

Distribution of ABO and Rh(D) blood types among the Santal of Puruliya, West Bengal, India

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ABSTRACT

The study was aimed to determine phenotypic and allelic frequencies of ABO & Rh (D) blood types; and also to ascertain the pattern of variation of ABO blood types across the sex and generation among the Santals of Purulia District, West Bengal, India.

After proper ethical approval blood samples were collected from randomly selected 260 participants (130 of each sex). The participants were divided into three generation, ≤ 20 years age group as generation-III, 21-44 years age group as generation-II and ≥ 45 years age groups as generation-I. ABO and Rh(D) blood types were determined by the antigen antibody agglutination test of direct slide method. For statistical consideration chi square test was used at 0.05 significant level ($p < 0.05$).

Out of 260 individuals 25% was 'A' blood type, 36.15% 'B' blood type, 25.38% 'O' blood type and 13.47% 'AB' blood type. The allele frequencies found were 0.21, 0.29, and 0.50 for A, B and O, respectively. In that population phenotypical and allelic frequency changed across the generations, however, this change is statistically non significant at $p < 0.05$ level.

In respect of Rh(D) blood type no such variation was observed, as none of them were found to be Rh(D) negative.

Key words: ABO and Rh(D) blood types, phenotypic and allele frequencies, Santals

INTRODUCTION

The discovery of ABO blood system by Karl Landsteiner in 1900 and Rhesus blood type by Landsteiner and Wiener in 1937 are two important landmarks not only in blood transfusion and treatment of haemolytic disease (in medicine) but also to use as important variables to understand ethnic and geographic differentiation because of its non-adaptive nature (in anthropology).

It is well established that in human population ABO and Rh (D) blood group distribution widely varies among different geographical regions and ethnic groups (Jaff, 2010). The worldwide distribution of O, A, B and AB blood types are 47%, 41%, 9% 3% for Caucasians in the United States, 46%, 27%, 20% and 7% for African American, and 46%, 42%, 9% and 3% for Western Europeans (Adeyemo and Soboyejo, 2006). The most widely studied ABO blood types show in general, the allele frequencies of the World to be ABO*O = 0.623; ABO*A = 0.215; ABO*B = 0.162 (McArthur and Penrose, 1949).

In India the incidence ABO*B is higher (0.233) compared to allele ABO*A (0.186), were as frequency of allele ABO*O is 0.581. Among the caste/ ethnic groups of the India, the difference between A and B frequencies are less among the Scheduled Tribes (A=0.213 and B=0.218) compared to different Scheduled Castes (A=0.181 and B=0.246); the frequency of O is almost similar among Scheduled Tribes (0.572) and different Scheduled Castes (0.573) (Bhasin and Walter, 2001; Bhasin et al, 2006).

The worldwide distribution of Rh(D) blood type is unique; in the United States, the frequency of Rh negative is about 15%; almost 20% among European Americans and approximately 5-10% among African Americans. On contrary, less than 1% (sometimes zero) of Asian (mainly Mongoloid) and Native Americans are Rh negative (Mack, 2001). In India, the incidence of Rh(D) positive blood group varies from 94 to 98 % compared to 2 to 6% Rh(D) negative (Behra and Raj, 2013).

Keeping in mind, the worldwide (and Indian context) distribution the present study was aimed to determine phenotypic and allelic frequencies of ABO & Rh (D) blood types; and also to ascertain the pattern of variation of ABO blood types across the sex and generation among the Santals of Puruliya district, West Bengal, India.

MATERIAL AND METHODS

The present study was conducted among Santals of Susunia, Tilabad, Kenthol, Boro-Shaluni and Kherak villages of Santuri block of Purulia district during December 2016.

After proper ethical approval (from the Anthropological Survey of India) and Written Informed Consent, 260 blood samples were collected from randomly selected participants. Out of 260 individuals 130 were male and 130 were female.). The participants were divided into three generations, ≤ 20 years' age group as generation-III, 21-44 years' age group as generation-II and ≥ 45 years' age groups as generation-I.

ABO and Rh-D blood groups were determined by the antigen antibody agglutination test of direct slide method, all the materials of blood groups determination like anti-A, B & D, slide,

cotton, alcohol, needle were provided by AnSI. The result was calculated as the frequency of each blood type expressed as percentage. Chi-square test was used to test the heterogeneity of population on the basis of ABO frequency ($p < 0.05$).

RESULTS AND DISCUSSION

It reveals from the Table-1 that frequency of B blood type is higher (36.15%) among the Santals followed by O blood type (25.38%), A blood type (25%) and AB blood type (13.46%). The ordinal sequence of the ABO blood type distribution among the Santals population of the present study is B>O>A>AB.

Among 130 male Individuals 'A' blood type was found among 24.62% compared to 25.38% for their female counterpart. Frequency of blood type 'B' among male and female was 33.07% and 39.24%, respectively. The 'O' blood type was present in 27.69% males and in 23.07% females. Lastly 'AB' blood type was found 14.62% in males and 12.3% in females. The ordinal sequence of the ABO blood group distribution among the male Santal population of the present study is B>O>A>AB while among the female it is B>A>O>AB. However, the differences are not statistically significant at 0.05 levels.

Table – 1: Percentage wise distributions of ABO Blood Type Phenotypes among the Santals of Purulia

ABO Blood Type	Male (n=130)		Female (n=130)		Total (n=260)	Total (%)
	Number of Individual	Percentage (%)	Number of Individual	Percentage (%)		
A	32	24.62	33	25.39	65	25.00
B	43	33.07	51	39.24	94	36.15
O	36	27.69	30	23.07	66	25.38
AB	19	14.62	16	12.30	35	13.47
Total	130	100	130	100	260	100
χ^2 Value = 1.53 ($p > 0.05$)						

Fig-1: ABO Blood Type Phenotypes among the Santals of Purulia

The percentage wise ABO blood group distribution of total population across the generation was presented in Table 2. Generation-I comprised of 60 Individuals of both sexes; out of which 16.67% were of A type, 35% B type, 30% O type and rest 18.33% of AB blood type. The ordinal sequence of the ABO blood group in Generation-I is B>O>AB>A.

In generation-II (comprised of 120 Individuals of both sexes) 30% possess A type, 35% B type, 23.33% O type and 11.67% AB blood type. In generation-II highest percentage of blood type is B, followed by A, O and lastly AB (B>A>O>AB).

Table-2: Generation wise ABO Blood Type Phenotypes among the Santals of Purulia

ABO Blood Type	Total Population					
	Generation-I(45+)		Generation-II(21-44)		Generation-III(<=20)	
	Number	Percentage (%)	Number	Percentage (%)	Number	Percentage (%)
A	10	16.67	36	30.00	19	23.75
B	21	35.00	42	35.00	31	38.75
O	18	30.00	28	23.33	20	25.00
AB	11	18.33	14	11.67	10	12.50
Total	60	100	120	100	80	100
χ^2 Value = 7.66 (p>0.05)						

In generation-III out of 80 Individuals 23.75% were A type, 38.75% B type, 25% O type and 12.50% were AB type. In this generation highest percentage of blood group is B, and lowest AB (B>O>A>B).

Phenotypic value of ABO blood group on Santal population is changing across the generation but the differences are not statistically significant at (p<0.05) level.

Fig-2: Generation wise ABO Blood type Phenotypes among the Santals of Purulia

Regarding allele frequencies of ABO blood group- 'O' allele (r) frequency is predominant (0.5), followed by 'B' allele (q) (0.29) and 'A' allele (p) (0.21). Ordinal sequence of allele frequency of ABO blood group is $r > q > p$.

Table-3 explores the homogeneity of the ABO blood group phenotypes among the Santal of Purulia. As per χ^2 value the differences are statistically non-significant; therefore, the population maintained homogeneity and also conform the Hardy Weinberg equilibrium.

Table-3: Test of homogeneity of the ABO blood group phenotypes

ABO Blood Groups	Observed Value	Expected Value
A	65	66
B	94	97
O	66	65
AB	35	32
Total	260	260
χ^2 Value = 0.40457 (p>0.05)		

Table 4 exhibits percentage on phenotype of Rh(D) blood group system among the present population. Regarding Rh(D) blood type no such variation was observed, as none of them found to be Rh(D) negative.

Table-4: Percentage wise distribution of Rh(D) Blood Group phenotype among the Santals of Purulia

Rh(D) Blood Types	Male (n=130)	(%)	Female (n=130)	(%)	Total (n=260)	%
Rh(D) Positive(+ve)	130	100	130	100	260	100
Rh(D) Negative(-ve)	0	0	0	0	0	0
Total	130	0	130	0	260	100

Table-5: Comparison with Santals of different geographical location

Areas in Santals	Blood Types				Total	χ^2 value	Reference
	A	B	O	AB			
Present Santal	65	94	66	35	260	Present Study 2016
Medinipore	94	122	87	22	325	7.68	Giri et al,1962
Hoogly	22	52	27	14	115	3.084	Mukherjee et al 1977
Bankura	37	51	49	18	155	4.36	Unpublished data of ANSI
Jharkhand	54	64	9	16	193	3.77	Pandey and Ranjhana 2012
Bihar	96	141	68	45	350	7.76	Pandey and Mishra 2012
Orrisa	68	66	65	51	250	1.963	Mohanty and Das 2010
$(p>0.05)$							

Table-5 is basically a comparison of present data with six other studies among the Santal population of different geographical locations. There is no significant difference found in respect of ABO blood types among Santal population of different geographical areas.

Table-6 is comparison with other tribal communities of West Bengal. There is no significant difference with Munda, Ho, and Bhumij ($p>0.05$); But the ABO blood type of Oraon, Lepcha and Toto exhibits highly significant differences when compared with Santals of present study ($p<0.01$). It is also interesting to note that Santal, Bhumij, Munda and Ho belongs to the Austro-Asiatic language family, while the Oraon belongs to the Dravidian language group, Lepcha is Tibeto-Chinese language group, and Toto is a Tibeto-Burman linguistic group. Therefore, present study also exhibits that ABO blood type significantly differs in respect of different language groups.

Table-6: Comparison with other tribal communities of West Bengal

Name of tribes	Blood types				Total	χ^2 Value
	A	B	O	AB		
Present Santal	65	94	66	35	260
Munda	46	30	34	15	125	2.56
Ho	43	50	28	27	148	3.58
Oraon	48	38	45	00	131	25.504**
Bhumij	29	37	16	16	98	3.58
Lepcha	94	41	99	16	250	39.594**
Toto	33	61	03	18	115	28.669**

** $p<0.01$

CONCLUSION:

The study reveals that the Santals of Purulia are characterized by the following facts:

In the present study highest percentage of ABO blood type was 'B' (36.15%), and the lowest percentage was 'AB' blood group (13.46%). However, in respect of Rh(D) blood type no such variation was observed, as none of them found to be Rh(D) negative.

In ABO blood type there is no statistical differences across the sex and generation in Santals; and therefore it maintained the homogeneity. There is no significant difference found in Santal population of different geographical areas with present study. However, there is statistical significant difference in different language family group regarding ABO blood types.

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