Review Article

Pediatric testicular cancer: Two decades of Saudi national data

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Abstract

Pediatric testicular cancer is exceedingly rare. There are no data available touching Saudi children. The aim of the study is to determine the trends and patterns of testicular cancer among Saudi children over a period of 20 years. The national database of the Saudi Cancer Registry (SCR) on pediatric testicular cancer over the last two decades was examined including epidemiological and histological patterns. From 1994 to 2013, 82 cases of testicular cancer among Saudi children aged 1–14 years were accumulated at the SCR. The annual percentage change rate was 3.3%. Of all cases, 62% appeared within the first 2 years of life. Seminomas were seen in 39%, nonseminomas in 40.3%, and paratesticular tumors in 20.7%. No gonadal stromal tumors observed. About 91% of the seminomas accrued in the first decade (1994–2003), while all nonseminomas fell in the last decade (2004–2013). The most common subtypes of the nonseminomas were yolk sac tumors and mixed tumors. More than 80% of the paratesticular tumors were rhabdomyosarcomas and lymphomas. The SEER summary stage of seminomas was localized in 56%, regional in 22%, and distant in 16%, while of nonseminomas was 56%, 16%, and 28%, respectively, and no stage improvement over the studied period was noted. No temporal trend in incidence rate was observed. The most affected age group was the first 2 years of life. Noteworthy was the high incidence of seminoma and the low rate of teratomas and stromal tumors, when compared to Western data. Notable was the dominance of the seminomas in the first decade and of the nonseminomas in the second decade. At the time of diagnosis, nonseminomas were more advanced than seminomas. No stage improvement noted over the studied period.

Keywords: Histopathology, pediatric patients, Saudi Arabia, testis cancer, trends

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INTRODUCTION AND OBJECTIVES

Testicular cancer is a rare malignancy worldwide. It is largely a disease of young and middle-aged men, around 7% of cases occur in children. Testicular cancer accounts for approximately 1% of all cancer in males; consequently, testicular cancer incidence in children is extremely low.[1,2] There is a paucity of data regarding testicular cancer among Saudis in general and between children in particular. Furthermore, a significant increase of testicular cancer incidence among Saudis over the last decade was observed.[3] The aim of the study is to determine the trends and patterns of testicular cancer cases among Saudi children using the Saudi Cancer Registry (SCR) data over a period of 20 years.

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MATERIALS AND METHODS

The national database of the SCR on pediatric testicular cancer over the last two decades was studied including epidemiological and histological patterns. During a period of 20 years, the population-based SCR accumulated 82 cases of testicular cancer among Saudi children aged 0-14 years, which reflects 7.6% of all testicular cancer among Saudis. The studied raw data, uploaded kindly by the SCR-team on Excel tables, contain all required demographical, epidemiological, and histological details. In addition, pediatric testicular cancer data from King Faisal Specialist Hospital (KFSH) (1980–2013) were also as a reference evaluated. The 82 cases of pediatric testicular cancer reported by the SCR will be the subject of this study.

Data analysis

The data are presented as counts, mean, and percentages or annual percentage change rates. Numerical variables were summarized as the sample mean and range and categorical variables were summarized as the number and percentage. Institutional approval for the study was obtained. There was no funding required.

RESULTS

From 1994 to 2013, 82 cases of testicular cancer among Saudi children were reported to the SCR, with a mean incidence rate of 4.1 cases per year and an annual percentage change rate of 3.3%. Age of the cases ranged from <1 year to 14 years, with a mean of 7.7 years. About 62% of all cases occurred within the first 2 years of life [Figure 1]. Right testicles were affected in 53.6%, left in 41.5%, and bilateral in 4.9%. Neoplasm in undescended testis was observed in 2 cases (2.4%). Nearly, 79.3% of the cases were malignant germ cell tumors (GCTs), and 20.7% were paratesticular tumors. Of all cases, seminomas were seen in 39% and nonseminomas in 40.3%, while no gonadal stromal tumors were recorded [Table 1]. About 91% of seminomas accrued in the first decade (1994–2003), while all cases of nonseminomas (100%) fell in the last decade (2004–2013) [Figure 2]. The most common subtypes of the nonseminomas were yolk sac tumor and mixed tumor [Figure 3]. More than 80% of the paratesticular tumors were rhabdomyosarcomas and lymphomas. The SEER summary stage of seminomas was localized in 56%, regional in 22%, and distant in 16%, while of nonseminomas was 56%, 16%, and 28%, respectively. No improvement seen in stage status over the studied period.

DISCUSSION

Pediatric testicular cancer is exceedingly a rare disease, accounting for 7% of all testis cancer and with an incidence

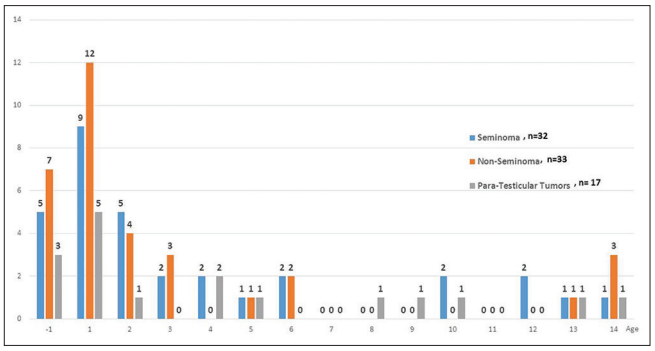

Figure 1: Malignant pediatric testicular tumors by age, Saudi Cancer Registry 1994–2013

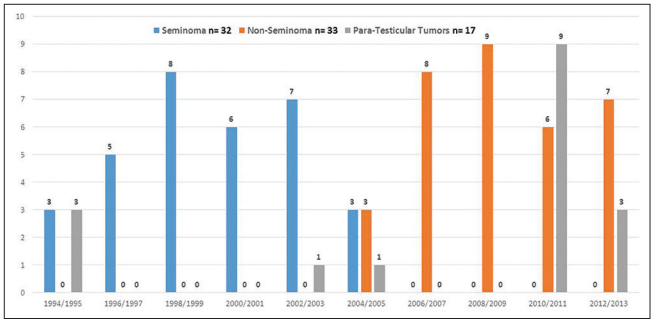

Figure 2: Malignant pediatric testicular tumors by year groups, Saudi Cancer Registry 1994–2013

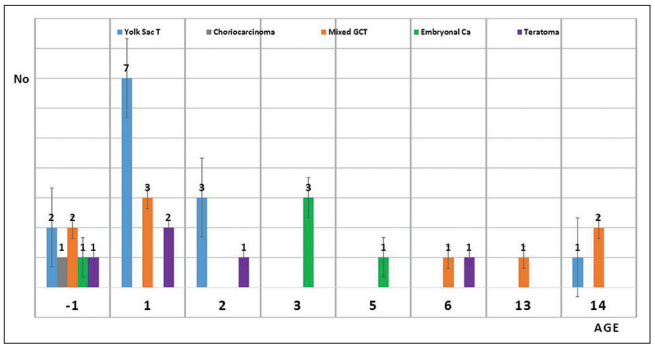

Figure 3: Distribution of nonseminomas in Saudi children by age, Saudi Cancer Registry 1994–2013

rate of 0.5–2.0/100,000 children. Current literature revealed that pediatric testicular tumors are distinct from those of adults in histopathology, malignant potential, and clinical behavior. The patients are also dissimilar regarding morbidity, potential organ preservation, and approach of treatment. The occurrence of GCTs in both groups is also discrete. The histologic pictures of GCTs in adults are mostly seminomas and mixed GCTs, while in children, the most common histologic features are yolk sac tumors and teratomas.[4,5] Several studies showed the high prevalence of yolk sac tumors, gonadal stromal tumors, and teratomas in the pediatric population. In contrast, many hospitals have reported that benign tumors are more common than malignant. This irritated situation leads to a lot of

Table 1: Malignant pediatric testicular tumors, SCR 1994-2013

Cell types	Malignancy	%
Germ cell tumors (GCTs) *n*=65	Seminomas	39.0
	Non-seminomas	40.3
Gonadal stromal tumors *n*=0	Sertoli cell tumors	0.0
	Leydig cell tumors	
Para-testicular tumors *n*= 17	Lymphomas	20.7
	Rhabdomyosarcomas	
	Others	

confusion worldwide. There are no precise figures on the prevalence of benign and malignant testis tumors among children, which are largely the results of the rarity of the disease and a registry reporting dilemma. Even the data of the Prepubertal Testis Tumor Registry of the American Academy of Pediatric are contradicting several reports originated from different institutions. Almost all national tumor registries worldwide are capturing only malignant tumors and the literatures on benign tumors are virtually the outcome of scattered hospital-based data.[6-8] Regrettably, there are no published Saudi data available on this topic and neither from the neighboring countries. However, a study originated from the respected Urology and Nephrology Center of Mansoura, Egypt, reported recently on 13 cases of prepubertal testis tumors accumulated over a period of 10 years. The distribution of the tumors was GCTs in 38%, stromal in 31%, and paratesticular in 15%. About 54% of all cases were benign tumors. Most of the GCTs tumors were yolk sac tumors and no single teratoma observed.[9]

This brief review with its unsettled figures is an essential introduction to appreciate the undermentioned distinct Saudi profile. Testicular cancer is a rare disease, accounting for 1.8% of all malignant cancer among Saudi males. Despite its low incidence, it is the most common solid malignancy among young Saudi men. While the worldwide incidence of testicular cancer has taken four decades to double, the doubling among Saudis took only two decades to take place with a high annual percentage change rate of 11.56%.[3] This temporal variation has not been noted among children <14 years of age worldwide.[6] The SCR is tracking only malignant tumors; therefore, no national data on benign testis tumors are available. Our study confirms that the incidence of pediatric testicular cancer is by far less than in adults, accounting for 7.6% of all testis cancer in the Saudi population with a modest increase of incidence over the studied period, which replicates the rate worldwide. The most affected age group in children is the first 2 years of life, which goes well with reported data globally. The most common pediatric testis cancer was seminoma followed in equal rate by mixed GCT and rhabdomyosarcoma. Although seminomas in children are recognized to be rare, it is by far the most common testis cancer in Saudi children, reaching 39.0% of all pediatric testicular cancer. About 59% of the seminomas appear in the first 2 years of life and all of them but one were of classic form. This population-based high prevalence of seminomas is not seen when looking at a single Saudi hospital-based data. During the period 1980–2013, fifty cases of pediatric testis cancer were accumulated at the KFSH, where seminomas were present in only 6% of all cases (unpublished data). It is also remarkable to find out that 91% of all seminomas occurred in the first decade (1994–2003) and all nonseminomas in the second decade (2004–2013). This notable phenomenon is also observed in the adult population.[3] These striking findings warrant further clarification, particularly, whenever literature link the presence of seminomas in children with gonadal dysgenesis associated with the Y chromosome, the correlation of seminomas to cryptorchidism, and in utero estrogen exposure.[10-12] Nearly, 79% of the cases are of germ cell origin, which reflect the same rate worldwide. Approximately, 21% of the cases were paratesticular cancer with rhabdomyosarcomas and lymphomas in dominance. Most of the rhabdomyosarcomas were of embryonal subtype and 67% occurred within the first 4 years of life. This high proportion of paratesticular tumors in children is a universally observed experience. The paucity of gonadal stromal tumors is reflecting its true low frequency, which also noted among adult Saudis.[3] The high rate of advanced disease at presentation particularly in seminomas, indicates deficient early detection and postponement of appropriate intervention.

To the best of our knowledge, the current study is the first article reporting population-based national data on pediatric testicular cancer among Saudis. We describe the largest reported series to date of this rare tumor in the region and provide contemporary epidemiological and histopathological data in addition to the KFSH data for comparison. The study showed no secular trends in incidence rate as was seen clearly in the adult counterpart.[3] Comparing the distribution of the types of GCTs with that of Western countries, we found various disparities. The overall GCTs histologic picture in pediatric is mimicking the adult pertaining to the distribution of seminomas and nonseminomas. An enormously high rate of seminomas reaching 39%, which is nearly resembling the Saudi adult rate, is a real phenomenal issue. The nonseminomas spectrum is also copying the adult allotment with very low frequency of teratomas and relatively low incidence of yolk sac tumors [Table 2].

The current study has some shortcomings. Several essential clinical data are not tracked by the SCR, which limited the

Table 2: Testicular cancer among Saudis, comparative data: Adult vs pediatric cases

Cell types	Histologic subtypes	Adult SCR *n*=1004	Pediatric SCR *n*=82	Pediatric KFSH *n*=50
GCTs	Seminoma	40.7%	39%	6.0%
	Mixed GCT	23%	11%	6.0%
	Embryonal Ca	8.9%	6.1%	6.0%
	Yolk Sac tumor	5.5%	15.8%	54.0%
	Teratoma	2.7%	6.1%	2.0%
	Choriocarcinoma	1.6%	1.2%	0.0%
Para-Test	Rhabdomyosarcoma	3.4%	11%	22%
Tumors	Lymphoma	5.0%	6.1%	2.0%
Stromal tumors	Sertoli cell, Leydig cell	0.3%	0.0%	2.0%

SCR: Saudi Cancer Registry, GCT: Germ Cell Tumor, KFSH: King Faisal Specialist Hospital

outcome of the study. Unfortunately, we were incapable to report on the mode of patient presentation, the modality of treatment applied, and updated survival and mortality data of the followed up patients. Nevertheless, our study has several strengths. The data delivered is the first published national figures on pediatric testis cancer among Saudis extending over a period of two decades. The population-based data from the SCR include almost all children diagnosed with testis cancer nationwide. One advantage of population-based registries is that they provide the opportunity to compile large number of cases of a given rare condition. In addition, we collected and analyzed as a reference the data on all Saudi children with testis cancer accrued from 1980 to 2013, at the main referral cancer center in the country, namely the KFSH-Riyadh. We predict the data identified in this study will serve as a useful platform for further investigation on pediatric testicular cancer among Saudis and should urge the researcher to strive for more innovative research covering this understudied urological cancer in our country. A large-scale multicenter joint study with participation of several high-volume centers would constitute the foundation for delineating the incidence and types of pediatric benign testis tumors, which will identify the true rate of the tumors and may clarify some of the obscured issues not answered in this study. Hopefully, the newly created Saudi Cancer Center will ultimately proceed to establish, implement, and supervise nationwide current practice guidelines to enhance the detection, diagnosis, and treatment of all cancer and ensure the execution of these arrangements by transferring guidelines into practice such as the national second opinion network for testicular cancer patients, which has been successfully implemented in Europe.[13,14] Eventually, the nonguideline-directed care proved to be associated with increased relapse risk.[15] The Saudi pioneer work on management guidelines for testicular GCTs has already been launched in 2014.[16]

CONCLUSIONS

No secular trends in incidence rate were identified. The most affected age group was the first 2 years of life. Noteworthy was the high incidence of seminomas and the low rate of teratomas and stromal tumors, which resembles the distribution in the adult counterpart. Remarkably was the dominance of the seminomas in the first decade and of the nonseminomas in the second decade, which was also observed in the adult counterpart? At the time of diagnosis, nonseminomas were in more advanced stage than seminomas. Early capture and prompt intervention are warranted.

Acknowledgment

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Conflicts of interest

There are no conflicts of interest.

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