Gezira Journal Of Health Sciences 2018 vol.14(2)

EDITORIAL

The Incidence of Lymphoma in Children in Gezira State During 2005-2014:A general Population-Based Study

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Abstract:

Introduction: Lymphomas are the third most often diagnosed malignant neoplasms among children and adolescents. They constitute about 10-15% of childhood malignancies. We aimed to quantify incidence of Lymphomas (HD and NHD) in the Gezira State and their difference with gender and age**.**

Methods: The data was abstracted and classified accordingly to the third revision of the International Classification of Childhood Cancer. Age-standardised rates (ASR) for three 5-year age groups (0–4 years, 5–9 years and 10–14 years) calculated for males and females.

Results: The total number of children diagnosed with lymphoma was 140 patients. NHL forms 75/140(53%) and HD 65/140(46%). Incidence of NHL was 6.68/million. Males with NHL was 48/75 (64%) with an ASR of 5.71/million and females 27/75(36%) with ASR of 4.04/million and a ratio of 1.7:1. The most common age group of presentation of NHL in males was 5-9 years of age, while in females was from 10-14 years of age. Incidence of HD was 4.22/million. Males constituted about 40/65 (62%) with an ASR of 4.72/million, while females were 25/65(38%) with and ASR of 3.72 and males to females ratio of 1.6:1. The common age of presentation of HD in both males and females was 5-9 years of age.

In conclusion: The results presented in this study were similar with international results and comparable with them. implemented analytical studies to clarify the different types of haematological malignancies will help to choose the right treatment and better cure.

Keywords: Non-Hodgkin lymphoma, Hodgkin lymphoma, Age-standardised rates and Age specific rate, Sudan

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Introduction:

Lymphomas are the third most frequently diagnosed malignant neoplasms among children and adolescents [1]. They constitute 10-15% of childhood malignancies. Non-Hodgkin lymphoma accounts for approximately 60% of all lymphomas in children and adolescents. They constitute a heterogeneous group of malignant tumors of lymphoid tissues derived from mature B or T cells [2]. The histological pattern of NHL in children differs from that in adults. While indolent lymphoma is common in adults, high grade lymphoma is the predominant lymphoma in children [3].

Lymphoma was the most prevalent childhood malignancy in the National Cancer Institute, University of Gezira (NCI-U of G) where it acounted for (42.8%) [4]. The incidence of Hodgkin's lymphoma in Yemen and Lebanon is more than 5.5/100000, while it is less than 1/100000 in China and Japan [5]

The incidence of Non - Hodgkin Lymphoma has increased in the western world over recent decades, rising by 3 – 5% per annum [5]. NHL has become the fifth most common cancer in the USA, occurring at a frequency of approximately 17.4 per 100000. It is slightly more common in males than in females, and is more common in white people than in black people [5].

Material and Methods:

Procedure:

In this epidemiological, population-based registry study, multiple data sources were used including hospitals records (Public and Private), pathology laboratories, and death certificates that remain the major sources for case finding, beside access to oncology departments at Wad Madani and Radio Isotope Center Khartoum, imaging techniques and haematology laboratories.

Cancer patients' data were abstracted from medical records, based on clinical and/or histopathology diagnosis, by Gezira Cancer Registry trained cancer registrars. The data abstracted included personal identification (name, sex, and age), demographic information (including: address, telephone number, ethnic groups, place of birth), and tumor details (date of diagnosis, primary site, histology, behavior, grade, stage, basis of diagnosis). The primary site (topography) and histology (morphology) of the malignancies were identified and coded according to the International Classification of Diseases for Oncology 3rd Edition (ICD-O-3), published by the World Health Organization (WHO), 2000 [6]. From the ICD-O3 codes each case was classified according to the third revision of the International Classification of Childhood Cancer (ICCC-3) [7]

The computer software programs CanReg 5.42 (the last update-released programme) was used to enter the data. The registry confidentiality is based and depended on restricted guidelines of the IACR/IARC (2004) [8].

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Statistical analysis:

First, we calculated age-specific incidence rates (ASR) for three 5-year age groups (0–4 years, 5–9 years and10–14 years)

We defined the number of cases and the number of person-years (males and Females) for the applicable times, and the result was expressed per million persons per years. We defined person-years as the sum of the population counts in Gezira State in each year from the first, of January 2005 to 31 of December 2014, categorised by gender.

The age-standardised rate (ASR) was calculated, using the age-specific rates (R1, R2, R3) and the world standard population (Table 1), for the three age groups 0–4, 5–9, and 10–14: ASR = [(R1 × 12000) (R2 × 10000) (R3 × 9000)]/31000.

We calculated the sex ratios by dividing the incidence in male individuals with that in female individuals. Statistical analysis was done using SPSS version 23 IBM.

Results:

In the current study, the total numbers of children diagnosed with lymphoma were 140 during the study period. The males were 88/140(62%) and the females were 52/140(38%) with a male to female ratio of 1.6:1. NHL accounted for 75/140 (53%) and HD for 65/140 (46%).

The incidence of NHL was 6.68/million. Males with NHL were 48(64%) with an ASR of 5.71/million and females 27(36%) with ASR of 4.04/million and a ratio of 1.7:1. The age specific rate for NHL was different according to the age group and gender (Table 2). In males with NHL from 0-4 years was 4.75/million, from 5-9 was 6.95/million and from 10-14 years was 5.62/million. While in females, the age ASR according to the age distribution from 0-4 years was 4.21/million, from 5-9 years was 3.61/million and from 10-14 years was 4.28/million. The common age group presentation of NHL in the males was 5-9 years of age while in the females was 10-14 years of age (Table 2).

The incidence of HD is 4.22/ millions. Males accounted for 40/65 (62%) with an ASR of 4.72/ million, while females were 25/65 (38%) with ASR of 3.72/million and males to females ratio of 1.6:1 (Table 2). The age specific rate was (3.39, 5.85 and 5.24) per million for males at age groups (0-4, 5-9 and 10-14 years respectively); while in females were (3.3, 4.47 and 3.80) per million for age groups (0-4, 5-9 and 10-14 years respectively) (Table 2). The common age of presentation of HD in both males and females was from 5-9 years of age (Table 2).

Figure: 1A illustrates the percentage distribution of the most frequent lymphoma by individual year of age. There was considerable variation between males and females in the age at diagnosis. in the case of Hodgkin Lymphoma which was more frequent in males at Age 5, 10 and 14 years accounting for 16%, 10% and 10% respectively. However, there is one peak in females at age of diagnosis 14 years accounting for 14% of the females cases.

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Males diagnosed with Non-Hodgkin lymphoma were over two year old, and had three peaks of frequent at age of diagnosis 4, 7 and 14 years accounting for 8%, 7% and 8% respectively. Females had two peaks at age of diagnosis 3 and 5 years (Figure: 1B).

Age standardised rate for Non-Hodgkin lymphoma had two peaks in males 2007-2008 and 2011-2012, while in females had one peak in 2007-2008 (figure: 2), as well as Hodgkin lymphoma (Figure: 3).

Figure: 4 and 5 showed a comparison of Sudanese NHL and HL age standardized rate per million according to age and gender from 2005-2014 with African, North America, European and Asian cancer registries.

Table (1): The world standard population for Childhood

Age classes	Population
0-4 y	12,000
5-9	10,000
10-14	9,000
All ages	31,000

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Table (2): Hodgkin's lymphoma and Non- Hodgkin lymphoma age specific rate and ASR per million by age and gender

Cancer	0-14 Years				Age-specific rate per million					
NHL	ASR per million				Male			Female		
	N	All (M&F)	M	F	0-4	5-9	10-14	0-4	5-9	10-14
	75	4.68	5.71	4.04	4.75	6.95	5.62	4.21	3.61	4.28
HL	65	4.22	4.72	3.72	3.39	5.85	5.24	3.37	4.07	3.80

Note: - N: Number, M: Male, F: Female and ASR: Age Standardized rate, ALL: Males and Females, NHL: Non- Hodgkin lymphoma and NH: Hodgkin lymphoma

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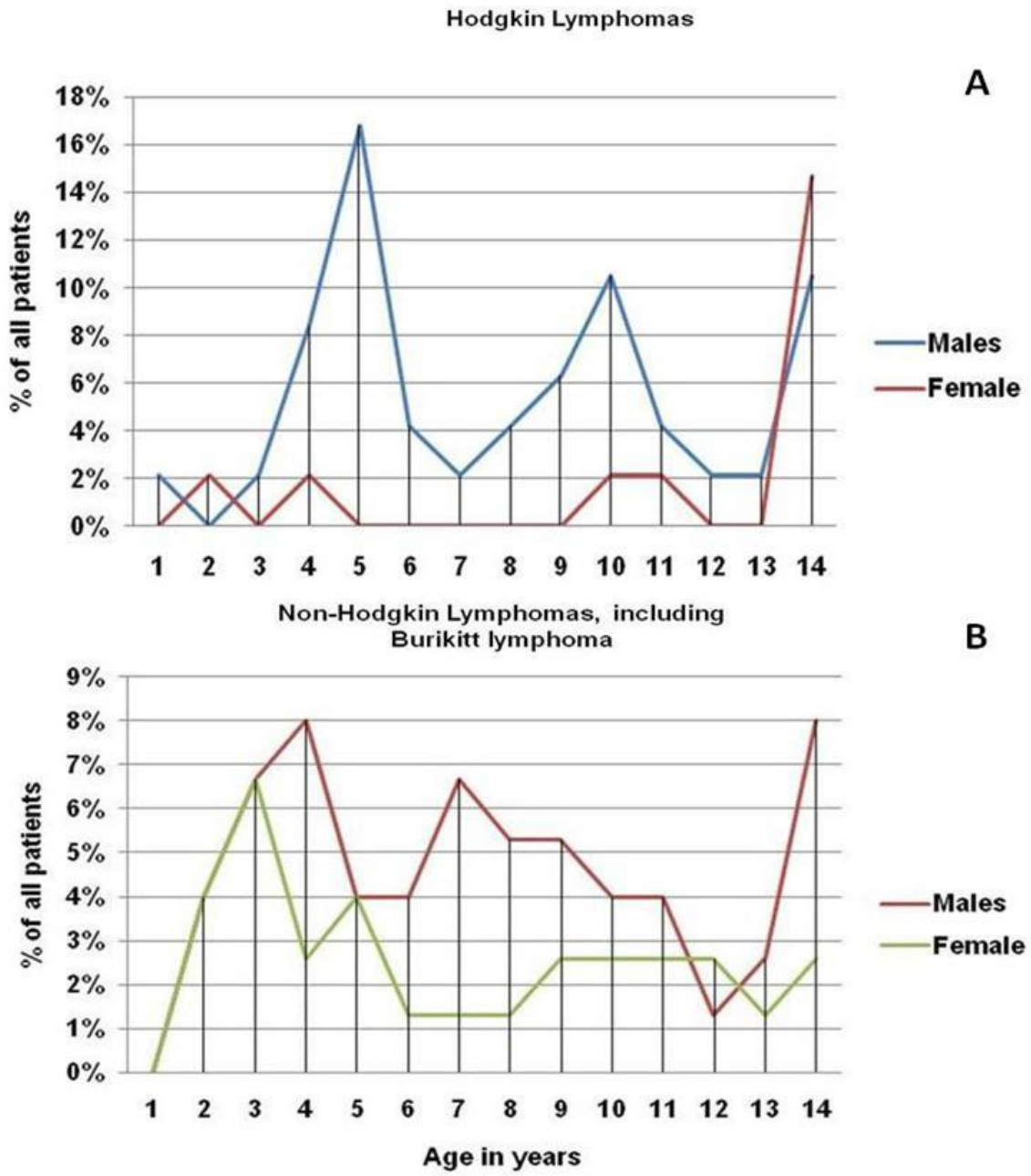

Figure 1: Percent distribution of study subject by age and gender according to age at diagnosis 2005-2014:

A: Hodgkin lymphoma

B: Non-Hodgkin lymphoma

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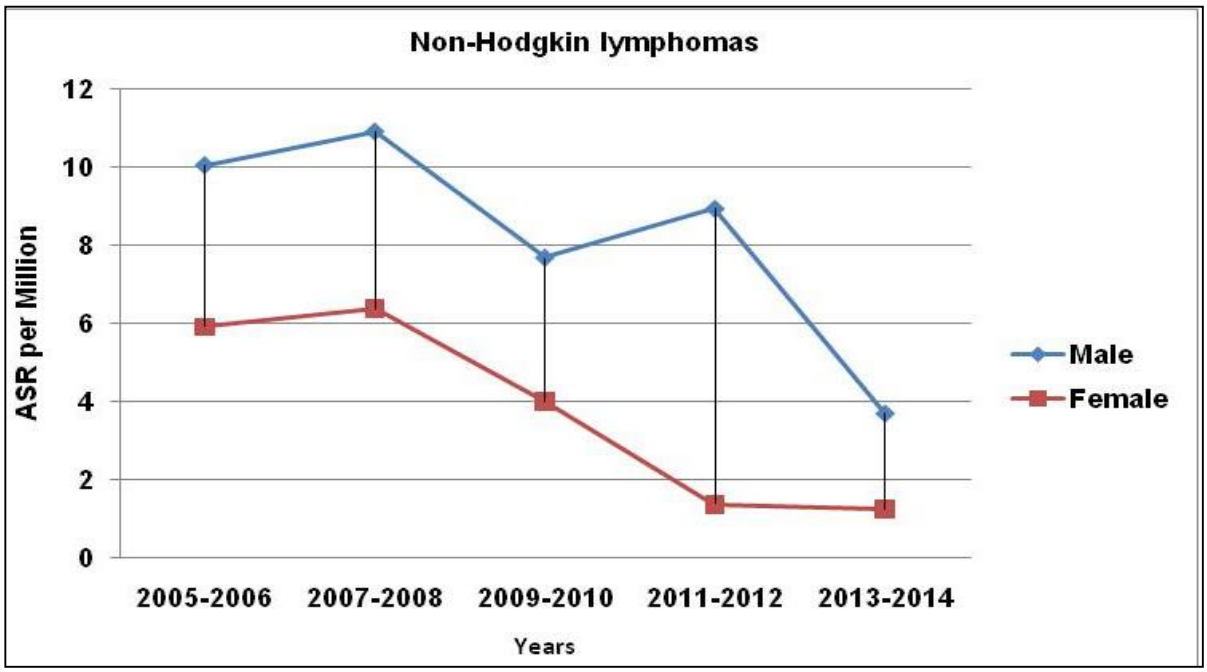
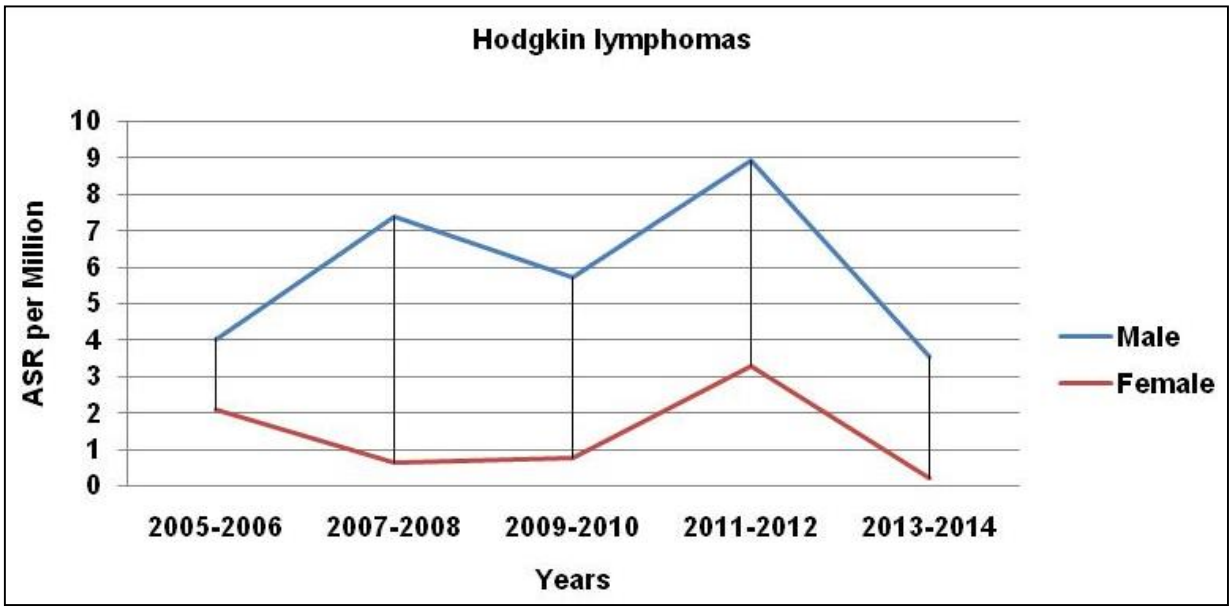


Figure 2: Non-Hodgkin lymphoma average of two years age standardization incidence rate per million by age and gender, 2005-2014

Figure 3: Hodgkin lymphoma average of two years age standardization incidence



rate per million by age and gender, 2005-2014

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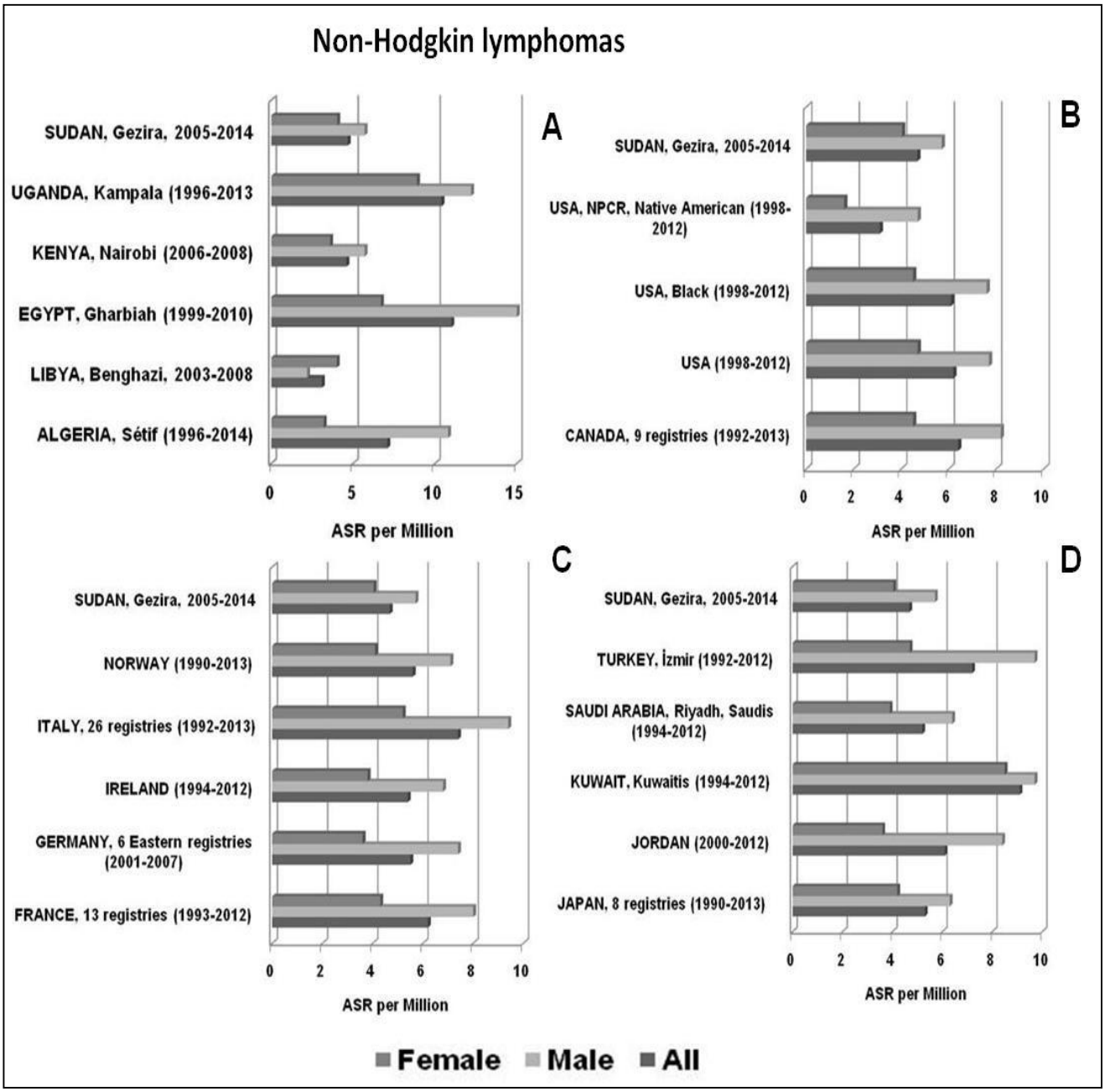

Figure 4: Comparison of Non-Hodgkin lymphoma age standardization incidence rate per million by age and gender, 2005-2014:

A: African registries

B: North America registries

C: European registries

D: Asian registries

[Data for comparison is *Available from: http://iicc.iarc.fr/results/*,].

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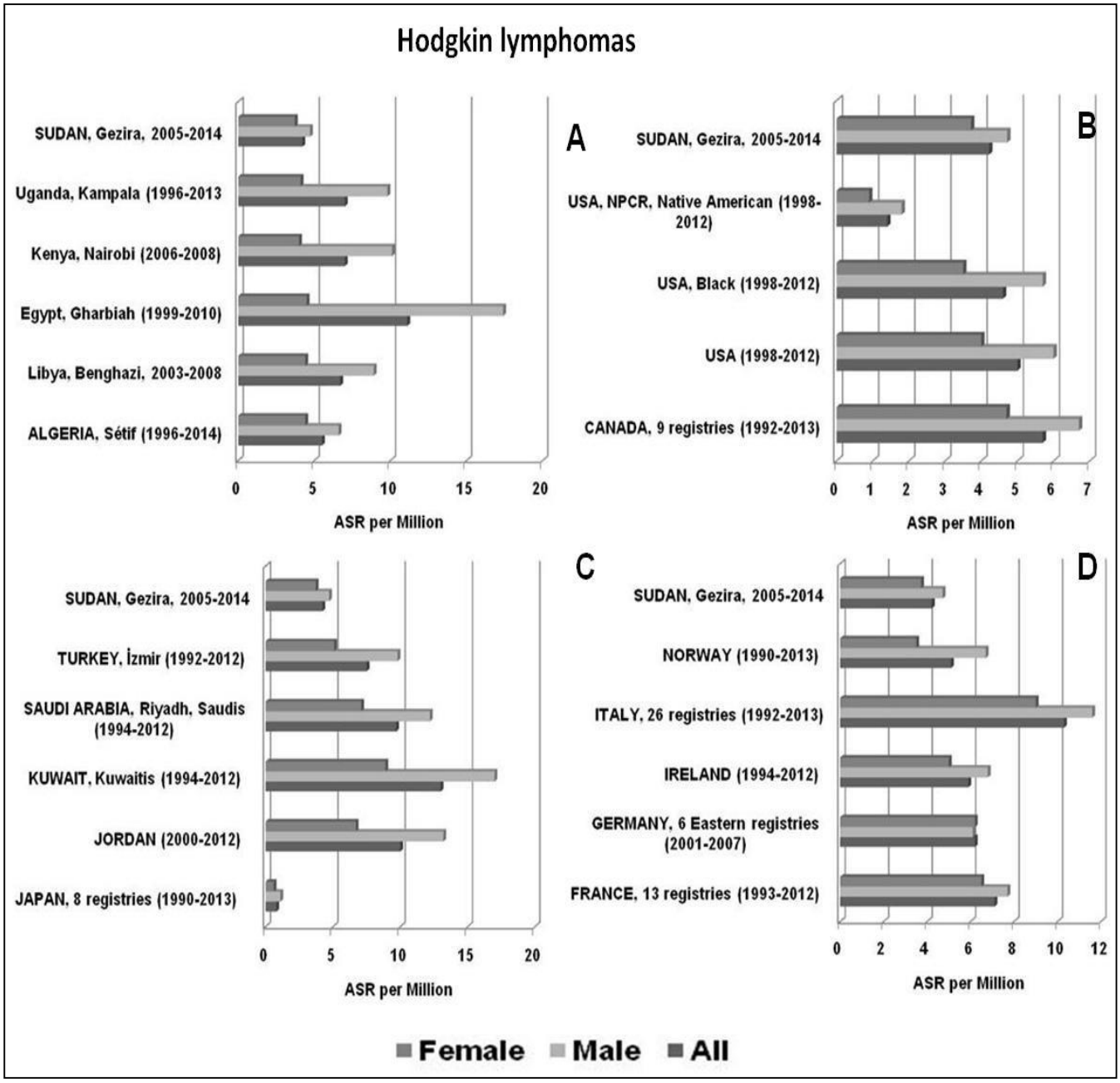

Figure 5: Comparison of Hodgkin lymphoma age standardization incidence rate per million by age and gender, 2005-2014

A: African registries

B: North America registries

C: European registries

D: Asian registries

[Data for comparison is Available from: http://iicc.iarc.fr/results/,].

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Discussion:

The National Cancer Institute, University of Gezira is the only center of oncology in Gezira to which sent the most children diagnosed with lymphoma in Gezira State. In addition to active data collected from Gezira and other resources indicated that our result is representative of the Gezira State populations. Interestingly, this is first study on lymphoma in Sudan, which reported the incidence rates per millions and compared the results with the most recent published data from different cancer registries in Africa, North America, Europe and Asia.

There is variation in age-specific incidence in African Hodgkin lymphoma children. Some countries reporting the higher rate at age 5–9 than at 10–14 [10]. Our data showing increased in incidence rates in age 5–9 in both males and females (5.85 and 4.07 per millions respectively) than at age 10–14. Hodgkin lymphoma is more common among males than in females [11]. In present study sex ratio among males and females were found to be higher than in the USA (1.3 M/F) but nearer to that in Europe (1.6 and 1.7 M/F respectively) [11]. In East Africa, the ASR is greater two times in Ethiopian than in Sudan, however, incidence rates were similar to the findings reported in Malawi, Uganda, Mauritius and Zimbabwe (5.6, 4.5, 5.6 and 3.2 per millions respectively) [10].The incidences rates in West Africa are more less than the Gezira rates. Whereas, higher incidence rates was publicized in Mali [10]. Stiller and Parkin reported that it was not possible to estimate the acquired incidence rates of childhood Hodgkin disease in Africa, however, the incidence in many African countries may indeed similar to that in developed ones [12].ASR results for HL in Sudanese was lower than European countries Norway, Ireland, Germany, France and Turkey. It was higher than Asian countries Saudi Arabia, Kuwait , Jordan and Japan [11]. These differences between our age incidence compared to the foreign countries may be explained by the interplay of both environmental and racial factors [13].

Non –Hodgkin lymphoma in childhood is always near high grades. Lymphoma, other than BL usually have total ASR of 5- 9 per millions, though incidence rates may be a little higher than in North Africa (Algeria and Egypt) [10]. However, the North Africa may have genes and environmental factors that may be involved in occurring incidences.

In East Africa there is a variation in the incidence rates of NHL, while it was higher in Uganda and lower in Kenya [10]. In USA the rates in dark skin, populations have lower rates than in whites. This may probably explained by environmental changes and exposures.

In Asian countries, such as Kingdom of Saudia Arabia (KSA) and Japan were showed similar outcomes of ASR when compared to Gezira cancer consequences, Sudan. Moreover, some other countries like Turkey and Jordan showed higher incidence in males than in females, while Kuwait showed the lower differences between males and females. Additionally, the Kuwaiti females showed the highest incidence rates of NHL among those in Arabs countries [11]. The incidence of NHL among females in European countries was found to be similar to that obtained in Gezira incidence data. However, the incidences in males ASR are higher [11]. A comparison of NHL in Gezira, Sudan ASR result was higher

than in North American registries , we found that our ASR result was higher than NPCR (Native American population) and lower than USA dark colors people and Canadian [11].

In conclusion, our data presented in this study was similar with international result and comparable with them. Implemented knew tools like molecular techniques will improve the detection of different types of tumors and help to choose the right treatment and prophylaxis for better cure of haematolgical malignancies among Sudanese children.

Acknowledgements:

We are grateful to all Gezira Cancer Registry (GCR) for their help and support during this study: Sana yousif Elhaj, Safa Salah Khogaly, Mujahed Ahmed Ali Ahmed and Dr. Moawia Mohammed Ali. In addition, we thank all members of the Advisory committee of Gezira cancer registry. We acknowledge hospitals record (Public and Private) the death certificates, oncology department at Wad Madani and Radio Isotope Center Khartoum, Imaging techniques and Haematology laboratories.

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