ORIGINAL RESEARCH

Exploring the Clinicopathological Characteristics of Testicular Cancer: A Study at the Southern Philippines Medical Center

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Objective: To investigate the clinicopathologic profile of testicular cancer at the Southern Philippines Medical Center (SPMC) in Davao City from January 2017 to December 2022.
Methods: This is a retrospective study that analyzed data from a cohort of 33 patients using a combination of descriptive statistics and chi-square tests.
Results: The study revealed a mean patient age of 35 years, with the majority (82%) falling between 19 and 59 years. Cryptorchidism was associated with 9% of cases, and most tumors (55%) were located on the right side, with sizes between 3 and 10 cm (58%). The predominant symptom was a painless testicular mass (100%), underscoring the importance of self-examination. Pathologic stage distribution indicates a predominance of advanced stages, notably Stage IIIC at 24%. Germ cell tumors constitute 91% (52% seminoma, 39% non-seminoma), with no significant correlation between tumor stage at diagnosis and number of risk factors identified or body mass index (BMI). Symptom duration trends towards significance in association with advanced stages.
Conclusion: The study contributes to a comprehensive understanding of testicular cancer in the Philippines, aligning with global trends. It emphasizes the crucial role of early detection through self-examination and timely consultation. The prevalence of advanced stages highlights the imperative for heightened awareness and intervention.

Key words: testicular neoplasms, clinicopathologic profile, epidemiology, germ cell tumor

Introduction

Germ cell tumors, constituting 98% of testicular malignancies, exemplify a paradigm of treatable neoplasms.[1] Despite its rarity, the annual incidence of testicular cancer was found to have increased by a factor of 1.80 over a 25-year period, escalating from 37,231 cases in 1990 to 66,833 new cases in 2016.[2] In various cultures around the world, testicular cancer is currently the most common malignancy in young men, 15-34 years of age.[3] The regions with the highest incidence rates were Western and Northern Europe, while Asia and Africa exhibited the lowest rates. Paradoxically, despite the generally low incidence and the categorization of testicular cancer as a treatable neoplasm, Africa and Asia faced elevated death rates.[4] This observation points towards potential challenges linked to insufficient knowledge, inefficient detection methods, and restricted access to medical care and treatment. At present, there is a lack of research describing the clinicopathologic profile of testicular cancer in the Philippines.

In a comprehensive overview of testicular cancer in different geographical settings, Chalya et al. (2014) conducted a retrospective study in Tanzania spanning a decade, identifying 56 cases. With an average age of 28, patients predominantly presented with right-sided testicular swelling

(67.9%), and the majority had seminoma (62.2%). Inguinal orchidectomy emerged as the primary surgical intervention (77.4%), with adjuvant chemotherapy (11.1%) and radiation (7.4%) applied in select cases.[5] Similarly, Dusaud et al. (2015) investigated 341 cases of testicular cancer in a French military hospital from 1990 to 2011. The majority of patients sought medical attention following self-examination for testicular masses (47.1%). Non-seminomatous germ cell tumors prevailed, and no significant difference in 5-year survival rates was discerned between seminomas and non-seminomatous germ cell tumors.[6] Examining the scenario in Kashmir, India, Mustafa et al. (2017) conducted a review of 40 cases of testicular germ cell cancers over a 5-year period. The predominant histological type was also seminoma (65%), and testicular swelling was also the most common presenting symptom (65%). High inguinal orchiectomy was the prevailing surgical procedure, conducted in over 67% of cases.[7] These diverse studies collectively contribute to our understanding of the clinicopathological patterns and management strategies in different populations.

The main objective of the study was to determine the clinicopathologic profile of testicular cancer at Southern Philippines Medical Center (SPMC), Davao City, from January 2017 – December 2022. Understanding the clinicopathologic profile of patients in a specific region, is crucial for devising effective prevention, early detection, and treatment strategies. By comprehensively studying the cases at SPMC, this research can contribute to improving the overall health outcomes of individuals diagnosed with testicular cancer in the locality.

Methods

The study employed a descriptive retrospective document review to outline the clinicopathological profile of testicular cancer patients at the Southern Philippines Medical Center (SPMC), Davao City, Philippines, from January 2017 to December 2022. Conducted in the SPMC, a tertiary government hospital with a 1,500 bed-capacity, the focus was on all diagnosed testicular cancer patients. Data were extracted from the initial entry of qualified patients in the SPMC medical records section to avoid duplication.

Inclusion Criteria:

- Any age group
- Patients who underwent radical orchiectomy at SPMC
- Patients confirmed with a histopathological diagnosis of testicular cancer
- Patients who received medical/surgical care, including diagnosis, treatment, or follow-up at SPMC
- Patients for whom comprehensive clinicopathologic data, including tumor type, stage and histological details are available for analysis

Exclusion Criteria:

- Patients who did not undergo radical orchiectomy at SPMC
- Patients who have metastatic testicular involvement originating from other primary cancers
- Cases lacking essential clinicopathologic details necessary for comprehensive analysis

The independent variable in the study is the clinicodemographic profile of target patients, considering factors like age, congenital malformations, family history of testicular or other cancers, carcinoma in situ history, personal testicular cancer history, body mass index, tumor location and size, signs and symptoms, duration of symptoms, histologic type, and pathologic stage.

Main Outcome Measures

The following were the variables used in the study, described accordingly.

Age. This was presented as a mean age with the standard deviation of the chronological age of the patients at the time of diagnosis. Frequency and percentage were used to report data based on the following age groups: 0-18 years old, 19-59 years old, or 60 years old and above.

Associated congenital malformations. This referred to the presence or absence of congenital malformations diagnosed concurrent with testicular tumor,

specifically cryptorchidism and hypospadias (surgically treated or not). This was presented as frequency and percentage of the population.

Family history of testicular cancer. This referred to the presence or absence of any family history of testicular cancer up to the second degree relative. This was presented as frequency and percentage of the population.

Family history of other cancer(s). This referred to the presence or absence of any family history of cancer(s), other than testicular cancer up to the second degree relative. This was presented as frequency and percentage of the population.

History of carcinoma in situ of the testis. This referred to the presence or absence of a previous diagnosis of carcinoma in situ of the patient's testis (ipsilateral or contralateral). This was presented as frequency and percentage of the population.

Personal history of testicular cancer. This referred to the presence or absence of a previous patient's diagnosis of testicular cancer. This was presented as frequency and percentage of the population.

Body mass index. This described the general habitus of the patient, and in this study, it was described using frequency and percentage based on the following groups: underweight (<18.5), normal (18.5 – 24.9), overweight (25 – 29.9), Obese Class I (30.0 – 34.9), Class II (35 – 39.9), or Class III (≥40).

Location of tumor. This referred to the laterality of the testicular tumor whether right, left or bilateral. This was presented as frequency and percentage of the population.

Tumor size. This referred to the widest dimension of the tumor: ≤ 3cm, > 3cm to 10cm, or ≤ 10cm. This was presented as frequency and percentage of the population.

Signs and symptoms presented. This was presented as the frequency and percentage of the total population and included the following signs and symptoms: painless testicular mass either by self-examination or systematic examination by a physician, acute testicular pain, chronic/episodic testicular pain, gynecomastia, infertility, weight loss, and abdominal/flank pain.

Duration of symptoms prior to consultation. This pertained to the time duration from symptom onset up to the time of initial consultation: <1 month, 1 to 3 months, 3 to 6 months, 6 months to 1 year or more than 1 year. This was presented as frequency and percentage of the population.

Histologic type. This was presented as the frequency and percentage of the total population and included the following types of testicular cancer: 1) Germ Cell Tumor: Seminoma, 2) Germ Cell Tumor: Non-Seminoma, 3) Spermatocytic Seminoma and 4) Non-Germ Cell Tumor.

Pathologic stage. In the context of this study, denoted the specific staging level determined through comprehensive evaluation of the official histopathologic findings post-radical orchiectomy, coupled with a thorough metastatic work-up which included the following: Stage IA, IB, IS, IIA, IIB, IIC, IIIA, IIIB, and IIIC. This was presented as frequency and percentage of the population.

Sample Size Computation

A total enumeration of patients with testicular cancer who met the specified inclusion and exclusion criteria, from January 2017 to December 2022 at SPMC was included in the study. To determine the minimum sample size for this study, the investigator used the following assumptions and the sample size calculation for proportions found in Open Source Epidemiologic Statistics for Public Health (OpenEpi):

1. Based on the charts, there were approximately 40 records of patients with testicular cancer from January 2017 to December 2022 at SPMC
2. The confidence interval was set at 90%.
3. The prevalence of those who have tumor size greater than 3cm is at least 50%, the default value in our calculation.

The minimum sample size for this study was 30.

Data Handling and Analysis

Frequencies and percentages were used to describe categorical click demographic variables. Mean and standard deviation were used to summarize continuous clinicodemographic variables. The prevalence of the different types of testicular cancer as well as its pathologic stages at diagnosis were reported as frequencies and percentages. Correlation analysis using chi-square test was employed to investigate the relationship between pathologic stage at diagnosis and the following clinical factors: 1) number of risk factors identified; 2) body mass index (BMI); and 3) consultation delay or the duration of symptoms prior to first consultation. All statistical analyses used a 0.05 level of significance.

Ethics Review

The researchers obtained approval from both the Davao Center for Health Development Joint Research Ethics Committee (DCHD JREC) and the SPMC Department of Urology, including the consultant in charge.

Results

The study examined the clinicopathologic characteristics of 33 testicular cancer patients at the Southern Philippines Medical Center (SPMC) from January 2017 to December 2022. As presented in Table 1, the mean age of patients diagnosed with testicular cancer at SPMC was 35.39 years ± 13.83. The majority of cases (82%) fell within the age range of 19 to 59 years, with a noteworthy representation of older individuals at 15% for those aged 60 and above. Pediatric cases (0-18 years old) accounted for only 3% of the total.

The association between testicular cancer and cryptorchidism (not surgically treated) was noted in 9% of cases, underscoring the significance of considering congenital factors in the pathogenesis of testicular cancer. Surprisingly, there was an absence of a family history of testicular cancer or other cancers, as well as a history of carcinoma in situ of the testis in the studied cohort. Personal history of testicular cancer was observed in only 9% of cases (3 out of 33).

Table 1. Clinicodemographic profile of patients with testicular cancer.

Characteristics	Values
Age	35.39 ± 13.83
0 to 18 years old	1 (3%)
19 to 59 years old	27 (82%)
60 years old and above	5 (15%)
Associated Congenital Malformation	
Cryptorchidism (surgically treated)	0 (0%)
Cryptorchidism (not surgically treated)	3 (9%)
Hypospadias (surgically treated)	0 (0%)
Hypospadias (not surgically treated)	0 (0%)
None	30 (91%)
Family History of Testicular Cancer	
With History	0 (0%)
Without History	33 (100%)
Family History of Other Cancer(s)	
With History	0 (0%)
Without History	33 (100%)
History of Carcinoma in Situ of the Testicle	
With History	0 (0%)
Without History	33 (100%)
Personal History of Testicular Cancer	
With History	3 (9%)
Without History	30 (91%)
Body Mass Index	
Underweight (<18.5)	5 (15%)
Normal (18.5-24.9)	19 (58%)
Overweight (25.0-29.9)	6 (18%)
Obese I (30.0-34.9)	2 (6%)
Obese II (35.0-39.9)	1 (3%)
Obese III (≥40)	0 (0%)
Location of Tumor	
Right	18 (55%)
Left	14 (42%)
Bilateral	1 (3%)
Size of Tumor	
≤ 3cm	3 (9%)
> 3cm to 10cm	19 (58%)
> 10cm	11 (33%)
Duration of Symptoms Prior to First Consultation	
<1 month	2 (6%)
1 to 3 months	6 (18%)
3 to 6 months	2 (6%)
6 months to 1 year	12 (36%)
more than 1 year	11 (33%)

Examining the distribution of tumor location revealed a slightly higher incidence on the right side (55%) compared to the left (42%), with bilateral cases being minimal (3%). This corresponded with findings in existing literatures, which frequently report a higher prevalence of tumor occurrence in the right testicle. Tumor size analysis revealed that 58% of cases exhibited tumors ranging from three to 10 cm, 33% had tumors exceeding 10 cm, and only 9% presented with tumors smaller than 3cm. The analysis of the timeframe during which individuals experienced symptoms before seeking medical consultation indicated that 6% sought consultation within the first month of symptom onset, 18% had their initial consultation between one and three months, 36% of patients presented after six months, while 33% waited for over a year before seeking medical advice.

Table 2 shows a comprehensive overview of the diverse manifestations observed within the study population. The ubiquitous and primary symptom reported across all cases is a painless testicular mass with 100% prevalence. While a painless testicular mass stands out as the predominant presentation, a small percentage (3%) of cases manifested acute testicular pain. Moreover, a noteworthy proportion (21%) experienced chronic or episodic testicular pain. Remarkably, none of the patients in the study presented with gynecomastia nor infertility, suggesting that these specific manifestations might not be prevalent in this particular cohort. Weight loss, reported in 12% of cases, and abdominal/flank pain, observed in 21% of cases, have drawn attention to the systemic impact of testicular cancer.

Table 2. Signs and symptoms of testicular cancer.

Signs and Symptoms	Values
Painless testicular mass	33 (100%)
Acute testicular pain	1 (3%)
Chronic/episodic testicular pain	7 (21%)
Gynecomastia	0 (0%)
Infertility	0 (0%)
Weight loss	4 (12%)
Abdominal/flank pain	7 (21%)

Table 3 displayed a detailed breakdown of the pathologic stage and histologic type of testicular cancer at SPMC. The distribution across pathologic stages revealed a diverse landscape, with the majority falling within advanced stages. Stage III constituted the highest percentage at 39% followed by Stage I at 33% and Stage II at 27%.

Table 3. Pathologic stage and histologic type of testicular cancer.

Characteristics	Values
Pathologic Stage	
Stage IA	5 (15%)
Stage IB	6 (18%)
Stage IS	0 (0%)
Stage IIA	2 (6%)
Stage IIB	1 (3%)
Stage IIC	6 (18%)
Stage IIIA	3 (9%)
Stage IIIB	2 (6%)
Stage IIIC	8 (24%)
Histologic Type	
Germ Cell Tumor: Seminoma	17 (52%)
Germ Cell Tumor: Non-seminoma	13 (39%)
Embryonal	3 (9%)
Yolk Sac Tumor	5 (15%)
Teratoma	4 (12%)
Choriocarcinoma	1 (3%)
Spermatocytic Seminoma	2 (6%)
Non-Germ Cell Tumor	1 (3%)

The histologic analysis underscored the prevalence of germ cell tumors, constituting the majority (91%) of cases. Among these, seminoma (52%) and non-seminoma (39%) were the predominant subtypes. Among the non-seminomatous GCT, the most common subtype was yolk sac tumor (15%), followed by teratoma (12%), embryonal carcinoma (9%), and choriocarcinoma (3%). In 6% of cases, biopsy revealed a spermatocytic seminoma and only one of 33 (3% of the study population) had non-germ cell histology, specifically, lymphoma.

Table 4 shows a comprehensive overview of the correlation between clinical factors and tumor

stage at the time of diagnosis using chi square analysis, shedding light on the influence of several key clinical variables. The distribution of tumor stages did not reveal a significant correlation with the number of identified risk factors (p=0.753). Among individuals with no risk factors, 91% were diagnosed at Stage I, 89% at Stage II, and 77% at Stage III. Only one out of the 33 cases had two or more identifiable risk factors and was diagnosed with a Stage III tumor.

An examination of the relationship between BMI and tumor stage through chi-square analysis yielded no statistically significant association (p = 0.567). Various BMI categories exhibited diverse proportions across tumor stages, with no discernible trend of correlation.

The duration of symptoms before the initial consultation did not significantly correlate with tumor stage at the time of diagnosis (p=0.105). However, there was a noticeable trend towards significance. Patients seeking medical attention within the first month or within 1 to 3 months of symptom onset tend to receive an earlier-stage diagnosis, while individuals with symptoms lasting

Table 4. Correlation of clinical factors with tumor stage at diagnosis.

Clinical Factors	Stages			*p-value*
	I	**II**	**III**	
Number of Risk Factors Identified				
None	10 (91%)	8 (89%)	10 (77%)	
One	1 (9%)	1 (11%)	2 (15%)	0.753
Two or more	0 (0%)	0 (0%)	1 (8%)	
Body Mass Index				
Underweight (<18.5)	2 (18%)	2 (22%)	1 (8%)	
Normal (18.5-24.9)	5 (45%)	6 (67%)	8 (62%)	
Overweight (25-29.9)	3 (27%)	0 (0%)	3 (23%)	0.567
Obese Class I (30.0-34.9)	0 (0%)	1 (11%)	1 (8%)	
Obese Class II (35-39.9)	1 (9%)	0 (0%)	0 (0%)	
Obese Class III (≥40)	0 (0%)	0 (0%)	0 (0%)	
Duration of Symptoms Prior to First Consultation				
<1 month	1 (9%)	0 (0%)	1 (8%)	
1 to 3 months	5 (45%)	0 (0%)	1 (8%)	
3 to 6 months	0 (0%)	0 (0%)	2 (15%)	0.105
6 months to 1 year	2 (18%)	5 (56%)	5 (38%)	
more than 1 year	3 (27%)	4 (44%)	4 (31%)	

6 months to 1 year or more than 1 year were more likely to be diagnosed at advanced stages.

Discussion

The clinicopathologic profile of testicular cancer at SPMC was analyzed, revealing trends that aligned with global patterns. Testicular cancer predominantly affected the young and middle-aged population (19-59 years old), consistent with established epidemiological trends. Examination of tumor sizes indicated a notable percentage of cases with tumors ranging from three to 10 cm (58%), followed by tumors exceeding 10 cm (33%). This implied a potential delay in seeking medical attention, as larger tumors may have been associated with prolonged symptom duration.

Examining the time frame during which individuals experienced symptoms before seeking medical consultation yielded valuable insights into patient awareness and healthcare-seeking behavior. The data revealed that a significant number of patients delayed seeking consultation, with 36% presenting after six months, and 33% waiting for over a year before seeking medical advice. Only 6% of cases displayed a sense of urgency, seeking consultation within the first month of symptom onset.

The primary symptom reported across all cases was a painless testicular mass, emphasizing the critical role of self-examination and early detection. Patients displayed diverse symptoms, with some experiencing acute pain and others reporting chronic or episodic testicular pain. This variability in symptomatology underscored the importance of comprehending both acute and chronic pain patterns during clinical assessments in the context of testicular cancer. Systemic symptoms reported, including weight loss and abdominal/flank pain, may have served as indicators of advanced disease stages, emphasizing the necessity of addressing the holistic well-being of patients beyond localized manifestations. This broader perspective was crucial for comprehensive patient care, ensuring that the clinical focus extended to encompass the systemic implications of testicular cancer.

The distribution across pathologic stages revealed a diverse landscape of testicular cancer presentations. Notably, the majority of cases fell within the advanced stages, with Stage III constituting the highest percentage at 39%. This highlighted a potential trend of delayed diagnosis or presentation at more advanced disease stages. Understanding the pathologic stage distribution was essential for prognosis determination and treatment planning, emphasizing the need for increased awareness campaigns to promote early detection and intervention. Seminoma emerged as the predominant subtype, aligning with established epidemiologic trends. The coexistence of diverse subtypes underscored the imperative for customized treatment approaches, emphasizing the pivotal role of precise histologic classification in ensuring optimal patient management.

The distribution of tumor stages did not reveal a significant correlation with the number of identified risk factors ($p=0.753$). This finding implied that the presence of multiple risk factors may not have been a decisive factor in predicting the progression of testicular cancer at the time of diagnosis in this specific population. Similarly, there was no significant association between tumor stage and BMI. The absence of a substantial correlation between these factors in this dataset suggested that BMI alone may not have served as a robust predictor of advanced cancer at the time of diagnosis. This finding aligned with a 2015 study by Markt et al, which conducted a retrospective review of 960 germ cell tumors in patients treated at the Dana-Farber Cancer Institute (DFCI) between 1997 and 2012, revealing no association between BMI and tumor characteristics at baseline.[8] Another study by McGregor et al in 2019, analyzing 1161 electronic medical records from the same institution (DFCI) during the same period, found that lower BMI was linked to adverse prognostic variables at presentation according to the International Germ Cell Consensus Classification (IGCCC) risk groups for metastatic GCT. However, this association was not observed in terms of relapse. The study indicated that, in the metastatic disease setting, men with a BMI less than 25 kg/m^2 were less likely to present with good-risk disease, and overall, men with lower BMI were more likely to present with intermediate-risk or poor-risk GCT.[9] It was crucial to consider other potential confounding factors or interactions between BMI and unexplored variables in this analysis.

Duration of diagnosis delay was an issue that still retained its importance for testicular tumors. According to Gercek et al (2023), delayed diagnosis not only resulted in an increase in tumor size but also adversely impacted tumor stage and prognostic factors. The correlation analysis conducted by Gercek et al found a positive association between the duration of diagnostic delay and radiological and pathological tumor size, the rate of detecting retroperitoneal lymphadenopathies, and the N stage.[10] In contrast to this study, the duration of symptoms before the initial consultation did not exhibit a significant correlation with tumor stage at the time of diagnosis as presented in Table 4. However, there was a noticeable trend towards significance for the duration of symptoms before consultation (p=0.105). Patients who sought medical attention within the first month or within 1 to 3 months of symptom onset tended to receive an earlier-stage diagnosis. Conversely, individuals with symptoms lasting 6 months to 1 year or more than 1 year were more likely to be diagnosed at advanced stages. This underscored the critical role of timely medical consultation in the early detection and diagnosis of testicular cancer. A systematic review conducted by Clarke and Williams (2022), covering 15 articles between 1996 and 2020, identified various modifiable factors contributing to diagnostic delay, including lack of awareness, patient embarrassment, misdiagnosis, and delays in referrals for ultrasound scans.[11]

This study acknowledged limitations that may have affected its generalizability and reliability. These included potential selection bias due to the exclusive focus on SPMC patients, a small sample size, and a single-center design, limiting broader applicability and statistical power. The retrospective design may have introduced incomplete or inaccurate information and recall bias. Furthermore, the analysis incompletely addressed the impact of socioeconomic and cultural factors, and the study lacked exploration of genetic or molecular factors. Recognizing these limitations was crucial for accurate interpretation.

Recommendations for future research shall involve targeted awareness campaigns to promote early detection. To enhance generalizability, future studies should diversify the study population beyond SPMC, consider a larger sample size, and adopt a multicenter approach. Prospective study designs are encouraged to minimize retrospective limitations. Additionally, prioritizing comprehensive exploration of socioeconomic, cultural factors, and genetic/molecular aspects are essential to advance understanding and guide effective interventions in testicular cancer clinicopathology.

Conclusion

In summary, this retrospective chart review at SPMC yielded a comprehensive insight into the clinicopathologic features of testicular cancer patients in the locality. The results mirrored global patterns, underscoring the predominance of this cancer among individuals aged 35 years on average, with a notable correlation with cryptorchidism. The diverse distribution of tumor sizes, predominantly falling between three and 10 cm, and the right testicle as the primary location further characterized the cohort. The prevailing histologic type was seminomatous germ cell tumors.

This study emphasized the critical role of prompt medical consultation in early detection, especially given that a substantial proportion of patients—over 60%—deferred seeking medical advice for more than six months after symptom onset. Examining symptoms revealed a prevalent presentation of a painless testicular mass, accentuating the significance of self-examination for early identification.

The distribution of pathologic stages underscored a prevalence of advanced stages, particularly Stage III, implying potential patterns of delayed diagnosis. Although no statistically significant associations emerged for the number of identified risk factors and BMI, the trend approaching significance in the relationship between duration of consultation delay with tumor stage at diagnosis suggested that this aspect warranted further exploration in a larger-scale study.

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References

1. Partin AW, Dmorchowski RR, Kavoussi LR, Peters CA. Neoplasms of the testis. In: Campbell-Walsh-Wein Urology. 12th ed. Canada: Elsevier, Inc.; 2021. p. 2411–2447.
2. Wang SC, Chang NW, Chen WJ, et al. Trends of testicular cancer mortality-to-incidence ratios in relation to health expenditure: an ecological study of 54 countries. Int J Environ Res Public Health [Internet]. 2021 [cited 2023 Jan 18];18:1546. Available from: https://www.mdpi.com/journal/ijerph. DOI: https://doi.org/10.3390/ijerph18041546.
3. Manecksha RP, Fitzpatrick J. Epidemiology of testicular cancer. BJU Int [Internet]. 2009 [cited 2023 Jan 20];104:1329–33. Available from: https://pubmed.ncbi.nlm.nih.gov/19840008/. DOI:10.1111/j.1464-410X.2009.08854.x.
4. Park JS, Kim J, Elghiaty A, Ham WS. Recent global trends in testicular cancer incidence and mortality. Medicine (Baltimore) [Internet]. 2018 Sep [cited 2023 Jan 18]; 97(37):12390. DOI: 10.1097/MD.0000000000012390
5. Chalya PL, Samson S, Rambau PF. Ten-year experience with testicular cancer at a tertiary care hospital in a resource-limited setting: a single centre experience in Tanzania. World J Surg Oncol [Internet]. 2014 [cited 2023 Jan 18];12:356. Available from: http://www.wjso.com/content/12/1/356. DOI: doi:10.1186/1477-7819-12-356.
6. Dusaud M, Durand X, Desfemmes FR, et al. A 20-year epidemiological review of testis cancer at a French Military Hospital. Military Medicine [Internet]. 2015 Nov [cited 2023 Jan 18]; 180(11):1184. Available from: https://academic.oup.com/milmed/article/180/11/1184/4160602. DOI:10.7205/MILMED-D-14-00604.
7. Mustafa SA, Mitla V, Banday SZ, Kuchay S. Profile of testicular germ cell tumors in Kashmir: a retrospective analysis. Int J Sci Study [Internet]. 2017 Jul [cited 2023 Jan 18]; 5(4):183-6. Available from: http://www.ijss-sn.com/uploads/2/0/1/5/20153321/ijss_july_oa39_-_2017.pdf. DOI:10.17354/ijss/2017/361.
8. Markt SC, Miller R, O'Donnel E, et al. BMI at diagnosis and adverse outcomes among men with malignant testicular germ cell tumors. J Clin Oncol [Internet]. 2015 Mar 1 [cited 2023 Nov 30]; 33(7). Available from: https://ascopubs.org /doi/10.1200/jco.2015.33.7_suppl.400. DOI:10.1200/jco.2015.33.7_suppl.400.
9. McGregor BA, Miller RE, O'Donnel E, et al. Body mass index and outcomes in germ cell tumors. Clin Genitourin Cancer [Internet]. 2019 August [cited 2023 Nov 30];17(4):283-90. Available from: https://www.sciencedirect.com/science /article/abs/pii/S1558767319301387. DOI:10.1016/j.clgc.2019.04.012.
10. Gercek O, Topal K, Yildiz AK, Yazar VM. The effect of diagnosis delay in testis cancer on tumor size, tumor stage and tumor markers. Actas Urol Esp [Internet]. 2023 Nov 18 [cited 2023 Dec 5]; 47(10):132-4. Available from: https://pubmed.ncbi.nlm.nih.gov/37981168/. DOI:10.1016/j.acuro.2023.09.004.
11. Clarke R, Williams T. Factors impacting the delay in diagnosis and treatment of testicular cancer: a systematic review. J Health Des [Internet]. 2022 [cited 2023 Dec 5]; 7(2):465-85. Available from: https://www.journalofhealthdesign.com/JHD/article/view/164. DOI:10.21853/JHD.2022.164.