

Taste Sensitivity to P.T.C. and Colour Blindness Among the Brahmin of Sundarnagar, Himachal Pradesh

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INTRODUCTION

Tasting ability to Phynylthiocarbamide (P.T.C.) is a character which divides human populations in two groups, (a) Tasters and (b) Non Tasters, according to their ability to taste P.T.C. This character has been used to study variation in human populations since its discovery by Fox in 1932. The inheritance of tasting ability is controlled by a bi-allelic autosomal gene, dominant *T* responsible for tasting ability and recessive *t* responsible for non-tasting ability.

Colour blindness on the other hand can be classified into many types. The red-green colour blindness and blue blindness are X-linked recessive defects controlled by genes located on Xq28 (McKusick, 1983). Colour blindness as a trait is also used in the understanding of evolutionary forces of selection and relaxation.

The present paper reports on P.T.C. tasting sensitivity and red green colour blindness among the Brahmin of Sundarnagar, Himachal Pradesh and compares the result with the populations of Himalayan region.

MATERIALS AND METHODS

A sample of 223 (97 males and 125 females) unrelated Brahmin individuals from schools of Sundarnagar was selected for the study. The method of serial dilution as given by Harris and Kalmus (1949) was used for testing ability. Examination of colour blindness was done by Ishihara (1960) plates numbered 1 to 25.

RESULTS AND DISCUSSION

P.T.C.. Tasting Ability

Bimodal distribution was obtained for the graphs plotted for the threshold distribution. The antimode for males lies at threshold no. 5 while that of females it lies at threshold no. 4. The total population shows the antimode at

threshold no.4. Table 1 list the Mean threshold values, Standard Deviation, D/S index of Penrose and Percentage of misclassification. In case of males the mean threshold lies on 9.395 and 1.905 for tasters and non-tasters respectively and in case of females the mean threshold lies on 9.32 and 0.875 for tasters and non-tasters respectively. Thus both males and females have almost same mean threshold for tasters but for non-tasters the mean threshold is less for females than for males. D/S index of Penrose is higher than 3 for each, males (5.208), females (5.436) and total (5.12). This clearly shows that the distribution of tasters and non-tasters in the three cases is statistically bimodal. The values of percentage of misclassification show that there have been some misclassification of individuals as tasters and non-tasters but the misclassification is not very high enough to effect the result in a significant way.

Table 2 lists the percentage and gene frequencies of tasters and non-tasters for the males, females and total combined population. Among males studied 78.35% are tasters and 21.65% are non-tasters. Among the females studied 80.95% are tasters and 19.04% are non-tasters. The gene frequency for the non-taster gene *t* for males and females comes out to be 0.4653 and 0.4364 respectively. The difference between the gene frequency between males and females is statistically non-significant. Among the total population studied 80.72% are taster and 19.28% are non-tasters. The gene frequency for the non-taster gene *t* is 0.4391 for the total population.

A lot of work on taste sensitivity to P.T.C has been done in Himalayan region by various anthropologists. The *t* gene frequency is highly variable throughout the Himalayan region, ranging from a minimum of 24.5% in Angami Nagas of Nagaland (Seth and Seth, 1973) to a maximum of 71.5% in Brahmins of Bilaspur (Bhalla, 1978). The variability is also evident in the three zones of Himalayan region. In Western Himalayas the value ranges from 71.5% in

Table 1: Mean, standard deviation D/S index and percentage of misclassification of taster and non tasters among Brahmins

Population	Tasters		Non-tasters		D/S	Percentage Of Misclassification
	M_1	S_1	M_2	S_2		
Males	9.395	1.96	1.905	0.916	5.208	0.93%
Females	9.32	2.18	0.875	0.927	5.436	0.67%
Total	9.306	2.13	1.186	1.042	5.12	1.05%

Where; M = Mean, D = $M_1 - M_2$, S = Standard Deviation, S = $(S_1 + S_2) / 2$

Table 2: Tasters and non-tasters among Brahmins

Population	No. tested	Absolute No.		Percentage		Gene Frequency	
		Taster	Non-taster	Taster	Non-taster	T	T
Males	97	76	21	78.35	21.65	0.5347	0.4653
Females	126	102	24	80.95	19.04	0.5636	0.4364
Total	223	180	43	80.72	19.28	0.5609	0.4391

Brahmins of Bilaspur (Bhalla, 1978) to 33.8% in Shipi's of Lahul (Chowdhary, 1987). In Central Himalayas it varies from 63.2% in Rajputs of Kumaon (Bansal, 1961-62) to 26.7% in Rang Bhotias females of Uttarkashi (Tiwari and Kapoor, 1984). In Eastern region the value varies from 61.4% in Kalitas males of Kamrup (Balgir, 1984) to 24.5% in Angami Nagas of Nagaland (Seth and Seth, 1973).

In the present study the t-gene frequency in Brahmin of Sundarnagar comes out to be 43.91% which is close to 42.6% of Brahmins of Palampur (Kapur, 1969) and 44.95% of Brahmins of Simla (Singh, 1968) in the nearby districts of Kangra and Simla respectively. The Chi-square test has been applied to compare the Brahmin Population of Sundarnagar with some of the populations of Himalayan regions, to see whether statistical difference exist among them for the frequency of t-gene in the populations. It is found that Brahmin of Sundarnagar show statistically non-significant differences with Brahmin of Palampur, Simla and Garhwal. In comparison the Brahmins of adjoining district of Kulu and Bilaspur show a significant difference when to the Brahmin of Sundarnagar. The Brahmin of Bilaspur show a very highly significant difference to the Brahmin of Sundarnagar. The other Brahmin populations which show statistical significant difference

compared with Brahmins of Sundarnagar are Brahmins from Tawi Valley (Western Himalayas), Kumaon (Central Himalayas) and Kamrup (Eastern Himalayas). Brahmin of Sundarnagar show the highly non-significant difference with the Rajputs of Narendranagar and Kalitas of Kamrup. Other populations, which show statistically non-significant difference, are Gorkhas of Dhauladhar range, Rajputs of Shimla and Kinnaur, Bhotias of Pithorgarh and Uttarkashi, Sah of Kumaon, Khasi of Arunchal and Shillong, Rieng of Tripura and Kaibartas of Kamrup. Brahmin of Sundarnagar show statistically very significant difference to the populations of Rajputs of Bilaspur (Himachal Pradesh) and Kumaon and Angami Nagas of Nagaland and Keot of Kamrup (Bhasin et al., 1992).

Isogenes were drawn joining the points of the gene frequencies falling in the same range. It has been observed that many regions shows a great variability of t-gene frequencies, that is at a place different populations show a wide variation of allele frequency. In Western Himalayas, three isogenes 0.3-0.4, 0.4-0.5 and 0.5-0.6 run almost parallel. No such pattern is observed in Central Himalayas. In Eastern Himalayas small pockets of 0.3-0.4, 0.4-0.5 isogenes can be seen. The isogene for 0.5-0.6

frequency shows a wide distribution. Areas like Kamrup Distt. in Assam shows all the isogenes. This may not only be an indication of high variability at one place only, since a lot of studies have been done in this region on many population groups. This on the other hand indicates the wide and complex variation in distribution of the *t* gene in the populations of Himalayan region.

Colour Blindness

Of the 97 males tested for color blindness there were only 3 individuals who could read less than 13 plates correctly and they can be classified as color vision deficient. The percentage of Color blindness among the males comes out to be 3.093%. Of the three colors blind two individuals were Deutan strong and one was total color blind. None of the females of the 125 tested were colorblind that was not unexpected due to the X-linked nature of the trait.

A lot of variations have been reported in the percentage of color blindness in the Himalayan region (Kapoor et al., 1983, Tiwari and Kapoor, 1984; Kapoor, 1992). The percentages varies from zero in many populations to a highest value of 10.4% in Apatanis of Arunachal Pradesh. It has been observed that Himalayan region specially the Eastern and to some extent Western comprises of many tribal populations. Most of the populations studied in these two regions, more than 50% of the populations have colour blindness less than 4%. In fact many of the tribal groups of east like Naga, War, Miri, Mikir of Assam and Nocte of Arunachal do not show color blindness. Very few tribals in Eastern Himalayan region have colour blindness greater than 4%. It's the non-tribal population in general, which show a higher percentage of colour blindness.

Most of the populations of Eastern and Western regions are rural and are based on agriculture or forest based economy. In such populations negative selection for color blindness take place and it reduces the frequency of color blindness in these populations. In comparison to the urban societies which show a higher frequency compared to the rural and tribal populations. The central Himalayan populations studied are mostly non-tribal and none of them show any frequency of color blindness. The

Brahmin of Sundarnagar are close to the Rajputs of Kulu, Bodhs of Kulu, Brahmins of Kumaon, Rajputs of Garhwal and Wanchoo and Padam-minyong of Arunachal Pradesh as far as frequency of color blindness is concerned.

Finally it is suggested that more genetic data on Brahmin and other caste groups of district Sundarnagar, Himachal Pradesh is needed to explain the anthropological similarity or diversity which shall focus on the dynamics of microevolution.

KEY WORDS P.T.C. Colour Blindness. Brahmin. Himalayan Population.

ABSTRACT A study of taste sensitivity of P.T.C. and colour blindness among the Brahmins of Sundarnagar of Himachal Pradesh was done. The *t* gene frequency was found to be 0.4391 in the total population, and that of colour blindness 3.093 % among the males. The results have been compared with the populations of Himalayan region of India. The trait of colour blindness among the populations of Himalayan region has been looked into, in view of the selection relaxation hypothesis

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