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ORIGINAL ARTICLE

Cytogenetic Study In Criminals (Murderers): Role Of XYY Chromosome In Criminality

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ABSTRACT

Crime & criminals are curse to the society. All types of advanced scientific methods should be used for detection of crime, to prove the guilt of criminal and also to see that innocent subjects are not victimized. Although there are many methods of detecting crime, cytogenetic study has a unique character of its own in its application to forensic science. The crime rates in India are increasing and approximately 5% of the criminals are murderers. The famous Danish 'Adoption studies' states that in addition to socio-economic factors, hereditary plays an important role in the determination of criminality.

In this study an attempt has been made to find out if there is any definite association between the criminality and chromosomal aberrations. Hence the individuals who were convicted by the court of Law under IPC 302 as murderers are subjected to cytogenetic study. Out of 140 individuals subjected to study only 84 would be analyzed for chromosomal study because of culture failure in rest of the cases. By doing cytogenetic study of these criminals it was found that there is a definite association between the criminal behaviour and XYY chromosome. It is also suggested that this positive association should be studied in a large population before this observation can be used as a biological indicator of criminality.

Key Words: Criminals, genetic study, murderers.

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Introduction

Crime is defined as doing of any act declared by statute or ordinance to be punishable in definite way, such as, by fine, imprisonment or death. A person is assigned the status of a criminal when he is adjudged to be punishable by the authorities in a continuous political control over the territory in which he is. Male to female ratio in crime is 90: 10.

Lombroso (1911)[1] first emphasized the physical base of criminality. Hootan (1939)² showed that criminal behaviour could also be related to a specific anatomical trait.

Thus many investigators [3],[4],[5],[6],[7] works on criminality and some important theories are suggested to explain criminal behaviour including Genetic, Glandular and Constitutional theories of crime.

Montagle (1941) & Walker (1950) associated criminality to genetic factors. It was found that the XYY genotype is 20 times more common in prisoners than in the general population.

Bermann (1932) and Podolshy (1955) stated that glandular dysfunction is responsible for criminal behaviour of a person.

Three hypothesis were suggested to explain the violent behaviour in a person. These were biological instinctual theory, frustration theory and social learning theory. The biological instinctual theory was based on hereditary factors and is associated with the XYY syndrome.

Fraser, F Clarke and Nora James J. (1975, 1981), Thompson J.S. and Thompson M.W. (1970),[8] suggested the positive role of extra Y chromosome in violent

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behaviour. They estimated that XYY males are six times more likely to be imprisoned as compared to normal XY males.

Cohen [9] in (1985) had done chromosomal survey in newborns and found 0.5% -0.6% of chromosomal errors in them out of which 35% were sex chromosomal abnormalities. The most frequently occurring sex chromosome variations were Turner syndrome (45,X), Klinefelters syndrome (47,XXY), Polysomy X or Triple X (47,XXX) and polysomy Y or XYY (47, XYY).

He stated that though many individuals with sex chromosome variations can live functionally normal lives, others may experience developmental, physical, psychological, behavioral and learning impairments.

Mednick S.A. [10] in 1983 had studied criminal behaviour in many criminals; he especially emphasized chronic criminal behaviour and found that it is mainly genetically predisposed. In fact genetic, physiological and biochemical factors are causal agents in criminality as same as the family, low socio-economic status or neighborhood factors.

According to Pasqualinin R.Q; Vidal G, & Bur G.E. [11] in 1957 antisocial behavior was a feature of sex chromosome anomalies in males. Casey et al in 1966 had done a survey in two English state Hospitals for patients under special security because of persistent violent or aggressive behavior and yielded an identical proportion of chromatin positive males.

They further stated that about 3% of males in maximum security prisons were XYY and the incidence was over 20% among the age group over 6 ft tall.

In 2008 D.Soudek parvahan Laroya [12] carried studies over 84 male criminals without psychiatric problems. The length of Y chromosomes were measured and compared with Y chromosome of 38 staff men of a psychiatric hospital. It was found

that length of Y chromosome was significantly increased in prisoners as compared to controls. The length of both the fluorescent as well as non-fluorescent segment of Y chromosome was found to be increased

Chromosome studies on criminals are scanty. Moreover chromosome studies in murderers are very few. This study was undertaken to find out whether any specific chromosomal abnormality can be attributed to the criminals with record of violent crime such as murders in the Vidarbha area.

Aim and Objective

1. To study the chromosome abnormalities in murderers.
2. To find out whether a specific chromosomal abnormalities exists in murderers and whether it is significant.
3. This study intends to prepare the data for further research in the field of Human Genetics.

Materials And Methods

This study was conducted in the Genetics Laboratory, Department of Anatomy, Government Medical College, Nagpur in co-operation with the central Jail Authorities Central Jail, Wardha Road, Nagpur and comprises of Cytogenetic study of 140 cases of male murderers.

Blood lymphocyte culture: 1 ml venous blood was drawn under complete aseptic condition in a heparinized syringe and needle. About 0.5 ml of whole blood was then added to the culture medium consisting of RPMI 1640, and depending upon whether the blast counts were more or less 10% 0.1 ml of PHA was added. Culture bottles were incubated at 37° C for 72 hours with stoppers tightly closed, 2-3 hr before harvesting 0.25 ml of Colchicine was added to culture bottle and Cells were centrifuged at 1000 RPM for 5 minutes. 10 ml of 0.075 M potassium chloride (KCL) prewarmed (37°C) was added and incubated for 15 min. Then the chilled fixative was added and bottles were kept at room temperature for cells to be fixed.

2-3 drops of cells suspension were then added with Pasteur pipette over the wet chilled slides are then air dried. Slides were treated with 0.1% trypsin EDTA for 12-20 seconds and stained in buffered Giemsa solution (5%) for 5-6 min. The slides were microphotographed by using Olympus C x 31 microscope.

Observations

In all 140 criminals in the age group of 20-50 years with height 6 feet and above were subjected to cytogenetic study, by Giemsa banding technique.

Out of 140 cultures set, 84 (60%) cultures turned to be positive in which metaphases were studied. Out of 84 criminals studied, 80 (95.23%) were found to show normal cytogenetic complement and 4 (4.76%) cases were found to show abnormal cytogenetic complement [Table/Fig 1].

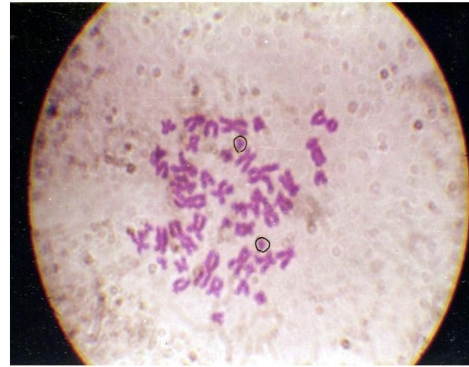
(Table/Fig 1) Showing the no. of cases in which the results were obtained.

Total cases	140
Culture Positive	84
Normal cases	80 (95.23 %)
Abnormal cases	4 (4.76 %)

Metaphases were studied by GTG banding technique with the binocular research microscope (LABO). The banding pattern of chromosomes was studied for individual chromosomal identification and structural abnormality, as per the Paris Classification adopted at the Paris Conference 1971 and published in standardization in human cytogenetic, "birth defects" 1972.

The chromosomal abnormalities were found as follows:

- 1) 47, XYY – Two cases
 - 2) 46, XYr (X)- Two cases
- 1) 47, XYY- Out of total 84 cases studied, two cases were showing extra Y chromosomes [Table/Fig 2].



(Table/Fig 2) Photograph showing 47, XYY Chromosomal abnormality

- 2) 46, XYr (X):- Out of 84 cases studied, two cases were showing ring chromosome. Chromosome 'X' was found to be ring chromosome [Table/Fig 3].



(Table/Fig 3) Photograph showing ring chromosome

Discussion

Number of studies [13],[14],[15],[16],[17] have been carried out over years throughout the world to find out the association between criminal behaviour and following factors.

- 1. Environment: Forssman and Hambert [18] in1963, Casey et al [19] in 1966, Mednick S.A & Finello HM in1983
- 2. Physical traits: Amstendam in1967, Voenev S, Sutherland G; Bartholomew A.A. & Hudson B. in 1968, Thompson & Thompson in 1970 and Hook in [20] 1973.
- 3. Heredity: Forbes in1964, Alter in 1965 & Howels in1985

It is observed that there is a definite association between the environmental parameters and crime.

The observations about association between criminal tendency and physical traits and heredity are found to be very variable. (Braun- Scharm H ;Schroeder-kurth (1986).

In this study an attempt has been made to find out if there is any definite association

between the criminality and chromosomal aberrations and hence the individual which were convicted by the Court of Law under IPC 302 as murderers were subjected to cytogenetic study. Out of the 140 individuals subjected to study only 84 would be analysed for chromosomal study because of culture failure in rest of the cases. This percentage of negative cases is in approximation with those of the other workers. (Cohen, 1985).

The scanned literature showed the following data regarding chromosomal aberrations [Table/Fig 4]

(Table/Fig 4) Showing percentage of chromosomal aberrations

	Chromosomal aberrations in Abortuses %	Chromosomal aberrations in Newborns %	Chromosomal aberrations in Criminals %
Total	6-7%	0-6%	7.2%
Autosomal aberrations	3%	0.36 %	6%
Sex chromosomal aberrations	1%	0.24 %	1.2%

The present study reveals normal diploid number of chromosomes in 95.23% cases where as chromosomal aberrations are found in 4.76% cases.

The percentage of chromosomal abnormalities is found to slightly more than the previous workers.

The data available is inadequate to compare the incidence of these individual abnormal karyotypes in the criminals and general population.

Many studies have revealed the association between 47 XYY and criminality with the varying incidence ranging between 0 - 2% percent. But many of these studies were carried out selectively on the persons in prison. (Thompson & Thompson 1970). In the absence of the definite data on association between the XYY in general population, it can be said that there is a need to study this association more thoroughly in a large population.

This study reveals that there is a definite association between the criminal behaviour and XYY. Even then it is suggested that the association should be studied in a large population before this observation can be use as a biological indicator of criminality.

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