International Journal of
Life Sciences
International Peer Reviewed Open Access Refereed Journal

Special Issue A 12: March 2018:283-285
UGC Approved Journal No 48951

Original Article | Open Access

Analysing human trait from population of Nagbhid, based on Hardy- Weinberg's Principle

Rudey RJ

Department of zoology, R.M.G. college Nagbhid, Chandrapur, Maharashtra, India.

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Editor: Dr. Arvind Chavhan

Cite this article as:
Rudey RJ (2018) Analysing human trait from population of Nagbhid, based on Hardy- Weinberg's Principle, *Int. J. of. Life Sciences*, Special Issue, A12: 283-285.

ABSTRACT

Hardy-Weinberg states that in random mating population an equilibrium is established between allelic frequency and remains unaltered from one generation to the next regardless of their dominant and recessive relationship if mutation, migration, selection, genetic drift does not act on it. In present study total sample of 289 individuals, aging from 18 to 79 years were surveyed from Nagbhid area. Those were the students of the college, their parents, relatives and other people from Nagbhid area to study the morphological trait of length of index finger in order to discourse Hardy- Weinberg law. As this is sex influenced character, males and females were analyzed separately to see whether it follows Hardy-Weinberg Principle or not. In the sample of 119 males, 80 showed dominant character and 39 males were recessive. In the sample of 170 females 136 were found recessive. And it was observed that both the sexes show very high degree of deviation than expected by application of Chi- Square test. Hence it was established that certain forces like nonrandom mating, mutation migration selection have great effect.

Keywords: Hardy-Weinberg principle, Allelic frequency, genetic drift, mutation, Chi Square test.

INTRODUCTION

Evolution can be defined as changes in gene frequency within the population. The mathematical model that explains change in gene frequency in population i.e. evolution was provided by Godfrey Hardy and Wilhelm Weinberg in 1908. They specified a relationship between genotype frequency and allele frequency in their principle which states that 'in random mating population equilibrium between frequencies of allele is established in one generation and remain unchanged in successive generations regardless of their dominant and recessive relationship if factors like mutation, migration, selection, genetic drift do not act on it'. The mathematical model of Hardy and Weinberg is based on some assumptions that there should be large population size, random mating, isolation, no gene mutation, segregation of alleles according to

Mendel's law of segregation, no selection pressure and there should be normal meiosis. Model can be easily applied to two allele system. When population show deviation from Hardy and Weinberg's principle means population may be randomly mating (Wakeley *et al*., 2016).

In present study one morphological character length of index finger compared to ring fingr was analyzed. According to Phelps (1952) relative index finger length is sex influenced trait in man, According to Mcdonald *et al*. (2007) short length of index finger compared to ring finger is dominant trait in male and short length of index finger is recessive trait in female. Present study is focused on distribution of genes and gene frequency of Nagbhid population and how it leads to evolution.

Aim of the present study is to see whether the population of Nagbhid follows Hardy-Weinberg's principle or not.

METHODOLOGY

Present study is based on survey method. (Kohli *et al*.2015) Data is collected by analyzing the length of index finger which is genetically transmitted, autosomal, sex influenced trait of students from Rashtrapita Mahatma Gandhi (R.M.G.) college Nagbhid, Chandrapur, Maharashtra, India, their parents, relatives and other people from Nagbhid. Data was collected in the month of August 2017. Permission of the Principal of R.M.G. college was taken and conscent of the parents, relatives and people surveyed was also taken.

Nagbhid is a place located at longitude of 79.67 and latitude of 20.57 Data include 289 adults of age ranging from 18 – 79 years. Out of these 289 individuals males are 119 and females are 170 (Joshi 2008). Data was collected by direct measurements of fingers from mid point of each proximal crease to tip of the finger (L. Gillam *et al*.2008) by using a scale. Also outline of hands was drawn on paper. Horizontal line was drawn from index finger to ring finger and length of index finger was confirmed.

RESULTS AND DISCUSSION

In present study sample is collected from students of R.M.G. College Nagbhid, their parents, relatives and other people of Nagbhid. Data of 289 individuals included 119 males and 170 females.

Females: out of 170 females 34 showed long index finger which indicates presence of dominant gene for length of finger in them. And 136 females showed short length of index finger compared to ring finger which indicates presence of recessive allele for length of finger in them.

In present study for same genetically transmitted, sex influenced, morphological character 119 males were analyzed. Out of 119 males 80 males showed short length of index finger which indicates that these males have dominant alleles for length of finger and 39 males showed long index finger which indicates presence of recessive alleles for length of finger.

To find out in observed and expected allele frequency values, 'P' value and Chi square test was applied (Engels 2009). Hardy-Weinbergs Principle in Algebric terms: - P2+2pq+q2=1 for genotype frequency.

P + q=1 for gene frequency.
P ---- Gene frequency for dominant allele.
P2 ---- Genotype frequency for dominant allele.
q ----- Gene frequency of recessive allele.
q 2----- Genotype frequency of recessive alleles.
Pq ----- genotype frequency of heterozygous.

Table 1: The distribution of morphological character among female and male individuals during survey.

Sr.No.	Sex	Dominant trait long index finger	Recessive trait short index finger
1	Female	34	136
2	Male	80	39

Table 2: The gene frequencies and genotype frequencies of female & male individuals, (N= 170 & N=119).

Sr.No.	Sex	Trait	P	q	p2	2pq	q 2
1	Female	Length of index finger	0.11	0.89	0.12	0.20	0.8
2	Male	Length of index finger	0.43	0.57	0.18	0.4	0.8

For females :

The data collected included 170 females. Out of them 34 had a long index finger and 136 females showed short index finger compared to ring finger. Their gene frequencies and genotype frequencies were calcutated.

Allele frequencies were calculated by using formulae : Frequency of p = p2 + ½(2pq) and frequency of q = 1 – p

Expected number of individuals were calculated and it was found that observed values differ from expected values. Chi square was applied and calculations were done to find out whether the values are significant or not.

The data collected included 119 males out of which 80 males showed dominant trait i.e. they showed short length of index finger and 39 males showed long index finger compared to ring finger meaning presence of recessive trait for length of index finger. Their gene frequencies and gene frequencies were found out.

Chi square method:-

$X^2 = \sum(Xo - Xe)^2 / Xe$

X^2 =96.2 For females

X^2 = 3.83 For males

From above values it is concluded that, there is a great significant difference between observed and expected values under Hardy- Weinberg law. Population of Nagbhid is showing great deviation from hypothesis and makes to conclude that population is not in equilibrium for genes of length of index finger.

CONCLUSION

Among the data collected from students of R.M.G. college Nagbhid district Chandrapur Maharashtra, India, their parents, relatives and other people of Nagbhid , it was found after application of Chi square method that there is a great degree of deviation than expected. The degree of deviation is so high that, it cannot be only due to chance only but certainly due to some forces like mutation, selection, migration, genetic drift etc. have great effect on the population.

Acknowledgements:

Author is thankful to Principal R.M.G. arts and science college Nagbhid for permission to collect data from students of college. Author is also thankful to Ms. Sharwari Panse, Ms. Aroona Ingole and Rima Mendhe for their great help during collection of data.

REFERENCES

Wakeley *et al*. (2016) Effects of the population pedigree on genetic signatures of historical demographic events. Proceedings of the national academy of sciences;113(29):7994-8001.

Kohli *et al*. (2015) Analyzing Human Traits Based on Hardy-Weinberg's Principle. *International Journal of Emerging Trends in Science and Technology. August 2;08:3071-3076.*

Joshi A (2008) Hardy-Weinberg Equilibrium and foundations of Evolutionary Genetics. Resonance, 13(9):812-835.Jul 1;34(4):385-402.

Engels WR (2000) Exact tests for Hardy-Weinberg proportions. Genetics. 2009 Dec 1;183(4):1431-41.

L Gillam *et al*. (2008) Human 2D(index) and 4D (ring) finger lengths and ratios: cross sectional data on linear growth patterns, sexual dimorphism and lateral asymmetry from4 to 60 years age, J Anat.2008 Sep; 213(3): 325-335.

Phelps VR (1952) Relative Index Finger Length as a Sex-influenced Trait in Man, American journal of Human Genetics. 1952 Jun; 4(2):72-89.