Incidence of structural chromosomal anomalies in patients of acute myeloid leukemia in North Indians

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Abstract

Introduction: Acute myeloid leukemia (AML) is a tumor of hematopoietic progenitors caused by acquired oncogenic mutations that impede differentiation, leading to the accumulation of immature myeloid blasts in the marrow. The single most important prognostic factor in AML is cytogenetics, which determine the prognosis and probability of relapse after treatment. Hence the cytogenetic analysis of AML patients plays a great role in prognosis and treatment.

Materials and Methods: Karyogram of diagnosed patients of AML was prepared from bone marrow and peripheral blood. This study was conducted in the Cytogenetic Laboratory of the Department of Anatomy, King George’s Medical University, UP, Lucknow. Patients were screened in the Department of Pediatrics Medicine and the samples were collected from there.

Observations and Results: We observed the frequency of chromosomal aberrations in different age groups and sex. Out of 22 successful cases 12 cases (54.54%) exhibited abnormal karyogram and 10 cases (45.45%) showed normal karyogram. Among total 22 cases, structural chromosomal abnormalities were observed in 11 cases (50%). Translocation was present in 9 cases (40.90%), p-arm abnormality on chromosome 19 (add 19p) was present in 1 case (4.54%) and q-arm abnormality on chromosome 16 (del 16q) was present in 1 case (4.54%).

Discussion and Conclusion: Translocation was found to be the most common structural anomaly in AML. We observed translocation t(8;21) in 9.09% cases. Other translocation was t(9;22) which was found in 9.09% cases. t(9;11) was observed in 9.09% cases in our study. t(15;17) was noted in 4.54% case which was also noted by previous authors. In AML t(8;21), t(15;17), inv(16) has good prognosis, intermediate prognosis is seen in abnormal 11q23, while del(5q), abnormal 3q, complex cytogenetic had poor prognosis.

Keywords: Acute myeloid leukemia (AML), Karyogram, Chromosomal aberrations, Anomalies, Translocation.
informed consent was taken from each patient. Patients without consent (lack of consent) were excluded from the study.

**Observation and Results**

We observed the frequency of chromosomal aberrations in different age groups and sex. Total 34 cases were analyzed in which 22 karyograms were obtained successfully. Out of 22 successful cases, 12 cases (54.54%) exhibited abnormal karyogram and 10 cases (45.45%) showed normal karyogram. Among total 22 cases, structural chromosomal abnormalities were observed in 11 cases (50%) and numerical chromosomal abnormalities were noted in 7 cases i.e. 31.81%. In successfully obtained 22 karyogram, 12 (54.54%) were male and 10 (45.45%) were female. Among 10 female karyogram, 6 karyogram were normal without any chromosomal aberrations and 4 karyogram were abnormal with chromosomal abnormalities (Table 1).

| Table 1: Gender wise distribution of cases with chromosomal abnormalities |
|--------------------------|--------------------------|--------------------------|--------------------------|
| Sex          | Number of Cases | Karyogram Obtained | Normal Karyogram | Abnormal Karyogram |
| Male        | 22             | 12                | 4              | 8              |
| Female      | 12             | 10                | 6              | 4              |
| Total=34    | Total =22      | Total =10         | Total =12      |

In structural chromosomal abnormalities, translocations was present in 9 cases (40.90%), p-arm abnormality on chromosome 19 (add 19p) was present in 1 case (4.54%) and q-arm abnormality on chromosome 16 (del 16q) was present in 1 case (4.54%) (Table 2, Fig. 1, 2).

| Table 2: Prevalence of structural chromosomal abnormalities in overall studied karyograms/total cases with abnormal karyograms |
|---------------------------------------------------------------|--------------------------|--------------------------|
| Structural Chromosomal Abnormalities | Number of Patients | Percentage (%) (N=22) |
| t(9;11)                                   | 2                        | 9.09                     |
| t (8;21)                                  | 2                        | 9.09                     |
| t(9;22)                                  | 2                        | 9.09                     |
| t (15;17)                                 | 1                        | 4.54                     |
| t(3;9)                                   | 1                        | 4.54                     |
| t(4;7)                                   | 1                        | 4.54                     |
| add 19 p+                                | 1                        | 4.54                     |
| del 16 q-                                | 1                        | 4.54                     |

*Fig. 1: Karyogram 46XY, t (9;11)*
Discussion

Acute myeloid leukemia is a heterogeneous group of diseases with several discrete syndromes having characteristic clinical, morphological and cytogenetic features. Cytogenetic abnormalities were observed in 54.54% of cases, comparable to large studies from different geographic regions (range of 52-80% abnormalities) as stated by various researchers. Our finding are nearly similar to Enjeti et al. (2004) who reported 61% of abnormal cases in South East Asia region (Singapore). 

In the present study, t(9;11) was found in two cases (9.09%) and this finding is in concordance with that of Ten et al. (1992) who described this translocation in 3 patient of Malysions of aged 5 & 31 year male and 2 year female, and despite it the most common translocation (Table 2, Fig. 1). Translocation (15;17) is found exclusively in acute promylocytic leukemia (Park et al., 2008). He described that t(15;17) and trisomy 8 were the most frequent karyotypic abnormalities seen in 52 cases (11%) and 33 cases (7.3%) respectively. In our study these chromosomal aberration were noted in North Indian population i.e t (15;17) in one case (4.54%) and trisomy 8 in two case (9.09%).

Movafagh et al. (2009) studied 65 patient of Iranian population aged 15 to 72 years and 62 Indian patient of aged 15 to 75 years and observed t(15;17) the most frequent type of translocation, 22 cases (33.8%) in Iranian population and 12 cases (19.3%) in Indian population. which we found it in one case (4.54%) in North Indian population. He also noted t(9;22) in 11 cases (16.9%) in Iranian population and 7 cases (11.3%) in Indian patients which was seen by us in 2 cases (9.09%) but we did not found inv(16)11q23 as described by him.

We observed del 16(q) in one case (4.54%) while Enjeti et al. (2004) reported inv (16) and t(16;16) as uncommon occurrence. This finding does not support as described by Movafagh et al. (2009) who described inv(16) occurring more frequently in Indian i.e. 2 cases out of 62 (3.2%) than Iranian 2 cases (3%) out of 65.

None of the studies was found to the best of our knowledge about add 19(p) which was found in one case (4.54%) in the present study. The present study will be extended by including more number of patients with longer follow-up duration.

Conclusion

In this study we observed the chromosomal aberrations in different age groups and sex and also frequency of various chromosomal structural anomalies in acute myeloid leukemia in North Indian population. Structural chromosomal abnormality in this study was in 11 cases (50%) out of 22 cases, in which translocation was most frequent and other were less. There are only a few population-based studies on AML subjects available in the literature. It is possible that ethnic and geographic factors (or both) could explain some of the variations from the previous findings by different authors. Large epidemiological studies involving different geographic regions of the world would enable the true nature of environmental and genetic interplay in AML to be completely unfolded. So cytogenetic analysis of AML patients plays a great role in to reveal burden of
chromosomal abnormalities in particular population, prognosis and treatment accordingly.

Conflict of Interest: None.

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