https://doi.org/10.15218/hcchs.2023.08

Frequency distribution patterns of some human traits in the Kurdistan region's population: A survey

Radwan Rushdi Mohammed[1], Barzan Muhamad Anwar[2], Abdulghani Taib Abdullah[3]

Abstract

Background and objective: The study of genetic attributes across multiple nations has revealed the complex interaction of heredity that forms our species. Specifically, the Kurdistan region, with its distinctive demographic history, offers anpossibility to investigate patterns of common human traits. This study aimed to analyze the genetic framework that influences specific traits in this population, giving insights with significant medical implications.

Methods: Data on nine phenotypic traits controlled by a single gene were collected from 602 participants from the Kurdistan region. Ethical standards were maintained by obtaining informed consent from all participants, ensuring privacy, and adhering to ethical research practices. The statistical analysis was conducted using Jamovi 2.3.21, employing Chi-square tests to assess differences in trait distribution across genders.

Results: The survey evaluated the distribution of traits such as widow's peak, straight hairline, earlobes, facial Dimples, tongue folding, tongue rolling, cleft chin, hitchhiker's thumb, bent little finger, and hand clasping. Significant differences in the prevalence of these traits were found between genders. For instance, widow's peak was observed in 26% of the population, showing a higher frequency in males compared to females. Other traits like tongue rolling and cleft chin also exhibited significant gender differences, which indicates that dominant alleles were predominant than recessive alleles.

Conclusion: This study highlights the genetic diversity and specific inheritance patterns of traits within the Kurdistan region’s population. While some traits displayed a recessive pattern, the overall genetic influence was significant. Future studies should expand on this genetic analysis and incorporate larger sample sizes to enhance the knowledge of genetic diversity and its implications in medical and genetic research.

Keywords: Genetic traits; Inheritance pattern; Phenotype frequency; Genes; Alleles.

[1,2,3] Department of Medical Laboratory Technology, Shaqlawa Technical College, Erbil Polytechnic University, Erbil, Iraq.

https://doi.org/10.15218/hcchs.2023.08

Introduction

The study of genetic attributes across various nations uncovers thecomplexinterweaving of heredity that shapes our species. These heritable qualities passed down from one generation to another, establish the basis of human diversity and distinctiveness. These characteristics can be affectedby a single gene or multiple genes, resulting in a widerange of physical and behavioral traits.[1,2]

Traits become evident in individuals through alleles, which are distinct forms of a gene. Alleles may be dominant or recessive, determining the pattern of inheritance and expression of traits within a population. Dominant alleles only require one copy to be expressed, meaning that if an individual inherits a dominant allele from one parent, the corresponding trait will be displayed. Conversely, recessive alleles need to be present in two copies, one from each parent, for the associated trait to be expressed.[3,4]

The Kurdistan region, known for its distinct demographic history, provides an intriguing possibility to examine the occurrence patterns of particular human characteristics. The aim of this study is to analyze the genetic framework that influences common traits in this population, thereby providing valuable genetic knowledge and medical implications on a wider scale.

The focus of this study is on nine specific traits, each with a clear dominant or recessive pattern. For instance, a widow's peak (W) is a dominant trait, while a straight hairline (w) is recessive.[5,6] Similarly, free earlobes (E) are dominant over attached earlobes (e).[7]Dimpled cheeks (D) are dominant to no dimpled cheeks (d).[8] The ability to fold the tongue (f) is recessive, while non-folders (F) are dominant, and the same pattern does not apply to tongue rolling, with rollers (R) being dominant over non-rollers (r).[9,10,11] A cleft chin (C) is dominant compared to a smooth chin (c).[12]Having no hitchhiker's thumb (T) is dominant over having one (t).[13] A bent little finger (B) is dominant over a straight little finger (b).[14]Having the left thumb on top when clasping hands (I) is dominant over the right thumb on top (i).[15] Each of these traits provides a simple yet profound understanding into the genetic design of the Kurdistan region's population. By examining the frequency distribution patterns of these traits, we can gain a deeper understanding of the genetic diversity and inheritance patterns within this specific human group.

Methods

Design of the Study: This study was designed to assess nine traits controlled by a single gene across a population sample. **Time of the Study**

The data was collected over a designated survey period, allowing for thorough analysis.

Setting of the Study: The study was conducted within the Kurdistan region, providing context to the population being analyzed.

Sample Size & Sampling Method: A total of 303 participants were involved in this extensive study, ensuring a representative sample for analysis.

Data Collection: The results from the survey provided valuable insights into the distribution of certain traits among genders. The study identified the most common traits within the population and determined the overall occurrence rate of these traits. Furthermore, this data has the potential to assist healthcare practitioners in interpreting the underlying

https://doi.org/10.15218/hcchs.2023.08

factors contributing to differences in disease prevalence among genders.

Statistical Analysis: The statistical analysis was done using Jamovi 2.3.21, and a Chi-square association test was used to find out association between gender and the nine traits. The P-values were calculated when the alternative hypothesis is not equal to 0.05.

Ethical Consideration: To ensure ethical informed consent before participating in the survey, all participants must willingly agree to take part in the study. The researchers then make a commitment to follow the highest possible ethical standards during the study. These standards include protecting the privacy and confidentiality of the participants, obtaining informed consent from each individual involved in the research, and transparently publishing data while protecting the rights and identities of the participants.

Results

The survey conducted on the population of the Kurdistan region assessed the distribution of nine different phenotypic traits among 602 participants. The results are summarized below, detailing the overall prevalence of each trait, the distribution across genders, and the statistical significance of these observations (**Table 1**).The dominant phenotype is referred to by a capital letter (e.g. A), and the recessive phenotype is referred to by a small letter (e.g. a).

https://doi.org/10.15218/hcchs.2023.08

Table 1. Distribution of the traits and their corresponding phenotypes.

Traits	Phenotypes	Total (%) N=602	*P* value	Gender	Count (%)	*P* value
Widow's Peak	Widow's peak (W)	157 (26.0)	<0.001	Male	83 (52.8)	<0.001
				Female	69 (43.9)	
	Straight hairline (w)	450 (74.7)		Male	162 (36.0)	
				Female	188 (41.7)	
Earlobes	Free earlobes (E)	353 (58.6)	<0.001	Male	127 (35.9)	0.005
				Female	226 (64.0)	
	Attached earlobes (e)	249 (41.3)		Male	118 (47.3)	
				Female	131 (52.6)	
Facial Dimples	Has dimples (D)	234 (38.8)	<0.001	Male	90 (38.4)	0.373
				Female	144 (61.5)	
	No dimples (d)	368 (61.1)		Male	155 (42.1)	
				Female	213 (57.8)	
Tongue Folding	Can't fold tongue (F)	317 (52.6)	0.192	Male	137 (43.2)	0.184
				Female	180 (56.7)	
	Can fold tongue (f)	285 (47.3)		Male	108 (37.8)	
				Female	177 (63.1)	
Tongue Rolling	Roller (R)	386 (64.1)	<0.001	Male	154 (39.8)	0.593
				Female	232 (60.1)	
	Non-roller (r)	216 (35.8)		Male	91 (42.1)	
				Female	125 (57.8)	

https://doi.org/10.15218/hcchs.2023.08

Cleft Chin	Cleft chin (C)	156 (25.9)	<0.001	Male	82 (52.5)	<0.001
				Female	74 (47.4)	
	Smooth chin (c)	446 (74.0)		Male	163 (36.3)	
				Female	283 (63.4)	
Hitchhiker's Thumb	No hitchhiker's thumb (T)	350 (58.1)	<0.001	Male	137 (39.1)	0.156
				Female	216 (61.7)	
	Hitchhiker's thumb (t)	252 (41.9)		Male	111 (44.0)	
				Female	141 (55.9)	
Little Finger	Bent little finger (B)	149 (24.7)	<0.001	Male	78 (52.3)	<0.001
				Female	71 (47.6)	
	Straight little finger (b)	453 (75.2)		Male	167 (36.8)	
				Female	288 (63.5)	
Hand Clasping	Left thumb on top (H)	305 (50.6)	0.744	Male	125 (40.9)	0.885
				Female	180 (59.0)	
	Right thumb on top (h)	297 (49.3)		Male	120 (40.4)	
				Female	177 (59.5)	

Widow's Peak and Straight Hairline

Widow's peak (W) was observed in 157 individuals, accounting for 26.0% of the population. This trait showed a significant gender difference, with 52.8% of males and 43.9% of females exhibiting this trait, both percentages being statistically significant ($P < 0.001$).Straight hairline (w) was more common, observed in 450 individuals (74.7%). Gender distribution was less pronounced here, with 36.0% males and 41.7% females.

Earlobes

Free earlobes (E) were present in 353 individuals (58.6%), with a significant gender distribution of 35.9% in males and 64.0% in females ($P < 0.001$ for overall prevalence, $P = 0.005$ for gender difference).Attached earlobes (e) were observed in 249 individuals (41.3%),

https://doi.org/10.15218/hcchs.2023.08

with a more balanced gender distribution of 47.3% males and 52.6% females.

Facial Dimples

Dimpled cheeks (D) were noted in 234 individuals (38.8%), with a significant overall prevalence ($P < 0.001$) but no significant gender difference ($P = 0.373$), where 38.4% were males and 61.5% were females. No dimples (d) were observed in 368 individuals (61.1%), with 42.1% males and 57.8% females.

Tongue Folding

Non-folders (F) comprised 317 individuals (52.6%), with a gender split of 43.2% males and 56.7% females ($P = 0.192$ for overall prevalence, $P = 0.184$ for gender difference).Folders (f) were fewer, with 285 individuals (47.3%), and a gender distribution of 37.8% males and 63.1% females.

Tongue Rolling

Rollers (R) were more frequent, with 386 individuals (64.1%) showing this trait. The gender distribution was 39.8% males and 60.1% females, with no significant gender difference ($P = 0.593$).Non-rollers (r) were observed in 216 individuals (35.8%), with a gender distribution of 42.1% males and 57.8% females.

Cleft Chin

Cleft Chin (C) was present in 156 individuals (25.9%), with a significant gender difference ($P < 0.001$), where 52.5% were males and 47.4% were females.Smooth chin (c) was observed in 446 individuals (74.0%), with 36.3% males and 63.4% females.

Hitchhiker's Thumb

No hitchhiker's thumb (T) was noted in 350 individuals (58.1%), with a significant overall prevalence ($P < 0.001$) and a gender distribution of 39.1% males and 61.7% females.Hitchhiker's thumb (t) wasless common, found in 252 individuals (41.9%), with 44.0% males and 55.9% females.

Little Finger

Bent little finger (B) was observed in 149 individuals (24.7%), with a significant gender difference ($P < 0.001$), where 52.3% were males and 47.6% were females.Straight little finger (b) was more common, observed in 453 individuals (75.2%), with 36.8% males and 63.5% females.

Hand Clasping

Left thumb on top (H) was seen in 305 individuals (50.6%), with a gender distribution of 40.9% males and 59.0% females ($P = 0.744$ for overall prevalence, $P = 0.885$ for gender difference).Right rhumb on top (h) was almost equally prevalent, observed in 297 individuals (49.3%), with 40.4% males and 59.5% females.

https://doi.org/10.15218/hcchs.2023.08

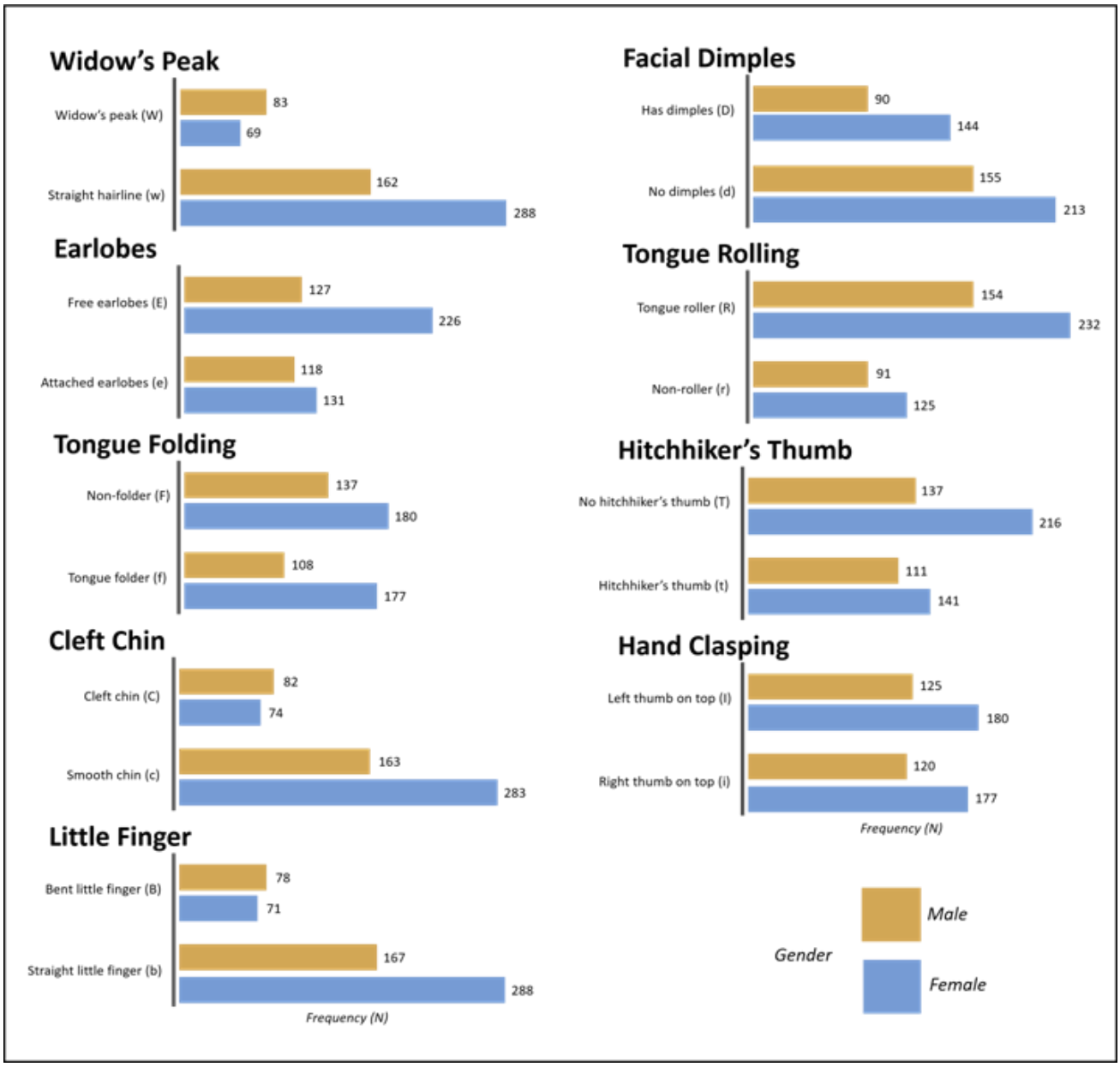

Figure 1. Results from the survey for the frequency distribution of the nine genetic traits in both genders

https://doi.org/10.15218/hcchs.2023.08

Discussion

In this study, we examined the frequency distribution of nine genetically influenced traits within the population of the Kurdistan region, comprising widow's peak, attached earlobes, facial dimples, tongue folding & rolling, cleft chin, hitchhiker's thumb, bent little finger, and hand clasping, across a total sample of 602 individuals (Figure 1). Our findings are contextualized with comparative analyses from populations in North America, Spain, Nigeria, China, Kosovo, and Pakistan, shedding light on both regional genetic variability and broader human genetic diversity. Widow's peak showed a recessive trend in our population with a frequency of 26.0% (157 individuals), which contrasts with its presentation as a dominant trait in North America and Spain.[16,17] In those regions, the trait was more prevalent among females, whereas in our study, males exhibited a higher frequency (52.8%) compared to females (43.9%) [North America: 28.71%, Spain: 94.17%].[18] Attached earlobes were more prevalent in our study, observed in 41.3% of the population, indicating a recessive trait compared to Kosovo where free earlobes are dominant (75.42%).[19] The ability to fold the tongue, present in 47.3% of our participants, and to roll the tongue, observed in 64.1%, also showed recessive patterns compared to the higher frequencies observed in Nigeria (tongue folding: 68.3%, tongue rolling: 72.9%) and Pakistan (tongue folding: 36.45%, tongue rolling: 46%).[20,21] Facial dimples appeared predominantly as a recessive trait in 61.1% of our population, contrasting with lower frequencies observed in Quetta, Pakistan (29.2%). This suggests that facial dimples may be influenced by regional genetic factors or environmental interactions [Kurdistan: 38.8%, Pakistan: 29.2%].[21] Further research is needed to explore the genetic and environmental factors that contribute to the variations in the prevalence of facial dimples across different populations. Cleft chin was less commonly dominant in our population (25.9%) compared to Kosovo (77.20%), indicating significant regional variations.19 Similarly, the hitchhiker's thumb showed a recessive trend in 41.9% of our participants, a lower frequency comparedto China (50%), reflecting different genetic and possibly environmental influences on this trait [Kurdistan: 58.1%, China: 50%].[22]The bent little finger was observed as a dominant trait in 24.7% of our study population, which is lower compared to other regions and suggests unique genetic or environmental effects [Kurdistan: 24.7%]. Hand clasping showed nearly balanced frequencies between dominant (Left thumb on top, 50.6%) and recessive (Right thumb on top, 49.3%) phenotypes. This trait did not exhibit a significant difference from the patterns observed in Kosovo (dominant: 38.28%, recessive: 61.72%), indicating a possible wider genetic similarity in this trait among different populations.[19]The current study was limited to the assessment of physical attributes without comprehensive comparisons to other populations. Future research should incorporate genetic analyses and larger sample sizes to enhance the understanding of genetic diversity and traits, thereby contributing to broader insights in the field.

https://doi.org/10.15218/hcchs.2023.08

Conclusions

In conclusion, this study examined the physical characteristics of a population sample in the Kurdistan region and found that females are significantly more likely to have a dominant allele for most of the traits rather than males P< 0.001 revealing that genetics plays a significant role in these traits. Therefore, future studies should include genetic analysis to deepen our understanding of the genetic variations within this population.

Acknowledgment: We would like to express our appreciation to the participants who took part in the survey and the individuals who engaged in discussions with us. We are grateful for their contributions, which were critical in shaping our understanding of the research topic.

Data, Materials and/or Code availability: The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Funding: Not applicable.

Competing interests: The authors declare that they have no conflict of interest

References

1. MedlinePlus [Internet]. Bethesda (MD): National Library of Medicine (US). Why are some genetic conditions more common in particular ethnic groups? [updated 2021 Apr 19; reviewed 2023 Jun 01; cited 2024 Jul 2]. Available from: https://medlineplus.gov/genetics/understanding/inheritance/.
2. Genovesi, E., Blinderman, L., & Natale, P. (n.d.). Human Traits Determined by Single Genes. In Unfolding the Mystery of Life: Biology Lab Manual for Non-Science Majors. [Accessed2023]. Available from: https://bio.libretexts.org/Unfolding_the_Mystery_of_Life_-_Biology_Lab_Manual_for_Non-Science_Majors.
3. Zschocke J. Dominant versus recessive: Molecular mechanisms in metabolic disease.Journal of Inherited Metabolic Disease2008; 31(5):599-618. doi:10.1007/s10545-008-1016-5. DOI:10.1007/s10545-008-1016-5.
4. Heim WG. What is a recessive allele? The American Biology Teacher. 1991;53(2):94-97.DOI:10.2307/4449229.
5. Medland SE, Nyholt DR, Painter JN, et al. Common variants in the trichohyalin gene are associated with straight hair in Europeans. The American Journal of Human Genetics. 2009;85(5):750-755.DOI:10.1016/j.ajhg.2009.10.009.
6. Thibaut S, Gaillard O, Bouhanna P, Cannell DW, Bernard BA. Human hair shape is programmed from the bulb. British Journal of Dermatology. 2005;152(4):632-638.DOI:10.1111/j.1365-2133.2005.06521.x.
7. El Kollali R. Earlobe morphology: a simple classification of normal earlobes. Journal of plastic, reconstructive & aesthetic surgery. 2009;62(2):277-280.DOI: 10.1016/j.bjps.2008.01.046
8. Wiedemann H. Cheek dimples. Am J Med Genet. 1990;36(3):376-376. DOI:10.1002/ajmg.1320360337.

https://doi.org/10.15218/hcchs.2023.08

9. Reedy JJ, Szczes T, Downs TD. Tongue rolling among twins. Journal of Heredity. 1971;62(2):125-127.DOI:10.1093/oxfordjournals.jhered.a108139.

10. Nwaopara AO, Anibeze CIP, Apkuaka FC, Agbontaen OF. Morphogenetic traits combination pattern amongst the population of Ekpoma, Nigeria: Focus on tongue rolling, ear lobe attachment, blood groups and genotypes. African Journal of Biotechnology. 2008;7(20).

11. Odokuma EI, Eghworo O, Avwioro G, Agbedia U. Tongue rolling and tongue folding traits in an African population. International Journal of Morphology2008;26(3):533-535.DOI:10.4067/S0717-95022008000300004.

12. Armand L, Jerome WY, Albert T. Saito, TA. Genetic study on the abnormal Camptodactyly. Journal of the American Medical shortenings of the finger Japanese Journal of Human Association. 1968;206:1565-1567.

13. Glass B, Kistler JC. Distal hyperextensibility of the thumbs. Human Heredity. 1953;4(2-3):192-206.DOI:10.1159/000150741.

14. Lebow MR, Sawin PB. Inheritance of human facial features: a pedigree study involving length of face, prominent ears and chin cleft. Journal of Heredity. 1941;32(4):127-132.DOI:10.1093/oxfordjournals.jhered.a105016.

15. Rassman WR, Pak JP, Kim J. Phenotype of normal hairline maturation. Facial Plastic Surgery Clinics. 2013;21(3):317-324.DOI:10.1016/j.fsc.2013.04.001.

16. Ceballos C, Priego C, Méndez C, Hoffner MV, García-Hernández MJ, Camacho FM. Study of frontal hairline patterns in Spanish Caucasian women. Actas Dermo-Sifiliográficas (English Edition). 2013;104(4):311-315.DOI:10.1016/j.adengl.2012.10.009.

17. Nusbaum BP, Fuentefria S. Naturally occurring female hairline patterns. Dermatologic Surgery. 2009;35(6):907-913.DOI:10.1111/j.1524-4725.2009.01154.x.

18. Alija AJ, Bajraktari ID, Bresgen N, et al. Frequency Distribution and Association of some Morpho-and Physiological Traits in Patients with Lung Diseases in Kosova. Collegium antropologicum. 2015;39(4):907-913.

19. Abimbola EO. A study on tongue rolling, tongue folding and cerumen type in a Nigeria population. Anatomy Journal of Africa. 2019;8(2):1540-1543.DOI:10.4314/aja.v8i2.188220.

20. Razzaq, Rabia, et al. "Tongue rolling, folding, cheek dimple and chin cleft; study of a morphogenetic traits in Quetta population." World J Zool 10.3 (2015): 237-40.

21. Gao W, Li L, Cao W, et al. Physical features observation: is it repeatable in zygosity determination of Chinese adult twins? Twin Research and Human Genetics. 2010;13(1):96-100.DOI:10.1375/twin.13.1.96.

22. Reiss M. The genetics of hand-clasping a review and a familial study. Annals of Human Biology. 1999;26(1):39-48. DOI:10.1080/030144699282967.