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# Dominant-Recessive Interaction and Their Probability on Human Phenotype

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## Abstract

In order to understand the genetic flow of the students which are responsible to their next progeny, this study has a great impact. A classroom was a good source for collecting these information regarding phenotypes. With few exceptions, the presence of common and visible dominant and recessive characteristics of male or female has been appreciated for the genetic study. This study aimed at determining the incidence of 34 characteristics (17 dominant - widow's peak, black hair, curly hair, brown eye, long eyelash, normal vision, free earlobe, large nose, broad lips, rolling tongue, dimples present, cleft chin, hairs on fingers, right handedness, normal skin with melanin, rh positive, normal blood clotting and 17 recessive - straight hair line, light black hair, straight hair, blue eye, short eyelash, color blindness, attached earlobe, small nose, thin lips, cannot able to roll of the tongue, dimples absent, smooth chin, no hairs on fingers, left handedness, albino skin, rh negative, hemophilic) in a population of a Cantonment School of Bangladesh. 420 students (210 male and 210 female) were considered for observing the probability of dominant characters between male and female students by physical examination and questionnaires in their classes. Only in brown iris, normal vision, and normal skin with melanin had 100% dominant in both male and female students. The chi-square result showed that there were no significant differences between male and female students on their dominant characters. The incidence of above inherited traits of the individuals resulting from the genotypes inherited from their parents by Mendelian trait.

## Introduction

Mendelian traits are those that are controlled by pair of alleles and are not so many in human. According to a recent estimate, human exhibits 200 traits of Mendelian inheritance (hair color, eye color, skin color etc). The inheritance of the remaining characteristics which are called non-Mendelian traits are more complicated in nature (linkage, epistasis, polygene, incomplete/co-dominance, lethal gene, supergene, pleiotropism etc) are influenced by various interaction of genes. Human beings show varieties of morphogenetic characters among one population itself [1]. Dominant characteristics are shown with a remarkable percentage in male and female but practically it can be opposite on lower population. Not only on dominant and recessive but also some traits are dominant for female and some on male (eg. White skin is dominant in female but recessive in male etc). Morphogenetic characters are physical characters of an individual and the pattern of inheritance of these traits is autosomal dominant as well as autosomal recessive [2]. Factors for those dominant or recessive characters are depended the genotype of their parents. Pattern of the genes either they are homozygous or heterozygous are linked with the interaction of genes. Human population provides an exclusive opportunity to study the morphogenetic variation among the endogamous populations living in different geographical and ecological circumstances [3]. The presence of genetic variation in man is controlled by many factors including assortment migration and genetic drift [4]. The principle of genetics concerns largely with an explanation of the differences existing among individual. It helps in analyzing the potentialities of individuals already leaving as well assign predicting the trait of future offspring from a given mating [5]. In this study some human traits which are more prevalent in our community have been focused. The frequency of a character in a population is related to whether its phenotypic effect is favorable or unfavorable. Expression of the genotypes is called phenotypes and of course it is very easy for understanding any external features of offspring. The objective of this study is to find out on which sex the dominant characters are showed enormously.

## Materials and Methods

The students of a Cantonment Public School and College were the target area of this research. This school was located in Saidpur upajila under Nilphamari district of Bangladesh. The survey method was chosen include the individual's name, sex, and trait, whether it as a dominant or recessive trait based on the phenotypic expression. A total of 420 individuals were observed for 31 different morphogenetic traits such as widow's peak, hair color, hair pattern, iris color, eyelash, vision status, earlobe, nose, lips, tongue folding, dimples, chin, hairs on fingers, handedness, skin color, rh factor, and blood clotting mechanism from the random population. Out of 420 subjects, 210 were males and 210 females. The observed data (31 traits) were plotted in excel for determining the probability of dominant characters between male and female students through chi-square test. SPSS software version 23 was used for this test.

## Results

### Widow's Peak

This character was found more in male students and this is a dominant phenomenon. If parent carries this character their children either they are male or female will carry this. Females were showed less with this character.

## Hairs Color

The black hairs were found the highest in males. Normally, males in Bangladesh they always spend their maximum time in outside. For protecting the harmful rays from the sun their hair produces more melanin. As females are spending their maximum time in home so that their hair is light black.

## Hairs Arrangement

Curly hair of female were shown threefold than males. Curly hair is dominant over straight hair. For the male's choice or for evolutionary evidences from the very beginning male choose this curly hair.

## Iris Color

Out of 420 students, all were with brown iris eye color. In Bangladesh, blue iris was completely rare. Homozygosity of the genes of the parent leads to produce brown color within their offspring.

## Eyelashes

This excellent phenomenon was the highest in female than the male. Evolutionary causes may explain this incident.

## Vision

Sex-linked inheritance (color blindness) is rare in Bangladesh. All students were capable to identify various colors especially red and green.

## Earlobe

Though females were the highest but males showed this too. Free earlobe is suitable for hanging ear ring in female.

## Nose

For excess muscle of the male they had large nose. In their adolescent stage, the size of the nose is changed rapidly.

## Lips

Lips are the very prominent part of human face. For greater attractiveness in male they had normally broad lips than the female.

## Rolling Tongue

This is dominant character of human. This ability was found more or less same in both sexes.

**Dimple**

Common dimples or for smiling somebody showed this phenomenon. It is happened for the defective structure of the face muscles.

**Chin**

Cleft chin incident was mostly same in male and female. If there are any malformations in the structure of mandible bone then cleft chin is occurred.

**Hairs on Fingers**

Normally males have remarkable testosterone sex hormone so that they showed more hairs on their fingers.

**Handedness**

Genetically most people of the world they have higher power in their right hand than the left hand.

**Skin Color**

Normally we have lots of melanin in the skin either we have fair-skinned or brown skin. Melanin helps to protect harmful rays from the sun or other radioactive sources. Sometimes for the metabolic disorder (albino skin) which happens by the mutation was not available during study.

**Rh Factor**

Blood group with rh factor is controlled by multiple genes. Moreover, rh positive is dominant over rh negative. In both sexes this positive factor was dominant.

**Blood clotting**

Hemophilia is happened for the sex-linked inheritance. This was only one incident in a male student out of 210 individuals.

Observed result showed 100% dominant in both male and female on brown iris, normal vision, and normal skin with melanin. Surprisingly, within 420 students there were no blue iris, color blindness, and albino skin as well (Table 1, 2, and 3).

*Table 1: Dominant characters of male and female students*

| Characteristics | Male | Female |
|---|---|---|
| widow's peak | 60 | 27 |
| black hair | 123 | 78 |
| curly hair | 12 | 36 |
| brown iris color | 210 | 210 |

| | | |
|---|---|---|
| long eyelash | 40 | 51 |
| normal vision | 210 | 210 |
| free earlobe | 185 | 193 |
| large nose | 173 | 119 |
| broad lips | 159 | 113 |
| rolling tongue | 103 | 109 |
| dimples present | 36 | 34 |
| cleft chin | 47 | 41 |
| hairs on fingers | 161 | 130 |
| right handedness | 204 | 203 |
| normal skin with melanin | 210 | 210 |
| rh positive | 204 | 206 |
| normal blood clotting | 209 | 210 |

*Table 2: Insignificant chi-square result of male students*

| Chi-Square Tests | | | |
|---|---|---|---|
| | Value | df | Asymptotic Significance (2-sided) |
| Pearson Chi-Square | 221.000[a] | 208 | .256 |
| Likelihood Ratio | 86.965 | 208 | 1.000 |
| N of Valid Cases | 17 | | |
| a. 238 cells (100.0%) have expected count less than 5. The minimum expected count is .06. | | | |

*Table 3: Insignificant chi-square result of female students*

| Chi-Square Tests | | | |
|---|---|---|---|
| | Value | df | Asymptotic Significance (2-sided) |
| Pearson Chi-Square | 221.000[a] | 208 | .256 |
| Likelihood Ratio | 85.239 | 208 | 1.000 |
| N of Valid Cases | 17 | | |
| a. 238 cells (100.0%) have expected count less than 5. The minimum expected count is .06. | | | |

## Discussion

It shows that some typical dominant characters were not expressed but the expression of recessive character was prevalent as in case of widow's peak. Presence of widow's peak is a dominant character in population but as per our study the absence of widow's peak (regarded as a recessive character) was more prominent in the population. The same was in case of cleft chin, absence of dimple etc all of which are recessive traits. In one study conducted in Nigeria, on morphogenetic traits combination pattern amongst the population shows

some significant results like morphogenetic combinations might be rare in that population [6]. It has an important role in the determination of the chance of occurrence of genetic diseases in the family otherwise in the society; pedigree analysis is one of the basic and important methods of genetic analysis of human families. It will study and trace their ancestral inheritance patterns and reaches at accurate understandings about the family history [7]. Unlike the preconceived notion the dominant alleles are always expressed more, the expression of dominant and recessive characters may vary and may depend on various factors. A study showed dominant trait such as free earlobe (65.5%), able to rolling tongue (53%), right handedness (97.6%) and the recessive characters such as dimples absent (79.5%), absence of widow's peak (70%), smooth chin (76.2%) [8]. Sometimes characteristics can be expressed as co-existing pattern as cheek and chin dimples [9].

## Conclusions

Cleft chin and cheek dimples are the defects of mandible and musculature of human. Through this type of study we easily understand the normal vision/color blindness, normal skin with melanin/albino, and normal blood clotting/hemophilia. If parents have these characteristics their offspring may carrier and sometimes their life shows fatal. In this case, if they choice test-tube option for their next generation will be good. The combination and pattern of phenotypic traits show some significant results in offspring. This type of study always helps for the treatment of genetic diseases in the family through the pedigree analyses. Sexual selection before marriage, exceptional characteristics if they have, evolutionary mentalities, non-Mendelian, and hormonal factors are depended on dominant and recessive characters.

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