INDIAN STREAMS RESEARCH JOURNAL

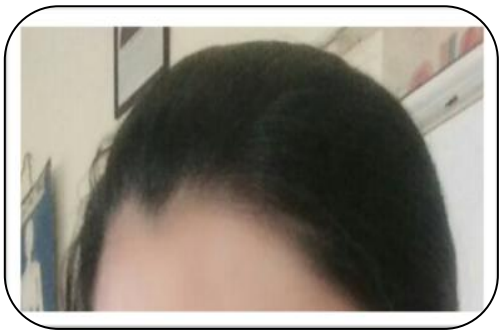
ISSN: 2230-7850
IMPACT FACTOR : 5.1651 (UIF)
VOLUME - 10 | ISSUE - 8 | SEPTEMBER– 2020

A SAMPLE STUDY OF WIDOWS PEAK A GENETIC TRAIT AT SOLAPUR MAHARASHTRA INDIA

Mr. Patil Sahebagouda S.
Department of Zoology, Sangameshwar College, Solapur Autonomous.
Email id : sspatildprc@gmail.com

ABSTRACT:

The study analyzed the presence of the widow's peak trait among 65 males and 231 females. Among males, 46.15% exhibited a widow's peak, indicating that the trait is not dominant, as straight hairlines were more prevalent. Similarly, among females, 49.35% had a widow's peak, with the percentage influenced by specific sample groups. Overall, only 48.56% of the 296 individuals surveyed had a widow's peak, making it difficult to classify it as a dominant trait.



The findings suggest that if the widow's peak followed Mendelian inheritance, its frequency should be higher. Instead, alternative explanations include migratory cell movement during morphogenesis, polygenic inheritance, or the possibility that it is a recessive trait. Chi-square analysis (p = 0.648725) confirmed no significant gender-based difference in the expression of this trait, aligning with similar studies conducted on Nigerian and Bini populations. The research supports prior findings that straight hairlines are more common than widow's peaks in the general population.

KEYWORDS : *Nigerian and Bini populations , straight hairlines , widow's peaks , general population.*

INTRODUCTION:

India is a large country with huge religious and cultural diversity. There are several states with different physiographic regions from Himalayn to Andam Nicaobar Islands, creating several climatic conditions which of course influence expression of genes. As we have studied in Darwin theory of Natural selection , that a particular trait is adapted by the organism and if it pass the test of natural selection, the same trait is acquired and inherited to several generations. It means nature plays important role in expressing characters or genes. In country like India where social factors like religion, cast, economic status plays very important role in transfer of hereditary characters. Marriages are preferred within cast or religion because of that genetic traits which are adapted or acquired are found to be inherited only among a particular group of Indian community. One can call it as interbreeding. In terms of Hardy Weinberg it can be called as non random mating. Therefore in country like India due to interbreeding, once the gene is fixed in one community it will be rare chance for it to penetrate into

the other community. Since unknown times cast and religion are the tight compartments that prevent inter cast marriages or inter religious marriages. Marriages within the same caste and same religion is the unwritten norm of the Indian society and acting against this norm is difficult and socially unacceptable (Kumdin et.al.,2011). In such conditions it is quite difficult for a gene penetrate widely among different group of the society. Rabia Razak from Quetta in Pakistan studied some morphogenetic traits in Baluchistan based on ethnicity, which has shown there is strong relation between ethnicity and morphogenetic trait (Rabia Razzaq et al., 2015), which clearly indicate that social factors are responsible for distribution of genetic characters. V.Deepak made an assessment of ethnicity in Indian population by using tooth crown metric dental traits. He found that difference in same traits is because of genetic factors as well as environmental factors and based on that he divided Indian population into four ethnic group (V.Deepak et al., 2015)

Morphological characters can be termed as phenotypic character expressed by the concerned gene or genes for example colour of skin, height of personality, hair colour, hair structure, eye colour, shape of nose, ear lobes, widows peak, rolling tongue etc. Throughout the course of evolution that can also be termed as co evolution, gradual changes have been accumulated in the basic morphology of organs. For example in human beings eye colour is notable feature with having different colours like black, brown, blue, greenish etc. It means the expression of characters or genes are interrupted by environmental factors. According to Lobo I, the external environment influence the internal development of organism like hormones, metabolism and thus on gene expression. Genes can be either put on off by the environment and thus environment control gene expression (Lobo I., 2008). If it is true and applied to Indian scenario where there is a great social and cultural diversity as well as physiographic and climatic diversity. Different terrains like Himalayan mountains, Deccan platue, westerghats, Ganga plain and physiography of north eastern states as well as latitudinal extension of Indian territory created variety of climatic condition, including man made habitats or ecosystems like dams, reservoirs etc. Different habitats having several abiotic and biotic factors influence expression of genes which lead to variation in morphological characters. Therefore it may true that there is wide variation found in morphological traits of Indian population.

Government of India took initiative to study genetic variability across the populations of country and identified about 5.6 lakh genetic markers across the genomes which were analyzed on 132 individuals from 25 diverse groups, representing 13 states comprising all the major language families and social groups (traditionally upper and lower castes, as well as tribal groups) (Government of India website).

Majority of the Indian population diverged from two distinct ancestral population Aryans and Dravidians, later on these two groups gave rise to several other population and mixed during last two to four thousand years (Priya Moorjani., 2013). Some morphogentic traits were studied by G. Bulliyya among the Vennekula Kshatriya of Andhra Pradesh, which is a endogamous caste population living in Chittoor district. The study was concentrated on morphogenetic traits like hand- clasping, arm-folding and handedness etc, in which it was found that frequency of right arm-folding was greater only among females. Jaswant Singh studied some morphological traits among Assam Sikh population in which he found that dry and flaky cerumen was highly frequent in males and while in females cerumen was wet and waxy type. He also observed negative overbite tooth occlusion is more in males than females. The frequency of free ear lobe is more than attached ear lobe (Jaswant Singh., 2004). Therefore there are several morphogenetic traits to study, but I have selected one of such a morphogenetic trait widows peak.

LITERATURE REVIEW

Widows peak is V shaped extension of hair follicles on forehead. This extension of hair follicle forms periorbital field dividing forehead into two symmetrical halves. The absence of such extension is called straight hairline. There is varying degree of peak in forehead. According to Hall and Judith widows peak results from a

lower than usual point of intersection of bilateral periorbital fields of hair growth suppression on forehead. The suppression is because of more widely spaced periorbitals. It is associated with abnormally wide apart eyes called hypertelorism (Hall., 2007). According to Smith D.W (1973) widows peak occur due to ectopic displacement of eyes (Smith D.W. at., al 1973) . According to National Institute of Health America, widows peak is because of Donnai-Barrow syndrome caused by mutation in LRP2 gene. Several studies were carried on widows in different countries. A study on widows peak was carried out on Spanish Caucasian women which was found to be different than American women, the purpose of this study was to find out surgical solutions for hair transplantation in relation to alopecia which is caused by hormones (Ceballos C., 2013). In a similar study of widows peak on Isoko tribals community of Nigeri it was found that in male the widows peak was found in less number as compared to female (Ese Anibor et al., 2015). The hair morphology is associated with genetic constituents. From international HapMap project it was found that local genetic differentiation in 170 genes related to hair morphogenesis, and further studies concludes that EDAR is a major genetic determinant of Asian hair thickness and the 1540C allele spread through Asian populations due to recent positive selection Fujimoto A et al., 2008) . In a study on Nigerian state university students found that presence or absence of widows peak was found to be balances in same sex, but the total number of peoples with straight hairline was more than with widows peak (HK Odion-Obomhense et al., 2008). In a similar study on Nigerian population it was found that expression of hair line shape controlled by two contrasting allele curved and straight hairlines which follow simple inheritance pattern (K.S.Orduet al., 2014). In a study of widows peak in Bini population of Nigeria, it is found that there is no significant gender wise difference (Anibor et al., 2014) . Jayashree Mujumdar studied morphogenetic traits in Bhils and Rajputs of Rajastan, which she found that combination of Widow's peak and detached earlobe was absent among the tribal population (Bhils) where as it was found among the Rajput population, whic may be because of low frequency of some traits and finding of combination of traits is a rare phenomena. The presence of Widow's peak was a rare incident while some other traits were significantly high. The frequency of some combined traits was high in both the populations which may be because of close marriages. The finding concluded that both the population groups vary significantly from one another in regard to the distribution of the combination of morphological traits (Mazumder Jayashree, et al., 2016). The hair line structure was studied by Gul Naz at Quetta region of Pakistan, where she found that straight line is more predominant than widows peak in general population as well as in both genders (Gul Naz et al., 2014)

OBJECTIVES OF THE PROJECT

Characters are controlled by genes. Environmental factors interfere the expression of characters. Widows peak and straight line hair are the characters may be controlled by genes. Dominance of allele can be deciphered with its high frequency in the population. With several inferences the following are the objective of the study of widows peak.

1) To Find out which character predominated in the sample surveyed whether straight hair line of widows peak.
2) To find out the gender bias in expression of this character
3) To find out the percentage of individual with straight line hairs
4) To find out the percentage of individual with widows peak
5) To compare this research with other similar research work done through out the world.

MATERIAL AND METHODS

Widows peak is extension of hair follicle in forehead. It is associated with genetic trait. The data is collected from young age group. The purpose of selecting age group between 12 to 25 is that there is no or least age related retreat of hair follicles, which is termed as alopecia. Data collected form hormone related or age related alopecia may lead to wrong inference therefore data collection is deliberately avoided to collect from people with more than 25 age.

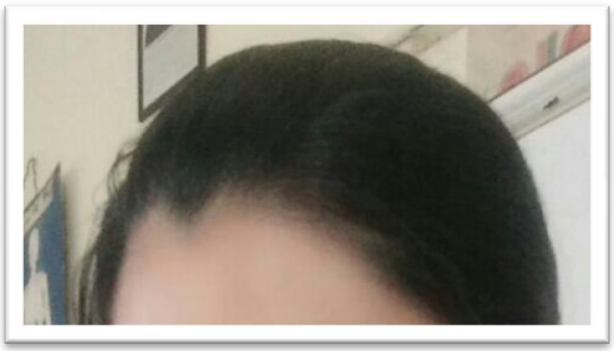


Fig. 1.1 Widows peak

Fig. 1.2 Straight hair line

The sample were selected from students of B.Sc first, second year and third year students studying in Zoology department of Sangameshwar college, Girls Hostel students of Sangameshwar college, and Annasaheb Patil Prashala, at Bhushan Nagar school Solapur. The purpose of collecting data from school and college students is that they belong to diverse background. Students are coming from different parts of the city, different near by villages and from different family background. The simple reason is, they do not belong to same family.

The presence or absence of widows peak is confirmed by keenly observing foreheads of students or sample population. A slight elevation even of 0.5 cm (5 mm) from straight hairline axis from forehead is considered as widows peak. The data is collected from individual male and female and entered properly in concerned table for tabulation. While collecting data utmost care has been taken by considering hormone related retreat of hairline and mentioned about it in front of each individual in tables. The individual data collected is mentioned in tables. The data is collected from five sources 1) Students of B.Sc first year 2) B.Sc second year 3) B.Sc third year 4) Ladies hostel students of Sangameshwar college with age group of 17 to 21 studying in various courses at Sangameshwar college. While collecting data from ladies hostel the girls who are studying in Zoology department at B.Sc I, II and III are avoided to overlapping of data collection. 5) Primary School Annasaheb Patil Prashala, at Bhushan Nagar, Solapur. All of the students belong to different family background, nearby villages. The collected data is used for further analysis in result and discussion. Statistical analysis is applied with help of excel program and chi square test is applied to compare mean in both gender. And comparison is discussed in conclusion part of this project.

RESULT AND DISCUSSION

Totally 290 samples were surveyed. The summery table for 296 sample is as follows

Table No.1 Summery table with number of peoples with and without widows peak, with or without straight hair line

Sample source	Male		Female		Total Male	Total Female	Total
	Male with straight hairline	Male with widows peak	Female with straight hairline	Female with widows peak			
B.Sc I	19	9	39	21	28	60	88
B.Sc II	1	4	13	16	5	29	34
B.SC III	5	2	4	7	7	11	18
Ladies Hostel	0	0	35	43	0	78	78
Annasaheb Patil Prashala	10	15	26	27	25	53	78
Total	**35**	**30**	**117**	**114**	**65**	**231**	**296**

The above table mentions about total 296 observation out of that Male are 65 and female samples are 231. From the male itself out of 65 students 35 are having straight hair line that is widows peak is absent while remaining 30 are having widows peak. From the total 231 female students 117 girls have straight hair line that is without widows peak while remaining 114 girls are having widows peak.

The samples surveyed from the First year B.Sc class 28 sample students were collected out of that 19 boys were having straight line hairs which was dominating in number than 9 boys with widows peak. In the same class randomly 60 girls were selected for identification of widows peak, here also straight hair line dominated with 39 girls in comparison 21 girls with widows peak of the same class.

In the sample survey from B.SC II year students only 5 boys were studied in which almost all of them showed widows peak except one. Among girls of the same class, twenty nine female students are studied in which widows peak predominated over straight line. There were 16 female students with widows peak over 13 straight hairlines. The samples were also collected from 18 B.Sc III year students, out of 7 boys all of them were having straight hair line except two., and among 11 female students widows peak dominated over straight line. There were 7 girls with widows peak over 4 girls with straight hair line.

The samples were also collected form girls of Sagameshwar college ladies hostel students. The samples at this place belong to diverse age group studying in different courses at different levels. While collecting samples from ladies hostel the data collection from girls studying at various levels of B.Sc with Zoology subject are avoided so as to prevent overlapping of data. There is no question of male samples from ladies hostel. Among 78 female sample surveyed from hostel widows peak predominated expressed in 43 girls while 35 girls were having straight hairline.

We visited Annasaheb Patil Prashala, a primary school at Bhushan Nagar Solapur. With the oral permission of school headmaster and with help of teacher male and female students from 6^{th} and 7^{th} standard class were surveyed. Out of total 78 students 25 were male and 53 were female. In male students widows peak predominated with 15 samples and straight hairline found in 10 boys. Among the 53 girls students expression of widows peak was almost 50%, that is widows peak was found in 27 girls and remaining 26 girls had straight hairline.

Table No. 2.11 Summery table in percentage of peoples with and without widows peak, with or without straight hair line

Percentage	Male with widows peak	Total Male	Percentage of Male with Widows Peak	Female with widows peak	Total Female	Percentage of Female with Widows Peak
B.Sc I	9	28	32.14	21	60	35.00
B.Sc II	4	5	80.00	16	29	55.17
B.SC III	2	7	28.57	7	11	63.64
Ladies Hostel	0	0	0.00	43	78	55.13
Annasaheb Patil Prashala	15	25	60.00	27	53	50.94
Total	30	65	**46.15**	114	231	**49.35**

In terms of percentage among male 46.15 % of boys from sample surveyed were having widows peak and 49.35% of girls were having widows peak. Among B.SC I and B.SC III year students the percentage with widows peak was less than 50% (B.Sc I – 32% and B.Sc III- 28%). But in remaining cases the percentage with widows peak in male is more than 50%, that is in samples from B.Sc II (80%) and school children at Annasaheb Patil Prashala (60%). Among female individuals percentage of widows peak was found to be more than 50% in the samples of B.Sc II (35%), B.Sc III(63.64%), ladies hostel (55%) and at Annasaheb Prashala (50.94%). Only in the case of B.Sc I sample the percentage of widows peak was extremely less (35%) which drags entire mean of percentage to below 50% for overall females (49.35%)

When total samples were considered out of all 65 males 30 are having widows peak, in terms of percentage hardly 46.15 percentage of male from sample are having widows peak. Similarly out of total 231 female samples 114 were having widows peak, that is 49.35 % of girls were with widows peak. When data from both male and female are combined for widows peak, 144 persons (30(male)+114(female)) are having widows peak from 296 total samples surveyed, that means widows peak is found only in 48.56% of sample surveyed.

Table. 2.12 Table for comparison through chi square test.

Values	Male	Female	Total
Widows peak	30 (31.62) [0.08]	114 (112.38) [0.02]	144
Straight hair line	35 (33.38) [0.08]	117 (118.62) [0.02]	152
Marginal Column Totals	65	231	296

The chi-square statistic of above mentioned values is **0.2075**. The **p-value is 0.648725**. This result is not significant at **p < .05**. It means there is no significant difference in expression of characters in both genders.

CONCLUSION

As per the observations made in results, when total samples were considered, out of all 65 males 30 are having widows peak, in terms of percentage hardly 46.15 percentage of male from sample are having widows peak. That means expression of widows peak character is not even 50% to call it as dominant character among male samples. The straight hairline predominated in male.

Similarly in case of female, out of total 231 female samples surveyed, 114 were having widows peak, that is 49.35 % of girls were having widows peak. The mean percentage is depleted by the influence of samples collected from B.Sc I class, otherwise in all samples the percentage of widows peak is more than 50%. Among the females also widows peak character do not cross 50% of sample to call it as dominant character.

When total number of individuals excluding gender bias are considered it is found that only 144 persons are having widows peak from 296 total samples surveyed, that means widows peak is found only in 48.56% of sample surveyed. Based on these concluding figures it is quite difficult to say that widows peak is dominant character among the sample population. If the widows peak is controlled by one pair of allele and if it follows Mendalian pattern of inheritance then the frequency of dominant allele should be more than recessive allele.

This research concludes that either widows peak is because of migratory movement of cells during morphogenesis because of its location along the central axis of symmetry in all sample which agrees with work done by Hall et.al., on hypertelorism and Smith D.W. work on ectopic displacement of eye, or controlled by multiple genes (polygenic inheritance) or it may be a recessive character or it may not follow pattern of Mendalian inheritance.

In consideration to gender bias when applied chi-square statistic for the samples surveyed the chi values is 0.2075. The p-value is 0.648725. This result is not significant at $p < .05$, that means there is no significant difference between male and female for the expression of this character.Similar study made by Nigeran student lead the same conclusion that there is no significant difference between male and female in concern to expression of character (HK Odion-Obomhense et al., 2008), the similar conclusion with study of Bini population (Anibor et al., 2014). This research completely agree with work done by Gul Naz, which says that straight hairline predominate in general population than widows peak (Gul Naz et al., 2014).

REFERENCE

1. **Anibor**, Ese & Edjomariegwe, Odiri & Ajayi, Abayomi. (2014). Genetic and morphological traits among the Binis. International Journal of Current Research. 6. 10222 - 10227.
2. **Ceballos** C, Priego C, Méndez C, Hoffner MV, García-Hernández MJ, Camacho FM. 2013 “Study of frontal hairline patterns in Spanish Caucasian women” Actas Dermosifiliogr. 2013 May;104(4):311-5. doi: 10.1016/j.adengl.2012.10.009. Epub 2013 Apr 10. https://www.ncbi.nlm.nih.gov/pubmed/23582301
3. **Donnai-Barrow** syndrome, National Institute of Health, http://ghr.nlm.nih.gov/condition/donnai-barrow-syndrome
4. **Ese Anibor**, Eloho Ogbor-Omorie, Adaeze Eucharia Opiah (2015) “The distribution of widow's peak trait among young adults of the Isoko ethnic group in Delta State, Nigeria” Year : 2015 | Volume : 3 | Issue : 2 | Page : 47-49
5. **Fujimoto A**, Kimura R, Ohashi J, Omi K, Yuliwulandari R, Batubara L, Mustofa MS, Samakkarn U, Settheetham-Ishida W, Ishida T, Morishita Y, Furusawa T, Nakazawa M, Ohtsuka R, Tokunaga K. (2007) “ A scan for genetic determinants of human hair morphology: EDAR is associated with Asian hair thickness “Hum Mol Genet. 2008 Mar 15;17(6):835-43. Epub 2007 Dec 8. https://www.ncbi.nlm.nih.gov/pubmed/18065779
6. **G. Bulliyya** (1999), “ Some Morphogenetic Traits among the Vennekula Kshatriya of Andhra Pradesh” Journal of Human Ecology Vol. 10, Iss. 4, 1999
7. **Governmetn of India** website- https://blog.mygov.in/genetic-diversity-in-indian-populations/
8. **Gul Naz**, Faiza Hameed, Zohra Bibi, DurKhatoon and Naheed Sajjad “Hairline shapes: study of a morphogenetic inheritance trait” Pak. J. Biochem. Mol. Biol., 2014; 47(1-2): 118-120
9. **Hall**, Judith G.; Allanson, Judith; Gripp, Karen; Slavotinek, Anne (2007). Handbook of physical measurements. Oxford medical publications. p. 336. ISBN 9780195301496

10. **HK Odion-Obomhense**, E Omore, OA Ebeye, OP Otuaga (2008) "A Study of Genetics Using Two Simple Mendelian Inheritance Journal of Experimental and Clinical Anatomy JECA. 2008; Vol 7: 1
11. **Ingrid Lobo**, Ph.D. (Write Science Right) © 2008 Nature Education Lobo, I. (2008) Environmental influences on gene expression. Nature Education 1(1):39
12. **Jaswant Singh** and Sarthak Sengupta (2004) "Some Morpho-genetic and Behavioural Traits Among the Assamese Sikhs" Anthropologist, 6(4): 253-255 (2004)
13. **K.S.Ordu**, and C.E.Agi (2014) "Inheritance pattern of hairline shape amongst Nigerian population" Int.J.Curr.Microbiol.App.Sci (2014) 3(2): 61-65
14. **Kumudin Das**, K. C. Das, T. K. Roy and P. K. Tripathy "Dynamics of inter-religious and inter-caste marriages in India" http://paa2011.princeton.edu/papers/111281
15. **Mazumder Jayashree**, Gupta Urvashi, Sachdeva M.P.(2016) " Distribution of Morphogenetic Traits among Bhils and Rajputs of Rajasthan" Voice of Intellectual Man- An International Journal Year : 2016, Volume : 6, Issue : 2 First page : (79) Last page : (84) Print ISSN : 2231-6914. Online ISSN : 2319-4308.
16. **Priya Moorjani**, Kumarasamy Thangaraj, Nick Patterson, Mark Lipson, Po-Ru Loh, Periyasamy Govindaraj, Bonnie Berger David Reich and Lalji Singh (2013) " Genetic Evidence for Recent Population Mixture in India" American Journal of Human Genetics. 2013 Sep 5; 93(3): 422–438.
17. **Rabia Razzaq**, Safoora Kanwal, Shandana, Nabeela Tariq and Naheed Sajjad (2015) "Tongue Rolling, Folding, Cheek Dimple and Chin Cleft; Study of a Morphogenetic Traits in Quetta Population" World Journal of Zoology 10 (3): 237-240, 2015 ISSN 1817-3098 © IDOSI Publications, 2015 DOI: 10.5829/idosi.wjz.2015.10.3.95205
18. **Smith, D.W**. Cohen, M.M. (November 17, 1973). "Widow's Peak Scalp-Hair Anomaly and its Relation to Ocilar Hyperthelorism". The Lancet. 302 (7838): 1127. doi:10.1016/s0140-6736(73)90939-2.
19. **V Deepak**, S N Goryawala, Yashwanth Reddy, R J Chhabra,4 Nandaprasad, and Nishit Kumar Shah (2015) "Assessment of Ethnicity in Indian Population using Tooth Crown Metric Dental Traits" J Int Oral Health. 2015 Sep; 7(9): 83–87. PMCID: PMC4589727