

## Distribution of Blood Groups among Jad Bhotia of Uttarakhand: A Transhumant Community of Tibetan Origin

Shafali Pawar\*, Harashwaradhana\*, Koel Mukherjee\*, Venu Gopal P.N.\*, Bimal Rawat\*

### Abstract

The distributions of ABO blood groups & Rh (D) factor have been reported among the Bhotia (Jad) of Uttarkashi district, Uttarakhand. The frequencies of blood groups among Bhotia (Jad) were as follows B(41.6)%, O(26.3)%, A(20.5)%, AB(11.6)%. The gene frequencies were found to be  $p = 0.1756$ ,  $q = 0.3152$ ,  $r = 0.50925$  and the Rh (D) negative blood groups was recorded 3.68% among this community. Further the results were compared with the other tribal populations of North India for the incidences of ABO & Rh (D) blood groups. However, these frequencies of blood groups had shown the affinity with North India tribal populations except the *Hindu* of Agra & Oudh and *Hindu Soldier* of U.P.

**Keywords:** Not Provided

### Introduction

The studies of blood group antigens can be used to characterize a population which is one aspect of their use as genetic markers. Among the different blood group systems, the ABO system is the most widely studied for obvious reasons (Salmon *et al.* 1984). Human populations share the same blood group systems but they differ in frequency of specific types. The frequencies of ABO and Rh blood groups vary from one population to other and time to time in the same region. Knowledge and distribution of ABO and Rh blood group is essential for effective management of blood bank services at regional level as well as national level.

Therefore, it is imperative to have information on

the distribution of the blood group in their population (Garratty *et al.* 2000, Mollison *et al.* 1994). On compilation of various studies worldwide the ABO gene frequency are as, 0.63 for gene  $p$  and 0.162 for gene  $q$  (Salmon *et al.* 1984). While on the basis of geographical differences it is interesting to reveal that gene frequency for gene  $r$  is 0.90 is higher among Central and South American Indians. But the frequency of gene  $q$  is almost totally absent in these populations. Similarly very low gene frequency of gene  $q$  in Australian aborigines and also in the population of Egypt and West Africa were reported. On the other hand it was observed that relatively high frequency of gene  $q$  in among the Central Asia and North India populations (Salmon *et al.* 1984, Tills *et al.* 1983).

In India, the distribution of gene frequency ( $q = 0.233$ ) is high as compared to gene  $p$  ( $p = 0.186$ ), whereas the frequency of gene  $r$  ( $r = 0.581$ ). Among the ethnic groups *viz.*, castes, scheduled castes, scheduled tribes and communities of India, the value of gene frequency  $q$  is high as compared to gene  $p$ . However the differences between gene  $p$  and gene  $q$  frequencies are less among scheduled tribes ( $p = 0.213$  and  $q = 0.218$ ) as compared to castes ( $p = 0.179$  and  $q = 0.248$ ) and scheduled castes ( $p = 0.181$  and  $q = 0.246$ ), whereas the frequency of gene  $r$  is almost similar among castes (0.572), scheduled castes (0.573) and scheduled tribes (0.569). In India, gene frequencies of  $q$  and  $p$  increases and frequencies of gene  $r$  decreases from south to north. This is also observed among some scheduled tribes of South India, Central India, West India and a few caste and community ethnic groups from West India (Bhasin *et al.* 2001, Bhasin and Walter *et al.* 1994).

A very few studies have been reported so far from the area under study and there is paucity of data on

**Author's Affiliation:** \*Anthropological Survey of India, North West Regional Centre, Dehradun.

**Corresponding Author:** Harashwaradhana, Superintending Anthropologist (Physical) & Head of Office, Anthropological Survey of India Govt. of India North West Regional Centre, Dehradun-248195 (UTTARAKHAND).  
E-mail: waradhana@gmail.com

the distribution pattern and frequency of ABO and Rh (D) blood group among the Bhotia (Jad) of Uttarkashi, Uttarakhand. Thus, the present study aims to provide information on the distribution pattern of the phenotypes and the gene frequencies of these genetic variants.

## Material and Methods

### Area and People of Study

The present study was conducted on the Bhotia (Jad) of Dunda village of Uttarkashi district, Uttarakhand. The place is located in the Himalayan ranges of Uttarakhand. According to the Constitution (Scheduled Tribes) (Uttar Pradesh) Order, 1967 and as inserted by Act 29 of 2000, they have been declared as Scheduled Tribe. The Bhotia's are one of the major groups of the Central Himalayan region. They are a transhumant community of semi-mongoloid people of Tibetan origin (Fuchs, 1982). They show close racial and cultural affinity to the Tibetans and for this similarity the Bhotia region is called as Bod or Bhot which means "Follower of Buddhism" (Srivastava, 1952-53).

### Ethical Consideration

The data were collected after obtaining the informed consent of the people only. The protocol was appended, while collection of the data and blood samples, which has been approved by the Ethical committee of Anthropological Survey of India. Confidentiality of the data was maintained. It is to be mentioned that the blood samples were collected under project entitled "Community Genetics

and Health: Bio-cultural Adaptations."

### Collection and Procedure of Blood Sample

The blood samples were collected with the help of trained para - medical personnel by intravenous prick with standard sterile needle in K<sub>2</sub> EDTA Vacutainer during the month of February 2015.

These blood samples were typed for ABO and Rh (D) by following the standard serological methods given by Race and Sanger (1962) with all necessary precautions.

### Statistical Methods Used

The gene frequencies for ABO blood groups were estimated by maximum likelihood method and frequencies for Rh (D) blood group were calculated according the Hardy – Weinberg principle (Russell, 1998). Chi-square test was applied for statistical analysis. The 5.0% level of significance was accepted for the same.

## Result and Discussion

The distribution of ABO & Rh (D) blood group among the Bhotia (Jad) are given in Table 1. It is evident that among all blood groups, B blood group showed highest frequencies (41.6%) with least occurrence for blood group AB (11.6%). The present population seems to be in Hardy Weinberg equilibrium for the ABO blood group system as the differences of the observed & expected frequencies are statistically non-significant among them ( $p < 0.05$ ).

**Table 1:** Prevalence of ABO blood groups in Bhotia (Jad)

Blood Group	Observed Frequency		Expected Frequency	Gene Frequency
	No.	%		
A	39	20.5	39.824	p=0.1756 q=0.3152 r=0.50925
B	79	41.6	79.86	
AB	22	11.6	21.033	
O	50	26.3	49.267	
<b>TOTAL</b>	190	100	189.984	

Goodness –of- fit ( $X^2$ ) = 0.08536 df= 1, non-significant ( $P < 0.05$ ).

**Table 2:** Prevalence of Rh (D) blood groups in Bhotia (Jad)

Phenotypes	No.	%	Gene Frequency
RhD(+)	183	96.32	d =0.1918 D =0.8082
RhD(-)	7	3.68	
Total	190	100	

It was recorded that the frequency of Rh (D) negative blood group is only 3.68% among the Bhotia (Jadh) under study whereas incidences of Rh (D)

positive blood group is recorded as 96.32% among them in Table 2. The gene frequencies of Rh (D) negative blood group & Rh (D) positive blood group

are observed as 0.918 & 0.8082 respectively, which showed similar pattern when compared with other tribal populations of North India for the Rh (D) blood groups.

The present results are also compared with the available data on the various tribal population of North India for the distribution of ABO blood group (Table 3). It is observed that in the present study population Bhotia (Jad) haveshown the incidences as B>O>A>AB which is true for all the tribal population of North India under comparison except firstly, in *Tharu Danguria* had shown the incidences

of Blood group A is higher than Blood group O which show the pattern as B>A>O>AB. But secondly, in the *Khasa Rajput* population the frequency of both blood group B & A are equal and also higher than O blood group which show the pattern as B=A>O>AB. However, these differences are statistically non-significant, but also show the significant differences with the *Hindu of Agra & Oudh* and *Hindu Soldier of U.P.* This suggests that the present study population *Bhotia (Jad)* of Uttarkhasi has some affinity with the North Indian tribal population except the *Hindu of Agra & Oudh* and *Hindu Soldier of U.P.*

**Table 3:** Comparison of the Bhotia (Jad) with other populations of North India for ABO Blood Group

Population	Place	Frequency of Blood Groups					(X <sup>2</sup> ) Value	Significance	Reference
		NO.	A	B	AB	O			
Ahir	Uttar Pradesh	270	65	99	29	77	0.1637	NS(P<0.05)	Shivaraman et al., 1971
ChamarJaiswar	Jaunpur	314	65	121	31	97	0.1487	NS(P<0.05)	Tandon et al., 1978
ChamarKureel	Lucknow	320	72	132	22	94	2.8834	NS(P<0.05)	Tandon et al., 1978
Muslim Pathan	Malihab-ad	150	33	67	13	37	1.1196	NS(P<0.05)	Srivastava, 1975
BaniaAgarwal	Uttar Pradesh	244	54	91	18	81	0.3819	NS(P<0.05)	Shivaraman et al., 1971
Bania Gupta	Uttar Pradesh	310	68	115	25	10	0.1144	NS(P<0.05)	Shivaraman et al., 1971
Brahmin	Uttar Pradesh	605	138	227	54	18	0.1953	NS(P<0.05)	Srivastava, 1978
Brahmin Punjabi	Uttar Pradesh	360	78	144	36	10	0.0198	NS(P<0.05)	Shivaraman et al., 1971
Chauhan	Uttar Pradesh	216	55	76	19	66	0.2309	NS(P<0.05)	Negi & Das, 1963
Garhwali	Garhwal	103	18	52	10	23	0.2717	NS(P<0.05)	Hirszfelfd, 1919
Gujjar	Uttar Pradesh	300	63	110	35	92	1.5045	NS(P<0.05)	Shivaraman et al., 1971
Hindu	Agra & Oudh	2356	577	877	190	71	7.5353	S(P>0.05)	Malone & Lahiri, 1928-29
Hindu Soldier	Uttar Pradesh	838	226	289	62	26	4.5933	S(P>0.05)	House & Mahalanobis, 1939-45
Jain	Uttar Pradesh	165	39	57	15	54	0.0063	NS(P<0.05)	Shivaraman et al., 1971
Jaiswal	Uttar Pradesh	430	88	166	46	13	0.4771	NS(P<0.05)	Shivaraman et al., 1971
Jat	Uttar Pradesh	322	83	115	28	96	0.6443	NS(P<0.05)	Shivaraman et al., 1971
Jaunpuri	Jaunpur	278	61	99	22	96	0.0174	NS(P<0.05)	Negi, 1977
Kayastha	Lucknow	514	104	189	41	18	0.0244	NS(P<0.05)	Srivastava, 1978
Khatri	Lucknow	345	58	143	31	11	0.4915	NS(P<0.05)	Srivastava, 1978
Khatri	Uttar Pradesh	125	30	42	13	40	0.1774	NS(P<0.05)	Majumdar, 1943
Kshatriya	Uttar Pradesh	416	112	136	40	12	0.0235	NS(P<0.05)	Majumdar, 1947
Muslim Soldier	Uttar Pradesh	109	23	37	13	36	1.2159	NS(P<0.05)	House & Mahalanobis, 1939-45
Muslim Sunni	Uttar Pradesh	220	47	81	20	72	0.0438	NS(P<0.05)	Majumdar, 1943
Sayyad	Lucknow	150	29	59	11	51	0.0602	NS(P<0.05)	Srivastava, 1975
Shaikh	Lucknow	377	99	127	41	11	0.0774	NS(P<0.05)	Srivastava, 1975
Mainpuri	Mainpuri	524	128	182	55	15	0.2132	NS(P<0.05)	Bhatia et al., 1955
Rajput	Kumaon	360	83	144	32	10	0.8626	NS(P<0.05)	Shivaraman et al., 1971
Rajput	Farrukhabad	769	173	286	72	23	0.1167	NS(P<0.05)	Negi & Das, 1963
Rajput Khasiya	Kumaon,	124	30	42	16	36	0.6982	NS(P<0.05)	Tiwari, 1952
Rastogi	Lucknow	150	29	70	10	41	1.5939	NS(P<0.05)	Rastogi, 1972
Rathor	Uttar Pradesh	211	33	86	17	75	0.3906	NS(P<0.05)	Negi & Das, 1963
Thakur	Kumaon	285	66	110	29	80	0.0372	NS(P<0.05)	Shivaraman et al., 1971
Vaishya	Lucknow	334	57	140	20	11	0.6179	NS(P<0.05)	Srivastava, 1978

Population	Place	Frequency of blood groups	( $\chi^2$ ) value	Significance	Reference				
		NO.	Rh+	Rh-					
Bhatu	Uttar Pradesh	113	28	45	9	31	0.9167	NS(P<0.05)	Majumdar, 1949
Chamar	Uttar Pradesh	151	28	59	9	55	0.2567	NS(P<0.05)	Majumdar&Kishen, 1947
Chamar Dom	Lucknow	100	24	36	14	26	0.4392	NS(P<0.05)	Deb&Shukla, 1977
Karval	Gorakhpur	180	41	71	9	59	2.9011	NS(P<0.05)	Majumdar, 1942
Pasi	Uttar Pradesh	155	35	63	17	40	0.0246	NS(P<0.05)	Majumdar, 1941-42
Bhoksa	Uttar Pradesh	183	34	90	14	45	1.6264	NS(P<0.05)	Aggarwal,1962
		136	28	52	12	44	0.0045	NS(P<0.05)	Majumdar&kishen, 1947
Khasa Artisan	Uttar Pradesh	108	26	44	11	27	0.27084	NS(P<0.05)	Majumdar &kishen, 1947
Rajput	Jaunsar Bawar	100	22	37	14	27	0.7552	NS(P<0.05)	Banerjee & Banerjee, 1967
Rana Tharu	Nainital	122	19	59	17	27	0.63701	NS(P<0.05)	Kaur et al., 197
Rana Tharu	Nainital	255	56	108	29	62	0.06521	NS(P<0.05)	Kumar, 1968
Tharu Danguria	BahraichGonda	185	38	95	19	35	2.0917	NS(P<0.05)	Srivastava, 1965
TharuPanchchmah	Gorakhpur	69	13	34	6	16	0.4522	NS(P<0.05)	Srivastava, 1965
Bhotia (Jadh)	Uttarkashi	190	39	79	22	50	0.08536	NS(P<0.05)	Present Study, 2015

**Table 4:** Comparison of the Bhotia (Jad) with other populations of North India for Rh (D) Blood Group

Population	Place	Frequency of blood groups	( $\chi^2$ ) value	Significance	Reference		
		NO.	Rh+	Rh-			
Khasa Rajput	Jaunsar	147	107	40	0.0348	NS(P<0.05)	Srivastava, 1984
Muslim Pathan	Uttar Pradesh	150	141	9	0.0000	NS(P<0.05)	Srivastava, 1975
ChamarJaiswar	Uttar Pradesh	314	285	29	0.0392	NS(P<0.05)	Tandon et al, 1978
ChamarKureel	Uttar Pradesh	320	294	26	0.0434	NS(P<0.05)	Tandon et al, 1978
Tharu Danguria	BahraichGonda	185	179	6	0.2000	NS(P<0.05)	Srivastava, 1965
TharuPanchchmah	Gorakhpur	69	69	0	0.0000	NS(P<0.05)	Srivastava, 1965
Bhotia (Jadh)	Uttarkashi	190	183	7	0.1305	NS(P<0.05)	Present Study, 2015

Likewise, the frequency of Rh (D) blood group was also compared with available data of North India tribal population. The present sample show the same trend as the incidence of Rh (D) negative blood group is lowest (3.68%) compared to other populations. These differences are also statistically non-significant when compared with present study population (Table 4). It is interesting to record that incidences of Rh (D) blood group are similar among the *TharuDanguria* and *Bhotia (Jad)* under the present study.

### Acknowledgement

The Authors are grateful to the Director, Anthropological Survey of India, Kolkata, for providing the opportunity and financial support to work on the people under study. Authors are also thankful to those who donated blood samples for this study.

### Reference

1. Bhasin, MK and Walter H (2001). Genetics of Castes and Tribes of India. Kamla-Raj Enterprises, Delhi.
2. Bhasin, M.K., Walter, H. and Danker-Hopfe, H.: People of India. An Investigation of Biological Variability in Ecological, Ethno-Economic and Linguistic Group. Kamla-Raj Enterprises, Delhi (1994).
3. Fuchs, S. 1982. The aboriginals tribes of India, Macmillan India Ltd. New Delhi.
4. Garratty G, Dzik W, Issitt P D, Lublin D M, Reid M E, Zelinski T. Terminology for blood group antigens and genes—historical origins and guideline in the new millennium. *Transfusion*. 2000; 40: 477–89.
5. Mollison P L. The genetic basis of the Rh blood group system. *Transfusion*. 1994; 34: 539–41.
6. Race, B.R. and R. Sanger. 1962. Blood Groups in Man. Oxford: Blackwell Scientific Publication.
7. Russell, P.J. Population Genetics. In: Genetics. USA : The Benjamin/Cummings Publishing Company, Inc.

- 1988; pp. 714-771. 191203.
8. Salmon C, Cartron J, Rouger P. The human blood groups. New York: Masson Publishing.
  9. USA Inc, 1984: 441-51.
  10. Srivastava, R. P., 195253. Rang Bangin the changing Bhotia Life, The eastern Anthropologist. 6(34):
  11. Tills D, Kopec AC, Tills RE. The distribution of the human blood groups and other.
  12. Polymorphisms. Supplement 1. Oxford: Oxford University Press, 1983; 1-20.



### **Red Flower Publication Pvt. Ltd.**

*Presents its Book Publications for sale*

- |  |                     |
|--|---------------------|
| <b>1. Breast Cancer: Biology, Prevention and Treatment</b> | <b>Rs.395/\$100</b> |
| <b>2. Child Intelligence</b>                               | <b>Rs.150/\$50</b>  |
| <b>3. Pediatric Companion</b>                              | <b>Rs.250/\$50</b>  |

#### **Order from**

Red Flower Publication Pvt. Ltd.

48/41-42, DSIDC, Pocket-II, Mayur Vihar, Phase-I

Delhi - 110 091 (India)

Tel: 91-11-22754205, 45796900, Fax: 91-11-22754205

E-mail: redflowerpppl@gmail.com, redflowerpppl@vsnl.net

Website: [www.rfpppl.co.in](http://www.rfpppl.co.in)