



## Prevalence of Different Genetic Traits and their association with gender among the Population of Punjab, Pakistan.

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### ABSTRACT

The present study was conducted in the province of Punjab, Pakistan to determine the presence of genetically controlled traits like ear lobe, tongue rolling, ABO blood group system, facial dimple, color blindness and hair texture. Sometimes expression of these traits can vary due to the influence of environment like that of facial dimple which are genetically dominant but their presence can also due to chubby cheeks or dysfunctional facial muscle. A total of 1000 individuals were observed randomly comprising of 500 male and 500 female. The presence and expression of these genetic traits was observed as: dominant traits like tongue rolling (66.6%), straight hair type (57.3%), B+ blood group (35.7%) and free earlobe (62.3%) and were more frequently present among the population. While color blindness (97.9%) and facial dimple (77.7%) show recessive nature and were expressed more in recessive form in the population. The association of these traits with gender was also observed. Chi-square test showed association of gender with some of the traits.

**Keywords:** • Human genetics • Morphogenetic traits • facial dimple • ABO blood group • Tongue rolling

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### Introduction:

Human population provides an opportunity to study different characters, their forms and occurrence in a population [1]. In humans there are several traits that are under the control of genes that pass from parents to offspring. Every human being is unique in these characters. Most of these characters are under the control of gene and environment. Environment can influence the expression of these characters. Genetic variability is the main characteristic of humans. The presence of genetic variability is due to several factors like mutation, migration, genetic drift and assortment etc. [2].

Some characters show dominant expression while some show recessive. Earlobe is an inherited morphogenetic trait and used to solve paternity disputes. It can be attached or detached to the sides of the head. The allele for attached lobe is recessive in nature and those for detached lobe are dominant in nature [3]. However this finding has contradiction with other studies which consider this character as polygenic or of single gene having multiple alleles [4]. Human ABO blood group system is a multi-allelic trait as it is controlled by 3 alleles A, B and O which can be inherited to the next generation. This trait is solely dependent on inheritance and environmental factors cannot change the blood group of any individual [5]. These blood groups are studied and investigated in various regions of the world and have shown high variation among the population [6].

Tongue rolling is a morphogenetic trait. Tongue is a muscular organ. Tongue folding and rolling are controlled by dominant gene and the inability to fold or roll tongue is due to the presence of recessive gene [7]. But still its genetic mechanism is unknown. The recent researches have shown that tongue rolling is more in female than in male [8]. Color blindness is an inability to distinguish colors. This mostly occurs in male. This inability is transferred through genes and is present on X chromosome that's why this inability is mostly found in male. Color blind person can only experience few hundred shades of color while the normal person can experience millions of shades. These people

are unfit for some specific jobs like traffic police. Most people are unaware of this inability and mostly they came to know about this when they undergo some checkup for some job etc. [9].

Facial dimple is a visible indentation present on the skin. Dimple can be present on various parts of the body but are more prominent on face. They may be due to some fats deposition which may disappear with age. They can also appear due to heredity. Their inheritance follows the laws segregation and independent assortment. Facial dimple is inherited as dominant trait of autosomal chromosome and its recessive have no expression of facial dimple [10]. Another genetically controlled character is hair texture. The texture of hair depends upon heredity. Some people have straight type hair, some may have curly or some may have intermediate type. This depends upon inheritance of this trait. The degree of curliness of hair depends upon the distribution of keratin protein in hair. The development of hair depends upon the genes controlling hair growth and development. Environment also influence the growth, development and texture of hair. The diet of a person also effects the growth of his hair [11]

The present study was conducted to analyze the presence of these 6 characters that are both genetically and environmentally influenced in the population of Pakistan and their association with the gender is also studied.

**Methodology:**

Random samples were taken from the province of Punjab, Pakistan. A total of 1000 students comprising of 500 male and 500 female students having age between 19-24 years were selected randomly to participate in this study. The characters selected to study were- Ear lobe, tongue rolling, ABO blood group system, facial dimple, color blindness and hair texture. The students belong to different areas of Punjab province of Pakistan. The period of study was 3 months. Before taking the sample the students were briefly demonstrated in order to assure the accuracy of the sample.

**Data Collection:**

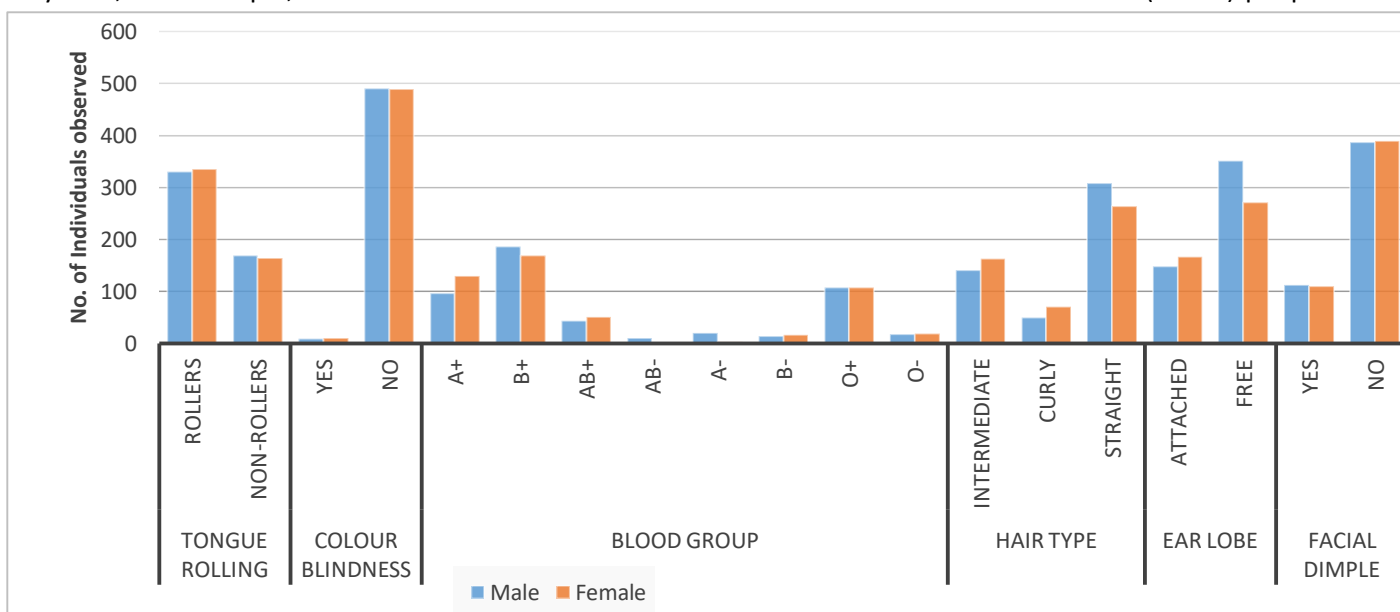
The data was collected by distributing questionnaire on which a brief purpose of research was mentioned and the questionnaire consists of 6 close-ended questions related to the trait. The questionnaire was distributed to the students in the classes and hostels. Online data was also collected by google forms and the description of the trait and research was also mentioned on the questionnaire. After collecting the data was analyzed.

**Data Analysis:**

The data was distributed in two groups on the basis of gender. Chi-square analysis was performed and the results were generated with XLSTAT software with 5% level of significance.

**Results and Discussions:**

A total of 1000 individual were studied for genetically controlled traits- Ear lobe, tongue rolling, ABO blood group system, facial dimple, color blindness and hair texture. The results showed that about 666 (66.6%) people of the



population showed the ability of tongue rolling and out of this 666 people, 331(66.2%) were male and 335 (67%) were female (Fig. 1). The same results were obtained in a research conducted in India in which the tongue rolling character was found more in female as compared to male [12, 13]. The tongue rolling has the highest occurrence as compared to all the other traits in the population.

Figure. 1: Difference of occurrence of traits in male and females.

On the other hand, the presence of color blindness in this study showed low percentage 21 (2.1%). The ratio of the presence of color blindness in both male and female was almost equal 10 (2%) out of 500 males, while in female the percentage was 11 (2.2%) out of 500 (Fig. 1). About 97.9% of the population didn't show the presence of color blindness. The prevalence of facial dimple was 223 (22.3%) in the population where the occurrence of this trait was more in male 113 (22.6%) as compared to female 110 (22%). About 77.7% of the population didn't show the presence of this trait (Fig. 1). The blood groups showed a wide range of variation. Most of the population fall in the B+ blood group 357 (35.7%) out of which 187 (37.4%) were male and 170 (34%) were female. The 2<sup>nd</sup> largest was A+ blood group occurred in 227 (22.7%) of the population in which 97 (19.4%) were male and 130 (26%) were female. The least common blood group was AB- and occurred in only 13 (1.3%) of the population. Among this 11 (2.2%) were male and 2 (0.4%) were female. The order of prevalence of blood group in male was (B+ > O+ > A+ > AB+ O- > A- > B- > AB-) the same order of male blood group was observed in a research conducted in Bangladesh [15]. While among the female the order of prevalence was (B+ > A+ > O+ > AB+ > O- > B- > A- > AB-). In the current study the frequency of straight hair type was 264 (52.8%) in which more straight hair percentage was in male 309 (61.8%) as compared to female 264 (52.8%) and less percentage of curly hair was found in male 50 (10%) as compared to female 71 (14.2%). The intermediate hair type was more in female 163 (32.6%) and less in male 141 (28.2%) (Fig. 1). The next trait observed was the ear lobe which was found free in 623 (62.3%) of the population while only 149 (29.8%) of the male and 167 (33.4%) found attach earlobe.

Gender	Total	Tongue rolling		Color blindness		Facial Dimple		Ear lobe	
		Rollers	Non-Rollers	Yes	No	yes	No	Attached	Free
Male	500 (50%)	331 (66.2%)	169 (33.8%)	10 (2%)	490 (98%)	113 (22.6%)	387 (77.4%)	149 (29.8%)	351 (70.2%)
Female	500 (50%)	335 (67%)	165 (33%)	11 (2.2%)	489 (97.8%)	110 (22%)	390 (78%)	167 (33.4%)	272 (54.4%)
<b>Total</b>	<b>1000</b>	<b>666 (66.6%)</b>	<b>334 (33.4%)</b>	<b>21 (2.1%)</b>	<b>979 (97.9%)</b>	<b>223 (22.3%)</b>	<b>777 (77.7%)</b>	<b>316 (31.6%)</b>	<b>623 (62.3%)</b>
<b>Chi Square</b>		x <sup>2</sup> = 0.072, DF= 1, p-Value= 0.789		x <sup>2</sup> = 0.049, DF= 1, p-Value= 0.825		x <sup>2</sup> = 0.052, DF= 1, p-Value= 0.820		x <sup>2</sup> = 7.110, DF= 1, p-Value= 0.008	

Table 1.0: Prevalence of genetic traits in male and female.

Gender	Total	Blood Group								Hair type		
		A+	B+	AB+	AB-	A-	B-	O+	O-	Intermediate	Curly	Straight
Male	500 (50%)	97 (19.4%)	187 (37.4%)	44 (8.8%)	11 (2.2%)	21 (4.2%)	14 (2.8%)	108 (21.6%)	18 (3.6%)	141 (28.2%)	50 (10%)	309 (61.8%)

<b>Female</b>	500 (50 %)	130 (26%)	170 (34%)	51 (10.2 %)	2 (0.4 %)	3 (0.6 %)	17 (3.4 %)	108 (21.6 %)	19 (3.8 %)	163 (32.6%)	71 (14.2 %)	264 (52.8 %)
<b>Total</b>	<b>1000</b>	<b>227 (22.7 %)</b>	<b>357 (35.7 %)</b>	<b>95 (9.5%)</b>	<b>13 (1.3 %)</b>	<b>24 (2.4 %)</b>	<b>31 (3.1 %)</b>	<b>216 (21.6 %)</b>	<b>37 (3.7 %)</b>	<b>304 (30.4%)</b>	<b>121 (12.1 %)</b>	<b>573 (57.3 %)</b>
<b>Chi square</b>	x <sup>2</sup> = 26.171, DF= 7, p-Value= 0.0000							x <sup>2</sup> = 8.767, DF= 2, p-Value= 0.012				

Table 1.1: Prevalence of genetic traits in male and female.

The statistical analysis chi-square was used in this research to check the association of the each specific trait with the gender and it was found that p-value was greater for following traits: tongue rolling, color blindness and facial dimple which shows that there is no enough evidence to conclude any association between the gender and these traits (Table 1.0). While the p-value was less for blood group, earlobe and hair type trait which shows some association between the gender and the respective trait (Table 1.0 and 1.1) [14]

#### Conclusion:

The traits discussed in the present study were both genetically and somewhat environmentally controlled. Their expression depends upon the expression of that respective gene. The expression of the dominant allele is more as compared to the recessive allele. The association of the traits with gender was also studied. Tongue rolling and free ear lobe shows highest occurrence in the population as compared to other traits. Some traits in this study show association with gender like blood group, earlobe and hair type show association while the other didn't show any association. Moreover, further studies can reveal the inheritance pattern and other factors that affect the occurrence of these traits.

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