

Ear Lobe Attachment in an Andhra Village and Other Parts of India¹

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Abstract. The incidence of attached ear lobe was studied in a village of Andhra Pradesh and compared with other Indian populations. Geographical, ethnic and social hierarchical clines are noticed in the overall frequencies of the trait. Preliminary observations on diversity in sex difference, a small decline in generations, assortative mating due to consanguinity and dominant inheritance with sex influence of attached lobe are also discussed. The use of overall frequencies of attached lobe is recommended for population studies, and quantitative variation for further genetic analysis.

Key Words

Ear lobe attachment types
Indian population study
Family study

Introduction

Attachment of ear lobe in man is mostly influenced by heredity, although the mode of its inheritance is not established [HILDEN, 1922; CARRIÈRE, 1937; QUELPRUD, 1934, 1941; POWELL and WHITNEY, 1937; WIENER, 1937; KLOEPFER, 1946; SUZUKI, 1950; GATES, 1954]. A broad trend of ethnic difference is reflected by higher incidence of attached lobe in a few African populations studied, in comparison to the Europeans [GATES, 1954; GABEL, 1958; SALDANHA, 1962; GLASS, 1954]. In recent years, frequencies of attached lobe have been reported from about 40 populations of India. But

¹ The data used for this study have been collected in connection with a research scheme on 'Genetic Studies in Relation to Fertility', supported by grants from Indian Council of Medical Research, New Delhi.

some authors have used 'completely attached lobe' for ethnic comparisons [DUTTA, 1963; DUTTA and GANGULY, 1965; BASU, 1966; CHATTOPADHYAY, 1968] while others [DAS, 1967; SINGH and MALHOTRA, 1970] have found the total frequency of 'attached lobe' including 'intermediate types' more efficient for this purpose. The methodological difference has led to comparisons within selected populations without proper geographical considerations. Observed overlapping of ranges between 'Mongoloids' and 'Caucasoids' [CHATTOPADHYAY, 1968] and close similarity of discrete populations [BASU, 1966] have raised questions about the anthropological usefulness of this trait [MARTIN, 1928].

DUTTA and GANGULY [1965] have suggested the effects of isolation and genetic drift on the differences between Nicobarese populations, while they assume that selection and breeding pattern as such have not played any role.

In this paper, we will discuss the nature of population variation in the frequency of attached ear lobe on the basis of (1) new data from a single village, Gajukuntapalle of Andhra Pradesh, (2) compilation of available material from other regions of India, and (3) a preliminary genetical analysis of the data collected from Gajukuntapalle.

Material and Method

The types of ear lobe were observed on 403 of 750 villagers, 256 males and 147 females, from Gajukuntapalle of Anantapur district in Andhra Pradesh, India. The individuals belonged to different endogamous groups and were aged 5–70 years. The data were finally arranged in four population groups namely, (1) Kodithi Kapu (an endogamous subcaste), (2) Rajamahendravaram Baliya (an endogamous subcaste), (3) other castes (mainly Kurava, with a few Golla, Vadde and Ediga; they are pooled together on the basis of similar frequencies), and (4) Muslim (mainly Sheik with a few Julaha). The two sexes were treated separately to study the nature of sex difference and to test the representative nature of the samples.

As the samples were drawn from a village in which cross-cousin and maternal uncle-niece marriages were common, they did not consist of strictly unrelated individuals. We could have avoided close relatives, by excluding only 40 individuals but they did not affect the population frequencies and helped us to trace seven 'three generation-pedigrees'. 36 married couples and three single parents also occurred.

Only two types of ear lobe were classified: (1) attached lobe, which formed an angle of 90° or more at the point of attachment with the cheek, and (2) free lobe, which bent at an acute angle on the cheek and formed a notch. Data on both total frequencies of attached lobe and that of completely attached lobe in Indian populations were compiled from existing literature for comparative purposes.

Observations and Discussion

Frequencies of attached and free ear lobes in the four groups of populations of Gajukuntapalle are compared for each sex in table I. In each group, the two sexes show remarkable similarities, as measured by χ^2 values. This also suggests that the samples are representative in nature. The intergroup comparison of both separate and combined male and female samples points to the clear divergence of the Kapu from the rest of the villagers who have higher incidence of attached lobe. χ^2 of the difference (31.45) between them and Kapu is highly significant.

In table IIa-c, the incidence of attached ear lobe on these Andhra Pradesh samples is compared with that from other parts of India. While most of the information concerns male samples, there are a few other populations for which female data are available. The sex difference is not statistically significant in any of these populations except perhaps the Southern Nicobarese. However, there is a consistent excess of non-attached ear lobe among females in Gajukuntapalle in contrast to diverse sexual trends in others, and reports [GATES, 1954; QUELPRUD, 1934] of significant excess of attached lobes in females of non-Indian samples. A relatively smaller sex difference can, however, be expected in relatively more homogeneous populations as in other traits [MUKHERJEE, 1971].

Table IIa-c shows that the total frequency of all types of attached ear lobes is relatively more useful for comparative purpose. It is possible to observe an overall geographical cline using this criterion. The attached lobe increases towards southern and eastern directions, and the lowest incidences

Table I. Distribution of types of ear lobe in the males and females of Gajukuntapalle, A.P.

Population	Attached			Free		Sex difference χ^2 (d.f. = 1)
	sex	n	%	n	%	
Kapu	M	35	43.2	46	56.8	0.0161
	F	24	42.1	33	57.9	
Baliya	M	48	73.8	17	26.1	0.2773
	F	22	68.7	10	31.2	
Kurava	M	55	71.5	22	28.5	0.4862
	F	30	65.3	16	34.7	
Muslim	M	26	78.8	7	21.2	0.0731
	F	9	75.0	3	25.0	

Table IIa. Distribution of attached ear lobe in the populations of eastern India including Nicobar islands)

Area and population	Sex	Size of sample	Attached ear lobe			Authors
			total	?	com- plete	
<i>Bihar</i>						
1 Southern Pahira	*	183			25.1	BASU [1966]
<i>West Bengal</i>						
2 Northern Pahira	*	119			32.5	BASU [1966]
3 Gandhabanik	M	100	57.0		24.0	DUTTA [1963]
4 Rarhi Brahmin	M	55		21.8		CHATTOPADHYAY [1968]
	F	40		30.0		CHATTOPADHYAY [1968]
5 Kayastha	M	73		27.4		CHATTOPADHYAY [1968]
	F	58		24.1		CHATTOPADHYAY [1968]
6 Baidya	M	15		26.7		CHATTOPADHYAY [1968]
	F	13		23.0		CHATTOPADHYAY [1968]
Bengalee upper castes (3-6 and others)	M	148		25.0		CHATTOPADHYAY [1968]
	F	117		26.5		CHATTOPADHYAY [1968]
<i>Assam</i>						
7 Suri	M	100	45.0		21.0	DAS and DEKA [1960]
8 Kalita	M	120	45.0		23.3	DAS [1964]
9 Rabha	M	300	82.0		23.7	DAS [1967]
10 GARO	M	200	73.0		46.5	DAS [1967]
11 Rajbanshi	M	100	54.0		26.0	DAS [1967]
12 Kachari	M	100	68.0		34.0	DAS [1967]
<i>Manipur</i>						
13 BRAHMIN	M	59	62.7		25.4	SINGH and MALHOTRA [1970]
	F	57	59.6		19.3	SINGH and MALHOTRA [1970]
14 Meithei	M	106	87.7		64.5	SINGH and MALHOTRA [1970]
	F	111	81.1		46.8	SINGH and MALHOTRA [1970]
<i>Nicobar Islands</i>						
15 Nicobarese	M	428	79.7		34.3	DUTTA and GANGULY [1965]
	F	301	80.0		46.2	DUTTA and GANGULY [1965]
16 Car Nicobarese	M	175	81.1		42.3	DUTTA and GANGULY [1965]
	F	166	83.1		47.6	DUTTA and GANGULY [1965]
17 Teressan	M	77	63.6		30.0	DUTTA and GANGULY [1965]
	F	81	63.0		23.5	DUTTA and GANGULY [1965]
18 Southern Nicobarese	M	65	84.6		55.4	DUTTA and GANGULY [1965]
	F	54	96.3		75.9	DUTTA and GANGULY [1965]
19 CHOWRITE	M	111	85.6		42.3	DUTTA and GANGULY [1965]

? Indicates lack of clarity in classification.

* Sex is not mentioned.

Table IIb. Distribution of attached ear lobe in the populations of southern India

Area and Population	Sex	Size of sample	Attached ear lobe		Authors
			total	complete	
<i>Kerala</i>					
20 Urali	M	125	28.8		CHATTERJEE and KUMAR [1956]
21 Mannan	M	46	56.5		CHATTERJEE and KUMAR [1957a]
22 Paliyan	M	47	55.3		CHATTERJEE and KUMAR [1957b]
23 Malapantaram	M	37	91.9		CHATTERJEE and KUMAR [1957b]
<i>Andhra Pradesh (Gajukuntapalle)</i>					
24 Kodithi Kapu	M	81	43.2		present study
	F	57	42.1		present study
	both	138	42.6		present study
25 Baliya	M	65	73.8		present study
	F	32	68.7		present study
	both	97	71.3		present study
26 Kurava	M	77	71.5		present study
	F	46	65.3		present study
	both	123	68.4		present study
27 Muslim	M	33	78.8		present study
	F	12	75.0		present study
	both	45	76.9		present study
<i>Mysore</i>					
28 Samarth Brahmin	M	116	62.9	19.8	BASU [1968]
	F	108	63.9	17.6	BASU [1968]
29 Madhava Brahmin	M	105	61.0	19.0	BASU [1968]
	F	100	66.0	26.0	BASU [1968]
30 Iyengar Brahmin	M	104	69.2	20.2	BASU [1968]
	F	110	64.6	26.4	BASU [1968]
31 Lingayat	M	106	68.9	29.3	BASU [1968]
	F	105	61.9	17.1	BASU [1968]
32 Vokkaliga	M	121	70.3	25.6	BASU [1968]
	F	105	71.4	24.9	BASU [1968]
33 Adikarnatak	M	102	69.6	23.5	BASU [1968]
	F	106	67.9	30.2	BASU [1968]
34 Muslim	M	108	46.3	13.9	BASU [1968]
	F	102	54.9	17.7	BASU [1968]

are noted in northern regions of U. P. and Punjab. From an ethnic point of view, the Mongoloid and Australoid elements may tend to have a higher frequency of all attached lobes. The higher incidences among the Mongolian tribes in comparison to Caucasian elements [DAS, 1967] become disputable

Table IIc. Distribution of attached ear lobe in the populations of central and northern India

Area and Population	Sex	Size of sample	Attached ear lobe		Authors
			total	complete	
<i>Madhya Pradesh</i>					
35 Muriya (Bastar tribe)	M	103	90.3	27.7	BASU [1967]
36 Bhatra (Bastar)	M	132	73.9	19.7	BASU [1967]
37 Brahmin	M	97	36.1	14.4	DUTTA and GANGULY [1965]
38 Intermediate caste	M	103	43.7	16.5	DUTTA and GANGULY [1965]
39 Chamar	M	54	50.0	13.0	DUTTA and GANGULY [1965]
40 Tribals	M	54	48.1	25.9	DUTTA and GANGULY [1965]
41 Muslim	M	102	51.0	25.5	DUTTA and GANGULY [1965]
<i>Uttar Pradesh</i>					
42 BOTIA	M	100		18.0	TIWARI [1954]
43 Muslim	M	115	20.9		VERMA [1957]
44 Brahmin	M	224	10.7		VERMA [1957]
45 Kshatriya	M	128	17.2		VERMA [1957]
46 Ahir	M	123	14.6		VERMA [1957]
47 Pasi	M	74	14.9		VERMA [1957]
48 Kurmi	M	44	13.6		VERMA [1957]
49 Chamar	M	46	21.7		VERMA [1957]
<i>Delhi</i>					
50 Jat	M	107	18.7		CHATTOPADHYAY [1968]
51 Ahir	M	80	31.2		CHATTOPADHYAY [1968]
<i>Punjab</i>					
52 Khatri-Arora	M	94	5.0		AHUJA and TICKOO [1970]
53 India	M	111	35.1		LAI and WALSH [1966]

Tibetan immigrants of Mongolian origin [TIWARI and BHASIN, 1969] show 69.9 and 83.9% for males and females, respectively.

only when the criterion of total frequency of attached lobe is abandoned [CHATTOPADHYAY, 1968].

Within each region, the data support the hypothesis that populations with a higher position in the caste hierarchy have relatively smaller frequency of attached lobe. For example, the Brahmans of U. P. Mysore or Manipur show distinctly smaller frequencies compared to the other local castes. The small female sample of Bengalee Brahmans does not seem to provide a significant exception to this trend. The Muslim populations are generally

homogeneous with their neighbours in respect of this trait, except the sample drawn from Mysore Muslims who may show some heterogeneity. The tribal populations have an excess of attached lobe over other populations.

In Gajukuntapalle, a high incidence of attached lobe can be expected in view of the geographical location of the village in south eastern Andhra Pradesh. The smaller frequency among the Kapu is compatible with their higher position in the caste hierarchy.

Geographical clines within similar ethnic populations and exceptions to the general pattern among the Urali, Terressan or Pahira suggest the operation of some mechanism such as selection, drift, differential breeding pattern and so on, behind the population differences. DUTTA and GANGULY [1965] have argued for genetic drift among island populations of the Nicobar and genetical stability of large communities in the mainland India. But the heterogeneity observed among large communities in one village in the present study adds complexity to the problem.

Therefore, results of a preliminary genetical analysis on the populations are reported here. Although the distribution of attached ear lobe in different age groups (table III) shows no significant generation change supporting GLASS [1954], a small trend towards an increase of free lobe is apparent. The frequency of assortative mating tends to be higher than that expected by random mating, although there is no significant statistical difference between them. This appears to reflect frequent consanguineous matings occurring in the populations. The family data are summarised in table IV. Although they are inadequate for analysis of genetical segregation, the information is largely compatible with the hypothesis of dominant inheritance of attached ear lobe, ignoring a single case of apparent exception. But, in fact, the hypothesis of dominant or recessive inheritance does not help us to gather further knowledge of inheritance of the trait. The proportions of concordant pairs of relatives of different types are recorded in table V which suggest a strong hereditary influence on the trait. It is, however, interesting that the concordance is apparently greater among pairs of male relatives, such as father and son, or brother and brother, suggesting sex influence.

It can be expected that exact genotypes of the trait and their phenotypic modifications can be understood better by a systematic analysis of the quantitative variation. For this purpose, the study of the angle of attachment of the ear lobe with the cheek may serve as an objective and useful measure of this variation. The existing subdivisions of attached ear lobe are not efficient for population comparisons and studies of microevolution and also, the phenotypic variation of attached and non-attached lobes does not suf-

Table III. Attached ear lobe in three generations in Gajukuntapalle

Generation	Age group, years	n	Attached lobe, %	S E
I	51-75	33	66.7	±8.2
II	26-50	152	65.8	±3.8
III	up to 25	218	59.2	±3.3

Table IV. Combination of attached (A) and free (F) ear lobes in parents and offspring in Gajukuntapalle

Parental combination			n	A:F		
father		mother		sons	daughters	children
A	×	A	13	23:2	6:3	29: 5
F	×	F	9	0:8	1:5	1:13
A	×	F	5	5:0	0:3	5: 3
F	×	A	4	0:2	2:2	2: 4
F	×	—	1	2:2	—	2: 2
—	×	F	2	1:2	—	1: 2

Table V. Concordance of the type of ear lobe in pairs of relatives in Gajukuntapalle

Pairs	n	Concordance, %
Spouses	33	66.9
Parent: offspring	118	75.4
Sibpair	71	77.5
Father: child	58	77.6
Father: son	36	88.9
Father: daughter	22	59.1
Mother: child	60	73.3
Mother: son	38	73.7
Mother: daughter	22	72.7
Brother: brother	37	91.9
Sister: sister	5	40.0
Brother: sister	29	65.5
Uncle/aunt: nephew/niece	27	59.3
Cousin: cousin	8	50.0

ficiently clarify the nature of inheritance of the trait. In any case, the present study suggests a simple inheritance of the trait which is subject to micro-evolutionary changes and influence of sex.

References

- AHUJA, Y. R. and TICKOO, J. L.: Study of PTC sensitivity, colour blindness, ear lobe attachment, helix folding, arm folding, leg folding, hand clasping and handedness among Punjabis in Delhi. Abst. 1st Nat. Congr. of Hum. Genet., Poona, pp. 18-19 (1970).
- BASU, A.: A note on the ear lobe. *Acta genet.*, Basel 16: 184-185 (1966).
- BASU, A.: Observations on ear lobe attachments in some population groups of Mysore (India). *Acta genet.*, Basel 18: 380-385 (1968).
- BASU, M. P.: Some somatoscopic traits and hand clasping behaviour of two tribes of Bastar. *Bull. Anthropol. Surv. India* 16: 111-131 (1967).
- CARRIÉRE, R.: Über erbliche Ohrformen, insbesondere das angewachsene Ohrläppchen. Z. Abst. Vererb. (1937); zit. in POWELL and WHITHNEY (1937).
- CHATTERJEE, B. K. and KUMAR, G. D.: Somatic characters and the racial affinities of the Urali of Travancore and Cochin states. *Anthropologist* 3: 1-23 (1956).
- CHATTERJEE, B. K. and KUMAR, G. D.: Somatometric and somatoscopic observations and their affinities of the Mannans of Travancore-Cochin. *J. Asiat. Soc., Sc.* 23: 1-18 (1957a).
- CHATTERJEE, B. K. and KUMAR, G. D.: A comparative study of the somatometric and somatoscopic observations and their racial affinities of the Paniyans and the Malapantarams of Travancore-Cochin. *J. Asiat. Soc., Sc.* 23: 19-42 (1957b).
- CHATTOPADHYAY, P. K.: Ear lobe types among the Bengalees. *J. Indian Anthropol. Soc.* 3: 67-70 (1968).
- DAS, B. M.: A note of variation of ear lobe attachment. *Acta genet.*, Basel 17: 154-157 (1967).
- DAS, B. M. and DEKA, U.: Physical characters of the Sura of Assam. *J. Gau. Univ.* 11: 87-98 (1960).
- DAS, R.: A note on the ear lobe of the Kalita. *J. Assam Sci. Soc.* 7: 91 (1964).
- DUTTA, P. D.: A note on the ear lobe. *Acta genet.*, Basel 13: 290-294 (1963).
- DUTTA, P. and GANGULY, P.: Further observations on ear lobe attachment. *Acta genet.*, Basel 15: 77-86 (1965).
- GABEL, N. E.: A racial study of the Fijians. *Anthrop. Rec.* 20: 20 (1958).
- GATES, R. R.: Etudes sur le croisement de races. III. Nouvelles observations concordant les oreilles, en particulier les lobes. *J. Génét. hum.* 3: 95-112 (1954).
- GLASS, B.: Genetic drift in human populations. *Amer. J. phys. Anthropol.* 14: 541-555 (1954).
- HILDEN, K.: Über die Form des Ohrläppchens beim Menschen und ihre Abhängigkeit von Erbanlagen. *Hereditas, Lund.* 3: 351-357 (1922).
- KLOEPFER, H. W.: An investigation of 171 possible linkage relationships in man. *Ann. Eugen.* 13: 35-37 (1946).

- LAI, L. Y. C. and WALSH, R. J.: Observations on ear lobe types. *Acta genet.*, Basel 16: 250–257 (1966).
- MARTIN, R.: *Lehrbuch der Anthropologie*, vol. 7, 2075 (Fischer, Jena 1928).
- MUKHERJEE, D. P.: Trends of dermatoglyphic research; in *Indian Anthropology*. Silver Jubilee vol. *Anthrop. Survey India* (in press, 1971).
- POWELL, E. F. and WHITNEY, D. D.: Ear lobe inheritance. *J. Hered.* 28: 185–186 (1937).
- QUELPRUD, T.: Familienforschungen über Merkmale des äusseren Ohres. *Z. Abst. Vererb.* 67: 296–299 (1934); cit. in GATES (1946).
- QUELPRUD, T.: Variability and genetics of the human external ear. *Proc. Int. Congr. Genetics*, Edinburgh 1941, p. 243; cit. in GATES (1946).
- SALDANHA, P. H.: The genetic effects of immigration in rural community of Sao Paulo, Brazil. *Acta genet. med.*, Roma 11: 158–224 (1962).
- SINGH, N. R. and MALHOTRA, K. C.: Ear lobe among the Brahmins and Meitheis of Manipur, India. *Bull. Deccan College. Res. Inst.*, Poona 29: 165–168 (1970).
- SUZUKI, A.: Genetic studies on the human lappets. On the inheritance of the lobulus auricularae. *Jap. J. genet.* 25: 157–159 (1950).
- TIWARI, S. C.: Anthropometric studies of the Bhotias of Almora district (U. P.). *Anthropologist* 1: 22–32 (1954).
- VERMA, B. K.: Observations taken on the ear lobes of a group of U. P. convicts. *Eastern Anthropol.* 10: 211–213 (1957).
- WIENER, A. S.: Complications in ear genetics. *J. Hered.* 28: 425–426 (1937).

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