ADULT LEUKAEMIA IN THE NIGER DELTA REGION OF NIGERIA

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ABSTRACT

Objective: To determine the incidence and survival of patients with Leukaemia in the Niger Delta region of Nigeria, noted for its petrochemical industries.

Design: A prospective study of 120 cases of leukaemia from December 1993 to 2003.

Setting: University of Benin Teaching Hospital, Nigeria.

Main Outcome measures: Demographic and clinical information including duration of illness before presentation was obtained by oral interview.

Results: Chronic Myeloid Leukaemia (CML) was the most frequent subtype (33.3%). There was a strong association between the white blood cell count at presentation and 1 year survival in CML and CLL patients (p= 0.0001). The 2-year survival for CML, CLL and PLL was 12.5%, 40% and 32% respectively. Duration of illness before presentation was found to influence 1-year survival in CML (p=0.0075) and CLL (p= 0.0001).

Conclusion: The 2-year survival is still very poor and this may not be unconnected with late presentation and other strong limiting factors.

KEY WORDS: Leukaemia, incidence, survival

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INTRODUCTION

Leukaemias are a group of heterogenous neoplastic disorders of white blood cells whose aetiology is still obscure although the role of ionizing radiation and benzene in the development of leukaemia is well known.[1] The occurrence of leukaemia is worldwide and there is no doubt that adult leukaemia in Africa occurs as often as it does in the Caucasian.[2] The epidemiological features of leukaemia in Africans suggest a role for the influence of lifestyle in leukaemogenesis while the clinical patterns of these disorders suggest that the biological characteristics differ from those of similar diseases in the Western world.[3] Also, there is a decline in mortality and higher probability of survival for leukaemia patients in the Western world due to advanced novel therapy protocol and wider use of diagnostic tools for early diagnosis when it is most treatable.[4] However, this cannot be said for developing countries.

In the last two decades, the incidence and survival of leukaemia patients in the Niger Delta region has not been studied. It becomes necessary because of the increasing westernized mode of behavior and industries being constructed. We therefore aim to determine the incidence of the various types of leukaemia seen in this region and the epidemiological analysis of survival for the various leukaemias.

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PATIENTS AND METHODS

All cases of adult leukaemia seen at the University of Benin Teaching Hospital, Edo state, a major referral center serving the Niger Delta region of Nigeria from December 1993 to November 2003 were reviewed. Clinical and demographic information of 120 patients who required hospitalization were obtained after informed consent and Ethical Committee approval of the hospital. These include the age, sex, marital status, occupation and educational status including the duration of illness.

On admission, blood samples were collected for haematological parameters like full blood count, which was done using Automated Coulter Counter. Diagnosis was established based on clinical information and cytological features of well-stained (leishman) peripheral blood smears and bone marrow aspirates. The criteria for the diagnosis of prolymphocytic leukaemia (PLL) was according to Melo et al.[5] One year survival was calculated using simple percentage of those alive and those that died before 1 year of diagnosis. Only patients aged 18 years and above were included in this study.

Data Analysis: The data obtained from this study was analyzed by computer using the Instat package system. The statistical methods applied include frequency counts and cross tabulations using Yates correction whenever necessary. The haematological indices were estimated using the Mann-Whitney and one-way analysis of variance (ANOVA) for significant association with the various leukaemia subtypes.

RESULTS

A total of 120 patients aged 18-72 years with a diagnosis of either acute or chronic leukaemia were established based on the cytological-clinical criteria over a ten-year period (1993-2003). This comprises of 42 males and 78 females with a male-to-female ratio of 1:1.9.

Among the various types of leukaemia, chronic myeloid leukaemia (CML) was the most frequent with 33.3%, followed by chronic lymphocytic leukaemia (CLL) and prolymphocytic leukaemia (PLL) with an incidence of 20.8% each (table-I). The incidence of acute myeloid leukaemia (AML) was 16.7%

Table-I: Frequency distribution, age and sex of leukaemia at the time of diagnosis

	Leukaemia Type				
Variables	*CML* *n = 40*	*CLL* *n=25*	*PLL* *n=25*	*AML* *n=20*	*ALL* *n=10*
Age (years)	38.8(±15.4)	57.0(±10.7)	53.3(±10.3)	26.7(±8.24	24.0(±4.0)
Sex (M:F)	20:20	5:20	8:17	5:15	7:3
Incidence (%)	33.3	20.8	20.8	16.7	8.3

Table-II: Haematological indices of the leukaemias at the time of diagnosis

(g/dl)	*Haemoglobin* *(x 10^9/l)*	*Total leucocyte count* *(x 10^9/l)*	*Platelet count*
CML	7.0(±1.7)	578(±223)	463(±202)
CLL	6.0(±2.1)*	135(±95)	237(±105)*
PLL	8.1(±3.1)	57(±46)	113(±52)
AML	6.5(±1.1)	13(±6.0)	67(±56)
ALL	7.4(±1.8)	24(±13)	53(±19)

* r = 0.3765; p = 0.0643

while that of acute lymphoblastic leukaemia (ALL) was 8.3% as shown in table-I. The mean ages at presentation for the various leukaemia types are also shown in table-I. A female preponderance (F:M) of 4:1, 2:1 and 3:1 was found for CLL, PLL and AML respectively while a male preponderance (M:F) of 2.3:1 was found for ALL.

The mean haematological values of haemoglobin (Hb), white blood cell count (WBC) and platelet count at presentation are shown in table-II. In CLL a positive correlation between the Hb and platelet count at presentation was obtained ($r = 0.3755$; $p = 0.0643$). We found a strong association between the WBC at presentation and 1-year survival in patients with CML and CLL ($p = 0.0001$). Also, the mean platelet count for CML patients alive at 1 year was significantly lower than those that died within 1-year ($p = 0.0112$) while it was significantly greater for those alive in CLL patients ($p = 0.0192$). The 1-year survival for patients with CML, CLL and PLL was 37.5%, 64% and 72% while the 2-year survival was 12.5%, 40% and 32% respectively. The haematological values at presentation were found to influence the outcome of survival after chemotherapy was started (table-III). The duration of illness before presentation was also found to influence the 1-year survival as shown in figure-1. The 1-year survival was significantly better for patients with shorter duration of illness compared to those with longer duration of illness before presentation; for CML ($p = 0.0075$) and for CLL ($p = 0.0001$).

DISCUSSION

The incidence of leukaemia in adults in the Niger Delta region of Nigeria which is known for its petrochemical industries is of importance as this study forms a baseline data for Environmental Impact Assessment for the communities in the oil producing states. The health status of these people is of great medical and socio-economic significance since they live close to the oil fields and gas flare sites. The occurrence of leukaemia is worldwide but there are considerable differences in the recorded incidence in different geographic areas. In general it has been reported that African countries report low leukaemia rates[6] except in the last two decades where there is no doubt that adult leukaemia in the African occurs as often as it does in the Caucasian.[1,7]

The most frequent leukaemia subtype was the CML (33.3%) with a mean age of 38.8 years and equal number of patients in both sexes. This is similar to the finding of more than two decades ago in the same institution.[7] This inci-

Table-III: The mean total leucocyte count and platelet counts in chronic leukaemia at presentation and outcome at one year of therapy

		Outcome		
Parameters		*Alive*	*Dead*	*p value*
CML		n =15	n = 15	
	WBC ($x10^9/l$)	255 (±228)	661 (±194)	0.0001
	Platelet count ($x10^9/l$)	317 (±192)	492 (±158)	0.0112
CLL		n = 16	n = 6	
	WBC ($x10^9/l$)	38 (±43)	237 (±120)	0.0001
	Platalet count ($x10^9/l$)	196 (±95)	95 (±16)	0.0192
PLL		n = 18	n = 7	
	WBC ($x10^9/l$)	73 (±49)	83 (±28)	ns
	Platelet count ($x10^9/l$)	143 (±14)	87 (±17)	ns

dence and age distribution in CML was also similar to a previous study in Ibadan, a large urban center in South-Western rain forest area of Nigeria.[8] Some important differences in geographic, racial/ethnic, age and trend patterns have also been identified with different aetiologic factors.[9] In the Western countries however, CML accounts for 20% of the leukaemia subtype while CLL accounts for 25% of cases.[10]

The next most frequent leukaemia subtype was CLL and PLL with an incidence of 20.8% each while AML and ALL had an incidence rate of 16.7% and 8.3% respectively. That leukaemia occurs more frequently in males had been reported[11] but there was a frequent occurrence in females with a female-to-male ratio of 4:1, 2.1:1, 3:1 for CLL, PLL and AML in that order. Only ALL had a male preponderance, which is known to have poor prognosis. The age range in these series agrees with previous studies except for CML. CML is generally a disease of middle age with an incidence in the 4th and 5th decade of life.[12] The peak age distribution of 20-39 years observed in this study agrees with the earlier incidence of 20-40 years reported in Lagos, Nigeria.[13] The difference in the age incidence observed in Nigerians when compared to the Western countries may be due to the interplay of both environmental (urbanization and industrialization) and racial factors.[14]

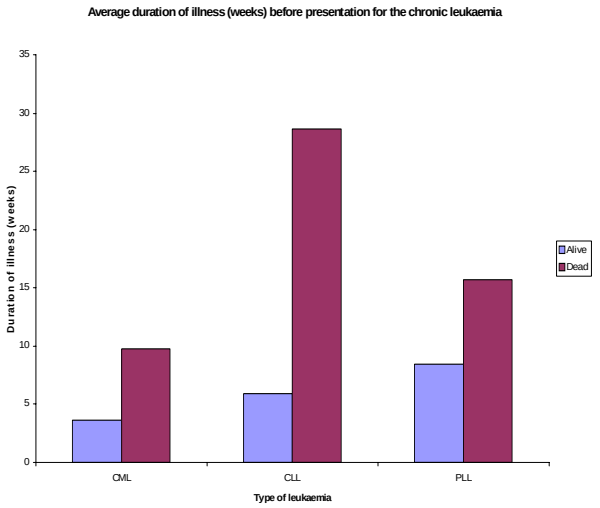

Figure 1: Average duration of illness (weeks) before presentation for the chronic leukaemia. Abbreviations-CML:Chronic myeloid leukaemia; CLL: Chronic lymphocytic leukaemia; PLL: Prolymphocytic leukaemia

In this study, majority of the patients (86.7%) at the time of diagnosis had haemoglobin of less than 10g/dl. This is not surprising because anaemia has been known to be a common finding in haematological malignancies including leukaemia. The probability of occurrence of anaemia in cancer patients depends on a number of variables.[15] These include the type, stage and duration of the malignancy, intensity of treatment protocol and the occurrence of intercurrent infection.

A considerable number of the patients presented with the expected haematological counts. Expectedly, in CLL a positive correlation between the Hb at presentation and platelet count was obtained ($r = 0.376$; $p = 0.064$). Patients with a higher WBC had a significantly lower remission rate with a poor outcome. This was shown in the strong association between the WBC at presentation and 1 year survival in patients with CML and CLL ($p = 0.0001$). Also, the mean platelet count for CML patients alive at 1 year was significantly lower than those that died within 1 year ($p = 0.0112$) while for CLL patients alive, the platelet count was significantly higher than those that died ($p = 0.0192$).

We also found in this study that the 1 year overall survival for patients with CML, CLL and PLL was 37.5%, 64% and 72% while the 2 year survival was 12.5%, 40% and 32% respectively. The better outcome of CLL and PLL was not unexpected, as they are known to be indolent diseases. However, this is still poor when compared with Western outcome as the 5 year survival could not be estimated because the patients did not live up to this number of years as well as poor follow up. The poor 2 year survival observed in our chronic leukaemia probably underscores the lack of access to high-tech treatment as seen in the technologically advanced world. For the acute leukaemia the survival was even the worst as only 6 months survival could be estimated. This is similar to the finding in Kenya.[16] Without treatment, all forms of leukaemia are invariably fatal; the

average survival of untreated acute leukaemia patients is said to be about 3 months and this could explain the fatal outcome. When all leukaemias are lumped together, the global 5 year survival is 20%.[17] In developed countries, 31% survive for 5 or more years compared with 15% in developing countries.[17]

The success rate for leukaemias in our environment is still poor irrespective of the biological subtypes. Factors responsible for this include late presentation of disease due to poverty, illiteracy and ignorance, unavailability of drugs, high cost of therapy and often times lack of supportive blood components. This was reflected in the average duration of illness before presentation where it was found to significantly influence the survival in each patient. The shorter the duration of illness before presentation, the better the outcome in chemotherapy-treated patients. The average duration of illness before presentation for those alive at 1 year for CML, CLL and PLL was 3.6, 5.9 and 8.4 weeks while for those dead it was 9.7, 28.7 and 15.7 weeks respectively. This further emphasizes that early presentation and prompt diagnosis with rapid implementation of adequate treatment will improve the survival outcome of the patients.

In conclusion, we studied the incidence of leukaemia in the Niger Delta region of Nigeria over a ten-year period. We found that CML is the most common subtype. A positive correlation between Hb and platelet count at presentation for CLL patients was found. Also, we found a positive correlation between survival and duration of illness at presentation and haematological counts (WBC and platelet count) at presentation. The two year survival is still very poor and this may not be unconnected with late presentation and other strong limiting factors.

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