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Study of Numerical Chromosomal Aberrations in Leprosy Patients

Abstract

Leucocyte cultures were initiated from 15 normal individuals and 15 cases of leprosy. Present research was carried out to study numerical aberrations in chromosomes of leprosy patients. It was observed that frequency of numerical chromosome aberrations in leprosy cases are not much increased.

Keywords: Numerical Chromosome Aberrations, Leprosy.

Introduction

Leprosy is a public health problem. The disease bears a social stigma, and there is a widespread belief that hereditary is involved in susceptibility to the disease and is produced by acid fast organism *Mycobacterium leprae*. It is well known that some races are more susceptible to leprosy than others. Answers to these questions are still controversial. There is an immunological basis as to what type of leprosy a person would develop. All forms of leprosy may cause some degree of peripheral neurological damage like nerve damage in arms and legs that causes sensory loss in skin and muscles weakness. If untreated, can cause progressive and permanent damage to skin, nerves eyes and limbs. Beiguelman (1967) reviewed the research work on leprosy to find out if any association exist between leprosy and certain genetic markers. Beiguelman (1972) gave appraisal of genetic studies on leprosy. Beiguelman and Pisani in 1976 reported chromosome aberrations in leprosy cases receiving diaminodiphenyl sulphone therapy. Beiguelman et al (1974) gave factors affecting level of dapsone in blood. Alter et al. (2008) gave leprosy is a genetic model for susceptibility to common infectious disease. Tosh et al. (2002) in their studies gave region of chromosome 20 is linked to leprosy susceptibility in a south Indian population. Siddiqui et al. 2001 studied major susceptibility locus for leprosy in India maps to chromosome 10p13. Marcelo et al (2003) studied chromosome 6q25 showed susceptibility to leprosy in a Vietnamese population. Elizabeth et al. (2010) made a study on leprosy and Human Genome.

A genetic component to the etiology of leprosy is well recognized but the mechanism of inheritance and the genes involved are yet to be established. Misch et al 2010 made series of studies over past forty years suggest that host genes influence the risk of leprosy acquisition. Studies suggest that genetic factors influence susceptibility to leprosy. The hypothesis was tested by clinical analysis of the familial distribution of lepromin reaction. Beiguelman et al (1975) studied in vitro effect of dapsone on human chromosomes. Alter et al. (2008) gave leprosy is a genetic model for susceptibility to common infectious disease.

Aims

Aims of study are:

1. To study numerical aberration rates in group of leprosy patients under different of treatment.
2. To study numerical chromosomal aberrations relating to sex and period of treatment of leprosy cases.

Material and Methods

Peripheral leucocytes cultures were initiated from leprosy patients and normal individuals to obtain a large number of cells in metaphase stage. Dalhousie University, Halifax Novascotia method requires only few drops of blood. 8 to 10 drops of blood were dropped directly into each of universal containers having following : 5 ml of Tc 199 medium, 1 ml of serum, .15 ml PHA (Phytohaemagglutinin) and 1 – 2 drops of heparin.

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Culture bottles were kept in water bath at 37^o C for 72 hrs 0.3 ml Colchicine (0.04%) was added to each culture tube on morning of third day. After giving hypotonic treatment, cells were fixed in freshly prepared fixative. Giemsa was used for staining slides. All the stained slides from each aliquot were labeled and screened under lower power for the quality of preparation. Slides were selected for differential count of the metaphases. The chromosome analysis was made on microscope with film projection at magnification. Twenty metaphases were analyzed for each case. Leprosy patients taken for study were under treatment for different period of time.

Results and Discussion

Leucocyte cultures were initiated from 15 normal individuals and 15 leprosy patients under treatment. Normal individuals were 9 males and 6 females. Leprosy patients were 8 males and 7 females.

Table - 1.1 : Showing Sex – Wise Distribution of 15 Healthy Individuals

S. No.	Sex	No. of cases
1.	Male	9
2.	Females	6
	Total	15

Table 1.1 shows 15 healthy human were taken for study. They were 9 males and 6 females.

Table 1.2: Showing Sex –Wise Distribution of Leprosy Cases

S. No.	Sex	No. of cases
1.	Male	8
2.	Females	7

Table 1.2 shows 15 cases of leprosy were taken for study. They were 8 males and 7 females.

Table 1.3 Shows Metaphases With Numerical Aberrations in Leprosy Cases.

Case number	Hyperploidy	Hypoploidy	Chromosomal pattern of abnormal metaphases
L-1	-	-	-
L-2			
L-3		3	45XX-C
L-4		4	45XY-B
L-5			
L-6			
L-7		1	45XX-B
L-8			
L-9		5	45XX-D
L-10	5		47XX+C
L-11			
L-12		1	45XX-C
L-13			
L-14		1	45XY-D
L-15	2		47XY+D

Table 1.3 shows 15 cases of leprosy were taken for study. Abnormal metaphases were observed in eight cases. Hyperloid and hypoploid metaphases were seen.

Table 1.4 Showing Numerical Aberrations in Metaphases of Normal Individuals.

S. No.	Cases number	Hyperloid metaphase	Hypoploid metaphase	Chromosomal pattern of abnormal metaphases
1.	N-1	-	-	-
2.	N-5	-	-	-
3.	N-5	-	-	-
4.	N-6	-	-	-
5.	N-7	-	-	-
6.	N-10	-	3	45 XY – C
7.	N-12	-	-	-
8.	N-15	-	-	-
9.	N-16	-	5	45 XX – B
10.	N-18	-	-	-
11.	N-19	-	-	-
12.	N-20	-	-	-
13.	N-22	-	-	-
14.	N-23	-	-	-
15.	N-28	-	-	-

Table 1.4 shows chromosomal pattern in metaphases of normal individuals. Hypoploid metaphases were observed in only two individuals.

Table 1.5 Shows Distribution of Abnormal chromosome according to affected group in leprosy patients

Chromosome group	Hyperploidy	Hypoploidy
A		
B		5

C	5	4
D	2	6
E	-	-
F	-	-
G		

It is observed that chromosomes of B, C and D groups were affected.

Table 1.6 Shows Distribution of Metaphases With Aberrations According to Sex in Leprosy Patients

Sex	No of cases	Number of metaphases analyzed	Number of abnormal metaphases	Numerical aberrations	
				Hyperploid cells	Hypoploid cells
Male	8	160	7	2	5
Female	7	140	15	5	10

Table 1.6 shows more abnormal metaphases in females. They were more hypoploids.

Table 1.7 Shows Distribution of Metaphases With Aberrations According to Period of Treatment in Leprosy Patients.

Treatment period in years	Number of cases	Number of metaphases analyzed	Numerical aberrations in metaphases	
			Hperploidy	Hypoploidy
4 to 8	7	140		6
8 to 12	5	100	2	6
12 to 16	3	60	5	8

It is observed in table 1.7 in treatment period 4-8 years 4% metaphases showed aberrations, in 8-12 years period 6% and in 12-16 years 5% metaphases showed aberrations. Thus there is not much difference.

Table 1.8 Showing Abnormal Metaphases in Normal Individuals and Leprosy Patients.

Types of cells	Leucocytes of leprosy patients showing aberrations. Patients cell number=300	Leucocytes of normal individuals showing aberrations.patients cell number=300
Hyperploid metaphases	7	
Hypoploid metaphases	15	8

Table 1.8 shows hyperploids and hypoploid metaphases in leprosy patients but in normal individuals only hypoploid metaphases were observed.

Louocyte cultures were initiated from 15 normal individuals and 15 cases of leprosy. Patients were receiving 50 mg. of DDS for a period ranging from 4 to 16 years. The chromosomal counts performed on healthy individuals and leprosy cases showed that frequency of numerical aberrations are higher in leprosy cases than in normal individuals. Lubs and Samuelson (1967) studied chromosomal abnormalities in lymphocytes from normal human subjects. Bloom et al. (1973) studied chromosomal breakage in leucocytes of South American. Ten cases were taken for the study. Five cases showed normal chromosomal pattern, but in other five cases 11 metaphases showed structural aberrations. Chromatid breaks and gaps were observed. Beiguelman and Pisani (1976) study of metaphases with abnormal counts did not show a significant increase. In the present study chromosome of group B were most affected. In study by Beiguelman and Pisani (1976) chromosome of group C were more

affected. Jacobs (1963) study showed that from sixth decade onwards changes occur in chromosomes of man. Beiguelman et al.(1975) showed in a in vitro study that numerical aberrations were not induced by addition of 0.4µg/ml. DDS, but a higher concentration of this (4µg/ml) were able to significantly increase frequency of aneuploidy and achromatic gaps. Since the plasma level of DDS in individuals receiving a daily dose of 50mg varies from 0.4µg/ml, (Degowin et al. 1967). It is likely that most of the leprosy patients to whom low doses of sulfone are administered orally will not be showing extensive chromosomal aberrations.

Conclusion

It can be concluded that there is increase in numerical aberrations compared to normal individuals. In leprosy cases 7.3% cells and in normal individuals 2.6% metaphases showed aberrations. Chromosomes of B, C and D group were effected. More aberrations were seen in females. There was not much difference in aberrations in patients undergoing treatment for different periods.

Suggestions

Suggestions of study were :

1. Studies should be carried out on larger samples.
2. Further studies on genes and molecular basis may help to eradicate the disease.

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