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Original Article

CURRENT TRENDS IN ACUTE LEUKEMIA: A CROSS-SECTIONAL SURVEY OF ADULT ACUTE LEUKEMIA CASES

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ABSTRACT:

Acute Leukemia (AL) is one of the cancer on rise globally, there is dearth of regional information in particular gender pattern of the disease among adult population from Pakistan. Therefore, this cross-sectional study was designed and conducted at Medical Oncology department at Jinnah Postgraduate Medical Center (JPMC), Karachi, Pakistan. The said department receives cancer patients all over from the province of Sindh as well as other provinces. A total of 130 adult patients presenting at Oncology OPD with diagnosis of acute leukemia and included in this study. Participants were selected using non-probability convenient sampling technique. Data was collected using a structured questionnaire and analyzed using SPSS version 24.0. The median age of male AL patients was significantly higher as compared to female AL patients i.e. 30 years ; IQR =18 versus 24 years; IQR=21.25 years (p-value= <0.05). The study found male: female ratio of AL was 1.8:1. No statistically significant differences were observed in the socio-demographic and disease-related characteristics among male and female AL patients. The current study concludes that acute leukemias has male predominance whereas the average age of presentation was comparatively lower among females as compared to males.

Keywords: Acute Leukemia, Epidemiology, Oncology

INTRODUCTION

Globally, epidemiology of various cancers showing obvious dipartites in the incidence, disease prognosis and mortality on the basis of differences in gender (1). According to the cancer statistics of 2020 the overall combined incidence of all cancers can be 19% more among men as compared to women. However, the estimates may vary in some populations depending on regional variations (2). The role of gender can be explained by various differences in the normal human physiology under the influence of sex hormones, chromosomal differences or genetics as well as difference in environmental exposures (3-7). Hence, the gender has been recognized to play a crucial role in deciding the susceptibility for a particular type of cancer as well as its overall prognosis including treatment outcomes and mortality (2, 3).

Leukemias have been identified globally as one of the commonest type of cancer. According to global cancer statistics of cancer from 186 countries. Leukemias is the 11th major contributor to the global cancer related mortality (6). The global age standardized incidence of leukemia in the developing world is 3.8 cases /100,000 among males while 2.9 cases/100,000 among females. However, it is important to explore the possible regional differences for understanding the diseases epidemiology and risk stratification (1). The burden of Leukemia is on rise particularly in the developing countries located in South Asian region. Among all the South Asian countries the highest incidence of leukemia is reported from India, followed by Pakistan, Bangladesh and Sri Lanka. However, the gender-based burden of leukemia is unevenly differentiated in most of the populations (7).

Pakistan is a country where cancer burden is on rise while health care system is struggling with many other chronic as well as communicable diseases. In Pakistan women found to had a higher incidence of Leukemia than men. Moreover, leukemias are more common in younger age groups (7). A retrospective study conducted in 2016 at Institute of Radiotherapy and Nuclear Medicine (IRNUM) Peshawar found that in Khyber-Pakhtun-Khwa Acute leukemia was more prevalent in adult males as compared to females. However, there is dearth of regional information regarding gender distribution of Acute Leukemia cases among adult population from other provinces. This warrants for targeted research to establish the basic epidemiology of Acute Leukemia in different regions of Pakistan. Hence, this study aimed to determine the gender distribution of Acute Leukemia among adult patients presenting at Medical Oncology department at Jinnah Postgraduate Medical Center (JPMC), Karachi, Pakistan.

Understanding the basic epidemiology of leukemia and identifying the gender based differences in the disease epidemiology with help in better planning and management of health services at all levels.

METHODS:

A prospective cross-sectional study was conducted in the Out-Patient-Department (OPD) of Oncology Department of JPMC, Karachi, Pakistan between September 2023 and February 2024. The JPMC Oncology department is offering oncology services for all kind of cancers including acute leukemia. The department receives cancer patients all over from the province of Sindh as well as other provinces. The adult patients presenting at Oncology OPD with diagnosis of acute leukemia were approached and invited to participate in this study using non-probability convenient sampling technique. Hence, male and female patients of aged 18 years or above presenting at Oncology Department of JPMC with histopathology confirmed diagnosis of acute leukemia were included in this study. However, any patient presenting in a severely debilitating condition or any patient who was mentally unstable to provide written informed consent was excluded from the study despite meeting study inclusion criteria. The study was completed within six months after obtaining approval from Institutional Review Board of JPMC, Karachi. The sample size for this study was calculated using WHO Sample Calculator. At 95% level of confidence, 80% power and an anticipated proportion of leukemia cases 59% among males and 41% among females we obtained a sample size of 118. After adjusting for 10 % non-response rate we obtained a final sample size of 130 (2, 8). Data was collected by trained data collectors with a medical background including Principal Investigator. The patients presenting at Oncology OPD at JPMC and eligible to participate in this study were directly approached by the designated data collectors. The data was collected using a structured questionnaire translated into local language i.e. Urdu. The face validity of the questionnaire was assessed by a senior experienced in oncology research. However, the cognitive validity as well as lingual validity of the questionnaire was tested before the start of actual data collection by running a pilot survey in another OPD at JPMC. The information was collected regarding the socio-demographic characteristics including age, gender, education, marital status, ethnicity, and occupation. The questionnaire also included health related characteristics including type and stage of acute leukemia and family history of acute leukemia. The information regarding disease diagnosis including histopathology findings or type, stage and origin of cancer was also verified from the medical records available with the patient. The patients whose cancer staging or diagnosis was incomplete during the first contact were followed up on phone or during next follow-up visits to collect the required clinical information.

Statistical analyses

Data was analyzed using Statistical Package for Social Sciences (SPSS version 24.0). Descriptive statistics were calculated for the socio-demographic and health related characteristics among the patients presenting with acute leukemia at Oncology department of JPMC, Karachi. Chi-square test of significance was applied to assess the possible differences in the presentation of disease due to differences in various socio-demographic in particular due to gender of patient.

RESULTS:

In total 130 adult patients who presented with AL during the study period were included in the study. The median age of patients was 28 years with Interquartile Rage (IQR) of 20 years. The highest proportion of patients i.e. 51.5% (n=67) of all patients were of age between 18-28 years followed by the second highest proportion of AL patients from the age category of 29-38 years i.e. 27.7% (n=36). 64.4% (n=84) of all the AL patients were male while 35.4% (n=46) were females. The majority of the AL patients included in the study were married (53.3%, n=68), the overall majority were literate (53.1%, n=69) or had some level of formal education. Most of the patients belonged to Pashto ethnicity i.e.33.8% (n=44) followed by Sindhi (23.8%, n=31) and Urdu speaking ethnicities (20.8%, n=27). A summary of the data is given in Table 1. When compared for age and socio-demographic characteristics the study found significantly higher median age among male patients as compared to females i.e. 30 years (IQR=18 years) versus 24 years (IQR=21.25 years)(p value= 0.04). Similarly statistically significant differences were observed in the distribution of AL patients in various age categories on the basis of difference in gender. Statistically significant differences were also observed in the occupation among male and female patients; however, no significant differences were found among male and female AL patients observed on the basis of marital status, educational status, ethnicity and socio-economic status (Table 1).

Table 1. Socio-demographic characteristics of the adult patients presenting with Acute Leukemia – Male versus female patients

Variables	Frequency (%)	Males (n=84) Frequency (%)	Females (n=68) Frequency (%)	P-value
Mean Age: 28 years (IQR= 20 Years)		30.0(18) years	24(21.25) years	0.04
Age (in completed years)				
18- 28years	67 (51.5)	37(44.0)	30(65.2)	
29-38years	13 (10.0)	13(15.5)	0	0.009
39-48yeras	36 (27.7)	26(31.0)	10(21.7)	
49-59 years	08 (6.2)	04(4.8)	04(8.7)	
60 years and above	06 (4.6)	04(4.8)	02(4.3)	
Marital status				
Unmarried	62 (47.7)	39 (46.4)	23(50.0)	0.69
Married	68 (52.3)	45 (53.6)	23(50.0)	
Literacy status				
Literate	69 (53.1)	46 (54.8)	23(50.0)	0.60
Illiterate	61 (46.9)	38(45.2)	23(50.0)	
Ethnicity				
Urdu	27 (20.8)	17(20.2)	10(21.7)	
Sindhi	31 (23.8)	19(22.6)	12(26.1)	
Pashto	44 (33.8)	09(10.7)	03(6.5)	
Punjabi	12 (9.2)	29(34.5)	15(32.6)	0.90
Balochi	13 (10.0)	07(8.3)	06(13.0)	
Saraiki	01 (0.8)	01	0	
Hindko	02 (1.5)	02	0	
Occupation				
Businessman/ woman	16 (12.3)	16 (19.0)	0	<0.001
Farmer	14 (10.8)	14(16.7)	0	
Home maker	28 (21.5)	0	28(60.9)	
Student	46 (35.4)	29(34.5)	17(37.0)	
Laborer/Manual worker	15 (11.5)	15(17.9)	0	
Technician	07 (5.4)	07(8.3)	0	
Office job	04 (3.1)	03(3.6)	01(2.1)	
Socioeconomic status				
Very poor	14 (10.8)	08(9.5)	06(13.0)	0.89
Poor	61 (46.9)	40(47.6)	21(45.7)	
Lower-middle	49 (37.7)	31(36.9)	18(39.1)	
Middle	02 (1.5)	02(2.4)	0	
Rich	04 (3.1)	03(3.6)	01(2.2)	

Male and female AL patients were also compared for disease-related characteristics including type of AL, biopsy finding, risk category, reported symptoms and organs involved. No statistically significant differences were observed on the basis of difference in sex i.e. male versus female AL patients (Table.3).

DISCUSSION

This study is one of the few studies exploring the epidemiology of AL among adults presenting in oncology department of Pakistan. This study reported that average age of adults presenting with AL was 28 years (IQR=20 years) with a male to female ratio of 1.8:1; hence reporting approximately 2 cases of AL among male population for each case of AL in female population. This finding is consistent with the results of recent study conducted in KPK which found same ratio of leukemia among male and female patients (1.8:1). However, when compared to regional

evidence the male: female ratio of AL in our study was comparable to the evidence from Southern China but was relatively higher when compared to evidence from Iran (9,10). The higher rate of AL among Irani population could be related to their higher risk of the disease.

Table 2. Comparison of disease-related characteristics among adult male and female patients presenting with Acute Leukemia in Oncology

Variable	Total Sample N=130	Male N=84	Female N=46	P-value**
	Frequency (%)			
Type of AL				
B-Cell ALL	75 (57.7)	47(56.0)	28 (60.9)	
T-Cell ALL	06(4.6)	05(6.0)	01(2.2)	0.66
AML	47(36.2)	30(35.7)	17(37.0)	
APML	02 (1.5)	02(2.4)	0	
Biopsy finding				
>30% blasts cells	01 (0.8)	01(1.2)	0	
>50% blasts cells	03(2.3)	0	03(6.5)	0.16
>60% blast cells	37(28.4)	21(25.0)	16(34.8)	
>70% blast cells	24(18.5)	17(20.2)	07(15.2)	
>80% blast cells	25(19.2)	18(21.4)	07(15.2)	
>90% blast cells	40(30.7)	27)32.1)	13(28.3)	
Risk Category				
Poor Risk	41 (31.5)	29(34.5)	12(26.1)	
Standard Risk	20(15.4)	09(10.7)	11(23.9)	0.14
Good Risk	69 (53.1)	46(54.8)	23(50.0)	
Main Symptoms*				
Fever	119(91.5)	77(91.7)¡	42(91.3)	1.00
Bleeding	108(83.0)	67(79.8)	41(89.1)	1.73
Gum swelling	30(23.0)	24(28.9)	06(13)	0.041
Weakness	56(43.0)	37(44.6)	19(41.3)	0.81
Fatigue	67(51.5)	44(53.0)	23(50.0)	0.74
Shortness of breath	74(56.9)	49(58.3)	25(54.3)	0.66
Body ache	98(75.3)	61(73.5)	37(80.4)	0.37
Organs involved				
Liver and Lymph node	07(5.4)	07(8.3)	0	
Liver, Spleen and lymph node	02(1.5)	01(1.2)	01(2.2)	
Liver and Lung	01(0.8)	01(1.2)	0	0.29
Liver only	20(15.4)	12(14.3)	08(17.4)	
Lymph node only	04(3.1)	02(2.4)	02(4.3)	
None	96(73.8)	61(72.6)	35(46.1)	

**Multiple Responses Possible. **Chi-square test was applied to compare disease characteristics among male and female sex. P-value of 0.05 or less was considered statistically significant.*
¡Chi-square test was applied suing 2x2 table.

This finding is also supported by the previous evidence from various populations including South American, Caribbean, Asian, and African populations which revealed higher burden acute leukemia among male sex as compared to females (10-13). However, the average age of male patients presenting with AL was higher as compared to female patients with AL and this finding was statistically significant. Similarly, statistically significant differences in the age distribution of male and female patients were observed. A total of 65% of all female patients presented between the ages of 18 to 28 years as compared to male patients with only 44% of patients presented between the ages of 18 to 28 years. Similar differences were observed for other age group categories among male and female patients. This can be supported by the possible role of genetic predisposition as supported by a recent study conducted among adult patients with Acute Lymphoblastic Leukemia (ALL). The study investigated the gene expressions and concluded that genetic susceptibility can be a major determinant for the age at diagnosis of ALL among adult patients in China and Singapore (14-16). However, further research is required to determine the

role of genetic expressions in the development of acute leukemias on the basis of difference in gender (16). Furthermore, the age at the diagnosis and patient`s gender are widely recognized as important predictors of prognosis among patients with acute leukemia. Therefore, the age and gender of the leukemia patient need to be considered while assessing the prognosis and survival to decide the overall treatment plan.

This study found no statistically significant differences in the characteristics of AL among male and female patients such as the frequency distribution for the type of AL, biopsy findings, risk category as well as symptoms except gum swelling and organ involved. This finding can be explained by the limited sample size of this study and need further exploration with a larger representative sample to reach a definite conclusion. However, this finding is similar to the previous studies conducted in Asia including Iran and China reporting no significant differences in the AL morphology among male and female patients on the basis of difference in gender (9, 17).

This study had few limitations, first of all this study was not a population-based study but it represented general population from one of the largest public sector hospital in Karachi receiving patients from Karachi as well as remote areas. Hence, this limits generalizability of the study findings at large. This study did not collect any information regarding family history of leukemias, hence comparison of the male and female groups for genetic susceptibility as well as any possible differences in the age at the time of presentation among those with a family history of leukemias as compared to those with no such family history. Moreover, this study did not collect detailed information about the education level such as qualification or level of education achieved as well as socioeconomic status of participants. This did limit the assessment of differences among study participants; specifically male and female patients on the basis of differences in socio-demographic characteristics.

Nevertheless, this study contributes valuable information to the local evidence regarding the AL epidemiology. In a country with no established effective surveillance of cancers even small scale studies are of crucial importance to gain insight to the local situation. Findings from this study are found consistent with previous studies from other populations. This study also highlights a dire need to further explore possible differences in the epidemiology of AL among male and female patients. Large scale multi-center or population based studies need to be conducted to explore the unknown as well as emerging facts about AL prevention, diagnosis as well as management.

CONCLUSION

The current study concludes that acute leukemias among local patients presenting with a male predominance while comparatively younger female patients. Further large scale studies are required to explore more differences with risk factor analysis which will certainly pave a way for control of the disease.

Conflict of Interest

Authors declare no conflict of interest.

Ethical consideration

Ethical approval for this study was obtained from Institutional Review Board of JPMC, Karachi. Written informed consent was obtained from each study participant at the time of data collection once they were fully explained about the possible risks and benefits for participating in this study.

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