EPIDEMIOLOGICAL REVIEW

# CANCERS AMONG CHILDREN AND ADOLESCENTS AT A CANCER HOSPITAL IN PAKISTAN

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**Background:** The Shaukat Khanum Memorial Cancer Hospital and Research Centre (SKMCH & RC), is a tertiary care cancer centre, providing the best facilities in cancer diagnosis and treatment in the region. A record of the registered patients is being maintained in the hospital-based registry and the results are posted on its official website on a regular basis. **Methods:** This is an epidemiologic review of cancer patients 0–19 years of age, reporting cancers recorded at SKMCH & RC) Lahore, Pakistan, from January 1, 2011-December 31, 2012, in patients aged less than or equal to 19-years, belonging to Lahore district. It includes: i) those who had come to the Hospital laboratory for diagnosis only; ii) those who were diagnosed and registered for treatment at the Hospital; and iii) those who were not accepted for registration (regardless of the centre of diagnosis), as per Hospital policy, and subsequently went to other centres for treatment. The results were summarized by sex, 5-year age-group (0–4, 5–9, 10–14, and 15–19), and the International Classification of Childhood Cancers' (ICCC) diagnostic group. The annual Age-Standardized Incidence Rates (ASIR) were computed through the Segi World Standard (1960), per 100,000 population. **Results:** New cancer cases: 669. ASIRs for common malignancies: among males-leukaemia and myelo-proliferative/dysplastic disorders 2.1, lymphoma and reticuloendothelial neoplasms 1.8, CNS and miscellaneous intracranial/intraspinal tumours 1.1; among females-leukaemia and myelo-proliferative/dysplastic disorders 1.9, CNS and miscellaneous intracranial/intraspinal 0.8, and malignant bone tumours 0.6. **Conclusion:** The rates are low compared to the rates reported in the West. However, it has been estimated that over 80% of the paediatric cancer cases, diagnosed among Lahore residents, are being recorded by this institution alone. Accordingly, reviewing the statistics on a regular basis can be very important in evaluating trends in childhood cancers in Lahore and implementing cancer control programs in the region.

**Keywords:** Paediatric cancers; age-standardized incidence rates; developing countries

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## INTRODUCTION

The Shaukat Khanum Memorial Cancer Hospital and Research Centre, a charitable Hospital, has been functioning for over two decades, in the city of Lahore, Pakistan, in the Southern region of Asia. It is a comprehensive cancer care centre providing high quality facilities in cancer diagnosis and management. The Hospital has a triage policy and this is applicable to all patients attending the Hospital through the walk-in clinic. A record of the registered patients is being maintained in the hospital-based cancer registry within the 'Cancer Registry and Clinical Data Management' unit and, the results are posted on its official website, every year, on a regular basis.[1]

The authors earlier published a paper on childhood cancers registered at the Hospital in the year 2008, in patients 14 years of age or less, belonging to the district of Lahore, in Pakistan.[2] The current paper is a sequel to the paper published in the past, but with the age-group 0–19 years included in the results, with stratification again by 5-year age-group. The age-category under review has been broadened to 0–19 years so as to include cancers in young adults along with those seen in children after a Surveillance, Epidemiology, and End Results' (SEER) publication that included both.[3,4] The reasons why the age-band has been expanded to include young adults have been provided by the International Agency for Research on Cancer (IARC); according to IARC, their upcoming publication titled 'International Incidence of Childhood Cancer-Volume 3' (IICC-3) will include the 0–19 year age-category because rates for some tumour types that are seen frequently among children, increase in the ages between 15 and 19 years.[4] Further, the International Classification of Childhood Cancers (ICCC-3) coding scheme is appropriately modified to tumours seen in adolescents than the International Classification of Diseases (ICD), used in the publication titled 'Cancer Incidence in Five Continents' for tumours of all ages.[5–7]

Moreover, as it is essential to have standardized treatment protocols for children (0–14 years) and adolescents (15–19 years), understanding of cancer in the relatively unnoticed category of young adults will increase if discussed at a global level, as the IICC-3 publication. Keeping in perspective the rationale provided by IARC, this paper on SKMCH & RC statistics includes the age-range of 0–19 years.

## MATERIAL AND METHODS

This epidemiological review reports cancer cases recorded at the Shaukat Khanum Memorial Cancer Hospital and Research Centre, Lahore, Pakistan, in a two-year time period extending from January 1, 2011 till December 31, 2012. The patients eligible for the study were those who were less than or equal to 19-years of age and their geographic area of residence was Lahore district, one of the 36 districts of the province of Punjab within Pakistan, where the Hospital is also located. Population estimates for Lahore district were obtained using an average annual growth rate of 3.46%;[8] the distribution is shown in Table-1.

The patients were categorized into five-year age-groups of 0–4, 5–9, 10–14, and 15–19 years. There were three categories of patients: i) those who had come to the Hospital laboratory for diagnosis only and did not receive treatment at the Hospital; ii) those who were both diagnosed and registered for treatment at the Hospital; and iii) those who were not accepted for registration, regardless of the laboratory where the diagnosis was made, as per Hospital Policy, and subsequently went to other centres for treatment. A check for duplicate records was also performed to rule out a case having been registered twice. The results were stratified by sex, 5-year age-group and the International Classification of Childhood Cancers' diagnostic group. The Age-Standardized Incidence Rates were computed through the Segi Standard population (1960), to determine the incidence per 100,000 population, per year.[9,10] Microsoft Excel was used to conduct the analysis. The Institutional Review Board of the Hospital was informed about the study.

## RESULTS

The total number of patients belonging to Lahore district in a 2-year time period was 669. There were 409 (61%) male and 260 (39%) female patients. The ASIRs per 100,000 population, for cancers in the age-range 0-14 years was 6.3, in 15–19 years: 7.9, and in 0–19 years: 6.7. Table-2 shows results for both genders combined, whereas, Tables-3 and 4 present results for male and female patients, respectively.

The three commonest cancers in the 0–14 year age-group, by age-standardized rates were: 1) among males-leukaemia and myelo-proliferative/dysplastic disorders 2.5, lymphoma and reticuloendothelial neoplasms 1.7, and CNS and miscellaneous intracranial/intraspinal tumours 0.9; and 2) among females-leukaemia and myelo-proliferative/dysplastic disorders 2.2, CNS and miscellaneous intracranial/intraspinal tumours 0.6, and retinoblastoma 0.5.

In the 15–19 year age-group, the most common diagnoses were: 1) among males-lymphoma and reticuloendothelial neoplasms 2.1, malignant bone tumours 1.9, and CNS and miscellaneous intracranial/intraspinal neoplasms 1.7; and 2) among females-CNS and miscellaneous intracranial/intraspinal neoplasms 1.5, malignant bone tumours 1.1, and for each of the three diagnostic groups (i) leukaemia and myelo-proliferative/dysplastic disorders, (ii) lymphoma and reticuloendothelial neoplasms 0.7, and (iii) germ cell/trophoblastic tumours/neoplasms of gonads, it was 0.7.

In the 0–19 year age-group, the three top ranking cancers were: 1) among males-leukaemia and myelo-proliferative/dysplastic disorders 2.1, lymphoma and reticuloendothelial neoplasms 1.8, and CNS and miscellaneous intracranial/intraspinal tumours 1.1; and 2) among females-leukaemia and myelo-proliferative/dysplastic disorders 1.9, CNS and miscellaneous intracranial/intraspinal 0.8, and malignant bone tumours 0.6.

**Table-1: Population of Lahore district, Pakistan**

| **Time period: 2011-2012** | **Population estimates for Lahore district** | | | **World standard population by 100,000** |
|---|---|---|---|---|
| Age-group (years) | Female | Male | Both sexes combined | |
| 0–4 | 1,233,224 | 1,281,782 | 2,515,006 | 12,000 |
| 5–9 | 1,307,924 | 1,391,778 | 2,699,702 | 10,000 |
| 10–14 | 1,269,748 | 1,364,224 | 2,633,972 | 9,000 |
| 15–19 | 1,100,562 | 1,167,474 | 2,268,036 | 9,000 |
| Age-group 0–19 | 4,911,458 | 5,205,258 | 10,116,716 | 40,000 |

**Table-2: Distribution of cancers by age-group (years) and ASIRs, in both genders combined, in Lahore district (2011-2012)**

| | Number of cases | | | | | Age-specific rate | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DIAGNOSTIC GROUP↓ AGE IN YEARS→ | 0-4 | 5-9 | 10-14 | 15-19 | All ages | 0-4 | 5-9 | 10-14 | 15-19 | Crude | % | ASR 0-14 | ASR 0-19 |
| **I ) Leukemias, myeloproliferative diseases, & myelodysplastic diseases:** | **38** | **33** | **21** | **9** | **101** | **2.8** | **2.2** | **1.5** | **0.7** | **1.8** | **23.5** | **2.2** | **1.9** |
| a ) Lymphoid Leukaemia | 29 | 27 | 15 | 3 | 74 | 2.1 | 2.0 | 1.1 | 0.2 | 1.3 | 17.2 | 1.8 | 1.4 |
| b ) Acute myeloid leukemias | 1 | 1 | 1 | 1 | 4 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.9 | 0.1 | 0.1 |
| c ) Chronic myeloproliferative diseases | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| d ) Myelodysplastic syndrome and other myeloproliferative diseases | 0 | 1 | 0 | 1 | 2 | 0.0 | 0.1 | 0.0 | 0.1 | 0.0 | 0.5 | 0.0 | 0.0 |
| e ) Unspecified and other specified leukemias | 8 | 4 | 5 | 4 | 21 | 0.6 | 0.3 | 0.4 | 0.3 | 0.4 | 4.9 | 0.4 | 0.4 |
| **II ) Lymphomas and reticuloendothelial neoplasms:** | **11** | **28** | **15** | **28** | **82** | **0.8** | **2.0** | **1.1** | **2.0** | **1.5** | **19.1** | **1.3** | **1.5** |
| a ) Hodgkin lymphomas | 7 | 13 | 4 | 15 | 39 | 0.5 | 0.9 | 0.3 | 1.1 | 0.7 | 9.1 | 0.6 | 0.7 |
| b ) Non-Hodgkin lymphomas (except Burkitt lymphoma) | 1 | 14 | 9 | 12 | 36 | 0.1 | 1.0 | 0.7 | 0.9 | 0.7 | 8.4 | 0.5 | 0.6 |
| c ) Burkitt lymphoma | 3 | 1 | 2 | 1 | 7 | 0.2 | 0.1 | 0.1 | 0.1 | 0.1 | 1.6 | 0.2 | 0.1 |
| d ) Miscellaneous Lymphoreticular Neoplasms | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| e ) Unspecified lymphomas | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **III ) CNS and miscellaneous intracranial and intraspinal neoplasms:** | **7** | **20** | **18** | **22** | **67** | **0.5** | **1.5** | **1.3** | **1.6** | **1.2** | **15.6** | **1.1** | **1.2** |
| a ) Ependymomas and choroid plexus tumor | 1 | 1 | 2 | 3 | 7 | 0.1 | 0.1 | 0.1 | 0.2 | 0.1 | 1.6 | 0.1 | 0.1 |
| b ) Astrocytomas | 0 | 5 | 6 | 9 | 20 | 0.0 | 0.4 | 0.4 | 0.7 | 0.4 | 4.7 | 0.2 | 0.3 |
| c ) Intracranial and intraspinal embryonal tumors | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| d ) Other gliomas | 0 | 1 | 1 | 1 | 3 | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 | 0.7 | 0.0 | 0.1 |
| e ) Other specified intracranial and intraspinal neoplasms | 4 | 11 | 9 | 9 | 33 | 0.3 | 0.8 | 0.7 | 0.7 | 0.6 | 7.7 | 0.6 | 0.6 |
| f ) Unspecified intracranial and intraspinal neoplasms | 2 | 2 | 0 | 0 | 4 | 0.1 | 0.1 | 0.0 | 0.0 | 0.1 | 0.9 | 0.1 | 0.1 |
| **IV ) Neuroblastoma and other peripheral nervous cell tumors:** | **3** | **0** | **1** | **1** | **5** | **0.2** | **0.0** | **0.1** | **0.1** | **0.1** | **1.2** | **0.1** | **0.1** |
| a ) Neuroblastoma and ganglioneuroblastoma | 3 | 0 | 1 | 0 | 4 | 0.2 | 0.0 | 0.1 | 0.0 | 0.1 | 0.9 | 0.1 | 0.1 |
| b ) Other peripheral nervous cell tumors: | 0 | 0 | 0 | 1 | 1 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.2 | 0.0 | 0.0 |
| **V ) Retinoblastoma:** | **14** | **6** | **0** | **0** | **20** | **1.0** | **0.4** | **0.0** | **0.0** | **0.4** | **4.7** | **0.5** | **0.4** |
| **VI ) Renal tumors:** | **7** | **3** | **1** | **1** | **12** | **0.5** | **0.2** | **0.1** | **0.1** | **0.2** | **2.8** | **0.3** | **0.2** |
| a ) Nephroblastoma and other nonepithelial renal tumors | 6 | 3 | 0 | 0 | 9 | 0.4 | 0.2 | 0.0 | 0.0 | 0.2 | 2.1 | 0.2 | 0.2 |
| b ) Renal carcinomas | 0 | 0 | 1 | 1 | 2 | 0.0 | 0.0 | 0.1 | 0.1 | 0.0 | 0.5 | 0.0 | 0.0 |
| c ) Unspecified malignant renal tumors | 1 | 0 | 0 | 0 | 1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 |
| **VII ) Hepatic tumors:** | **7** | **0** | **1** | **0** | **8** | **0.5** | **0.0** | **0.1** | **0.0** | **0.1** | **1.9** | **0.2** | **0.2** |
| a ) Hepatoblastoma | 7 | 0 | 0 | 0 | 7 | 0.5 | 0.0 | 0.0 | 0.0 | 0.1 | 1.6 | 0.2 | 0.2 |
| b ) Hepatic carcinomas | 0 | 0 | 1 | 0 | 1 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 |
| c ) Unspecified malignant hepatic tumors | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **VIII ) Malignant bone tumors:** | **2** | **6** | **9** | **19** | **36** | **0.1** | **0.4** | **0.7** | **1.4** | **0.7** | **8.4** | **0.4** | **0.6** |
| a ) Osteosarcomas | 0 | 1 | 5 | 11 | 17 | 0.0 | 0.1 | 0.4 | 0.8 | 0.3 | 4.0 | 0.1 | 0.3 |
| b ) Chondrosarcomas | 0 | 0 | 1 | 2 | 3 | 0.0 | 0.0 | 0.1 | 0.1 | 0.1 | 0.7 | 0.0 | 0.0 |
| c ) Ew ing tumor and related sarcomas of bone | 2 | 5 | 2 | 4 | 13 | 0.1 | 0.4 | 0.1 | 0.3 | 0.2 | 3.0 | 0.2 | 0.2 |
| d ) Other specified malignant bone tumors | 0 | 0 | 0 | 1 | 1 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.2 | 0.0 | 0.0 |
| e ) Unspecified malignant bone tumors | 0 | 0 | 1 | 1 | 2 | 0.0 | 0.0 | 0.1 | 0.1 | 0.0 | 0.5 | 0.0 | 0.0 |
| **IX ) Soft tissue and other extraosseous sarcomas:** | **2** | **4** | **4** | **14** | **24** | **0.1** | **0.3** | **0.3** | **1.0** | **0.4** | **5.6** | **0.2** | **0.4** |
| a ) Rhabdomyosarcomas | 2 | 2 | 1 | 4 | 9 | 0.1 | 0.1 | 0.1 | 0.3 | 0.2 | 2.1 | 0.1 | 0.2 |
| b ) Fibrosarcomas, peripheral nerve sheath tumors, and other fibrous neoplasms | 0 | 0 | 1 | 2 | 3 | 0.0 | 0.0 | 0.1 | 0.1 | 0.1 | 0.7 | 0.0 | 0.0 |
| c ) Kaposi sarcoma | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| d ) Other specified soft tissue sarcomas | 0 | 2 | 1 | 4 | 7 | 0.0 | 0.1 | 0.1 | 0.3 | 0.1 | 1.6 | 0.1 | 0.1 |
| e ) Unspecified soft tissue sarcomas | 0 | 0 | 1 | 4 | 5 | 0.0 | 0.0 | 0.1 | 0.3 | 0.1 | 1.2 | 0.0 | 0.1 |
| **X ) Germ cell tumors, trophoblastic tumors, and neoplasms of gonads:** | **3** | **4** | **6** | **5** | **18** | **0.2** | **0.3** | **0.4** | **0.4** | **0.3** | **4.2** | **0.3** | **0.3** |
| a ) Intracranial and intrspinal germ cell tumors | 0 | 1 | 1 | 0 | 2 | 0.0 | 0.1 | 0.1 | 0.0 | 0.0 | 0.5 | 0.0 | 0.0 |
| b ) Malignant extracranial and extragonadal germ cell tumors | 2 | 1 | 1 | 0 | 4 | 0.1 | 0.1 | 0.1 | 0.0 | 0.1 | 0.9 | 0.1 | 0.1 |
| c ) Malignant gonadal germ cell tumors | 1 | 2 | 4 | 5 | 12 | 0.1 | 0.1 | 0.3 | 0.4 | 0.2 | 2.8 | 0.2 | 0.2 |
| d ) Gonadal carcinomas | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| e ) Other and unspecified malignant gonadal tumors | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **XI ) Other malignant epithelial neoplasms and malignant melanomas:** | **4** | **2** | **6** | **22** | **34** | **0.3** | **0.1** | **0.4** | **1.6** | **0.6** | **7.9** | **0.3** | **0.6** |
| a ) Adrenocortical carcinomas | 1 | 0 | 0 | 0 | 1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 |
| b ) Thyroid carcinomas | 0 | 1 | 0 | 2 | 3 | 0.0 | 0.1 | 0.0 | 0.1 | 0.1 | 0.7 | 0.0 | 0.1 |
| c ) Nasopharyngeal carcinomas | 0 | 0 | 1 | 2 | 3 | 0.0 | 0.0 | 0.1 | 0.1 | 0.1 | 0.7 | 0.0 | 0.0 |
| d ) Malignant melanomas | 1 | 0 | 0 | 0 | 1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 |
| e ) Skin carcinomas | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| f ) Other and unspecified carcinomas | 2 | 1 | 5 | 18 | 26 | 0.1 | 0.1 | 0.4 | 1.3 | 0.5 | 6.1 | 0.2 | 0.4 |
| **XII ) Other and unspecified malignant neoplasms:** | **2** | **5** | **8** | **7** | **22** | **0.1** | **0.4** | **0.6** | **0.5** | **0.4** | **5.1** | **0.3** | **0.4** |
| a ) Other specified malignant tumors | 0 | 1 | 4 | 2 | 7 | 0.0 | 0.1 | 0.3 | 0.1 | 0.1 | 1.6 | 0.1 | 0.1 |
| b ) Other unspecified malignant tumors | 2 | 4 | 4 | 5 | 15 | 0.1 | 0.3 | 0.3 | 0.4 | **0.3** | 3.5 | 0.2 | 0.3 |
| **TOTAL:** | **100** | **111** | **90** | **128** | **429** | **7.3** | **8.1** | **6.6** | **9.4** | **7.8** | **100.0** | **7.4** | **7.8** |

**Table-3: Distribution of cancers by age-group (years) and ASIRs, in male patients, in Lahore district (2011-2012).**

| | Number of cases | | | | | Age-specific rates | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DIAGNOSTIC GROUP↓ AGE IN YEARS→ | 0-4 | 5-9 | 10-14 | 15-19 | All ages | 0-4 | 5-9 | 10-14 | 15-19 | Crude | % | ASR 0-14 | ASR 0-19 |
| **I ) Leukemias, myeloproliferative diseases, & myelodysplastic diseases:** | **24** | **18** | **14** | **4** | **60** | **3.4** | **2.4** | **1.9** | **0.6** | **2.1** | **23.8** | **2.6** | **2.2** |
| a ) Lymphoid Leukaemia | 18 | 15 | 8 | 1 | 42 | 2.6 | 2.0 | 1.1 | 0.2 | 1.5 | 16.7 | 2.0 | 1.5 |
| b ) Acute myeloid leukemias | 1 | 1 | 1 | 0 | 3 | 0.1 | 0.1 | 0.1 | 0.0 | 0.1 | 1.2 | 0.1 | 0.1 |
| c ) Chronic myeloproliferative diseases | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| d ) Myelodysplastic syndrome and other myeloproliferative diseases | 0 | 1 | 0 | 1 | 2 | 0.0 | 0.1 | 0.0 | 0.2 | 0.1 | 0.8 | 0.0 | 0.1 |
| e ) Unspecified and other specified leukemias | 5 | 1 | 5 | 2 | 13 | 0.7 | 0.1 | 0.7 | 0.3 | 0.5 | 5.2 | 0.5 | 0.5 |
| **II ) Lymphomas and reticuloendothelial neoplasms:** | **9** | **20** | **13** | **17** | **59** | **1.3** | **2.6** | **1.8** | **2.7** | **2.1** | **23.4** | **1.9** | **2.0** |
| a ) Hodgkin lymphomas | 6 | 10 | 4 | 8 | 28 | 0.9 | 1.3 | 0.5 | 1.3 | 1.0 | 11.1 | 0.9 | 1.0 |
| b ) Non-Hodgkin lymphomas (except Burkitt lymphoma) | 0 | 9 | 7 | 8 | 24 | 0.0 | 1.2 | 0.9 | 1.3 | 0.8 | 9.5 | 0.7 | 0.8 |
| c ) Burkitt lymphoma | 3 | 1 | 2 | 1 | 7 | 0.4 | 0.1 | 0.3 | 0.2 | 0.2 | 2.8 | 0.3 | 0.3 |
| d ) Miscellaneous Lymphoreticular Neoplasms | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| e ) Unspecified lymphomas | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **III ) CNS and miscellaneous intracranial and intraspinal neoplasms:** | **4** | **11** | **8** | **12** | **35** | **0.6** | **1.5** | **1.1** | **1.9** | **1.2** | **13.9** | **1.0** | **1.2** |
| a ) Ependymomas and choroid plexus tumor | 1 | 0 | 1 | 1 | 3 | 0.1 | 0.0 | 0.1 | 0.2 | 0.1 | 1.2 | 0.1 | 0.1 |
| b ) Astrocytomas | 0 | 3 | 1 | 4 | 8 | 0.0 | 0.4 | 0.1 | 0.6 | 0.3 | 3.2 | 0.2 | 0.3 |
| c ) Intracranial and intraspinal embryonal tumors | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| d ) Other gliomas | 0 | 1 | 1 | 1 | 3 | 0.0 | 0.1 | 0.1 | 0.2 | 0.1 | 1.2 | 0.1 | 0.1 |
| e ) Other specified intracranial and intraspinal neoplasms | 2 | 6 | 5 | 6 | 19 | 0.3 | 0.8 | 0.7 | 0.9 | 0.7 | 7.5 | 0.6 | 0.6 |
| f ) Unspecified intracranial and intraspinal neoplasms | 1 | 1 | 0 | 0 | 2 | 0.1 | 0.1 | 0.0 | 0.0 | 0.1 | 0.8 | 0.1 | 0.1 |
| **IV ) Neuroblastoma and other peripheral nervous cell tumors:** | **3** | **0** | **0** | **0** | **3** | **0.4** | **0.0** | **0.0** | **0.0** | **0.1** | **1.2** | **0.2** | **0.1** |
| a ) Neuroblastoma and ganglioneuroblastoma | 3 | 0 | 0 | 0 | 3 | 0.4 | 0.0 | 0.0 | 0.0 | 0.1 | 1.2 | 0.2 | 0.1 |
| b ) Other peripheral nervous cell tumors: | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **V ) Retinoblastoma:** | **9** | **3** | **0** | **0** | **12** | **1.3** | **0.4** | **0.0** | **0.0** | **0.4** | **4.8** | **0.6** | **0.5** |
| **VI ) Renal tumors:** | **6** | **2** | **1** | **1** | **10** | **0.9** | **0.3** | **0.1** | **0.2** | **0.4** | **4.0** | **0.5** | **0.4** |
| a ) Nephroblastoma and other nonepithelial renal tumors | 5 | 2 | 0 | 0 | 7 | 0.7 | 0.3 | 0.0 | 0.0 | 0.2 | 2.8 | 0.4 | 0.3 |
| b ) Renal carcinomas | 0 | 0 | 1 | 1 | 2 | 0.0 | 0.0 | 0.1 | 0.2 | 0.1 | 0.8 | 0.0 | 0.1 |
| c ) Unspecified malignant renal tumors | 1 | 0 | 0 | 0 | 1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.4 | 0.1 | 0.0 |
| **VII ) Hepatic tumors:** | **4** | **0** | **0** | **0** | **4** | **0.6** | **0.0** | **0.0** | **0.0** | **0.1** | **1.6** | **0.2** | **0.2** |
| a ) Hepatoblastoma | 4 | 0 | 0 | 0 | 4 | 0.6 | 0.0 | 0.0 | 0.0 | 0.1 | 1.6 | 0.2 | 0.2 |
| b ) Hepatic carcinomas | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| c ) Unspecified malignant hepatic tumors | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **VIII ) Malignant bone tumors:** | **1** | **4** | **4** | **13** | **22** | **0.1** | **0.5** | **0.5** | **2.0** | **0.8** | **8.7** | **0.4** | **0.8** |
| a ) Osteosarcomas | 0 | 1 | 3 | 8 | 12 | 0.0 | 0.1 | 0.4 | 1.3 | 0.4 | 4.8 | 0.2 | 0.4 |
| b ) Chondrosarcomas | 0 | 0 | 0 | 2 | 2 | 0.0 | 0.0 | 0.0 | 0.3 | 0.1 | 0.8 | 0.0 | 0.1 |
| c ) Ew ing tumor and related sarcomas of bone | 1 | 3 | 1 | 2 | 7 | 0.1 | 0.4 | 0.1 | 0.3 | 0.2 | 2.8 | 0.2 | 0.2 |
| d ) Other specified malignant bone tumors | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| e ) Unspecified malignant bone tumors | 0 | 0 | 0 | 1 | 1 | 0.0 | 0.0 | 0.0 | 0.2 | 0.0 | 0.4 | 0.0 | 0.0 |
| **IX ) Soft tissue and other extraosseous sarcomas:** | **1** | **3** | **2** | **8** | **14** | **0.1** | **0.4** | **0.3** | **1.3** | **0.5** | **5.6** | **0.3** | **0.5** |
| a ) Rhabdomyosarcomas | 1 | 2 | 1 | 4 | 8 | 0.1 | 0.3 | 0.1 | 0.6 | 0.3 | 3.2 | 0.2 | 0.3 |
| b ) Fibrosarcomas, peripheral nerve sheath tumors, and other fibrous neoplasms | 0 | 0 | 0 | 1 | 1 | 0.0 | 0.0 | 0.0 | 0.2 | 0.0 | 0.4 | 0.0 | 0.0 |
| c ) Kaposi sarcoma | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| d ) Other specified soft tissue sarcomas | 0 | 1 | 1 | 2 | 4 | 0.0 | 0.1 | 0.1 | 0.3 | 0.1 | 1.6 | 0.1 | 0.1 |
| e ) Unspecified soft tissue sarcomas | 0 | 0 | 0 | 1 | 1 | 0.0 | 0.0 | 0.0 | 0.2 | 0.0 | 0.4 | 0.0 | 0.0 |
| **X ) Germ cell tumors, trophoblastic tumors, and neoplasms of gonads:** | **1** | **1** | **1** | **4** | **7** | **0.1** | **0.1** | **0.1** | **0.6** | **0.2** | **2.8** | **0.1** | **0.2** |
| a ) Intracranial and intrspinal germ cell tumors | 0 | 1 | 0 | 0 | 1 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.4 | 0.0 | 0.0 |
| b ) Malignant extracranial and extragonadal germ cell tumors | 0 | 0 | 1 | 0 | 1 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.4 | 0.0 | 0.0 |
| c ) Malignant gonadal germ cell tumors | 1 | 0 | 0 | 4 | 5 | 0.1 | 0.0 | 0.0 | 0.6 | 0.2 | 2.0 | 0.1 | 0.2 |
| d ) Gonadal carcinomas | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| e ) Other and unspecified malignant gonadal tumors | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **XI ) Other malignant epithelial neoplasms and malignant melanomas:** | **2** | **0** | **3** | **13** | **18** | **0.3** | **0.0** | **0.4** | **2.0** | **0.6** | **7.1** | **0.2** | **0.6** |
| a ) Adrenocortical carcinomas | 1 | 0 | 0 | 0 | 1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.4 | 0.1 | 0.0 |
| b ) Thyroid carcinomas | 0 | 0 | 0 | 1 | 1 | 0.0 | 0.0 | 0.0 | 0.2 | 0.0 | 0.4 | 0.0 | 0.0 |
| c ) Nasopharyngeal carcinomas | 0 | 0 | 1 | 0 | 1 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.4 | 0.0 | 0.0 |
| d ) Malignant melanomas | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| e ) Skin carcinomas | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| f ) Other and unspecified carcinomas | 1 | 0 | 2 | 12 | 15 | 0.1 | 0.0 | 0.3 | 1.9 | 0.5 | 6.0 | 0.1 | 0.5 |
| **XII ) Other and unspecified malignant neoplasms:** | **1** | **4** | **0** | **3** | **8** | **0.1** | **0.5** | **0.0** | **0.5** | **0.3** | **3.2** | **0.2** | **0.3** |
| a ) Other specified malignant tumors | 0 | 1 | 0 | 1 | 2 | 0.0 | 0.1 | 0.0 | 0.2 | 0.1 | 0.8 | 0.0 | 0.1 |
| b ) Other unspecified malignant tumors | 1 | 3 | 0 | 2 | 6 | 0.1 | 0.4 | 0.0 | 0.3 | 0.2 | 2.4 | 0.2 | 0.2 |
| **TOTAL:** | **65** | **66** | **46** | **75** | **252** | **9.3** | **8.7** | **6.2** | **11.8** | **8.9** | **100.0** | **8.2** | **9.0** |

**Table-4: Distribution of cancers by age-group (years) and ASIRs, in female patients, in Lahore district (2011 – 2012)**

| | Number of cases | | | | | Age-specific rates | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DIAGNOSTIC GROUP↓ AGE IN YEARS→ | 0 - 4 | 5 - 9 | 10-14 | 15-19 | All ages | 0 - 4 | 5 - 9 | 10 - 14 | 15-19 | Crude | % | ASR 0-14 | ASR 0-19 |
| **I ) Leukemias, myeloproliferative diseases, & myelodysplastic diseases:** | **14** | **15** | **7** | **5** | **41** | **2.1** | **2.1** | **1.0** | **0.8** | **1.5** | **23.2** | **1.8** | **1.6** |
| a ) Lymphoid Leukaemia | 11 | 12 | 7 | 2 | 32 | 1.6 | 1.7 | 1.0 | 0.3 | 1.2 | 18.1 | 1.5 | 1.2 |
| b ) Acute myeloid leukemias | 0 | 0 | 0 | 1 | 1 | 0.0 | 0.0 | 0.0 | 0.2 | 0.0 | 0.6 | 0.0 | 0.0 |
| c ) Chronic myeloproliferative diseases | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| d ) Myelodysplastic syndrome and other myeloproliferative diseases | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| e ) Unspecified and other specified leukemias | 3 | 3 | 0 | 2 | 8 | 0.4 | 0.4 | 0.0 | 0.3 | 0.3 | 4.5 | 0.3 | 0.3 |
| **II ) Lymphomas and reticuloendothelial neoplasms:** | **2** | **8** | **2** | **11** | **23** | **0.3** | **1.1** | **0.3** | **1.8** | **0.9** | **13.0** | **0.6** | **0.8** |
| a ) Hodgkin lymphomas | 1 | 3 | 0 | 7 | 11 | 0.1 | 0.4 | 0.0 | 1.2 | 0.4 | 6.2 | 0.2 | 0.4 |
| b ) Non-Hodgkin lymphomas (except Burkitt lymphoma) | 1 | 5 | 2 | 4 | 12 | 0.1 | 0.7 | 0.3 | 0.7 | 0.4 | 6.8 | 0.4 | 0.4 |
| c ) Burkitt lymphoma | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| d ) Miscellaneous Lymphoreticular Neoplasms | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| e ) Unspecified lymphomas | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **III ) CNS and miscellaneous intracranial and intraspinal neoplasms:** | **3** | **9** | **10** | **10** | **32** | **0.4** | **1.3** | **1.4** | **1.7** | **1.2** | **18.1** | **1.0** | **1.2** |
| a ) Ependymomas and choroid plexus tumor | 0 | 1 | 1 | 2 | 4 | 0.0 | 0.1 | 0.1 | 0.3 | 0.1 | 2.3 | 0.1 | 0.1 |
| b ) Astrocytomas | 0 | 2 | 5 | 5 | 12 | 0.0 | 0.3 | 0.7 | 0.8 | 0.4 | 6.8 | 0.3 | 0.4 |
| c ) Intracranial and intraspinal embryonal tumors | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| d ) Other gliomas | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| e ) Other specified intracranial and intraspinal neoplasms | 2 | 5 | 4 | 3 | 14 | 0.3 | 0.7 | 0.6 | 0.5 | 0.5 | 7.9 | 0.5 | 0.5 |
| f ) Unspecified intracranial and intraspinal neoplasms | 1 | 1 | 0 | 0 | 2 | 0.1 | 0.1 | 0.0 | 0.0 | 0.1 | 1.1 | 0.1 | 0.1 |
| **IV ) Neuroblastoma and other peripheral nervous cell tumors:** | **0** | **0** | **1** | **1** | **2** | **0.0** | **0.0** | **0.1** | **0.2** | **0.1** | **1.1** | **0.0** | **0.1** |
| a ) Neuroblastoma and ganglioneuroblastoma | 0 | 0 | 1 | 0 | 1 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.6 | 0.0 | 0.0 |
| b ) Other peripheral nervous cell tumors: | 0 | 0 | 0 | 1 | 1 | 0.0 | 0.0 | 0.0 | 0.2 | 0.0 | 0.6 | 0.0 | 0.0 |
| **V ) Retinoblastoma:** | **5** | **3** | **0** | **0** | **8** | **0.7** | **0.4** | **0.0** | **0.0** | **0.3** | **4.5** | **0.4** | **0.3** |
| **VI ) Renal tumors:** | **1** | **1** | **0** | **0** | **2** | **0.1** | **0.1** | **0.0** | **0.0** | **0.1** | **1.1** | **0.1** | **0.1** |
| a ) Nephroblastoma and other nonepithelial renal tumors | 1 | 1 | 0 | 0 | 2 | 0.1 | 0.1 | 0.0 | 0.0 | 0.1 | 1.1 | 0.1 | 0.1 |
| b ) Renal carcinomas | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| c ) Unspecified malignant renal tumors | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **VII ) Hepatic tumors:** | **3** | **0** | **1** | **0** | **4** | **0.4** | **0.0** | **0.1** | **0.0** | **0.1** | **2.3** | **0.2** | **0.2** |
| a ) Hepatoblastoma | 3 | 0 | 0 | 0 | 3 | 0.4 | 0.0 | 0.0 | 0.0 | 0.1 | 1.7 | 0.2 | 0.1 |
| b ) Hepatic carcinomas | 0 | 0 | 1 | 0 | 1 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.6 | 0.0 | 0.0 |
| c ) Unspecified malignant hepatic tumors | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **VIII ) Malignant bone tumors:** | **1** | **2** | **5** | **6** | **14** | **0.1** | **0.3** | **0.7** | **1.0** | **0.5** | **7.9** | **0.4** | **0.5** |
| a ) Osteosarcomas | 0 | 0 | 2 | 3 | 5 | 0.0 | 0.0 | 0.3 | 0.5 | 0.2 | 2.8 | 0.1 | 0.2 |
| b ) Chondrosarcomas | 0 | 0 | 1 | 0 | 1 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.6 | 0.0 | 0.0 |
| c ) Ewing tumor and related sarcomas of bone | 1 | 2 | 1 | 2 | 6 | 0.1 | 0.3 | 0.1 | 0.3 | 0.2 | 3.4 | 0.2 | 0.2 |
| d ) Other specified malignant bone tumors | 0 | 0 | 0 | 1 | 1 | 0.0 | 0.0 | 0.0 | 0.2 | 0.0 | 0.6 | 0.0 | 0.0 |
| e ) Unspecified malignant bone tumors | 0 | 0 | 1 | 0 | 1 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.6 | 0.0 | 0.0 |
| **IX ) Soft tissue and other extraosseous sarcomas:** | **1** | **1** | **2** | **6** | **10** | **0.1** | **0.1** | **0.3** | **1.0** | **0.4** | **5.6** | **0.2** | **0.4** |
| a ) Rhabdomyosarcomas | 1 | 0 | 0 | 0 | 1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.6 | 0.1 | 0.0 |
| b ) Fibrosarcomas, peripheral nerve sheath tumors, and other fibrous neoplasms | 0 | 0 | 1 | 1 | 2 | 0.0 | 0.0 | 0.1 | 0.2 | 0.1 | 1.1 | 0.0 | 0.1 |
| c ) Kaposi sarcoma | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| d ) Other specified soft tissue sarcomas | 0 | 1 | 0 | 2 | 3 | 0.0 | 0.1 | 0.0 | 0.3 | 0.1 | 1.7 | 0.0 | 0.1 |
| e ) Unspecified soft tissue sarcomas | 0 | 0 | 1 | 3 | 4 | 0.0 | 0.0 | 0.1 | 0.5 | 0.1 | 2.3 | 0.0 | 0.1 |
| **X ) Germ cell tumors, trophoblastic tumors, and neoplasms of gonads:** | **2** | **3** | **5** | **1** | **11** | **0.3** | **0.4** | **0.7** | **0.2** | **0.4** | **6.2** | **0.5** | **0.4** |
| a ) Intracranial and intrspinal germ cell tumors | 0 | 0 | 1 | 0 | 1 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.6 | 0.0 | 0.0 |
| b ) Malignant extracranial and extragonadal germ cell tumors | 2 | 1 | 0 | 0 | 3 | 0.3 | 0.1 | 0.0 | 0.0 | 0.1 | 1.7 | 0.2 | 0.1 |
| c ) Malignant gonadal germ cell tumors | 0 | 2 | 4 | 1 | 7 | 0.0 | 0.3 | 0.6 | 0.2 | 0.3 | 4.0 | 0.3 | 0.2 |
| d ) Gonadal carcinomas | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| e ) Other and unspecified malignant gonadal tumors | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **XI ) Other malignant epithelial neoplasms and malignant melanomas:** | **2** | **2** | **3** | **9** | **16** | **0.3** | **0.3** | **0.4** | **1.5** | **0.6** | **9.0** | **0.3** | **0.6** |
| a ) Adrenocortical carcinomas | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| b ) Thyroid carcinomas | 0 | 1 | 0 | 1 | 2 | 0.0 | 0.1 | 0.0 | 0.2 | 0.1 | 1.1 | 0.0 | 0.1 |
| c ) Nasopharyngeal carcinomas | 0 | 0 | 0 | 2 | 2 | 0.0 | 0.0 | 0.0 | 0.3 | 0.1 | 1.1 | 0.0 | 0.1 |
| d ) Malignant melanomas | 1 | 0 | 0 | 0 | 1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.6 | 0.1 | 0.0 |
| e ) Skin carcinomas | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| f ) Other and unspecified carcinomas | 1 | 1 | 3 | 6 | 11 | 0.1 | 0.1 | 0.4 | 1.0 | 0.4 | 6.2 | 0.2 | 0.4 |
| **XII ) Other and unspecified malignant neoplasms:** | **1** | **1** | **8** | **4** | **14** | **0.1** | **0.1** | **1.2** | **0.7** | **0.5** | **7.9** | **0.4** | **0.5** |
| a ) Other specified malignant tumors | 0 | 0 | 4 | 1 | 5 | 0.0 | 0.0 | 0.6 | 0.2 | 0.2 | 2.8 | 0.2 | 0.2 |
| b ) Other unspecified malignant tumors | 1 | 1 | 4 | 3 | 9 | 0.1 | 0.1 | 0.6 | 0.5 | 0.3 | 5.1 | 0.3 | 0.3 |
| **TOTAL:** | **35** | **45** | **44** | **53** | **177** | **5.2** | **6.3** | **6.4** | **8.8** | **6.6** | **100.0** | **5.9** | **6.6** |

## DISCUSSION

In our study, the total number of cancers recorded in the 0–19 year age-group was 669 and in the 0–14 one, it was 489. That makes it an average of about 245 cases per year, in the 0–14 year age-group. This figure is lower than what has been estimated for children in the state of California in the United States (US), where it has been reported that, every year, over 1,000 individuals between 0 and 14 years are diagnosed with cancer and, nearly 1 of every 265 children will develop some form of cancer before they reach age 20[10].

Further, in California, in a 5-year time period between 2007 and 2011, in the 0–19 year age-group, 9,196 children were diagnosed with cancer, and the rate stood at 17.6 diagnoses per 100,000 children and youth.[10] Compared to this, in our study,

in the time-period between 2011 and 2012, also in those aged 0–19 years, 669 cases were recorded and the ASIR stood at 6.7, again this figure being lower than what has been seen in California. Nevertheless, California is the most populous state of the United States of America, having over 38 million people residing in it in the year 2014.[11] Further, in California, the reporting of cancers to cancer registries is mandated by law. The population of Lahore district was over 10 million in the year 2012 estimated using an annual growth rate of 3.46%.[8] The results reported in this study represent one centre of the district only. However, in the context of the developing countries of the world, including Pakistan, it has also been published that specialized cancer treatment facilities are likely to attract all patients with a diagnosis of cancer.[12] Accordingly, in order to gauge as to how many cases the SKMCH & RC Registry was actually capturing, of the cases being recorded in the population, a comparison of the SKMCH & RC paediatric and adolescent cancer cases was made with similar cases recorded by the Punjab Cancer Registry (PCR).[13]

PCR is a population-based cancer registry in the province of Punjab, Pakistan. It was established in 2005 by a group of professionals, representing various hospital and laboratories of Lahore, including private and government centres. A comparison has shown that nearly 80% of the paediatric and young adult cancer cases, recorded by PCR, for Lahore district, were reported by SKMCH & RC alone, representing one specialized centre.

This is a significant number and cannot be ignored at this stage despite the fact that the completeness of PCR reporting is debatable, as PCR might not be capturing all (100%) of the cases being diagnosed in the population living in the geographic area under consideration, primarily due to under-reporting of cases by some of the reporting facilities. As PCR reporting improves further, there will be clarity about the proportion of cases being captured by the Hospital, of the total cases being diagnosed in the catchment area.

A comparison of the current study with another study done by the same authors on childhood cancers in 2009 has shown that the results are not much different from what was reported earlier.[2] The incidence rates have been on the lower side in both the studies, which is somewhat expected in the field of paediatric and young adolescent oncology. However, the results are even lower than what has been reported in the US, which are 178.0 and 160.1 and, in China, 96.2 and 76.4 per 1,000,000 (million) boys and girls, respectively, in the 0–14 year age-group.[14,15] In the US, for the ages 15–19 years, the ASIRs were 237.7 and 235.5 and for 0–19 years, 196.7 and 182.3, per million, male and female population, respectively, again higher than what has been reported in our study.[14] Nevertheless, in all the aforementioned studies, the incidence rates were higher among males than females.

In the US, in the 0–19 year age-group, the three common cancer diagnoses by ICCC grouping, among boys, were leukaemia, brain and CNS tumours, and lymphoma and reticuloendothelial neoplasms, whereas, among girls, brain and CNS tumours, leukaemia, and lymphoma and reticuloendothelial neoplasms.[14] This is somewhat different from what has been recorded in our study. However, leukaemia continues to be the most common diagnosis among both males and females in our study. Given the limitations of the study mentioned above, comparison with results obtained from population-level studies conducted in the region, at a subsequent stage, can demonstrate if the differences in the incidence rates and ranking of cancers between the population of Pakistan and the West prevail.

Over the years, different aspects related to cancer registration have been published by the authors.[16–18] In the areas of epidemiology and public health, cancer surveillance is, undoubtedly, an important tool in the implementation and evaluation of programs related to cancer prevention, early detection, and control. This includes follow-up studies to determine mortality and survival, thereby, leading to improvement in the quality of life of patients suffering from this disease, as a continuum of care. This can be accomplished by continuing co-operation among health-care professionals working for the betterment of the community at large. Although, this goal is difficult to achieve, it is, nevertheless, achievable, and this is where we should head for.

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## CONFLICT OF INTEREST

The study was presented at the 8th Regional Conference of the Asian-Pacific Organization for Cancer Prevention held in November 2015, in Tehran, Iran.

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