

Assessment of Morphogenetic Inherited Traits; Earlobe Attachment, Bent Little Finger and Hitchhiker's Thumb in Quetta, Pakistan

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Abstract: Morphogenetic traits are physical characters of an individual and the pattern of inheritance of these traits is autosomal dominant as well as autosomal recessive. It is believed that free earlobe and bent little finger having autosomal dominant pattern of inheritance (homozygous/heterozygous) while Hitchhiker's thumb has recessive mode (beside other factors), so this character appeared in recessive (homozygous) condition. The present study was conducted to screen random population for morphogenetic traits i.e. earlobes attachment (attached/free), little finger (bent/straight) and thumb (Hitchhiker's/straight) to find out an association of these traits with gender and ethnicity in Quetta, Pakistan. A total of 2000 subjects (female 1197, male 803) were collected randomly from April-August 2014. The prevalence of these morphogenetic characters were observed as; free earlobe 48.35%, attached earlobe 51.65%, bent little finger 35%, straight little finger 65%, Hitchhiker's thumb 49.4% and straight thumb 50.6%. The higher prevalence of free earlobes, bent little finger and Hitchhiker's thumb was observed among females. The Chi-Square test showed an association ($p < 0.05$) of bent little finger and Hitchhiker's thumb with gender as well as ethnicity.

Key words: Bent Little Finger · Earlobe Attachment · Hitchhiker's Thumb and Morphogenetic Traits

INTRODUCTION

Population variability gives a chance to investigate the morphogenetic variations in endogamous population facing different ecological circumstances [1]. Morphogenetic traits are physical characters of an individual. Though the genetic mechanism to control the morphogenetic traits is still not clear as they observed with variable frequency among different population but the study of morphogenetic traits is of enormous value in the study of evolution, human diversity and taxonomy [2].

The individuals having earlobes, hang freely have free earlobes and those having fused with the sides of head are termed as attached earlobes, the earlobes are further classified into three different types on the base of attachment or angle such as obtuse, acute and right [3]. The single gene regulate this trait for which free earlobe is dominant and attached earlobe is recessive, however other factors such as sex and age also influence the length of earlobes [4,5].

Kirner first time described the phenomena of bent little finger [6]. The presence of bent little finger is due to the dominant gene (Bb/BB) and straight little finger is due to recessive gene (bb) [7]. Bent little finger is classified into three different types; Clinodactyly, Camptodactyly and Kiner's deformity. Clinodactyly term is used when little finger diverge away from axial point of finger and it is actually a physical trait which does not related with any deformity [8, 9]. Camptodactyly derived from Greek word; camptos mean bend and dactulos mean finger, which was described by Landouzy, is defined as "an enduring contraction of single or both little fingers at the distal proximal interphalangeal (PIP) joints" [10].

Hitchhiker's thumbs which is "distal hyper extensibility" or bent thumb, is a feature in which thumb can be bent backward mostly up to 90 degree angle. Glass and Kistler called all thumbs as Hitchhiker's thumb which could bent equal to or greater than 50 degree angle [11]. It is believed that this trait is regulated by recessive gene (h), so character appears in homozygous condition [12].

The aim of this study was to assess the morphogenetic traits among the population of Quetta which is valuable for evolutionary and taxonomic investigation, this study has not been reported previously from Quetta region.

MATERIALS AND METHODS

A total of 2000 subjects for morphogenetic traits of attached and free earlobes, bent and straight little finger, Hitchhiker's and straight thumb were observed at random after well informed consent from different localities of Quetta from April-August, 2014. Observations were recorded on the basis of gender and ethnic groups. The studied populations belonged to various ethnic groups: Pushtoon (874), Baloch (464), Punjabi (401), Hazara (Persian) (54), Sindhi (59), Saraiki (51) and Urdu speaking (97). Traits were characterized by using standard techniques [13]. Statistical analysis was done by using statistical package for social sciences (SPSS) version 16 by the application of chi-square test, contingency table (2×2 for gender) (7×2 for ethnicity) to find out the relation of morphogenetic traits with gender and ethnic groups at 5% level of significance.

RESULTS AND DISCUSSION

In the present study data of 2000 subjects was observed among which 1197 (60%) were female and 803 (40%) were male (Table 1). It was observed that the frequency of free earlobe was lower than attached earlobe. Among studied groups prevalence of free earlobe was found to be 48.35% (female 58.2%, male 41.8%) while the attached earlobe was 51.65% (female 61.4%, male 38.6%), (Figure 1 a b c, 1 d e f). Data analyzed by Chi-Square test at 0.05 significance level revealed no association ($p>0.05$) between gender and attached/free earlobes (Table 1). The present study showed similarity with different studies, among them the attached earlobes were found more frequent than free earlobes. Lai and Walsh studied monogoloid-Japanese and Chinese population and found the frequency of attached earlobe among monogoloid-Japanese 67.1% and Chinese 64.3% [14]. The similar study was conducted among Tibetans population and was found 50.4% population having attached earlobes [15]. Shah *et al.* claimed that the Muslims are of caucasoid in origin having much lower frequency of attached earlobes [16]. Different studies

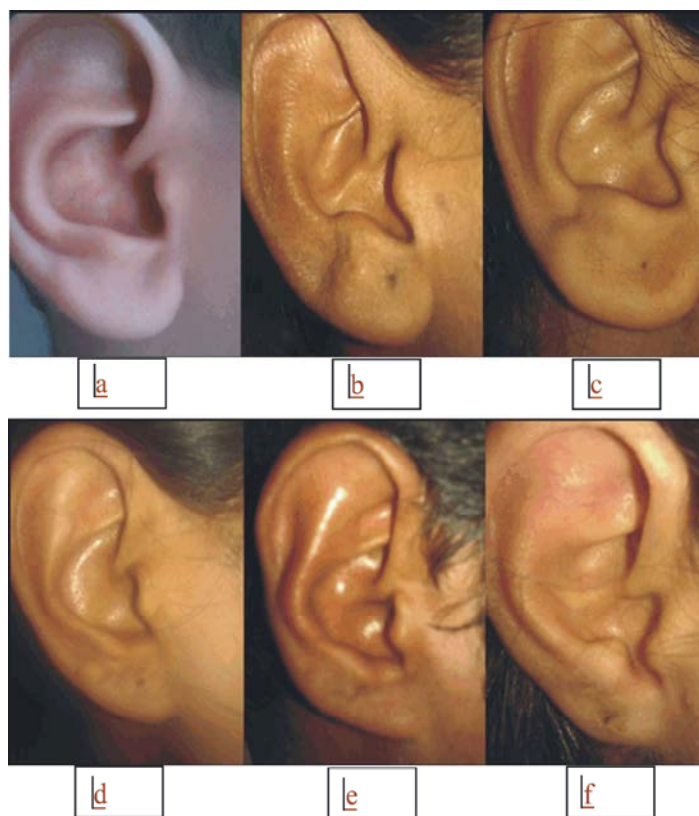


Fig. 1: (a) (b) (c):Free earlobes (left) and (d) (e) (f): Attached earlobes (left).

Table 1: Prevalence of morphogenetic traits in genders

Gender	Total	Earlobe		Little finger		Thumb	
		Free	Attach	Bent	Straight	Hitchhiker's	Straight
female	1197(60%)	564(58.2%)	634(61.4%)	451(64.4%)	748(57.4%)	619(62.6%)	579(57.2%)
male	803(40%)	404(41.8%)	399(38.6%)	249(35.6%)	554(42.6%)	368(37.4%)	433(42.8%)
total	2000(100%)	968(48%)	1033(51.6%)	700(35%)	1302(65%)	987(49.4%)	1012(50.6%)
chi square		$\chi^2=1.963, df=1, p=0.161$		$\chi^2=9.294, df=1, p=0.02$		$\chi^2 df=1, p=0.016$	

Table 2: Prevalence of morphogenetic traits in different ethnic groups

Ethnic group	Total	Earlobe		Little finger		Thumb	
		Free	Attach	Bent	Straight	Hitchhiker's	Straight
Baloch	464(23.2%)	240(24.8%)	224(21.7%)	183(26.2%)	280(21.5%)	249(25.1%)	215(21.2%)
Pashtoon	874(43.7%)	393(40.6%)	481(46.6%)	286(41%)	589(45.2%)	362(36.6%)	512(50.7%)
Hazara (persian)	54(2.75%)	31(3.2%)	23(2.2%)	27(3.9%)	27(2.1%)	42(4.3%)	12(1.2%)
Punjabi	401(20%)	210(21.7%)	191(18.5%)	139(19.9%)	262(20.1%)	213(21.6%)	188(18.6%)
Sindhi	59(2.95%)	21(2.2%)	38(3.7%)	29(4.1%)	30(2.3%)	38(4%)	21(2.1%)
Saraiki	51(2.55%)	32(3.3%)	19(1.8%)	14(2%)	37(2.8%)	33(3.2%)	18(1.8%)
Urdu	97(4.85%)	41(4.2%)	56(5.4%)	20(2.9%)	77(5.9%)	52(5.2%)	45(4.4%)
Total	2000(100%)	968(48.4%)	1033(51.6%)	698(35%)	1302(65%)	989(49.45%)	1011(50.55%)
Chi square		$\chi^2=20.150, df=6, p=0.003$		$\chi^2=20.150, df=6, p=0.003$		$\chi^2=56.040, df=6, p=0.000$	



Fig. 2a: Bent little finger and b: Straight little finger



Fig. 3 a: Hitchhiker's thumb and b: Straight thumb

claimed dissimilarity with present study. They reported free earlobes more common as attached earlobe [17, 18]. In the present study the female possessed the higher percentage (28.15%) of free earlobe than male (20.2%). A study conducted in Borkola village of Assam claimed the higher prevalence of free earlobes among female (90.3%) than male (76.92%) [19].

The prevalence of bent little finger was 35% (female 64.4%, male 35.6%) and the prevalence of straight little finger was 65.1% (female 57.4%, male 42.6%) (Figure 2 a, b). The chi-square test showed an association ($p < 0.05$) between little finger and gender (Table 1). The results

showed similarity with different studies, as the frequency of bent little finger in females was higher than males and in total population percentage of straight little finger was higher [7, 20, 21].

The result illustrated the prevalence of Hitchhiker's thumb lower than straight thumb (Table 1). The prevalence of Hitchhiker's thumb was 49.35% (female 62.6% and male 37.4%) and the straight thumb was 50.60% (female 57.2% and male 42.8%) (Figure 3 a, b). The chi-square test showed an association ($p < 0.05$) between Hitchhiker's thumb and gender (Table 1). The results showed similarities with the study conducted in Nigeria, among females the phenotypic frequency of Hitchhiker's thumb was higher (16.8%) than male (15.5%) and in total population the frequency of Hitchhiker's thumb was higher [21]. The study of Hitchhiker's thumb has not been given attention in past and further research is needed regarding this trait.

Beside gender association of these morphogenetic traits, ethnicity of subjects was also observed. In all ethnic groups, Pushtoon having the highest percentage in all morphogenetic traits (free earlobes 40.6%, bent little finger 41%, Hitchhiker's thumb 36.6%), it may be due to large sample size (874/2000). The chi-square test showed an association ($p < 0.05$) of these traits with ethnicity (Table 2). With respect to ethnicity no previous data was available.

The analysis of morphogenetic traits is very significant in the area of forensic and anthropological study. The data with greater sample size is recommended

for future studies, it can give additional information regarding the morphogenetic variations, evolution and taxonomic investigation.

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