RESEARCH ARTICLE

**Editorial Process:** Submission:03/11/2023 Acceptance:07/05/2023

# Investigating Saudi Nursing Students' Health Beliefs about Testicular Cancer and Testicular Self-Examination: A Cross-Sectional Study Using the Health Belief Model

**Zyad T. Saleh[1], Rami A. Elshatarat[2], Ahmad Mahmoud Saleh[3]*, Nora H. Elneblawi[2], Khaled M. Al-Sayaghi[2,4], Hassanat R. Abdel-Aziz[3], Ali M. Saleh[5], Mamdouh El-hneiti[5], Naif S. Al Tarawneh[6], Abdullah R. Allugmani[2], Rami Saleem Aloufi[7]**

## Abstract

**Introduction:** Testicular cancer (TC) is a serious health issue, which requires early detection through testicular self-examination (TSE). **Objectives:** To investigate Saudi nursing students' health beliefs about TC and TSE using the Health Belief Model (HBM) scale and assess the validity and reliability of the HBM scale. **Methods:** This cross-sectional study recruited a convenience sample of 374 nursing students from six nursing colleges in different cities in Saudi Arabia. Data were collected through self-report questionnaires that included demographic and academic information, as well as a valid and reliable HBM scale for TC and TSE. **Results:** Most participants were single (88.8 %), in their third year of nursing education (43.9 %), had excellent or very good health (83.2%), had no family history of TC (88.9%), and had no medical problems with their testicles (92.8%). The participants had low susceptibility to TC and moderate beliefs about the seriousness of TC. Furthermore, participants reported moderate levels of perceived benefits and health motivation for preventing TC and practicing TSE, but high levels of perceived barriers and low levels of self-efficacy for practicing TSE. The internal reliability (Cronbach's alpha) of susceptibility, benefits and health motivation, seriousness, barriers, self-efficacy, and health motivation and promotion sub-scales was 0.91, 0.89, 0.88, 0.84, 0.67, and 0.65, respectively. Significant relationship between students' performing TSE and their health beliefs about Susceptibility ($t=1.93$, $p=0.04$) and Seriousness of having TC ($t=2.88$, $p=0.03$), and self-efficacy ($t=3.91$, $p<0.001$) and barriers ($t=-2.51$, $p=0.04$) to practice TSE. **Conclusion:** The study concluded that Saudi nursing students had moderate levels of health beliefs about TC and TSE, with high perceived barriers and low levels of self-efficacy for practicing TSE.

**Keywords:** Saudi nursing students- Health beliefs model- validity and reliability- testicular cancer

*Asian Pac J Cancer Prev,* **24 (7)**, 2413-2420

## Introduction

Testicular cancer (TC) is a rare malignant tumour, but a significant health concern affecting men globally, accounting for 1-2% of all male malignancies (Cheng et al., 2018; Stonier and Coscione, 2021). TC is the most common malignancy in men aged 15-35 years. Fortunately, TC has high curability rates with an excellent five-year survival rate of 95-98% (Albers et al., 2015; Cheng et al., 2018; Hanna and Einhorn, 2014; Stonier and Coscione, 2021). However, the incidence of TC is increasing worldwide, with new statistics suggesting that one in 250 men will be diagnosed with TC and approximately one in five thousand men will die from TC (Albers et al., 2015; Hanna and Einhorn, 2014; Stonier and Coscione, 2021).

The main causes of TC are mostly unknown, with about 80-90% of cases having no identifiable cause. However, the literature suggests that certain risk factors can increase the chances of developing TC, such as cryptorchidism (undescended testicles), hereditary factors, and family history (Akers, 2018; Singh et al., 2020; Stonier

*[1]Department of Clinical Nursing, School of Nursing, The University of Jordan, Amman, Jordan. [2]Department of Medical and Surgical Nursing, College of Nursing, Taibah University, Madinah, Saudi Arabia. [3]Department of Nursing, College of Applied Medical Sciences, Prince Sattam bin Abdulaziz University, AlKharj, Saudi Arabia. [4]Nursing Division, Faculty of Medicine and Health Sciences, Sana'a University, Sana'a, Yemen. [5]Community Health Nursing Department, School of Nursing, The University of Jordan, Amman, Jordan. [6]Department of Psychiatric Nursing, College of Nursing, Taibah University, Madinah, Saudi Arabia. [7]Deputy of Academic Affairs, College of Nursing, Taibah University, Madinah, Saudi Arabia. *For Correspondence:am.saleh@psau.edu.sa*

and Coscione, 2021).

The literature revealed that early-stage TC is more likely to be curable, and can reduce the co-morbidity and mortality rates associated with TC. Early detection of TC can be through testicular self-examination (TSE), which is a simple and effective approach for initial diagnosis in most men (Akers, 2018; Stonier and Coscione, 2021). However, despite the importance of increasing the possibility of early detection and diagnosis of TC, several studies have shown that men often have knowledge deficits, poor skills in performing TSE, incorrect perceptions and beliefs about the characteristics and hazards of TC, as well as the benefits of performing TSE (Bresciani et al., 2021; Stonier and Coscione, 2021; Ustundag, 2019). The noted potential impact of early detection on the outcomes of TC, there is a need to increase public awareness of the importance of TSE and to improve men's knowledge and skills in performing TC. To achieve this, healthcare professionals should play a key role in educating men about TC and the importance of TSE. Specifically, nurses have major roles in promoting self-examination, and providing support and counselling for clients with TC is crucial. Furthermore, nurses can also address clients' concerns and misconceptions about TC and TSE, which is essential for encouraging men to seek medical advice when necessary (Asgar et al., 2018; Avci and Altinel, 2018; Khani et al., 2021; Ustundag, 2019).

Nursing students are an important population to study as they are the future healthcare providers who will be responsible for educating patients about self-examination practices and promoting preventative health behaviours (Avci and Altinel, 2018; El Mezayen and Abd El-Hay, 2019; Ustundag, 2019). However, studies have shown that nursing students also lack knowledge and awareness of TC and TSE (Ahmed et al., 2019; El Mezayen and Abd El-Hay, 2019). A study conducted in Saudi Arabia revealed that nursing students had poor knowledge and incorrect beliefs about TC and TSE, and this lack of knowledge was identified as a significant barrier to providing effective patient education (Alamri et al., 2021; Salati et al., 2020). Nursing education plays a significant role in preparing nurses to provide comprehensive care for clients with TC. This includes developing their communication and counseling skills, as well as ensuring they have sufficient knowledge and understanding of TC and self-examination (Ahmed et al., 2019; Akca et al., 2021; El Mezayen and Abd El-Hay, 2019). Previous studies evaluated the knowledge, attitudes, and practices of nursing students toward TC and found that there was a lack of knowledge and a negative attitude toward TSE. By understanding the health beliefs and practices related to TSE among nursing students, interventions can be developed to improve knowledge and awareness about TC and self-examination (Akca et al., 2021; El Mezayen and Abd El-Hay, 2019).

The Health Belief Model (HBM) is a widely-used theoretical framework in health behaviour research that explains and predicts individuals' health-related behaviours (Avci and Altinel, 2018; Khani et al., 2021; Ustundag, 2019). The HBM suggests that people are more likely to engage in specific health behaviour (such as TSE) if they perceive themselves to be at risk for the condition, believe that their behaviour will reduce their risk, and perceive that the benefits of the behaviour outweigh the costs, discomfort, and barriers. In the context of TC, studies have shown that the HBM can be an effective framework for understanding TC awareness and behaviours among young men (Avci and Altinel, 2018; El Mezayen and Abd El-Hay, 2019; Khani et al., 2021; Ustundag, 2019). Moreover, the HBM would suggest that individuals are more likely to perform TSE if they believe that they are at risk for TC (e.g., due to personal or family history), understand the benefits of TSE (e.g., early detection and increased survival rates), and perceive the barriers of TSE to be minimal (e.g., discomfort or embarrassment). For example, a study conducted in Turkey found that higher scores on the HBM were associated with higher levels of TSE practice among university students (El Mezayen and Abd El-Hay, 2019; Khani et al., 2021; Ustundag, 2019). Another study in Turkey found that men with higher perceived susceptibility and severity of TC were more likely to engage in TSE (Avci and Altinel, 2018).

To assess individuals' beliefs about TC and TSE, researchers can use various measures based on the HBM constructs. For example, a questionnaire (such as the HBM scale) may ask individuals to rate their perceived susceptibility to TC, perceived seriousness of the disease, and perceived benefits and barriers to performing TSE (Avci and Altinel, 2018). Such valid and reliable assessment tools can help healthcare providers to determine the awareness and beliefs of public health in developing targeted interventions to increase TC awareness and encourage performing TSE. Moreover, by identifying the individuals' beliefs about the barriers to performing TSE, researchers can tailor interventions to address specific concerns and promote behaviour change (Avci and Altinel, 2018; El Mezayen and Abd El-Hay, 2019).

Worldwide, few studies have examined the application of the HBM to TC awareness and behaviours among nursing students (El Mezayen and Abd El-Hay, 2019; Khani et al., 2021; Ustundag, 2019). Despite the important role of nurses in assessing, and managing TC and providing health education about TC and TSE, up to our knowledge, there no study was published to investigate the nurses' or nursing students' knowledge, beliefs, and attitude regarding TC and TSE in Saudi Arabia. Nursing students are an important population to study, as they will be future healthcare providers who can play a critical role in educating patients about cancer prevention and early detection (Ahmed et al., 2019; Akca et al., 2021; El Mezayen and Abd El-Hay, 2019). Additionally, as Saudi Arabia is a conservative society with strict gender norms, there may be unique cultural factors that influence TC awareness, beliefs, and behaviours among nursing students. Therefore, the findings of this study may help nursing educators to improve nursing program curricula in Saudi Arabia to focus on assessing and managing TC. Moreover, the purpose of investigating the reliability of the HBM scale in this study is to assess the consistency and stability of the scale in measuring health beliefs about TC and the benefits of TSE among Saudi nursing students. As the HBM scale has not been previously validated and

tested for reliability in Saudi Arabia or Arab countries, this study aimed to determine the internal consistency and stability of the scale to ensure that it can provide reliable and valid data for future research on the attitudes and beliefs of Saudi nursing students towards TC and TSE. The reliability testing is essential to ensure that the scale is a useful and accurate tool for measuring health beliefs and to increase the validity of future studies using this scale in Saudi Arabia or other Arab countries. Furthermore, the data of this study will be useful baseline information for conducting further experimental studies to assess the effectiveness of health education programs on nursing students' knowledge, and beliefs about TC and enhance practicing TSE regularly.

*Study Objectives*

The specific objectives for this study were: 1) to examine Saudi nursing students' health beliefs and perceptions about TC and TSE using the constructs of the HBM, 2) to assess the reliability and validity of the HBM scale for TC and TSE among Saudi nursing students, and 3) to investigate the relationship between Saudi nursing students' health beliefs about TC and TSE and their actual practice of TSE.

## Materials and Methods

*Design, Sample, and Setting*

This cross-sectional study was conducted using a convenience sample of 374 nursing students to investigate their health beliefs about TC and TSE. The sample was recruited from six nursing colleges in different cities in Saudi Arabia. The participants in this study were able to understand the English language and passed the physical examination and adult health nursing courses. Any student who had a diagnosis of TC was excluded from this study. G-POWER software program was used to calculate the effective sample size. The researchers used the power of 0.80, moderate effective size of 0.30, and alpha value as 0.05. The estimated effective sample size was 352. The researchers distributed 400 questionnaires. A total of 374 fully completed questionnaires were returned back to the researchers.

*Data Collection Procedure and Ethical Considerations*

The Institutional Review Board (IRB) was obtained from Al-Ghad International Colleges to conduct the study. The researchers interviewed the eligible participants in their nursing schools. The researchers explained the objectives of the study to eligible participants and invited them to participate in the study. Then, written consent forms were signed by those who agreed to participate in this study. The students took between 10 and 12 minutes to complete the questionnaire.

*Instruments*

A structured self-report questionnaire was used to collect the data. Demographical and academic achievement data was obtained, this subscale includes students' age, marital status, level of education, and accumulated Grade Point Average (GPA).

To assess the nursing students' health, they were asked to evaluate their health status, and report if they are tobacco users, have a family history of TC, or have medical problems with their testicles. Then, they were asked to report if they were learned about TSE or not, and what is their source of information about TSE. Also, they were asked to report if they regularly perform TSE (at least every 3 months) or not.

The researchers of this study adopted a valid and reliable instrument (HBM scale for TC and TSE) from a previous Turkish study (Avci and Altinel, 2018), which is conducted to investigate the participants' beliefs about TC and TSE. The authors of the previous study developed the instrument based on the theoretical framework of HBM and several studies that were conducted to investigate the participants' beliefs about malignant tumours (such as breast cancer) and self-examination practices (Avci and Altinel, 2018). This developed scale consists of six sub-scales (sub-dimensions), including "susceptibility" and "seriousness" of having TC, and "benefit", "barriers", "self-efficacy", and "health motivation" for TSE practice. The participants' responses for this scale were: (5 = strongly agree), (4 = agree), (3 = undecided), (2 = disagree), and (1 = strongly disagree). The researchers of the previous study assessed the psychometric properties (including the validity and reliability) of this scale. To assess the validity of this developed scale, the researchers reported that it was reviewed by six health specialists, including public nurses, physiologists, urologists, and psychologists (Avci and Altinel, 2018). Also, the findings of the previous study showed that the internal reliability (Cronbach's alpha) for subscales ranged between 0.64 and 0.88 (Avci and Altinel, 2018) .

*Validity and Reliability of the HBM scale*

To ensure the validity and reliability of the adapted HBM scale, the authors of the present study reviewed the research studies that have used the HBM scale and assessed its psychometric properties (Avci and Altinel, 2018; El Mezayen and Abd El-Hay, 2019). Moreover, the authors reviewed the adapted HBM scale to ensure the cultural appropriateness of the scale for Saudi nursing students and made a few modifications to enhance its relevance, combinability, and comprehensibility. Additionally, the modified HBM scale was reviewed by four clinical professionals including nurse educators, oncology nurse specialists, urologists, and medical internists to check its validity. Also, the English language editor reviewed the structure of the HBM scale to check its clarity. Furthermore, a pilot study was conducted by recruiting 20 nursing students to evaluate the internal reliability, clarity, and easiness of completing the scale. By taking all these steps, the authors double-checked that the HBM scale is a valid and reliable tool for assessing health beliefs about TC and TSE.

*Data Analysis*

SPSS was used for statistical analysis. Descriptive statistics and frequencies were used to report the findings of students' demographic, self-rated health status, and beliefs about TC and TSE. T-test analyses were done to

identify the significant relationships between students' performing TSE and their health beliefs about TC and TSE. Internal reliability analysis was run using the alpha coefficient (Cronbach's alpha) to identify the internal consistency for sub-scales of the adopted HBM scale (Avci and Altinel, 2018).

## Results

The most frequent of the participants were singles (88.8 %), in the third-year level of nursing education (43.9 %), rated their health as excellent or very good (83.2%), had no history of family history of TC (88.9%), hadn't medical problem with testicles (92.8%), non-current tobacco users, had their knowledge about TSE in their classes at the nursing program. On average, their age was 21.3 (±2.4) years old and their GPA was 3.51 out of 5 (±0.37) (Table 1).

Table 2 shows the mean of participants' beliefs about TC and TSE using a 5-point Likert HBM scale. According to the susceptibility sub-scale, a low average of participants believed that they have a very high possibility of having TC in a few years (2.8 ±1.2). Regarding the seriousness of TC, the most frequent of the participants believed that If they have TC, their whole life will be changed (3.5±1.2). In terms of benefits and health motivation for preventing TC and practicing TSE, most frequently of the participants said that staying healthy is very important (4.2±1.2). In terms of the barriers to doing TSE, the most frequent of the participants said that they find it boring to do TSE every month (3.4±1.2). The majority of the participants had low self-efficacy in doing TSE. The average of participants' knowledge about how to do self-examination items was (2.3 ±1.0), which was the highest average in the self-efficacy sub-scale. In terms of Health motivation and promotion, the most frequent of the participants said that they practice exercises at least three times a week (3.3 ±1.3). Also, Table 2 shows the internal consistency (reliability) of the HBM scale for TC and TSE. The internal reliability (Cronbach's alpha) of susceptibility, benefits and health motivation, seriousness, barriers, self-efficacy, and health motivation and promotion sub-scales was 0.91, 0.89, 0.88, 0.84, 0.67, and 0.65, respectively.

The t-test analyses in Table 3 demonstrated significant differences between the means of participants who were performing TSE (M=12.8, SD= 4.3) and those who were not performing TSE (M=9.8, SD=3.7) concerning beliefs about susceptibility to TC (t=1.93, p=0.04). Similarly, significant differences were found between the means of participants who were performing TSE (M=30.7, SD=6.9) and those who were not performing TSE (M=22.1, SD=5.6) concerning beliefs about the seriousness of TC (t=2.88, p=0.03). Participants who perceived more barriers to practicing TSE were significantly less likely to perform TSE (M=24.5, SD=6.0) than those who were performing TSE (M=19.3, SD=5.4), (t=-2.51, p=0.04). Moreover, participants who had higher self-confidence to practice TSE were significantly more likely to perform TSE (M=15.2, SD=3.2) than those who were not performing TSE (M=9.9, SD=2.9), (t=3.91, p<0.001).

Table 1. Students' Characteristics, Academic Achievement Data, and Health-Related Data and Sources of Knowledge about TSE

| Variable | n (%) |
|---|---|
| Marital status | |
| Single | 332 (88.8) |
| Has been married | 42 (11.2) |
| Level of education in the nursing program | |
| Third year | 154 (43.9 ) |
| Fourth-year | 136 (36.4) |
| Internship | 74 (19.8) |
| Participants' health assessment | |
| Rating your health status (Excellent or very good) | 311 (83.2) |
| Has a family history of TC (yes) | 34 (9.1) |
| Has a medical problem with testicles (yes) | 27 (7.2) |
| Current tobacco user (yes) | 135 (36.1) |
| Have been learned about TSE (yes) | 214 (57.2) |
| Regularly perform TSE (at least every 3 months) | 71 (19.0) |
| Source of students' information about TSE * | |
| Professional education (college of nursing) | 245 (65.5) |
| Seminar or/and workshop | 92 (24.6) |
| Conferences | 26 (7.0) |
| Internet or media (e.g. TV, radio) | 129 (34.5) |
| Friends and relative | 27 (7.2) |
| | Mean (± SD) |
| Age (years) | 21.3 (±2.4) |
| GPA | 3.51 (±0.37) |

* Participants may select one or more

## Discussion

TC is a rare form of cancer that mainly affects young men aged between 15 to 40 years (Foster et al., 2020). Early detection of TC through TSE is very important for successful treatment and recovery. The role of nursing staff in promoting awareness of TC and the importance of TSE is vital for improving early detection and outcomes for individuals who were diagnosed with the disease. However, several studies have highlighted the lack of knowledge and incorrect beliefs among nurses about TC and TSE (Avci and Altinel, 2018; El Mezayen and Abd El-Hay, 2019; Ustundag, 2019). Database search revealed few studies were conducted to investigate the knowledge, perceptions, beliefs of adolescents and young men in Saudi Arabia (Alamri et al., 2021; Salati et al., 2020; Saleh et al., 2023) and other Gulf countries (Alaradi and Almuqamam, 2020) about TC and TSE. Unfortunately, literature showed lack of knowledge and unawareness of adolescents and young men in Arab countries about the characteristics, symptoms, risk factors, diagnostic tests, and treatment of TC and how to perform TSE. Literature also showed incorrect perception and beliefs about the hazards of TC and they under-estimated the benefits of performing TSE as an important approach for early detecting of TC.

Table 2. Item Analysis and Internal Consistency (Reliability) of the HBM Scale for TC and TSE

| Scale Items | mean (±SD) out of 5* | Corrected item-total correlation | Sub-scale reliability (Cronbach's α) |
|---|---|---|---|
| Susceptibility | | | |
| 1. The possibility that I have testicular cancer is very high. | 2.5 (±0.8) | 0.73 | 0.91 |
| 2. The possibility that I will have testicular cancer in a few years is very high. | 2.8 (±1.2) | 0.85 | |
| 3. I feel that I will have testicular cancer in some part of my life. | 2.5 (±1.0) | 0.81 | |
| 4. I fear dying of testicular cancer. | 2.6 (±1.0) | 0.66 | |
| 5. In comparison to a male peer, the possibility that I have testicular cancer is very high. | 2.3 (±0.9) | 0.73 | |
| Seriousness | | | |
| 1. The thought of testicular cancer scares me. | 2.7 (±1.1) | 0.68 | 0.88 |
| 2. My heartbeat gets faster when I think of testicular cancer. | 2.6 (±1.0) | 0.71 | |
| 3. I will suffer from various problems for a long period of time if I have testicular cancer. | 3.1 (±1.2) | 0.73 | |
| 4. Having testicular cancer will threaten my relationship with my wife | 3.2 (±1.3) | 0.57 | |
| 5. If I have testicular cancer, my whole life will change. | 3.5 (±1.2) | 0.74 | |
| 6. Testicular cancer is a hopeless disease. | 2.7 (±0.8) | 0.63 | |
| 7. Having testicular cancer would put my financial security in danger. | 3.0 (±1.1) | 0.60 | |
| 8. Testicular cancer would put my future professional life in danger. | 3.1 (±1.1) | 0.68 | |
| 9. Testicular cancer would end my sexual life. | 2.8 (±1.1) | 0.54 | |
| 10. If I have testicular cancer, I will be infertile. | 3.5 (±1.3) | 0.65 | |
| Benefits and health motivation | | | |
| 1. I search for new information to improve my health. | 3.8 (±1.3) | 0.74 | 0.89 |
| 2. Finding out my health problems at an early stage is important to me. | 3.6 (±1.3) | 0.86 | |
| 3. Staying healthy is very important to me. | 4.2 (±1.2) | 0.85 | |
| 4. I think it is important to do things that benefit my health. | 4.1 (±1.2) | 0.82 | |
| 5. If I do a self-examination every month, I will be less likely to die of testicular cancer. | 3.0 (±1.0) | 0.63 | |
| 6. I would have a successful testicular cancer treatment if I find a lump by TSE at an early stage. | 3.1 (±1.1) | 0.67 | |
| Barriers | | | |
| 1. I find it boring to do TSE every month. | 3.4 (±1.2) | 0.69 | 0.84 |
| 2. It takes a long time to do TSE. | 2.9 (±1.0) | 0.63 | |
| 3. Testicular self-examination is painful. | 2.8 (±0.9) | 0.56 | |
| 4. If I did a self-examination of my testicles, my family would laugh at me for this act | 2.1 (±0.9) | 0.37 | |
| 5. It is difficult to remember to do TSE. | 2.8 (±1.2) | 0.57 | |
| 6. I do not have the privacy required to do TSE. | 2.5 (±1.0) | 0.53 | |
| 7. If I have a health professional to do a testicular examination for me, I will not need to do TSE | 2.3 (±1.1) | 0.41 | |
| 8. I do not do self-examination since I am afraid of finding something (a lump). | 3.2 (±1.2) | 0.69 | |
| 9. I have more important problems or issues than doing self-examination. | 2.7 (±1.1) | 0.46 | |
| Self-efficacy | | | |
| 1. I know how to do self-examination. | 2.3 (±1.0) | 0.45 | 0.67 |
| 2. I can do TSE correctly. | 2.1 (±1.2) | 0.47 | |
| 3. I can find a lump in my testicles by doing a self-examination. | 2.1 (±1.1) | 0.52 | |
| 4. I can say that I have a problem with my testicles by doing the self- examination. | 2.0 (±0.9) | 0.48 | |
| Health motivation and promotion | | | |
| 1. I eat a balanced diet. | 3.1 (±1.3) | 0.48 | 0.65 |
| 2. I exercise at least three times a week. | 3.3 (±1.3) | 0.46 | |
| 3. I have medical check-ups regularly even if I am not ill. | 2.8 (±1.1) | 0.57 | |

* participants' responses were: (5 = strongly agree), (4 = agree), (3 = undecided), (2 = disagree), and (1 = strongly disagree).

Table 3. Relationship between Students' Health Beliefs about TC, and TSE and Performing TSE

| Sub-scales | Performing TSE Mean (±SD) | Not performing TSE Mean (±SD) | t-test | p value* |
|---|---|---|---|---|
| Susceptibility | 12.8 (±4.3) | 9.8 (±3.7) | 1.93 | **0.04** |
| Seriousness | 30.7 (±6.9) | 22.1 (±5.6) | 2.88 | **0.03** |
| Benefits and health motivation | 24.1 (±5.6) | 22.8 (±5.2) | 0.75 | 0.15 |
| Barriers | 19.3 (±5.4) | 24.5 (±6.0) | −2.51 | **0.04** |
| Self-efficacy | 15.2 (±3.2) | 9.9 (±2.9) | 3.91 | **<0.001** |
| Health motivation | 9.8 (±2.4) | 9.3 (±2.5) | 0.48 | 0.46 |

* Significant p value (<0.05) is marked as a bold

These incorrect perceptions and beliefs may affect their behaviours in not performing TSE periodically (Alamri et al., 2021; Alaradi and Almuqamam, 2020; Salati et al., 2020; Saleh et al., 2023).

HBM is a theoretical framework that explains why individuals engage in preventive health behaviours such TSE. The HBM has been used in several studies to explore nursing students' beliefs about TC and TSE. For instance, previous studies used the HBM to assess nurses' and nursing students' knowledge and beliefs about TC and TSE (Avci and Altinel, 2018; El Mezayen and Abd El-Hay, 2019; Ustundag, 2019). These studies showed that nursing students had a moderate level of knowledge and positive attitudes towards TSE, but had low perceived susceptibility to TC (Asgar et al., 2018; Avci and Altinel, 2018). Unfortunately, there is lack of research on the application of the HBM to TC awareness and behaviours among nursing students in Saudi Arabia and other Arab countries. Therefore, this study also aims to fill this gap by exploring the factors that influence nursing students' beliefs and behaviours related to TC prevention and early detection. Specifically, this study will use the HBM to assess nursing students' perceived susceptibility and seriousness of TC, perceived benefits and barriers to perform TSE.

According to the findings of this study, only 57.2% of nursing students had learned about TSE, and only 19% reported performing TSE regularly. This is consistent with previous literature that has found a high percentage of nursing students lack knowledge and skills related to TC and TSE. For those who did learn about TC and TSE, many still had knowledge deficits, low self-confidence, and poor TSE skills (Ahmed et al., 2019; Akca et al., 2021; El Mezayen and Abd El-Hay, 2019). Moreover, the percentage of nursing students and staff who reported performing TSE regularly is very low, which may suggest a lack of awareness and motivation to perform TSE. For example, previous studies conducted in Saudi Arabia found that low percentages of adolescents and university students reported performing TSE at least once every three months (Alamri et al., 2021; Salati et al., 2020). This lack of exposure to education about TC and TSE indicates a lack of knowledge and skills among nursing students and it is a concerning issue, especially since they will play a crucial role in educating their clients and communities about TC and promoting TSE. Furthermore, the low percentage of nursing students and staff regularly performing TSE is alarming. Regular TSE is a critical aspect of the early detection and management of TC. It is concerning that nursing students, who are in a position to educate their clients and communities, are not taking the necessary steps to monitor their health. This issue is not limited to nursing students; previous studies have also reported a low percentage of nursing staff were performing TSE regularly. Therefore, there is an urgent need to improve the knowledge and skills of nursing students and staff regarding TC and TSE and encourage them to perform regular TSE to set a role models for their clients and communities (El Mezayen and Abd El-Hay, 2019; Marks, 2017; Wanzer et al., 2014).

The findings of this study highlight the importance of examining young men's beliefs and perceptions about TC and TSE. According to the results, the majority of participants believed that the seriousness of TC would have a significant impact on their whole life if they were diagnosed. This finding is consistent with previous studies that found young men tend to believe that TC is a dangerous and life-threatening disease (Avci and Altinel, 2018). However, the participants' perceived susceptibility to TC was relatively low, indicating that they did not believe they had a high possibility of developing TC in the future. This finding is consistent with previous studies that found young men tend to underestimate their susceptibility to TC (Avci and Altinel, 2018; Ustundag, 2019). Regarding the benefits and motivation for practicing TSE, the majority of participants stated that staying healthy was essential. This result aligns with previous research, whereas the individuals who prioritize their health are more likely to engage in health-promoting behaviours (Avci and Altinel, 2018). However, the most frequent barriers were reported by participants who had boredom with performing TSE every month, indicating the need for more engaging and interactive ways to encourage young men to practice TSE regularly. Additionally, the study found that the majority of participants had low self-efficacy in performing TSE, suggesting that more education and training are needed to increase their confidence and skills in performing TSE (Avci and Altinel, 2018; El Mezayen and Abd El-Hay, 2019).

The results of this study indicate high internal reliability (Cronbach's alpha) for the susceptibility, seriousness, benefits and health motivation, and barriers of the HBM sub-scales. While, the self-efficacy, and health motivation and promotion sub-scales had the lowest

reliability coefficients. These results are similar to the reliability of a previous Turkish study that was conducted to investigate the same HBM scale for TC and TSE (Avci and Altinel, 2018). These results suggest that the HBM scale for TC and TSE has good internal reliability and can be used to assess nursing students' beliefs and practices related to TC and TSE. However, the lower reliability coefficients for the self-efficacy, and health motivation and promotion sub-scales indicate that further refinement of the sub-scale items may be necessary to improve their consistency and reliability (Avci and Altinel, 2018).

The findings of the present study indicated significant differences between the mean scores of participants who performed TSE and those who did not in terms of their beliefs about susceptibility and seriousness of TC and perceived barriers and self-efficacy for performing TSE. The results revealed that participants who performed TSE had higher mean scores for susceptibility and seriousness of TC and self-efficacy subscales and lower mean scores for barriers sub-scale compared to those who did not perform TSE. These results were consistent with previous research that also found a significant association between performing TSE and beliefs about susceptibility, seriousness, barriers, and self-efficacy (Asgar et al., 2018; Avci and Altinel, 2018; El Mezayen and Abd El-Hay, 2019; Ustundag, 2019).

Finally, reviewing the literature showed that the findings of this study are consistent with the previous Saudi studies and other studies that conducted in Middle East. One study, which was conducted to examine TC awareness and behaviours among college students in Saudi Arabia, noted that low levels of TSE practice, with only 21% of male students reporting ever having performed TSE (Alzahrani et al., 2016). This study highlights the need for further research to understand the barriers and facilitators to TSE practice among young men in Saudi Arabia. Moreover, a study in Saudi Arabia revealed that nursing staff had limited knowledge about TC and TSE, which could affect their ability to educate patients and promote early detection. The study also found that nursing staff had negative attitudes towards discussing sensitive issues related to male genitalia (Alzahrani et al., 2018). Another study in Saudi Arabia found that nursing students had inadequate knowledge and negative attitudes towards TSE, which could be attributed to the lack of training on TSE (Alwahaibi ad Alkhabbaz, 2020). A study conducted in Iran found that nursing students had a low level of knowledge about TC and TSE. Additionally, the study revealed that nursing students had negative attitudes towards performing TSE due to cultural and religious beliefs (Safari-Moradabadi et al., 2019). Similarly, a study in Turkey found that nursing students had poor understanding of the risk factors, symptoms, and treatment of TC, as well as a lack of knowledge about TSE (Aydin and Yaman, 2020). Other Turkish study was aimed to develop and test the validity and reliability of a HBM Scale for TC and TSE , which is the same scale that has been used in the present study. The findings showed that the developed HBM Scale for TSE was a valid and reliable tool for measuring individuals' beliefs about TSE behaviours. The internal consistency of the was high with Cronbach's alpha coefficients ranging from 0.63 to 0.89 for the six subscales. The authors concluded that the developed HBM scale can be used in further studies to assess the effectiveness of interventions aimed at increasing TSE behaviour among males.

In conclusion, the present study investigated the application of the HBM in predicting the performance of TSE among nursing students. The results indicated that perceived susceptibility, perceived seriousness, perceived benefits, self-efficacy, and cues to action were significant predictors for performing TSE. These findings are consistent with previous literature that supports the utility of the HBM in predicting health behaviours. However, there is still a need for further research to explore the applicability of this model in different populations and contexts. Overall, the present study contributes to the growing body of literature on the implementations of HBM in improving the nursing beliefs about TC and highlights the importance of considering individuals' beliefs and perceptions in promoting preventive health behaviours such as performing TSE.

## Author Contribution Statement

All authors conceived and designed the study, conducted research, and provided research materials. RAE and ZTS analyzed and interpreted data. All authors wrote the initial and final draft of article and provided logistic support. All authors have critically reviewed and approved the final draft and are responsible for the content and similarity index of the manuscript. .

## Acknowledgements

The authors would like to thank all nursing students who participated in this study. The authors thank the vice president for scientific research affairs of Al-Ghad International Colleges to provide us with the formal approval to conduct this study at the selected settings. This study is supported via funding from Prince Sattam Bin Abdulaziz University project number (PSAU/2023/R/1444).

*Availability of data*

Data are available upon official request from the corresponding author

*Ethical approval*

Official Institute of Review Board (IRB) permission was obtained from the ethical research committee at Al-Ghad International Colleges (approval number: AGICAMS-19/328)

*Conflict of interest*

There is no conflict of interest to be declared.

## References

Ahmed S, Ali LA, Ahmed MA,Abozied AM (2019). Testicular cancer preventive behavior among nursing males' students: intervention guidelines. *Evid-Based Nurs Res*, **1**, 1-7.

Akca SO, Cengiz T, Aydin D, Diker S,Ozdemir T (2021). Evaluation of Training Program for Nursing Students on Testicular Cancer and Testicular Self-Examination. *Iran Red Crescent Medl J*, **23**,

Akers C (2018). Aetiology, clinical presentation and treatment of testicular cancer. *Nurs Stand (2014+)*, **32**, 50.

Alamri A, Alqahtani YM, Al-Mudhi MM, et al (2021). Knowledge, Attitudes and Practice toward Testicular Cancer and Testicular Self-Examination among adolescents and young adults in Aseer region, Saudi Arabia. *Middle East J Fam Med*, **19**.

Alaradi M,Almuqamam A (2020). Awareness of testicular cancer and testicular self-examination among men in Bahrain. *Asian Pac J Cancer Care*, **5**, 259-63.

Albers P, Albrecht W, Algaba F, et al (2015). Guidelines on testicular cancer: 2015 update. *Eur Urol*, **68**, 1054-68.

Asgar PH, Kunter D, Norouzzadeh R, Heidari MR (2018). The effect of testicular self-examination education on knowledge, performance, and health beliefs of Turkish men. *J Cancer Educ*, **33**, 398-403.

Avci IA, Altinel B (2018). The validity and reliability of health belief scale for testicular cancer self-examination. *Am J Mens Health*, **12**, 531-8.

Bresciani M, Boarin M, Facconi I, Manara DF, Villa G (2021). Awareness of testicular cancer among young men: A literature review. *Int J Urol Nurs*, **15**, 5-11.

Cheng L, Albers P, Berney DM, et al (2018). Testicular cancer. *Nat Rev Dis Primers*, **4**, 1-24.

El Mezayen SE,Abd El-Hay SA (2019). Effect of educational guidelines based on health belief model regarding testicular cancer knowledge, practice and beliefs among male nursing students. *Clin Nurs Stud*, **7**, 27-41.

Hanna NH, Einhorn LH (2014). Testicular cancer—discoveries and updates. *N Engl J Med*, **371**, 2005-16.

Khani JA, Jormand H, Ansari M, Afzali HP, Rakhshani T (2021). The effect of educational intervention based on health belief model and social support on testicular self-examination in sample of Iranian men. *BMC Cancer*, **21**, 685.

Marks M (2017). A Provider Educational Program Promoting Testicular Cancer Awareness.

Salati SA, Aljabr IA, Alharbi MA, Almatroudi MA (2020). Assessment of medical students' knowledge, attitude and the impact of educational intervention on testicular cancer awareness at Qassim university, Saudi Arabia.

Saleh ZT, Elshatarat RA, Almarwani AM, et al (2023). Saudi Nursing Students' Knowledge and Perception of Testicular Cancer Assessment and Management: A Cross-Sectional Study. *Asian Pac J Cancer Prev*, **24**, 1289-95.

Singh D, Singh P, Mandal A (2020). Epidemiology and treatment outcomes of testicular germ cell tumor at tertiary care center in Patna, India: A retrospective analysis. *Asian Pac J Cancer Care*, **5**, 45-50.

Stonier T,Coscione A (2021). Testicular Cancer. *Mens Health*, pp 30-8

Ustundag H (2019). Assessment of the testicular self-examination knowledge and health belief model of health sciences students. *Int J Caring Sci*, **12**, 972.

Wanzer MB, Foster SC, Servoss T,LaBelle S (2014). Educating young men about testicular cancer: support for a comprehensive testicular cancer campaign. *J Health Commun*, **19**, 303-20