TASTE DEFICIENCY FOR PHENYLTHIOCARBAMIDE IN MATHUR KAYASTHS COMMUNITY OF HYDERABAD, A.P.

VIJAY DEVI MATHUR

Department of Physiology,
Kakatiya Medical College, Warangal – 506 007

and

SANGITA MATHUR AND BIR BAHADUR

Department of Botany,
Kakatiya University, Warangal – 506 009

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Summary : The ability to taste phenylthiocarbamide (PTC) has been investigated in 422 individuals representing both sexes among the Mathur Kayastha community of Hyderabad, A.P. There is a great excess of non-tasters with a high 't' gene frequency (0.76). There is no significant difference between the males and females for the t-gene. It is suggested that the high incidence of non-tasters in Mathurs is possibly due to their Aryan origin or even endogamdus customs.

Key words : phenylthiocarbamide (PTC) high frequency of t-gene Mathur Kayasths community

INTRODUCTION

Little is known on the genetic studies of the Kayasths community in general and the Mathur Kayasths of Hyderabad in particular, although their settlement in Hyderabad dates back to 1750 A.D. The Kayasths traditionally are a "writing caste" of highly adaptable and intelligent people; their historical prominence dates back to the establishment of Muslim rule in India (25, 26, 33). According to Leonard (26) the Kayasths are noted through out India as highly Islamized one as evidenced by the Hyderabd Kayasths whose allegiance to Moghul administration and culture terminated with the rule of the Nizam of Hyderabad. The Hyderabad Kayasths hail from North India (Chitragupta

Kayasths). The Prabhu Kayasths of Maharashtra and Bengali Kayasths are culturally and structurally different from the Chitragupta Kayasths despite this, their contribution to administration in political, social, cultural and various other aspects in India in general and that of Hyderabad in particular is worth recording (25, 26).

Sanghavi and Khanolkar (34) have first studied the frequency of the PTC gene in Chandrasena Kayasths Prabhu. Recently, Chattopadhya (13) has studied the folding of hands and arms to the left and right hand sides as well as camptodactyly in Bengali Kayasths. There is thus no study that deals with any genetic aspect of the Mathurs of Hyderabad or for that matter India as a whole. This paper the first in the series deals with the frequency of tasters and non–tasters gene to Phenylthiocarbamide (PTC).

The taste polymorphism in human beings for phenylthiocarbamide or phenyl–thio-urea has been studied by many workers and a great interracial variability has been recorded. Its bitter taste was accidentally discovered by Fox (18). This trait has been shown to be inherited as a single dominant gene by Blakslee and Salmon (8) and later by Snyder (39). Persons who taste the substance are called taster and those who cannot taste at all are called as non–tasters and are referred to show taste blindness for PTC. Although the cellular and the molecular basis is not understood but the genetical and physiologic basis is no known (24). Tasters have the genotype TT and Tt and the non-tasters have only one genotype tt. Tasters have atleast one parent who is also a taster but a non taster has both the parents non–tasters such that the non–taster trait breeds true (38). The taste blindness for PTC is comparable to odour polymorphism for musk (41).

MATERIAL AND METHODS

In the present study 422 individuals representing both sexes belonging to about 100 families of the Mathur Kayasths community of Hyderabad were surveyed for the frequency of tasters and non–tasters for the substance Phenylthiocarbamide (PTC). For this the sorting technique of Harris and Kalmus (20) and modified by Das (14) was followed. A total of 13 solutions of PTC were used. The 1st solution was 0.13/100 ml and in each successive solution the strength was reduced by half. The threshold is indicated numerically as a point ranging from 1 to 13 for a solution of particular strength when

the taste was recognised. Accordingly persons able to taste solution 5 to 13 are tasters and solutions 1 to 4 are non–tasters. Labelled plastic fillers were employed to put the solution on the clean tongue of the individual. Every individual was given solution No. 1; noting his or her reaction to the taste sensitivity of PTC as judged by the bitterness of the solution and facial expression on the other. Some experienced an intensely bitter taste and others found no taste at all. Their ages ranged from 10 to 60 years. The data has been analysed sex wise as well as on the total by applying the Hardy–Weinburg law (38). It may be pointed out that Chakraborty and Ghorai (12) have devised a new method of classification of tasters and non–tasters but this is applicable to populations where the number of non–tasters are few and therefore not followed in the present work.

RESULTS AND DISCUSSION

Data on the distribution of PTC taste blindness for 422 Mathurs is given in Table I. A perusal of the data shows that out of a total of 178 males and 244 females tested, a great excess of non–tasters has been observed in males (60.765%) and females (55.738%) respectively. Since the population with regard to tasters and non–tasters is panmictic; the three genotypes for the PTC trait mate at random. According to Hardy–Weinburg law, a Mendelian population may have any proportions of dominant and recessive genes and the relative frequencies of each gene allele tend to remain constant generation after generation provided mutation, selection and migration exerts no pressure.

TABLE I : Distribution of tasters and non-tasters phenotype and gene frequencies for PTC in Mathur Kayasths of Hyderabad.

Sex	*Number tested*	*Tasters (TT,Tt)*	*Non–Tasters (tt)*	*Tasters %*	*Non–Tasters %*	*Allele frequency T(1-q)*	*Allele frequency t(q)*
Male	178	70	108	39.325	60.765	0.2211	0.7789
Female	244	108	136	44.262	55.738	0.2535	0.7465
Total :	422	178	244	42.18	57.82	0.2397	0.7604

Following this law, the gene frequencies of the tasters and non–tasters would be :

$$q^2TT;\ 2q\ (1-q)\ Tt\ :\ (1-q)^2\ tt$$

Since the non–tasters (tt) constitute 0.578 (57.82%) of the population the frequency of the 't' gene in the gene pool would be :

$$(1-q) = \sqrt{0.5782} = 0.7604$$

The frequency of the gene 'T' in the gene pool would be :

$$q = (1-0-0.7604) = 0.2396$$

The calculated gene frequencies of the three genotypes in the population presently sampled would be :

$$q^2TT = 0.0574;\ 2q\ (1-q)\ Tt = 0.3645;\ (1-q)^2tt = 0.5781$$

A perusal of the data in Table I further suggests that there is variation of PTC blindness with sex. Thus, in the present study the percentage of males as non–tasters is higher (60.765%) in comparison to females (55.738%). Accordingly the 't' gene frequency is high in males than in females. This confirms the earlier findings of Agarwal (1) and Chattopadhya (13) have similarly observed higher percentage of non–tasters in males in Burmese immigrants of Andaman Islands and Jats respectively. Some what similar results have been obtained by number of workers (5, 15, 21, 22, 30, 35, 40). Recently Chandraiah and Bahadur (11) have studied the PTC gene frequency in six endogamous groups of Gadwal in Andhra Pradesh. In general they observed great deficiency for taste blindness, with high percentage among the females than males in Harijans but in other castes the reverse was true. The only study in which excess of non–tasters among females was observed is in Israel by Brand (9).

The distribution of threshold values for the overall population and for the both males and females is given in Table II. The values indicate that the distribution is bimodal with the antimode at solution 5 and 6 in both the sexes. This is comparable to Chattopadhya (13) on Jats and Chandraiah and Bahadur (11) on six endogamous castes of Gadwal. According to Chakraborty and Ghorai (12) the threshold distribution for a given population is bimodal but Das (14) regards the bimodality as due to the overlapping of the threshold distribution of the tasters and non–tasters groups.

The only data on PTC taste blindess on Kayasths is by Srivastava (36) on Chandrasena Kayasth Prabhu. He sampled only 52 persons and found 25% non–tasters. This in itself is a meagre data since Kayasths as mentioned earlier are a heterogeneous

group comprising of as many as 12 sects of which some are said to be extinct (26). The data of Srivastava (37) may be compared with the data presently obtained but his data is very limited and hence incompatible with the present one, since the present work deals exclusively with the Mathur Kayasths where the t–gene frequency is very high and this is comparable to the Punjabis and Muslims whose t–gene frequencies are 0.76 and 0.623 respectively (16, 36); both the caste groups hailing from North India. The data on Mathurs presented though is limited in scope, nevertheless provides interesting clue that the Kayasths are Aryans as Sir H. Risley remarked, "the Kayasths possesses remarkable intellectual attainments indicates that they posses Aryan blood (25). This observation is compatible with the data on similarity on t–gene frequencies between the Punjabis and Muslims who are likewise Aryans.

Data on taste blidness to PTC in human populations is vast and a great deal of work has been done not only on various interracial populations but major races of mankind the world over (10, 27). Table III and IV summarise the percentage of non-tasters and the t–gene frequencies in Indian and non-Indian populations respectively. A perusal of the data in Table III shows that the t–gene frequency ranges from 0.363 to 0.77. among the Indians the t–gene frequency is as low as 0.363 in Aligarh population (32) while the highest t–gene frequency (0.77) has been reported for the Punjabis (16).

TABLE II : Distribution og the threshold values among the Mathur Kayashths of Hyderabad.

PTC Threshold	*Males*		*Females*		*Both sexes combined*	
	No.	%	*No.*	%	*No.*	%
1	40	22.4	37	15.16	77	17.4
1	23	12.9	33	13.52	53	13.23
2	20	11.23	26	10.65	46	10.9
3	16	9.0	20	8.2	36	8.53
4	9	5.05	20	8.2	29	6.87
5	3	1.68	4	1.64	7	1.65
6	3	1.68	7	2.87	10	2.37
7	6	3.37	10	4.09	16	3.79
8	22	12.36	38	15.57	60	14.2
9	18	10.11	20	8.2	38	9.0
10	8	4.49	13	6.96	21	5.0
11	4	2.24	8	3.27	12	3.0
12	4	2.24	5	2.04	9	2.1
13	2	1.01	3	1.23	5	1.2
Total :	178	32.7	244	57.8	422	

TABLE III : Comparison of frequency of non-tasters in Indians.

Sect/religion population	*Total tested*	*Non–tasters %*	*t–gene frequency*	*References*
Aligarh (Misc.)	1941	45.30	0.363	Rizvi *et al.* (32)
Hyderabad (Misc.)	2428	36.73	0.394	Hashim, M (23)
Hindus (Riang)			0.403	ex. Mansoevitz *et al.* (27)
Brahmins	69	24.63	0.469	Srivastava, R.P. (36)
Indian Tamils (Malaya)	50	27.20	0.471	ex. Manosevitz *et al.* (27)
Kayasths	52	24.99	0.499	Srivastava, R.P. (36)
Indian Iranis	200	25.0	0.500	ex. Manosevitz *et al.* (27)
Muslims (Syed Pathan)	300	26.38	0.513	Srivastava, A.C. (37)
Khattri	30	30.00	0.547	Srivastava, R.P. (36)
Indians (Ceylon)	50	30.2	0.550	ex. Manosevitz *et al.* (27)
Hindus	489	33.7	0.581	Das, S.R. (14)
Vaishya	53	37.73	0.614	Srivastava, R.P. (36)
Muslims	67	38.80	0.623	,,
Hindus (Bombay)	200	42.5	0.652	Sanghavi and Khanolkar (34)
Hindus (Misc.)	285	52.63	0.72	Dhesi *et al.* (16)
Hindus (Malavedan)	200	25.0	0.732	ex. Manosevitz *et al.* (27)
Hindus (Non Jat Sikh)	285	55.08	0.75	Dhesi *et al.* (16)
Hindus (Punjabis)	338	58.99	0.77	,,
Hindus (Jat Sikhs)	536	58.96	0.77	,,

TABLE IV : Comparison of the high incidence of t-gene frequency.

Population/Nationality	*t–gene frequency %*	*References*
Australian natives (South)	0.702	ex. Manosevitz *et al.* (27)
Australian natives (Central)	0.707	,,
Melanesians Pygmies and New Guinea	0.713	,,
Hindus Malavedan	0.732	,,
Punjabis (Indian)..	0.76	Dhesi *et al.* (16)
Mathur Kayastha Hyderabad, India	0.76	(present work)

a relationship between the PTC response and menstural cycle. It may recalled that Harris and Kalmus (20, 21) correlated taste sensitivity to PTC in goitre and diabetes. Unfortunately, in the present work no correlation studies were possible but in view of the fact that the Mathur community has many diabetics, a study in relation to PTC sensitivity would be interesting and rewardng.

A comparative study of the three Kayasths communities viz., North Indian Kayasths, Bengali Kayasths and Maharashtra Kayasths would be interesting in relation to PTC and other genetic characters, since this would shed additional light on the ethnic origin of Kayasths in general and the regional groups and their differences in any if particular.

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