



The Pattern of Leukaemias among Adults in Jos, North Central Nigeria

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Abstract

Introduction: Leukaemias are haemopoietic malignancies classified into acute and chronic. Each of these two main groups is further divided into lymphoid or myeloid leukaemia depending on the cell of origin. Acute leukaemias are common in childhood while the chronic entities dominate the adult life.

Aim: This study aimed to determine the pattern of leukaemia cases seen in our setting.

Methods: All leukaemia cases seen in the Jos University Teaching Hospital, (JUTH), Jos: North Central Nigeria, from the year 2001 to 2016 were studied. Sociodemographic clinical and laboratory data of the patients were obtained from their case files. Data were analyzed using epi info statistical software.

Results: Two hundred and thirty one (231) adults were diagnosed of leukaemia over the study period, 120 (51.95%) males and 48.05% females, aged 18 and 85 years (mean 44.0 ± 17.2). Distribution leukaemia cases based on patient's age; showed peaks at age 30, 50 70 years. The lowest annual leukaemia capture were the years 2001 and 2010 while the highest rate of diagnosis was in 2014. The chronic and acute were respectively diagnosed in 64.1% and 35.9% of studied subjects. The frequency of individual cases was; CLL (32.5%), CML (31.6%), AML (19.0%) and ALL (16.9%). Acute myeloblastic, lymphoblastic and chronic myelocytic leukaemia showed overall increase with increasing patient's age over twelve years. The rate of diagnosis of chronic lymphocytic leukaemia however tended to decline from a recorded peak in 2013. Leukaemia in adults was highest in the age group 20-40 years, followed by aged 40-60, 60-80, 18-20 years and least in 80-100 years respectively.

Conclusion: Acute leukaemias may be commoner in adults below 40 years while the chronic disorders are commoner in those above 40 years with the age of 30, 50 and 70 years at increased risk.

Keywords: Pattern; Adult; Leukaemia; Nigeria

Introduction

Leukaemias are a heterogeneous group of haemopoietic stem cell malignancy characterized by clonal proliferation and accumulation of neoplastic haemopoietic cells in the marrow, spillage of the cells into the peripheral circulation and infiltration of organs [1]. The cardinal features of leukaemia are due to neoplastic marrow infiltration, marrow failure, organ infiltration and hypermetabolism [1,2]. Leukaemia affects all age groups without significant gender predilection. Acute leukaemias are found dominantly among children, though a higher proportion of Acute Myeloblastic Leukaemia (AML) are in adults and the elderly, while chronic leukaemias occur mainly in the adult age and the elderly [1,3].

A report from work done in the Niger Delta region of Nigeria between 1997 and 2003 show that Chronic Myelocytic Leukaemia (CML) accounted for 33.3% of adult leukaemias, establishing the relationship between one year survival in CML and Chronic Lymphocytic Leukaemia (CLL) to the total White Blood Cell Count (WBC) [4]. Nwannadi et al. [5] studying the characteristics of patients with leukaemia in the South South Nigeria between 1999 and 2008 found a 52.1% prevalence of the disease among the male sex. They also documented various mean age of occurrence of different types of leukaemia; Acute Lymphoblastic Leukaemia (ALL) at 4.4 years, AML at 25.6 years, CML at 35.2 years and CLL at 57.1 years [5]. The symptoms of disease documented in the patients were fever (78.5%), weakness (82.2%), weight lost (54.6%) and bone pains (31.9%). Major clinical signs recorded in their study were pallor, splenomegaly and hepatomegaly [5]. A study from Ilorin, Nigeria, described the pattern of Haematologic Malignancies (HM) seen in the Teaching Hospital,

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Table 1: Gender distribution of leukaemia cases.

Diagnosis	Male (%)	Female	Total(%)
ALL	24 (20.0)	15 (13.5)	39 (16.9)
AML	23 (19.2)	21 (18.9)	44 (19.1)
CLL	26 (21.7)	47 (42.3)	73 (31.6)
CML	47 (39.2)	28 (25.2)	75 (32.4)
Total	120 (51.9)	111 (48.1)	231 (100.0)

Abbreviations: ALL: Acute Lymphoblastic Leukaemia; AML: Acute Myeloblastic Leukaemia; CLL: Chronic Lymphocytic Leukaemia; CML: Chronic Myelocytic Leukaemia

as leukaemias (26.6%), ALL (4.9%), AML (5.5%), CLL (5.4%) and CML (11.4%) [6]. Omoti studying adult leukaemia in Benin City of Nigeria, found that CML accounted for 27.7%, while CLL and Prolymphocytic Leukaemia (PLL) were each responsible for 21.3%. They also noticed increasing cases of leukaemia among the youth aged 21 to 40 years [7]. Omoti, in another study; found that AML occurred mainly below the age of 19 years while CML was reported in patients aged 20 to 39 years. AML M4, ALL-L1 and ALL-L3 were the commonest morphologic diagnosis made on review of well-prepared blood and marrow films [8]. Adedeji, in his study of acute leukaemia in adults of Benin City, showed a 51.2% prevalence of AML and ALL (23.1%) affecting more males [9]. ALL was found in patients predominantly between the ages of 21 and 30 years. Commonest presentation occurring in 77.3% of patients with AML was anaemia while fever and night sweat were predominant (in 80% of Patients) symptoms present in those with ALL [9].

In Ethiopia, Shamebo reported the median age of 29.6 years for patients diagnosed of adult acute leukaemia with greater male affectation. He observed a higher prevalence of AML (53.7%) compared to 46.3% ALL [10]. He found that anaemia, fever, bleeding and splenomegaly each occurred in higher frequency among patients with ALL, and generally, haemoglobin and platelet counts were low at diagnosis while leucocytes counts were high [10]. There was a high rate of patient lost to follow up, while sepsis and haemorrhage were the leading causes of death in their patient series [10]. In an earlier study on adult leukaemia in Ethiopians, 180(2.3%) of all hospital admissions were for leukaemia with a 2.3:1 male to female ratio [11]. The observed prevalence were 57.8%, 21.1% and 21.1%; CML, CLL and acute leukaemias (46.7% AML and 53.4% ALL) respectively [11]. Another study in Blantyre, Malawi, between 1994 and 1998, Mukiibi et al. [12] found 95 cases of leukaemia with 27(28.4%) occurring within age 0 to 15 years, while 71.6% were in patients aged greater than 15 years. Patients with CLL had lymphadenopathy in 63.6% and splenomegaly (59.1%) while abdominal swelling was observed (87.5%) of patients with CML [12].

Khan and his colleagues reported on leukaemia cases in Central Hospital Ryadh, Saudi Arabia, between 1981 and 1988 and documented a prevalence of 0.13% leukaemia among their patients. ALL was commoner in childhood, CML in adult and CLL predominates the elderly with leukaemias [13]. Hassan and others in their study on the morphologic pattern of 234 cases of leukaemia, reported the prevalence of 62.8% for acute leukaemias and 37.2% for chronic leukaemias while lymphoma leukaemia cases were uncommon [14]. They also documented AML commoner than ALL with a ratio of 2.5:1 in adults and 1:3 in children [14]. In a large Poland epidemiologic study between 1963 and 1990, Kwatkowski reported on 38,200 patients with leukaemia. He found that 50% of cases were acute leukaemias, 25% CLL and 15% CML with 10% of undefined

leukaemias [15].

Leukaemias have not been sufficiently studied in our centre even though an earlier study by Egesie et al. [16] in Jos University Teaching Hospital, Identified acute leukaemia as the cause of anaemia warranting bone marrow aspiration. This was supported later by Damulak and colleague who studied the diagnostic outcome of bone marrow aspiration in a new centre in Jos and documented a 28.6% cases of leukaemias as outcome of cytologic bone marrow evaluation [3]. Leukaemia contributes to the significant 13.5% per 100000 men and women per year burden of cancers with a high annual death rate in the United State [17]. There is need to study the leukaemias seen in our setting to generate baseline data considering the regional variability in environmental factors that are associated with the development of leukaemias.

Aims

This study sought to determine the pattern of leukaemias among adults seen in the Jos University Teaching Hospital, Jos, Nigeria. The findings from this research would warrant recommendation that could form the bases for a compact health planning and development strategy that would accommodates adequate care for patients with leukaemia.

Materials and Methods

This study was a retrospective study of all leukaemia cases seen among adults at the Jos University Teaching Hospital, (JUTH), Jos: North Central Nigeria, from the year 2001 to 2016. The study site serves as a training institution and referral centre for secondary and primary health institutions within the north central geopolitical zone of the country. Jos is strategically located on the major rail and road routes connecting the northern and southern parts of Nigeria. Sociodemographic data of the patients (age, sex, highest educational qualification and occupation) were obtained from their case files). The clinical features and other indications for bone marrow evaluation and diagnosis were also sourced from records in the case notes and the haematology department of the hospital. Diagnoses were extracted from reports of examined well prepared Romanosky stained blood and bone marrow aspiration films. Data were analyzed using epi info statistical software. Facilities for cytochemistry, immunohistochemistry and cytogenetic studies which improved diagnosis, disease classification, prognostication targeted treatment monitoring are not available.

Ethical clearance for this work was obtained from the ethical unit of the Jos Universiyy Teaching Hospital (JUTH), Jos while permission to use patient's information was sought from the department of Haematology and Blood Transfusion of the hospital. There is no conflict of interest involving any of the authors in this work what so ever.

Results

Two hundred and thirty one (231) adults were diagnosed of leukaemia over the study period of 15 years (2001 to 1016). One hundred and twenty (51.95%) of the cases were males while 48.05% were females. The gender distributions of leukaemia did not vary significantly ($P = 0.09$), although higher figures were recorded in the male sex except for CLL (Table 1). The ages of leukaemic patients ranged between 18 and 85 years with a mean age of 44.0 ± 17.2 years. There is no consistent distribution leukaemia cases based on patient's age; however an early peak occurred at age 30 and a second and

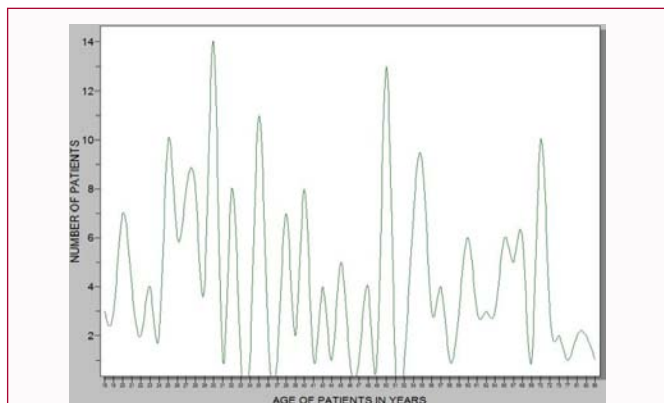


Figure 1: Distribution of leukaemia patients by age.

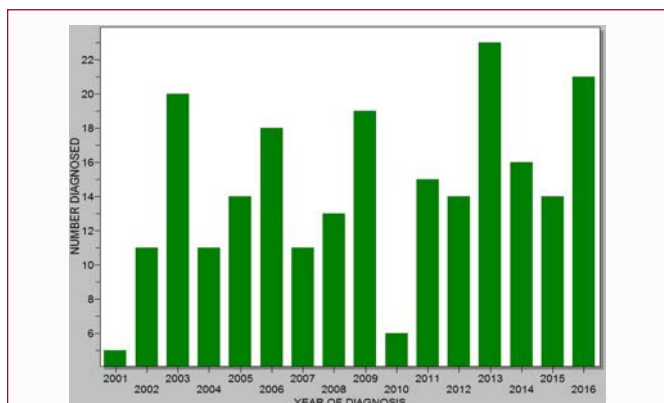


Figure 2: Distribution of all leukaemia cases by year of diagnosis.

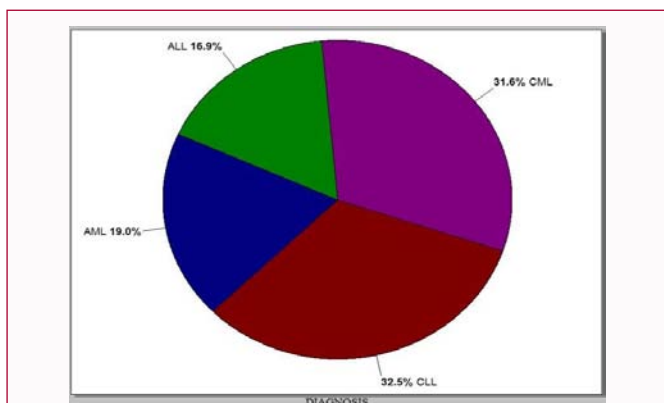


Figure 3: Types of leukaemia diagnosed. ALL: Acute Lymphoblastic Leukaemia; AML: Acute Myeloblastic Leukaemia; CLL: Chronic Lymphocytic Leukaemia; CML: Chronic Myelocytic Leukaemia

third at 50 and 70 years (Figure 1). Thirteen (5.6%) were without any formal education while 11.3%, 44.1% and 39.0% attained primary, secondary and tertiary education respectively. Higher proportion of the patients with leukaemia were self-employed (19.5%), unemployed 42(18.2%), 41(17.8%) students and farmers constituted 16.0%. The minority populations; 9.1%, 7.4% and 3.5% respectively were health workers, teachers and the military/related security agents while other occupations constituted 8.7%.

There is also no consistent rate of the annual diagnosis of leukaemia in our findings. The lowest annual leukaemia capture were the years 2001 and 2010 while the highest rate of diagnosis was in 2014 (Figure 2). The chronic leukaemias affected 148(64.1%) while acute

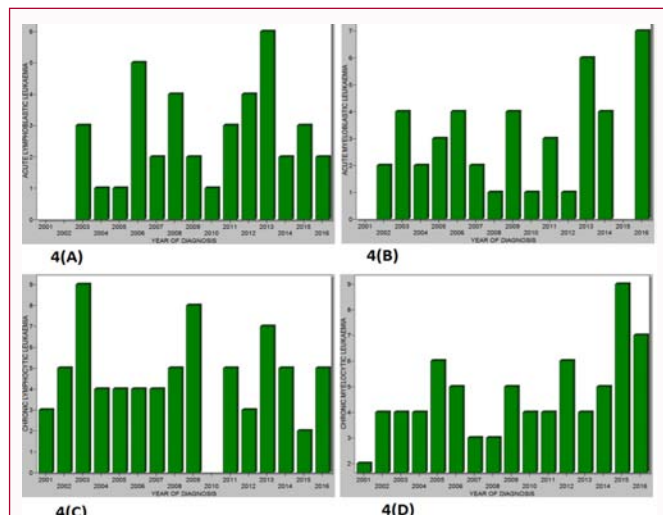


Figure 4:(A) Yearly cases of acute lymphoblastic leukaemia diagnosed; (B) Acute myeloblastic leukaemia by year of diagnosis; (C)Yearly cases of chronic lymphocytic leukaemia; (D) Distribution of chronic myelocytic leukaemia by year of diagnosis.

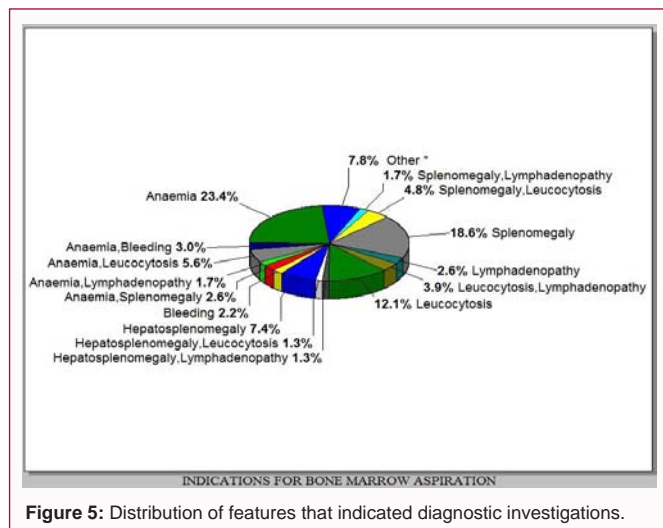


Figure 5: Distribution of features that indicated diagnostic investigations.

leukaemia was diagnosed in 83(35.9%) of studied subjects. Overall, the commonest leukaemia was CLL affecting 32.5% of our subjects closely followed by chronic myelocytic leukaemia (31.6%) while acute myeloblastic leukaemia and acute lymphoblastic leukaemia respectively affected 19.0% and 16.9% (Figure 3).

Acute myeloblastic and lymphoblastic leukaemias both showed overall increase with increasing patient's age over twelve years (Figures 4A and B). The incidence of acute lymphoblastic leukaemia declined thereafter while acute myeloblastic leukaemia continued to increase with further increasing age. The yearly incidence of chronic myelocytic leukaemia also showed evident of increase over the period under review (Figure 4C). The rate of diagnosis of chronic lymphocytic leukaemia however tended to decline from a recorded peak in 2013 (Figure 4D). Figure 4 has been presented a, b, c and d for the purpose of clarity of this this work.

Leukaemia in adults was highest in the age group 20-40 years, followed by aged 40-60, 60-80, 18-20 years and least in 80-100 years respectively (Table 2). Further analysis of our subjects revealed that between the ages of 18 and 20years, 61.6% had acute leukaemias (ALL (38.5%) and AML (23.1%)) and 38.5% had chronic leukaemias

Table 2: Distribution of all leukaemia cases by age groups

	Age Groups (years)							TOTAL
	18-20	21-40	18-20	21-40	41-60	61-80	81-100	
Diagnosis	No (%)	No (%)	No (%)	No (%)	No (%)	No (%)	No (%)	No (%)
ALL			5 (38.5)	23 (22.1)	8(12.1)	3 (7.0)	0 (0.0)	39 (16.9)
AML			3 (23.1)	21 (20.2)	9(13.6)	9 (20.9)	2 (40.0)	44 (19.0)
CLL			2 (15.4)	7 (6.7)	37(56.1)	27 (62.8)	2 (40.0)	75 (32.5)
CML			3 (23.1)	53 (51.0)	12 (18.2)	4 (9.3)	1 (20.0)	73 (31.6)
Total			13(100.0)	104(100.0)	66(100.0)	43(100.0)	5(100.0)	231(100.0)

Abbreviations: ALL: Acute Lymphoblastic Leukaemia; AML: Acute Myeloblastic Leukaemia; CLL: Chronic Lymphocytic Leukaemia; CML: Chronic Myelocytic Leukaemia

between the ages of 18 and 20 years. Between the ages of 21 and 40 years, chronic leukaemias are responsible for 57.7%; CML (51.0%) and CLL (6.7%) of the disorders. In this study, the acute leukaemia was more pre. valent (51.95%) than its chronic counterpart (48.10%) in adult patients below 40 years (Table 2). The rate of chronic leukaemia peaked in the patients between the ages of 41-60 years (74.3%), then declined to 72.1% and 60.0% in those aged 61-80 and 81-100 years respectively maintaining its dominance over the acute leukaemia (Table 2).

The features associated with leukaemia that warranted diagnostic investigations were; anaemia found in 36.3% of subjects (anaemia alone in 23.4% while with other features in 12.9%), leucocytosis affecting 25.7% of all cases, lymphadenopathy (11.2%), splenomegaly (32.9%), bleeding (5.2%) while hepatomegaly occurred only in the presence of other features in 10.0% of cases (Figure 5).

Discussion

The mean age (44.0 years) of leukaemia patients in our setting is lower than 52.1 years earlier reported in the South region of Nigeria [5]. This difference may be due to early development of western civilization with better economic opportunities, health care and a resultant longer life expectancy in the South part of our country. Home to the crude oil deposit of Nigeria, this region may have higher volume and profitable ventures to the resource empowerment of the locals. The low life expectancy of Nigerians may well explain the lower mean age of 44.0 years for all leukaemias documented in this study since the older population keeps reducing. The mean age of leukaemia patients in both ours and the South report differ from that of Shemabo et al. [10] in Ethiopia where a lower mean age of 29.6 years was documented for adult acute leukaemia. The difference is attributable to their study subjects that were limited to acute leukaemia cases. There is need to replicate the East African study in the West African region to confirm or refute their report.

A minority (39.5%) of our patients attained tertiary education while the larger group had no formal, only primary or at best secondary education. This general low educational level of leukaemia patients is a reflection of decades of low school enrolment and educational apathy among the populace. Affordable education will increase educational level of the people, enhanced awareness and positive individuals and societal attitude to health. A little more than half of our patients were not gainfully employed, implying the low employment rate and prevalent poverty which might have influenced hospital presentation for evaluation of early symptoms. The fewer income earners seen in these patients suggest that a number of patients might not have presented at all for medical evaluation. There is need for government at all levels to provide free care for patients

with leukaemia. The inclusion of medical services for leukaemia patients under the coverage of the national health insurance scheme needs urgent attention.

The gender distribution of adult with leukaemia in our setting show male preponderance similar to earlier documentations of Groves et al. [18]. Overall, the chronic leukaemias dominate the acute forms in our adult population (Figure 3), similar to earlier documentations in Poland [19]. The dominance of crude acute over crude chronic leukaemia in patients between the ages of 18-40 years is however evident in this work. The increasing trend in incidence observed for acute leukaemias and chronic myelocytic leukaemia in the face of a declining proportion of chronic lymphocytic leukaemia in this study is worth noting (Table 2). The higher prevalence of AML over ALL recorded in our study concurs with the report of Paul and others in Zimbabwe who classified their acute leukaemia using traditional staining and cytochemistry [19]. It may no longer be true that acute leukaemia only dominates in childhood as documented earlier [2]. While there is need to confirm these findings in subsequent studies, we opined that adequate planning, budgeting and investment of resources into the care for patients with leukaemia particularly the acute forms that dominates the first four decades of life in this study will be beneficial. Further research to evaluate current environmental factors that may associate with leukaemias should include insensible radiations from telecommunication masks for example. There is need to increase the scope of evaluation of leukaemia cases to include cytochemistry, and cytogenetic studies for superior characterisation, prognostication and specific intervention.

Leukaemia in adults seems to have three peaks in our environment, the first and highest is observed among patients aged 30 years, a second lower and the third in those aged fifty and seventy years (Figure 1). This pattern of adult leukaemia with peaks at patient aged 30, 50 and 70 years (every two decade span of life) is strange to us and we are not aware of any such earlier description. Though this pattern may not be fully explained, the multi-hit phenomenon in the evolution of leukaemia may be significant or have significant clinical effects in a score of years in the life of human [2]. This observation may require further and larger studies considering all leukaemia cases for collaboration with our observation.

The variability in our incidence of leukaemia may be a reflection of the frequent industrial unrest in the health sector, since fewer patients will be seen at such periods (Figure 2). Ethnoreligious crisis that persisted in our part of the country might have affected negatively, on patients turnover, influencing the incidence of leukaemia also. There is need to ensure stability in our health sector respect for peaceful coexistence for continuous smooth quality service delivery with the opportunity of data capturing of leukaemia and other disorders still

poorly documented.

The age groups of our adult patients with leukaemia showed the highest disease burden in the age range of 20-40 years (Table 2). This finding is supported by the initial observation in this study that leukaemia in adults peaked first at the age of thirty years. It is further collaborated by the study of Omoti et al. [7] in south-south Nigeria, who documented increase cases of leukaemia in adults aged 21-40 years.

The proportion of chronic leukaemias (64.1%) recorded in this study (Table 2) is similar to 70.3% earlier reported by Omoti et al. [7] in Benin city but lower than 78.9% chronic leukaemia earlier reported by Shemabo [11] in Ethiopia, suggesting a possible regional variability in the incidence of leukaemia. The dominance of CLL over CML in our study despite its declining trend is similar to a study reported by Brincker and colleagues [20] who found a 38% and 15% CLL and CML respectively among their adults (mean age 67 years) with leukaemia in the review of 1973-1976 in Danish Cancer Registry, suggesting a long term stability in the prevalence of chronic leukaemias. Chronic leukaemias being indolent diseases may be captured more, if the index of suspicion is improved by training and retraining, complimented with the development of appropriate intra and inter hospital referral network. The proportions of acute leukaemias in our study and that of Benin are however higher than that of Ethiopia suggesting a likely higher rate of aggressive disease in our region [11].

The indications for investigations that led to the diagnosis of leukaemias in our patients were familiar features associated with this category of malignancies. Although major features of leukaemias such as anaemia, splenomegaly, leukocytosis, bleeding and lymphadenopathy were observed respectively in decreasing frequency order, bone pain and fever were rare (Figure 5). The features of leukaemias have been linked to suppression of normal haemopoiesis, increase cellular proliferation and spillage of clonal cells into circulation as well as organs infiltration. Bone pain in leukaemia has been linked to stretching of the periosteum while fever and pruritus are linked to hypermetabolism and infections due to secondary immunosuppression [21,22].

Conclusion

Leukaemia among adult in Jos may have two patterns of age distribution with acute leukaemias being commoner in adults aged 40 years and below, while the chronic disorders are commoner after the age of 40 years. It is also concluded that the age of 30, 50 and 70 years may be the ages at increased risk for leukaemia. We further conclude that all types of leukaemia in our setting except chronic lymphocytic leukaemia affect the male more than the female. That the incidence of chronic lymphocytic leukaemia is seemingly declining while the acute leukaemia is probably increasing among our adult population.

Recommendation

We recommend the application of identified clinical and laboratory features related to leukaemia in patient classification and appropriate referrals for proper diagnosis and intervention. The higher rate of acute leukaemia in economically productive adults require a robust health care system that provide adequate supportive and definitive treatment as adult patients aged below 40 years stands transplant conditioning better than those at the extremes of life. This data should further influence policy makers in planning for the future management of these potentially curable diseases that presently

constitute a major drain on our national purse via medical tourism to other countries of the world with better health care system. Further studies may collaborate our finding and provide additional valuable information on leukaemias in the adult age.

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