PRINT: ISSN 0970-9274 ONLINE: 2456-6608 DOI: 10.31901/24566608.1992/03.03.01

JOURNAL OF HUMAN ECOLOGY J. Hum. Ecol., 3(3): 163-166 (1992)

Distribution of Blood Groups Among the Bodhs, Baltis and Tibetans of Ladakh, Jammu and Kashmir, India

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KEY WORDS Blood Groups. Ladakh. Tribals. Mongoloid. Polymorphism.

ABSTRACT The distribution of A_1A_2BO, MNSs, Rhesus and Kell blood group systems among the three population groups—Bodhs, Baltis (Scheduled Tribes) and Tibetans of Ladakh region of Jammu and Kashmir state have been studied. All the three population groups are showing similarities with the population groups with mongoloid affinities of Western Himalayan region in the distribution of these genetic markers.

Ladakh, the largest division of the northernmost Indian state of Jammu and Kashmir, covers an area of 97,872 sq. km. representing 70 per cent of the total area of the state, and is one of the elevated regions of the earth. It is situated between 32°-15' and 36° north latitude and 75°-15' and 80°-15' east longitude and its altitude ranges between 2400 and 5500 metres above sea level. Ladakh province is bounded in the north by China, in the east by China and Tibet, in the north-west by Gilgit and Skardu (under the occupation of Pakistan), in the west by Baramulla and Srinagar, Anantnag and Himachal Pradesh (Valley of Lahaul and Spiti) touch its southern borders. Administratively, Ladakh is divided into two districts, (1) Leh and (2) Kargil.

The early history of Ladakh and its people is shrouded in mystery. Theories put forth about it are based on all sorts of observations—ethnographic, linguistic etc. and postulate migration of different people. The people of Ladakh show largely Mongoloid affinities and belong to the two major religious groups: the Buddhists and the Muslims. The Buddhist population is constituted by Dard Buddhist, Bodh and Tibetan ethnic communities while Muslim population is represented by Balti, Dard, Purigpa (which have been declared Scheduled Tribes in 1989) and Argon communities. The Buddhists are confined to Leh district and Muslims chiefly to Kargil and areas around it. The language of Buddhists is Tibetan (popularly called Bodhi), which belongs to the Tibeto-Chinese language family and slightly differs from the language used in Kargil.

In the present work, an attempt has been made to provide new data on the distribution of various blood group systems, *viz.*, A_1A_2BO, MNSs, Rhesus and Kell, among three population groups, namely Bodhs, Baltis (Scheduled Tribes) and Tibetans of Ladakh division of Jammu and Kashmir, from where only a few studies are available (Kaul et al., 1962; Bhattacharjee, 1966, 1968; Bansal, 1967; Kaur et al., 1977).

The details of population groups studied are given below.

Bodhs

The Bodhs considered in this study are a so-called Scheduled Tribe and form the bulk of the population of Leh *tehsil*. Racially the Bodhs are Mongoloids (Eickstedt, 1926). The language of these people is Tibetan (popularly called Bodhi), which belongs to the Tibeto-Chinese language family. The devotion of Bodhs to their religion - a tantric form of

Buddhism is profound and intense. Buddhism does not recognise any caste or racial differences but some differentiation is made on the basis of social and occupational considerations. The Bodhs include Beda (piper), Bot/Boto (*Rigzang* and *Mangriks*),Changpa (nomads of Changthang), Garra (blacksmith) and Mon (drummer).

Baltis

The Baltis (Scheduled Tribe) are a product of the admixture between Caucasoids (Dards) and Mongoloids (Eickstedt, 1926). Baltistan, the real home of these people, is synonymous with the *tehsil* of Skardu which is now disputed area but the *tehsil* of Kargil also contains a considerable Balti population, which professes the Shia Muslim faith. The Baltis are hardy, industrious people living on the meagre yield of their lands and transport labour. They speak Balti, a language of Tibeto-Chinese family.

Tibetans

Ladakh has received immigrants-Tibetans (Mongoloid) from the direction of the Tibet. These Tibetans either have lived side by side or coalesced and merged into each other resulting in a people with a rich culture *i.e.* Bodhs of Ladakh. Those who retained their identity as the original inhabitants migrated from Tibet to Ladakh are called Tibetans. Their population is confined to Ladakh, Kishtwar and Srinagar. Leh town, the village 'Choglamsar' of Leh *tehsil* and Nubra valley are their main centre of habitation in Ladakh division. They speak Tibetan (Tibeto-Chinese language family).

MATERIAL AND METHODS

A total of 390 fingertip blood samples was collected from three population groups — Bodhs (185) and Tibetans (107) of Leh District and Baltis (99) of Kargil District of Ladakh region. The field work was conducted in the years 1988 and 1989.

Blood samples were analysed for blood group systems—(1) A_1A_2BO (tested with Anti-A_1, -A, and -B); (2) MNSs (tested with Anti -M, -N and -S); (3) Rhesus (tested with Anti -C, -D, -E, -c and -e); and (4) Kell (tested with Anti-K) following the standard serological techniques and manufacturer's instructions enclosed with the different blood grouping reagents. All antisera for testing blood group systems were obtained from Biotest, Germany, except Anti-A_1, and-D which were procured from Associated Laboratories, Bombay. The gene and chromosome frequency calculations have been done after Mourant et al. (1976).

RESULTS AND DISCUSSION

The phenotypes and gene/chromosome frequencies for the four blood group systems among the three population groups of Ladakh are listed in tables 1 and 2, respectively.

A_1A_2BO System

Tibetans and Bodhs of Ladakh are showing higher frequencies of gene *B* (23.08 and 24.13 per cent, respectively) than gene *A* (17.80 and 21.09 per cent, respectively)—a pattern similar to that reported among various population groups of Western Himalayas such as the Lahaulis of Himachal Pradesh (Delhi University, 1958), Muslims and Buddhists of Ladakh (Bansal, 1967); Ladakhis (Bhattacharjee, 1968). On the other hand, Baltis of present study show almost similar frequencies of *A* and *B* genes (23.07 and 23.65 per cent, respectively), a trend similar to that found among Muslims of Ladakh reported by Kaur et al. (1977).

The frequency of gene A_2 found in the present study varies from 0.56 (Tibetans) to 4.72 (Baltis) per cent. This range of A_2 gene frequency is compatible with that observed among other population groups of Western Himalayas (nil to 5.9 per cent) (Bhasin et al., 1992).

Table 1: Distribution of various blood groups among population groups of Ladakh

System/ Phenotype	*Observed Numbers*		
	Bodhs	*Baltis*	*Tibetans*
A_1A_2BO			
O	58	24	39
A_1	44	29	23
A_2	4	5	1
B	57	35	33
A_1B	17	3	11
A_2B	5	2	0
Total	185	98	107
MNSs			
MMS	31	16	17
MMss	49	28	51
MNS	19	22	10
MNss	47	22	20
NNS	4	3	1
NNss	13	7	8
Total	163	98	107
Rhesus			
CCDEE	2	1	1
CCDEe	4	0	6
CCDee	42	23	38
CCddee	0	0	1
CcDEE	4	12	8
CcDEe	12	8	17
CcDee	10	28	10
ccDEE	7	11	13
ccDEe	5	8	9
ccDee	1	1	3
ccddee	1	3	1
Total	88	95	107
Kell			
K+	0	0	0
K-	79	9	107
Total	79	9	107

Table 2: Gene/chromosome frequencies of blood groups among population groups of Ladakh

System/Gene/ Chromosome	*Gene /Chromosome frequencies*		
	Bodhs	*Baltis*	*Tibetans*
A_1A_2BO			
A_1	18.10	18.35	17.24
A_2	2.99	4.72	0.56
B	24.13	23.65	23.08
O	54.78	53.28	59.12
Total	100.00	100.00	100.00
MNSs			
MS	15.93	16.80	12.21
Ms	53.40	50.55	65.35
NS	2.89	6.95	1.85
Ns	27.78	25.70	20.57
Total	100.00	100.00	99.98
Rhesus			
CDE	7.25	7.99	8.03
CDe	62.07	42.53	44.45
Cde	0.00	0.00	6.86
cDE	19.46	25.69	27.48
cDe	3.29	3.19	7.47
cde	7.94	20.60	5.70
Total	100.01	100.00	99.99
Kell			
K	0.00	0.00	0.00
k	100.00	100.00	100.00
Total	100.00	100.00	100.00

MNSs System

MS, *Ms* and *Ns* chromosome frequencies among Bodhs and Baltis are almost similar but *NS* is high among Baltis (6.95 per cent). Among the Tibetans, the frequency of *Ms* is quite high (65.35 per cent), and that of *NS* rather low (1.85 per cent). Among all the three population groups of Ladakh in the present study very low frequencies of gene complexes *MS* (12.21 -16.80 per cent), *NS* (1.85 - 6.95 per cent) and *Ns* (20.57 - 27.78 per cent) have been observed, which is similar to the pattern of distribution observed among other population groups with Mongoloid affinities from

Western Himalayas [Ladakhi (Bhattacharjee, 1968); Tibetans (Bhattacharjee, 1967; Papiha et al., 1989); Kanet (Papiha et al., 1984)].

Rhesus System

It has been observed that the frequency of *CDe* is high among Bodhs (62.07 per cent), whereas among both Baltis and Tibetans, it is comparatively low - 42.53 and 44.45 per cent, respectively. The chromosome *cde* frequency is quite low in Bodhs and Tibetans (7.94 and 5.70 per cent, respectively) as compared to the Baltis (20.60 per cent). The frequency of *cDE* is observed rather high among all of them Bodhs (19.46 per cent), Baltis (25.69 per cent) and Tibetans (27.48 per cent) whereas the frequency of chromosome *cDe* is low (range 3.19 to 7.47 per cent). The frequency of chromosome *CDE* is over 7 per cent in each of them.

Relatively high incidence of *CDe* and low incidence of *cde* have been found among the present population of groups of Ladakh, particularly among Bodhs and Tibetans. The chromosomes *cDE* and *CDE* are also quite frequent among them. This shows that the distribution of the Rhesus system in the present material is similar to that observed among other population groups with Mongoloid affinities from Himalayan region [Ladakhis (Bhattacharjee, 1968); Bodhs (Bhasin et al., 1983; Chowdhury, 1987); Tibetans (Papiha et al., 1989)].

Kell System

It is apparent that gene *K* is completely absent in the present sample from Ladakh - a feature characteristic of most populations with Mongoloid affinities, among whom this gene is almost absent or present with a low frequency.

ACKNOWLEDGEMENTS

The financial assistance provided by Ministry of Environment and Forests, Government of India for the project entitled, "Environment, Human Settlement and Human Activities in Jammu and Kashmir with Special Reference to Ladakh" under MAB (Man and Biosphere Programme, UNESCO, Ref. No. 14/122/84 RE-MAB) Dr. M.K. Bhasin, Principal Investigator, Department of Anthropology, University of Delhi, Delhi 110 007, is gratefully acknowledged.

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