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Beliefs and Behaviors toward Breast Cancer Screening among Women in Rural Southern Iran: A Health Belief Model Approach

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ABSTRACT

Background: Early detection of breast cancer through screening significantly improves survival rates; however, there is limited understanding of rural Iranian women's beliefs and behaviors related to breast cancer screening. This study explores these beliefs and behaviors among women in the Khonj region of Iran, using the Health Belief Model (HBM) as a framework.

Methods: A cross-sectional survey was conducted with 394 women aged 20–68 using a structured questionnaire assessing demographics, HBM constructs (perceived susceptibility, severity, benefits, barriers, self-efficacy, cues to action), and screening behaviors (BSE, CBE, mammography). Pearson correlations and logistic regression analyzed relationships between beliefs, risk factors, and screening behaviors.

Results: The HBM focuses on the beliefs of the individual about health conditions to predict health-related behaviors. The model predicts that the higher the perceived susceptibility, severity, and benefit of a desired health behavior, the higher the likelihood of engagement in health-promoting behavior. This study revealed that participants had a low perceived susceptibility towards breast cancer (mean=2.34± 2.48) and a low confidence in doing a breast self-examination (mean=5.47± 4.68). However, they had a relatively high perceived benefit towards clinical breast examination (mean=15.15± 5.85) and mammography (mean=17.21± 7.91)**.** Overall, participants perceiving the severity of breast cancer positively affected their perception of the benefits of getting breast self-examination (r =.119, p <.05), clinical breast examination (r =.276, p <.05), and mammogram (r =.238, p <.05).

Conclusions: Women recognized the seriousness of breast cancer and the benefits of screening, but low perceived susceptibility and limited self-efficacy restricted participation in preventive behaviors. Accordingly, interventions targeting self-efficacy, BSE skills training, and provider-led CBE programs were recommended. Since early detection is the key to survival rate, raising awareness of breast cancer can positively affect the quality of life for women.

Keywords: Breast cancer, women, Iran

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Introduction

Breast cancer is a significant public health challenge due to its rising incidence and high mortality. In 2018, approximately 9.6 million cancer deaths occurred worldwide, with breast cancer accounting for 24% of new cancer cases and 15% of cancer-related deaths among women (WHO, 2020; Heer et al., 2020). Projections indicate that global breast cancer cases will rise by over 46% by 2040 (Heer et al., 2020). While breast cancer remains most prevalent in high-income countries, its incidence is rapidly increasing in low- and middle-income regions, where late-stage detection is common (Bray et al., 2018).

The burden is particularly pronounced in Asia, the Middle East, and North Africa, where breast cancer represents 30% of all female cancers, and mortality rates exceed 16 per 100,000 women (Stewart & Wild, 2014). In Iran, breast cancer accounts for 14.2% of all female cancer deaths (WHO, 2014), with nearly 40,000 women diagnosed in 2016, and cases rising by approximately 7,000 annually (Hassabzadegm et al., 2021). The Global Burden of Disease (GBD, 2010) estimates a mean Disability-Adjusted Life Year (DALY) of 66,765, reflecting significant health and social impacts. Given Iranian women's central roles in families, the disease profoundly affects household well-being, often leading to emotional distress and diminished quality of life (Gaemi et al., 2019).

In recent years, there has been growing interest in understanding breast cancer screening behaviors and predictors among Iranian women, with studies highlighting both progress and ongoing challenges. (Emami et al.,2021) reported that among 372 women aged 40 and above in Tabriz, 68.3% performed breast self-examination (BSE), 60.2% underwent clinical breast examination (CBE), and 51.3% obtained mammography, though only 9.9% performed monthly BSE. Similarly,(Keshavarzi et al., 2022), using the Theory of Planned Behavior, found that age, literacy, menopause status, family cancer history, and ethnicity were significant determinants of mammography uptake in rural southern Iran.

A systematic review by Raeissi Dehkordi et al. (2025) analyzed 129 studies from 2000 to 2023 and revealed persistent gaps in Iran's breast cancer screening infrastructure, including sociocultural barriers, health insurance limitations, and the lack of a coordinated national program. Another meta-analysis applying the Health Belief Model (HBM) across Iranian studies showed generally low perceived susceptibility, severity, and benefits, while cues to action and self-efficacy were relatively stronger predictors of screening participation (Bahri et al., 2022).

Qualitative research has also contributed valuable insights. A 2025 study by Jabbari et al. identified implementation barriers in Iran's breast cancer screening services, including governance challenges, workforce shortages, insufficient equipment, and fragmented information systems (Jabbari et al.,2025) At the regional level, a systematic review across Middle Eastern countries further confirmed variations in HBM constructs and recommended prioritizing strategies to strengthen perceived benefits and susceptibility (El-Masry et al., 2022).

Primary screening methods include breast self-examination (BSE), clinical breast examination (CBE), and mammography. Studies suggest that women who perform regular BSE detect abnormalities earlier (Bashirian et al., 2020). CBE remains especially valuable in low-resource settings, while mammography has been shown to reduce mortality by 20% (WHO, 2020).

Despite advancements, several barriers hinder timely detection, including limited access to healthcare, cost, cultural beliefs, and stigma surrounding cancer (Özkan & Taylan, 2021). Beyond its physical toll, breast cancer affects body image, sexuality, and mental health, often resulting in psychosocial challenges (Fingeret et al., 2014). Given its growing prevalence and profound personal, social, and economic consequences, breast cancer requires urgent global attention and

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targeted regional strategies for prevention, early detection, and improved treatment outcomes.

Together, these findings reinforce the continued need for culturally sensitive, accessible, and evidence-based screening interventions, particularly in underserved rural populations similar to Khonj. This study investigated breast cancer screening beliefs and behavior of women in southern Iran utilizing the Health Belief Model (HBM). Breast cancer screening methods in this study included BSE, CBE, and mammography. Participating women live in and around Khonj County in Southeast of Iran (Figure 1 shown). They receive health services from Nabi Akram Hospital located in the City of Khonj.

Methods

The hospital is equipped with all the necessary resources (human and technological, etc.) to treat patients who live in the Khonj region and its surrounding areas (approximately 50-60 km radius).

All the locations (the hospital – Level 3, the Centers – Level 2, and the Health Houses, Level 1- see Figure 2 shown) have clinics and waiting rooms that provide comfortable and adequate space and privacy to participants. Data collection took place in the reception areas (figure 2).

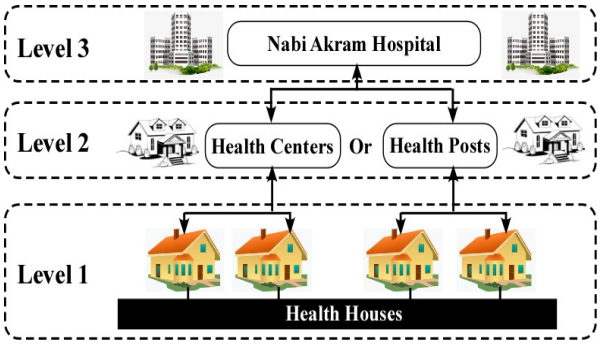

Figure 2. the three levels of Iran's health net system

This study utilized a convenience sample of females ages 18 and above, who were not pregnant and never had breast cancer. Beginning on July 27 through August 31, 2019, data was collected from all three levels; 15 health houses (level 1), 1 health center (Level 2), and one hospital (Nabi Akram Hospital, Level 3). The study sample consisted of women visiting one of these three levels of health care facilities, either seeking healthcare services or accompanied patients seeking health services. Cochran sample size formula was applied to determine the sample size. $n_{\circ} = \frac{z^2 pq}{e^2}$

Based on the above formula, and since the prevalence of breast cancer in Iran was 33% (YJC, 2018) while conducting this study, with a population of 10,000, 95% confidence level, and ±5% precision, a sample size of 329 females with ages 18 and above was desired.

Sampling Design and Rationale

A convenience sampling method was employed to recruit women aged 18 and above who were not pregnant and had no prior diagnosis of breast cancer. Participants were drawn from visitors to the three levels of health care facilities within the Khonj health network, 15 health houses (Level 1), 1 health center (Level 2), and Nabi Akram Hospital (Level 3), between July 27 and August 31, 2019.

This approach was selected due to logistical constraints in the rural Khonj region, where population dispersion, limited transport access, and irregular health facility attendance patterns made probabilistic sampling methods impractical. The convenience sampling method enabled the researcher to access a broad and diverse cross-section of women within the target region and document prevailing breast cancer beliefs and screening behaviors. The sample size was determined using Cochran's formula, yielding a target of 329 participants, assuming a 33% national breast cancer prevalence, a 95% confidence level, and ±5% precision. A total of 392 surveys were collected to account for potential missing data.

Data were collected using a paper-pencil, self-administered survey that combined items from two established instruments: 1. The Million Women Study (MWS) Questionnaire, used to collect demographic and health-related data, including age, family and personal medical history, lifestyle

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factors (e.g., diet, physical activity), and reproductive health. This portion of the survey provided contextual information on breast cancer risk factors and screening practices. 2. Champion's Revised Health Belief Model (HBM) Scale for Mammography Screening (1999), used to assess perceived susceptibility, perceived severity, perceived benefits, and perceived barriers to breast cancer screening behaviors. This instrument consisted of 47 items covering all three screening methods: BSE, CBE, and mammography, with responses measured on a five-point Likert scale (1 = strongly disagree to 5 = strongly agree). Both instruments were translated into Persian following a standard forward–backward translation process to ensure linguistic and conceptual equivalence. Previous studies conducted in Iran using the Persian version of Champion's HBM scale (e.g., Charkazi et al., 2013) have reported acceptable levels of validity and reliability. The combined instrument was reviewed by local health professionals for content relevance and cultural appropriateness prior to administration.

Data collection was coordinated by the study supervisor, a certified CITI-trained researcher, due to restricted access to the CITI program within Iran. Ethical approval was obtained from Jackson State University's Institutional Review Board (IRB) and the Ethics Committee of Nabi Akram Hospital. Participation was voluntary, and informed consent was obtained from all respondents before survey completion.

The questionnaire consists of 47 questions for the six constructs of HBM. The answers to the questions are based on a five-point Likert scale from the strongly disagree to strongly agree. The 47 questions cover all three breast cancer screening methods: BSE, CBE, and mammography. To obtain demographic and health history data, the researcher used the MWS, which was designed to get full prospective information on the risk of breast cancer associated with different types of menopausal hormone therapy. The questionnaire consists of questions regarding health history, family health history, social demographic status, age, height, weight, diet, and nutrition. A total number of 392 surveys were collected.

The reported descriptive analysis included mean, standard deviation, median, range, interquartile range (IQR) for continuous variables, and frequency output for categorical ones. Categorical regression analysis was also used to determine the factors contributing to participants' delay in breast cancer screening (Table 1).

Table 1. Independent and dependent variables shown

Independent Variables	Dependent Variables
• Health belief about breast cancer	• BSE
• Breast cancer knowledge	• CBE
• History of breast cancer	• Mammography
• Socio-demographic variables such as age, weight, level of education, Social Economic Status (SES)	

Binary logistic regression was used to ascertain the effect of perceived BSE and CBE benefits on likelihood of performed breast cancer screening by participants.

A flowchart was employed to illustrate the data analysis process. Then, data were analyzed using *IBM SPSS Statistics* version 25. Descriptive statistics, including the mean, standard deviation, median, range, and interquartile range (IQR), were computed for continuous variables, while frequency distributions were generated for categorical variables.

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Inferential analyses were performed to examine relationships among study variables. Specifically, a categorical regression analysis was conducted to identify factors contributing to participants' delay in breast cancer screening.

In addition, a binary logistic regression was used to determine the effect of perceived benefits of BSE and CBE on the likelihood of participants performing breast cancer screening.

The dependent variable in the logistic regression model was breast cancer screening behavior (coded as 1 = performed, 0 = not performed). Moreover, the independent variables entered into the model were perceived BSE and CBE benefits. Including these variables in the text, along with the corresponding figures, enhances the readability and replicability of the analysis.

Results

The participants' beliefs and behavior towards breast cancer screening were examined by their relation to each concept comprising the HB for each construct of HBM (Table 2).

Table 2. Health belief model and breast cancer screening behaviors diagram

Component	Definition related to breast cancer screening
Perceived susceptibility	One's opinion of the risk of a breast cancer diagnosis in the long term or immediate future
Perceived severity	One's opinion of how serious breast cancer is and what are the consequences of this disease
Perceived benefits	One's opinion of breast cancer screening behaviors include BSE, CBE, and mammogram for early detection of breast cancer
Perceived barriers	One's opinion of performing breast cancer screening behaviors indicates the screenings are emotional, painful and difficult, and costly
Cues to action	Strategies to activate one's readiness for breast cancer screening behaviors relate to BSE, CBE, and mammograms
Self-efficacy	One's confidence in one's ability to get breast cancer screening such as BSE, CBE, and mammograms

Source: Glanz, K., Rimer, B. K., & Viswanath, K. (2008). *Health behavior and health education: theory, research, and practice* (4th ed.). San Francisco, CA: Jossey-Bass

The survey had a set of questions related to that concept. Perceived susceptibility, perceived severity, perceived benefit of BSE, perceived barrier of BSE, confidence in BSE efficacy, perceived benefit of CBE, perceived barrier of CBE, perceived benefit of mammography, perceived barrier of mammography, and at the end, health motivation (cut to action) were the frame of this questionnaire.

Our objectives in this investigation were to: 1) examine the relationship between women's perceptions of breast cancer, specifically perceived susceptibility and perceived severity, and their engagement in breast cancer screening methods, including BSE, CBE, and mammography, and 2) assess how key behavioral and demographic risk factors (such as age, exercise, hypertension, and BMI) are associated with the practice of these screening methods among women in the Khonj region.

To address these objectives, the authors analyzed the interrelationships among perceptions, risk factors, and screening behaviors to better understand the determinants of breast cancer screening participation in this population.

The participants' age ranged from 20 to 68 years old, with a mean of 37 years old. Among participants, 67% (N = 253) had an education level of high school or higher, and 69% (N = 264) had kids (Table 3).

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Table 3. Demographic characteristics of the study sample

Demographic	%	n
Age		348
20-30	24.7	86
31-40	45.1	157
41-50	20.1	70
51-60	8.0	28
61 and above	2.0	7
Level of education		377
Elementary School	18.8	71
Middle School	13.8	53
High School	33.5	126
University	33.7	127
Having kids		385
Yes	68.6	264
No	31.4	121

Participants' age ranged from 20 to 68 (M=37), most of whom were between 31 and 40 (45.1%). Over two-thirds (67%) had completed at least high school, and 69% reported having children.

Perceptions related to the HBM constructs: Overall, participants demonstrated low perceived susceptibility to breast cancer (M=2.34, SD=2.48) and moderate perceived severity (M=10.33, SD=6.4), suggesting limited personal risk perception but moderate concern about the disease's seriousness.

Perceived benefits of BSE were relatively high (M=19.46, SD=7.46), and most of the women agreed that monthly self-examination enhances early detection and reduces worry. Conversely, perceived barriers to BSE were low (M=9.47, SD=5.40); participants largely disagreed that BSE was time-consuming, difficult to remember, or embarrassing. Despite this, participants showed low confidence in their ability to perform BSE correctly (M=5.47, SD=4.68).

Perceptions of the benefits of CBE were moderately high (M=15.15, SD=5.85); over half believed that physician-performed exams reduce anxiety and aid early detection. Perceived barriers to CBE were generally low (M=7.57, SD=4.98); furthermore, most participants did not find CBE embarrassing, painful, or time-consuming.

Similarly, perceived benefits of mammography were high (M=17.21, SD=7.91), with the majority recognizing mammography as an effective method for early detection and reduced mortality. Perceived barriers to mammography were low (M=10.53, SD=6.20), with few concerns about cost, pain, or access. Health motivation, or cues to action, was strong (M=18.00, SD=5.95). Nearly half of the participants reported exercising, eating balanced meals, and valuing early health checkups.

Research question 1. Correlation analyses revealed no significant relationship between perceived susceptibility and perceived benefits of BSE, CBE, or mammography. However, perceived severity was positively correlated with perceived benefits of all three screening methods; BSE ($r = .119$, $p < .05$), CBE ($r = .276$, $p < .01$), and mammography ($r = .238$, $p < .01$). This indicates that women who viewed breast cancer as more serious were more likely to perceive screening as beneficial.

Research question 2. Approximately 38.1% of the participants had previously undergone a breast cancer screening (BSE, CBE, or mammogram). A significant relationship emerged between perceived benefits of CBE and screening history ($r = –.114$, $p < .05$), suggesting that women who valued CBE were more likely to have participated in screening. Logistic regression confirmed that higher CBE benefit perception significantly predicted prior screening (OR=1.05, p=.014).

Research question 3. Analyses exploring breast cancer risk factors showed no significant

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differences in perceived BSE, CBE, or mammography benefits by age group or exercise frequency. A significant difference was found between participants with and without hypertension, and those with high blood pressure reported lower perceived BSE benefits ($t = –2.05$, $p < .05$). However, BMI category was not significantly associated with perceived benefits of any screening method.

Among all the participants, 185 (38.1%) had a previous history of breast cancer screening. There was a significant association between CBE's perceived benefits ($r =-.114$, $p<.05$) and the history of breast cancer screening behavior. However, the association between BSE's perceived benefits and mammography's perceived benefits and their breast cancer screening behavior was not statistically significant. The significant relationship between CBE's perceived benefits and breast cancer screening behavior indicated participants who did the screening had a higher perception of CBE benefits. Still, overall, participants' perception of BSE and mammography benefits did not positively or negatively affect their decision to do breast cancer screening.

Overall Summary

Taken together, findings suggest that women in the Khonj region possess moderate awareness and positive attitudes toward breast cancer screening, though perceived susceptibility remains low. The perceived seriousness of breast cancer plays a crucial role in shaping screening attitudes, particularly toward BSE, CBE, and mammography. Structural and emotional barriers appear minimal with this sample; however, low confidence in performing BSE and limited perceived personal risk may hinder active engagement in self-screening. Health promotion initiatives that emphasize the seriousness of breast cancer, build self-efficacy for BSE, and sustain health motivation could enhance screening participation rates among women in this region.

Discussion

The purpose of this study was to examine breast cancer screening beliefs and behaviors among women in southern Iran within the framework of the HBM. Specifically, this study assessed relationships between perceived susceptibility, severity, and benefits of breast cancer screening behaviors, including BSE, CBE, and mammography. The results provide valuable insights into the current state of breast cancer awareness and screening practices among women in the Khonj region and highlight important implications for health education and health promotion efforts.

Breast cancer perceptions and screening behavior: The findings indicated that participants had a relatively low perception of susceptibility to breast cancer but a moderate to high perception of the severity of the disease. This pattern suggests that while participants recognized breast cancer as a serious illness, they did not perceive themselves as personally at risk. These results are consistent with previous studies showing that women in developing countries often underestimate their personal susceptibility to breast cancer despite acknowledging its seriousness (Champion, 1999; Charkazi et al., 2013; Ghourchaei, 2013). According to the HBM, both perceived susceptibility and perceived severity are critical determinants of preventive health behaviors (Glanz & Viswanath, 2008). Thus, the low perceived susceptibility found in this study may contribute to the relatively low engagement in breast cancer screening practices among participants.

A significant relationship was found between perceived severity and perceived benefits of BSE, CBE, and mammography, supporting earlier findings that women who recognize the potential seriousness of breast cancer are more likely to value screening behaviors (Avci, 2008; Wu et al., 2018). However, no significant relationship was observed between perceived susceptibility and screening behavior, a finding that diverges from some studies (Champion, 1999; Charkazi et al., 2013) but aligns with others ,showing that perceived severity may have a stronger influence than susceptibility on screening behavior in certain cultural contexts (Ghourchaei, 2013).

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Predictors of Screening Practices

The study revealed that only 38% of the participants had engaged in any form of breast cancer screening. Among the three screening methods, perceived benefits of CBE showed a significant association with past screening behavior, whereas perceived benefits of BSE and mammography did not. This suggests that CBE may be the most accessible and trusted screening method in this population, likely due to its affordability and availability in local health centers. These results align with previous studies in Iran and other middle-income countries, where CBE has been identified as a practical and cost-effective method for early detection of breast cancer (Hajian-Tilaki et al., 2012; Parsa et al., 2008; Burton & Bell, 2013).

The limited association between mammography and screening behavior may reflect systemic barriers such as high cost, limited availability, and lack of national mammography programs in Iran (Harirchi et al., 2008; Harirchi et al., 2008). Similarly, the low utilization of BSE may be attributed to inadequate knowledge and low confidence in performing the technique correctly, as indicated by participants' responses. Educational interventions that focus on skill-building and enhancing self-efficacy in performing BSE may therefore be beneficial.

Influence of Risk Factors

Analysis of demographic and lifestyle factors revealed that age, exercise, hypertension, and body mass index (BMI) did not significantly affect perceptions of BSE, CBE, or mammography benefits. However, a notable exception was that women with hypertension reported significantly lower perceived benefits of BSE compared to those without hypertension. This finding is consistent with research indicating that women with chronic conditions often engage less in preventive health behaviors, possibly due to competing health priorities or lower health motivation (Kardan-Souraki et al., 2019). Targeted education programs for women with chronic illnesses, emphasizing the importance of preventive screening alongside disease management, may improve participation in screening.

The lack of a significant relationship between physical activity and perceived screening benefits may reflect cultural and environmental barriers to exercise in rural Iranian communities, where access to fitness facilities is limited, and social norms may restrict women's participation in physical activities. Furthermore, the absence of a relationship between BMI and perceived benefits of screening contrasts with studies linking obesity to increased breast cancer risk (Stewart & Wild, 2014). These findings highlight the need for culturally sensitive education strategies that address both lifestyle risk factors and the importance of early detection.

Implications for Health Education and Promotion

The findings of this study underscore the urgent need for culturally tailored health education interventions aimed at increasing breast cancer awareness and screening participation among women in rural areas of Iran. Educational programs should focus on enhancing perceived susceptibility and self-efficacy while reinforcing the benefits of BSE, CBE, and mammography. In particular, integrating breast cancer education into existing primary health care services could ensure broader reach and sustainability. Collaboration between government health agencies and community-based organizations may also strengthen screening initiatives and improve access to preventive care.

Given that participants expressed strong motivation to maintain good health, this positive orientation can be leveraged in future health promotion efforts. Programs emphasizing empowerment, family's well-being, and community health may resonate more effectively within the sociocultural context of southern Iran.

Limitations and Recommendations for Future Research

This study had several limitations. First, the use of self-reported data may introduce response bias, particularly in estimating screening practices.

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Second, the cross-sectional design limits causal inference. Third, the sample was restricted to women from a single rural region, which may limit generalizability to other populations in Iran. Future studies should employ larger and more diverse samples use longitudinal designs to assess changes over time, and explore additional psychosocial factors such as social support, perceived barriers, and health system accessibility.

Conclusion

Overall, the findings contribute to the growing body of evidence that perceptions of severity and benefits, rather than susceptibility, play a pivotal role in predicting breast cancer screening behaviors among women in rural Iran. Enhancing awareness, improving access to screening, and strengthening women's confidence in performing preventive behaviors are essential strategies to reduce breast cancer morbidity and mortality in this region.

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Conflict of Interest

The authors declared no conflict of interests.

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Ethical considerations

Jackson State University's Internal Review Board (IRB) approved the IRB application. All research ethical matters were conducted in accordance with the Collaborative Institutional Training.

Code of Ethics

A letter from Nabi Akram Hospital submitted to meet the required code of ethics

Authors' Contributions

Conceptualization was done by S. Aseel and M. Shahbazi. Methodology was devised by Aseel. Formal analysis was done by M. Karimi. Investigation was done by A. Ahmadiazad, M. Shahbazi and S. Aseel. Ahmadiazad and Shahbazi conducted project administration. Aseel wrote the original draft. M. Moradimehrabadi and Shahbazi reviewed and edited the draft for this publication. Shahbazi and Ahmadiazad administered and supervised the study.

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