Assessment of childhood cancer at National Oncology Center in Sana’a city, Yemen

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Abstract

Background: No published studies assess childhood cancer and obstacles to receive cancer treatment in Yemen. The aim of this study was to assess childhood cancer and obstacles to receive cancer treatment at National Oncology Center (NOC) in Sana’a city, Yemen.

Methods: A descriptive cross-sectional study of 119 children with cancer was conducted at the NOC in Sana’a city, Yemen from March to May 2012. Data was collected through face-to-face interview and retrospectively from patients’ files. The data regarding socio-demographic characteristics, medical history of childhood cancer and obstacles to receive cancer treatment were collected by structured questionnaires. The collected data was analyzed using the SPSS. A p-value <0.05 (2-sided) was considered statistically significant.

Results: One hundred and nineteen children with cancer and their parents were included in our study. The mean age and SD was 8.7 ± 4.5 years. 63.9% of the participants were boys. Lymphomas were the most common cancer diagnosed, representing 35.3% of all childhood cancers followed by leukemia (22.7%) and malignant bone tumors (12.6%). A high proportion of childhood cancer was diagnosed at advanced stages and constituted for 58%. Tumor grading was mentioned in 25.2% of cases. Histology diagnosis was achieved in 89.1% of cases. 80.7% did not receive cancer treatment on regular basis.

Conclusion: The study concluded that at the National Oncology Center, lymphomas were the most common childhood cancer diagnosed, followed by leukemia and malignant bone tumors. The distribution of cancer was more in boys than girls. Poor service was the main obstacle to received cancer treatment regularly. The study recommends that a national cancer registry should be introduced. (El Med J 2014; 2:4)

Keywords: Childhood Cancer, National Oncology Center, Yemen, Obstacles, Cancer Treatment

Introduction

Cancer is a group of diseases characterized by uncontrolled growth and spread of abnormal cells [1]. According to World Health Organization (WHO), childhood cancer is becoming an increasingly important cause of morbidity and mortality worldwide [2]. Cancer is next to injury, the second most common cause of childhood death in developed countries [3, 4].

Cancer may affect people at all ages, even fetuses, but risk for the more common varieties tends to increase with age. Incidence rates are highest among infants, decline until age 9, and then rise again with increasing age [5]. In all age groups, the incidence is significantly higher in boys than in girls; boys have an overall 20-25% excess risk for cancer due mainly to a greater risk of lymphomas, leukemias and central nervous system (CNS) tumors [3].

A study conducted by Bawazir et al. to study prevalence of cancer in Aden governorate and adjacent governorates through the information registered in the register for treatment board of the Aden health offices (1989-1993) [6]. Out of 685 cases of cancer, 69 (10.1%) were children aged 0-19 years. The distribution of childhood cancers by sex were 43 (62.3%) in males and 26 (37.7%) in females.

The absence of a national cancer registry means there is a lack of reliable data for evaluating the real situation of childhood cancer in Yemen. There was no national survey in Yemen to estimate incidence of childhood cancer. Despite the rising importance of this disease, there is a lack of studies which characterize the incidence or distribution of different types of childhood cancer in Yemen.

To the best of our knowledge, this is the first study was done to assess childhood cancer and obstacles to receive cancer treatment in Sana’a-Yemen. The aim of the study was to assess childhood cancer and obstacles to receive cancer treatment at National Oncology Center in Sana’a city, Yemen.

Methods

The study was conducted at the National Oncology Center (NOC) in Sana’a city, Yemen. The NOC is the first and the only unique public health center in Yemen Republic which provides chemotherapy, radiotherapy and laboratory investigations for patients with cancer. A descriptive cross-sectional study was conducted in the above mentioned setting to assess childhood cancer and obstacles to receive cancer treatment from March to May 2012. A convenience sample of 119 children with cancer was selected. Children were selected during their attendance at the NOC. The inclusion criteria were both sex children attending the NOC for follow-up treatment and approved to participate in the study.

The required sample size was calculated using EpiCalc program, 2000. When the size of the sample was calculated, researchers depended on the following criteria: proportion of childhood cancer in Gulf center for cancer registration (GCCS) from 1998-2005 = 8.5%, Precision = 5% [6]. A sample size (n) with 95% confidence level was 119 children. A structured questionnaire was compiled and adopted questions from published studies and was administered in a face-to-face interview with study participants. The questionnaire consisted of demographic characteristics of children, medical history of childhood cancer and obstacles to receive cancer treatment.

Questions related to demographic data, habits and obstacles to receive cancer treatment were asked directly in a standard way to ensure data reliability. Medical history of childhood cancer was taken by access to the patients’ medical record files to validate the provided data. When there were discrepancies between data sources,
the data in the medical record files were used. In case, some data was not available in the patient’s medical record files, data was extracted from the physician who was responsible for treatment of the case. The primary site (topography) and histology (morphology) of the neoplasms were classified according to the international classification of childhood cancer-3 (ICCC-3) based on international classification of diseases-oncology-3 (ICD-O-3) [7].

The collected data was analyzed using SPSS, version 16.0. Fisher’s exact test was performed for categorical variables to test for dependency (presence of relationship) between variables. Fisher’s exact test is more appropriate than the asymptotic chi-square when the table contains cells with expected counts less than 5. Appropriate test of significance was applied to determine the significance of association. A p value <0.05 (2-sided) was considered statistically significant. Informed consent was obtained from parents of children. The survey was approved by the nursing division and faculty of medicine and health science, Sana’a University.

**Results**

The age of about 40.3% of the participating children fell between 5-9 years, followed by those with age between 10-14 years (26.9%), while the least percent (13.4%) was among the age group 15-19 years. The mean age and SD was 8.7 ± 4.5 years (8.7 ± 4.6 years for boys and 8.7 ± 4.5 years for girls). Nearly two thirds (63.9%) of the participants were boys, and more than the half (54.6%) of them were urban residents. The majority of the children (70.6%) had a birth order <5. 95.8% of children were full-term and 84% without family history of cancer (Table 1).

**Table 1: Demographic characteristics of children**

<table>
<thead>
<tr>
<th>Demographic characteristics</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Current age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-4 years</td>
<td>23</td>
<td>19.3</td>
</tr>
<tr>
<td>5-9 years</td>
<td>48</td>
<td>40.3</td>
</tr>
<tr>
<td>10-14 years</td>
<td>32</td>
<td>26.9</td>
</tr>
<tr>
<td>15-19 years</td>
<td>16</td>
<td>13.4</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>76</td>
<td>63.9</td>
</tr>
<tr>
<td>Girls</td>
<td>43</td>
<td>36.1</td>
</tr>
<tr>
<td><strong>Place of residence</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>65</td>
<td>54.6</td>
</tr>
<tr>
<td>Rural</td>
<td>54</td>
<td>45.4</td>
</tr>
<tr>
<td><strong>Birth order</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;5</td>
<td>84</td>
<td>70.6</td>
</tr>
<tr>
<td>≥5</td>
<td>35</td>
<td>29.4</td>
</tr>
<tr>
<td><strong>Gestational age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full-term</td>
<td>114</td>
<td>95.8</td>
</tr>
<tr>
<td>Pre-term</td>
<td>5</td>
<td>4.2</td>
</tr>
<tr>
<td><strong>Family history of cancer</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>100</td>
<td>84.0</td>
</tr>
<tr>
<td>No</td>
<td>19</td>
<td>16.0</td>
</tr>
</tbody>
</table>

Table 2 shows the distribution of childhood cancers according to types. Lymphomas were the most common cancer diagnosed, representing 35.3% of all childhood cancers followed by leukemias (22.7%), malignant bone tumors (12.6%), soft-tissue sarcomas (8.4%), renal tumors (6.7%), CNS neoplasms (4.2%), germ cell tumor (3.4%), other nervous system tumors (2.5%). Hepatic tumors, carcinomas and retinoblastoma, accounted for 1.7%, 1.7% and 0.8% respectively. The proportion of different sites showed that, Non-Hodgkin’s lymphoma (NHL) was most frequently represented (23.5%) followed by lymphoid leukemia, which accounted for 21%, malignant bone tumors, which occurred in 12.6%, Hodgkin’s lymphoma (HL) in 11.8%, connective/soft-tissue in 8.4%, brain/nervous system in 6.7%, kidney in 6.7% and other sites (myeloid Leukemia, eye, liver, spinal, thyroid, ovarian and chest) in 9.2%.

**Table 2: Distribution of types of childhood cancers according to ICCC-3**

<table>
<thead>
<tr>
<th>Types of childhood cancers</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leukemias</td>
<td>27</td>
<td>22.7</td>
</tr>
<tr>
<td>Lymphomas</td>
<td>42</td>
<td>35.3</td>
</tr>
<tr>
<td>Central Nervous System</td>
<td>5</td>
<td>4.2</td>
</tr>
<tr>
<td>Sympathetic Nervous System Tumors</td>
<td>3</td>
<td>2.5</td>
</tr>
<tr>
<td>Retinoblastoma</td>
<td>1</td>
<td>0.8</td>
</tr>
<tr>
<td>Renal Tumors</td>
<td>8</td>
<td>6.7</td>
</tr>
<tr>
<td>Hepatic Tumors</td>
<td>2</td>
<td>1.7</td>
</tr>
<tr>
<td>Malignant Bone Tumors</td>
<td>15</td>
<td>12.6</td>
</tr>
<tr>
<td>Soft-Tissue sarcomas</td>
<td>10</td>
<td>8.4</td>
</tr>
<tr>
<td>Germ cell tumor</td>
<td>4</td>
<td>3.4</td>
</tr>
<tr>
<td>Carcinomas</td>
<td>2</td>
<td>1.7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>119</td>
<td>100</td>
</tr>
</tbody>
</table>

With regards to the stages of cancer at diagnosis, the results indicated that, the stages at diagnosis were available for 101 cancer cases (84.9%) while 18 (15.1%) had an unknown diagnosis (Figure 1).

**Figure 1: Distribution of childhood cancers by stages at diagnosis**

Tumor grading was mentioned in 30 (25.2%) cases, while the majority of cases (74.8%) were labelled as “cannot be assessed” (Figure 2). Histological diagnosis was achieved in 106 (89.1%) cases, compared to 10 (8.4%) children who were diagnosed by cytology and only 3 (2.5%) were diagnosed by radiology (Figure 3).

With regards to distribution of childhood cancer by children characteristics, Fisher’s exact test showed association of distribution of childhood cancer by sex, age at diagnosis, governorates, place of residence and child birth order (P<0.05) while no relationship existed...
with gestational age and family history of cancer (P>0.05). Furthermore, Fisher’s exact test showed relationship in distribution of childhood cancer by maternal age father age (P<0.05) while no relationship according to mother smoking was seen during pregnancy (P>0.05).

The results of the study regarding obstacles to receive cancer treatment showed that 71 (74%) study participants stated that the poor service/time taken to wait were the main obstacles to receive cancer treatment regularly, 70 (72.9%) cases were hindered due to physical condition of child and 66 (68.8%) lacked resources to travel. For 44 (45.8%) cases, the type of treatment was not available. 29 (30.2%) lacked the funds to pursue some cancer drugs and in 24 (25%) cases, health care workers were not present (Figure 4).

Non-Hodgkin’s lymphomas accounted for 23.5% of lymphomas and Hodgkin’s lymphoma accounted for 11.8%. Lymphomas were more common in boys than girls, and occurred at all ages, but the peak was found to be between 5-9 years. Similar results were reported by a study in Aden [6]. This study was consistent with study conducted in Turkey, where the distribution of childhood cancer showed that lymphomas were observed more frequently than leukemias and CNS tumours [10].

Leukemia ranked second among cancer diagnoses for children ages 0 to 19 in our study, accounting for 22.7% of all childhood cancer morbidity. Acute lymphocytic leukemia (ALL) represents about 92.5% of all childhood leukemias and acute myeloid leukemia accounted for 7.5% of leukemia cases. Leukemias were more common in boys than girls and occur at age ranged from 0-14 years, but the peak was occurs in aged 10-14 years. The proportion of leukemias in our study were lower than reported by SEER, by Georgia and by Thailand and higher than reported by Hadramout governorate [11-14]. Similar result was found by USA [15]. The most common cancer type diagnosed in United States between 1999-2005 was leukemias. In Europe, leukemias constitute approximately one-third of cancers in children aged 0-14 years) and 10% in aged 15-19 years [16]. This result is higher than reported in the present study.

Malignant bone tumors in our study made up the third category of childhood cancers, accounting for 12.6% of all childhood cancers. Malignant bone tumors were approximately same in boys and girls and occurred at ages ranging from 5-19 years, but the peak was between 10-14 years. Osteosarcoma was the most common cancer in this category, which in children often occurs in the bones around the knee, and accounted for 60% while Ewing’s sarcoma was the second bone tumor in this category, accounting for 40%. Bone tumors in our study were higher than reported by MECC countries, European countries, SEER areas and in Asia [13, 17-19].

Soft tissue sarcomas were the fourth childhood cancer accounting for 8.4% of all childhood cancers. Soft tissue sarcomas of children and adolescents arise primarily from the connective tissues of the body, such as fibrous tissue, adipose tissue, and muscle tissue. Rhabdomyosarcomas were the most common soft tissue tumor among children younger than 20 years. Soft tissue sarcomas were more common in boys than girls and occurred at all ages, but the peak was between 0-9 years. The proportion of soft tissue sarcomas were

approximately similar to that reported by SEER [1]. The result of this study was similar to the study from Turkey [20]. The incidence of soft tissue sarcomas was higher as in other Asian populations [13].

Renal tumors were the fifth childhood cancer accounting for 6.7% of all childhood cancers. Renal tumors occurring in children comprise a spectrum of morphologic subtypes, including some with benign histopathology. Wilms’ tumor accounted for 100% of malignancies of the kidney among children. Wilms’ tumor was more common in boys than girls and occurred among children younger than 15 years but the peak was between 5-9 years. The relative frequencies of Wilms’ tumor in the present study was higher than those reported from Shanghai and western countries [21].

Central nervous system tumors in our study made the sixth category of neoplasms in children, accounting for 4.2% of all childhood cancers. They were almost equal among males and females and occurred at ages ranging from 0-9 years. The most common types of brain tumors were primitive neuroectodermal tumor (PNET). Other common brain tumors in our study was medulloblastoma. The rate in our study was lower than reported by SEER areas [22]. The proportion of CNS tumors in the present study was slightly lower than in other Asian countries and markedly lower than in developed countries [9].

Germ cell tumors ranked seventh among cancer diagnoses for children aged 0 to 19 in our study, accounting for 3.4% of all childhood cancer morbidity. Germ cell tumors were more common in girls than boys and occurred among children younger than 15 years. Yolk sac tumors and teratomas were the most common tumors in this category found in our study. Germ cell tumors are biologically diverse and histologically heterogeneous, with a substantial proportion having benign rather than malignant behavior (particularly among young children) [9, 23]. Germ cell tumors originate in primordial germ cells, which may undergo germinomatous or embryonic differentiation. The results of the study were lower than reported by SEER areas but similar compared to those reported by Georgia [12, 24].

In the present study, sympathetic nervous system tumors were the eighth childhood cancer, accounting for 2.5% of all childhood cancers. Neuroblastoma accounted for virtually all cases of cancer in this category. Neuroblastoma is a solid cancerous tumor that begins in nerve tissue in the neck, chest, abdomen, or pelvis, but usually originates in the abdomen in the tissues of the adrenal gland. Two-thirds of children with neuroblastoma are diagnosed when they are younger than 5 years of age [1]. Although neuroblastoma may be present at birth, it does not always proceed to become an invasive malignancy, a circumstance unique to neuroblastoma. In contrast with CNS malignancies, survival is highest among infants under 1 year of age, and declines with increasing age [1]. The proportion of neuroblastoma in the present study was lower than reported in Thailand, Singapore, Japan, China and the Philippines [9, 13].

In the present study, hepatic tumors were the ninth childhood cancer, accounting for 1.7% of all childhood cancers and hepatoblastoma was the commonest tumor in this category. All tumors were found in girls. A rare malignancy in childhood, liver tumors account for just over 1 percent of childhood cancers [1]. More than two-thirds of hepatic tumors in children are hepatoblastoma, most of which appear during the first 18 months of life and may be caused by an abnormal gene.

Carcinomas were the tenth childhood cancer, accounting for 1.7% in our study. Carcinomas are rare in Yemeni children, as they are in Thailand, and in general [13, 25]. Thyroid carcinoma accounted for virtually all cases of cancer in this category. Carcinomas are very rare among children. All of the carcinomas combined comprised 9.2% of cancer in children younger than 20 [26]. Retinoblastoma had the lowest frequency, accounting for 0.8 percent of all childhood cancers. Retinoblastoma is a rare tumor involving the retina of the eye, or sometimes the pineal gland [1]. Retinoblastoma most often occurs in younger children, usually before the age of 5 years [1]. The tumor may be in one or both eyes [27]. Retinoblastoma is usually confined to the eye and does not spread to nearby tissue or other parts of the body. Retinoblastoma in our study was lower than reported by SEER, Thailand and in neighboring countries [9, 28].

Obstacles: The results of the study regarding obstacles to receive cancer treatment showed that poor service/too long a wait, physical condition of child, lack of resources to travel/too far to travel, type of treatment not available, lack of funds to pursue some cancer drugs were the main obstacles to receive cancer treatment regularly. However, there is extreme paucity of data addressing the pattern and impact of abandonment on outcome of childhood cancer from India and other Asian developing countries [29, 30]. Pisani and Hery reported that, misdiagnosis, refusal of treatment, abandonment of therapy, toxic death, lack of resources and affordable drugs, and comorbidities all contribute to a poor outcome alongside other overwhelming challenges [31]. In India, quantifying the burden also faces other barriers: parents may not recognize the signs of cancer, or not have the resources to get the patient to a medical facility [32].

The limitation of the study was that many cancer patients in Yemen still prefer to go abroad for treatment and are consequently not recorded. Therefore, it may be unreliable to attempt to calculate the childhood cancer incidence in this study as it may be underestimated.

Conclusion
The three most common childhood cancer in our study were lymphomas, leukemias and malignant bone tumors, which represented 70.6% of all childhood cancer. The proportion of childhood cancers was more among boys than girls, except for nervous system tumors. A high proportion of childhood cancers (58%) was diagnosed at advanced (regional/metastasized) stages.

Recommendation
National cancer registry should be established to provide reliable measure of cancer incidence rate in Yemen.

Competing interests: The authors declare that no competing interests exist.
Received: 3 May 2014  Accepted: 14 December 2014
Published Online: 16 December 2014

References