

Study of Blood Groups in Relation to Reproductive Performance Among Muslims of Purnia Division, Bihar

B.N. Pandey, A.K. Jha and M.K. Sinha

Post Graduate Department of Zoology, Purnia College, Purnia 854 301, Bihar, India

KEY WORDS Blood Groups. Consanguinity. Incompatibility. Muslims. Reproductive Performance.

ABSTRACT ABO blood group incompatibility and effect of parental consanguinity on fertility and mortality in 172 Muslims of Purnia division, Bihar suggest a negative effect of consanguinity on fertility and mortality. In comparison to compatible marriages, incompatible marriages lead to less pregnancy wastages but it has negative effect on mean number of pregnancies. Among compatible mating type B x B and in incompatible matings type O x A shows better reproductive performance.

INTRODUCTION

Survival of any population in any ecological zone depends upon its growth. The vital process of life like fertility and mortality are fundamental determinants of population growth and they represent an essential feature of approach to the understanding of human biology (Reddy et al., 1993). Fertility and mortality are in many ways related to various aspects of human social as well as biological life. Thus the survival of any population depends upon its reproductive fitness. Several studies are now available on reproductive performance in relation to blood group incompatibility and consanguinity (Satyanarayana et al., 1978; Reddy and Rao, 1978; Reddy and Reddy, 1980; Rami Reddy and Subhashini, 1985; Govinda Reddy, 1986, 1987; Banerjee and Das, 1986; Srivastava and Sinha, 1989; Bandopadhyaya, 1992; Rajeswari et al., 1992; Ravi and Busi, 1993; Reddy et al., 1993).

Muslims are one of the major community of the Purnia division of Bihar. Marriage between genetically related spouses (consanguineous marriage) is most prevalent in them.

Such marriages have been reported to increase the incidence of foetal loss and/or of postnatal and prenatal deaths (Mortan, 1958; Rao, 1988; Badaruddoza and Afzal, 1992). The effects of consanguinity on blood groups and intelligence quotient (I.Q.) among Muslim children of Purnia have already been studied by Pandey and Mishra (1991) and Pandey et al. (1994). The aim of the present work is to study the effects of both ABO incompatibility and consanguinity on fertility and mortality among the Muslim of Purnia division of Bihar.

MATERIAL AND METHODS

A total of 172 randomly selected couples of all age groups were surveyed. The data were collected using a pre-tested proforma devised for the purpose by direct interview from the villages of Kasba, Krityanand Nagar, Harda, Chimni Bazar, Banbhag, Maranga, Araria and Kishanganj. All couples of different ages were visited and interviewed at their houses. The reproductive history included total number of pregnancies, livebirths, abortions, stillbirths, and postnatal mortality (death up to one year, 1-6 years and 7-20 years). Reproductive wastage from 5th week of pregnancy up to 7th month of pregnancy was recorded as stillbirth.

Blood samples were collected by finger prick method in normal saline from husband, wife and their available children for typing the ABO blood groups.

RESULTS AND DISCUSSION

A total of 68 couples entering into consanguineous marriages and 104 into non-consan-

Table 1: Incidence of compatible and incompatible marriage among consanguineous and non-consanguineous couples

Nature of mating	Compatible marriage				Non-compatible marriage				Total			
	No.	%	±	SC	No.	%	±	SC	No.	%	±	SC
Consanguineous	41	60.29	±	5.9	27	39.71	±	5.9	68	39.53	±	3.7
Non-consanguineous	66	63.46	±	4.7	38	36.54	±	4.7	104	60.47	±	3.7
	107	62.20	±	3.7	65	37.80	±	3.7	172			

guineous marriage was surveyed (Table 1). Since the couples were selected randomly, this data show that consanguineous marriage are rather less favoured in the community.

Regarding the incidence of compatible and incompatible marriages, the former comprised of about two thirds (62.20%) and the later about the one third (37.80%) (Table 1). Incidentally, the frequencies of these two categories of marriages were almost same in both consanguineous and non-consanguineous groups. This similarity is amazing since no blood group matching for compatibility test is done in these populations. Perhaps, the simi-

larity is mainly due to blood group distribution pattern in the population itself.

In table 2 the fertility and mortality measures are given for consanguineous and non-consanguineous marriages. The mean values of pregnancies, livebirths and surviving offsprings are relatively less in consanguineous marriages. The pregnancy wastage like abortions, stillbirths, and postnatal deaths *i.e.*, newborn to 1 year, 1 year to 6 years are higher in consanguineous than in non-consanguineous group. No distinct effects of the degree of consanguinity, sex of the child or spatial distribution of the populations were noted.

Table 2: Fertility and mortality among the compatible, incompatible, consanguineous (C) and non-consanguineous (NC) unions

Mating	Total number marriages		Total of pregnancies		Total live children		C		NC		Postnatal deaths		Total pregnancy wastage	
	C	NC	C	NC	C	NC	Abor-tion	Still birth	Abor-tion	Still birth	C	NC	C	NC
	<i>Compatible</i>													
O x O	15	10	21	75	19	21	1	1	0	1	12	10	14	11
A x O	2	8	4	40	4	7	2	0	2	0	5	0	4	2
B x O	11	9	42	30	58	76	1	1	0	1	4	1	6	2
AB x O	0	5	0	25	0	58	0	0	1	0	3	0	3	1
A x A	2	2	6	18	3	16	0	0	1	0	2	1	2	2
B x B	8	20	12	43	25	42	2	0	0	1	1	0	3	1
AB x AB	0	6	0	16	0	40	3	0	1	2	2	0	5	3
AB x A	2	3	4	8	5	10	0	1	1	0	2	1	3	2
AB x B	1	3	2	6	4	18	2	0	0	1	1	2	3	3
Total	41	66	91	261	125	288	11	3	6	6	32	15	46	27
<i>Incompatible</i>														
O x A	4	6	8	20	12	18	0	1	0	0	1	1	2	1
O x B	5	7	16	45	19	34	1	0	0	1	2	4	3	5
O x AB	1	6	2	14	32	40	2	1	1	0	3	2	6	3
A x B	5	6	18	10	18	11	0	1	0	0	2	1	3	1
B x A	7	8	12	10	12	30	1	0	0	0	6	2	7	2
A x AB	0	4	0	18	0	26	1	2	0	0	4	1	7	1
B x AB	5	1	4	22	6	48	1	0	0	1	2	1	3	2
Total	27	38	60	109	99	207	6	5	1	2	20	12	31	15

Age specific consanguinity effects on fertility and offspring mortality show lower fertility and offspring mortality values in consanguineous mothers in the age range of 25 years and below as reflected in their pregnancies, livebirths, surviving offsprings and mortality then in non-consanguineous mothers. No stillbirths were found in non-consanguineous matings. In the age group of 24-45 years, consanguineous mothers reported higher fertility and mortality than the non-consanguineous mothers (except surviving offsprings and abortions). Thus the data indicate that consanguinity decreases fertility and increases mortality which differs from the findings of Rao and Inbaraj (1980). This may be due to difference in the history and marriage practice of the population concerned. Brahmins of South India have been practicing consanguinity for the last two to three thousand years and due to their long history of consanguinity the lethal and detrimental genes capable of affecting their reproductive fitness, have been eliminated (Rao and Inbaraj, 1980).

The results of our study show that the in-

Table 3: Segregation of ABO blood groups

Mating	Marriage type	No. of matings	O	A	B	AB	Total
<i>Compatible</i>							
	O x O	25	40	-	-	-	40
	A x O	10	6	4	-	-	10
	AB x O	5	-	-	5	-	5
	B x O	20	6	-	18	-	24
	A x A	4	2	4	-	-	6
	B x B	28	10	-	15	-	25
	AB x A	5	-	6	8	6	20
	AB x B	4	-	4	-	5	9
	AB x AB	6	-	5	6	8	19
Total		107	64	23	52	19	158
<i>Incompatible</i>							
	O x A	10	8	6	-	-	14
	O x B	12	12	-	10	-	22
	O x AB	7	-	12	11	-	23
	A x B	11	-	5	6	-	11
	B x A	15	4	2	4	6	16
	A x AB	4	-	3	2	2	7
	B x AB	6	-	5	4	3	12
Total		65	24	33	37	11	105

Table 4: Mean values of reproductive performance in the two mating types

Reproductive performance	Mating			
	Compatible		Non-compatible	
	$\bar{X} \pm$	S.E.	$\bar{X} \pm$	S.E.
Pregnancies	3.28 \pm	0.03	2.6 \pm	0.32
Living children	3.85 \pm	0.37	4.70 \pm	0.58
Child mortality	0.44 \pm	0.04	0.76 \pm	0.09
Postnatal deaths				
Abortions	0.15 \pm	0.001	0.01 \pm	0.00001
Stillbirths	0.084 \pm	0.0007	0.10 \pm	0.00001

crease in consanguinity leads to increase in the prenatal and postnatal deaths thereby decreasing fertility, livebirths and survival of offsprings (Table 3). A gradually rising incidence of prenatal deaths with degree of consanguinity can be directly attributed to the appearance of homozygosity at different gene loci and recessive lethal effects of such abnormalities, resulting in abortions and still births. Similar observations have been made by Mian and Mushtaq (1994) in the Pakistani population. The postnatal death is also higher in consanguineous marriage in comparison to non-consanguineous marriages which might be due to expression of recessive alleles in suitable environmental conditions. In comparison to compatible marriages, incompatible marriages lead to less pregnancy wastage but have negative effects on mean number of pregnancies. Reddy and Sheshu (1986) have also reported negative effect of incompatibility on fertility. Among compatible mating type B x B has positive effect on mean number of pregnancies, living children and negative effect on pregnancy wastage. While in incompatible matings type O x A has better performance on mean number of pregnancies, livebirths, prenatal and postnatal deaths.

From the regression analysis of the ABO blood groups in children (Table 4) it is clear that selection is acting against blood group A in matings of blood group O involved compatible matings and against both blood groups A and B in the incompatible matings. When total

matings are considered in each category, selection is towards blood groups O in the compatible matings and O and B in the incompatible matings. Matsunaga and Itoh (1958) have found that group O women have significantly fewer group A children than expected. The present study confirms their results.

ACKNOWLEDGEMENT

We express our sincere thanks to Prof. S.P. Sinha, Head, Department of Zoology, Bhagalpur University, Bhagalpur for his valuable suggestions.

REFERENCES

- Badaruddoza and Afzal, M. : Inbreeding in the human populations. *Man in India*, **72** : 431-453 (1992).
- Bandopadhyaya, A.R. : A study on fetal wastage and blood groups in a Bengali population. *J. Hum. Ecol.*, **3** : 159-161 (1992).
- Banerjee, A.R. and Das, S. : Incompatibility selection. *Ind. J. Phy. Anthropol. Hum. Genet.*, **12** : 1-8 (1986).
- Govinda Reddy, P. : Effects of inbreeding on mortality : A study among three South Indian communities. *Hum. Biol.*, **37** : 47-59 (1985).
- Govinda Reddy, P. : Effects of consanguineous marriages on fertility among three endogamous groups of Andhra Pradesh. *Soc. Biol.*, **34** : 68-77 (1987).
- Matsunaga, E. and Itoh, S. : Blood groups and fertility in Japanese population with special reference to intrauterine selection due to maternal foetal incompatibility. *Am. J. Hum. Genet.*, **22** : 111-131 (1958).
- Miun, A. and Mushtaq, R. : Consanguinity in population of Quetta (Pakistan). *J. Hum. Ecol.*, **5** : 49-53 (1994).
- Morton, N.E. : Empirical risks in consanguineous marriages. Birth weight, gestation time and measurement of infants. *Am. J. Hum. Genet.*, **10** : 344-349. (1958).
- Pandey, B.N. and Mishra, S.K. : Frequency of ABO blood groups in consanguineous marriages in Muslims of Purni, Bihar, U.P. *J. Zool.*, **11** : 87-88 (1991).
- Pandey, B.N., Jha, A.K. and Das P.K.L. : Effects of consanguinity on blood groups and intelligence quotient among Muslim children of Purnia, Bihar. *J. Hum. Ecol.*, **5** : 221-223 (1994).
- Rajeswari, G.R., Narahari, S. and Rao, B.B. : ABO blood group incompatibility consanguinity in relation to reproductive performance. A study among two occupational caste groups of Andhra Pradesh. *J. Hum. Ecol.*, **3** : 49-52 (1992).
- Rao, P.S.S.S. and Inbaraj, S.G. : Inbreeding effects on fetal growth and development. *J. Med. Genet.*, **17** : 27-33 (1980).
- Rao, P.S.S.S. : The measurement of inbreeding and its effects, pp 208-241. In : *Statistical Methods in Human Population Genetics*. K.C. Malhotra (Ed.). Indian Institute of Bio-social Research and Development, Calcutta (1988).
- Ravi, B.V. and Busi, B.R. : Fertility and reproductive performance of Aramadravida Brahmins of Andhra Pradesh. *J. Hum. Ecol.*, **4** : 51-57 (1993).
- Rami Reddy, V. and Subhashini, A.B. : Effects of consanguinity on fertility and mortality among Palli Reddis of Tirupati. *Comp. Physiol. Ecol.*, **10** : 141-144 (1985).
- Reddy, P.C. and Sheshu, N.R.K. : ABO blood group in relation to fertility, mortality and selection in an isolate. *Ind. Anthropologist*, **16** : 115-124 (1986).
- Reddy, T.P.K., Reddy, K.S. and Reddy, P.G. : Consanguinity and inbreeding effects on fertility and mortality among Malas of Chittoor district, Andhra Pradesh. *J. Hum. Ecol.*, **4** : 97-103 (1993).
- Reddy, V.R. and Rao, A.P. : Effects of parental consanguinity on fertility, mortality and morbidity among the Pattusalis of Tirupati, South India. *Hum. Hered.*, **28** : 226-234 (1978).
- Reddy, V.R., and Reddy, B.K.C.S. : ABO blood group mating types and fertility among the Redis and Chittoor district, Andhra Pradesh. *Anthropologist*, **21** : 1 (1980).
- Satyanarayana, M., Vijayalakshami, M., Sambasiva Rao, C. and Mathew, S. : ABO blood group and fertility with special reference to intrauterine selection due to maternofetal incompatibility. *Am. J. Phys. Anthropol.*, **49** : 489-496 (1978).
- Srivastava, A.K. and Sinha, S.P. : Reproductive performance of ABO blood group related compatible and incompatible marriages among Kayasthas of Bihar. *Persp. Cyto. Genet.*, **6** : 87-90 (1989).