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Incidence of Colour Blindness among the Santals of East Singhbhum, Jharkhand

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Introduction

Study of colour-blindness is usually undertaken more out of an academic interest than clinical relevance. However employment in certain professions like working in the capacity of the pilot, loco drivers and the few other necessitates normal colour vision and colour blind person are likely to be rejected such kind of professional job. Being a genetic disorder, such incidences of colour blindness vary from population to population and also different geographical regions of the world inhabited by people of different ethnicity. Maximum incidence of colour blindness has been reported from Caucasian population consisting mostly of the European and the minimum incidence are reported from the certain regions of Africa; the incidences from the various Asian countries being in between two (Ahmed *et.al* 2013).

Colour vision plays an important role in health care system. Colour has three attributes- hue, intensity and saturation. Colour blind people are not actually blind, but are colour deficient, so more appropriate to be used for colour blindness is colour vision deficiency. The first known scientific paper on colour vision deficiency (CVD) was written by Jhon Dalton, who himself was colour blind so CVD is called Daltonism. CVD is a condition characterized by disturbance of colour perception that occurs if the amount of visual pigment per cone is reduced or if one or more of the three cone systems are absent. Individuals with CVD are often unable to distinguish between different colours of the spectrum (Cabrero *et al*. 1997)).

Four types of CVD are protan, duetan, tritan and achromatopsia. Aetiologically, colour vision may be congenital or acquired. Congenital CVD has 8% prevalence for men and 0.4% for women in general population. Red green perceptive disorders are x-linked recessive, but blue colour perceptive disturbance is caused by a single gene which is

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caused by a simple mutation in gene coding for blue receptor on chromosome 7, and is autosomal dominant. The acquired deficiencies are the most common of acquired form. The prevalence of acquired deficiencies is not known but probably greater than the congenital, particularly in older people (Rahman. *et.al* 1998).

Kherumian and Pigkford (1963) have cited fifty seven studies, mostly by Ishihara test, but some with anomaloscope. These data shows that among European, American and Australian whites frequencies of colour blindness is about 6-10 percent. The average figure (of CVD) 7.25% was given for British men. Among Turks, Armenians, Finns, Jews in various parts and other eastern peoples, the frequency fall to 4 to 7 percent. It is 5-6% among Chinese, but as low as 2 to 5 % in Japanese, Indians and Mexicans. Among American Indians it is as low as 1-2 % (Pandey *et al*. 2013).

If we focus on India, Bhasin (2006) reported that the frequency of colour blind males of Indian population is 0.036 (varies from complete absence to 0.231 among Kshatriyas of Andhra Pradesh). The average frequencies in West, East and Central zones are similar (0.032, 0.033 and 0.033, respectively); whereas in case of South and North zones it is higher (0.040 and 0.038, respectively). The frequencies are lowest among scheduled tribes (0.026); however it varies from complete absence to 0.128 among Todas of Tamil Nadu. The frequencies are low in Islands population (0.024) followed by Himalayan mountain complex (0.030) as compared to other natural regions. The maximum numbers of studies are available from tropical savannah type and monsoon type with dry winter climatic regions from where the frequencies are similar to that observed among total populations of India (0.033, 0.036 and 0.036, respectively).

In the present paper an attempt has been made to find out the incidence of colour vision deficiency of the Santals of Galudih block, East Singbhum district of Jharkand, India.

Material and Methods

The study is cross sectional in nature and data were collected from 316 Santals (155 male, 161 female) of Galudih, East Singhbhum of Jharkhand during March 4^{th}-8^{th} , 2014. Participants were selected through random sampling among people of six to sixty years. Care was taken to avoid close blood relatives being included in the sample. Participants were tested for colour vision with the help of Ishihara isochromatic colour plates (Ishihara charts, 1984) during day time in a room with sufficient sun light. The Ishihara charts were held at 75 cm from the person and tilted at right angle to the line of vision. Participants were asked to read the numbers seen on the test plates 1 to 17. If 13 or more plates are read correctly, the colour vision is regarded as normal. The time given for telling the number on

a plate was less than 5 second. Non-literate participants were asked to trace the figure plates with his/her finger.

The phenotypes were recorded for CVD for each individual and the allele frequencies were calculated using Hardy-Weinberg law by means of gene counting method.

Results and Discussion

Total 316 Santals of age group 6-60 years were studied. Two males and one female were found to be having colour blindness. The percentage of CVD in the subjects is shown in the following Tables-

Table 1: Incidence of colour blindness and allele frequency among Santals

Sex	**Total**	**Normal**	**Affected**	**Percentage**	**Allele Frequency**
Male	155	153	2	1.29%	0.11
Female	161	160	1	0.62%	0.08
Total	**316**	**313**	**3**	**0.95%**	**0.09**

Table 2: Type of colour blindness in males and females

Sex	**Type of colour blindness**	**No**
Male	Deutan type	2
Female	Deutan type	1

In the present study the incidence of colour blindness in male is 1.29% and in female 0.62%. The results of Ishihara colour charts test shows that two males and one female were of deutan type. No monochromat and trichromat have been found in this population. Affected people are all dichromat and their colour blind were mild. An interesting observation in this study was that most of the affected individuals did not know that they have any defect regarding their colour vision.

Observation

The incidence of colour blindness is much more in male as compared to female. The result of the present study with Ishihara colour chart shows that the frequency of deuternomaly is more than the protanomaly. This can be explained by the heredity of the colour blindness.

Thus, the incidence of 1.29% amongst the Indian male in our study is close to, though somewhat lower than, the incidences reported by several other workers which vary from 2.88% to 5.66% in different parts of the country (Pandey *et al*. 2013).

Similarly, the low incidence of 0.62% amongst the Indian female in the present study is comparable to the incidences reported by workers from other parts of India, with the incidences ranging from 0.0% to 1.13% amongst the females in such studies (Pandey *et al*. 2013).

However, as only one female and two male were found to be colour blind, it is not wise to conclude anything regarding colour blind incidence of the population through present data. To conclude about incidence of colour vision of the population, a further study with more participants is essential. However, despite a comparatively smaller sample size, the results of the present study compare well with those of several other studies about the incidence of colour blindness.

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