

Pattern of Leukemia in the Multi-Ethnic and Racial Population: A Hospital Based Study

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Abstract

Background: The purpose of this study was to analyze the trends in the incidence rates of major types of leukemia viz. acute myelogenous leukemia (AML), acute lymphocytic leukemia (ALL), chronic myelogenous leukemia (CML), chronic lymphocytic leukemia (CLL) and mixed phenotypic acute leukemia (MPAL), in the population of upper Assam who have visited Assam Medical College, Dibrugarh, during the period June 2012 to June 2016. Due to the lack of any leukemia screening program, the majority of the people are not aware of the disease. Epidemiological study can play a vital role in understanding the occurrence and outcome of the disease. The present study is carried out to see the pattern of leukemia in different ethnic population of upper Assam. **Method:** 204 cases of leukemias comprising of 120 males and 84 females were analysed focusing on their ethnicity. **Result:** The highest number of leukemia cases was found in Mongoloids 83 cases (40.69%) followed by Tea tribes 58 cases (28.43%). The highest number of AML (45.74%), ALL (39.13%) and CLL (72.73%) cases were found in Mongoloids while the highest number of CML (34.09%) was found in Tea tribes. **Conclusions:** Ethnicity is independent of disease type and severity at diagnosis and should be taken into consideration in the management of leukemic patients, especially in terms of social and psychological support. It reflects socioeconomic differences and must be taken into consideration for long time survival of patients with leukemia.

Keywords: Leukemia; Ethnicity and Race.

Introduction

Leukemia is the second most common blood cancer after lymphoma. The five major types of leukemias classified immunophenotypically are acute myelogenous leukemia (AML), acute lymphocytic leukemia (ALL), mixed phenotypic acute leukemia (MPAL), chronic lymphocytic leukemia (CLL), and chronic myelogenous leukemia (CML). Although leukemia occurs most often in adults, it is among the most common childhood cancers. ALL accounts for approximately 75 percent of all childhood leukemias. By contrast, the most common types of leukemia in adults are AML and CLL, followed by ALL and CML

[1].

There is an extensive literature concerning the risk factors and prognostic significance for survival of leukemic patients. Specific risk factors for leukemia depend on the type of leukemia. In general, increased risk is associated with being male, smoking, exposure to certain chemicals such as benzene, exposure to radiation, past treatment with chemotherapy or radiation therapy, having certain inherited or genetic disorders and having a family history of leukemia [2].

The prognostic significance for survival of patients differs with different leukemias. The most widely recognized of these are age and comorbidity [3], white blood cell count at diagnosis [4], morphologic subtypes [3], chromosomal aberrations [5-8], and the presence of another malignancy or receipt of chemotherapy in the past (secondary malignancy) [5].

Ethnicity is an independent predictor for long time

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(Received on 12.04.2017, Accepted on 24.04.2017)

survival in adult patients with leukemia. The differences observed in survival by ethnic group likely reflect socioeconomic and not genetic differences, and they are independent of disease type and severity at diagnosis. This factor must be taken into consideration in the management, treatment, and follow up of leukemia patients, especially in terms of social and psychological support and maximizing compliance with the timing and intensity of treatment. Identification of the factors contributing to social class and ethnic differences in survival should be a research priority, as it is a prerequisite for developing interventions that diminish such inequalities.

In this context an extensive study has been conducted in DBT Healthcare Flowcytometry Lab Department of Pathology, Assam Medical College and Hospital for a time period of 4 years June 2012-June 2016. It is the first ever attempt to describe the prevalence and risk of leukemia in its varied population by compiling the data of the patients suffering from five main types of Leukemia namely chronic lymphocytic leukemia (CLL), chronic myelogenous leukemia (CML), acute lymphocytic leukemia (ALL), acute myelogenous leukemia (AML) and mixed phenotypic acute leukaemia (MPAL) from the patients admitted in the hospital during the period of study.

Aims and Objective

To study the distribution of different types of leukemia in multi-ethnic and racial population.

Materials and Methods

The present cross-sectional study was carried out in the Advanced Haematology and Flow Cytometry Section of the Pathology Department, Assam Medical College & Hospital, Dibrugarh during four years period extending from June 2012 to June 2016. The inclusion criteria include all cases of leukaemia as evidenced by clinical and laboratory investigation in all age groups and both the sexes.

The leukemia cases were subjected to routine haematological investigations and cytochemistry followed by multiparametric flowcytometry. Diagnosis of leukemia was made on routinely stained bone marrow aspiration and blood smears. Immunophenotyping was carried out in acute leukemia and CLL cases on bone marrow or peripheral blood.

Complete blood count was done by using Sysmex XS-800i and peripheral blood film stained by Giemsa

stain to find the presence of blast cells. A total of 500 cells of WBC were counted and blasts cells over 20% are regarded as acute leukemias (Figure 1). Then whole blood or aspirate samples were prepared by cell lysing and fixing method for immunofluorescence staining with different antibodies named as CD markers which were conjugated with fluorochromes (i.e APC H7, PE cy7, FITC, PE, APC and PerCP) and cell washing was done with phosphate buffer saline (PBS) ($\text{NaH}_2\text{PO}_4 \cdot 2\text{H}_2\text{O}$, Na_2HPO_4 and NaCl). When whole blood is added to the monoclonal antibody reagent, the fluorochrome labeled antibodies in the reagent bind specifically to leucocyte surface antigens. The stained samples were then treated with FACS Lysing solution (NH_4Cl) which lyses erythrocytes under gentle hypotonic conditions while preserving the leucocytes.

The permeablizing solution containing 15% formaldehyde and 50% diethylene glycol and proprietary permeablizing agent used for intracellular staining of antigens such as MPO, CD79a, CD3 Cytoplasmic and Tdt. Data acquisition and analysis were performed on a FACS Canto 2 flow cytometer (Becton Dickinson, San José, USA) using BD FACS Diva software. Identification of blast cells was performed using side scatter (SSC) versus CD45 intensity dot plots (Figure 2). The percentage of gated abnormal population expressing a particular CD marker was analysed whether expression was positive or negative (>20% for surface antigen and >10% for cytoplasmic antigen).

Results and Observations

In the present study, a total of 235 cases of leukemia were recorded. 31 cases were sent to the DBT Laboratory with only sample id number and initials of names, so they could be categorized in any ethnic groups. So the study included 204 patients comprising 120 males and 84 females.

The leukemia cases were categorized into the following broad ethnic groups: Aryans, Mongoloids, Tea Tribes, and Mohammedans. We have got 46 cases (22.55%) of leukemia in Aryans, 83 cases (40.69%) in Mongoloids, 58 cases (28.43%) in Tea tribes and 17 cases (8.33%) in Mohammedans as shown in table 1 and figure 3.

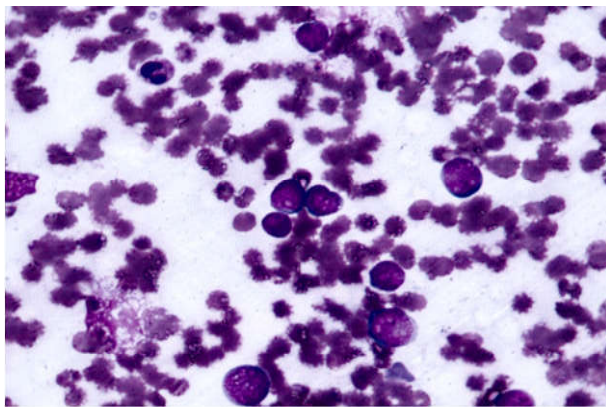
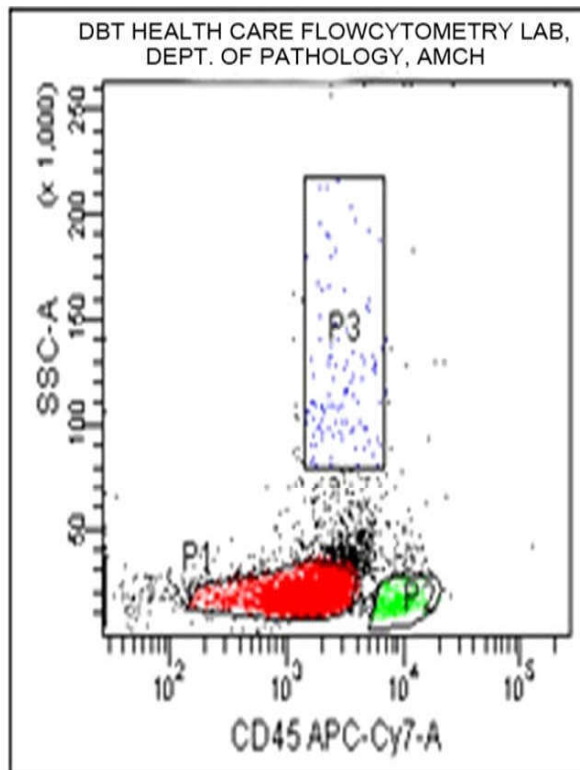
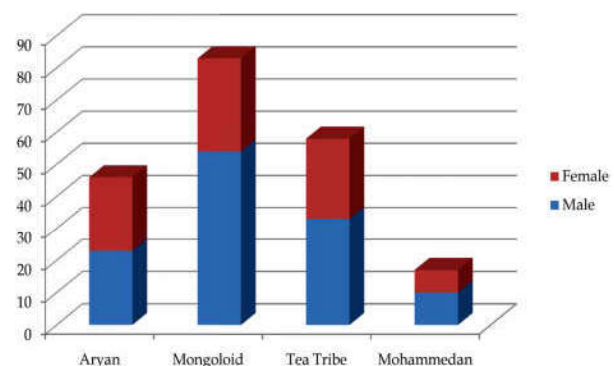
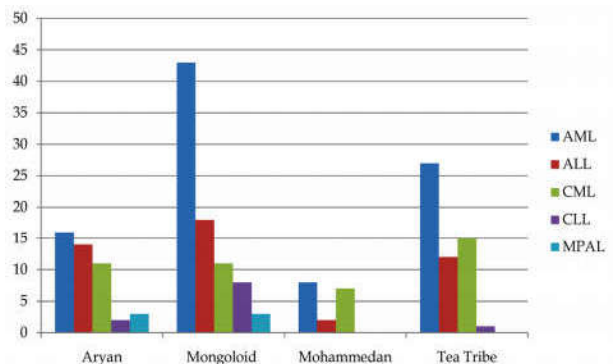
The highest number of leukemia cases was found in Mongoloids 83 cases (40.69%) followed by Tea tribes 58 cases (28.43%). The highest number of AML (45.74%), ALL (39.13%) and CLL (72.73%) cases were found in Mongoloids while the highest number of CML

Table 1: Distribution of leukemias in different ethnic groups

Race	Male	Female	Total (%)
Aryan	23	23	46 (22.55)
Mongoloids	54	29	83 (40.69)
Tea Tribe	33	25	58 (28.43)
Mohammedan	10	7	17 (8.33)
Total	120	84	204

Table 2: Distribution of different types of leukemias in different ethnic groups

Race	AML (%)	ALL (%)	CML (%)	CLL (%)	MPAL (%)	Total (%)
Aryan	16(17.02)	14(30.43)	11 (25.0)	02(18.18)	03(33.33)	46(22.55)
Mongoloid	43(45.74)	18(39.13)	11 (25.0)	08(72.73)	03(33.33)	83(40.69)
Tea Tribe	27(28.72)	12(26.09)	15(34.09)	1 (9.09)	03(33.33)	58(28.43)
Mohammedan	8 (8.51)	2 (4.35)	7 (15.91)	0 (0)	0 (0)	17 (8.33)
	94	46	44	11	9	204

**Fig. 1:** PBS showing the blasts in acute leukaemia**Fig. 2:** Showing the primary gate in acute leukaemia**Fig. 3:** Distribution of leukemia in different ethnic groups**Fig. 4:** Distribution of different types of leukemias in different ethnic groups

(34.09%) was found in Tea tribes as shown in Table 2 and Figure 4.

Discussion and Conclusion

Leukaemia is a group of malignant disorders affecting the blood and blood-forming tissues in the bone marrow, lymphatic system, and spleen. The word leukemia literally means “white blood” because it is a neoplastic proliferation of one type of blood cell,

typically a leukocyte or white blood cell. It is characterized by widespread, rapid and disorderly proliferation of leukocytes and their precursor and by the presence of immature leukocytes in blood often in very large number.

According to national cancer institute, the incidence of leukemia in 2013 was 13.82 % of all cancers (www.seer.cancer.gov). In 2013, males have been accounted for more than 57 percent of the new cases of leukaemia [9]. High incidence of subtypes of leukemia in males was due to higher exposure to occupational and environmental carcinogens [10,11].

Epidemiology has played a vital role in learning about the causes of leukemia in the past few decades. The developing countries have greater burden of cancer including haematological malignancies due to population growth, aging and urbanization, changing dietary habits, better control of infections, and increasing tobacco consumption [12].

Northeast India and specifically Assam is the homeland of different ethnic groups and many scholars consider it the melting pot of diverse races, castes, religions, languages and cultures. In our study we considered the occurrence of leukaemia in these ethnic groups and observed, the highest number of leukemia cases was found in Mongoloids 83 cases (40.69%) followed by Tea tribes 58 cases (28.43%). The highest number of AML (45.74%), ALL (39.13%) and CLL (72.73%) cases were found in Mongoloids while the highest number of CML (34.09%) was found in Tea tribes. Similar study on ethnicity was done by Modak et al [13] but could not be compared with our study as monogloid race is found in high density only in this part of India. Thus the study also provide new insight into the ethnic differences that exist in this part of India.

The reason of occurrence needs further evaluation in relation to the lifestyle, geographical and environmental conditions and precise molecular and genetic studies in the respective population.

Conclusion

Ethnicity reflects socioeconomic differences and being an independent predictor, ethnicity must be taken into consideration for long time survival of patients with leukemia and ideally to prevent the disease. The localized communities visiting the Medical College needs to be further studied to get a better understanding for the higher risk of occurrence of leukemia. Moreover, since the spectrum of cancer

epidemiology seen in India is different from that in developed countries more emphasis should be placed on better development of regional and national health conditions.

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