

Reproductive Fitness and Selection Intensity Among Muslims of North India

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KEYWORDS Fertility. Mortality. Sex-Ratio. Selection Intensity. Ashraf. Ajlaf

ABSTRACT North Indian Muslim populations occupy a position of historical, linguistic, and socio-religious significance in the Indian sub-continent, having a prehistoric and medieval intermixture of various ethnic groups. While the political dimensions of the demographic transition is still relevant, a genetic study of these populations can throw light on their origin, migration and selection forces operative in the region. We have reported incidence of marriage, reproductive fitness, reproductive wastage and selection intensity among women of high rank Muslims (Ashraf) and low rank Muslims (Ajlaf) by retrospective method. Significant effect of consanguinity and maternal age are also seen on fertility, mortality sterility and secondary sex ratio of the offspring. MAVA revealed significant F ratio on fertility, mortality and secondary sex ratio.

INTRODUCTION

Muslims in India comprise more than 12 % of the population (Shariff, 1998) yet their genetic structure has not been properly investigated. They belong to two major sects: Sunnis and Shias, while each sect has different *biradaris*, grouped under Ashraf and Ajlaf (Ansari, 1959). The former comprise of higher rank Muslims like Syeds, Sheikhs, Pathans and Moghuls while the latter comprise Qureishis, Ansaris, Saifis and other groups of lower occupations (Ahmad, 1970). A large number of the latter may also be converts from local indigenous population of other faiths (Afzal, 1984). Though Islam does not distinguish the groups on any material grounds, the social isolation may have led to differentiation of the groups over many generations, including the differences in their gene pools. The study of gene pool may throw some light on their origin, ancestry and also relate with their health and morbidity status, their being some rare mutations or genetic polymorphism for one or the other marker (Kirk, 1985). A study of this type may thus have great relevance to adaptations and fitness of the population (Basu, 1982). While details of the study, on the genetic structure and micro differentiation process of Muslim populations, including their genetic distance and isolation will be presented later on, Muslim women of Aligarh (Afzal, 1992) have been

surveyed here to know the incidence and types of marriage, marital age, fertility, mortality, sex-ratio and selection intensity, and notice effect of consanguinity of two social categories Ashraf and Ajlaf on the same. The sampling of individuals was done with respect to the following factors. (i) *Caste (biradari)*: Ashraf (Syed, Sheikh, Pathan and Shia-Syed); Ajlaf (Qureishi, Ansari and other lower groups) (ii) *Consanguinity*: Different types of consanguinity such as first cousin, first cousin ones removed, second cousin, third cousin and distant cousin and (iii) age of the parents: women below 45 years and above 45 years of age were separated for the fertility study. There was no significant variation in educational status and food habits of the parents.

MATERIALS AND METHODS

The survey was conducted from December 2002 through April 2003 as per the proforma given. The survey was confined to Aligarh city in civil lines as well as Upper court, Jamalpur, Delhi Gate and Sarai Rahman areas. Households were selected on random *a priori* basis during the day time by door to door contact by the investigator. Local informers and volunteers guided the project fellow. Information was collected on detailed interview with the mother and father of the children. Caste, consanguinity, sect, age and sex status of the individuals were noted and pedigrees were drawn. Death and abortions were included and disease of any type was also noted. A master chart was drawn from the information in the

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*This paper is dedicated to the memory of late Mr. M.A. Rahim, M.A. my revered father who passed away on 2nd June 2004.

proforma, frequency tallies were made, and tables for calculation of mean, mode, median, deviation and standard error were drawn for age of the parents and fertility, mortality and secondary sex ratio including selection intensity were calculated. The results are presented.

RESULTS

Marriage Incidence: Out of 300 married women surveyed, the highest frequency (23.7%) was that of Pathans, followed by (Qureishis 19.7%) and least was that of Ansaris (3.0%) (Fig. 1a). About 10 percent of total marriages taken place, were observed to be of mixed type where couples belonged to different groups (Pathan $\times$ Sheikh, Sheikh $\times$ Syed, Sheikh $\times$ other groups). Others included different endogamous groups

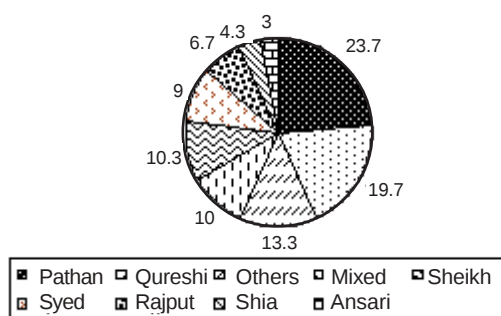
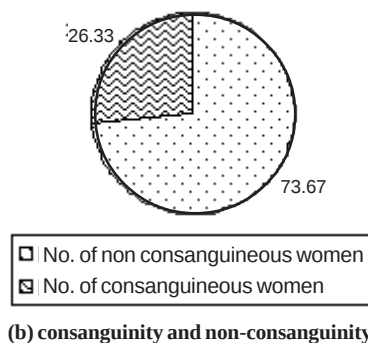


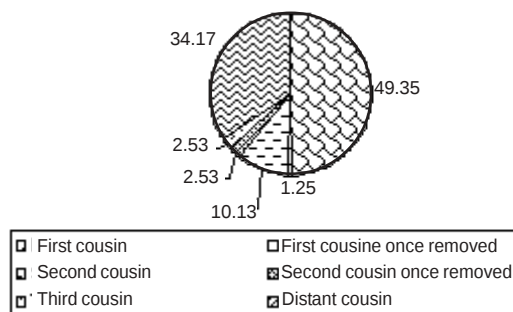
Fig. 1. Frequency of married women in (a) different castes



(b) consanguinity and non-consanguinity

like Rajput, Saifi, Abbasi, Alvi, Mewati, Teli, Rain, Rangrez and so on. Out of this, non-consanguineous woman comprise 74 percent (Fig. 1b) where as consanguineous women are 26 percent, again, about 50 percent of consanguineous marriages are of first cousin type, (Fig. 1c) and 34 percent distant cousins. While

second cousins comprise 10 percent, other types of consanguinity are limited. The mean age of the mother at the time of marriage was 18 years



(c) types of consanguinity

(Fig. 2). The mean age of married women ($n = 300$) was 45 years (Table 1), while mean age of parents differed among fathers and mothers. In the age group above 45, the mother's age was 5 years lower, i.e. 54 than father's age, 59. In the age group below 45, mother's age being 34 was 3

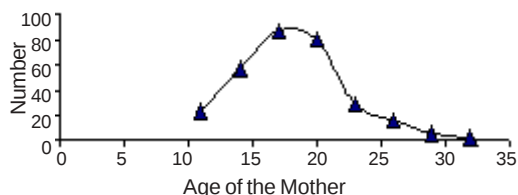


Fig. 2. Frequency of mothers of different age at the time of marriage.

Table 1: Age distribution of mothers ($\bar{x}=45.0\pm0.70$) and mean age of parents

Age groups	Mid Class	No. of women	Percent
<20	17	1	0.3
20-24	22	3	1.0
25-29	27	30	10.0
30-34	32	31	10.3
35-39	37	51	17.0
40-44	42	23	7.6
45-49	47	54	18.0
50-54	52	41	13.6
55-59	57	32	10.6
60-64	62	15	5.0
65-69	67	10	3.3
70-74	72	6	2.0
75-79	77	2	0.66
80 <	82	1	0.33
Mean age	$\bar{x}$ Age of Father	Age of Mother	Combined Age
Below 45	37.103 $\pm$ 0.49	34.54 $\pm$ 0.45	35.10 $\pm$ 0.14
Above 45	58.86 $\pm$ 0.67	54.37 $\pm$ 0.586	56.2 $\pm$ 0.20
Total	51.75 $\pm$ 0.74	54.5 $\pm$ 0.7	48.5 $\pm$ 0.3

years lower than father's age. The combined age of parents below 45 was 35 years and above 45 was 56 years, while the overall combined mean age of the parents was 48 years (Fig. 3).

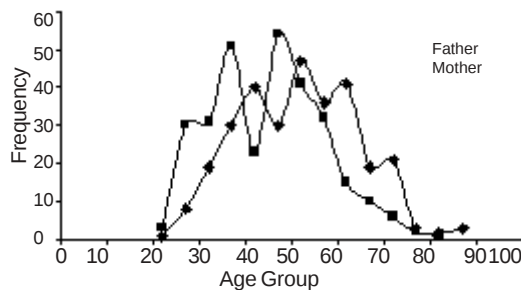


Fig. 3. Frequency distribution of fathers and mothers of different age groups

Fertility: Of the children born (Table 2), the mean age of children in mothers below 45 years was 10 years; in higher age group of mothers, the mean age increased to 23 years, while the mean age of offspring was 19 years. The range in age was total lower, being 0 – 29 years, for below 45

year age group, it was 0 – 59, for beyond 45 years and over all range it was 0-54 years. The modal values were 12, 22, and 17 and mean age of offspring was 14, 29, and 29, respectively.

In the age pyramid, maximum children, (i.e., 47%), were below 9 years, in the first group, while maximum children were in 20 – 29 years in the senior group. This shows more number of children in the younger age group of the mother (Fig. 4).

The mean number of children born per mother (Table 3), is higher for males in all age groups; the mean is higher 6.28 years, for above 45 years of age of mothers. The sterility rate is 6.32 per 1000 for senior age mothers; the figures for lower age mothers is 16.6 which may be due to the use of contraceptives (Somkuti, 1996), (not prevalent in senior age mothers) and may not be really due to sterility. Mean fertility for Ashraf is 4.54 per mother being lower due to educational training than Ajlaf, 5.72 per mother. There is 29.9 per thousand sterility for Ashraf due to late marriage. The effect of consanguinity is not apparent. Interactions between AC, AD, BC, CD and between A_1A_2 , B_1B_2 are significant at the 0.05

Table 2: Statistics and Mean age the offspring in different age groups of mothers (M-Male, F-Female, T-Total)

Age of offspring	Mothers below 45			Mother above 45			Total mothers		
Range	0-29			0-59			0-59		
Mode	12			22			17		
Median	14.5			29.5			29.5		
Mean (among sexes)	M	F	T	M	F	T	M	F	T
	10.36	10.55	10.45	23.41	23.23	23.33	18.8	18.81	18.93
	±0.36	±0.39	±0.26	±0.46	±0.46	±0.33	±0.38	±0.40	±0.28

Table 3: Mean fertility, sterility, mortality and secondary sex ratio of the offspring in different groups.

No. of mothers in different groups	Sterility	Fertility/mothers (X)			Mortality %			Secondary sex ratio		χ^2 (5%)
		M	F	T	M	F	T	M	F	
All age group (n=300)	16.16	2.75±0.10	2.37±0.10	5.09±0.17	6.42	7.74	6.90	809	711	113.78
Above 45	6.32	3.30±0.15	2.95±0.15	6.28±0.24	6.87	8.12	7.47	509	468	108.76
Below 45 (n=138)	28.16	2.11±0.12	1.72±0.12	3.76±0.18	5.56	6.17	5.89	300	243	123.45
Ashraf (n=169)	29.94	2.407±0.12	2.23±0.13	4.54±0.22	7.75	10.16	8.90	400	364	109.89
Ajlaf (n=131)	7.52	3.54±0.17	2.60±0.16	5.72±0.26	5.35	5.37	5.36	411	335	122.68
Non-consanguineous (n=221)	22.727	2.836±0.122	2.304±0.125	5.463±0.22	5.21	6.27	5.66	634	487	130
Consanguineous (n=79)	0	2.425±0.185	2.56±0.187	5.037±0.65	8.47	7.54	7.96	177	212	83

* Statistically significant at 5%

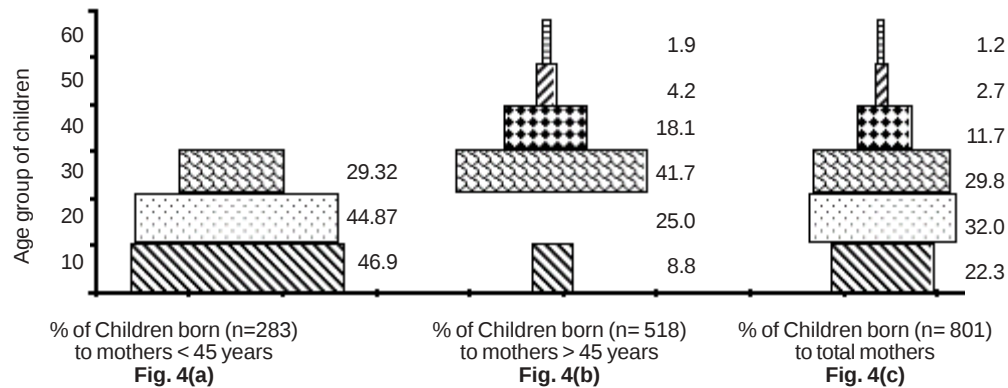


Fig. 4. percentage of children born to mothers a) below 45 years b) above 45 years and total mothers

level (Table 5), where A_1, A_2 denote age below 45 and beyond 45 years, B_1 and B_2 denote Ashraf and Ajlaf, C denotes consanguinity and D denotes sex of child.

Table 4: Selection intensity among offspring of mothers belonging to different groups (I_n =Index due to mortality, I_f = Index shown to fertility, I = selection intensity)

Different groups	I_m	I_f	I_f/P_s	I
All age group	0.77	0.317	0.3415	0.4186
Above 45	0.0807	0.2264	0.2446	0.3253
Below 45	0.0625	0.3575	0.3798	0.4423
Ashraf	0.097	0.377	0.4138	0.5108
Ajlaf	0.0559	0.2730	0.2882	0.3442
Non-consanguineous	0.07365	0.3725	0.3999	0.4735
Consanguineous	0.0864	0.2307	0.2506	0.33705

Mortality and Secondary Sex Ratio: The mortality figures vary from nearly 5.36 to 8.9 per hundred children, born there being no obvious relation with age groups of mothers on this parameter (Table 3). The secondary sex ratio, defined here as the number of male children born per hundred female, is higher for lower age group being 123, than for higher age group, 109. Mortality figure is significantly different for the Ashraf 8.90 than for the Ajlaf 5.36. This is perhaps the most important finding of this survey. Mortality among females is higher, i.e., 10.16 as compared to males 7.75, which is unusual. There is higher mortality among inbred children 7.96 (Table 3) than for outbred children, 5.66 comprising due to abortions, miscarriages and stillbirth. The secondary sex ratio is lower for inbred children 83 than for outbred ones, 130 the difference is significant at 5 percent. Lower values obtained for consanguineous children may

Table 5: MAVA table for average fertility

Source of variation	df	Mean square	F
$A_1 A_2$	1	4.61	50.176 *
$B_1 B_2$	1	.9760	10.62 *
$C_1 C_2$	1	.0274	.2984
$D_1 D_2$	1	.0698	.7603
AB	1	.1989	2.16
AC	1	1.147	12.49 *
AD	1	1.105	12.0 *
BC	1	4.781	52.0 *
BD	1	4.759	51.62 *
CD	1	5.688	61.96 *
ABC	2	.08575	.93
ABCD	3	.0339	.3692
Within groups	8	.0918	
Factors			
A_1 Below 45		C_1 Non-consanguineous	
A_2 Above 45		C_2 Consanguineous	
B_1 Ashraf		D_1 Male	
B_2 Ajlaf		D_2 Female	

$P < 0.05$

* Statistically significant

be due to differential survival rate of female and male foetus due to sex-linked or even sex influenced lethals or detrimental. Significant interactions are observed between $A_1 A_2$, $B_1 B_2$, $C_1 C_2$, $D_1 D_2$ and CD at the 0.05 level (Table 6). However, significant interaction is also seen in case of factors $C_1 C_2$ (Table 7).

Selection Intensity: The selection intensity for the offspring is higher, 0.4423 in lower age group than in the higher group viz. 0.3253 (Table 4). Again the selection is higher for Ashraf 0.5108 than among the Ajlaf 0.3442. The latter are neo-converts, and seem to be more adaptive. Among consanguineous and non-consanguineous

Table 6: MAVA table for mortality

Source of variation	df	Mean square	F	
A ₁ A ₂	1	90.68	16.87	*
B ₁ B ₂	1	51.36	9.5597	*
C ₁ C ₂	1	35.72	6.6486	*
D ₁ D ₂	1	33.43	6.2224	*
AB	1	11.59	2.159	
AC	1	19.41	3.614	
AD	1	20.56	3.826	
BC	1	6.2605	1.1652	
BD	1	18.73	3.48	
CD	1	26.554	4.9425	*
ABC	2	4.1736	.7768	
ABCD	3	11.487	2.13	
Within groups	8	5.3725		
Factors				
A ₁ Below 45		C ₁ Non-consanguineous		
A ₂ Above 45		C ₂ Consanguineous		
B ₁ Ashraf		D ₁ Male		
B ₂ Ajlaf		D ₂ Female		

P<0.05

*Statistically significant

Table 7: MAVA table for secondary sex ratio

Source of variation	df	Mean square	F	
A ₁ A ₂	1	18	.0477	
B ₁ B ₂	1	72	.1911	
C ₁ C ₂	1	1800	4.778*	
AB	1	1179	3.13	
AC	1	315	.836	
BC	1	288	.764	
ABC	2	123.3	.327	
Within groups	6	376.66		
Factors				
A ₁ Below 45		C ₁ Non-consanguineous		
A ₂ Above 45		C ₂ Consanguineous		
B ₁ Ashraf		D ₁ Male		
B ₂ Ajlaf		D ₂ Female		

P<0.05

*Statistically significant

neous offspring, a high rate of selection intensity 0.4735, is seen in non-consanguineous than in consanguineous ones 0.33705. It is an unusual finding which might be due to small sample size.

DISCUSSION

The present study is a preliminary finding of the major work to be done on genetic structure and fitness of Muslims of Uttar Pradesh (North India). The region is well-known for its socio-religious and cultural significance, particularly due to the location of the institution of modern

learning called Aligarh Muslim University. While the residential colonies of the teaching community may have elite women or Ashraf showing lower fertility, the lower class i.e. Ajlaf are Muslim women of the original city who have higher fertility rate. This area is educationally neglected and lacks enlightenment. A comparison with women of the university residential colonies could be informative. The present work was conducted while reporting the gene diversity, so the data are limited. Nevertheless, they show us some light on the demographic trend and effect of consanguinity in the population.

The comparison of Ashraf and Ajlaf is very interesting *viz a viz* consanguinity. The Ashrafs are less fertile in the non-consanguineous category, while the fertility is higher among the consanguineous category (Hussain, 2004); this may be due to long practice of consanguinity leading to elimination of harmful genes with prolonged history of inbreeding (Sanghvi, 1966). Ajlaf are neo-converts and show recent history of consanguinity. On mortality in case of non-consanguinity, Ashrafs show higher rate than Ajlafs due to their lower adaptation, Ajlafs are the local indigenous population and so are well adapted and have lower mortality.

There is a clear distinction between the different classes of society with respect to their present birth rate. Marriage rate is now lower and the age at marriage is greater than a generation ago. The marriage rate among Ashraf is distinctly lower than in Ajlaf class, also the age at marriage is plainly greater in the former than in the later. Marriages occur at a later age among Ashraf than among Ajlaf due to lower population size. Both marriage age and rate are important as they influence the birth rate. It remains true that large families are nearly always begun early, so Ashraf produce smaller families than the Ajlaf.

Reduction in birth rate of Ashraf is attributable to delayed marriage due to lack of partners. The well-off classes have much smaller families than the poor. It may be argued that poverty is the result of large families. Ajlaf, with low wages or irregular employment may have larger families than those with higher wages, a trend seen in other castes of different religion may also influence the number of children. In present case, the level of education and economic status do not vary and hence may not have significant effect on these parameters.

ACKNOWLEDGEMENTS

Thanks are due to the major project entitled "Molecular and Genetic studies on Certain Human Isolates" funded from the Muslim Association for the Advancement of Science (MAAS), Aligarh 2002 (MAS/RS/02). The work is a preliminary study of this project and S. S. Aarzo is Junior Research Assistant.

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