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Allelic frequency of ABO and Rh-D blood groups among the mbororo ethnic group of momo division in the north west region of Cameroon

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Abstract

A study was carried out to determine blood groups of a random population sample from the Mbororo ethnic group in Momo Division in the North West Region of Cameroon. The ABO and RH-D blood groups were collected retrospectively for five years (2009 – 2013) from the records of the Presbyterian General Hospital, Acha Tugi. Out of total of 2000 Mbororos estimated to inhabit Momo Division, the records for 263 individuals were examined for ABO and Rh blood groups. Blood A, B, AB and O were respectively 72 (27.38%), 31 (11.79%), 14 (5.32%) and 146 (55.5%) in the population. This distribution differed significantly ($P<0.05$) from those expected under the Hardy – Weinberg law. The percentages of the individuals belonging to the different ABO blood groups also varied significantly ($P<0.05$) during the period of study. On the other hand, 252 (95.82%) individuals were Rh^{+ve} (DD + Dd) while 11 (4.18%) individuals were Rh^{-ve} (dd). This study revealed that the distribution and proportion of individuals belonging to the Rh blood groups did not differ significantly ($P>0.05$) from those expected under the Hardy–Weinberg law. From these studies it is concluded that phenotypically, O and Rh^{+ve} blood groups were dominant in the Mbororo ethnic group of Momo Division in Cameroon. Also, gene frequencies in this population were in the series: O > A > B > AB.

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Introduction

It is important to study the ABO and Rh blood groups because they have been shown to be associated with diseases such as malaria, duodenal ulcer, diabetes mellitus, urinary tract infection, Rh and ABO incompatibility of the newborn, all types of glaucomas and HIV- AIDS (Akhtar *et al.,* 2003; Qureshi and Bhatti, 2003; Nkuo-Akenji *et al.,* 2004; Ziegler *et al*., 2004; Khan *et al.,* 2009; Anees and Jawad, 2011). Information on ABO and Rh blood groups would also be useful to geneticists and clinicians when planning to address future health challenges relating to blood transfusion and marriage counseling (Iyiola *et al.,* 2012; Ndoula *et al.,* 2014).

Momo Division in the North-West Region of Cameroon is made up of a two ethnic groups that include the Widikums and the Mbororos. The Widikum ethnic group is large and constitutes more than 90% of the population in this division. They show a lot of similarities in culture, language, religion and folklore tradition. The Mbororos, usually considered a marginalized group, form a minority and are found on hill tops in the division. They constitute less than 2% of the population of Momo Division. Mbororos rear cattle, are Muslims, polygamous, involved in consanguineous marriages (marry even first cousins) and are underscholarized. Their men do not marry Widikum women and only a few Widikum men have married Mbororo girls (MINADER, 2012). Therefore the Mbororo ethnic group in Momo Division is an isolated population and is therefore expected to carry some genetic signature of human origin and is expected to reveal unusual frequencies of some alleles, show rare alleles, and also provide opportunities to study the association between genetic structure, health, and disease status.

So far, there is no precise and up-to-date data on ABO and Rh-D blood groups available for the Mbororo ethnic group in Cameroon and in Momo Division in particular. The Mbororos of Momo Division are yet to be investigated for population genetics. Even though few reports have been documented on the distribution of ABO and Rh blood systems in Cameroon, none has featured on the North West Region and the Mbororo ethnic group in particular. This study therefore provides pioneer information on the frequency of phenotypic and gene frequency distribution of the ABO and Rh-D blood groups among the Mbororo ethnic group in Momo Division of the North West Region in Cameroon.

Materials and methods

The study area

The Mbororos investigated in this study occupy hill tops in the villages that make up the Mbengwi, Njikwa and the Ngie Sub-divisions of Momo Division in the North West Region of Cameroon. Momo division is geographically located between latitude 5°.45 to 6°.15 North and 9°. 40 to 10°.100 West on the map of the world. The landscape of Momo division is characterized by dissected Western Cameroon High land which are endowed with patches that are gentle sloping, undulating, rolling land and ragged land mountainous. The altitude ranges from 500m in areas like Widikum and Ajoh to 2049m above sea level in Anong and parts of Andek and Ngie. The division is situated within the subtropical climatic zone with a climate that is transitional and ranges from warm humid forest type to cold temperatures that are of the savannah type. This gives the division average temperatures ranging from 21.70° C to 31.15° C. Momo division is constituted of a forest belt situated in the middle zone between the savannah and the dense equatorial forest. The division is also characterized by abundance of food and cash crops such as coffee, oil palms, cassava, sweet potatoes, beans, groundnuts, pears, plums, mangoes, guavas, oranges, paw paws and several vegetables. The about 2000 Mbororos found in this division inhabit hill tops and are mainly cattle rearers. They are known to intermarry only amongst themselves with marriages between first and second cousins, hence consanguineous (MINADER, 2012).

The Presbyterian General Hospital Acha Tugi is the oldest and biggest hospital (created in 1964). This hospital serves the Mbengwi, Njikwa and the Ngie Sub-divisions of Momo Division and hence the

majority of Mbororos in the division.

The study population

The study population consisted of Mbororo individuals who had consulted for blood related illnesses or donated blood at the Presbyterian General Hospital Acha Tugi from 2009 to 2013.

Collection of data on blood groups

Authorization to examine the medical records was obtained from the Medical Doctor in charge, the Chief laboratory Officer and Administrator of the Presbyterian General Hospital Acha Tugi. Laboratory records for blood group typing of individuals ranging from infants to adults spanning a 5 year period (2009–2013) in this Hospital were retrospectively examined and data collected.

Statistical methods

Phenotypic frequencies were determined as percentages of observed numbers. Allele frequencies were calculated under the assumption of Hardy–Weinberg equilibrium and are here expressed as percentages. Chi-square test was used to compare observed allelic and phenotypic frequency distributions of the ABO and Rh blood groups to that expected under the Hardy–Weinberg law.

Results and discussion

We studied the gene frequencies for the ABO and Rh-D alleles in a Mbororo population in Momo Division in the North West Region of Cameroon, consisting of different age groups over a period of 5 years (2009–2013). Hospital records for 263 individuals out a population of about 2000 Mbororos in the study area were examined for ABO and Rh blood groups, respectively.

Table 1. Distribution of phenotypic frequencies of various ABO blood group system from 2009 –2013 in the Mbororo population of Momo Division North West Cameroon.

Study Years	Blood Group								Total
	A		B		AB		O		
	N	%	N	%	N	%	N	%	N
2009	12	16.67	0	0	4	28.57	58	39.73	74
2010	13	18.06	11	35.48	2	14.29	16	10.96	42
2011	19	26.39	9	29.03	1	7.14	23	15.75	52
2012	18	25.00	5	16.13	3	21.43	14	9.59	40
2013	10	13.89	6	19.36	4	28.57	35	23.97	55
Total	72	27.38	31	11.79	14	5.32	146	55.51	263

Data collected revealed that the ABO blood group frequencies were in the series: O>A>B>AB (55.51%, 27.38%, 11.79% and 5.32%) respectively (Table 1). Also, with respect to Rh-D blood group system, we observed that 95.82% of the Mbororo population examined were Rh^{+ve} while 4.18% were Rh^{-ve} (Table 2). Compared to results from studies elsewhere, our results are consistent with previous findings in other parts of the world including Cameroon. For example, Al-Bustan *et al.,* (2002) reported that the phenotypic distributions of ABO blood groups in a Kuwaiti sample population of 18,558 subjects were 4962 (26.7%) with A, 4,462 (24.1%) with B, 858 (4.6%) with AB, and 8,276 (44.6%) with O. In Illorin, Nigeria, Iyiola *et al.,* (2011) also reported 58.1%, 1,800 (18.7%), 1,699 (17.6%) and 539 (5.6%) for blood group O, A, B and AB respectively and 95.5% and 4.5% for Rh^{+ve} and Rh^{-ve} respectively. In Lagos Nigeria, Iyiola *et al.,* (2012) reported the ABO and Rh-D group frequencies to occur in the following order: O > A >B > AB (52.9%> 23.1%> 21.3% >2.7% and 97% > 3.0%. In Northern Cameroon, Ndoula *et al.,* (2014) reported the frequencies of the antigens of blood groups O, A, B and AB to be 48.62%, 25.07%, 21.86% and 4.45%, respectively and Rh^{+ve} > Rh^{-ve} to be 96.32% > 3.68%. Our results however do not agree with those for Brazilian Bororos in which all 119 individuals examined were all of blood group O (Ottensooser and Pasqualin, 1949). Similarly, in the Galo and Mishing subtribes of the Adi tribal cluster in

East Siang District of Arunachal India, blood groups O and AB were predominant (28.4 and 27.4 % respectively) (Krithika *et al.,* 2007). In the Sahiwal district, Punjab province, Pakistan, Anees and Jawad (2011) reported 22.0%, 36.9%, 9.9% and 31.3% for groups A, B, AB and O, respectively, and 87.1% for Rh^{+ve}. Our results also showed that the difference between B and AB was large. Similar observations have been made by Iyiola *et al.,* (2011) for the Ilorin population in Nigeria and Ndouala *et al.,* (2014) for a Northern Cameroon population. Contrarily, Iyiola *et al.,* (2012) observed a marginal difference between the frequencies of blood group B and AB in the Lagos, Nigeria population.

Table 2. Distribution of phenotypic frequencies of various Rh-D blood group system from 2009–2013 in the Mbororo population of Momo Division North West Region of Cameroon.

Study Year	Blood Group				Total
	Rh $^{+ve}$		Rh $^{-ve}$		
	N	%	N	%	N
2009	72	28.57	2	18.18	74
2010	42	16.67	0	0	42
2011	47	18.65	5	45.46	52
2012	40	15.87	0	0	40
2013	51	20.24	4	36.36	55
Total	252	95.82	11	4.18	263

Table 3 shows the overall allele frequencies for the ABO and Rh antigens in the studied population. The ABO blood group allele frequencies were 0.084, 0.171 and 0.745 for A, B and O alleles respectively. This occurred in the order: O > B > A. The phenotype frequencies were A = 13.23%, B= 28.39%, AB =2.87% and O = 55.51%. The allele frequency of blood group O was the highest. For the Rh blood group system, allelic frequencies were D = 0.795 and d = 0.205. The genotypic frequencies were DD= 0.632, Dd = 0.3259 and dd= 0.0418 while the phenotypic frequencies were Rh – D $^{+ve}$ = 0.9579 and Rh-D $^{-ve}$ = 0.0418. There was a higher proportion of Rh –D $^{+ve}$ individuals than the Rh-D $^{-ve}$ individuals in the studied population.

Table 3. Gene frequencies of ABO and Rh blood group alleles for the years 2009 – 2013 in the Mbororo population of Momo Division, North West Region of Cameroon.

Blood group system	Blood group	Gene (allele)	Frequency	Genotype	Genotypic frequency	Phenotype	Phenotypic frequency
ABO	A	A	0.084	AA	0.0071	A	0.1323
				AO	0.1252	A	
	B	B	0.171	BB	0.0292	B	0.2839
				BO	0.2547	B	
	AB	-	-	AB	0.0287	AB	0.0287
	O	O	0.745	OO	0.5551	O	0.5551
Rh-D	Rh^{+ve}	D	0.795	DD	0.6320	Rh-D $^{+ve}$	0.9579
				Dd	0.3259	Rh-D $^{+ve}$	
	Rh^{-ve}	d	0.205	dd	0.0418	Rh-d $^{-ve}$	0.0418

Table 4 shows a comparison between observed and expected values for both ABO and Rh-D blood groups among the Mbororo population, in Momo division of the North West Region of Cameroon. The observed and expected values were respectively A (27.38.1%, 13.23%), B (11.79%, 28.38%), AB (5.32%, 2.87%) and O (55.51%, 55.51%). The observed frequency for Rh positive was 95.82% and the expected was 95.79% while the observed frequency for Rh negative was 4.18% and the expected value was 4.21%. The Chi – square (X^2) value obtained for the ABO blood group system was 70.834 at 3 degrees of freedom. This indicated that the distribution and proportion of individuals belonging to the different ABO blood

groups differed significantly from those expected under the Hardy – Weinberg's law (P<0.0001). On the other hand the Chi – square value obtained for the Rh-D blood groups system was 0.000, at 1 degree of freedom. This indicated that the distribution and proportion of individuals belonging to the different Rh-D blood groups did not differ from those expected under the Hardy-Weinberg's law (P>0.05).

Table 4. Observed versus expected frequency of ABO and Rh-D blood groups among Mbororo individuals sampled in Momo Division, North West Cameroon from 2009 - 2013.

Blood group system	Blood Group	Observed Number	Observed Frequency (%)	Expected Frequency (%)	Expected Number
ABO	A	72	27.38	13.23	34.79
	B	31	11.79	28.39	74.67
	AB	14	5.32	2.87	7.55
	O	146	55.51	55.51	145.99
	Total	263	100	100	263
Rh-D	Rh^{+ve}	252	95.82	95.79	251.93
	Rh^{-ve}	11	4.18	4.21	11.07
	Total	263	100	100	

The dominance of the O blood group in this population could be attributed to the fact that the Mbororos are Muslims who practice consanguineous marriages. Dominance of the O blood group in the Illorin Nigeria Muslim dominated city has also been explained to consanguineous marriages (Iyiola *et al.,* 2011).

In this paper, we report the frequencies of the ABO and Rh-D blood groups in the Mbororo ethnic group population in Momo division in the North West Region of Cameroon. The O and Rh^{+ve} blood groups were predominant in this population. Also, no significant differences were found in the ABO and Rh-D blood systems compared to that obtained from other ethnic groups in Cameroon (Ndoula *et al.*, 2014). However, the ABO blood group distribution showed departure from the Hardy-Weinberg equilibrium and this could be attributed to the fact that the Mbororos in the region of Cameroon are conservative (do not intermarry with their widikum neighbours) and their practice of consanguineous marriages (even first cousins marry).

References

Akhtar MN, Tayyib A, Tasneem T, Butt AR. 2003. ABO blood group in patients with peptic ulcer disease: Association with secretor status. Annuals of King Edward Medical University **9,** 238-40 (2003).

Anees M, Jawad A. 2011. Distribution of ABO and Rh Blood Group Alleles in Sahiwal district of the Punjab, Pakistan Proceedings of the Pakistan Academy of Sciences **48(1),** 39–43, 2011.

Iyiola OA, Igunnugbemi OO, Bello OG. 2012. Gene frequencies of ABO and Rh (D) blood group alleles in Lagos, South West Nigeria. The Egyptian Journal of Medical Human Genetics **13,** 147 – 153. http://dx.doi.org/10.1016/ijmhg.2011.08.006

Iyiola OA, Igunnugbemi OO, Raheem UA, Anifowoshe AT. 2011. Gene frequencies of ABO and Rh (D) blood group alleles in Ilorin, North-Central Nigeria. World Journal of Biological Research **4(1),** 6 – 14.

Khan MI, Micheal S, Akhtar F, Naveed A, Ahmed A, Qamar R. 2009. Association of ABO blood groups with glaucoma in the Pakistani population. Canadian Journal of Ophthalmology **44,** 582-586.

Krithika S, Maji S, Vasulu TS. 2007. Intertribal

and Temporal Allele-Frequency Variation at the ABO locus among Tibeto-Burman-Speaking Adi Subtribes of Arunachal Pradesh, India. Human Biology **79,** 355 – 362.

MINADER. 2012. Annual Report of the Divisional Delegation of the Ministry of Agriculture and Rural Development, North West Region, Cameroon.

Ndoula ST, Noubiap JJN, Nansseu JRN, Wonkam A. 2014. Phenotypic and allelic distribution of the ABO and Rhesus blood groups in the Cameroonian population. International Journal of Immunogenetics **0,** 1 -5. http://dx.doi.org/10.1111/iji.12114.

Nkou-Akenji T, Wepngong P, Akoachere J. 2004. Effects of ABO/Rh blood groups, G-6-P-D enzyme activity and haemoglobin genotypes on malaria parasitaemia and parasite density. African Journal of Health Science **11,** 93 – 97.

Ottensooser F, Pasqualin R. 1949. Blood types of Brazilian Indians (Matto Grosso). Review of Brasilian Biology **4,** 531-537.

Qureshi MA, Bhatti R. 2003. Frequency of ABO blood groups among the diabetes mellitus type 2 patients. Journal of College of Physician and Surgeons Pakistan **13,** 453-435.

Ziegler T, Jacobson N, Funfstuck R. 2004. Correlation Between blood group phenotype and virulence properties of Escherichia coli in patients with chronic urinary tract infection. Proceedings of the 8th International Symposium on Clinical Evaluation of Drug Efficacy in Urinary Tract Infection, Durban, South Africa. International Journal of Antimicrobial Agents **24(S1),** 70-75.