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Demographics, Clinical Characteristics, and Treatment Patterns in Patients with Testicular Tumor: A Single Hospital-Based Study

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Abstract

Background: Testicular cancer (TC) is one of the most prevalent malignancies that develops in young adult males aged 15–40 years. This study aimed to assess and evaluate the prevalence, incidence, clinical symptoms, and management of TC in the Qassim region of Saudi Arabia.

Methods and Results: This retrospective study was conducted at King Fahad Specialist Hospital in Buraidah, Qasim Region, Saudi Arabia. The study population comprised 14 patients diagnosed with TC between October 2017 and July 2024, with complete medical records. Most patients (64.3%) were aged between 20 and 30 years. All patients exhibited symptoms, primarily testicular swelling (42.9%) or a combination of testicular swelling and pain (28.6%). Seminoma was the most prevalent histological type (64.3%), with lesions more frequently located in the right testicle (57.1%) and most tumors measuring ≤4 cm (85.7%). Concerning tumor markers, half of the patients exhibited elevated beta-human chorionic gonadotropin (ß-hCG) levels (50%). In contrast, alpha-fetoprotein (AFP) and lactate dehydrogenase (LDH) levels were elevated in fewer cases (21.4% and 35.7%, respectively). Most patients presented with early-stage tumors—T1a (28.6%), T1b (35.7%), and T2 (28.6%), the predominant stages observed. Lymph node involvement was minimal, with a significant portion classified as N0 (71.4%), while a smaller group exhibited N2 involvement (21.4%). Notably, none of the patients demonstrated distant metastasis (M0). A substantial proportion of patients received adjuvant treatment (92.9%), and the primary surgical approach employed was open radical inguinal orchiectomy (78.6%). Nearly all patients completed their therapy (92.9%), with follow-up durations predominantly within one year (57.1%) or extending to 1–3 years (35.7%). There were no recorded cases of recurrence. Sperm cryopreservation was done for 5(36.7%) patients.

Conclusion: The study findings highlighted testicular swelling as the most common presenting symptom, with seminoma being the predominant subtype. Notably, the right testicle was more frequently affected, and elevated ß-hCG levels were observed as a common biomarker for TC. (**International Journal of Biomedicine. 2024;15(1):135-140.**)

Keywords: testicular cancer • seminoma • ß-hCG

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Introduction

Testicular cancer (TC) is one of the most prevalent malignancies that develops in young adult males aged 15–40 years.[1] The incidence of TC is relatively higher in developed countries; however, the mortality rate of TC is relatively higher in low- and middle-income nations. The estimated prevalence of TC is approximately 1% of malignancies in males and 5% of urological neoplasms.[2] In 2020, TC ranked 20th on the list of leading malignancies globally.[3] In 2016, the West Asia and North Africa regions ranked highest among countries with disease burden, represented by disability-adjusted life years, which increased during 1999–2019.[4]

Testicular cancer is a collective term for various malignant growths, or neoplasms, in the testis, with most cases attributed to testicular tumors derived from germ cells. Testicular germ cell tumors are further divided into seminomas and non-seminomas, with the former being more common.[5,6] The other two types of primary TCs are sex cord-stroma tumors and extragonadal tumors. Testicular cancer is likely to metastasize,

and the most frequent sites of metastasis include the lungs, liver, bone, and the central nervous system.[6] Testicular cancer is highly curable, with the cure rates approaching 90% and 100% for patients with seminomas and non-seminomas, respectively.[7] TC patients who have undergone treatment have a cumulative risk of approximately 2% of developing cancer in the contralateral testicle within 15 years following the initial diagnosis.[7,8] The factors determining the risk of relapse in TC patients may include tumor size and invasion.[9]

At present, the risk of testicular cancer is determined in prenatal or utero stages, with the only unanimously agreed risk factor being cryptorchidism, a congenital condition characterized by failure of descent of one or both testis.[10] The pathophysiology of TC involves an interplay of genetic and environmental factors. Nonetheless, infections, occupational exposure to carcinogens, and other environmental factors affect the likelihood of cancer.[11] Huang et al.[12] identified a positive association between the rate of TC occurrence and alcohol consumption, physical inactivity, obesity, and hypercholesterolemia.

In the United States, Hispanics are at a greater risk of higher incidence of TC than other racial/ethnic groups.[13] Regions with the highest incidence of TC are Western Europe, New Zealand, Australia, Southern Europe, and Northern Europe; however, the rising trend in the occurrence of TC is found to be the most remarkable in Asia.[12]

As highlighted earlier, the rising trend in the incidence of TC in West Asia, North Africa and the Middle East region prompts further investigation regarding the unique demographics, histological patterns, mortality data, treatment, and prognosis of TC in this region. The rising incidence can be attributed to multiple factors. These include the aging population, exposure to endocrine disruptors and other environmental factors, lifestyle changes, and cultural considerations influencing screening programs and educational initiatives.[4] Notably, variations in the incidence of TC in different regions can be accounted for by the differences in exposure to risk factors and protective factors.[14] In addition to the environmental factors, genetic predictors, and ethnic diversity in Arab countries, consanguineous marriages also contribute to the cancer burden in the region.[15] The regional prevalence of TC is further shaped by cultural elements specific to the region.[16]

To date, various studies have explored the knowledge, awareness, incidence, and characteristics of the primary neoplasm of testis in Saudi Arabia. Based on the results of these studies, it can be inferred that most men in Saudi Arabia know about TC; however, only a small percentage of the male population is aware of testicular self-examination. Not only does limited knowledge about TC contribute to delays in the diagnosis and reporting of cases, but late detection of TC also impacts the disease prognosis.[17] According to a cross-sectional study conducted at Qassim University, the knowledge of TC and self-assessment is low among young males in the region.[18] According to a study based on the Saudi Arabia Cancer Registry, a considerable rise in the occurrence of TC occurred from 2008 to 2017, with most of the cases diagnosed as seminoma.[16] However, the study demonstrated a notable decline in the mortality trends in TC patients during this period, which can be explained by advancements in the treatment options for TC.[16] According to another Cancer Registry-based study in Saudi Arabia, in the Qassim region during the period 2002–2016, TC was found to have a significant annual percentage change in the age-standardized incidence rate.[19]

To the extent of our current understanding, no prior study has investigated the incidence and mortality trends, demographic and clinical features, and neoplasm properties of TC in the Qassim Region of Saudi Arabia. Investigating regional disparities in Saudi Arabia, particularly in the Qassim region, will highlight tailored strategies for understanding and managing TC in specific geographic areas.

This study aimed to assess and evaluate the prevalence, incidence, clinical symptoms, and management of TC in the Qassim region of Saudi Arabia.

Materials and Methods

This retrospective study was conducted at King Fahad Specialist Hospital in Buraidah, Qasim Region, Saudi Arabia. King Fahad Specialist Hospital is a tertiary care facility in the Qassim region of Saudi Arabia to which all tumor cases in the Qassim region are referred. The study population comprised all patients diagnosed with TC between October 2017 and July 2024, with complete medical records.

Patients with incomplete medical records were excluded from the analysis. A pre-designed, standardized data-collection checklist was employed to extract data from the medical records. The collected data encompassed patients' demographics, clinical characteristics, histopathological features, and treatment outcomes. To ensure data quality and reliability, the researchers verified the accuracy of the extracted data through random checks.

The study was approved by the Qassim Region Research Ethics Committee (QREC).

Statistical analysis was performed using statistical software package SPSS version 26.0 (SPSS Inc, Armonk, NY: IBM Corp).

Results

This retrospective observational study included a total of 14 TC patients. Most patients were aged between 20 and 30 years (64.3%), with only one patient (7.1%) reporting a family history of TC. Most patients presented without any associated conditions (85.7%), whereas a minority reported contralateral TC (7.1%) or cryptorchidism (7.1%) (Table 1).

All patients exhibited symptoms, primarily testicular swelling (42.9%) or a combination of testicular swelling and pain (28.6%). The time to seek medical attention varied; some patients presented within two weeks (35.7%), while others delayed care for over a month (21.4%) (Table 2).

Seminoma was the most prevalent histological type (64.3%), with lesions more frequently located in the right testicle (57.1%) and most tumors measuring ≤4 cm (85.7%) (Table 3).

Table 1.

Demographic and baseline characteristics of the study participants.

Characteristic	Category	Frequency (n)	Percentage (%)
Age, years	<20	1	7.1%
	20–30	9	64.3%
	31–40	3	21.4%
	>40	1	7.1%
Family history of testicular cancer	No	13	92.9%
	Yes	1	7.1%
Associated conditions	Contralateral TC	1	7.1%
	Cryptorchidism	1	7.1%
	None	12	85.7%

Table 2.

Clinical presentation and exhibited symptoms.

Characteristic	Category	Frequency (n)	Percentage (%)
Clinical presentation	Symptomatic	14	100
Main presenting symptom	Pain	4	28.6%
	Testicular swelling	6	42.9%
	Testicular swelling and pain	4	28.6%
Time to medical attention	≤2 weeks	5	35.7%
	>2 weeks – 1 month	1	7.1%
	>1 month – 2 months	3	21.4%
	>2–6 months	2	14.3%
	>6 months – 1 year	2	14.3%
	Not available	1	7.1%

Table 3.

Tumor histopathology and site characteristics

Characteristic	Category	Frequency (n)	Percentage (%)
Histopathological type	Embryonal carcinoma	1	7.1%
	Mixed germ cell tumors	4	28.6%
	Seminoma	9	64.3%
Site of lesion	Bilateral	2	14.3%
	Left	4	28.6%
	Right	8	57.1%
Tumor size, cm	≤4 cm	12	85.7%
	5–7 cm	1	7.1%
	≥10 cm	1	7.1%

Concerning tumor markers, half of the patients exhibited elevated beta-human chorionic gonadotropin (ß-hCG) levels (50%). In contrast, alpha-fetoprotein (AFP) and lactate dehydrogenase (LDH) levels were elevated in fewer cases (21.4% and 35.7%, respectively) (Figure 1).

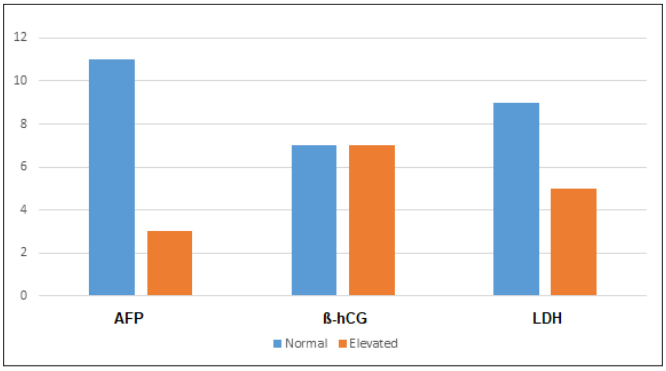

Fig. 1. *Tumor marker levels.*

Most patients presented with early-stage tumors—T1a (28.6%), T1b (35.7%), and T2 (28.6%), the predominant stages observed. Lymph node involvement was minimal, with a significant portion classified as N0 (71.4%), while a smaller group exhibited N2 involvement (21.4%). Notably, none of the patients demonstrated distant metastasis (M0) (Table 4).

Table 4.

Tumor Staging and Metastasis

Staging characteristic	Category	Frequency (n)	Percentage (%)
Tumor stage (T)	T1a	4	28.6%
	T1b	5	35.7%
	T2	4	28.6%
	Tis	1	7.1%
Nodal stage (N)	N0	10	71.4%
	N1	1	7.1%
	N2	3	21.4%
Metastasis (M)	M0	14	100.0%

Table 5.

Treatment and surgical details and follow-up, recurrence, and fertility considerations

Treatment	Category	Frequency (n)	Percentage (%)
Type of treatment	Adjuvant	13	92.9%
	Surveillance	1	7.1%
Type of surgery	Laparoscopic radical inguinal orchiectomy	3	21.4%
	Open radical inguinal orchiectomy	11	78.6%
Follow-up characteristic	Category	Frequency (n)	Percentage (%)
Completed therapy	Yes	13	92.9%
	No	1	7.1%
Follow-up duration	≤1 year	8	57.1%
	>1 year – 3 years	5	35.7%
	Not available	1	7.1%
Recurrence	No	14	100.0%
Sperm freezing	Yes	5	35.7%
	No	9	64.3%

A substantial proportion of patients received adjuvant treatment (92.9%), and the primary surgical approach employed was open radical inguinal orchiectomy (78.6%). Nearly all patients completed their therapy (92.9%), with follow-up durations predominantly within one year (57.1%) or extending to 1–3 years (35.7%). Moreover, there were no recorded cases of recurrence. Regarding fertility considerations, sperm cryopreservation was done for 5(36.7%) patients (Table 5).

Discussion

The current study demonstrated that the most frequent symptom of TC was testicular swelling, and the most prevalent histological subtype was seminoma, with lesions more frequent in the right testicle. The most common elevated tumor marker found in TC patients was ß-hCG. The majority of the patients were diagnosed with early-stage tumors and exhibited minimal lymph node involvement. Additionally, the most common type of treatment and surgical approach employed for TC patients were adjuvant treatment and open radical inguinal orchiectomy, respectively. Almost all patients completed their treatment, and the study findings indicated no recurrence. In the context of fertility considerations, a few of the patients froze their sperms. The consistency of the findings of our study with the results reported by other existing observational studies conducted in Saudi Arabia is variable.[16,20]

According to a United Kingdom-based case-control study published in 2018, testicular swelling was found to be among the topmost independent features associated with TC, including testicular lump and scrotal swelling. The combination of the testicular lump with testicular swelling or pain had positive predictive values of 17% and 10%, respectively.[21] In addition to primary TCs, testicular swelling may also be an initial presentation in patients with gastric cancer metastasized to the testes; however, gastric cancer metastases to the testes are a rare occurrence.[22,23] The clinical presentation of males with those symptoms mentioned above, and other less common ones, prompts a complete patient history and assessment, including testicular examination of the affected and the contralateral testis, evaluation of the lymph nodes, and scrotal ultrasonography as the initial imaging of choice.[24] Notably, a recent Saudi Arabian study demonstrated that most of the study participants knew about TC, but only very few performed testicular self-examination. This is indicative of increased awareness and academic efforts in raising understanding of TC symptoms and risk factors, but not of testicular self-examination.[17]

In the current study, the majority of TC patients were diagnosed with seminoma. Studies from Saudi Arabia have reported variable findings regarding the prevalence of histological subtypes of TC. Generally, germ cell tumors constitute the most common histological subtype of TC, and they are further divided into seminomas, non-seminomas, mixed tumors, and teratomas.[2] The national database study demonstrated that seminomas and non-seminomas were the dominant histological subtypes of TC in1994–2003 and 2004–2013, respectively.[25] Another study based on the Saudi Cancer Registry analyzed data from 2008 to 2017, concluding that the non-seminomatous germ cell tumor was the predominant histological subtype of TC. The study also highlighted a statistically significant association between histopathology subtypes and survival (P=0.01) and between histopathology subtypes and tumor stage (P<0.001), with longer survival related to lower tumor stage and seminomatous germ cell tumors.[16] The serum tumor markers for TC include ß-hCG, AFP, and LDH.[26] According to our study findings, elevated ß-HCG was the most common tumor marker in TC patients. Compared to seminomas, non-seminomatous germ cell tumors are characterized by elevated levels of AFP in approximately 50%–70% of the patients. On the contrary, syncytiotrophoblasts present in seminomas produce ß-hCG.[6] Therefore, compared to other tumor markers, higher levels of ß-HCG in our study population can be explained by the greater prevalence of seminomas compared to other TC subtypes.

According to the American Urological Association (AUA) guidelines, surveillance remains the mainstay of management in patients with TC stage I.[27] Given the high cure rates in most TC patients, close observation following radical orchiectomy along with adjuvant therapy with chemotherapy or radiotherapy is now considered a standard approach for patients diagnosed with clinical stage IA/IB seminoma.[28] According to the current study, the most common surgical approach was radical inguinal orchiectomy. According to the medical literature, inguinal exploration plus radical orchidectomy is considered the gold standard approach to the initial management of a testicular mass that is suspected of malignancy. This surgical technique facilitates histopathological evaluation and disease staging. Radical orchidectomy is curative for more than 80% of men diagnosed with stage I testicular seminoma and approximately 70% of men with a Stage I non-seminomatous giant cell tumor.[29,30] While TC is a curable condition, the cytotoxic modalities and the malignancy itself negatively influence fertility, with approximately one-third of treated patients diagnosed with oligospermia before any treatment. Therefore, TC patients are offered sperm cryopreservation and other fertility preservation options before orchiectomy.[31-33]

Limitations

While this retrospective observational study successfully identified and reported the clinical presentation, histopathological characteristics, management, and outcomes in TC patients from the Qassim region, Saudi Arabia, the study has several limitations. The study's retrospective nature is associated with potential selection bias, given that the authors relied on existing medical records for data acquisition. This may further limit the accuracy of the data and the study findings. The small sample size of TC patients may limit the statistical power of the study as well as the generalizability of the study findings to a broader population of TC patients. Since the current study was conducted at a single tertiary center, the study population and findings may not represent the entire Saudi Arabian population. Given that most of the patients in this study had a follow-up of one year, the long-

term outcomes, such as survival and quality-of-life outcomes, could not be assessed.

Future Implications

Based on the study findings, several future implications can be considered. These include enhancing early detection and diagnosis of TC by implementing targeted public awareness campaigns, providing comprehensive training to primary care providers to improve early referrals to specialists, and developing standardized diagnostic protocols. The next approach is to optimize the treatment strategies for TC. Future studies can achieve this by identifying predictive biomarkers for personalized treatment approaches. Future studies may also explore strategies to minimize the side effects of chemotherapy and radiotherapy, including supportive care interventions and fertility preservation techniques. The novel therapeutic approaches can be further evaluated by clinical trials. Lastly, conducting population-based studies such as epidemiological and genetic studies may provide opportunities to identify areas for intervention based on disease burden, recognize at-risk individuals, and develop targeted prevention strategies.

Conclusion

In summary, this retrospective observational study provided valuable insights into the clinical presentation, histological characteristics, and the management of TC in Saudi Arabian men. The study findings highlighted testicular swelling as the most common presenting symptom, with seminoma being the predominant subtype. Notably, the right testicle was more frequently affected, and elevated ß-hCG levels were observed as a common biomarker for TC. Most patients were diagnosed with early-stage disease and minimal lymph node involvement; this can be related to early detection and timely intervention. Notably, the study indicated a high treatment completion rate and no reported recurrence of TC. While the small sample may limit the findings' generalizability, the current study underscores the significance of early detection and treatment of TC. Future research with larger cohorts may further elucidate the clinical course, histological characteristics, and optimal management strategies for TC. Additionally, future studies may address the importance of fertility considerations and explore fertility preservation approaches for TC patients.

Competing Interests

The authors declare that they have no competing interests.

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