Spectrum of haematologic malignancies and survival outcomes of adult lymphomas in Maiduguri, North eastern Nigeria- a fourteen year review

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Summary

Background: The incidence of Haematologic malignancies has been shown to vary according to gender, age, geographic region, and histologic subtypes, while cure rates can vary according to region and may be impacted by treatment availability and access to care.

Method: This was an institution based review of data from the Medical Records Department, Department of Haematology and Cancer Registry of the Histopathology Department of the University of Maiduguri Teaching Hospital between January 1998 and December 2011. The aim was to study the spectrum of Haematologic malignancies and the survival pattern of adult lymphomas in this region and to compare our findings to studies reported elsewhere.

Results: The Haematologic malignancies represented 6.05% of all cancer cases seen and 0.31% of hospital admissions. Among the Haematologic malignancies, Non-Hodgkins Lymphoma (NHL) was the most frequent, constituting 51.3% while others include: Hodgkins Lymphoma (HL), 26.7 % Chronic Myeloid Leukaemia (CML), 5.5%, Acute Myeloblastic leukaemia (AML), 4.2% Multiple Myeloma (MM), 4.2% Acute Lymphoblastic leukaemia (ALL), 3.8%, Chronic Lymphocytic Leukaemia (CLL), 3.4% Myelodysplastic Syndrome (MDS), 0.4% and Chronic Myelofibrosis 0.4%. Haematologic malignancies are more common in younger age group and also more common in males than females. Lymphomas are particularly common in young adults and the incidence tends to fall after 70 years. Similarly, the characteristic bimodal age incidence for HL found in western world has not been seen in this study. The histological subtypes for both NHL and HL are similar to the pattern reported elsewhere. Default rate was high and we found a strong association between cycles of chemotherapy given and survival in lymphoma patients.

Conclusion: This study has shown that Haematologic malignancies are not uncommon in our environment. There is need to provide basic facilities and training for immunophenotyping and immunohistochemistry in all cancer treatment centers across the country. Cytotoxic drugs must be subsidized and also be made readily available to all patients with Haematologic malignancies.

Keywords: *Haematologic malignancies, survival, lymphomas, Maiduguri*

Résumé

Introduction : L'incidence des tumeurs malignes hématologiques a été démontrée variant selon le sexe, l'âge, la région géographique et le sous-type histologique ; tandis que le taux de guérison peut varier selon les régions et peut être affectée par la disponibilité des traitements et l'accès aux soins. L'objectif était d'étudier le spectre de tumeurs malignes hématologiques, la fréquence de survie des lymphomes chez les adultes dans cette région et de comparer nos résultats à des études rapportées ailleurs.

Méthodologie : Il s'agissait d'une étude basée sur l'institution de données du service des archives médicales, l'unité d'hématologie et de greffe de Cancer du Département histopathologie de l'hôpital universitaire de Maiduguri entre Janvier 1998 et Décembre 2011.

Résultats : Les résultats des tumeurs malignes hématologiques représentaient 6,05% de tous les cas de cancer observés et 0,31% des admissions à l'hôpital. Parmi les tumeurs malignes hématologiques, le lymphome non- hodgkinien (LNH) est le plus fréquent, constituant 51,3% tandis que d'autres étaient constitués de lymphome (HL), 26,7% chronique de leucémie myéloïde (LMC), de 5,5%, une leucémie aiguë myéloblastique (LAM), 4,2% Le myélome multiple (MM), 4,2% la leucémie lymphoblastique aiguë (LLA) de 3,8%, la leucémie lymphoïde chronique (LLC), 3,4% syndrome myélodysplasique (MDS), 0,4% et myélofibrose chronique de 0,4%. Les tumeurs malignes hématologiques sont plus fréquentes dans le groupe d'âge plus jeune et aussi plus fréquent chez les hommes que chez les femmes. Les lymphomes sont particulièrement fréquents chez les jeunes adultes et

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l'incidence tend à diminuer après 70 ans. De même, l'incidence de l'âge bimodale caractéristique pour HL trouvé dans le monde occidental n'a pas été observée dans cette étude. Les deux sous-types histologiques LNH et HL sont similaires aux fréquences signalés ailleurs. Le taux de défaut était et nous avons trouvé une forte corrélation entre les cycles de chimiothérapie données et la survie chez les patients atteints de lymphome. En conclusion, Cette étude a montré que les tumeurs malignes hématologiques ne sont pas rares dans notre environnement.

Conclusion : Il est nécessaire de fournir des installations et la formation d'immunophénotypage et immunohistochimie dans tous les centres de traitement du cancer à travers le pays. Egalement les médicaments cytotoxiques doivent être subventionnés et également être facilement accessibles à tous les patients atteints de tumeurs malignes hématologiques

Introduction

Haematologic Malignancies (HMs) are primary cancers of the blood and blood forming organs that are heterogeneous and of diverse incidence, prognosis and aetiology. Population based incidence and survival outcomes of haematologic malignancies in many Sub-Saharan African countries has been difficult to estimate for many years. Lack of functional Cancer Registry and/or rudimentary or non-existent medical records were partly responsible for the partial information about cancer incidence, treatment and follow-up in Africa [1-2]. Studies using population based cancer registry in developed countries have successfully assessed incidence, mortality and prevalence patterns of Haematologic malignancies and related disorders using various classification schemes for these neoplasm [3-13]. Comparison of HMs incidences has greatly varied across regions over time due to existence of different classification systems. Most developed countries classify HMs (using the third revised International Classification of Diseases-Oncology (ICD-O-3) at the most basic level according to cell lineage and maturity but use morphology, genetic, and immunohistochemical criteria, as well as clinical behaviour, to further subdivide this entities [14,15]. Various studies in some parts of Africa although scanty, sporadic and most often hospital-based, tried to report on the incidences, distribution and survival of the various HMs based on morphology and clinical behaviours alone [16-27].

The incidence of HMs has been shown to vary according to gender, age, geographic region, and histologic subtypes, while cure rates can vary according to region and may be impacted by treatment availability and access to care. University of Maiduguri Teaching Hospital is the largest referral hospital in the north eastern region of Nigeria. The patients who attend this hospital come from diverse ethnic groups in Nigeria, neighbouring countries, such as Cameroun, Chad, and Niger Republic. It is reasonable therefore to suspect that there may be a disparity in the incidence, epidemiology and survival of HMs particularly the adult lymphomas in this part of Nigeria compared to other parts of Nigeria and the developed countries. We therefore set out to study the spectrum of the various HMs, the incidence and the survival pattern of adult lymphomas in this region and to compare our findings to studies reported elsewhere.

Material and methods

This was both a retrospective and prospective study of histologically and/or morphologically confirmed cases of HMs seen at the University of Maiduguri Teaching Hospital between January 1998 and December 2011. University of Maiduguri Teaching Hospital (U.M.T.H) is the largest referral hospital in the northeastern region of Nigeria. It is a 530 bedded Hospital with about 85% patient's occupancy most of the time. The patients who attend this hospital come from diverse ethnic groups in Nigeria, neighbouring countries, such as Cameroun, Chad, and Niger Republic. Maiduguri is the capital of Borno State; it is lying within latitude 115°–N of the equator and longitude 135°-E of the Greenwich meridian, Borno state has an area of 65,436 sq km and is the largest state of the federation in terms of landmass and is the only state in Nigeria that share international borders with three countries namely, Republic of Niger to the north, Chad to the northeast and Cameroun to the east. Within the country its neighbours are Adamawa state to the south, Yobe state to the west and Bauchi state to the south-west. Therefore, data from this hospital can be representation of subjects of various socio-economic groups.

This study was institution based review of data from the Medical Records Department, Department of Haematology and Cancer Registry of the Histopathology Department of the U.M.T.H. Diagnosis of lymphomas was established based on tissue samples that were studied by histological examination of surgical biopsy from lymph node or other accessible sites. The specimens were fixed in 10% formalin, routinely processed and embedded in paraffin wax. Sections were cut at 3μ-5μ and stained with routine haematoxylin and eosin stains. Non-Hodgkin's Lymphomas (NHL) was classified according to the International Working Formulation (IWF) [28]. Diagnosis of Hodgkin's Lymphoma was based on the presence of Reed-Sternberg cell in tissue histology surrounded by inflammatory cellular

elements (lymphocytes, plasma cells and eosinophils) and was classified according to the 1989 Cotswold modification of the Ann Arbor staging criteria [29-30]. Any case without adequate histological confirmation of diagnosis was excluded. For the lymphomas bone marrow aspiration and/or biopsy was not needed for diagnosis, but is recommended prior to initiating therapy in cases with cytopaenia. Diagnosis of acute leukaemias, chronic leukaemias and other HMs was based on clinical features, blood counts and morphological examination of well stained peripheral and/or bone marrow films as described by Dacie and Lewis [31]. The classification of acute and chronic leukaemias was based on the French-American-British classification as described by Bennett and Catovsky [32,33]. Other investigations done to guide in diagnosis or management included complete blood counts and coombs test; serum sodium, potassium, urea, creatinine, calcium and phosphate; X-rays, liver function tests; serum protein electrophoresis, serum albumin and total proteins, Bence - Jones protein, urinalysis and infectious disease makers, especially viral hepatitis and Human immunodeficiency viruses. One year survival for lymphomas (NHL and HL) was calculated using simple percentage of those alive and those that died before 1 year of diagnosis. Burkitt's lymphoma patients were mostly treated at the paediatric department of the Hospital and as such adequate information's were not accessible to us to carry out survival studies on BL patients. The most commonly used chemotherapeutic regimen for NHL in this study was CHOP (cyclophosphamide 750mg/m^2 iv day 1, Adriamycin 50mg/m^2 iv day 1, Oncovin 1.4mg/m^2 (max.2mg) iv day 1 and Prednisolone 100mg/m^2/d orally days 1-5). In elderly patients (>65 years), mini CHOP was used (dosage of Adriamycin is halved). As for the HL the commonly used regimen was Cylophosphamide Oncovin, procarbazine and prednisone (COPP) or ABVD (cyclophosphamide 650mg/m2 IV days 1 and 8, Oncovin 1.4mg/m2 (max.2mg) iv days 1 and 8, Procarbazine 100mg/m2/d orally days 1-14 and Prednisolone 40mg/d orally days 1-14 or Adriamycin 25mg iv day 1 and 15, Bleomycin 10mg iv day 1 and 15, Vinblastine 6mg iv day 1 and 15 and Dacarbazine 375mg iv day 1 and 15).

All analyses were performed using the SPSS statistical software (SPSS for Windows, version 16.0, SPSS Inc Chicago, Illinois, USA) and presented in form of cross tabulation, figure and tables.

Results

A total of 3,896 cancer cases were recorded between 1st January 1998 and 31st December 2011 at the University of Maiduguri Teaching Hospital (U.M.T.H), out of which there were 236 cases of haematologic malignancies. The approximate total number of hospital admission for this period was 75,600. The haematologic malignancies represented 6.05% of all cancer cases seen and 0.31% of hospital admissions during the period under review. There were 157 (66.5%) males and 79 (33.5%) females, giving a male to female ratio of 2:1. Their ages ranged from 2-80 (median 22.5) years. Among the Haematologic malignancies, NHL was the most frequent with an incidence of 28.8 % while HL and BL had an incidence of 26.7 % and 22.5 % respectively (figure I &table I).Others include CML

Table 1: Incidence and sex distribution of HMs at diagnosis

Haematologic Malignancies	Male (number/percent)	Female (number/percent)	Total (number/percent)
HL	45 (19.1)	18 (7.6)	63 (26.7)
NHL	43 (18.2)	25 (10.6)	68 (28.8)
CLL	4 (1.7)	4 (1.7)	8 (3.4)
CML	8 (3.4)	5 (2.1)	13 (5.5)
ALL	7 (3.0)	2 (0.8)	9 (3.8)
AML	7 (3.0)	3 (1.3)	10 (4.2)
Chr.MF	0 (0.0)	1 (0.4)	1 (0.4)
MM	6 (2.5)	4 (1.7)	10 (4.2)
MDS	1 (0.4)	0 (0.0)	1 (0.4)
BL	36 (15.3)	17 (7.2)	53 (22.5)
TOTAL	157 (66.5)	79 (33.5)	236 (100.0)

Key: HL=Hodgkin's Lymphoma, NHL=Non-Hodgkin's Lymphoma, CLL= Chronic Lymphocytic Leukaemia, CML= Chronic Myeloid Leukaemia, ALL= Acute Lymphoblastic Leukaemia, AML= Acute Myeloblastic Leukaemia, Chr. MF=Chronic Myelofibrosis, MM=Multiple Myeloma, MDS= Myelodysplastic Syndrome, BL=Burkitt's lymphoma.

Figure 1: Spectrum of Haematologic Malignancies in Northeastern Nigeria.

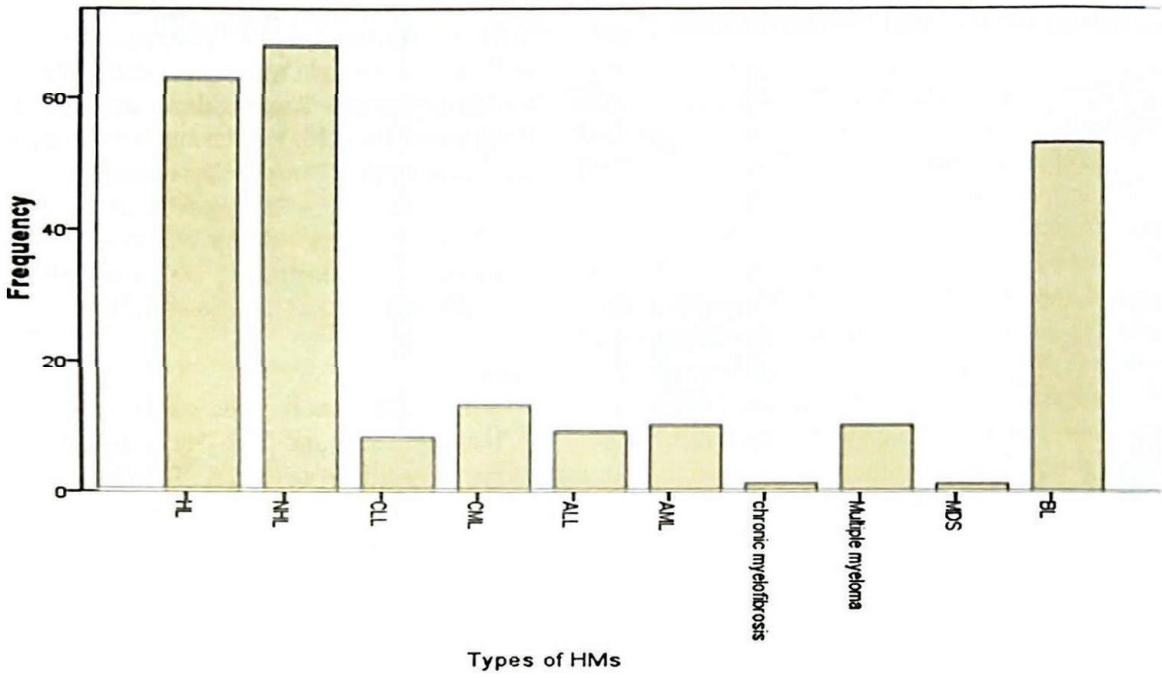

Table 2: Age ranged distribution of HMs at diagnosis

HMs	0-10 (years)	11-20 (years)	21-30 (years)	31-40 (years)	41-50 (years)	51-60 (years)	61-70 (years)	71-80 (years)	Total
HL	11	22	12	7	5	2	4	0	63
NHL	5	11	18	7	13	6	7	1	68
CLL	1	0	1	0	2	2	1	1	8
CML	1	0	2	6	4	0	0	0	13
ALL	1	5	2	0	1	0	0	0	9
AML	0	5	1	3	1	0	0	0	10
Chr. MF	0	0	1	0	0	0	0	0	1
MM	0	0	0	1	1	4	2	2	10
MDS	0	0	0	0	1	0	0	0	1
BL	42	9	2	0	0	0	0	0	53
Total	61	52	39	24	28	14	14	4	236

(5.5%), AML (4.2%) and MM (4.2%) and ALL (3.8%), CLL (3.4%) and MDS (0.4%) as well as Chronic Myelofibrosis (0.4%). Haematologic malignancies are more common in younger age group and also more common in males than females in this study (table 2). Hodgkin's Lymphomas are more common in patients aged 11-20 years (22.0%) whereas NHL and BL are commer in patients aged 21-30 years (16.5%) and 0-10 years (25.8%) respectively (table 2).The lymphoma incidence is low after 70 years in this study (table 2). According to the International Working Formulation, Diffuse, mixed small cleaved and large cell is the commonest histologic subtype (26.5%) followed by Immunoblastic large cell (16.1%) in NHL whereas according to WHO classification (2008), nodular sclerosis classical

Hodgkin's Lymphoma (NS-CHL) is the commonest (49.2%) histologic subtype followed by mixed cellularity classical HL (23.8%) and lymphocyte depleted CHL (14.3%) in this study (tables 3 and 4).

Table 3: Sex distribution of Non-Hodgkin's lymphoma by histologic subtype

Histologic Subtypes	Male	Female	Total
Small Lymphocytic/ Plasmacytoid	3	03	6
Follicular small cleaved	1	1	2
Follicular, mixed small cleaved and large cell	4	3	7
Follicular large cell	3	1	4
Diffuse small cleaved cell	2	1	3
Diffuse, mixed small cleaved and large cell	11	7	18
Diffuse large cell	5	1	6
Imunoblastic large cell	7	4	11
Lymphoblastic	4	0	4
Small, non-cleaved cell (Burkitt's, non-Burkitt's)	3	4	7
Total	43	25	68

Table 4: Sex distribution of Hodgkin's Lymphoma by Histologic Subtype.

Histologic Subtypes	Male	Female	Total
Nodular lymphocyte predominant HL	2(3.2%)	2(3.2%)	4(6.3%)
Lymphocyte depleted CHL	4(6.3%)	5(7.9%)	9(14.3%)
Nodular sclerosis CHL	23(36.5%)	8(12.7%)	24(49.2%)
Mixed cellularity CHL	12(19.0%)	3(4.8%)	15(23.8%)
Lymphocyte rich CHL	4(6.3%)	0(0.0%)	4(6.3%)
Total	45	18	63

The median Haematocrit, Total white cell count and Platelet count for patients with HL in this study was 36% ±6.57, 4.6 x10⁹/L ±2.10 x10⁹/L and 320 x 10⁹/L ± 109 x10⁹/L respectively. The 1 year survival for patients with HL and NHL was 15.9% and 7.4% respectively (table 5). The percentage of patients that died from NHL and HL before 1 year of diagnosis was 10.3% and 1.6% respectively whereas those that were lost to follow-up within 1 year of diagnosis for NHL and HL was 82.4% and 82.5% respectively (table 5). None of the patients with lymphomas were seropositive for the human immunodeficiency viruses and majority did not present with adverse prognostic factors. We found a strong association between cycles of chemotherapy given and survival in both NHL and HL patients (P-value=0.0001, table 6). All 10 patients with HL that survived 1 year after diagnosis received between 5-8 cycles of chemotherapy whereas 3 (4.4%) out of the 5 patients with NHL that survived 1 year after diagnosis also received between 5-8 cycles of chemotherapy (table 6). Six (9.5%) out of the 10 HL patients that survived had a stage I disease without risk factors, 2 (3.2%) had stage II without risk factors and 2 (3.2%) had advance stage III disease (p-value=0.02).

Discussion

Changing definitions, classifications and treatment of HMs has made the comparison of incidence, prevalence and survival outcomes across regions, between countries and even between treatment centers and cancer registries difficult. The results presented in this study are unique in the sense that it is the first documented report on the spectrum of HMs and survival outcomes of adult lymphomas in

Table 5: Sex and survival in patients with lymphomas at 1 year of chemotherapy

HMs				Sex Male	female	Total
HL	survival	Alive one year after diagnosis	Count	7	3	10
			% of Total	11.1%	4.8%	15.9%
		Died before one year of diagnosis	Count	1	0	1
			% of Total	1.6%	.0%	1.6%
		Lost to follow up within one year of diagnosis	Count	37	15	52
			% of Total	58.7%	23.8%	82.5%
	Total		Count	45	18	63
			% of Total	71.4%	28.6%	100.0%
NHL	survival	Alive one year after diagnosis	Count	2	3	5
			% of Total	2.9%	4.4%	7.4%
		Died before one year of diagnosis	Count	6	1	7
			% of Total	8.8%	1.5%	10.3%
		Lost to follow up within one year of diagnosis	Count	35	21	56
			% of Total	51.5%	30.9%	82.4%
	Total		Count	43	25	68
			% of Total	63.2%	36.8%	100.0%

Table 6: Cycles of chemotherapy and survival in patients with lymphoma.

HMs				Survival			
				Alive one year after diagnosis	Died before one year of diagnosis	Lost to follow up within one year of diagnosis	Total
HL	cycle 1	None	Count	0	0	35	35
			% of Total	.0%	.0%	55.6%	55.6%
		1-4 cycles	Count	0	1	17	18
			% of Total	.0%	1.6%	27.0%	28.6%
		5-8 cycles	Count	10	0	0	10
			% of Total	15.9%	.0%	.0%	15.9%
	Total		Count	10	1	52	63
			% of Total	15.9%	1.6%	82.5%	100.0%
NHL	cycle 1	None	Count	0	2	48	50
			% of Total	.0%	2.9%	70.6%	73.5%
		1-4 cycles	Count	1	4	7	12
			% of Total	1.5%	5.9%	10.3%	17.6%
		5-8 cycles	Count	3	1	1	5
			% of Total	4.4%	1.5%	1.5%	7.4%
		9.12 cycles	Count	1	0	0	1
			% of Total	1.5%	.0%	.0%	1.5%
	Total		Count	5	7	56	68
			% of total	7.4%	10.3%	82.4%	100.0%

Maiduguri, Northeastern Nigeria during the years 1998-2011. The haematologic malignancies represented 6.05% of all cancer cases seen and 0.31% of hospital admissions during the period under review. We therefore conclude that haematologic malignancies are not uncommon in our environment and that under-diagnosis during the early years due to lack of expertise might be responsible for the lower cases recorded. Now, with the increasing expertise in haematological care and diagnostic skills, the incidence and prevalence in subsequent studies may show an increased incidence rates comparable to works done elsewhere.

We observed a consistently male predominance of HMs in this study with a male to female ratio of 2:1.This finding agrees with both local and international studies [3,4,16,19,34] this is a well-known phenomenon and could be in part the result of lower exposure to environmental and occupational risk factors in women than men coupled with hormonal and genetic differences. Keeping in mind all possible biases (time frame, disease classification and quality of data reporting), Among the Haematologic malignancies, NHL was the most frequent with an incidence of 28.8 % while HL and BL had an incidence of 26.7 % and 22.5 % respectively. Both NHL and BL accounted for 51.3 % of all cases of lymphomas. This is similar to previous studies from developed countries and Africa [3-11, 16-18]. Although no case of HIV infection was seen in this study, other factors such as chronic antigenic stimulation and cytokine production together with persistent malarial infection and Epstein-Barr virus infection (EBV) may be responsible for the increasing incidence of lymphomas in our environment. Interesting observation in this study is that Hodgkin's Lymphomas are more common in patients aged 11-20 years whereas NHL and BL are commoner in patients aged 21-30 years and 0-10 years respectively. Burkitt's lymphoma accounts for 60% of childhood malignancies in Nigeria and is the most common childhood cancer in tropical Africa, where incidence is related to EBV and malaria [17]. Less developed countries continue to show high rates of lymphomas in young adults and decrease incidence after the age of 70 years as seen in this study and also reported in southern Nigeria [18]. This is not surprising because only few people in our population live beyond 70 years. Other reasons may be the differences in the geographical regions, environmental factors (burden of infections, exposure to pesticides) and broad range of genetic polymorphisms. The incidence of lymphomas has also been shown to vary according to the histologic subtypes.

We also observed that in NHL, the histologic subtype showing the highest incidence was found to be diffuse mixed small and large cell followed by Immunoblastic large cell lymphomas. This is similar to a study from southern Nigeria [18] but contrary to

some findings from a population based study from northern Italy and United States of America where diffuse large B-cell lymphoma (DLBCL) was found to have the highest incidence [9,13]. A higher proportion of diffuse large B-cell lymphomas and BL and a lower frequency of follicular lymphomas have been reported in developing countries in comparison with western series [2,35] Our inability to use immunohistochemical criteria to further characterize the lymphomas and the small number of cases seen may be responsible for the differences in the histologic subtypes reported. That Hodgkin's lymphoma is next to NHL in incidence as seen in this study agrees with both local and international studies [18, 35-40]. Both NHL and HL are more frequent in males than females and the characteristic bimodal age incidence for HL found in western world has not been seen in this study. By histological subtypes, Classical HL is the commonest followed by Nodular lymphocyte predominant HL and among the classical HL, nodular sclerosis is the commonest followed by mixed cellularity.

This is similar to western and industrialized countries [6,41]. Next in frequency after the lymphomas in this study was chronic myeloid leukaemia accounting for 5.5% of the haematologic malignancies reviewed and is commoner among males than females with a median age of 38 years (range, 5-47 years). Chronic myeloid leukaemia has an annual worldwide incidence of 1/100,000, with a male to female ratio of1.5:1 and the incidence tend to rise slowly with age to reach a median of about 60 years [42]. The median age of patients with CML in Nigeria and other African countries with a similar demographic pattern is 38 years [43-45]. This is similar to the work reported in Ilorin [16], North West Nigeria where CML also came third in distribution after the lymphomas with a frequency of 11.4% and also in Benin, Southern Nigeria where a frequency of 9.5% was reported for CML in the review of the epidemiology of haematological malignancies at the University of Benin Teaching Hospital [46]. Differences in frequency rates reported across the regions for the CML could be partly due to demographic pattern and the sample size. Chronic myeloid leukaemia was also found to be more common than CLL in this study. This is in agreement with studies from Africa [16,24, 47].

In Western countries however, CLL is reported to be the commonest type of leukaemia [48] Although CLL has been diagnosed in childhood [48] the only case reported within the age range 0-10 years in this study could as well be a case of small lymphocytic lymphoma (SLL) which is often misdiagnosed due to lack of immunophenotyping and immunochemical studies. Multiple myeloma (MM) and acute myeloblastic leukaemia both had a distribution frequency of 4.2 % each. The median age for MM in this study was 59 years (range, 38-78) and is more common in males than females. This is similar to previous study from South West Nigeria [25] but lower than what was reported in North West Nigeria [16]. Acute myeloblastic leukaemia (4.2 %) was more common than acute lymphoblastic leukaemia (3.8%) in this study. The median age for AML was 22 years (range 15-43) and for ALL was 17 years (range, 7-41).

This is in contrast with equal percentages of the leukaemia that was reported in North West Nigeria [16] and also ALL preponderance over AML in Southern Nigeria [46]. The differences in demographic pattern and the sample size could be responsible for the variations reported across the regions. Since all the local studies reported so far were hospital based, comparison between the local centers and with international studies can be difficult. There is therefore, strong need to conduct a population based epidemiological study on HMs in Nigeria. Chronic Myelofibrosis and MDS both had a lower frequency distribution of 0.4 % each in this study. Under-diagnosis during the early years due to lack of expertise might be responsible for the lower cases recorded.

The 1 year survival for NHL and HL observed in this study was significantly lower than that reported from other studies [16-20, 49]. Poor survival rates were also reported from Singapore and Dakar [50,51]. A recent study from Nigeria showed that non-compliance was the main reason (68 %) for the poor outcome of treatment of patients with lymphomas [52] Some of the reasons known to influence survival outcomes of lymphomas in Africa include high default rate, accessibility to treatment centers, availability of chemotherapeutic drugs, compliance to treatments, educational level of the patients, parents or guardians, the socio-economic status and the perception of services offered at the treatment centers. We also observed high default rates of 82.4 % for NHL and 82.5 % for HL in this study. The high cost of drugs was responsible for the high default rates observed in this study. This is similar to a study from South East Nigeria where high costs of drugs, drug scarcity and drug side- effects were reasons for the high default rates observed [52]. We also found a strong association between cycles of chemotherapy given and survival in both NHL and HL patients, p-value=0.0001. In as much as this is a good news, the high cost of drugs has been reported as one of the reasons for high default rates in Nigeria [17,52].

Conclusion

According to the WHO, Cancer fact sheet number 297, by 2020, demographic changes alone will result in an increase in the global cancer incidence and burden and the bulk of this is likely to occur in low-income and middle-income countries. This study has shown that haematologic malignancies are not uncommon in our environment and that under-diagnosis during the early years due to lack of expertise might be responsible for the lower cases recorded. Now, with the increasing expertise in haematological care and diagnostic skills across the country, the incidence and prevalence in subsequent studies may show an increased incidence rates comparable to works done elsewhere. We strongly recommend that cytotoxic drugs should be heavily subsidized and readily made available in cancer treatment centers across the country. And if possible, the National Health Insurance Scheme should make provision to include cancer treatment amongst its priority lists. There is also need to limit the observed high default rate through introduction of home visitation.

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