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Morphological traits in peoples of Mongolian nationality of the Hulunbuir League, Inner Mongolia, China*

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With 3 tables

Summary: A sample of 947 Mongolians of Bargud, Elute and Buriat was investigated on 9 indexes (hair form, forehead hair-ledge point, eyefold of the upper eyelid, Mongoloid fold, ear lobe type, nasal profile, nostril type, front teeth type, and chin projection) in the Hulunbuir league, Inner Mongolia in September 1997. The results are as follows: 1. Most of the Mongolians in Hulunbuir league are characterised by straight hair, forehead hair-ledge point absence, eyefold eyelid, Mongoloid fold appearance, shovel-shaped front teeth, straight nose, wide nostril, free ear lobe, non-projecting chin. 2. The frequencies of the forehead hair-ledge point appearance, shovel-shaped front teeth appearance and projecting chin showed significant differences between the three groups. 3. The incidence of ear lobe type, nasal profile and front teeth type showed obvious sexual differences. 4. Correlations did not occur between most of the nine traits.

Key words: Morphological traits, Mongolian population groups, Inner Mongolia (China), intergroup and correlation analyses.

Zusammenfassung: An einer Stichprobe von 947 Mongolen (Bargud, Elute und Buriat) wurden neun morphologische Merkmale untersucht: Haarform, Haaransatz an der Stirn, Augenfalte des oberen Augenlides, Mongolenfalte, Ohrläppchentyp, Nasenprofil, Form der Nasenlöcher, Form der Frontzähne und Kinnvorsprung. Die Untersuchungen wurden im September 1997 in der Hulunbuir-Region (Innere Mongolei) durchgeführt. Folgende Ergebnisse konnten beobachtet werden: 1. Die meisten der untersuchten Mongolen sind durch straffes Haar, Verlauf der Stirnhaarbegrenzung, Augenlidfalte, Mongolenfalte, schaufelförmige Frontzähne, geraden Nasenrückenverlauf, weite Nasenlöcher, freies Ohrläppchen und nicht-prominentes Kinn charakterisiert. 2. Die Häufigkeitsunterschiede im Verlauf der Stirnhaarbegrenzung, im Vorhandensein schaufelförmiger Frontzähne sowie in der Kinnausprägung lassen signifikante Unterschiede zwischen den drei Gruppen erkennen. 3. Deutliche Geschlechtsunterschiede ergaben sich für den Ohrläppchentyp, das Nasenprofil sowie die Ausprägungsform der Frontzähne. 4. Zwischen den meisten der neun morphologischen Merkmale zeigten sich keine korrelativen Beziehungen.

Schlüsselwörter: Morphologische Merkmale, mongolische Bevölkerungsgruppen, Innere Mongolei (China), Intergruppen- und Korrelationsanalysen.

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Introduction

Some morphological traits in man are influenced by genetic factors. Based on different genetic factors different population groups show therefore different frequencies of various morphological traits. Many scholars have paid attention to these traits and affirmed genetic patterns of some of them.

Mongolians have played an important role in the course of world history. The population number of Chinese Mongolians was 4.8 millions in 1990 (Wang Zhen et al. 1997). The Hulunbuir League is situated in Inner Mongolia, where Mongolians live compactly. The Hulunbuir League is characteristic by the Xing'an Mountains and extensive grasslands. The Mongolians, who mostly live on animal husbandry, can be divided into three groups. The first group, the Bargud, live mainly in the Cheng *Bargud* Banner and Xin *Bargud* Banner. Their ancestors lived east of the Bajeer Lake and moved into the Hulunbuir League in the early 18th century. The second group are the *Elute*. Most of them live in the Ewenke Banner. Their ancestors had been living in Xinjiang before they settled down in the Hulunbuir League. The third group are the *Buriat*. They formerly lived around the Bajeer Lake and moved into the Hulunbuir League in the early 20th century. Presently, the population number of this group amounts to several thousand, living in the Ewenke Banner.

Because up to now only very few data have been reported on Mongolians, we carried out the present study, in which some morphological traits of the head and the face are considered.

Materials and methods

In September 1997 a total 947 Mongolian students (439 boys and 508 girls) of the three population groups Bargud, Elute, and Buriat was investigated. All of them are living in the Hulunbuir League, Inner Mongolia, China. Nine morphological traits were recorded: Hair form, forehead hair-ledge point, eyefold of the upper eyelid, Mongoloid fold, ear lobe type, nasal profile, nostril type, front teeth type and chin projection. The 413 students from the Bargud (196 boys, 217 girls) were investigated in the No. 2 Middle School of the Cheng Bargud Banner. The 426 Elute students (201 boys, 225 girls) and the 108 Buriat ones (42 boys, 66 girls) were investigated in the No. 1 Middle School of the Ewenke Banner and the Ewenke Middle School. All the subjects are healthy and aged between 12 and 20 years. They were randomly selected.

The eyefold of the upper eyelid, the Mongoloid fold, the front teeth type and the chin projection were investigated following the MEASURE HANDBOOK OF HUMAN BODY (Shao Xianqing 1985). Concerning the forehead hair-ledge point, the nasal profile and the nostril type we followed the instructions given in HUMAN GENETICS BASIS (Compiling Group about Human Genetics 1987) and the ear lobe type was ascertained according to Martin & Saller (1961).

If the hair was wavy or curly in shape, it was classified as curling hair (C), otherwise as straight (S).

If an individual's forehead hair-ledge point showed a triangular point, it was considered as point appearance (Y), otherwise as point absence (N).

The trait eyefold of the upper eyelid could be judged by the existence of the eyefold. If the upper eyelid had an eyefold, it was classified as eyefold appearance (Y), otherwise as eyefold absence (N).

The Mongoloid fold, in other words the Epicanthus, could be classified as fold appearance (Y) or fold absence (N), according to the existence of a Mongoloid fold in the inner corner of the eye.

The ear lobe type could be classified as ear lobe appearance (Y) and as ear lobe absence (N), according to the existence of a lobe.

Concerning the nasal profile it was checked if there was a protuberance on a nose. In this case it could be considered as a projecting nose (P), otherwise as a straight nose (S).

If an individual's nostril had its longest diameter in horizontal direction, it was considered as a wide nostril (W). Was the longest diameter in vertical direction, it was considered as narrow nostril (N).

The trait front teeth type could be classified into shovel-shaped teeth (Y) and non-shovel shaped teeth (N), according to the shape of the incisors.

If an individual's chin projected obviously, it was classified as a projection chin (P), otherwise as a straight chin (S).

Results and discussion

The results of our studies are given in Tables 1–3. Table 1 shows the distribution of the nine morphological traits in the three population groups, Table 2 the results of the groupwise performed significance tests (χ^2 -tests), and Table 3 the results of the correlation analyses.

Hair form

The overwhelming majority of the investigated Mongolian students of the Hulunbuir League (90.81 %) is characterized by straight hair. The frequencies in the three groups are as follows: Elute (92.02 %) > Bargud (90.07 %) > Buriat (88.9 %). These differences are, however, statistically not significant (see Table 2).

Comparing our results with that observed in other Chinese population groups, it is seen that the samples from the Hulunbuir League show lower frequencies of straight hair than other population groups of the Yunnan province, e.g. Hani (Wang Guilun et al. 1982), Daizu (Wu Rongyou et al. 1982), Baizu (Cheng Wengliang et al. 1982), Achang (Li Ming et al. 1992) and Primi (Li Ming et al. 1995), in which the frequency of straight hair amounts to 100.0 %. High frequencies of straight hair were also observed in the following groups of Xinjiang: Mongolians from Tuerhute (males 92.63 %, females 92.68 %; Wang Jinglan et al. 1993), Mongolians from the Yili district (males 96.70 %, females 98.42 %; Al Qionghua et al. 1994a). It can be said furthermore that the frequency of straight hair among the Mongolians of the Hulunbuir League is close to that of Kazak (91.19 %; Al Qionghua et al. 1994b) and higher than in Uygur (79.81 %; Al Qionghua et al. 1993) and Tajik (males 25.71 %, females 20.01 %; Shao Xingzhou et al. 1990). On the whole it can be said that the Mongolians of the Hulunbuir League show lower frequencies of straight hair than other Chinese population groups.

Table 1. Distribution of nine morphological traits in three Mongolian population groups (first row: absolute numbers, second row: percentages).

	Bargud			Elute			Buriat			Total			
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	
Hair form	S	178	194	372	184	208	392	35	61	96	397	463	860
		90.82	89.40	90.07	91.54	92.44	92.02	83.33	92.42	88.89	90.43	91.14	90.81
	C	18	23	41	17	17	34	7	5	12	42	45	87
		9.18	10.60	9.93	8.46	7.56	7.98	16.67	7.58	11.11	9.57	8.86	9.19
Forehead	Y	85	98	183	91	95	186	11	20	31	187	213	400
hair-ledge		43.37	45.16	44.31	45.27	42.22	43.66	26.19	30.30	28.70	42.60	41.93	42.24
point	N	111	119	230	110	130	240	31	46	77	252	295	547
		56.63	54.84	55.69	54.73	57.78	56.34	73.81	69.70	71.30	57.40	58.07	57.76
Eyefold of	Y	163	186	349	165	181	346	30	51	81	358	418	776
upper eyelid		83.16	85.71	84.50	82.09	80.44	81.22	71.43	77.27	75.00	81.55	82.28	81.94
	N	33	31	64	36	44	80	12	15	27	81	90	171
		16.84	14.29	15.50	17.91	19.56	18.78	28.59	22.73	25.00	18.45	17.72	18.06
Mongoloid	Y	191	208	399	198	210	408**	38	64	102	427	482	909
fold		97.45	95.85	96.61	98.51	93.33	97.77	90.48	96.97	94.44	97.27	94.88	95.99
	N	5	9	14	3	15	18	4	2	6	12	26	38
		2.55	4.15	3.39	1.49	6.67	4.23	9.52	3.03	5.56	2.73	5.12	4.01
Lobe type	Y	168	154	322**	171	171	342*	35	47	82	374	372	746**
		85.71	70.97	77.97	85.07	76.00	80.28	83.33	71.21	75.93	85.19	73.23	78.78
	N	28	63	91	30	54	84	7	19	26	65	136	201
		14.29	29.03	22.03	14.93	24.00	19.72	16.67	28.79	24.07	14.81	26.77	21.23
Nasal profile	S	157	188	345	150	182	332	28	57	85	335	427	762
		80.10	86.64	83.54	74.63	80.89	77.93	66.67	86.36	78.70	76.31	84.06	80.47
	P	39	29	68	51	43	94	14	9	23*	104	81	185**
		19.90	13.36	16.64	25.37	19.11	22.07	33.33	13.64	21.30	23.69	15.94	19.54

Table 1.

	Bargud			Elute			Buriat			Total		
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
Nostril type	196	217	413	201	225	426	42	66	108	439	508	947
	127	148	275	139	157	296	27	42	69	293	347	640
	64.80	68.20	66.59	69.15	69.78	69.48	64.29	63.64	63.89	66.74	68.31	67.58
	69	69	138	62	68	130	15	24	39	146	161	307
	35.20	31.79	33.41	30.85	30.22	30.52	35.71	36.36	36.11	33.26	31.69	32.42
Front teeth	186	183	369**	175	187	362	32	50	82	393	420	813**
type	94.90	84.33	89.35	87.06	83.11	84.98	76.19	75.76	75.93	89.52	82.68	85.85
	10	34	44	26	38	64	10	16	26	46	88	134
	5.10	15.67	10.65	12.94	16.89	15.02	23.81	24.24	24.07	10.48	17.32	14.15
Chin	126	134	260	174	186	360	31	50	81	331	370	701
projection	64.29	61.75	62.95	86.57	82.67	84.51	73.81	75.76	75.00	75.40	72.83	74.02
	70	83	153	27	39	66	11	16	27	108	138	246
	35.71	38.25	37.05	13.43	17.33	15.49	26.19	24.24	25.00	24.60	27.17	25.98

*: significant sexual difference (0.01 < p < 0.05), **: extremely significant sexual difference (p < 0.01)

Table 2. χ^2 -analysis of the frequency differences in the distribution of nine morphological traits in the three Mongolian population groups.

	Bargud × Elute	Bargud × Buriat	Elute × Buriat
Hair form	0.976	0.131	1.072
Forehead hair-ledge	0.036	8.615**	7.991**
Eyefold of upper eyelid	1.590	5.364*	2.081
Mongoloid fold	0.399	3.659	3.036
Lobe type	0.681	0.205	0.999
Nasal profile	4.222*	1.386	0.030
Nostril type	0.810	0.278	1.247
Front teeth type	3.570	13.258**	5.036*
Chin projection	50.501**	5.494*	5.414*

*: significant difference ($0.01 < p < 0.05$), **: extremely significant difference ($p < 0.01$)

Forehead hair-ledge point

The total frequency of the forehead hair-ledge point appearance in the population groups of the Hulunbuir League comes to 42.24 %. These frequencies in the three groups are as follows: Bargud (44.31 %) > Elute (43.66 %) > Buriat (28.70 %). The differences between Bargud and Buriat as well as that between Elute and Buriat are statistically highly significant. No significance could be observed concerning the sex differences. – Comparisons with other populations are not possible, as up to now this trait has not yet been studied in them.

Eyefold of the upper eyelid

Most of the Mongolian students of the Hulunbuir League (81.94 %) show the eyefold appearance of the upper eyelid. The frequencies in the three groups under study are as follows: Bargud (84.50 %) > Elute (81.22 %) > Buriat (75.00 %). The frequency differences between Bargud and Buriat are statistically significant. The sex differences are statistically insignificant.

In Western populations the appearance of an eyefold of the upper eyelid is rather uncommon (Lu Zudong 1983). Against it, this trait is rather frequent in Chinese populations, in which its frequency is increasing with increasing age. The frequencies observed among the population groups of the Hulunbuir League are lower than that of 12 to 20 years old Mongolians from the Alashan League (88.54 %; Zheng Lianbin & Butegeleqi 1989), and close to that of 9 to 18 years old Huizu from Huhhot city (82.47 %; Zheng Lianbin et al. 1993). They are obviously higher than that observed among 7 to 16 years old Manzu from the Jilin province (39.22 %; Han Xiangjun et al. 1993).

Mongoloid fold

Whereas in Western populations the occurrence of this trait is quite uncommon, it is essentially more frequent in Mongolians. Among the students of the Hulunbuir

Table 3. Correlation analysis between the nine morphological traits in the three Mongolian population groups.

	Hair form		Forehead hair-ledge point		Eyefold of upper eyelid		Mongoloid fold		Lobe type		Nasal profile		Front teeth type		Chin projection	
	Y	N	Y	N	Y	N	Y	N	Y	N	P	S	N	W	Y	N
Forehead hair-ledge point	37	363														
	50	497														
Eyefold of upper eyelid	65	711	327	449												
	22	149	73	98												
	3.385		0.017													
Mongoloid fold	86	823	387	522	742	167										
	1	37	13	25	34	4										
	1.303		1.046		1.517											
Lobe type	67	679	317	429	613	133	711	35								
	20	181	83	118	163	38	198	3								
	0.178		0.093		0.124		4.207*									
Nasal profile	19	166	89	96	154	31	174	11	142	43						
	68	694	311	451	622	140	735	27	604	158						
	0.323		3.247		0.263		2.231		0.56							
Nostril type	35	272	149	158	255	52	296	11	229	78	86	221				
	52	588	251	389	521	119	613	27	517	123	99	541				
	2.668		7.380**		0.384		0.218		4.752*		20.770**					
Front teeth type	70	743	338	475	671	141	784	29	641	172	158	655	256	557		
	17	117	62	72	104	30	125	9	105	29	27	107	51	83		
	2.291		1.039		1.979		2.962		0.016		0.034		2.267			
Chin projection	24	222	103	143	203	43	233	13	193	53	52	194	72	174	214	32
	63	638	297	404	573	128	676	25	553	148	133	568	235	466	599	102
	0.129		0.019		0.075		1.396		0.02		0.543		1.505		0.357	

*: significant correlation between 2 traits (0.01 < p 0.05); **: extremely significant correlation between the 2 traits.

League its total frequency was found to be 95.99 %. The frequencies found in the three groups under study are as follows: Elute (97.77 %) > Bargud (96.61 %) > Buriat (94.44 %). These differences are statistically not significant. As among all hitherto tested Mongolian populations no statistically significant sex differences concerning the appearances of this trait have been observed, one can assume that this trait is not related with sex. With exception of the Elute this holds true for our three population groups, too. It is most likely, however, that this exception is due to chance.

Previous studies have revealed that the frequency of the Mongoloid fold is associated with the age structure of a population. So we compared our data with Mongolian population samples of the same age. The frequencies of the Mongolian students of the Hulunbuir League are rather similar to that observed in 9 to 18 years old Huizu and 13 to 17 years old Zangzu (93.65 %; Xia Yuanmin et al. 1982). In comparison to Mongolians from the Alashan League (89.13 %), Yaozu from the Guangxi province – aged from 7 to 16 years (87.17 %; Wu Rongyou et al. 1982) and Manzu from the Jilin province – aged between 7 and 16 years (77.45 %) the frequencies are somewhat higher. In general it can be said that the frequency of the Mongoloid fold is rather high among the different Mongolian population groups of China. The geographic and ethnic distribution of this trait shows remarkable frequency differences, as it is usually found in Central, Eastern, Northern and Western Asia, whereas it is quite uncommon among Europeans, Australian Aborigines, Melanesians, and Africans (Shao Xiangqing 1985).

Ear lobe type

In most of the investigated Mongolian students from the Hulunbuir League (78.77 %) the ear lobe appears. The frequencies in the three groups under study are as follows: Elute (80.28 %) > Bargud (77.97 %) > Buriat (75.93 %). In males the frequency of this ear lobe type is higher than in females.

The Mongolian students of the Hulunbuir League show a rather low frequency of ear lobe absence (21.23 %), which is much more frequent in other Asian populations: Chinese in Hongkong (64.3 %; Lai & Walsh 1965), Japanese (67.1 %; Lai & Walsh 1965), Pakistani (46.70 %; Mian et al. 1994), Central Indian Murias (53.90 %), Halbas (44.92 %), Bison Horn Marias (64.40 %) – Datta et al. (1989) –, North Indian Pangwalas (45.9 %), Settled Gaddis (49.9%), Transhumant Gaddis (50.4 %) – Bhasin et al. (1986) –, Sherpas (433.6 %), Lepchas (60.2 %), and Bhutias (51.3 %) – Bhasin et al. (1987). On the whole it can be said that in comparison with other Asian populations the frequency of ear lobe appearance is rather high in the Mongolians of the Hulunbuir League.

Nasal profile

Most of the students of the Hulunbuir League show a straight nose (80.47 %). The frequencies in the three groups are as follows: Bargud (83.54 %) > Buriat (78.70 %) > Elute (77.93 %). The differences between Bargud and Elute are statistically significant. In the Mongolian population the frequency of straight noses is in females significantly higher than in males ($p < 0.01$).

The population groups of the Hulunbuir League show lower frequencies of straight noses than Mongolians in general (97.93 %; Al Qionghua et al. 1996), Kazak in Xinjiang (90.71 %), Yugur (96.2 %) – Dai Yujing et al. (1987) – and Huizu (92.3 %) from the Gansu province (Dai Yujing et al. 1986). The frequencies are higher than that observed among Manzu of the Jilin province (68.33 %) or the Daur of the Heilongjiang province (67.38 %; Shi Quande et al. 1983). Compared with populations from Southern China the Hulunbuir League samples show also obviously lower frequencies of straight noses: Hani 99.47 %, Jino 95.60 % (Cheng Wengliang et al. 1982) and Yaozu (98.08 %). It can be said therefore that the Mongolians of the Hulunbuir League are characteristic by obviously lower frequencies of straight noses.

Nostril type

The majority of the Mongolian students of the Hulunbuir League (67.58 %) show a wide nostril, which is interrelated with a comparatively flat nose and a low value of nose depth. It can be deduced that northern people tend to have narrow nostrils, based on their projecting noses and high values of nose depth. The frequencies of wide nostrils in the three groups under study are as follows: Elute (69.48 %) > Bargud (66.59 %) > Buriat (63.89 %). These differences are statistically not significant. Statistically insignificant are also the observed sex differences.

Front teeth type

A great number of the Mongolian students of the Hulunbuir League (85.85 %) show the shovel-shaped type of the front teeth. The frequencies in the three groups under study are as follows: Bargud (89.35 %) > Elute (84.98 %) > Buriat (75.93 %). The Buriat are striking by an obviously lower frequency of the shovel-shaped type of front teeth as compared with the other two groups. These differences are statistically highly significant. Significant are also the observed sex differences ($p < 0.001$).

Chin projection

The frequency of straight chin comes to 74.02 % in the total group of the Mongolian students of the Hulunbuir League. The frequencies in the three groups are as follows: Elute (84.51 %) > Buriat (75.00 %) > Bargud (62.95 %). These differences are statistically significant or even extremely significant. Between the sexes no statistically significant differences were observed. In previous studies it could be demonstrated, however, that the frequency of straight chins is lower in males than in females, e.g. in Uygur (males 33.33 %, females 63.95 %), Mongolians (males 69.18 %, females 81.03 %), Tujia (males 60.43 %, females 91.47 %); Luo Yuncai et al. (1985). Further studies about the sexual differences of this trait are necessary.

Interrelation analysis between the nine morphological traits (ϕ -interrelated analysis)

The interrelated analysis between the nine morphological traits showed that of the 36 pairs of traits only 4 of them show interrelations (Table 3). It can be deduced that the nine head-face traits have little influence on each other. The four pairs of traits with interrelation are the following: 1. ear lobe type – Mongoloid fold, 2. nostril type – forehead hair ledge-point, 3. nostril type – ear lobe type, 4. nostril type – nasal profile. The coefficient of interrelation comes to 20.77 between the nostril type and nasal profile. Of the 307 students with a narrow nostril those with a projecting nose account for 28.01 %, and those with a straight nose account for 71.99 %. However, of the 640 students with a wide nostril, those with a projecting nose account for 15.47 %, and those with a straight nose for 84.33 %. It can be concluded that narrow nostril and projecting nose can be regarded as a pair of related characters as well as wide nostril and straight nose.

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