high

percentage of the population (75.8%) believe that they could develop oral cancer, similar to other studies in countries such as Malaysia (83%) [22]. This is important because previous studies have shown that the perception of vulnerability and seriousness of the disease motivates preventive behaviours. The perception of disease and the usefulness of preventive measures influence the implementation of preventive behaviours.

In this study, we did not ask about beliefs about known risk factors such as tobacco and alcohol, as several knowledge-based surveys already shown that the population is well informed about these. Instead, we focused on less well-known risk factors. For example, the belief that factors such as sun exposure, oral sex, and poor diet could cause oral cancer was low. To the best of our knowledge, this is the first study using the HBM that examined these types of risk factors.

Another engagement result is that there is an association between perceived threat, gender, common law union and age under 40, suggesting that young women are more aware than men of the possibility of developing oral cancer, early signs of oral cancer, and certain risk factors. Despite the fact that the relationship between marital status and oral cancer beliefs has been investigated in other studies, not such relationship has been identified [23]. This finding is novel and should be explored further.

This underscores the importance of creating educational campaigns to increase accurate beliefs about oral cancer risk factors other than tobacco and alcohol, particularly in the under-40 population, where there is an increasing number of individuals developing oral cancer without traditional risk factors. A significant percentage of this group still believes that oral cancer mainly affects older adults.

On the other hand, regardless of socio-demographic and economic variables, most respondents believe they can benefit from reducing their risk of developing oral cancer by being informed, making lifestyle changes, seeking timely medical advice, and investing in their health. This underscores the importance of promoting health promotion at both the community and individual levels during consultations, as there is a willingness to change. Studies such as Khwankong S. and colleagues [20] show different results, where a strong religious influence (Muslim) influenced beliefs about oral cancer.

It is important to note that, although a large proportion of participants stated that they did not know how to respond to beliefs in the “cues for action” dimension, 65% believe that “social media and the Internet are good tools for learning about oral cancer”. Some studies confirm that these tools play a crucial role in how young people and adults receive information and education today, making digital communication a key strategy for educating the general population and those in clinics about oral cancer and its risk factors [24,25].

To the best of our knowledge and based on our literature review, this is the first study in Colombia to use the HBM to provide information on beliefs about oral cancer in a population attending a dental school clinic and the general public. It shows that women and those under 40 have more

deeply rooted beliefs about risk factors other than tobacco and alcohol, and highlights social media as an important educational tool. It also shows that beliefs about the benefits of healthy behaviors are clear for most respondents, regardless of socioeconomic factors such as education level or social status.

There is a clear need to conduct health promotion campaigns to change public beliefs about oral cancer risk factors and to use digital media, such as social networking sites, with short and effective messages to educate the population.

Dental schools, public and private health services, and health professionals should play an important role in educating the public about “new” risks factors and oral cancer, through social media, especially targeting younger populations under the age of 40. Therefore, having validated instruments on this topic is crucial for both clinical and public health practice [26,27], as it allows application to the general population and provides results that facilitate the design of educational programs for prevention, risk reduction, and early detection, ultimately positively impacting communities and reducing the problems associated with late diagnosis of oral cancer.

The future goal of this work is that with the validated survey and its widespread use, educational strategies can be designed to improve community beliefs as reported in the literature [23]. After validation, the educational strategies will be implemented and the health behaviors of the target groups will be analyzed, demonstrating that education is effective in promoting the desired behavior [23–28]. Therefore, the development and implementation of educational programs based on the health promotion and disease prevention model is encouraged, as shown by Jeihooni *et al.* [23], who used a validated survey based on the HBM and found that six months after an educational intervention on oral cancer and its prevention, the construct scores increased when the survey was administered again.

Conclusion

A three-dimensional questionnaire based on the Health Belief Model was validated, showing that people are aware that they could develop oral cancer. However, further multimodal risk factor education is needed, targeting different populations and focusing on risk factors, their control, and oral self-examination.

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Conflicts of interest

The authors state that there is no conflict of interest with people or organizations.

Data availability statement

Data supporting the findings of the study titled 'Beliefs in Oral Cancer in an Adult Population in Medellín, Colombia: A Cross-Sectional Study', are available from the corresponding author upon reasonable request. Due to ethical considerations and confidentiality agreements approved by the institutional ethics committee, the dataset is not publicly available. However, de-identified data may be shared with qualified researchers for academic purposes, provided they comply with data protection regulations and obtain institutional approval.

Author contribution statement

Conceptualization, design and writing: A Hurtado, GJ Alvarez. Methodology, analysis, and writing: LS Giraldo. Bibliographic research, data collection, analysis and writing: M Villada, MF Mejía, MA Ramos, NR Serna, MA Díaz, L. All authors approved the final version of the manuscript.

Ethics approval

This study was reviewed and approved by the Bioethics Committee of the School of Dentistry of the University of Antioquia, as documented in Act Number 10 of September 13, 2019. The ethical conditions established in Resolution 8430 of 1993 were followed.

Informed consent

Written informed consent was obtained, authorizing participation in the project and the use of the data and results for academic dissemination.

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