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Developing a Health Marketing Model to Foster a Culture of Timely Prostate Cancer Prevention

Elham Sahafi[1], Tahmoores Hasanqolipour Yasuri[1], Jalil Hosseini[2], Ali Shams[2] *

1. Faculty of Management, University of Tehran, Tehran, Iran.

2. Men's Health & Reproductive Health Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran.

Abstract: **Background:** Prostate cancer poses a significant global public health concern for men. Despite advancements in medical knowledge and screening techniques, a considerable number of prostate cancer cases are diagnosed at advanced stages, leading to compromised treatment outcomes and increased mortality rates. This study aimed to develop and introduce a model focused on preventing prostate cancer in men.

Methods: This mixed-methods study comprises two phases. In the initial phase, grounded theory was employed to identify and define the influential factors based on the prospectives of both experts and patients. The data were continuously analyzed during data collection using the Strauss & Corbin method (1998) encompassing open, axial, and selective coding. Subsequently, a systematic review and a qualitative study were conducted and the data were integrated to develop a cohesive model.

Results: In the qualitative phase, axial coding yielded three axial subcategories: "Underlying factors", "Causal conditions", and "Intervening factors". All extracted categories and codes were linked to the causal, background, intervention factors, strategies, and consequences adopting an approach focused on fostering a culture of timely prostate cancer prevention. A systematic review generated a final scale of 23 questions organized into four subscales: "Life conditions", "Physical problems", "Mental injuries", and "Efficiency of hospitals" developed by the researcher in the second step. All steps of validity and reliability were undertaken. Following the integration of results from the systematic review and qualitative study (phases 1 and 2), the current research model measures the relationships between several latent variables (the primary variables of the research). Simultaneously, structural equation modeling was employed to analyze the data and test the hypotheses.

Conclusion: The developed study model is validated and reliable, encompassing all the factors influencing prostate cancer prevention in men. Tailored to our context, this model was developed to prevent prostate cancer in men. Further testing in diverse societies is recommended.

Keywords: Health Marketing, Marketing of Health Services, Prevention, Prostate Cancer

1. Introduction

Prostate cancer constitutes a significant global public health concern affecting men. Despite advancements in medical knowledge and screening techniques, many cases of prostate cancer are diagnosed at advanced stages, leading to compromised treatment outcomes and increased mortality rates (1). Timely prevention and early detection of prostate cancer can substantially enhance patient prognosis and survival rates (2). Studies conducted in Iran show that despite the disease's curability, a considerable number of patients do not seek treatment (3). This is attributed to a lack of awareness and proactive engagement among men regarding the importance of regular screenings and adopting a preventive approach (4, 5). The performance of health care as a system is significantly influenced by marketing according to the American Marketing Association, marketing involves "creating, communicating, and delivering value to customers and managing customer relationships in a way that benefits the organization and its stakeholders" (6). The centers for Disease Prevention and Control have adapted this definition to the definition for health marketing as "creating, informing,

***Corresponding Author:** Ali Shams; address: Men's Health & Reproductive Health Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran. Email: Ali.shams@hotmail.com, Phone: (+98) 9034259232.

and delivering health information and interventions using customer-centered and science-based strategies to support and promote the health of all populations" (7). Marketing also impacts health systems by shaping public perceptions of healthcare problems and priorities, acting as a crucial link between consumers and healthcare providers, and providing a vital role in disseminating health information (8). While commercial marketing aims to benefit product "sellers" and shareholders, the ultimate goal of health marketing is to benefit product "consumers" and the general public (9). Health and marketing are gaining a solid foundation as a distinct research field defined by its practical applications. The submission of health and marketing articles to marketing journals has experienced a rapid increase over the last five years with special sessions on health marketing held during major marketing conferences. The growing specialization in health and marketing among faculties, coupled with high social demand, has prompted schools to offer marketing classes tailored to healthcare, bridging connections in economics, psychology, or business and medicine, and the establishment of new chairs focused on health and marketing (5, 10, 11). By formulating an effective marketing strategy that addresses barriers and motivates behavioral change, we can empower individuals and communities to proactively prevent prostate cancer and mitigate its impact on public health (5). Therefore, this study aims to develop and introduce a model for preventing prostate cancer in men.

2. Methods

While various studies have investigated prostate cancer prevention, the existing literature still exhibits several research gaps, with an insufficient number of studies addressing Health Marketing. Consequently, opting for a mixed methodology is preferable in clarifying the complexity inherent in this research problem (12). The mixed-methods approach integrates qualitative and quantitative data collection and analysis procedures, offering the flexibility of simultaneous or sequential application within a single study (13). Furthermore, this method is anticipated to aid in validating the findings derived from both qualitative and quantitative analyses. Thus, a mixed-methods approach is employed, initiating the research with quantitative investigations to test our hypotheses, subsequently corroborated by qualitative research.

2.1. Phase 1: Quantitative study

The research was conducted in Tehran, the capital of Iran, and involved participants who were experts in health marketing science. The participants included university professors specializing in marketing management with a minimum of 15 years of teaching experience or research articles in health marketing. Additionally, heads of men's health clinics in Tehran, processing at least 5 years of experience and having chaired the clinics, were also included. It was a prerequisite for these individuals to have at least one article in the field of health marketing, social marketing, or prostate cancer. To encompass all facets of the research, patients with a history of delayed referral for prostate cancer were also invited to an interview. Purposive sampling was initially employed to select the professors and patients available at Tehran universities, followed by theoretical sampling. Men who had not decided to participate were excluded from the study; however, no other exclusion criteria were applied. Data were collected through unstructured deep interviews lasting between 40 and 120 minutes, employing open-ended questions. Some interviews involved sharing preliminary findings, completing information, correcting details, and making data adjustments. In total, 35 interviews were conducted comprising 15 professors and 20 patients. All interviews were digitally recorded with the interviewees' permission. The data collection period spanned 7 months from April 2022 to January 2023, and interviews took place in hospitals and men's health clinics (chosen based on the participants' preference and comfort). During the interview, the participants were asked about their observations of examples of paranoia in the organization, their analysis of the causes and factors influencing these behaviors, and the resultant consequences. Supplementary questions were designed to direct the topics and elicit the categories related to the investigated phenomenon. Recording the interviews facilitated a comprehensive analysis, allowing for a thorough examination of the participants' expressed views. An example of the main interview protocol is included in the attachment; outlining the main question, and proposing additional questions based on interviewees' responses. Theoretical sampling continued until theoretical saturation was achieved.

2.1.1. Statistical analysis

The data were continuously analyzed during the data collection process, utilizing the Strauss & Corbin method (1998)(14), which involves three phases of open, axial, and selective coding. The first author with experience in qualitative research, particularly grounded theory, assessed each interview by one of the co-authors. Each interview was immediately transcribed verbatim with multiple reviews. Nonverbal communication and body language of the participants such as facial expressions, smiles, laughter, giggling, pauses, emphasis, etc. were parenthetically noted alongside their statements. Upon importing interview content into MAXQAD2010, a word-for-word reevaluation led to the creation of semantic codes. Semantically similar codes were grouped into primary categories, which were repeatedly revised to form more abstract concepts. This process continued until categories could no longer be merged, achieving conceptual saturation. The result of axial coding in 7 ax-

Table 1: Demographics of study participants

1 Patients' age	36-47 years with a mean age of 40 years
2 experts' age	4 women, and 11 men with a mean age of 47 years and an average of 15 years of work experience
3 Occupation (patients)	5 employed by the government, and 15 self-employed
4 Time of cancer	From 1 to 5 years with a mean of 2.2 years
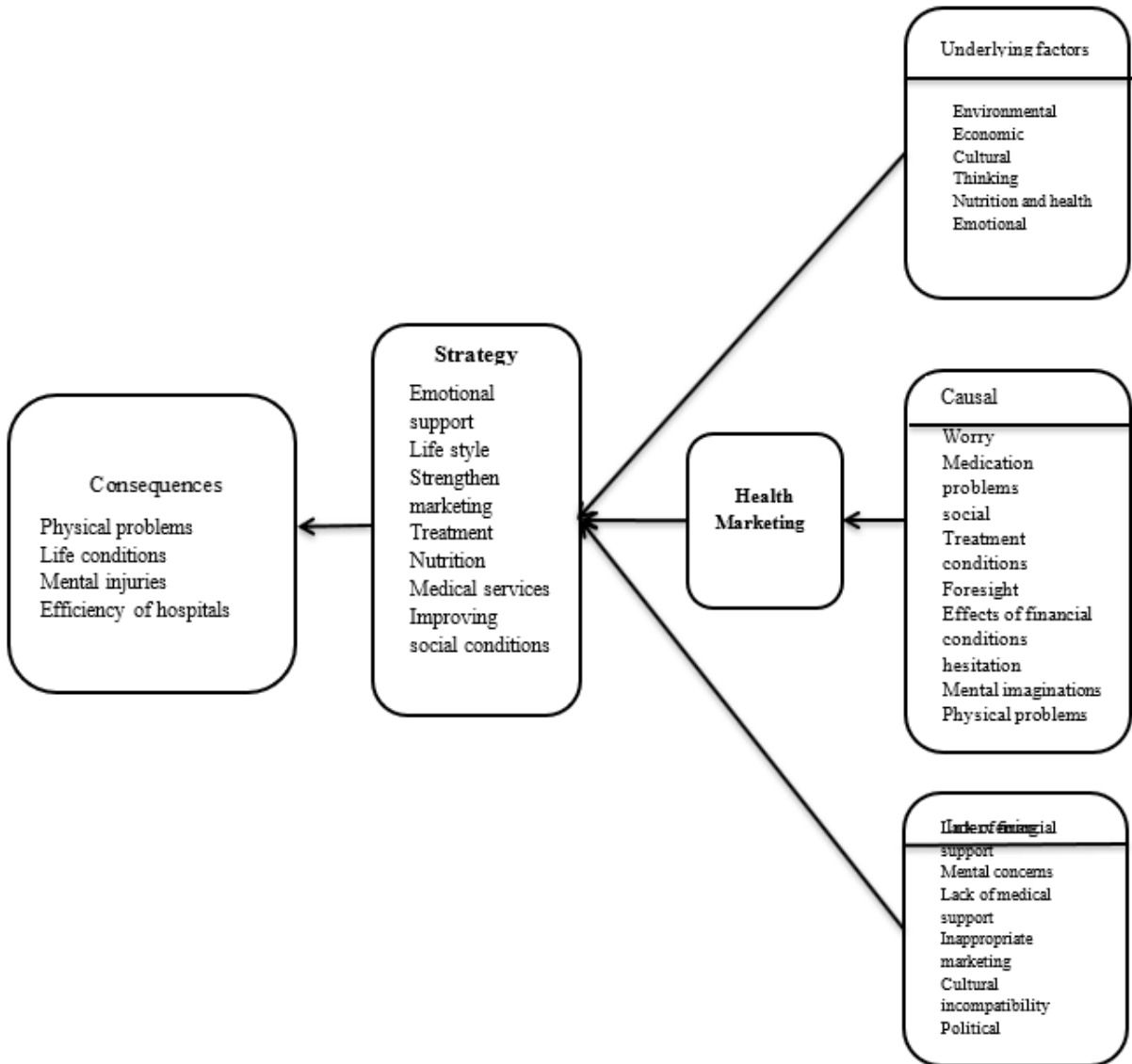
Figure 1: The final model of the coding paradigm of health marketing with the culture of timely prevention of prostate cancer

ial categories and the storyline technique identified the core concept, revealing the main problem of the participants. In this way, the core concept was determined through the use of concepts, not raw data or storyline. Memo recording started with the first interview and continued till the final stages of drafting the study, generating a total of 70 memos imported to MAXQDA2010.

To enhance the credibility, confirmability, and dependability of findings (15), research validation followed five criteria outlined by Lincoln & Guba (1994) as cited in Polite (2016). These criteria encompassed prolonged engagement with the research topic over 9 years, member checks by 5 participants,
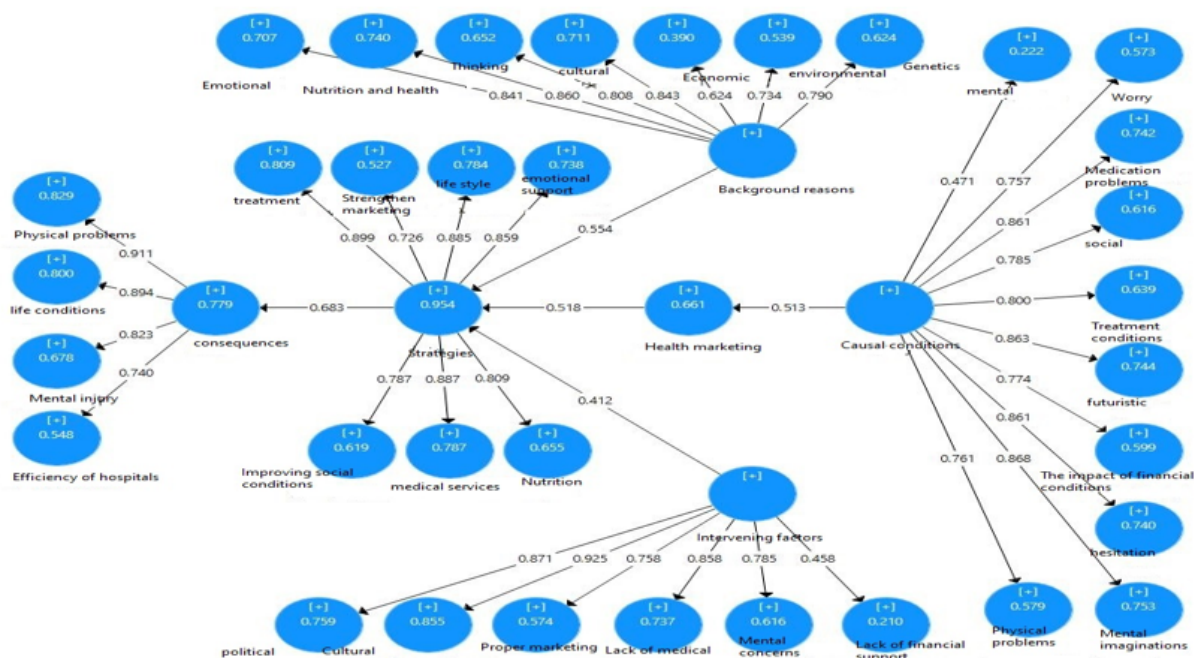
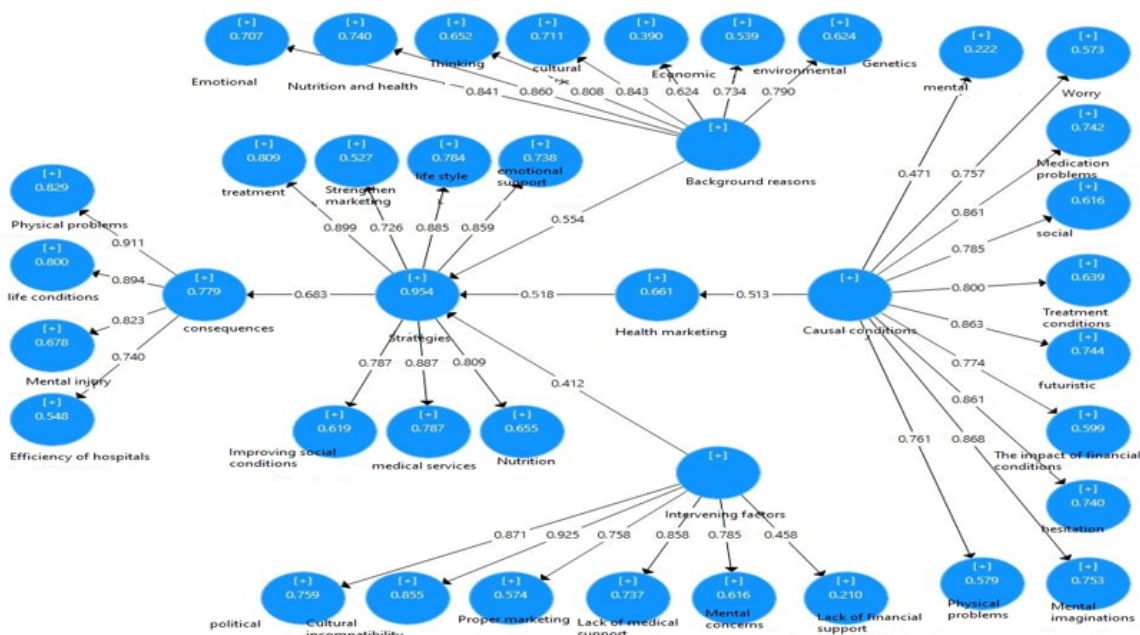**Figure 2:** The output of the external model (structural equations) of the research model in smart PLS software

Figure 3: The output of the internal model (structural equations) of the research model in smart PLS software

Table 2: R^2 index

Result	R Square	Health marketing
Strong	0.661	Strategies
Strong	0.954	consequences
Strong	0.779	Health marketing

data analysis verification by other highly qualified members of the research team specializing in qualitative studies, incorporation of outsider opinions through an etic perspective, triangulation of data resources via sampling patients and professors, and time triangulation via sampling patients at various cancer stages. Additionally, accurate data record-

Table 3: filling index (Q2)

Result	Q^2	Variable
Strong	0.320	Health marketing
relatively strong	0.398	Strategies
Strong	0.387	Consequences

ing at all study stages was done to ensure dependability, confirmability, and authenticity (15).

2.2. Phase 2: Qualitative study

In the second phase, the target population comprised all male patients who were suffering from prostate cancer and were referred to Tehran hospitals for treatment patients during this period, totaling 700 patients. Through convenience sampling, 248 patients were selected for the study. Data were collected through a researcher-developed questionnaire. To formulate the scale, a systematic review was conducted encompassing both quantitative and qualitative studies on health marketing and cancer prevention of prostate cancer. The review, including key terms such as "health marketing", "Marketing of Health Services", "prostate cancer", and "prevention", considered studies published until December 5m 2022, across PubMed, Web of Science, Scopus, ProQuest, Embase, and Cochrane Library. For content validity, the theoretical and operational definitions of indicators, scales, and variables were adjusted based on the quality of existing literature. To determine content validity, input was sought from professors, experts, and researchers in the relevant field. The validity of each question and construct was examined. Face validity of the scale was assessed quantitatively through the item impact scale (IIS), with a satisfactory level of ≥1.5, and qualitatively through feedback from 10 patients who evaluated the simplicity and clarity of items on a 5-point Likert scale. Content validity assessed through both qualitative and quantitative methods, involved evaluating grammar, wording, item allocation, and scaling indices by 10 experts' opinions. Quantitative content validity was determined through content validity ratio (CVR), item-level content validity index (I-CVI), scale-level content validity, and the index/ averaging calculation method (S-CVI). Fifteen specialist experts rated the importance of each item on a three-point scale to calculate CVR, ensuring a minimum acceptable value of 0.49 according to Lawshe's Table (16-18). After confirming the questionnaire with specialists, it was administered to the statistical sample, and the structural validity was checked. Cronbach's alpha coefficient, a reliability measure indicating how well items in a set are interconnected, was used to assess the internal consistency of the index items(17).

2.2.1. Statistical analysis

The data were analyzed using SPSS version 20 (IBM Corpo-

ration). Descriptive statistics including frequencies, means, and standard deviations were applied for both item-and subscale-level analyses. The normality of the data, skewness, kurtosis, and outliers were assessed. The data showed a normal distribution. Outliers were removed and missing values were replaced with the series mean in the SPSS version 20.

2.2.2. Modeling

Considering that the current research model assesses relationships among multiple hidden variables (the primary variables of the research) simultaneously, structural equation modeling was employed to analyze the data and test the hypotheses. In this study, the PLS method was utilized for more accurate results, and to test the conceptual model of the research, as it is a variance-based path modeling technique that allows simultaneous examination of theory and metrics (19). This method involves two models: 1. external model, which is used to examine the relationships between the indicators (research questions) and their corresponding main variables. It is equivalent to the measurement model in covariance-based methods. 2. internal model, measures the structural part of the model. This model assesses the relationships between hidden variables (main variables) forming research hypotheses.

2.2.2.1. External model

In the initial stage of the data analysis phase, the measurement model was assessed to ensure an acceptable level of validity and reliability. By examining this model, the relationship between variables and observed indicators is determined. The PLS-Algorithm function was used for this purpose, examining suitability indicators (19).

2.2.2.2. Internal model

In the subsequent step, the structural model and relationships between structures were examined using the bootstrapping function. With 248 statistical samples in this research, 700 Bootstrap test samples were considered. The t-value, a primary criterion for confirming or rejecting the hypotheses, is indicated in the relationships. If this value exceeds 1.64, 1.96, and 2.57, respectively, the hypothesis is considered approved at the 90, 95, and 99% confidence levels (19).

3. Results

Participants' statements were analyzed and classified based on Straus and Glaser's grounded theory, through open coding and axial coding. The findings were obtained in two parts: A) Identification Process, and B) Challenges and Risks.

3.1. Quantitative results in phase 1

The participants, aged 36-47 years, had a mean age of 41 years. Table 1. outlines the demographics of participants, revealing 1875 primary codes from open coding without con-

Table 4: Results of rejecting and Confirming Research hypotheses at a glance

Hypothesis number	The path of the hypothesis	Amare T	Path coefficient	desired significance level	A significant level of research	Result
1	Causal conditions → Health marketing	759/7	0.513	P<0.05	0.000	confirmation
2	Health Marketing → Strategies	437/5	0.518	P<0.05	0.000	confirmation
3	Intervening factors → strategies	906/2	0.412	P<0.05	0.000	confirmation
4	underlying factors → strategies	979/3	0.554	P<0.05	0.000	confirmation
5	Strategies → Consequences	9/054	0.683	P<0.05	0.000	confirmation

sidering data overlaps. Axial coding resulted in 3 subcategories including: "Underlying factors", "Causal conditions", and "Intervening factors". Figure 1. illustrates the final axial categories related to causal, background, intervention factors, strategies, and consequences, all aligned with the culture of timely prevention of prostate cancer. Emphasizing lifestyle emerged as a highly effective approach to cancer prevention.

3.2. Qualitative results in Phase 2

A final scale of 23 questions with four subscales "L,ife conditions", "Physical problems", "Mental injuries", and "Efficiency of hospitals" was extracted in the second step. Validity and reliability were confirmed with the qualitative face validity leading to the removal of one item due to low impact scores. After the qualitative face validity, six items of the scale were revised based on patients' feedback. The S-CVI/Ave of the scale was 0.90 (CVR & CVI were acceptable). Cronbach's alpha coefficient for the total scale was 0.84, with subscales rating from 0.76 to 0.88.

After integrating the results of the systematic review and qualitative study (phases 1 and 2), the research model, measuring the relationships among hidden variables (the main variables of the research) simultaneously, underwent structural equation modeling to analyze the data and test the hypotheses. the external model of research hypotheses was established (Figure 2), demonstrating an acceptable level of validity and reliability.

The subsequent examination of the Internal model (fitting the structural model of the research) confirmed the hypothesis at the 90, 95, and 99% confidence levels as indicated by t-values (Figure 3)

The fit of the structural model was assessed using $R2$ coefficients for endogenous (dependent) hidden variables of the model. $R2$ is a measure that indicates the impact of an exogenous variable on an endogenous one with values of 0.19, 0.33, and 0.67 considered as criterion values for weak, medium, and strong values of $R2$ respectively. According to Table 2, $R2$ values have been calculated for the endogenous constructs of the research, confirming the appropriateness of the structural model based on three criterion values (Table 2). These values fall within the expected range.

Another criterion assesses the predictive power of the model, and if the Aston Geisser value for a dependent variable (endogenous) is significant. It attains values of 0.02, 0.15, and 0.35, denoting weak, medium, and strong predictive power for the variable, respectively. This criterion applies to both dependent and independent (exogenous) variables linked to the corresponding dependent variable. The assessment, presented in Table 3, gauges the quality of the structural model for each endogenous block, and values related to Q2 further affirm the predictive model's strength according to the criterion. The fit of the structural model is reconfirmed in this step.). Finally, in the last phase, the final model underwent thorough scrutiny to confirm its validity. This involved testing and comparing all the hypotheses, as detailed in Table 4.

4. Discussion

The study aimed to develop and introduce a model for preventing prostate cancer in men. Initially, a qualitative study was conducted to redefine the new definition of the concept of health marketing in the context of prostate cancer. Subsequently, the scale was developed through a systematic review, followed by an examination of the psychometric properties. The model incorporated all the main and latent variables, confirming all the hypotheses in the final stage. During the qualitative study phase, interviews were conducted with both experts and patients. The extracted categories and codes were linked to the causal, background, intervention factors, strategies, and consequences with an emphasis on the cultural aspect of timely prostate cancer prevention. In the scale development phase, items were formulated using a systematic review of both qualitative and quantitative studies. The integration of findings from these two studies yielded a robust model for preventing prostate cancer in men within the cultural context of Iran.

The results indicate that lifestyle Changes are highly effective in cancer prevention, underscoring the increasing importance of preventive measures. Consequently, researchers have initiated investigations into the impacts of lifestyle on cancer development. This study specifically delves into the factors contributing to cancer causation.

In 2022, Langlais et al. conducted a study examining the influence of lifestyle on prostate cancer. Their results revealed associations between three indices (EDIP, EDIH, EDIR) and two lifestyles (ELIH, ELIR) previously developed to estimate biomarker concentrations for inflammatory and insulin pathways. These associations were linked to prostate cancer progression and PCSM (Prostate Cancer-Specific Mortality). The study suggests that diets with high inflammatory or insulinemic potential post-prostate cancer diagnosis are associated with a 2.61-fold and 1.63-fold higher risk of prostate cancer progression, respectively, for those in the highest versus lowest quintiles. While the evidence was somewhat weaker, it remained consistent with a positive association for diets promoting insulin resistance (20). Contrary to the widespread belief that genetic abnormalities contribute significantly to cancer cases, 90% of malignancies are rooted in lifestyle and environmental exposure. Addressing this, lifestyle medicine employs evidence-based behavioral interventions to treat, manage, and prevent modern diseases, predominantly chronic but potentially extending to acute and infectious diseases. This medical approach is deeply connected to lifestyle factors (21-24).

In the study, we identified another crucial factor: fear. While the mere mention of this disease typically instills terror and anxiety in patients and their families, the advancements in cancer treatment in recent years offer a glimmer of hope for overcoming it. The key lies in acquiring sufficient knowledge and awareness of this disease. Stress and mental pressures contribute to the release of the cortisol hormone, playing a pivotal role in suppressing the body's immune system. Cortisol breaks down proteins, including perforin and interferons. Additionally, stress renders cancer cells more resistant. The impact of cancer on individuals' lives can vary. Typically, cancer affects the nerves of certain patients, resulting in behavioral changes. Ultimately, these changes directly influence their lives. In 2023, Mardani and her colleagues conducted a study in Iran to explore the experience of Fear of Cancer Recurrence (FCR) and relevant coping strategies among Iranian prostate cancer survivors. The data analysis resulted in the identification of three themes. The theme "Living with Insecurity" encapsulates the participants' experiences regarding triggers for FCR, with two categories: "fear of incomplete cure" and "fear of cancer return." Additionally, the theme "Struggling to Cope" includes two categories, namely "psychological strategies" and "spiritual coping," presenting coping strategies employed by the participants to mitigate FCR. Furthermore, the theme "Trying to Prevent Cancer Recurrence" encompasses two categories, "seeking health" and "lifestyle modification," highlighting the coping strategies utilized by participants to prevent cancer recurrence (25).

Another factor impacting the course of the disease is the loss of hope and contemplation of death among prostate cancer patients. A systematic review of eight quantitative studies examining the psychological impacts of active surveillance, encompassing anxiety, sub-clinical depression, illness uncertainty, and hopelessness in men with prostate cancer, revealed that a negative impact may be experienced at any treatment stage and at varying levels of severity (26). The study by Tasan demonstrated a statistically significant relationship between the mean Spiritual Orientation Scale scores of patients and their sociodemographic characteristics (sex, age, marital status, educational status, employment status, income) (p<0.05). Additionally, a statistically significant relationship was identified between the mean Beck Hopelessness Scale scores of patients and their sociodemographic characteristics (age, marital status, income status) (p<0.05). Linear regression analysis indicated a significant negative correlation between patients' spirituality and hopelessness levels (p<0.01, R2=0.503, b=0.641). As patients' spirituality increased, their levels of hopelessness decreased (27), aligning with the findings of the present research

Another influential factor is support (from family, friends, community, etc.). It is well-established that socioeconomic factors play a role in prostate cancer risk. Prostate cancer incidence rates tend to be positively associated with socioeconomic status, while low socioeconomic status is linked to an increased risk of poorer survival. Disparities in prostate cancer survival are documented by socioeconomic status, race, education, and census tract–level poverty. Du et al., using data from the SEER-Medicare linked database, found that low socioeconomic status was significantly associated with decreased survival in men with prostate cancer. Those in the lowest quartile of socioeconomic status were 31% more likely to die than those in the highest quartile (hazard ratio [HR] = 1.31, 95% confidence interval [CI] = 1.25, 1.36). When adjusting for poverty, income, or composite socioeconomic variables, the risk of mortality in African-American men with prostate cancer was not significantly different from whites (28). Examining prostate cancer data from Alameda County, California, Ernster et al. found no gradient in age-specific mortality and incidence rates by socioeconomic status for both whites and African Americans (29). Weiner et al., analyzing National Cancer Database data from 2004 to 2013, discovered that lower socioeconomic status (first vs. fourth quartile; adjusted odds ratio = 1.39, 95% CI = 1.35, 1.44) was associated with higher odds of presenting with metastatic prostate cancer (30).

We've also identified a crucial category termed "physical problems," which pertains to engaging in exercise and other physical conditions. The recognition of the benefits of incorporating exercise into cancer care, including directly within treatment centers, is on the rise.

Schumacher et al. examined current evidence derived from investigations into the effects of exercise on physical function

and treatment-related side effects in men undergoing radiation therapy for prostate cancer. The study encompassed seven publications from six randomized controlled trials involving 391 prostate cancer patients at stages I to IV, with Gleason scores ranging from 6 to 10. Exercise consistently yielded significant benefits for physical function, particularly in terms of cardiovascular fitness (standardized mean difference [SMD], 0.83; 95% confidence interval [CI], 0.31-1.36; P < .01) and muscle function (SMD, 1.30; 95% CI, 0.53-2.07; P < .01). Additionally, the exercise demonstrated a significant positive effect on urinary toxicity (SMD, –0.71; 95% CI, –1.25 to –0.18; P < .01), although no significant impact was observed on intestinal (P = .21) or hormonal toxicity (P = .41), depression (P = .45), or sleep symptoms (P = .88) (31).

Consequently, our study proposes a comprehensive model encompassing a broad spectrum of influential factors for prostate cancer patients. This model is designed to be easily applicable across various disease stages. It is essential to note that the development of this model occurred within the context of Iran's healthcare system. Therefore, the model's applicability in different cultures remains uncertain. We recommend testing the model's suitability in other societies in future research.

5. Conclusion

The present study model is valid and reliable, encompassing all factors relevant to the prevention of prostate cancer in men. It was specifically crafted for the prevention of prostate cancer in men within our context. There is a suggestion that it should undergo testing in other societies.

6. Appendix

6.1. Acknowledgment

None.

6.2. Conflict of interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

6.3. Funding support

None.

6.4. Author's contributions

All the authors had the same contribution.

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