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Allelic Frequencies of Four Phenotypic Traits of Tharu Tribes Along Nepal Border of Lakhimpur Kheri District of Uttar Pradesh, India

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Abstract: The Tharu groups were randomly selected for four morphological and behavioural traits viz attached ear lobe, dimple in chin, widow's peak, and tongue rolling to U-shape to obtain their allelic frequencies. The distribution of these four traits was shown in number as well as in percentage. The frequencies of dominant and recessive alleles of this group were also calculated. Their allelic frequencies have also been depicted because these characters are determined and inherited by single gene. The frequencies of recessive alleles were higher in all the phenotypes except ear lobe phenotype in which dominant allele (61.3%) is more prevalent than recessive allele (38.7%). Between males and females the allelic frequencies were higher in males than females except ear lobe frequency which was very close between male (38.1%) and female (39.9%). The present results have been compared with the previous data for the same traits reported from different districts of eastern Uttar Pradesh and other region of our country.

Keywords: Allelic frequency, Phenotype, Morphological traits, Behavioural traits

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Introduction

The Tharu tribe is one of the largest and diverse ethnic groups scattered across the Terai region of southern Nepal and northern Indian borders. There are few endogamous subgroups of Tharu tribe, viz. Rana, Chaudhary and Katheriya. Marriages between the two separate groups in the Tharu are a rare phenomenon. Small number of Tharu people reside in the adjacent Indian districts as Champaran (Bihar); Gorakhpur, Kushinagar, Basti, Gonda, Balrampur, Shravasti, Lakhimpur Kheri (Uttar Pradesh); and Khatima (Uttarakhand).

As we know India represents one of the largest human biodiversity pools in the world. There are 4635 anthropological populations with little or no gene flow among them. Out of these anthropological populations there are 532 tribes, 72 primitive tribes and 36 are hunters and gatherers. Hence, study on Indian populations known for their cultural and genetic diversity reveals their complex origin, history and relatedness. In the pursuit of estimating allelic frequencies of four phenotypic traits among the Tharu tribe residing in poorly explored region of

Nepal border of Lakhimpur Kheri district reveals the micro-evolutionary aspects of human population.

Study of the Mechanism by which the genetic changes are affected in a population constitutes the field of population genetics. Population genetics is of considerable importance to the understanding of the elemental forces of evolution. A Mendelian population is essentially a group of inbreeding individuals that share a common gene pool. A gene pool is the total genetic information possessed by sexually reproducing individual i.e., the sum of all alleles of all genes present in the population at a given time. Changes in the organization, location and size of a population can lead to changes in the genetic structure of the population. Population genetics of a large number of animal species has been studied in detail which has provided important information on the mechanism of evolution (Dobzhansky, 1955, 1959; Lederberg, 1966; Hartle, 1980).

A number of studies on the distribution of genetical, morphological and behavioural traits among the people of Indian region have been reported (Chakraborty *et al.*, 1986; Bhasin *et al.*, 1992; Bhasin, 1994). These four phenotypic traits are genetically determined. The different populations have been analysed for their morphological traits, which show monohybrid pattern of inheritance (Som, 1970; Mian *et al.*, 1989). It was quite unfortunate that the Tharu people of Terai region have not been included for this kind of study.

The analysis and distribution of allelic frequencies of some genetically determined traits in human populations of eastern Uttar Pradesh were observed to know the micro-evolutionary aspects in different castes (Singh and Singh, 2004, 2006). In the present study four phenotypic traits (three morphological and one behavioural) i.e. widow's peak, dimple in chin, free and attached ear lobes, and tongue rolling to U-shape were investigated. The aim of present study was to analyze the allelic frequencies of these traits in the Tharu tribe of Lakhimpur Kheri district, Uttar Pradesh, India.

Materials and Methods

In the present study all subjects (both sexes) belonging to Tharu tribe population inhabiting near Nepal border area of Lakhimpur Kheri district were observed for four phenotypic traits. No caste difference could be ascertained so their number is presented as single group. Following morphological and behavioural traits were considered-

1. *Widow's Peak*: The front line of hair projects down in the middle of forehead. It is inherited as an autosomal dominant character. Persons were classified into widow's peak (homozygous WW or heterozygous Ww) and smooth hair line (homozygous ww).
2. *Tongue Rolling*: It is a behavioural trait and it is controlled by a dominant gene 'R'. Individuals having dominant gene can roll their tongue to U-shape may be homozygous (RR) or heterozygous (Rr).Thus persons were classified into two groups i.e. tongue rolling ability present and absent.
3. *Dimple Chin*: Dimple or depression in the lower part of chin is inherited as an autosomal character. Subjects with dimple in chin may be homozygous (DD) or heterozygous (Dd). Subjects with smooth chin are homozygous for recessive gene (dd).
4. *Ear Lobe***:** Ear lobes may be free or attached. A dominant gene 'A' controls free ear lobe while attached rear lobe is controlled by recessive allele 'a'. Free ear lobes are genotypically AA or Aa. Attached ear lobe is due to homozygous recessive allele 'aa'.

From the phenotypic data, the allelic frequencies were calculated by the following procedure described by Strickberger (1990).

$$frequency\ of\ recessive\ allele = \sqrt{\frac{No\ of\ persons\ with\ recessive\ phenotype}{Total\ number\ of\ persons\ analysed}}$$

The frequency of dominant allele = 1– value of recessive allele.

Table 1: Distribution (number and percentage) of morphological and behavioural traits in Tharu population of Lakhimpur Kheri

Number of subjects observed	Phenotypes							
	Widow's Peak		Tongue Rolling		Dimple Chin		Ear Lobe	
	Present	Absent	Present	Absent	Dimple	Smooth	Free	Attached
Male (309)	93 (30.10)	216 (69.90)	136 (44.01)	173 (55.99)	45 (14.56)	264 (85.44)	169 (54.69)	140 (45.31)
Female(191)	61 (31.94)	130 (68.06)	100 (52.36)	91 (47.64)	39 (20.42)	152 (79.58)	91 (47.64)	100 (52.36)
Total (500)	154 (30.8)	346 (69.2)	236 (47.2)	264 (52.8)	84 (16.8)	416 (83.2)	260 (52.0)	240 (48.0)

***** Values given in parentheses are percentage

Table 2: Allelic frequencies of four phenotypic traits in Tharu population of Lakhimpur Kheri

Phenotypes	Widow's Peak		Tongue Rolling		Dimple Chin		Ear Lobe	
Alleles	**W**	**w**	**R**	**r**	**D**	**d**	**A**	**a**
Male	0.164	0.836	0.252	0.748	0.076	0.924	0.327	0.673
Female	0.176	0.824	0.310	0.690	0.108	0.892	0.277	0.723
Total Frequency	0.169	0.831	0.274	0.726	0.088	0.912	0.308	0.692

Results and Discussion

The heritability of these traits are determinable from family studies. Table 1 shows the number and percentage i.e. distribution of four phenotypic traits in the Tharu population of Lakhimpur Kheri district. Table 2 shows the allelic frequencies of all these phenotypes. The frequency of widow's peak trait is less than the smooth hair line. In the Tharu group, allelic frequency of 'W' allele 0.169 is more than those of different castes of Hindu population of Sultanpur district in eastern Uttar Pradesh (Singh and Singh, 2004). A similar trend has also been reported in earlier studies from Varanasi population (Lata and Singh, 1996). Although its frequency is less in the males than females. Tongue rolling to U-shape is a behavioural trait and has genetic basis of inheritance. The present study of Tharu tribe population showed 0.274 allelic frequency i.e. less than 50% can roll their tongue to U-shape. The frequency of "R" allele in males is 0.252 and in females it is 0.310. Dimple in chin has been observed in Tharu tribe where 16.8% population showed this phenotype, although frequency of 'D' allele is low i.e. 0.088. In case of ear lobe trait more than 50% individuals showed free ear lobe. The frequency of 'a' allele is

0.692. Male showed more number of free ear lobe (54.69%) than females (47.64%).

Studies on some human phenotypic traits have been done in different regions of Uttar Pradesh (Bhowmick, 1971; Tyagi and Gupta, 1973; Garg, 1979; Kapoor,1982; Lata and Singh,1996; Singh and Yadav, 2000). The frequency of widow's peak trait is less than the smooth hair line. In the Tharu group allelic frequency of 'W' allele (0.169) is more than those of different castes of Hindu (0.142) population of Sultanpur district in eastern Uttar Pradesh (Singh and Singh, 2004). A similar trend has also been reported in earlier studies from Varanasi population (Lata and Singh, 1996). Although its frequency is less in the males than females.

Garg (1986) studied tongue rolling behaviour in male and female in Bhoksa population of Dehradun and reported 33% and 38% frequency, respectively. Singh and Singh (2004) have reported 51% tongue rolling behaviour in different castes of Hindus and Muslims of Sultanpur. However, the present study showed a high frequency of this behaviour in males (52.8%) and females (47.2%) of Tharu population.

Singh and Singh (2004) studied dimple in chin phenotype in different population of Hindus and Muslims of eastern Uttar Pradesh and reported highest frequency of this trait in Muslims (24.6%).The present study of dimple chin in Tharu population showed very low frequency (16.8%) for this trait. Highest frequency of this phenotype was observed in Tharu females (20.42%).

Bhowmick (1971) reported 7.7% frequency of 'aa' individuals (attached ear lobe) in Muslim caste of Lucknow. Garg (1979) has reported nearly 60% individuals with attached ear lobe. Tyagi and Gupta (1973) have reported 44% cases of ear lobe attachment in Kanykubja Brahmins of Lucknow and 55% cases in male Rajput of Lucknow. Singh and Singh (2004) have reported 55.4% frequency of 'aa' individuals in Hindus and 66.3% in Muslims of Sultanpur. In Tharu population more than 50% individuals showed free ear lobe. The frequency of 'a' allele is 0.692. Females showed more attached ear lobe (52.36%) than males (45.31%).

For the first time we have analysed the distribution of four phenotypic traits in Tharu population of Lakhimpur Kheri. We found that the distribution of these traits are almost similar, thus recent data of Tharu population come within this range of variation.

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