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COMMUNITY BASED EVALUATION OF PHENYLTHIOCARBAMIDE (PTC) SENSITIVITY AND DERMATOGLYPHICS AS A GENETIC MARKER IN TAMILNADU, INDIA

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Abstract

Devanga Community is a weaving and exporting cotton materials to abroad and local markets.It is profession oriented communities and plays a significant role in Indian economy. In the Devanga Community, conscious people and intercaste marriages are literally unknown. A large range of extreme and mild variations of the nervous system have been shown to have a genetic importance. A minimal yet striking example is the inheritance of the capacity to taste the substance Phenylthiourea. The ability to taste Phenylthiourea or Carbamide (PTC) has been an important character in the investigations of population genetics and racial research. The ability to taste PTC is a simple recessive and polymorphic character among them. In the present study 220 individuals consisting of 50 families from Devanga caste were tested for PTC taste sensitivity, to understand the nature and distribution of these simple genetic characters in a selected population. If the ability to taste is investigated by means of a series of graded concentrations of PTC, the population distribution of taste thresholds is clearly bimodel. The antimodel value which discriminates tasters and non-tasters differs according to the population studied. So far, no study was made on this community in Madras city. This gave ample opportunity to work on dermatoglyphics and PTC taste sensitivity of Devanga people. These observations were made in 1985 by the author but to bring it into the journal took very late due to certain unavoidable circumstances.

Key words: polymorphism, threshold value, PTC, dermatoglyphics.

Introduction: Every human being has a wholly distinctive set of finger prints. Their complex patterns of parallel ridges and furrows remain unchanged and are nearly indestructible. These qualities make finger prints an ideal means of

personal identification. The epidermal ridges that cover the palmar surfaces of fingertips, the palms of the hand and the sole of the foot are of interest not only to the Geneticists but also to the criminal investigator and anthropologist [2, 4]. Dermatoglyphics was named for the study of epidermal ridges and are credited for pointing out the increased frequency of dermatoglyphic abnormality in patients with chromosomal aberrations [1,3].

Today dermatoglyphic analysis is used by clinicians as an aid in diagnosing chromosomal and other clinical disorders [6]. The epidermal patterns are formed early in foetal life. At about the 12^{th} week of gestation, undulations appear on the inner surface of the epidermis [8]. It is these undulations that later develop into a structure of ridges and furrows that contain the ducts of sweat glands spaced along the surface of the ridges [5].

In PTC –taste sensitivity, a large range of extreme and mild variations of the nervous system have been shown to have a genetic basis [7]. A minimal yet striking example is the inheritance of the capacity to taste the substance Phenylthiourea. The ability to taste Phenylthiourea or Carbamide (PTC) has been an important character in the investigations of population genetics and racial research [11,13]. The ability to taste PTC is a simple recessive and polymorphic character. The dimorphism in intensity to PTC is believed to depend on a main pair of genes of which the recessive ones are in homozygous condition that causes the lack of tasting[9] .It is also used to find out the genetic variation and predisposition of overweight/obese, smoking/alcoholism and thyroid disease traits among tasters and non-tasters in Mysore population,South India [20].

Materials and Methods

As many as two hundred and twenty male and female individuals drawn from Fifty Devanga families living in Madras City are subjected to study. They are tested for three different genetic parameters such as Blood groups, Dermatoglyphics, and PTC sensitivity.

Dermatoglyphics

Method

There are several methods for demonstrating Dermatoglyphic patterns. All these different methods demand varied kinds of equipment and certain of them are time consuming. Dermatoglyphic patterns are recognizable even by the naked eye. A mangnifying lens helps greatly in scanning Dermatoglyphic patterns which are clear in infants and children and the permanent impression or prints are necessary for quantitative ananlyses of Dermatoglyphics [14]. A

good quality of Dermatoglyphic print is obtained by removing sweat, oil and dirt from the skin. Care is taken to print the ridged area completely [18]. A magnification lens of approximately 4 or 5 times is used in counting ridge and noting down the details of printed areas with the help of a needle[10].

Phenyl Thio-Urea(PTC) Taste Sensitivity

Method

In 1000ml of boiled distilled water, 1300 mg of phenyl thio-urea is dissolved completely. The solution was allowed to attain room temperature and transferred to properly cleaned enamel tray. Whatmann's filter is immersed and for 48 hours. The purpose of keeping filter paper for such a long time is for a proper and uniform distribution of Phenyl thio-urea. After allowing optimum length of time, the paper is allowed to dry in the room temperature[12, 19]. The filter paper is taken out and cut into small bits (1cm wide and 2 cm long) and are used to test the subjects. The taste threshold value for bitter taste in about 220 individuals are determined with the filter paper bits [15]. Taste sensitivity for phenyl thio-urea was noted from the answers given by the subjects and also from the facial expressions and reactions. Those who do not respond to taste with distilled water but do taste with soaked filter paper in phenyl thio – urea are classed as tasters [17].

A total of 220 individuals with 108 males and 112 females were tested for PTC taste sensitivity[16]. The chemical, Phenyl thio-urea used in the present study is obtained from KOCH-LIGHT Laboratories., Coin Brook Bucks England (B/No.59151).

Results

A total of two hundred and twenty (220) individuals drawn from fifty (50) Devanga families were tested for Dermatoglyphic pattern and phenyl thio-urea (PTC) taste sensitivity. Among these subjects, One hundred and eight (108) of them were males and One hundred and twelve (112) of them females. The blood group distribution in them was, group A=45, group B=69, group AB=13, and group O=93.

The PTC taste sensitivity test revealed 85 subjects to be tasters, and 135 to be non-tasters. Out of 50 Devanga families, 10 were consanguineous with 26 offspring, and 40 were non-consanguineous with 194 offspring.

As many as 60 individuals with 66 bodily disorders (health hazards) such as gastritis, blood pressure, primary complex, Chronic cold, diabetes, congential heart disease and asthma were observed and studied. The results have been

tabulated and shown in tables I to V. Appendix with details of cases and the parameters included in the present study is attached.

Table-I: Table Representing Number of Tasters and Non-Tasters in the Two Sexes and Their Relationship to Blood Groups.

BLOOD GROUPS	PTC TASTE SENSITIVITY OF SEX Males Tasters	PTC TASTE SENSITIVITY OF SEX Males Non-tasters	PTC TASTE SENSITIVITY OF SEX Females Tasters	PTC TASTE SENSITIVITY OF SEX Females Non-tasters	Total
A	10	15	8	12	45
B	14	18	12	25	69
AB	1	4	2	6	13
O	20	27	18	28	93
TOTAL	45	64	40	71	220

Table II: Table presenting age groups and PTC taste sensitivity.

PTC taste sensitivity	3-18 years	19-45 years	45 years and above	Total
Taster	47	45	11	103
Non-taster	52	85	23	160
Total	99	130	34	263

TABLE -III: Table showing PTC taste sensitivity in relation to the type of offspring.

PTC taste sensitivity	No. of offspring of Consanguineous marriage	No. of offspring of Non-consanguineous marriage	Total
Tasters	14	71	85
Non-tasters	12	123	135
Total	26	194	220

TABLE -IV: Table representing PTC taste sensitivity in relation to total finger ridge count (TFRC).

PTC taste sensitivity	Number of persons	Total finger ridge count (TFRC)
Tasters	85	9661
Non-tasters	135	16839
Total	220	26500

TABLE -V:Table showing bodily disorders and PTC taste sensitivity

Disorders	PTC taste sensitivity Tasters	PTC taste sensitivity Non-tasters	Total
Gastritis	6	22	28
B.P.	2	8	10
Primary complex	7	4	11
Chronic cold	4	4	8
Diabetic	1	3	4
Heart ailment	-	2	2
Asthma	1	1	2
Mentally retarded	-	1	1
Total	21	45	66

Discussion

Nearly forty genetic polymorphisms in the antigens of red blood cells, the red cell enzymes and the serum proteins are presently known. These characteristics are called genetic markers because their expressions are gene mediated, manifested in varied phenotypes, and evidencing simple mode of inheritance and revealing different frequencies in populations. Though all the genetic polymorphisms of blood might appropriately be called “Blood Groups”, the term is restricted in usage to the red cell antigens only.

The relationship, between blood groups and PTC taste sensitivity shows no association between them (Table I). Race and Sanger (1968) state that there is no correlation between blood groups and PTC taste sensitivity due to the simple

and unequivocal pattern of inheritance, absence of the effect of environmental factors, age, interaction with other genes on the expression of the trait. In recent years, Consanguinity has gained considerable importance in human genetics, since inbreeding increases homozygosity, which in turn results in the expression of recessive alleles (taste blindness, albinism etc) in the offspring. The present work is an attempt to know the relationship between the bodily disorders and offspring born of consanguineous and non-consanguineous marriages (Table III)

Significant relationship is found only between PTC taste sensitivity and the total finger ridge count (Table IV). The human polymorphism for taste sensitivity in response to the phenyl thio-urea (PTC) has been carried out in different races, by different investigators. The distribution of PTC taste sensitivity varied strikingly in different populations. The lack of taste threshold difference among Devanga sexes is that the present study concerns one community and subjects are tested at random. These parameters are related with other factors such as sex, age-group, consanguineous and non-consanguineous marriages and their offspring and some bodily disorders (Table V).

Summary and Conclusion

The present study consists of Dermatoglyphic pattern and Phenyl thio -urea (PTC) taste sensitivity among devanga community. The results are shown in tables I to V. An attempt is made to relate PTC taste sensitivity with sex. No significant difference has been found between sex (males and females) and the proportion of tasters and non-tasters. The relationship between tasters,non-tasters and total finger ridge count appears to have considerable significance. The association between types of offspring and certain bodily disorders are tabulated among Devanga individuals. Finger ridge count and bodily disorders are studied in 60 subjects (out of 220 individuals). Congenital heart patients and diabetic patients possess more number of arches. Non-tasters appear to be more susceptible to gastritis, blood pressure and congenital heart disease in the present study.

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