

Original Article

Prevalence and Nature of Adult Hematological Malignancies Using Bone Marrow Aspiration Cytology in a Tertiary Health Facility: A Seven Year Retrospective Review

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ABSTRACT

Bone Marrow Aspiration (BMA) is a procedure that is often used to evaluate patients with haematological disorders including haematological malignancies (HMs) which account for about 6.5% of all cancers worldwide. There is paucity of data on the prevalence and pattern of HMs from BMA cytology in Nigeria. We carried out a retrospective review to determine the prevalence and distribution of HMs among adult patients who had BMA cytology at Benue State University Teaching Hospital (BSUTH) from June 2012 to July 2019. A total of 158 BMA reports extracted from the marrow and clinic medical records were reviewed. Out of 158 adult BMA cytology reports, HMs accounted for 78(49.4%) of all haematological disorders. There was no significant gender difference. The Male 38(48.7%) to Female 40(51.3%) ratio (M:F) was 1:1.1. Their ages ranged from 16 to 85 years with the median age of 54.0 years. Out of the 78 HMs, Lymphoid neoplasms were the most prevalent 47(60.3%), the leukaemias were higher 53/78(67.9%) compared to the non-leukaemic neoplasms. Of the 53 leukaemias, those of chronic lymphoid types were more 24/53(45.3%), followed by the chronic myeloid 15/53(28.3%). Chronic lymphocytic leukaemia (CLL) was the predominant leukaemia 24/53(45.3%) as well as the most prevalent HM 24/78(30.8%), followed by chronic myeloid leukaemia (CML) 19.2%(15/78). Others were myelodysplastic syndrome (MDS) 11.5%(9/78), acute lymphoblastic leukaemia (ALL) 10.3% (8/78), multiple myeloma (MM) 10.3%(8/78), acute myeloblastic leukaemia (AML) 7.7%(6/78), non-Hodgkin's lymphoma (NHL) 6.4%(5/78), Small lymphocytic lymphoma (SLL) 2.6%(2/78) and Hodgkin's lymphoma (HL) 1.3%(1/78). In conclusion, we established high prevalence of HMs among patients who had BMA cytology evaluation at BSUTH with the preponderance of lymphoid malignancies. We advocate for inclusion of HMs in the National Health Insurance Scheme (NHIS) for full implementation and to prioritise provision of modern diagnostic equipments and treatment options for quality and optimal management of leukaemias in the center.

Keywords: Bone marrow; Haematological malignancies; Prevalence; Spectrum

INTRODUCTION

Globally, cancers are on the rise. This has been noted to be within the context of increasing cases of non-communicable diseases world-wide.^{1,2} There has been an increasing cancer burden over the decades, particularly in low and middle income countries, accounting for very high morbidity and mortality in the region.³ Cancers have greatly impaired the social lives and economic wellbeing of the affected global populations, putting a huge burden on the individual's finances as well as on global scarce healthcare resources.

Haematologic malignancies are a heterogeneous group of cancers arising from malignant transformation of cells of the bone marrow and or the lymphatic organs. According to the most recent data, Haematologic malignancies are estimated to represent about 6.5 % of all cancers worldwide.^{4,3} They affect all ages and genders world over. The distribution of types may vary with age, sex, culture and the geographic region.⁴

Haematologic malignancies have witnessed a number of classification systems over the past several years.^{5,6} In 2001 the World Health Organization (WHO) published a classification of malignancies of the hematopoietic and lymphoid tissues, which was the first worldwide consensus classification on hematologic malignancies. The WHO classification was based on clinical, morphologic, immunophenotypic and genetic characteristics of the malignancies. This classification was updated in the 2008 WHO classification of haematopoietic and lymphoid neoplasms in conjunction with the Society for Haematopathology and the European Association of Haematopathology. This refines the 2001 classification on the basis of more recent cumulative experimental evidence.⁶ There are two major groups of haematologic malignancies according to their cell lineage: myeloid and lymphoid. Lymphoid neoplasms

are a very varied group and the common subgroups are: NHL, HL, MM, WM, ALL, and CLL. Myeloid neoplasms are represented mainly by MPN, MDS and AML.⁵ The features of haematologic malignancies are as a result of bone marrow failure, organ infiltration, and immune dysregulation.⁷ The presentation may vary from mild non-specific in early presentation to more profound life threatening and often aggressive with rapid progression to fatality in delay or late presentation.^{8,9} Features may include enlargement of Liver, spleen, and or lymph nodes at the neck, axillae, inguinal, intra-abdominal and thoracic regions which are often painless rubbery and discrete.^{8,10} Other presenting features of haematologic malignancies may include bleeding, either as petechial rashes or bleeding from the orifices. Gum bleed following the use of toothbrush might often be the first presenting sign of a leukaemia. Other features may be evidence of infection such as skin and mucosal boils or abscesses.^{7,11,12}

Treatment of haematologic malignancies has witnessed one of the greatest advances in modern science. Recent advances in molecular targeted therapy has revolutionized blood cancer treatment with greatly improved Life expectancy for most haematologic malignancies.^{7,13} The use of monoclonal antibodies such as anti CD20 in B-lymphoid neoplasms, tyrosine kinase inhibitor Glivec (imatinib) and their newer generations, the availability of Cold centrifuge and apheresis machines for component transfusion and the improved modern blood transfusion services have all significantly changed the outlook, extend life expectancy, and improved survival and the overall quality of lives of patients with HMs.^{7,14,15} In some cases, these offer cure to patients with some haematologic malignancies.⁷

The Study aimed to document the prevalence and distribution of adult haematologic malignancies in

Benue State University Teaching Hospital over a 7-year period. BSUTH has no database of haematological malignancies, this hopes to be the first study to serve as a reference database of HMs for health policy formulation and implementation and draw attention to the burden of HMs in the region.

MATERIALS AND METHODS

This was a retrospective observational study aimed to document the prevalence and distribution of adult haematologic malignancies at Benue State University Teaching Hospital over a 7-year period. BSUTH is a 1500-Bed tertiary hospital. It provides specialist care to its immediate community and serves as a referral facility for the neighbouring states which include Nasarawa, Taraba, Calabar, Akwa-Ibom, Ebonyi, and Kogi states.¹⁶

The study population consisted of 158 adults' (Adult was defined as ages of 16 and above), bone marrow aspiration cytology records extracted from the bone marrow and clinic medical records, with haematologic disorders, malignant and non-malignant, diagnosed at the BSUTH over a 7-year period from June 2012 to July 2019.

The diagnoses of haematological disorders were made by the Haematologists based on clinical and the laboratory results which included complete blood count, peripheral and bone marrow films examinations. Those excluded from this study were children below 16 years of age, those with normal marrows and those with inconclusive diagnoses. Those included in the study were those with at least a bone marrow aspiration cytology diagnosis of haematologic disorder, malignant and non-malignant, irrespective of clinical outcome and adult patients from 16 years and above. The variables of interest collected were age, gender, tribe, state of residence and type of haematological pathology.

The data collected was first entered into a computer Microsoft Excel 2010 spreadsheet and then transferred

into IBM SPSS Statistics for Windows, version 20 (Armonk. NY: IBM Corp) for analysis, using simple descriptive statistics and the results presented as tables and figures.

RESULTS

Out of 158 adult BMA cytology reports, HMs accounted for 78(49.4%) of all haematological disorders (Table 2). Females constituted the majority 51.3% (40/78) with a Male to Female ratio (M:F) of 1:1.05 (Table 1). Their ages range from 16 to 85 years with the median age of 54.0 years. Out of the 78 HMs, Lymphoid neoplasms were the most prevalent 47(60.3%), the leukaemias were higher 53/78(67.9%) compared to the non-leukaemic neoplasms. Of the 53 leukaemias, those of chronic lymphoid types were more 24/53(45.3%), followed by the chronic myeloid 15/53(28.3%). Chronic lymphocytic leukaemia (CLL) was the predominant leukaemia 24/53(45.3%) as well as the most prevalent HM 24/78(30.8%), followed by chronic myeloid leukaemia (CML) 19.2%(15/78). Others were myelodysplastic syndrome (MDS) 11.5%(9/78), acute lymphoblastic leukaemia (ALL) 10.3% (8/78), multiple myeloma (MM) 10.3%(8/78), acute myeloblastic leukaemia (AML) 7.7%(6/78), non-Hodgkin's lymphoma (NHL) 6.4%(5/78), Small lymphocytic lymphoma (SLL) 2.6%(2/78) and Hodgkin lymphoma (HL) 1.3%(1/78) (Tables 2-3)

Table 1: Sex and Age Distribution of patients: n=78

	Frequency (n)	Percentage (%)
Sex		
F	40	51.3
M	38	48.7
Total	78	100.0
Age Group		
16-35	22	28.2
36-55	20	25.6
56-75	32	41.0
76 and over	4	5.1
Total	78	100.0

Table 2: Distribution of Haematological Malignancies: n=78

	Frequency (n)	Percentage (%)
HMs		
ALL	8	10.3
AML	6	7.7
CLL	21	26.9
*CLL/PL	2	2.6
CML	15	19.2
HL	1	1.3
MDS	9	11.5
MM	8	10.3
NHL	5	6.4
*PLL	1	1.3
SLL	2	2.6
Total	78	100.0

*Variants of CLL

Keys:

CLL:Chronic lymphocytic leukaemia; **CML:**Chronic myeloid leukaemia; **MDS:**Myelodysplastic syndrome; **ALL:**Acute lymphoblastic leukaemia; **MM:**Multiple myeloma; **AML:**Acute myeloblastic leukaemia; **NHL:**Non-hodgkin's lymphoma; **SLL:** Small lymphocytic lymphoma; **CLL/PL:**Chronic lymphocytic leukaemia / prolymphocytic leukaemia; **HL:**hodgkin's lymphoma; **PLL:**Prolymphocytic leukaemia (Table 2).

Table 3: Distribution of Haematological Malignancies

	Frequency (n)	Percentage (%)
Cell Lineage of HMs		
Myeloid	31	39.7
Lymphoid	47	60.3
Total	78	100.0
Types of HMs		
Leukemic	53	67.9
Non-Leukaemic	25	32.1
Total	78	100.0
Leukaemias		
Acute Myeloid	6	11.3
Chronic Myeloid	15	28.3
Acute Lymphoid	9	17.0
Chronic Lymphoid	23	43.4
Total	53	67.9

DISCUSSION

This study established a high prevalence of adult haematologic malignancies which accounted for close to half of all haematologic disorders (both malignant and non-malignant and only of haematologic type)

diagnosed by bone marrow studies. Most of the other studies reviewed in our literature reported HMs within the context of all malignancies (haematologic and non-haematologic). Take for example, Babatunde A *et al.*,¹² in a 10-year retrospective survey of haematological malignancies in Ilorin Nigeria, 370 cases of haematological malignancies of the total of 2050 cancer cases were reported. The haematological malignancies represented 18.05% of all cancer cases. This was lower than our finding for the fact that ours was HM among only haematologic disorders. Babatunde *et al* also reported NHL as the most common of their haematological malignancies. This differed from our study which found CLL instead as the most common. Though these two malignancies are both of lymphoid lineage and have similar prevalence rate, they are however two distinct disease entities. Interestingly, the prevalence of NHL 6.4%, in our study was similar to that of CLL 5.4% in their own study. There appeared to be a reversal in the most prevalent HM between the two regions. They were having more of NHL while we had more of CLL. The distribution of the remaining HMs in their center appeared similar to ours. In a related study from Morocco,⁴ NHL was also reported to be the most prevalent haematologic malignancy accounting for 29.7% of the HMs.

Akaba Kingsley *et al*,¹¹ in Calabar Nigeria, reported 10.5% prevalence of HMs. This was still lower than the 49.4% reported here. The Calabar study was among all cancers as against only haematologic disorders as in our study, which was a much specific smaller population. Among the HMs, just like in our study, they reported a prevalence of lymphoid malignancies been higher than myeloid (76.81% vs 23.91%) and just like ours, CLL was the commonest haematological malignancy (36, 26.09%) followed by Non- Hodgkin's lymphoma (NHL) 28 (20.29%).

In our study, Leukaemia 53/78(67.9%) was the most prevalent of all haematologic malignancies, accounting for more than half of all haematologic malignancies. Similar to our findings, a study by Egesie *et al*¹⁷ in Jos

also reported leukaemia as the commonest haematologic malignancy accounting for more than half of the HMs in their review with a prevalence of 51.7%. This similarity in the reported prevalence may be explained by the relatedness of the two states in geographical boundaries and sociocultural ties. This high prevalence of HMs found could be due to exposure to mineral elements in Tin contaminated water and food produce from the age-long Tin mining activities that took place within the region over time. More studies however may be required to ascertain the truthfulness or otherwise of this fact.

The finding of an Indian study,¹⁸ was also in agreement with ours and that of Jos. In this study, the most common haematologic malignancy was Leukemia 129/220 (58%).

In our study, among the leukaemias, chronic leukaemias were more common than acute leukaemias. This is also similar to the finding of Nwagu *et al*¹⁵ in Delta State Nigeria. CLL ranked as the highest haematologic malignancy in our study while in a related study from Benin Nigeria, CLL however ranked second (17.0%), after NHL (33.5%).¹⁹ Similarly, the work of Smith A *et al*²⁰ in UK also reported diffuse large B-cell lymphoma as the most common haematological malignancy, while CLL, which like diffuse large B-cell lymphoma is also a mature B-cell neoplasm, is the next most common.

Reports from most of these literatures, reviewed above, are in agreement with the findings from our center on the higher prevalence HMs of lymphoid origin as against myeloid, leukaemia as the most prevalent adult HM compared to lymphomas and that chronic leukaemias were more common than acute leukaemias. Many others also reported CLL as the most prevalent, not just of the leukaemias but of all HMs. A few other centers, in the contrary, reported NHL as the most prevalent HMs with CLL coming second. Most of the reports with strikingly similar findings seemed to suggest a clustering around the neighboring States like Jos, Calabar etc. This may be due to the geographic and

sociocultural ties these States share with Benue State, the study center. The slight variation, on which occurs commonly (CLL or NHL), between our center and others notwithstanding, the consensus of opinion seemed to align with the fact that CLL and NHL are both lymphoid and are mature B-cell neoplasms.

CONCLUSION

In conclusion, we established high prevalence of HMs among patients who had BMA cytology evaluation at BSUTH with the preponderance of lymphoid malignancies. Leukaemias were the most prevalent haematologic malignancies and CLL was the predominant leukaemia as well as the most prevalent haematological malignancy in our center.

Limitation

Reliance exclusively on bone marrow aspiration cytology for morphologic diagnosis, which was the only diagnostic means available in this centre, was the huge drawback of this study. This is common place in resource-poor settings like ours. The burden of the disease is however not lost out.

Recommendation

We advocate for inclusion of HMs in the NHIS list for full implementation and for a prioritised provision of modern diagnostic equipment and treatment options for quality and optimal management of leukemias at BSUTH.

There is urgent need to establish a haemato-oncology center through manpower training on diagnosis and management of haematologic malignancies.

There should be more training and provision of state-of-the-art Blood Transfusion, Bone Marrow Transplantation and Blood Component services. Furthermore, there is need for support staff to acquire additional skills on the use Cold Centrifuge, Apheresis Machine, Immunocytochemistry, Immunophenotyping, Polymerase Chain Reaction

(PCR) and other modern molecular diagnostic techniques to effectively diagnose and treats all forms of HMs coming to the facility.

Conflict of interests: None to declare.

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