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Quick Response Code:

Website: www.jehp.net
DOI: 10.4103/jehp.jehp_1627_23

Perception, knowledge, and factors influencing Saudi nursing students toward practicing testicular self-examination: A cross-sectional study

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Received: 10-10-2023

Accepted: 10-01-2024

Published: 28-09-2024

Abstract:

BACKGROUND: Testicular cancer poses a substantial health burden globally, and early detection through testicular self-examination (TSE) is vital for improving prognosis. The study aims to assess the perception, awareness, knowledge, and factors associated with TSE among Saudi nursing students.

MATERIALS AND METHODS: A structured questionnaire was distributed to 418 participants. Data analysis included descriptive statistics, Chi-square tests, and t-tests.

RESULTS: On average, the participants' self-confidence in their knowledge to perform TSE was 6.18 (± 3.3) out of 10. The majority of participants held misconceptions about TSE, perceiving it as painful (91.86%) and embarrassing (52.39%). The mean of correct awareness and knowledge levels of participants about steps in performing TSE was 9.2 (SD = ± 3.6) out of 21. On average, the correct perception of TC and TSE was 11.73 (± 4.11) out of 20. Significant relationships emerged between TSE performance and factors such as being married ($P = 0.043$), having good or less health status ($P = 0.015$), being a tobacco user ($P = 0.039$), having a medical problem with testicles ($P = 0.005$) or family history of TC ($P = 0.007$), has been learned about TSE ($P = 0.002$), high-grade point average ($P = 0.012$), had high self-confidence to perform TSE ($P = 0.033$), and had correct perception about TC and TSE ($P = 0.037$), had correct awareness about TSE ($P = 0.021$), had motivated factors that influencing to practice of TSE ($P = 0.003$), and had correct awareness and knowledge levels of participants about steps in performing TSE ($P = 0.002$).

CONCLUSION: The study underscores the need for targeted educational interventions and curriculum enhancements to dispel misconceptions, improve awareness, and promote accurate TSE practices among nursing students. Public health campaigns are recommended to address barriers and normalize TSE.

Keywords:

Knowledge gaps, nursing students, Saudi Arabia, testicular cancer, testicular self-examination

Introduction

Testicular cancer represents a significant health concern, especially among young males. Testicular cancer (TC) is the most

common malignancy in males aged 15 to 40.^[1,2] Early detection through testicular self-examination (TSE) is crucial for improving treatment outcomes and survival rates. TSE is a simple and accessible method

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How to cite this article: Saleh ZT, Elshatarat RA, Sawalha MA, Khraim F, Abdelkader R, Saleh AM, *et al.* Perception, knowledge, and factors influencing Saudi nursing students toward practicing testicular self-examination: A cross-sectional study. J Edu Health Promot 2024;13:355.

for detecting abnormalities like lumps or swelling in the testicles, enabling early identification and prompt medical intervention.^[2,3] Despite the potential benefits of TSE, many studies have revealed low awareness and knowledge of TSE among different populations, including healthcare professionals and students. This lack of awareness, knowledge, and practice of TSE among specific groups, such as nursing students, poses ongoing concerns.^[4-7]

Literature has shed light on the knowledge and awareness of TC and TSE among healthcare students in Saudi Arabia.^[4,5,8] Salati *et al.*^[8] (2020) reported that medical students in Saudi Arabia had a lack of knowledge regarding TC and its risk factors, emphasizing the need for similar research among nursing students to understand their level of awareness and knowledge. Similarly, previous literature showed that medical and nursing students in Saudi Arabia had limited knowledge about TC and TSE, highlighting the importance of educational interventions to enhance their awareness and knowledge.^[4,5,8]

Factors influencing TSE practices among healthcare students have also been explored.^[4,5,9] Moreover, literature showed the related factors such as lack of knowledge, time constraints, and perceived embarrassment that affected TSE practices among young men and healthcare professionals.^[5,6,10-13] Understanding these factors among nursing students can aid in the development of targeted interventions to overcome barriers and improve TSE practices.^[6,11,13,14] Moreover, cultural factors may also influence TSE practices among Saudi nursing students.^[4-6] Previous studies reported that cultural perceptions of TC and found that cultural taboos and societal norms may hinder discussions and awareness about testicular health. Addressing cultural factors and barriers through educational interventions can help promote TSE practices among Saudi nursing students.^[4,5,14,15]

Nursing students are future health care providers who can play a vital role in promoting health awareness and preventive practices among the general population. Given the unique position of nursing students in promoting health education and preventive practices, it is crucial to assess their perception, awareness, knowledge, and factors influencing TSE.^[16-18] However, limited research has specifically focused on TSE among nursing students in Saudi Arabia, highlighting the need for further investigation in this area.^[4,5] By understanding and addressing these factors, effective strategies can be developed to enhance early detection and prevention of TC among Saudi nursing students.

Educational interventions have shown promise in improving TSE practices among healthcare professionals

and students.^[4,8,9,11,19] Literature emphasized the effectiveness of educational programs in increasing TSE knowledge and promoting self-examination. Similar interventions can be developed and implemented among Saudi nursing students to enhance their perception, awareness, and knowledge of TSE.^[4,11,16,17,20]

This study bears immense significance as it delves into evaluating the perception, awareness, knowledge, and associated factors influencing TSE among Saudi nursing students. Given Saudi Arabia's predominantly young population and the substantial health concern posed by TC among males, this research addresses a critical gap in the literature by focusing specifically on the perception and practice of TSE among nursing students. The outcomes of this study have far-reaching implications, extending beyond the borders of Saudi Arabia. As Arab countries, including Saudi Arabia, share similarities in cultural contexts, healthcare systems, and educational frameworks, the findings can serve as a blueprint for developing nursing program curricula across the region. By shedding light on the nuanced aspects of TSE awareness and practices, the study not only enriches the existing literature but also provides a foundation for tailored interventions and educational programs. These, in turn, can significantly contribute to improving the health status of university students, particularly those in nursing programs, not only in Saudi Arabia but also in other Arab countries. The study's insights can guide the development of comprehensive curricula that address the specific needs of these students, fostering a culture of proactive self-examination and ultimately enhancing healthcare practices on a broader regional scale.

The study aims to explore Saudi nursing students' perspectives, practices, and awareness of TC and TSE. The specific objectives were to identify: (1) participants' sources of information about TSE and assess their willingness to enhance knowledge in this area, (2) participants' perceptions and awareness concerning TC and TSE, (3) participants' practices and attitudes toward TSE, and (4) the factors influencing the implementation of TSE.

Materials and Methods

Study design and setting

This study utilized a cross-sectional research design to assess the perception, awareness, knowledge, and associated factors influencing TSE among Saudi nursing students.

The study was conducted across eight branches of Alghad International Colleges for Applied Health Sciences, private institutions situated in diverse cities across Saudi Arabia, including Medinah, Riyadh, Jeddah,

Dammam, Najran, Tabuk, Qasim, and Abha. Alghad Colleges are equipped with state-of-the-art facilities, including lecture rooms and laboratories, offering nursing programs and various health programs. The selection of these colleges was strategic, considering their diverse student population and specialization in health sciences education.

Study participants and sampling

Participants were recruited through a convenient sampling method, ensuring representation from each branch. Inclusion criteria mandated enrollment in nursing programs at Alghad Colleges, successful completion of key courses like anatomy, physiology, pathophysiology, health assessment, and medical-surgical nursing, indicating exposure to adequate knowledge about TC and training in TSE. The participants were also required to demonstrate proficiency in the English language. Notably, individuals with a previous TC diagnosis were excluded. Providing these details enhances the understanding of the study's scope, emphasizing the well-equipped and regionally distributed nature of Alghad Colleges.

To determine the sample size for the study, G*Power software was utilized, considering a power of 0.80, a moderate effect size of 0.30, and an alpha value of 0.05 for *t*-test and Chi-square analyses. The calculated effective sample size was estimated to be 384 students. Subsequently, 450 questionnaires were distributed among the recruited eligible participants. Out of these, a total of 418 questionnaires were fully completed by the participants, forming the final sample for data analysis.

Data collection tools and technique

Structured self-report questionnaires, crafted based on pertinent literature, were employed for comprehensive data collection, targeting participants' perception, awareness, knowledge, and the factors influencing their TSE practices. The initial step involved identifying eligible participants through collaboration with nursing departments obtaining their names and class timetables. Subsequently, researchers approached these participants in the classrooms of selected nursing colleges, offering a thorough overview of the study's objectives and extending invitations to partake. To ensure clarity, participants received explicit instructions on questionnaire completion. Importantly, the data collection process excluded any physical measurements or educational interventions, preserving the natural setting. The questionnaire, requiring an average of 18 minutes for completion, was meticulously designed to capture nuanced insights into participants' perspectives on TSE-related aspects. This methodology aimed to extract rich and reliable data while respecting

participants' time and maintaining the integrity of the study's objectives.

Ethical considerations

Before the commencement of this study, the Institutional Review Board at Alghad International Colleges granted formal approval (ID #: AGICAMS-19/328). Rigorous adherence to ethical standards was maintained throughout the study to safeguard the well-being and rights of participants. Informed written consent, a pivotal component of ethical practice, was diligently obtained from all nursing students who willingly participated. The consent process explicitly outlined the study's purpose, emphasized participants' voluntary involvement, and guaranteed the confidentiality and anonymity of their personal details. Participants were informed of their right to withdraw from the study at any juncture without repercussions on their academic standing. To reinforce confidentiality, each participant received a unique identification code, ensuring that their data remained anonymized throughout the study. The study's ethical framework aligns with established guidelines and regulations, underscoring the commitment to conducting research with the utmost integrity and respect for participants' rights and privacy.

Instruments

The researchers used a structured self-report questionnaire, which include five sections. The first section consists of questions to assess participants' demographic, students' characteristics, academic achievement information and health data, source of information about TC, and willingness to improve knowledge about TC. Demographic information included respondents' marital status, accumulated grade point average (GPA), and level of education in nursing program. To evaluate the participants' health, they were asked to report their history of chronic disease and rate their health status using a 5-point Likert scale (1 = poor, 2 = fair, 3 = good, 4 = very good, and 5 = excellent). In addition, they were asked about their history of using tobacco and having medical problems with testicles and their family history of TC. The participants were also asked about their source of information about TC, their willingness to get more information on TC, and their self-confidence in their knowledge of assessing and managing TC. The participants' responses about self-confidence in their knowledge ranged between 0 (no self-confidence) and 10 (highest self-confidence). The second section consists of two parts; the first part includes 20 "yes" or "no" questions to assess. The second part includes six to seven multiple-choice questions to assess participants' awareness of TSE. The correct answer in the second section was coded as "one," and the incorrect answer was coded as "zero." The third section consists of eight items to assess participants'

practice of TSE. The fourth section consists of seven items to investigate factors influencing the practice of TSE. In this section, the participants were asked to select all that apply. The positive motivating influencing factors to practice TSE were coded as "one," and the barrier influencing factors to practice TSE were coded as "zero." The fifth section includes 21 items to assess the participant's awareness and knowledge about steps in performing TSE. The correct answer in the second section was coded as "one," and the incorrect answer was coded as "zero."

The questionnaires used in this study were developed based on relevant information from textbooks, previous studies, and validated scales.^[15,21-23] Existing validated scales related to perception, awareness, and knowledge of TSE were utilized, with necessary modifications to suit the context of Saudi nursing students. The questionnaires were pilot-tested before the main data collection to assess their clarity, validity, and reliability.

Data analysis

Data analysis was conducted using SPSS (version 27). Descriptive statistics, such as frequencies, percentages, means, and standard deviations, were used to describe the demographic characteristics of the participants and summarize the variables of interest. Inferential statistical tests, including Chi-square tests and t-tests, were utilized to explore the significant associated factors for performing TSE. The level of significance was set at $P < 0.05$ to determine statistical significance.

Results

Participants' characteristics, academic, and health data

The study revealed that the majority of participants were single (74.6%) and studying in the third year of a nursing program (37.6%). They rated their health status as very good or excellent (70.82%). On average, the participants achieved an accumulated GPA of 3.75 (± 0.41) out of 5. In terms of risk factors, a notable percentage of participants reported being tobacco users (32.53%), having a family history of TC (8.37%), or experiencing medical problems related to the testicles (9.80%) [Table 1].

Participants' source of information about TSE

The majority of participants had heard of TSE (92.58%) and had received education about TC (77.51%), primarily through professional education at their College of Nursing (91.04%). On average, participants expressed a self-confidence level of 6.18 (± 3.3) out of 10 in their knowledge to perform TSE. Additionally, the majority of participants showed a strong willingness to acquire more information on TSE (96.88%). Their preferred sources of knowledge to improve self-confidence in

Table 1: Participants' characteristics, health data, source of information about TSE, and willingness to improve knowledge about TSE

Variable	n (%) or Mean (\pm SD)
Marital status	
Single	312 (74.6%)
Has been married	106 (25.4%)
Level of education in nursing program	
Second year	86 (20.5)
Third year	157 (37.6%)
Fourth year	104 (24.9%)
Internship	71 (17.0%)
Rating health status	
Very good or Excellent	296 (70.82%)
Good. Fair or Poor	122 (29.18%)
Participants' risk factors	
Tobacco user (yes)	136 (32.53%)
Has family history of TC (yes)	35 (8.37%)
Has medical problem with testicles (yes)	41 (9.80%)
Grade point average (GPA) (out of 5)	3.75 (± 0.41)
Source of Participants' knowledge and willingness plan to participate in educational programs about TSE	
Having heard of TSE (yes)	387 (92.58%)
Have been learned about TSE (yes)	324 (77.51%)
Source of information about TSE (n=324)*	
Professional education (College of Nursing)	295 (91.04%)
Training courses or/and workshop	46 (14.19%)
Internet or Media (e.g., TV. radio)	129 (39.81%)
Others	42 (12.96%)
Participants' self-confidence in their knowledge to perform TSE (Ranging between 0 and 10)	6.18 (± 3.3)
Willing to get more information on TSE	362 (86.60%)
Preferred source of knowledge to improve Participants' self-confidence about the assessment and management of TSE (n=405)*	
Professional education (College of Nursing)	378 (93.33%)
Seminar or/and workshop	50 (12.34%)
Conferences	28 (6.91%)
Training courses	318 (78.51%)
Internet or Media (e.g. TV)	265 (65.43%)
Friends and relative	34 (8.39%)

assessing and managing TC were professional education at their College of Nursing (93.33%) and training courses (78.51%).

Participants' perception and awareness about TC and TSE

Table 2 presents the participants' perception and awareness regarding TC and TSE. The findings revealed that the majority of participants believed that TSE can be painful (91.86%) and that seeking information about TSE is embarrassing (90.66%). Additionally, a significant proportion of participants believed that TSE is the earliest diagnostic method for TC (88.51%). However, fewer participants expressed the belief that TC is primarily

Table 2: Participants' perception and awareness about TC and TSE

	<i>n (%)</i>
Perception about TC and TSE	
The age group at highest risk of TC is 60 years and above.	311 (74.40%)
I believe TC is a problem faced by athletes.	137 (32.77%)
I would need a doctor to do TSE.	154 (36.84%)
TC is a disease of the affluent.	219 (52.39%)
TSE is definitely an important healthy behavior.	321 (76.79%)
Weekly regular exercise can be substituted for TSE.	231 (55.26%)
I follow medical advice and believe TSE will benefit my health status.	353 (84.44%)
The practice of TSE will interfere with my activities.	99 (23.68%)
TSE would endanger person's marriage.	256 (61.24%)
The thought of TC makes me feel nervous.	366 (87.55%)
TSE could help detect a lump before it is discovered by doctors.	313 (74.88%)
Seeking out information about TSE is embarrassing.	379 (90.66%)
TSE could be performed by person's wife.	358 (85.64%)
Performing TSE would require starting a new healthy habit.	216 (51.67%)
Performing TSE could be a very difficult task.	239 (57.17%)
Performing TSE would cost me a significant amount of money and time.	115 (27.51%)
TSE can irritate the testicles, which may cause a health problem.	284 (67.94%)
The earliest diagnosis method for testicle cancer is TSE.	370 (88.51%)
TSE can be painful.	384 (91.86%)
Doing TSE is enough to test for TC.	143 (34.21%)
Awareness of TSE	
Who should know about TSE?	
All men	185 (44.25%)
Young men	49 (11.72%)
Older men	108 (25.83%)
Men with testicular health problems or TC	76 (18.18%)
TSE should be conducted by	
Men themselves	252 (60.28%)
Partner	43 (10.28%)
Physician	87 (20.81%)
Nurses	36 (8.61%)
How important is it to men's health to do regular TSE?	
Not at all important	45 (10.76%)
Somehow important	58 (13.87%)
Important	209 (50%)
Very important	106 (25.35%)
At what age should one start TSE?	
16-20 years	31 (7.41%)
21-25 years	63 (15.07%)
26-30 years	89 (21.29%)
31 years and above	235 (56.22%)
How often should men perform TSE?	
Every week	44 (10.52%)
Every month	58 (13.87%)
Every 3 months	189 (45.21%)
Every 6 months	71 (16.98%)
Once in a year	56 (13.39%)
How TSE is performed?	
Only look at testes (use inspection technique)	70 (16.74%)
Look and feel testes (use inspection and palpation techniques)	281 (67.22%)
I don't know	67 (16.02%)

a problem faced by athletes (32.77%), that TSE alone is sufficient to test for TC (34.21%), and that they would require a doctor to perform TSE (36.84%). Regarding

the participants' awareness of TSE, the most frequently agreed that all men should have knowledge about TSE (44.25%) and that TSE should be conducted by men

themselves (60.28%). They also believed that TSE should be performed starting at 31 years of age and above and should be conducted every three months (45.21%). Furthermore, when performing TSE, participants agreed that the examiner should both visually inspect and palpate the testes (using inspection and palpation techniques) (67.22%).

Participants' practice and attitude of TSE

The results of the study show that a significant proportion of participants have knowledge about the process and steps involved in TSE, with about 74% reporting familiarity with it. Additionally, a majority of participants (71%) reported having performed TSE at some point in their lives. Among those who had performed TSE, the most common timeframe mentioned for the last examination was a year ago (62.83%). When asked about reasons for not performing TSE, a large number of participants cited lack of confidence in examining themselves (88.52%) and a lack of knowledge about what to look for (79.50%). Only one-third of

participants (36.60%) reported regularly practicing TSE, and among them, the most common frequency mentioned was once every six months (58.82%). The majority of participants (67.97%) rated their ability to perform TSE as moderately competent, and a similar proportion (66.01%) expressed satisfaction with their self-examination technique. Regarding influencing factors for practicing TSE, the fear of discovering a lump (75.59%) was identified as the primary barrier, while the awareness that TSE plays a significant role in early detection of TC (86.36%) emerged as the strongest motivator for regularly performing TSE [Table 3].

Participants' awareness and knowledge about steps in performing TSE

Table 4 presents the participants' awareness and knowledge levels regarding the steps involved in performing TSE. Out of the 21 items assessing participants' awareness and knowledge, the mean and standard deviation were calculated. Results indicate a general lack of awareness and knowledge among participants, as the

Table 3: Participants' practice and attitude of TSE

	<i>n (%)</i>
Do you know the process and steps involved in TSE? (Yes)	307 (73.44%)
Have you ever performed TSE? (Yes)	296 (70.81%)
When last did you perform TSE? (<i>n</i> =296)	
Weeks ago	24 (8.10%)
Months ago	37 (12.50%)
A year ago	186 (62.83%)
Years ago	49 (16.55%)
Reasons for not doing TSE (<i>n</i> =122)*	
I don't know what to look for	97 (79.50%)
I don't feel confident examining myself	108 (88.52%)
Worried that I might find something	62 (50.81%)
Wouldn't want to know any testicular health problem	54 (44.26%)
Do you practice TSE regularly? (Yes)	153 (36.60%)
How often do you perform TSE? (<i>n</i> =153)	
Once every month	14 (9.15%)
Once every 3 month	30 (19.60%)
Once every 6 month	90 (58.82%)
Once every year	19 (12.41%)
Participants' self-rate ability to perform TSE (<i>n</i> =153)	
Not at all competent	13 (8.49%)
Low competent	23 (15.03%)
Moderate competent	104 (67.97%)
High competent	13 (8.49%)
Do you feel satisfied with the way you perform TSE? (Yes) (<i>n</i> =153)	101 (66.01%)
Factors influencing the practice of TSE *	
Touching testes is embarrassing	219 (52.39%)
Fear of discovering a lump	316 (75.59%)
Lack of knowledge on how to do TSE	132 (31.57%)
Touching testes is a sin	54 (12.918%)
TSE plays a major role in early detection of TC	361 (86.36%)
Doing TSE is time-consuming	213 (50.95%)
TSE should be conducted by older men	289 (69.13%)

*The participants selected all that apply

Table 4: Participants' awareness and knowledge about steps in performing TSE

Variable	n (%)
Correct statements (Participants' response is "True")	
It is more convenient to perform it after a hot bath or shower.	153 (47.22%)
If possible, the man should stand in front of the mirror and look for swelling on the scrotum.	228 (70.37%)
The examiner should check for any swelling on the scrotal skin.	289 (89.19%)
Using both hands, the scrotum should be gently lifted so that the area underneath can be checked.	171 (52.77%)
The index and the middle finger should be placed under each testicle with the thumb on top	149 (45.98%)
The examiner should pinch gently the testicle, so that the testicle doesn't move during the exam.	163 (50.30%)
On the back at the top of each testicle, the examiner should feel the epididymis, which is a normal lump and may feel tender to the touch.	116 (35.80%)
The testes should be examined one at a time.	219 (67.59%)
The examiner should gently roll the testicle between the thumbs and fingers to feel for any irregularities on the surface or texture of the testicle.	238 (73.45%)
Feel for lumps of any size (even as small as a pea) in the testicle.	220 (67.90%)
Testicle should be examined to determine whether the testicle has grown, hardened, or changed according to the previous examination.	242 (74.69%)
It is normal for one testicle to be slightly larger than the other.	76 (23.45%)
The examiner should tell his physician if he notices any pain or achy areas in his groin.	173 (53.39%)
The examiner should tell his physician if he notices any swelling, lumps, or changes in the size or color of a testicle	182 (56.17%)
Lumps or swelling in one or both testicles indicates cancer.	95 (29.32%)
Incorrect statements (Participants' response is "false")	
It is performed by pressing the testicle between the middle finger and thumb next to the testicle.	48 (14.81%)
Should be performed in a sitting position once awakened in the morning.	113 (34.87%)
Lie on the bed and look for swelling on the scrotum.	163 (50.30%)
Use both hands to examine both testes together as one.	98 (30.24%)
Roll each testis with thumb alone.	279 (86.11%)
There is no need to check for any changes or swelling in the testicle skin while performing.	292 (90.12%)
Total score of participants' awareness and knowledge about steps in performing TSE (out of 21)	Mean (SD)
	9.2 (±3.6)

mean score was (9.2 out of 21). Among the 21 items, only three items were correctly answered by more than 75% of the participants. These items include the recognition that there is a need to check for any changes or swelling in the testicle skin while performing TSE (90.12%), the understanding that it is incorrect to roll each testis with the thumb alone (86.11%), and the awareness that the examiner should check for any swelling on the scrotal skin (89.19%). However, less than half of the participants provided correct answers for eight out of the 21 items, indicating a lack of knowledge in those specific areas.

Significant associated factors for performing TSE

Table 5 illustrates significant factors associated with the performance of TSE among Saudi nursing students. The study, involving 418 participants, classified them based on TSE engagement. Marital status emerged as a significant determinant, with 74.6% of single participants performing TSE compared to 30.44% of married individuals ($P = 0.043$). Education level within the nursing program exhibited notable differences, as 83.01% of those in the second to fourth year engaged in TSE, in contrast to 16.98% of interns ($P = 0.063$). General health status proved influential, with participants rating their health as very good or excellent, demonstrating higher TSE performance at 26.35%, compared to 61.47%

among those with poorer health ($P = 0.015$). Various health-related factors were also significant, including tobacco use ($P = 0.039$), family history of TC ($P = 0.007$), medical problems related to testicles ($P = 0.005$), having learned about TSE ($P = 0.002$), and borderline significance for willingness to get more information on TSE ($P = 0.053$). Moreover, academic performance and knowledge-related factors significantly influenced TSE engagement. Participants with a higher GPA demonstrated better TSE performance ($P = 0.012$). Increased self-confidence in knowledge to perform TSE correlated with better TSE engagement ($P = 0.033$). Additionally, correct perception of TC and TSE ($P = 0.037$), correct awareness about TSE ($P = 0.021$), factors influencing TSE practices ($P = 0.003$), and correct awareness and knowledge levels about steps in performing TSE ($P = 0.002$) were all identified as significant contributors to the participants' engagement in TSE.

Discussion

The objective of this study is to deepen our comprehension of the perception, awareness, knowledge, and related factors shaping TSE among Saudi nursing students. Its purpose extends to bolstering early detection practices

Table 5: Significant associated factors for performing TSE

Variables	Total <i>n</i> (%) or mean	Perform TSE <i>n</i> (%) or Mean (\pm SD) (<i>n</i> =153)	Not perform TSE <i>n</i> (%) or Mean (\pm SD) (<i>n</i> =265)	<i>P</i> *
Marital status				
Single	312 (74.6%)	95 (30.44%)	217 (69.55%)	0.043
Has been married	106 (25.35%)	58 (54.71%)	48 (45.28%)	
Level of education in nursing program				
Second- to fourth-year	347 (83.01%)	117 (33.71%)	230 (66.28%)	0.063
Internship	71 (16.98%)	36 (50.70%)	35 (49.29%)	
In general, how would you rate your health status				
Very good or Excellent	296 (70.82%)	78 (26.35%)	218 (73.64%)	0.015
Poor, fair, or good	122 (29.18%)	75 (61.47%)	47 (38.52%)	
Tobacco user				
Yes	136 (32.53%)	95 (69.85%)	41 (30.14%)	0.039
No	282 (67.46%)	58 (20.56%)	224 (79.43%)	
Has a family history of TC				
Yes	35 (8.37%)	26 (74.28%)	9 (25.71%)	0.007
No	383 (91.62%)	127 (33.15%)	256 (66.84%)	
Has a medical problem with testicles				
Yes	41 (9.80%)	29 (70.73%)	12 (29.26%)	0.005
No	377 (90.19%)	124 (32.89%)	253 (67.10%)	
Have been learned about TSE				
Yes	324 (77.51%)	136 (41.97%)	188 (58.02%)	0.002
No	94 (22.48%)	17 (18.08%)	77 (81.91%)	
Willing to get more information on TSE				
Yes	362 (86.60%)	127 (35.08%)	235 (64.91%)	0.053
No	56 (13.39%)	26 (46.42%)	30 (53.57%)	
Grade point average (GPA)	3.75 (\pm 0.41)	4.27 (\pm 0.39)	3.49 (\pm 0.53)	0.012
Participants' self-confidence in their knowledge to perform TSE (ranging between 0 and 10)	6.18 (\pm 3.3)	7.42 (\pm 3.44)	4.54 (\pm 2.23)	0.033
Correct perception about TC and TSE (out of 20)	11.73 (\pm 4.11)	13.54 (\pm 3.85)	9.36 (\pm 2.87)	0.037
Correct awareness about TSE (out of 6)	3.89 (\pm 1.23)	4.47 (\pm 1.35)	2.99 (\pm 1.17)	0.021
Factors influencing the practice of TSE (out of 7)	4.78 (\pm 2.35)	5.36 (\pm 2.14)	3.57 (\pm 1.80)	0.003
Correct awareness and knowledge levels of participants about steps in performing TSE (out of 21)	9.2 (\pm 3.6)	12.86 (\pm 3.93)	8.85 (\pm 3.03)	0.002

*This column presents the results of Chi-square analysis or *t*-tests, with the *P* values reported. The significant *P* values are bolded

and advocating for testicular health. Through identifying areas of knowledge deficiency and barriers to TSE, this research aims to pave the way for precise interventions and educational initiatives geared toward heightening awareness and fostering consistent self-examination habits. By shedding light on these aspects, the study will not only enrich the existing body of knowledge but also lay a groundwork for forthcoming research endeavors and healthcare endeavors, all intended to alleviate the impact of TC in Saudi Arabia.

In this discussion, the authors will compare the results of this study with previous literature and highlight the implications of the findings. The results of this study provide valuable insights into the perception, knowledge, and factors influencing TSE among Saudi nursing students. Regarding participants' demographic characteristics, the majority of the participants were single and studying at the third-year level of their nursing program. This indicates that the study captured a diverse sample of Saudi nursing students from different backgrounds and academic

levels. Moreover, a significant percentage of participants rated their health status as very good or excellent, indicating a generally positive perception of their overall well-being. The participants' GPA was relatively high. This suggests that the participants exhibited satisfactory academic performance, which may reflect their ability to comprehend and engage with the subject matter of the study. In terms of specific factors related to TSE, the study found that a significant proportion of participants reported being tobacco users, having a family history of TC, and experiencing medical problems with their testicles. These factors are important to consider as they may influence participants' knowledge, awareness, and practice of TSE. These factors have been previously identified as important considerations in relation to TSE practices.^[5,9,11] It is crucial to address these factors through targeted interventions and education to promote TSE practices among at-risk individuals.

Most participants reported having heard of TSE and learning about TC, indicating a relatively high level of

exposure to relevant information. These findings were aligned with previous findings.^[4,15,23] Additionally, the majority of participants received their information about TSE from professional education (College of Nursing), highlighting the role of formal education in disseminating knowledge about TSE. Participants reported an average self-confidence level of 6.18 (out of 10) in their knowledge to perform TSE. However, despite the high exposure to TSE, participants' self-confidence in their knowledge and skills to perform TSE was relatively moderate. This finding is consistent with studies showing a gap between awareness and self-confidence in TSE.^[4,5,12] This suggests that while participants had confidence in their ability to perform TSE, there is an opportunity for improvement and further education to enhance their self-confidence. Moreover, further educational interventions should focus not only on increasing awareness but also on building participants' self-confidence in performing TSE. The majority of participants expressed their willingness to receive more information on TSE, indicating a positive attitude toward further education and increasing their knowledge in this area. Professional education at their College of Nursing and training courses were the preferred sources of knowledge to improve students' self-confidence about the assessment and management of TC. This finding aligns with previous studies highlighting the effectiveness of educational programs in increasing TSE knowledge and promoting self-examination.^[8,11,12] The findings suggest a need to improve nursing students' self-confidence, particularly in performing TSE. So, it is crucial to enhance the curriculum and incorporate TSE education into nursing programs to ensure that nursing students are equipped with the necessary knowledge and skills to educate others about TSE. Furthermore, educational interventions should be tailored to address individual factors such as tobacco use, family history of TC, and medical problems with the testicles.

Table 2 presents participants' perceptions and awareness concerning TC and TSE, aligning with previous literature that highlights inaccuracies in perception and gaps in awareness. For instance, a substantial majority believed TSE could be painful (91.86%), and finding information about it might lead to embarrassment (90.66%). These findings resonate with earlier research indicating that discomfort and embarrassment are common concerns surrounding TSE.^[10,11,17] Moreover, only a significant proportion perceived TSE as the earliest diagnostic method for TC (88.51%). This finding echoes previous studies illustrating that misconceptions about TSE's diagnostic role persist.^[5,11] A portion of participants wrongly associated TC primarily with athletes (32.77%), and a fraction believed TSE alone suffices for diagnosing TC (34.21%), mirroring previous research indicating the need for education to dispel these myths.^[5,11,12] Interestingly, a notable percentage believed

a doctor's involvement was necessary for TSE (36.84%), indicative of potential misunderstandings regarding its self-administered nature. These perceptions align with findings that point to knowledge gaps surrounding TSE.^[5,11] Participants' views on the necessity of TSE knowledge for all men (44.25%) and its self-conducted nature (60.28%) reflect a shared understanding of its significance in public health. This concurs with research advocating for broad awareness and empowerment of men regarding TSE.^[11,24] While participants suggested TSE initiation at 31 years and above (45.21%), guidelines recommend earlier commencement. This discrepancy highlights the need for education campaigns emphasizing early initiation to align with recommended practices.^[12,17,24,25] Participants' agreement on both visual inspection and palpation during TSE (67.22%) corresponds to guidelines stressing comprehensive examination techniques.^[10,11,22] Overall, these results corroborate previous literature by demonstrating misconceptions and awareness gaps surrounding TSE. Addressing these through educational interventions is crucial to rectify inaccuracies and promote accurate understanding and practices in TSE.^[11,12]

The study's outcomes underscore a notable level of awareness regarding the process and steps of TSE, with approximately 74% of participants expressing familiarity. This observation aligns with findings in the existing literature, indicating that a substantial portion of individuals possess knowledge about TSE.^[11,12] Furthermore, the study reveals that a majority of participants (71%) have engaged in TSE at some point in their lives. This finding is consistent with previous research demonstrating that a considerable proportion of individuals have attempted TSE.^[9,14] Among those who performed TSE, a significant percentage indicated their last self-examination occurred around a year ago (62.83%). This timeframe mirrors prior studies illustrating that self-examinations are often sporadic rather than routine.^[14] Conversely, reasons for not conducting TSE were cited as lack of self-confidence in the examination process (88.52%) and insufficient knowledge about what to look for (79.50%). These barriers resonate with the literature, emphasizing the need to address confidence-related and knowledge-related obstacles to promote regular TSE practices.^[12,14] Notably, only a third of participants (36.60%) reported regular TSE practice, and within this group, the most common frequency was once every 6 months (58.82%). These results are consistent with studies that have shown irregularity in TSE practice, highlighting the importance of interventions promoting consistent self-examination.^[11] Participants assessed their ability to perform TSE as moderately competent (67.97%), with a similar proportion expressing satisfaction with their self-examination technique (66.01%). This aligns with previous research indicating individuals'

self-perceived competence and satisfaction levels in TSE.^[11,12] Interestingly, the primary barrier to TSE practice was the fear of discovering a lump (75.59%), while awareness of TSE's role in early TC detection emerged as the strongest motivator (86.36%). These findings are in line with earlier studies that have identified fear as a deterrent to TSE and underscored the crucial role of awareness in driving regular TSE.^[11,12,19] In conclusion, the study's results regarding TSE practice, awareness, and influencing factors resonate with prior literature. Addressing knowledge gaps, bolstering confidence levels, and heightening awareness is vital in promoting consistent TSE practices and ensuring early detection of TC.

The outcomes from Table 4 in this study unveil a pervasive lack of awareness and knowledge among participants concerning the steps of TSE, as indicated by a mean score of 9.2 out of 21. Among the 21 items, only three received correct responses from over 75% of participants. Conversely, less than half of the participants answered 8 out of the 21 items correctly, pinpointing a lack of knowledge in these specific areas. These findings are consistent with previous literature, highlighting the need for educational interventions to enhance participants' comprehension and awareness of the proper steps in performing TSE. This underscores the significance of educational campaigns and initiatives aimed at augmenting knowledge and promoting accurate techniques for TSE, thus empowering individuals to recognize potential abnormalities and take proactive measures for the early detection of TC.^[11,12,19,25]

Table 5 reveals substantial associations between the practice of TSE and a range of factors, including marital status, general health perception, tobacco use, family history of TC, testicular-related medical problems, education about TC, academic performance (GPA), self-confidence in TSE knowledge, accurate perceptions of TC and TSE, awareness of TSE, and positive influences on TSE. These findings harmonize with prior research, emphasizing the critical role of these factors in shaping TSE practices.^[11,12,16] This alignment further underscores the importance of these determinants in influencing the likelihood of engaging in TSE. Consequently, the recommendation of health educational programs gains prominence. Such programs could be tailored to address the identified factors and their impact on TSE behavior. These initiatives should prioritize enhancing awareness and knowledge related to testicular health, debunking misconceptions about TSE, and cultivating self-confidence in performing TSE.^[11,12,17] Furthermore, developing nursing program curricula in Saudi Arabia presents a strategic opportunity. Integrating comprehensive modules on testicular health, including TSE education, into nursing education can equip future

healthcare providers with the skills and knowledge necessary to educate the general population effectively. Additionally, fostering collaboration between healthcare institutions and academic institutions can facilitate the implementation of targeted interventions, promote regular TSE, and mitigate the risk factors associated with TC.^[5,11,12,17]

The findings of this study among Saudi nursing students regarding TSE not only contribute valuable insights into the demographic, attitudinal, and knowledge-related determinants of TSE practices but also align with and extend existing literature in this domain. The observed factors influencing TSE, including marital status, academic level, general health, tobacco use, family history, medical problems, knowledge acquisition, and academic performance, resonate with global studies emphasizing the multifaceted nature of determinants in healthcare-related self-examination practices. The study highlights key obstacles, including low confidence and knowledge deficiencies, emphasizing the necessity of focused educational approaches to rectify misconceptions and boost awareness. It recommends a comprehensive strategy, integrating educational, psychological, and health-related elements, to promote TSE among Saudi nursing students. This approach, informed by the study's findings, forms a strong foundation for tailored programs, aiming to instill a proactive self-examination culture critical for early detection and prevention of TC.

Study limitation

The study's limitation stems from its reliance on self-reported data. This introduces the possibility of recall bias, as participants might inaccurately remember or exaggerate their TSE practices, awareness levels, and knowledge. Social desirability bias also poses a concern, potentially leading participants to underreport socially stigmatized behaviors or over-report positive behaviors. Furthermore, the exclusive focus on Saudi nursing students restricts generalizability, underscoring the need for caution when extending findings. Nevertheless, the research offers valuable insights into TSE behaviors and factors, motivating future studies to address these concerns and enhance understanding across diverse populations.

Research implementations and recommendations

The study's implementations and recommendations underscore the significance of improving TSE practices among nursing students and the wider population. Educational interventions are crucial to rectify knowledge gaps and dispel misconceptions about TSE, emphasizing early detection. Nursing curricula can be enhanced to educate future healthcare providers about testicular health and TSE, while public health campaigns should address barriers and spread accurate information.

TSE's pivotal role in early detection highlights the importance of promoting its practice. A holistic approach should encompass psychological support to boost self-confidence. Collaborative efforts can substantially reduce TC's impact. Future research should assess intervention effectiveness, curricular enhancements, and campaign outcomes to further advance TSE awareness and practice.

Conclusion

This cross-sectional study delving into the perceptions, awareness, knowledge, and influencing factors of TSE among Saudi nursing students has illuminated critical insights into an area with significant public health implications. The study's findings have not only unveiled existing gaps in knowledge and awareness but have also shed light on the psychological and cultural factors that shape TSE practices. These findings underline the urgent need for targeted interventions and educational initiatives that dispel misconceptions, enhance knowledge, and encourage regular TSE. By addressing the gaps in knowledge, dispelling misconceptions, and fostering a culture of proactive health engagement, healthcare professionals, educators, and policymakers can collaboratively contribute to reducing the burden of TC and improving the overall health and well-being of the population. Future research endeavors could explore the effectiveness of the recommended interventions, assess the long-term impact of curricular enhancements, and evaluate the outcomes of public health campaigns on TSE practices and awareness within various demographic groups.

Acknowledgments

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 Algalad International Colleges for providing us with the formal approval to conduct this study in the selected settings. This study is supported via funding from Prince Sattam Bin AbdulAziz University project number (PSAU/2023/R/1444).

Financial support and sponsorship

This study is supported via funding from Prince Sattam Bin AbdulAziz University project number (PSAU/2023/R/1444).

Conflicts of interest

There are no conflicts of interest.

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