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Clinico-Epidemiological Profile of Testicular Tumors in North Egypt, Single Center Study

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ABSTRACT

Background: Testicular cancer (TC) comprises about 1% of male neoplasms and holds the distinction of being the most encountered tumour among young males. TC represents major therapeutic challenges in developing countries with poor outcomes.

Aim: To identify the clinico-epidemiologic profile of testicular tumours in Oncology Center, Mansoura University (OCMU) in Egypt.

Patients and Methods: This retrospective descriptive study included 129 patients presented with manifestations of testicular tumour and presented to OCMU within the period from January 2006 to January 2024. The collected data from the medical records of the patients at OCMU included sociodemographic factors, associated morbidities, predisposing factors, manifestations, site of the tumour, histological types, staging and therapeutic option.

Results: the age mean was (36.1 ± 13.1) years, 13 (10.1%) presented with testicular anomalies: 8 (6.2%) had an undescended right testicle, there was painless enlargement of testis in 91 cases (70.5%), painful enlargement of testicles in 13 cases (10.1%), and abdominal pain in ten cases (7.8%). The distribution of histologic types in the current study aligns with the well-documented predominance of germ cell tumours (GCT) among testicular neoplasms. The scrotal ultrasound (US) findings showed that 42.6% exhibited heterogeneous echo-patterns, another 42.6% presented with hypoechoic lesions, 11.6% had normal echo-patterns, and 1.6% showed hyperechoic lesions.

Conclusion: The present study provided valuable insights into the histologic subtypes, imaging findings, tumour marker variations, staging, and treatment modalities of testicular cancer. There was predominance of germ cell tumours. Scrotal ultrasound findings varied, with heterogeneous and hypoechoic patterns being the most common.

Keyword: Testicular Tumours, GCT, SCST.

INTRODUCTION

Testicular tumours are the most frequent solid malignant tumor among adolescents, even though they account for about one per cent of solid tumours in males. The two primary types of testicular tumours are GCTs, representing ninety-five per cent of cases; others include sex cord-stromal tumours (SCSTs), mixed GCTs and SCSTs, hematopoietic tumours, miscellaneous tumours, and secondary tumours [1].

The variety of histological forms and different clinical courses, particularly among GCTs, make testicular pathology complex. As tumours with identical histological structure may behave in a different way based on such criteria, the nature or kinds of tumours present and clinical features such as the patient's age and primary site are important factors in the prediction of the biological behavior. Determining if chemotherapy is important and whether a patient has to undergo surgeries depends on accurate histological assessment as well as on the tumour stage [2,3].

There are multiple predisposing factors accompanied by testicular tumours; on the other hand, the actual cause of such tumours isn't identified till now. Some predisposing factors are well-identified, whereas others are believed to be potentially increasing the possibility for testicular tumours. Atrophies testis, hypospadias, family history of TC, previous history of contralateral TC, and cryptorchidism are identified predisposing factors for TC. Compared to men of other races, white men are more likely to develop TC. Loss of fertility, environmental exposures, and microcalcification are other possible predisposing factors that haven't conclusively demonstrated to be accompanied by a higher risk of TC [4].

Cases with localized disease often complain of the presence of a nodule or painless swelling in a single testicle [5]. The first presentation might be a dull discomfort in the lower abdomen. Blood or lymphatic spread features could be developed in cases with disseminated disease. Ultrasound (US) could identify testicular masses and distinguish between intrinsic and extrinsic testicular lesions. Radiological investigations (CXR and CT) of the abdomen and pelvis are the first staging workup when the diagnosis of TC is confirmed [6]. The optimum approach for offering local tumour control and histological assessment of the primary tumour is a radical inguinal orchiectomy [7].

AIM OF WORK

To identify the clinico-epidemiological profile of testicular tumours in OCMU and to identify the epidemiological determinants and clinical status of testicular tumours in northern Egypt.

PATIENTS AND METHODS

This was a single-center retrospective cross-sectional study conducted on cases presenting with manifestations of testicular tumour at OCMU, El Dakahlia Governorate, Egypt, within the period from January 2006 to January 2024 and those who were older than 18 years and diagnosed with testicular tumour. But

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we excluded patients who were diagnosed in different centers in northern Egypt and cases with ages less than 18 years old.

METHODS

The study was a retrospective descriptive study, in which the data were collected from patient's medical records at OCMU; including sociodemographic factors, associated medical problems, predisposing factors, symptoms and signs, site of the tumour, histologic type of the tumour, staging and therapeutic approach.

Testicular tumours were often diagnosed in adolescents and young adults. They were rare in children and less predominant in older adults. The causes of age distribution aren't identified; hormonal and genetic factors are believed to have central roles. Associated morbidities were hypertension (HTN), diabetes mellitus (DM), and etcetera.

Numerous predisposing factors for testicular tumors have been identified, including cryptorchidism, other testicular anomalies such as testicular atrophy or abnormal development, a history of testicular tumors in one testicle (which means there is a greater risk of acquiring it in the other testicle), and a positive family history. The patients complain of painless testicular swelling, a dull aching pain in the lower abdomen, and discomfort and it may include one or both sides.

The histological forms were divided into two primary histological forms: GCTs and non-GCTs (NGCTs). GCTs represent 95% of testicular tumors and are classified into seminomas and non-seminomas. About 1/3 of GCTs comprise more than one histological form. Essentially, seminoma often occurs among the elderly and tends to have a benign course compared to non-seminomas.

Diagnostic measures included clinical assessment (site, size, and features of the testicular mass), radiological approaches (US was utilized to assess swollen testicles and CT for metastatic workup), blood tests (serum tumour markers such as AFP, hCG, and LDH), and biopsies.

We used AJCC to assess the tumour staging, which includes the tumour size, node affection and distant metastasis and serum tumour markers following orchiectomy.

The therapeutic procedure for testicular tumours depended on different factors, such as the kind and stage, and the subject's health. The therapeutic approaches included radical inguinal orchiectomy, radiotherapy alone or following surgery to remove any residual tumour cells and chemotherapy.

Ethical consideration

Only scientific purposes were served by the information gathered from the medical records. The Mansoura University Faculty of Medicine's IRB (Institutional Research Board) staff reviewed and approved the research protocol. The Helsinki Declaration was followed throughout the study's conduct.

Statistical analysis

The collected data were analyzed by using SPSS Version 25. Quantitative data were evaluated in frequency and percentage and continuous quantitative data were evaluated as mean±SD.

RESULTS

Table **(1)** shows that the mean age of the studied cases was 36.1±13.1 years, and 11 cases (8.6%) had comorbidities. Diabetes mellitus was the most common comorbidity in six cases (4.7%). Regarding risk factors, according to testicular anomalies, no recorded anomalies were found in the majority of cases (89.9%). With regard to past history, it was free in one hundred cases (77.5%).

According to family history, there was a positive family history of a similar condition in a single case (0.8%) in all cases.

Table (1): Description of age, associated morbidities, and risk factors in the studied cases

		All patients (n= 129)
Age	**Mean±SD**	36.1±13.1
	Minimum–Maximum	18–80
Diabetes mellitus (DM)	Yes	Six
	No	123
Hypertension (HTN)	Yes	Four
	No	125
Ischemic heart diseases (IHD)	Yes	One
	No	128
Testicular anomaly	Free	116
	Undescended right testis	Eight
	Undescended left testis	Four
	Bilateral undescended testicles	One
Past history	Free	100
	Hernia	Nine
	Hydrocele	Nine
	Varicocele	Nine
	Traumas	Two
Family history	Free	128
	Cousin	One

Table **(2)** shows that regarding presentation, painless and painful enlargement of testicles were the most common. Regarding the lesional site, it was more in right testis in 62 cases (48.1% of all studied cases).

Table (2): Clinical presentation and site in the studied cases

Clinical presentation	**All patients (n= 129)**	
Painless enlargement testicles	91	70.5 %
Painful enlargement testicles	13	10.1 %
Abdominal pain	10	7.8 %
Backache	Four	3.1 %
Chest Pain	Two	1.6 %
Coughing	Two	1.6 %
Coughing with blood	One	0.8 %
Fever and weight loss	One	0.8 %
Headache	One	0.8 %
Left groin mass	Two	1.6 %
Accidental	Two	1.6 %
Sites		
Right testicle	62	48.1%
Left testicle	52	40.3%
Both sides	One	0.8%
Other primary site	14	10.9%

Table **(3)** shows that regarding histological forms, GCT was the most common one in 113 cases (87.6%) [57 cases 44.2% with seminoma and 56 cases 43.4% with non-seminoma].

Table (3): Distribution of histological forms

Histological types	**All patients (n= 129)**	
SCST	5	3.9%
GCT		
Seminoma	57	44.2%
Non-seminoma	56	43.4%
Other types		
Benign papillary mesothelioma	One	0.8%
Mesothelioma of the tunica vaginalis testis	One	0.8%
Minute atypical papillary serous	One	0.8%
Neuroendocrine	One	0.8%
Diffuse large B Cell	Four	3.1%
Pleomorphic rhabdomyosarcoma	One	0.8%
Testicular tissue: free from tumour	One	0.8%
Undifferentiated pleomorphic sarcoma	One	0.8%

Table (4) shows that regarding scrotal US results, there was heterogenous echotexture in 55 cases (42.6%) and hypoechoic mass in 55 cases (42.6%). Regarding tumour markers following orchiectomy, the mean HCG was (721± 3642), whereas the mean AFP was (396±1807), and, the mean LDH was (507±1012) in all studied cases.

Regarding TNM staging, there were three cases (2.3%) with stage zero, eleven cases (8.5%) with stage I NGCT, 39 cases (30.2%) with stage I GCT, 21 cases (16.3) with stage II GCT, a singel case (0.8%) with stage III (NGCT), and 54 (41.9%) with stage III GCT.

Table (4): The diagnostic measures and TNM staging

Histological types		**All patients (n= 129)**	
Scrotal US results			
Normal echotexture		**15**	**11.6%**
Heterogenous echotexture		**55**	**42.6%**
Hypoechoic mass		**55**	**42.6%**
Hyperechoic mass		**Two**	**1.6%**
Bulky Right Testis with normal echotexture		**One**	**0.8%**
Empty scrotum		**One**	**0.8%**
Tumour markers following Orchiectomy			
HCG	Mean±SD	**721 ± 3642**	
	Minimum – Maximum	**0 – 33480**	
AFP	Mean±SD	**396 ± 1807**	
	Minimum– Maximum	**0 – 18925**	
LDH	Mean±SD	**507 ± 1012**	
	Minimum – Maximum	**0 – 7683**	
TNM staging			
Stage 0		Three	2.3 %
Stage I (NGCT)		Eleven	8.5 %
Stage IA		Sixteen	12.4 %
Stage IB		Fifteen	11.6 %
Stage IS		Eight	6.2 %
Stage IIA		Five	3.9 %
Stage IIB		Eleven	8.5 %
Stage IIC		Five	3.9 %
Stage III (NGCT)		One	0.8 %
Stage IIIA		Ten	7.8 %
Stage IIIB		Twenty-seven	20.9 %
Stage IIIC		Seventeen	13.2 %

Table **(5)** displays the treatment distribution. Surveillance and radiotherapy were recorded in 14% and 15.5% of the studied cases, respectively. Nerve-sparing retroperitoneal lymph node dissection (RPLND) was not recorded in any case.

Table (5): Distribution of treatment in the studied cases

	All patients (n= 129)	
Surveillance	Eighteen	14.0%
Radiotherapy	Twenty	15.5%
Nerve-sparing retroperitoneal lymph node dissection	Zero	Zero %

Table (6) displays that regarding treatment by chemotherapy, twelve cases (9.3%) received only carboplatin for 1.75±1.4 cycles, 82 cases (63.6%) received BEP for 3.4±1 cycles, nineteen cases (14.7%) received EP for 3.2±0.9 cycles, and thirteen cases (10.1%) received VIP for 3.3±0.9 cycles.

Table (6): Distribution of chemotherapeutic agents:

		All patients (n= 129)	
Carboplatin Only		12	9.3%
Cycles	**Mean±SD**	1.75 ± 1.4	
	Minimum–Maximum	1 – 6	
BEP		82	63.6%
Cycles	**Mean±SD**	3.4 ± 1	
	Minimum–Maximum	1 – 6	
EP		19	14.7%
Cycles	**Mean±SD**	3.2 ± 1	
	Minimum- Maximum	2 – 4	
VIP		13	10.1%
Cycles	**Mean±SD**	3.3 ± 0.9	
	Minimum–Maximum	2 – 4	
TIP		4	3.1%
Cycles	**Mean±SD**	2.8 ± 2.2	
	Minimum–Maximum	1 – 6	
VeIP		4	3.1%
Cycles	**Mean±SD**	3 ± 1.4	
	Minimum– Maximum	1 – 4	
ICE		4	3.1%
Cycles	**Mean±SD**	2.8 ± 0.5	
	Minimum–Maximum	2 – 3	
Gemcitabine, Paclitaxel and Oxaliplatin		2	1.6%
Cycles	**Mean±SD**	4.5 ± 2.1	
	Minimum–Maximum	3 – 6	
Gemcitabine and Oxaliplatin		6	4.7%
Cycles	**Mean±SD**	4.7 ± 3.4	
	Minimum– Maximum	2 – 11	
Gemcitabine and Paclitaxel		2	1.6%
Cycles	**Mean±SD**	3 ± 1.4	
	Minimum – Maximum	2 – 4	
Gemcitabine and Docetaxel		2	1.6%
Cycles	**Mean±SD**	2.5 ± 0.7	
	Minimum– Maximum	2 – 3	
Paclitaxel and Carboplatin		3	2.3%
Cycles	**Mean±SD**	3 ± 2.6	
	Minimum– Maximum	1 – 6	
Paclitaxel Only		2	1.6%
Cycles	**Mean±SD**	2 ± 0	
	Minimum– Maximum	2 – 2	
Gemcitabine and Cisplatin		1	0.8%
Cycles	**Mean±SD**	4 cycles	
	Minimum –Maximum		
Cisplatin/Pemetrexed		1	0.8%
No of cycles	**Mean±SD**	4 cycles	
	Minimum –Maximum		
Vinorelbine		1	0.8%
Cycles	**Mean±SD**	2 cycles	
	Minimum – Maximum		
Ifosfamide and Doxorubicin		1	0.8%
Cycles	**Mean±SD**	1 cycle	
	Minimum–Maximum		
CHOP		3	2.3%
Cycles	**Mean±SD**	5 ± 1.7	
	Minimum–Maximum	3 – 6	
COP		1	0.8%
Cycles	**Mean±SD**	2 cycles	
	Minimum–Maximum		

DISCUSSION

Testicular cancer (TC) is the most frequently diagnosed malignant tumour in young adult males. There is considerable geographic change in the age-standardized incidence rate for TC, ranging from as low as 1.86/100,000 in Egypt [8]. The most frequent risk factors for TC involve cryptorchidism, Caucasian race, TC in situ, and personal and family history of TC. On the other hand, the etiology likely includes a multifactorial interplay of genetic and environmental effects [9]. The way testicular cancer is treated has improved. TC management was revolutionized by adding cisplatin-based combination chemotherapy, radiotherapy, and RPLND. Even in the existence of metastatic disease, cases diagnosed with testicular cancer have a good prognosis [10].

This cross-sectional retrospective study was conducted on 129 cases presenting with manifestations of testicular tumour at OCMU, to identify the clinico-epidemiological profile of testicular tumours. Among our studied patients, the age mean was (36.1±13.1) years. The current study's findings are consistent with the general trend that TC is most common in young and middle-aged adults.

Comparing these results to previous research, **El-Achkar *et al.*** [11] conducted a study on 241 patients with histologically confirmed testicular carcinoma and found a median age of 31 years (IQR: 25–36). Similarly, **Eltahir *et al.*** [9] studied 50 patients with testicular cancer and reported a mean age of 41.9 years.

With regard to comorbidities, there was diabetes mellitus (DM) in six cases (4.7%), hypertension (HTN) in four cases (3.1%) and ischemic heart diseases (IHD) in a single case (0.8%). A comprehensive study involving 169,959 cancer patients found a DM prevalence of 12.9% and HTN prevalence of 20.4% [12].

While in an Egyptian retrospective study of 32 patients with pathologically proven TCs, reported that there was IHD in 3 patients (9.4%), DM in 2 patients (6.3%), HCV in 2 patients (6.3%) and renal insufficiency in a single case (3.1%) [8].

Our findings of lower DM, HTN, and IHD prevalence among testicular tumour patients are consistent with other studies, likely reflecting the younger age profile of this patient group. However, it's crucial to monitor these comorbidities over time, as treatments like chemotherapy may elevate cardiovascular risks in long-term survivors. In our study of 129 patients with testicular tumours, 13 (10.1%) presented with testicular anomalies: 8 (6.2%) had an undescended right testicle, 4 (3.1%) an undescended left testicle, and 1 (0.8%) bilateral undescended testicles. Notably, 29 patients (22.5%) had a significant past medical history, including hernia (7%), hydrocele (7%), varicocele (7%), and trauma (1.6%). A positive family history was rare, with only one patient (0.8%) reporting a cousin with a similar condition.

The correlation between undescended testis (cryptorchidism) and TC is well-confirmed. A meta-analysis reported a relative risk of 6.33 for TC in the undescended testis and 1.74 in the contralateral descended testis, highlighting the increased risk in both testes, though more pronounced on the ipsilateral side [13]. An Egyptian retrospective analytical study of 60 testicular cancer patient, revealed that cryptorchidism was recorded in 7 case (11.7%) [10].

Zawam *et al.* [8] detected that about only 2 patients (6.2%) had history of undescended testis. Additionally, a population-based case-control study found that men with a history of inguinal hernia had an increased risk of testicular cancer (odds ratio 1.91), suggesting a potential link between congenital urogenital abnormalities and the development of testicular malignancies [14].

Regarding manifestations, there was painless testicular enlargement in ninety one cases (70.5%), painful testicular enlargement in thirteen cases (10.1%), abdominal pain in ten cases (7.8%), backache in four cases (3.1%), chest pain in two cases (1.6%), coughing in two cases (1.6%), hemoptysis in one case (0.8%), hyperthermia with WL in one case (0.8%), headache in one case (0.8%), left groin mass in two cases (1.6%), and accidentally found in two cases (1.6%) of all cases.

Also, **Eltahir *et al.*** [9] found that swollen testicles was the most commonly recorded presentation (70%), followed by abdominal swelling (30%). A retrospective analysis that was conducted on 72 patients diagnosed with testicular cancer, aligns with our finding as testicular swelling was the most frequent symptom followed by abdominal pain, abdominal swelling, difficult breathing, headache, and emesis [15].

In regard to the lesional site, it was in right testicle in sixty-two cases (48%), in left testicle in 52 cases (40%), bilateral in a single case (0.8%) and other primary site in 14 patients (10.9%) of all studied patients. In similar way, **Mesha *et al.*** [10] revealed that right testicle was the most affected site among their patients (51.7%). Likely, **Dieckmann *et al.*** [16] recorded that the primary tumour in cases was mainly situated on the right side (47.6%), followed by the left (47.4%), and 3.5% on both sides.

The distribution of histologic types in the current study aligns with the well-documented predominance of GCTs among testicular neoplasms. In our study, germ cell tumours accounted for 87.6% of cases, with a nearly equal division between seminoma (44.2%) and non-seminoma (43.4%). This finding is consistent with **Mesha *et al.*** [10] studies indicating that germ cell tumor (GCT) was recorded in 51 cases (85%): Seminoma was determined in 34 cases (56.6%).

Similarly, a retrospective study including 56 testicular cancer patients, revealed that 80.4% of cases had germ cell cancers, with seminoma representing 62.2% of cases [17]. A study of 152 patients who underwent inguinal orchiectomy with an initial diagnosis of a scrotal mass, reported that germ cell

cancer was recorded in 125 cases (95.42%): Seminoma was recorded in 43 case [18].

Sex cord-stromal tumours (SCSTs), identified in 3.9% of cases in the present study, are relatively rare compared to GCTs but remain an important subset of testicular tumours. Previous literature suggests that SCSTs account for approximately 4–6% of testicular neoplasms [19], which is in line with the current findings. These tumours, which include Leydig cell tumours and Sertoli cell tumours, generally exhibit a benign course but can occasionally show malignant potential.

Additionally, this study reported rare histologic subtypes, including pleomorphic rhabdomyosarcoma (0.8%), undifferentiated pleomorphic sarcoma (0.8%), and large B-cell non-Hodgkin's lymphoma (3.1%). Testicular lymphomas, especially diffuse large B-cell lymphoma (DLBCL), are well-recognized as the most frequent testicular malignancies in elderly patients, comprising up to 5% of testicular tumours and nearly 50% of testicular cancers in men over 60 years [20].

The scrotal US findings in the current study revealed a spectrum of echogenic patterns among the patients. Specifically, 42.6% exhibited heterogeneous echo-patterns, another 42.6% presented with hypoechoic lesions, 11.6% had normal echo-patterns, 1.6% showed hyperechoic lesions, and there were isolated cases (0.8% each) of a bulky right testis with normal echo-pattern and an empty scrotum.

Regarding tumour markers post-orchiectomy, the mean levels were as follows: human chorionic gonadotropin (HCG) at 721 mIU/mL (±3642, range 0–33,480), AFP at 396 ng/mL (±1807, range 0–18,925), and lactate dehydrogenase (LDH) at 507 U/L (±1012, range 0–7683). The wide range and high standard deviations observed in the tumour marker levels of this cohort suggest significant variability, possibly reflecting diverse tumour burdens and histologic subtypes among the patients.

Zawam *et al.* [8] detected elevation in biomarkers among their patients, the B-HCG was elevated in 31.2% of patients, AFP in 34.4% and LDH in 31.2% of patients. **Bhatti *et al.*** [5] reported that AFP was raised in 41% and hCG in 27% patients.

The TNM staging distribution in the current study reveals a considerable ratio of cases presenting with advanced-stage testicular cancer. Specifically, stages IIIA, IIIB, and IIIC collectively account for 41.9% of cases, indicating a substantial number of cases with metastatic disease at diagnosis. Conversely, early-stage diagnoses (stages 0, I, IA, and IB) comprise 34.8% of the studied patients, which is in the same line with results of other studies in developing nations.

Eltahir *et al.* [9] found that most of cases (64%) were diagnosed with late-stage disease (stage IIIA, IIIB, or IIIC). Also, **Chalya *et al.*** [17] showed that most of cases presented late with an advanced stage of cancer. Similarly, a retrospective review of 225 patients diagnosed with TGCT, reported that 80% of patients presented with stage 3 [21].

El-Achkar *et al.* [11] detected that following radical orchiectomy and staging, 153 (63.4%) cases received adjuvant therapy comprising chemotherapy (52%), radiotherapy (9.1%), and chemoradiation (2.5%), while 88 (36.5%) cases underwent active surveillance. **Mesha *et al.*** [10] found that all cases in their study underwent surgery then surveillance in (5%) or chemotherapy (80%) or radiotherapy (11.7%) or combined chemoradiotherapy (3.3%). Our data differ from the results of **Dong *et al.*** [22] where chemotherapy was in (20.7%) or radiotherapy in (60.3%) or chemotherapy and radiotherapy in (19%).

In the current study, chemotherapy regimens varied based on disease stage and individual patient factors. The majority received BEP (bleomycin, etoposide, and cisplatin), with an average of 3.4 cycles. EP (etoposide and cisplatin) was administered to 14.7% of patients, averaging 3.2 cycles, serving as an alternative for those where bleomycin posed risks. Single-agent carboplatin was used in 9.3% of cases, typically for early-stage seminomas. VIP (etoposide, ifosfamide, and cisplatin) was given to 10.1% of patients, often in salvage therapy settings. Other regimens, including TIP (PTX, ifosfamide, and cisplatin), VeIP, and ICE (ifosfamide, carboplatin, and etoposide), were utilized less frequently.

Randhawa *et al.* [15] reported that in seminoma, first-line chemotherapy was carboplatin AUC7 in 50%, BEP-based regimen (bleomycin, etoposide and cisplatin) in 35.7%, EP-based regimen in 7.1%, BEP followed by EP in 3.6% of cases, whereas in non-seminoma, first-line chemotherapy was BEP in 47.7%, EP in 20.5%, BEP followed by EP in 15.9%, and VIP-regimen (etoposide, ifosfamide, cisplatin) in 15.9% of cases respectively. **Zawam *et al.*** [8] found that ten cases with good risk received chemotherapy, with the majority (6/10) had three cycles of BEP, whereas four cases received 4 cycles of EP regimen.

Study Limitations

This study has numerous limitations. Its retrospective design may introduce selection bias and reliance on incomplete medical records, potentially affecting data accuracy. As a single-center study, the findings may not be generalizable to broader populations with different genetic backgrounds or healthcare systems. The relatively small sample size, particularly in certain treatment subgroups, may limit statistical power and the ability to detect significant trends. Additionally, the lack of long-term follow-up data restricts the assessment of disease recurrence, late complications, and overall survival outcomes.

CONCLUSION

There was predominance of GCTs, particularly seminomas and non-seminomas. Scrotal US findings varied, with heterogeneous and hypoechoic patterns being the most common. Tumour markers such as HCG, AFP, and LDH showed significant variability, reflecting

the diversity of tumour burden and histological subtypes. The TNM staging distribution indicated that a considerable ratio of cases presented with advanced-stage disease, highlighting the importance of early detection. Treatment strategies followed established protocols, with BEP being the most frequently used chemotherapy regimen.

Conflict of interest

All authors have no conflicts of interest that are directly relevant to the content of this review.

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