

Consanguinity and Its Effects on Fertility and Child Survival Among Muslims of Ladakh in Jammu and Kashmir

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INTRODUCTION

Marriage - a socio - cultural custom, is the basis for procreation and therefore, certain marriage practices of assortative nature deviating from panmixis - especially those between relatives, have been receiving widespread attention from various fields including, genetics, anthropology, sociology, demography. 'Relatives' according to Vogel and Motulsky (1986) are individuals who have certain portion of their genes in common by descent. Marriage between two such individuals who have at least one traceable common ancestor is said to be 'consanguineous' and offspring of such mating 'inbred'. The major points of interest in pursuing studies on consanguinity are its effects on fertility, mortality and morbidity and the risk of increased manifestation of deleterious homozygotes which are believed to influence the demographic and genetic structure of population. The consanguineous matings facilitate the recessive genes to manifest their effects and the semi-dominant genes to increase their effects by becoming homozygous. And, knowledge of these aspects is of considerable importance for studying the etiology of various diseases, defects, developmental disorders, genetic load and for genetic counselling.

The earliest attempts to gauge the incidence of consanguineous marriages and its effects, and to measure the degree of inbreeding in a population group were made by Bemiss (1858), Darwin (1875), Pearson (1902), Arner (1908), Wright (1922), Bell (1940), Malecot (1948), Neel et al. (1949). Thereafter, the incidence of consanguinity have been reported from Europe, Ireland, America, Kurdistan, Japan, although the levels of inbreeding appeared rather low, with the inbreeding coefficients rarely exceeding 0.01. Relatively higher inbreeding levels have been observed in isolates and isolated communities such as, the Ramah Navaho Indians (Sphuler and Kluckhohn, 1953), Dunkers (Glass, 1954), Dinkas

(Roberts, 1956), Susaks (Doliner, 1960) and in some isolated islands as Hosojima in Japan (Ishikuni et al., 1960), in Samaritan isolates (Bonne, 1963), in island of Tristan da Cunha (Bailit et al., 1966), as well as in a large number of Muslim communities in Sudan, Iran, Kuwait, Uzbekistan, Egypt and Pakistan (Ahmed, 1979; Naderi, 1979; Alfi et al., 1980; Ginter et al., 1980; Habib and Book, 1983; Hafez et al., 1983; Al-Awadi et al., 1986; Shami et al., 1989).

In India, inhabited by a vast congregation of castes, communities and Tribes, the consanguineous marriages are being practised for long amongst several groups, though many seem to proscribe the same. But, the studies on incidence and effects of consanguinity have been widely attempted only after the publications of Sanghvi (1954) and Sanghvi et al. (1956). There exist a few informative reviews of these studies (Mahapatra, 1966; Chakravarti, 1968; Malhotra, 1976; Roychoudhury, 1976a, b). In general, it appears that whereas some population groups prefer consanguineous marriages, many others proscribe these. Therefore, the observations cannot be generalized successfully for India as a whole.

Recently, in a comprehensive regional review on all aspects of consanguineous marriages in the Indian region by Bhasin and Nag (1994) too, similar picture has emerged. This regional appraisal has also shown that consanguineous marriages are practised not only in small isolates or geographically restricted communities, or Scheduled Tribes but also in numerically large caste groups and communities, due to diverse economic and socio-cultural reasons. It has broadly indicated that the states of the southern region of India overwhelmingly prefer and practise consanguinity across all major religious groups and ethnic entities, except Kerala, where comparatively low incidence has been found, owing perhaps to relatively high educational characteristics, and near absence of a major type of consanguineous marriage (prevalent especially in the southern states), those between Uncle

Niece, most probably due to the prevailing matrilineal traditions there till recent times. In the eastern region, many communities of Maharashtra appeared to submit to the Dravidian influence, thereby preferring such marriages fairly frequently. In the other states of western region; and the northern, eastern regions, as well as in the Islands, consanguinity in general, seemed to be proscribed or practised occasionally. However, the review also pointed out the incomplete and inconclusive picture regarding the practice of consanguinity as well as inconsistencies of its effects across various regions and populations of India, as seen elsewhere in the world.

In the present paper, an attempt has been made to study the incidence of consanguinity and its effects on fertility and child survival among the Muslims of Ladakh region in Jammu and Kashmir - a hitherto unexplored region regarding the practice. The reasons behind the practice have also been researched. An attempt has additionally been made to compare the study populations with other Indian Muslim population groups from available published materials.

MATERIALS AND METHODS

The northernmost state of Jammu and Kashmir in India can be broadly divided into the following three natural regions / ecological zones, taking into consideration the diversified and remarkable variations in the physiographical conditions: 1. Outer Hills, 2. Middle Himalayas, and 3. Inner Himalayas. This last region, which more or less synchronizes with the Ladakh region, is situated in the highland crystalline mass of trans-Himalayan rain shadow zone and mainly comprises of high-altitude mountains, glaciers, narrow valleys, alluvial fans and deep gorges.

The Ladakh region is the largest division of the state and covers an area of 96,701 sq. km (includes 37,555 sq. km under the illegal occupation of China), i.e., 70 percent of the total area of the state. It is situated between 32°15' and 36° north latitude and 75°15' and 80°15' east longitude. The land surface of the Ladakh region can be broadly divided into the upper zone above 4500 m and the lower zone between 2700 m and 4500m (approximately). All human settlements, and settled agriculture are confined to the lower zone. The Ladakh region, comprising of Leh and Kargil districts, constitutes the present study area.

The Ladakh region is inhabited by a number of ethnic groups belonging mainly to the two major religious groups, the Buddhists and Muslims. The practice of consanguinity is generally absent among Buddhists, but seen among Muslims. The Muslim population groups studied in this context are: Baltis, Brokpas and Arghuns.

Baltis (Scheduled Tribe): The Baltis inhabit most of the Kargil district and parts of Indus valley and Nubra-Shyok valley in the Leh district. They are believed to belong to the predominant ethnic stock of Ladakh region, i.e., having admixture of Mongoloid and Aryan (Dard) elements. It is suggested that they were earlier Buddhists, but long back converted to Islam when mass conversion took place in Baltistan - the original home of these people. Baltis profess Shia faith of Islam, and therefore they are sometimes referred as 'Shias'. They are mainly agriculturists, and horticulture, animal husbandry are sometimes marginally undertaken. Their spoken language is 'Balti', which belongs to the Tibeto - Chinese family and preserves the archaic characters of pronunciation. However, they use Urdu, Persian characters for writing.

Brokpas (Scheduled Tribe): 'Brok' means high pasture ground; and hence 'Brokpa' connotes 'highlander'. Brokpas are Muslim Dards, and inhabit the valleys along the Drass river and its tributaries in the Kargil district. They are also known as 'Shinna', after their spoken language, which belongs to the Dard group of languages in the non-sanskritic Indo-European family. They profess Sunni faith of Islam and many of their socio-cultural customs are now akin to those of Sunni Kashmiri Muslims inhabiting the adjacent region and also the Baltis. They have not retained much of original customs and rituals after their conversion to Islam long back, unlike their Buddhist counterparts inhabiting the lower Indus valley, who are also known as 'Brog-pa' in the Leh district, but 'Dog-pa' or 'Dukpa' in the Kargil district. They belong to the Aryan stock and are believed to have come from Dardistan (the Gilgit region) in distant past. It seems that they had been mentioned in ancient chronicles by the Greek authors. The main occupation of the Brokpas is agriculture. Their subsidiary occupation is animal husbandry, and negligibly horticultural activities. Many even venture out for jobs.

Arghuns (Community): Since long, the Ladakh region occupied a nodal position on the

central Asian trade route and, therefore, was frequently traversed by merchants from various regions including Kashmir valley and central Asia. Arghuns are the descendants of Muslim merchants of Kashmir valley, Yarkand, and also Muslim missionaries. These people married local Buddhist Ladakhi women who converted to Islam and eventually settled there. They profess Sunni faith of Islam. Many of their socio-cultural customs bear similarity with those of the Sunni Kashmiri Muslims of the Kashmir valley. They inhabit mainly the Indus valley in Leh district, but a smaller proportion is also found in the Zaskar valley in Kargil district.

Their spoken language is 'Ladakhi' belonging to the Tibeto-Chinese family, but many can converse in Balti, Turkish, Tibetan, and Kashmiri languages. However, Urdu characters are mostly used for writing. They are mainly engaged in trade and commerce. Some however, have taken to agriculture with minimal horticultural and animal husbandry activities.

The study data were collected from 503 married Muslim women (primary respondents) using interview schedules and participant observation. Of these, 298 were Baltis, 54 were Brokpas, and 151 were Arghuns. The samples were drawn randomly from both Leh and Kargil districts of the Ladakh region after studying their distribution pattern. Detailed information on demographic, economic and socio-cultural aspects were collected using probing and the life history approach method. That is, the integrated pregnancy /birth histories of the respondents were reconstructed as a detailed chronological list. In between, various other events in the household or in respondent's life were also fitted in. The collected information was continuously cross-checked from other members of the household, particularly elders, as well as, local para-medical staff, village heads, religious and local leaders, who were more conversant with the local population. Further, if a marriage was reported as consanguineous, the reason(s) were noted and the family pedigree was carefully drawn extending upward to two earlier generations on the side of each spouse in order to determine the existence and type of consanguinity involved. Consanguineous marriages in the present study were classified into: (i) uncle-niece marriages; (ii) first cousin marriages (parallel and cross-cousin marriages); and (iii) consanguineous marriages more distant than first cousins, i.e., second cousins and

beyond.

The collected data were then coded and entered in an IBM PC for analysis using the standard SPSS /PC+ program package (Statistical Package for Social Sciences). The data were analysed for incidence and type of consanguinity, coefficient of inbreeding, effects of consanguinity on fertility and child survival.

The degree of consanguinity, measured by the coefficient of inbreeding (F) is defined as the probability that a pair of genes at any particular locus in an offspring is derived from a single gene present in one of the ancestors common to both parents (Sanghvi, 1966). The F values of the offspring from marriages between uncles and nieces, between first cousins and between second cousins are, 0.1250, 0.0625 and 0.0156, respectively. The weighted average of all inbreeding coefficients of the progeny including those with $F = 0$, provides the mean inbreeding coefficient (α) of a population, the weights (p_i) being the relative frequency of the progeny with inbreeding coefficient (F_i). Thus,

$$\alpha = \sum p_i F_i$$

In practice, α is estimated from the marriages rather than from the progeny (Roychoudhury, 1976b). The patterns of consanguinity and mean inbreeding coefficients that have been observed in study populations are presented in table 1.

RESULTS AND DISCUSSION

In the Ladakh region of Jammu and Kashmir state, consanguineous marriages seemed to be proscribed among Buddhist Bodhs; but practised, though not widely, amongst various Muslim population groups. The frequencies of consanguineous marriages were found varying from a low of 14.8 percent among Brokpas, to a high of 21.8 percent among Arghuns. The mean inbreeding coefficients were found 0.0075, 0.0111, and 0.0140 in Brokpas, Baltis, Arghuns, respectively (Table 1). The most preferred type of consanguineous marriages amongst all was that between first cousins; more between cross-cousins than between parallel cousins. A few Balti, Brokpa, Arghun women (respondents) have also reported marriages between second cousins. Uncle-niece marriages have also been found in case of a few Arghuns (3 percent) and Baltis (1 percent), although this type is forbidden in Islam, as also reported by Roychoudhury (1976a) among Muslims of Jammu and Kashmir state. The Muslims (Pooled) group registered that the percentage of women marrying a relative was not

Table 1: Incidence of consanguineous marriages and coefficients of inbreeding among Muslims population groups of Ladakh region in Jammu and Kashmir

Population group	Non-consanguineous marriage	Consanguineous marriage	Type of Consanguineous Marriages				Mean Coefficient
			First Cousin				
			Uncle Niece	Parallel Cousin	Cross Cousin	Second Cousin	
Balti	81.2	18.8	0.7	7.0	8.7	2.4	0.0111
Brokpa	85.2	14.8	-	3.7	7.4	3.7	0.0075
Arghun	78.1	21.8	2.6	4.0	12.6	2.6	0.0140
Muslims (Pooled)	80.7	19.3	1.2	5.8	9.7	2.6	0.0116

exactly high (19.3 percent); as the overwhelming majority of marriages were of nonconsanguineous type (Table 1). The mean inbreeding coefficient for the Pooled data was estimated as 0.0116.

The main reasons behind this practice, which have been noted are: rural set-up, maintenance of social and economic status by upper classes; low socio-economic status of the lower classes; strengthening of ties between families; social solidarity; traditionalism; conformity to Islamic customs; maintenance of family property and land; parental domination in decision making and arranging marriages; extended family structure; preference for mates within kin groups; low level of educational attainment. Similar reasons for the practice of consanguinity have been cited by Basu and Roy (1972), Basu (1975), in their study among Delhi Muslims; by Huq (1976) among Muslims of West Bengal. Several other have also endorsed similar viewpoints (Dronamraju and Meera Khan, 1961, 1963; Centerwall et al., 1969; Rao et al., 1972; Rao and Inbaraj, 1977; Devi et al., 1982; Pingle, 1983; Reddy, 1983; Rao and Murthy, 1984; among others). However, it has been reported that there seems a general tendency of decline in the incidence in recent years, due to such factors as, spread of education; increasing mobility and communication facilities; as well as deviation from the traditional ways of mate selection etc. although specific study on the temporal changes is needed for a proper assessment.

It may be mentioned here that, in the Jammu and Kashmir state, whereas the frequency of consanguineous marriages among Ahmediyya Muslims (38.7 percent) reported by Kashyap (1976) seems rather high; the frequency among Muslims in general, has been found only 18.6 percent by Roychoudhury (1976a), which appears not much different from the frequency of consanguineous marriages in Ladakh Muslims

as a whole. These studies have also mentioned that the most frequent type of consanguineous marriage is between first cousins, similar to the finding of the present study.

The comparison of the frequencies of consanguineous marriages across the northern region of India (Table 2) has revealed that in the nomadic Muslim Gujjars of Garhwal Himalayas in Uttar Pradesh there exist relatively very high frequency of consanguinity (61.6 percent) (Bandyopadhyay et al., 1986). And despite physical isolation, and other socio-economic constraints, the Muslims of Ladakh region are practising the same with much lesser frequency (19.3 percent) than the Kashmiri Muslims (23.9 percent - Bhasin and Nag, 1999), and Ahmediyya Muslims of Jammu and Kashmir (38.7 percent - Kashyap, 1976); as well as Muslims of Delhi (range - 22.1 to 37.9 percent - Basu and Roy, 1972; Basu, 1975; Krishan, 1975); Uttar Pradesh (49.4 percent - Basu, 1975; 61.6 percent - Bandyopadhyay et al., 1986); Rajasthan (43.0 percent - Roychoudhury, 1976). These data additionally indicate that such marriage practice is not confined to isolates and geographically restricted communities but is preferred even in numerically large groups without similar constraints.

Table 2 also presents an overall view of practice of consanguinity, among Muslims across various regions / states of India. And, it may be noted that the Gujjar Muslims of Uttar Pradesh still register the highest proportion of such marriages, whereas the Bengali Muslims of Assam have shown the lowest proportion (3 percent - Mukherjee and Chakravorty, 1977).

Although no clear geographical trend in consanguinity is discernible, Table 2 broadly projects eastern region of India as a zone of low to moderate practice of consanguinity. All other region portrays moderate to high incidence of such marriages.

Further, studies on the effects of consan-

Table 2: Incidence of consanguinity and coefficients of inbreeding among Muslims of India

<i>S. No.</i>	<i>Country/Region/ State/Union Territories (U.T.) Population group</i>	<i>Sample size</i>	<i>Consen- guineous marriages</i>	<i>Coefficients of inbreeding (in percentages)</i>	<i>Authors</i>
I. North India					
1.	<i>Jammu and Kashmir</i>				
	Balti	298	18.8	0.0111	Present Study
	Brokpa	54	14.8	0.0071	Present Study
	Arghun	151	21.8	0.0140	Present Study
	Ladakh Muslim	503	19.3	0.0116	Present Study
	Kashmiri Muslim	46	23.9	0.0149	Bhasin and Nag, 1999
	Gujjar	29	13.8	0.0086	Bhasin and Nag, 1999
	Ahmediyya	300	38.7		Kashyap, 1976
	Muslim	3230	18.6	0.0120	Reychoudhary, 1976
2.	<i>Himachal Pradesh</i>				
3.	<i>Punjab</i>				
	Muslim	327	1.22	0.0010	Reychoudhary, 1976
4.	<i>Chandigarh</i>				
5.	<i>Haryana</i>				
6.	<i>Delhi (U.T.)</i>				
	Urban Sunni Muslim (Post Partition)	140	37.9		Basu and Roy, 1972
	Urban Sunni Muslim (Pre Partition)	572	15.9		Basu and Roy, 1972
	Sheikh Sunnis (Urban)	1158	29.1	0.0124	Basu, 1975
	Moghal Sunnis (Urban)	253	22.1	0.0112	Basu, 1975
	Pathan Sunnis (Urban)	72	23.6	0.0112	Basu, 1975
7.	<i>Uttar Pradesh</i>				
	Sayyad Shia (Urban)	1000	49.4	0.0199	Basu, 1975
	Muslim	1231	5.9	0.004	Roychoudhury, 1976
	Nomadic Gujjar (Pastoralist)	112	61.6	0.0370	Bandyopadhyay et al., 1986
8.	<i>Rajasthan</i>				
	Bohra Muslim	412	41.3	0.022	Basu, 1976
II. West India					
9.	<i>Gujarat</i>				
	Muslim	753	39.7	0.025	Roychoudhury, 1976
10.	<i>Maharashtra</i>				
	Memn	198	11.1	0.0066	Malhotra et al., 1977
	Momon	84	23.8	0.0159	Malhotra et al., 1977
	Khoja	95	14.7	0.0098	Malhotra et al., 1977
	Bohra	285	19.6	0.0124	Malhotra et al., 1977
	Irani	57	24.6	0.0175	Malhotra et al., 1977
	All Muslim	719	17.5	0.0094	Malhotra et al., 1977
	Memans	443	27.1	0.122	Sanghvi et al., 1956
	Bohra	493	26.0	0.126	Sanghvi et al., 1956
	Khoja	500	13.0	0.0064	Sanghvi et al., 1956
	Muslim and Parsi	2014	20.7	0.010	Sanghvi et al., 1956
11.	<i>Goa, Daman and Diu</i>				
12.	<i>Dadra and Nagar Haveli (U.T.)</i>				
III. East India					
13.	<i>Assam</i>				
	Bengali Muslim	203	3.0	0.003	Mukherjee and Chakravarty, 1977
15.	<i>Nagaland</i>				
16.	<i>Manipur</i>				
17.	<i>Mizoram</i>				
18.	<i>Tripura</i>				
	Muslim	693	5.2	0.003	Roychoudhury, 1976b
19.	<i>Meghalaya</i>				
20.	<i>Sikkim</i>				
21.	<i>West Bengal</i>				
	Muslim	471	19.3	0.0067	Barua, 1976
	Mominabad Muslim	145	26.9	0.0158	Huq, 1976
	Megha Muslim	187	25.1	0.0147	Huq, 1976

Table 2: Contd...

<i>S. No.</i>	<i>Country/Region/ State/Union Territories (U.T.) Population group</i>	<i>Sample size</i>	<i>Consen- guineous marriages</i>	<i>Coefficients of inbreeding (in percentages)</i>	<i>Authors</i>
	Patketdanga Muslim	175	13.1	0.0074	Huq, 1976
	Kabiraj Pur Muslim	131	17.6	0.0106	Huq, 1976
	Ekdala Muslim	118	28.0	0.0166	Huq, 1976
	Lalita Kundu Muslim	79	25.3	0.146	Huq, 1976
	West Bengal Muslim	835	22.2	0.135	Huq, 1976
	Muslim	63	5.9	0.004	Roychoudhury, 1976b
22.	<i>Bihar</i>				
	Muslim		55.0	0.027	Anjami and Roy, 1989
	Muslim	388	9.5	0.006	Roychoudhury, 1976
23.	<i>Orissa</i>				
IV.	<i>Central India</i>				
24.	<i>Madhya Pradesh</i>				
	Muslim and Bohra	351	59.3	0.0263	Goswami, 1970
	Muslim	173	60.1	0.0287	Goswami, 1970
	Bohar Muslim	178	52.8	0.0241	Goswami, 1970
V.	<i>South India</i>				
25.	<i>Karnataka</i>				
	Muslim (Hospital Patients)	616	22.4		Devi et al., 1981
	Muslim (Hospital Patients)	642	22.0	0.0131	Devi et al., 1981
	Muslim	76	27.6	0.018	Roychoudhury, 1976b
	Muslim		25.6	0.0159	Bittles et al., 1985
	Muslim	10789	27.7	0.0173	Bittles et al., 1987
	Muslim	43	46.5		Devi et al., 1987
26.	<i>Andhra Pradesh</i>				
	Shaikh and Syed	77	24.7	0.0154	Mukherjee et al., 1977
	Muslim	7	28.6	0.018	Mukherjee et al., 1977
	Urban Muslim		24.7	0.015	Dube, 1960
	Muslim	40	47.5	0.0296	Mukherjee et al., 1977
	Muslim	5	20.0		Dronamraju and Meera Khan, 1960
	Muslim	65	46.2	0.030	Roychoudhury, 1976b
	Muslim	356	36.2	0.025	Sanghvi, 1966
27.	<i>Tamil Nadu</i>				
	Muslim	983	34.2	0.021	Roychoudhury, 1980
	Urban Muslim	549	17.5		Ramesh et al., 1989
	Vellore Muslim			0.0019	Asha Bai et al., 1981
	Rural Muslim (N. Arcot)			0.0201	Rao, 1983
	Urban Muslim (N. Arcot)			0.0113	Rao, 1983
	Madras Muslim (Moplah)	500	24.0		Chakravarti, 1968
	Rural Muslim (N. Arcot)	212		0.0201	Rao and Inbaraj, 1977
	Urban Muslim (N. Arcot)	1960		0.0123	Rao and Inbaraj, 1977
	Muslim (N. Arcot)	6116	19.6		Rao et al., 1971
	Muslim (Vellore town)	15	60.0		John and Jayabal, 1971
	Muslim	983	34.2	0.021	Roychoudhury, 1976b
	Rural Muslim (N. Arcot)	120	37.7		Rao et al., 1972
	Urban Muslim (N. Arcot)	1445	19.4		Rao et al., 1972
28.	<i>Kerala</i>				
	Muslim	215	21.4		Ali, 1968
	Malayalam Muslim	45	26.7	0.0167	Ali, 1968
	Tamil Muslim	35	25.7	0.0130	Ali, 1968
	Urdu Muslim	42	31.0	0.0141	Ali, 1968
	Muslim	562	17.3	0.011	Roychoudhury, 1976b
29.	<i>Pondicherry (U.T.)</i>				
VI.	<i>Islands</i>				
30.	<i>Lakshadweep (U.T.)</i>				
	Koya Muslim	176	33.5	0.021	Roychoudhury, 1977
	Malmi Muslim	435	4.1	0.002	Roychoudhury, 1977
	Melachari Muslim	1471	6.3	0.004	Roychoudhury, 1977
31.	<i>Andaman and Nicobar Islands (U.T.)</i>				

Table 3: Average numbers of children ever born¹ and surviving¹ and proportion of surviving children¹ among Muslims of Ladakh region in Jammu and Kashmir

S. No.	Demographic Parameter	Type of marriage	Muslim population group			
			Baltis	Brokpa	Arghuns	Pooled
1.	Average numbers of children ever born ¹	Non-Consanguineous	4.50	4.98	3.57	4.28
		Consanguineous	4.91	5.13	4.18	4.68
2.	Average number of children surviving ¹	Non-Consanguineous	3.21	3.46	3.03	3.19
		Consanguineous	3.29	2.63	3.21	3.21
3.	Proportion of surviving children	Non-Consanguineous	0.713	0.695	0.849	0.745
		Consanguineous	0.670	0.513	0.768	0.686

¹Estimated per married woman (respondent)

guineous marriage on fertility have also shown varying findings. Darlington (1960) postulated that human stocks could maintain the highest fertility with regular consanguineous marriages. And, elevated fertility levels in such marriages than in non-consanguineous ones have been observed in various populations of the world by many authors (Eaton and Mayer, 1954; Book, 1956; Schull et al., 1970; Freire-Maia and Azevedo, 1971; Hussein, 1971; Schull and Neel, 1972; Phillippe, 1974; Shami et al., 1990).

In India, higher fertility levels in consanguineous marriage were noticed in Delhi and Uttar Pradesh by Basu (1975); in Orissa by Reddy (1979); in Karnataka by Devi et al. (1981), Saheb et al. (1981), Bittles et al. (1985, 1987), Hann (1985); in Andhra Pradesh by Reddy and Rao (1978), Ray (1979), Reddy and Reddy (1979), Sirajuddin and Basu (1984), Srikumari et al. (1985), Reddy (1987); in Tamil Nadu by John and Jayabal (1971), Asha Bai et al. (1981) (among others). Among the Ladakh Muslims as well, in the present study, fertility (number of children ever born) seems higher in consanguineous marriages than in non-consanguineous ones (Table 3).

Hence, the assumption that consanguinity is confined mostly to areas of low population density and leads to decreased fertility (Cavalli-Sforza and Bodmer, 1971) appear nullified. Recently, Rao (1991) concluded that inbreeding has not resulted in a marked decrease in fertility in South India, except in pre-selected groups such as, sick children or among the mentally retarded individuals. And therefore, rather than disturbing the established social practice of consanguinity (in south India) it would be advisable to provide genetic counselling to those families that have an affected child.

However, it may be noted that lower fertility levels in consanguineous marriages than in nonconsanguineous ones have also been

reported in many studies (Bemiss, 1858; Marcallo et al., 1964; Post, 1965; Centerwall and Centerwall, 1966; Kumar et al., 1967; Conterio, 1969; Ghosh, 1972; Barua, 1976; Reid, 1976; Ansari and Sinha, 1978; Devi et al., 1981; Srikumari et al., 1985).

Similarly, the studies on consanguinity and child mortality and survival also have been found varying. Many studies from across the world have reported elevated mortality rates in the offspring of consanguineous marriages as compared to those of non-consanguineous ones (Bemiss, 1858; Sutter and Tabah, 1953; Schull et al., 1970; Hussein, 1971; Seemanova, 1971; Shami et al., 1990; among others). In India too, a host of studies have observed the same trend (Stevenson et al., 1966; Kumar et al., 1967; Chakravarti et al., 1971; Basu, 1975, 1978; Reddy 1979; Saheb et al., 1981; Sirajuddin and Basu, 1984; among others). But on the other hand, some studies have also reported that parental consanguinity does not contribute to increased offspring mortality or decreased proportion of survivors (Cook and Hanslip, 1966; John and Jayabal, 1971; Bittles et al., 1985). In the present study too, the proportion of surviving children appears lower in consanguineous than in non-consanguineous marriages, as seen in many other regions (Table 3).

Thus, the above results and discussion points that the incidence of consanguinity is relatively low in Ladakh Muslims despite physical isolation and various socio-economic constraints, and probably several factors are involved in the mate-selection process. Further, even though increased fertility and decreased proportion of surviving children have been observed in consanguineous than in non-consanguineous marriages among Ladakh Muslims, as also noticed elsewhere, a variety of other independent determinants have been found to be influencing these as well (Bhasin and Nag, 1999).

KEY WORDS Consanguinity Incidence. Coefficient of Inbreeding. Fertility. Child Survival. Ladakh Muslims. Jammu and Kashmir. India.

ABSTRACT In the present paper, 503 married Muslim women belonging to Balti, Brokpa and Arghun population groups of Ladakh region have been studied. The incidence of consanguinity have been found relatively low at 19.3 percent, when compared with other Muslim population groups of northern India. The mean coefficient of inbreeding has been estimated as 0.0116 for Ladakh Muslims as a whole. The most prevalent type of consanguineous marriage is that between first cousins. The Ladakh Muslims also show increased fertility and decreased proportion of surviving children in consanguineous than in non-consanguineous marriages, as noticed elsewhere as well.

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