

Population Dynamics, Problems and Prospects of High Altitude Area: Ladakh

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INTRODUCTION

The areas situated 2500 meters above mean sea level are called 'high altitude' areas. Although there is no precise cut-off point. At this particular altitude, the lowering of oxygen pressure associated with high altitude zones, begins to have significant effect upon man and also exerts important effects on plants and animals which man uses for his subsistence (UNESCO, 1973). In other words, high altitude is a unified name given to a diverse group of areas in terms of the stresses they impose on human population. They differ widely with respect to low oxygen/atmospheric pressure (depending on elevation) and cold (depending on longitude and latitude). If such areas receive scanty rains, lasting only for a couple of hours, twice or thrice in a year, are swept away by excessively cold northern winds from central axis, with only marginal to no natural vegetation, reducing in general the oxygen availability for breathing, they become cold deserts. The moisture is present as ice and snow, but is not readily available for organic sustenance. In the absence of adequate supply of breathable oxygen and drinking water the region experience physiographic drought and thus constitutes *cold desert environment*.

In the high altitude areas, bio-chemical, physiological and anatomical features of acclimatisation become progressively more pronounced. People inhabiting these areas have to face environmental hazards like low atmospheric pressure, severe cold, strong winds and solar radiation. In such areas, man environment relationship is influenced by genetic make-up, eco-sensitivity and socio-cultural factors.

Extreme weather conditions do not attract communities due to unpleasant physiological and physical conditions associated with the cold deserts. However, these areas become attractive where there are mineral deposits or to people who are seeking refuge from political or religious persecution. In Ladakh, presence of gold attracted people. Much of the economic life of

Ladakh is carried on at high altitude and it has been for centuries. At this altitude, Ladakhis built a habitation with incredible terracing and ingenious irrigation system, forts and *Gompas*. It has been proved that human beings combine their bio-cultural capabilities to encounter environmental stresses. Some of these stresses are easily manageable by the socio-cultural factors, while others are not.

A social group adapts (*i.e.*, respond over time) to its environment through a cultural system that contains several dimensions, *i.e.*, technological, organisational and ideological. The relationship between nature and culture is both interactive and dynamic with human beings trying to mould the environment to their ends, thereby achieving a viable relationship over generations, although to a great extent they always have to work within the limits set by nature.

For centuries thus, man's interaction with his environment has been undergoing change and adaptation. But today, the increasing scale and rate of changes, be it unplanned (like rapid population growth, increasing population movements or mobility, growing aspirations, unforeseen natural processes) and/or planned (increasing ameliorative or developmental activities, often resulting from unplanned changes as well), threaten to exceed the present adaptive capacities of many individual societies, particularly in the fragile, finite areas like high-altitude zones, and the whole biosphere by altering natural and socio-cultural systems.

In such a backdrop, the present study has been conducted to explore problems and prospects of a high altitude area-Ladakh Division in the State of Jammu and Kashmir, India.

Ladakh division in the state of Jammu and Kashmir, comprising of Leh and Kargil districts, and inhabited by different ethnic groups, is remote, inaccessible, resource-poor high altitude zone in western Himalayas, that witnessed little change or advancement in the operative economic and technological level over the centuries. Till recent times, the region evidently remained a model of human adaptation to an

extremely sensitive environment by evolving time-tested methods to meet the challenges. The high-altitude, harsh natural environment of Ladakh is characterized by extreme cold and dryness, high radiation, strong winds, low precipitation, low humidity; and desert-like extensive barren landscape; rugged topography; steep and vertical glaciated slopes; minimal forest cover and mineral resources; few pasture lands at high elevations; and settlements in narrow oases like valleys having limited arable land and limited water for irrigation purposes [suggesting an encapsulated environment as elaborated by Goldstein (1981)].

AREA

The Ladakh region comprising of Leh and Kargil districts is a mountainous country situated in the Eastern part of the Kashmir valley in Jammu and Kashmir state, Lying between $32^{\circ} 15'$ to 36° latitude and $75^{\circ} 15'$ to $80^{\circ} 15'$ longitude, Ladakh is bounded on the north and east by China and in the north-west by Gilgit and Skardu, whereas

Baramulla, Srinagar, Anantnag and Doda districts of the state of Jammu and Kashmir lie in the west and the states of Punjab and Himachal Pradesh touch its southern borders. Ladakh with an area of 96,701 square kilometers (includes 78,414 sq. km under the illegal occupation of Pakistan, and 5,180 sq. km illegally handed over by Pakistan to China, and 37,555 sq. km under the illegal occupation of China), which represents about 44 percent of the total area of Jammu and Kashmir state is one of the most elevated regions on the earth (Table 1). It is inhabited by 71,857 persons and has one of the lowest population densities in the world (Table 2). Whereas Leh district consists of only Leh tehsil the Kargil district consists of Kargil and Zaskar tehsils (Table 1)

The land surface of Ladakh region can be broadly divided into the upper zone above 4500 m and the lower zone between 2700 m to 4500 m (approximately). In the former zone, most of the land surface is above 5000 m and is unfit for any vegetative growth or human settlements. Only very limited land surface between 4500 m to 5000 m

Table 1: Details of districts, area, number of tehsils, towns, villages, occupied residential houses (1981) in Ladakh and Jammu and Kashmir

State District	Area (in km ²)	Number of tehsils	Number of towns	Number of villages	Number of occupied residential houses
Jammu and Kashmir	222236 ¹	50	58	6758	819172
Ladakh Region					
Leh	82665 ²	1	1	113	14042
Kargil	14036	2	1	129	10654

1. Includes 78114 km² under illegal occupation of and 5182 km² illegally handed over by Pakistan to China, and 37555 km² under illegal occupation of China.

2. Includes 37555 km² under illegal occupation of China.

Source: Census of India, 1981, Part XII, Series 8, Census Atlas, Jammu and Kashmir, Director of Census Operations, Jammu and Kashmir, 1990.

Table 2: Distribution of Population (1981) intercensal change in population (1971-1981), density (1981), sex ratio (1981) in Ladakh and Jammu and Kashmir

State/District	Population			Intercensal Change in Population (1971-81)	Density	Sex ratio
	Males	Females	Persons			
Jammu and Kashmir	3164660 (4014100) ¹	2822729 (3704600) ¹	5987389 (7718700) ¹	29.69 (28.92) ²	59 (76) ²	892 (923) ²
Ladakh Region						
Leh	30248	32132	68380	31.78	2	886
Kargil	35609	30383	65992	23.58	5	853

1. The population figures exclude population of areas under unlawful occupation of Pakistan and China where census could not be taken. The figures in brackets indicate projected estimate of population in 1991, prepared by the Standing Committee of Experts on Population Projections (October 1989)

2. Figures in brackets indicate change in population during 1981-1991, density in 1991, sex ratio in 1991, as per projections prepared by the Standing Committee of Experts on Population Projections (October 1989), since the 1991 census has not been held in Jammu and Kashmir.

Sources: Director of Census Operation, Jammu and Kashmir (1990) - Census of India, 1981, Part XII, Series-8, Census Atlas, India: Paper-2 of 1992. Final Population Totals, Brief Analysis of Primary Census Abstract.

has few pastures and allow pastoral activities of rudimentary kind, as settled agriculture is not possible due to thin or no soil cover, extremely low temperature for most of the year and low precipitation. Human settlements and settled agriculture are confined to the lower Zone, in narrow oases like valleys, alluvial fans, talus cones, where soil cover is reasonably thick, slopes are gentler or land can be cut into terraces for cultivation and with a short summer season perennial or snow-fed springs or streams in the vicinity.

Cultivation and habitations in the Ladakh region are mostly confined to the river valleys, like Indus valley, Nubra-Shyok valley, Shingo-Sru valley (or Dras-Suru-Wakha valley) and Zaskar valley. Some villages are also situated on the low lying mountain slopes and around the rivers in the Chang-Chenmo, Ladakh and Zaskar ranges. The villages under present study are situated in the Indus valley, Shingo-Suru valley, and in the regions of Zaskar range.

Since both Leh and Kargil districts are situated in the Trans-Himalayan rain shadow zone, rainfall is low. In Leh district, it is limited to 99.7 mm as normal annual. Winter precipitation is also low, at 40 to 50 mm (approximately). The average annual rainfall in Kargil district is recorded 250 to 300 mm. Excepting the Drass region, where winter precipitation in the form of snow is high at 500 mm, in other places it usually does not exceed 200 mm.

In Leh district the minimum normal temperature is not more than 11.7°C, while the annual minimum temperature is as low as -1.3°C. The Kargil district has a mean annual temperature of 9°C. For nearly half of the year, the temperature remains below 6°C and the winter temperature in some areas drop even to -50°C. During winters, the human activities get extremely limited.

Land Utilization: Topographical features and harsh climatic conditions of the district restrict maximal land utilization. Details of the land utilization statistics are presented in table 3.

PEOPLE

Population Statistics: Population distribution of Ladakh is affected by its physiographic, orographic and stratigraphic set up. According to the Census of 1981, the population of Ladakh is 134,722 out of which 71,857 are males 62,515 are females. About 91 per cent of populations is rural. Density of population in Leh is 2 persons per sq. km, while in Kargil it is 5 persons per sq.

km as compared to density of the state, which is 59 per sq. km (in 1981). Sex ratio in Ladakh is 879 females per thousand males (Census of India, 1981); it is 886 in Leh District, which is a Buddhist dominated area, while it is lower in Kargil district, a Muslim dominated area at 853 females per thousand males (Table 2).

In 1981, total population of Leh district stood at 68,380, with 36,748 males and 32,132 females (Table 2). The rural areas returned 55,662 persons (87.25 percent) and only 8,718 person (12.75 percent) were recorded in the urban area. In the 1971-81 decade, the district registered an absolute population increase of 16,489 person over the 1971 population of 51,891. Therefore the percentage change (or the growth rate) during that decade was as high as 31.78 percent (Table 2).

In 1981, the Kargil district had an overall population of 65,992 persons, consisting of 35,609 males and 30,383 females (Table 2). The district had the lowest population as compared with other districts of the state. The rural population stood at 62,465 (94.66 percent); while urban areas returned only 3,527 persons (5.34 percent). In the 1971-81 decade, there has been a net addition of 12,592 persons in the district, resulting in high population growth rate of 23.58 per cent (Table 2).

According to the 1981 census, the district Leh had 29,777 (43.55 percent of total population) main workers. Of these, 21,029 (70.62 percent) were females (Table 4). In the primary sector, 17,415 persons were cultivators; 2,191 persons were agricultural labourers; 1,442 persons were engaged in livestock, forestry, orchards and allied activities and only 3 persons were engaged in mining and quarrying. In the secondary sector, 701; and 545 persons were active in manufacturing, processing, servicing, repairs and construction respectively. In the tertiary sector, 735 persons were engaged in trade, commerce; 306 persons in transport, storage; communications; and 6,439 in other services.

The Kargil district recorded 29,915 main workers (45.33 percent) in the year 1981; of which 19,604 workers were males (65.53 per cent) and only 10,311 workers were females (34.47 percent) (Table 4). In the primary sector, the district registered 22,204 cultivators, 973 agricultural labourers, 300 workers engaged in livestock, forestry and orchards and allied activities and only 7 workers engaged in mining and quarrying. The secondary sector returned 323 workers

Table 3: Land Utilization patterns in Leh and Kargil districts (in hectares) of Ladakh region, and in the state of Jammu and Kashmir (in lakh hectares).

Particulars	Leh District		Kargil District		Jammu and Kashmir
	1983-1984	1987-1988	1983-1984	1986-1987	1983-1984
Reporting area	44036	444798	19257	19347	24.17
Forest	-	-	64	64	6.70
Area not Available for Cultivation :					
Land put to non-agricultural uses	1737	1971	1147	1183	3.05
Barren and unculturable Land	24893	26969	4163	4337	2.56
Total	26630	26940	5310	5520	5.61
Cultivable Waste Land:					
Permanent pastures and other					
Grazing land	-	-	-	-	1.23
Land under miscellaneous trees and grooves	2546	2864	374	417	0.93
Cultivable waste land	4331	4250	4724	4481	1.45
Total	7171	7144	5098	4898	3.61
Fallow Land:					
Fallow other than current fallows	114	135	2	-	0.08
Current fallows	345	320	29	5	0.88
Total	459	455	31	5	0.96
Net Area sown	9990	9940	8754	8860	7.29
Total cropped area	10271	10054	9460	9780	2.82
Area sown more than once	281	114	715	920	10.11

Sources: Directorate of Economics and Statistics, Jammu and Kashmir, 1984-85, 1986-87, 1987-88

engaged in manufacturing, processing servicing and repairs; 676 workers in the construction activities. In the tertiary sector, 490 workers were engaged in trade and commerce, 295 workers; and 4,647 workers engaged in transport, storage, communications; and other services respectively.

In the Leh district of the total population of 60,565 (excluding 0-4 age group) returned at 1981 census only 17,209 were recorded as literate, registering the literacy rate of 28.41 percent (Table 4). The male literacy rate was 41.21 percent, as against a low female literacy rate of 13.76 percent. The urban literacy rates for both males (61.04 per cent) and females (35.33 per cent) were considerably higher than rural male (37.99 percent) and female (10.96 percent) literacy rates.

The district Kargil has only 12,443 literate in 1981, the lowest in the state, registering a literacy rate of 21.31 percent (excluding 0-4 age group) (Table 4). The male literacy rate (excluding 0-4 age group) of 35.99 percent was much higher than the female literacy rate of the district. Expectedly, urban male (65.57 percent) and female (21.78 percent) literacy rates were higher than the rural male (34.23 percent) and female (2.67 percent) literacy rates.

POPULATION GROUPS

Bodh/Bot/Boto: The Bodhs form bulk of the population in the Leh district, whereas in the Kargil district, they are the second largest population group. Although they belong mainly to the Mongoloid ethnic stock; historical accounts refer to the blending of both Mongoloid and Aryan elements, the former being the stronger one. They profess a form of Buddhism, which essentially includes Lamaism. The main occupation of Bodhs is cultivation, supplemented by horticulture, animal husbandry. Nowadays, they are increasingly opting for services and also trade and commerce. The language of the Bodhs is 'Ladakhi / Bodhi', which belongs to the Tibeto-Chinese family, and has regular grammar and dictionary.

Gara: The Garas are Mongoloid Buddhists of lower order (*Rigmun*) and speak Ladakhi. Their main occupation is blacksmithy and they are found in almost every large Ladakhi *Bodh* or *Bhoto* village. Between Gara and other ethnic groups in the village there is a specific kind of relationship which resembles *Jajmani* (patron-client) system of caste society of plains.

Table 4: Distribution of main workers and literates (1981) in Ladakh region and Jammu and Kashmir

State/District	Main Workers			Literates		
	Male	Female	Person	Male	Female	Person
Jammu and Kashmir	1651846	166726	1818572	1148569	448207	1596776
Ladakh Region						
Leh	21029	8748	29777	13323	3886	17209
Kargil	19604	10311	29915	11488	955	12443

Source: Director of Census Operation, Jammu and Kashmir (1990) Census of India, 1981. Part-XII, Series-8, Census Atlas, Jammu and Kashmir

Mon: Mons are Ladakhi speaking Buddhists, occupying a lower status (*Rignun*) in the social hierarchy of the Ladakhi society. They are professional drummers and musicians but few also grow barley, wheat in their small land holdings. It was stated in a recent report that the population of Mons in Leh district is 873 and forms 1.17 percent of the total population of Ladakh. The term 'Mon' has been used for water dwellers by Tibetans. They contributed largely to the development of Ladakhi irrigation system.

Beda: They too belong to the lower strata of the Ladakhi society. A family or two of these are found in every village. Bedas are pipers but have taken to agriculture on small land holdings. Bedas are 319 in number. They are Buddhists as well as Muslims and form 0.43 percent of the total population of the Leh district (Tribal Census of Ladakh, 1991, Registrar General of India). The term *Beda* is derived from the Tibetan word *be* and *da*. *Be* refers to separately and *da* means reside. Local tradition maintain that the Bedas came from Lahaul, a long time after the Mons. All Muslim

musicians are called Bedas. Muslim Bedas have permanent homes like the Mons whereas Buddhist Bedas are mostly wandering minstrels. Muslim Bedas have some land also while most Buddhist Bedas earn their living by playing music only.

Changpa: The Buddhist Changpas are the tribe of tent (*Rebo*) dwelling pastoral transhumants of Ladakh who form an ethnic entity. The nomadic and semi-nomadic Changpa people of the Rupshu plateau are pure Tibetans and it is probably herders like them who first populated Ladakh. They inhabit high plateaus of Rupshu, Kharnak and Karzok. In Rupshu and Kharnak, the whole community leads transhumant life, while in Karzok 90 percent are transhumant and ten percent lead sedentary life. In Karzok pastoralism, trading and marginal agriculture are the economic pursuits followed by Changpas. They too belong to the Mongoloid ethnic stock and *Changkyet*, a Tibetan dialect is spoken by them. They profess Buddhism but their youngmen do not become Lamas (Drew, 1912;

Table 5: Salient features of the population groups in Ladakh

S. No.	Population Group	Scheduled Tribe /Community	Religion	Language family	Occupation
1.	Bodh	Scheduled Tribe	Buddhism	Tibeto-Chinese	Agriculture, horticulture, animal husbandry
2.	Gara	Scheduled Tribe	Buddhism	Tibeto-Chinese	Blacksmithy
3.	Mon	Scheduled Tribe	Buddhism	Tibeto-Chinese	Carpentry, drummer, musicians
4.	Beda	Scheduled Tribe	Buddhism	Tibeto-Chinese	Pipers
5.	Changpa	Scheduled Tribe	Buddhism	Changkyet (Tibetan)	Pastoralism
6.	Brokpa/Dukpa	Scheduled Tribe	Buddhism	Brok-skad (Dardic)	Agriculture, horticulture, animal husbandry
7.	Balti	Scheduled Tribe	Islam (Shia Muslim)	Tibeto-Chinese	Agriculture, agricultural labour, horticulture, animal husbandry
8.	Purigpa	Scheduled Tribe	Islam (Shia Muslim)	Tibeto-Chinese	Agriculture, agricultural labour, horticulture, animal husbandry
9.	Arghun	Community	Islam (Sunni Muslim)	Tibeto-Chinese	Trading, agriculture
10.	Brokpa	Scheduled Tribe	Islam (Sunni Muslim)	Shinna (Dardic)	Agriculture, agricultural labour, animal husbandry

Genic 1954; Gazetteer of Kashmir and Ladakh, 1974). As the entire area is a high altitude plateau exposed to heavy snow fall, hail storms, high velocity winds and shifting sand dunes, their main source of livelihood is animal husbandry. In addition to the transhumant Changpas, other groups are found that regard themselves as directly derived from the Changpas or claim a common or collateral ancestry. In most of the villages of the regions through which Changpas migrate, there is a considerable sedentary population of Changpas. Some of these are recent settlers while others are third or fourth generation ones. Tentatively, the area can be divided into two major cultural areas - *Drok* and the *Rong*. The *Drok* cultural area corresponds to transhumant Changpas and *Rong* cultural area to semi-transhumant Lunpas and sedentary Rongpas. *Rong* cultural area lies in the high-altitude mountain valleys and along the narrow valleys of high mountains in the north. Rongpas living in these areas may or may not be transhumant the choice depending entirely on the number of animals owned by the family. The residents of Kerey and Chumoor villages in the northern regions of the Great Himalayan range are semi-transhumants. They have few cultivated fields around villages where they grow barley in summer. As they have large number of sheep and goats they migrate to higher mountain valleys or pasture zones with their flocks. Both Kerey and Chumoor villages are at 5500 meter and 6500 meter above sea level. As these villages are situated along the high narrow valleys. The inhabitants are popularly called *Lunpas*. Even under adverse weather conditions, they are able to grow barley, peas and turnips with simple technology.

The cultivated areas and settled population of Rongpas are mostly found in the villages of Kuyul, Damchok, Key, Chumathang, Nyoma, Ney, Kesar and Lickchay situated along the Indus river. Agriculture is their way of life.

Brokpas: Brokpas (highlanders) are Dards, who are believed to be the survivors of the pure Aryan race inhabiting the lower Indus valley from Dah of the Leh district to Batalik of the Kargil district. According to historians, they migrated from Dardistan in search of pastures and settled along the lower Indus region long ago in areas, which are comparatively warm, abounding in apples, apricots and grapes. Some 130 kilometers, north-east of Kargil there are villages of Dah-Bema, Hano (Hano Goma, and Hano Yogma),

Darchik and Garkon situated on the northern bank of Indus on the road to Baltistan which are inhabited by Dards. These villages are inhabited by 1920 Buddhist Brokpas (Census of India, 1991). All other Dard groups are Muslims and settled in few villages in Ladakh in the Drass region and in north of Kashmir in Gunials and Tibet. The Muslims Dards from Marol in Baltistan to the Buddhist Dards in Ladakh formed a contiguous line along the Indus. They separated during the 17th century when the border between Ladakh and Baltistan was demarcated at Gur-Gud. Buddhist Dards are known as Brogpa/Brokpa in Leh District but Dog-pas or Dukpas in the Kargil district. The Buddhist Brokpa Dard villages have once again in the last few years been subjected to an arbitrary jurisdictional division as subjects of Leh District and Kargil Tehsil of Kargil District. Administratively Dah-Bema, Hano are in Leh District and Darchik and Garkon are in Kargil Tehsil resulting in Buddhist influence in the earlier and Muslim influence in the later bringing changes among the growing generation. Buddhist Brokpas speak Brok-skad, an off-shoot of Dardic linguistic group.

The Brokpa form a distinctive cultural ethnic community nestled in central Ladakh on an offbeat track. They have preserved their language, social customs and many archaic traits of their Aryan forefathers through endogamy and oral tradition. Ethnically, they have no relationship with the Mongoloid - Tibetan strain, otherwise dominant in Ladakh. Surrounded by other ethnic groups on all sides, Ladakhis, Purigpas and Baltis, they are able to preserve certain archaic traits of language, dress and culture. Though nominally they are Buddhists, their Buddhism does not conform with the Buddhism of the rest of Ladakh. Their acceptance of Buddhism is superficial. All Buddhism has been able to accomplish is to provide prayer rituals for birth, marriage and death ceremonies. At present, there is one Lama in Dah village and prior to him there was one more. Dainelli (1925) during his visit to Dali in 1913-14, while sketching the Da Gompa enquired about the faith of the local inhabitants and they did not report themselves as Buddhists. Their real worship is that of local spirits or demons. They have their own dispute solving mechanism, and special religious ceremonies. Till now they have been able to maintain their seclusion and closed system by endogamous marriages, either from within the village or from

the neighbouring Buddhist Dard villages. Outsiders are not welcome in the village premises as Brokpas are scared of pollution.

These Dards of Dah-Bema have retained their ancient religion *Bon-Chos* and much of their ancient way of life. Even while adopting new customs in reference to religion, they adopted Buddhism diluted with remnants of the *Bon-Chos*.

The mainstay of the economy of the Brok-pa is agriculture, horticulture supplemented to a large extent by animal husbandry. Brok-pas rear mostly sheep, goats, dzos, bulls and horses. The Brok-pas do not rear cattle because of religious taboo. Poultry farming is also taboo. Barley, wheat or gram and *Cha* are the main crops. Two crops are grown in a short working season. Pea, tomato, turnip, radish and potato are grown in the house garden.

Balti: Baltis inhabit most of the Kargil district, and parts of 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 the latter being, the stronger one. It is suggested that they were earlier Buddhists, but long back converted to Islam when mass conversion took place, after Mirza Haider Dughlat invaded Baltistan. Baltis profess Shia faith of Islam; therefore they are sometimes referred as Shias. They are quite conservative and orthodox and mostly do not take any thing touched by non-Muslims. Music, dance, entertainment are still avoided unlike the Bodhs. In villages, mosques often serve as focal points.

Baltis are mainly agriculturists, and horticulture and animal husbandry are sometimes marginally undertaken. They too had some occupational stratification with chiefs and nobility forming the highest rank followed by commoners. Those engaged in menial jobs constituted the lowest class. But, it has become insignificant in the present scenario, though superiority of the highest class is still recognized. Their spoken language is Balti, which belongs to the Tibeto-Chinese family and preserves the archaic characters of pronunciation. However, the population being Muslim, Urdu and Persian characters are used for writing.

Purigpa: Much of the Kargil population consists of Purigpas. Originally, Kargil was known as - Purig'' and the Purigpas the original inhabitants and their descendants have been named after their original place. Purigs too claim themselves to be Baltis but Baltis refer to them

as *Purig-Pa*. They profess Islam. Their dialect is a mixture of Ladakhi and Balti. The main occupation of this population is agriculture and they grow barley, wheat and peas.

Argon/Arghun: Argons are the descendant of immigrants from Kashmir valley and Central Asia who intermingled with the local Ladakhi community. The Kashmiris who came from Srinagar in the 17th century were among the first Muslims to settle in the small Buddhist kingdom. Most were traders, but occasionally they were accompanied by men of religion. In Leh, they met the traders of central Asia. Unlike the Kashmiris, few of them lived there. Most would leave Leh when the caravan season was over. Many of Kashmiris who settled in Leh, married Ladakhi women and left progeny, of 'Argons / Arghuns.' Most of them speak the 'Ladakhi' language but can also converse in Turkish and Tibetan languages. They are found in both Leh and Kargil districts. They profess Sunni faith and are mainly traders. Few, however have taken to agriculture akin to the Boto community.

Ramsay (1890) wrote about Argons - "This is the general and only term for hybrid and by no means always signifies a half caste. Arghons are all Mahomedans most of them are Sunnis, but some also Shias. The former are the result of connections formed by Mahomedan traders, who yearly visit Leh in large numbers and the women of the country, while the latter are the result, generally speaking of connections formed between men of Baltistan and women of Ladakh..... The offsprings of these connections are in the first instance, half caste Tibetan Mahomedans called "Arghons", and these again frequently marry pure Tibetan women (converted to Mahomedanism) but their children too are "Arghons", thus it may happen that a man is particularly a pure Tibetan, nevertheless if he traces his descent from a connection formed between a Mahomedan and a Ladakhi woman, he is termed an Arghon" (Ramsay, 1890)

Brokpa/Drog-Pa/Shinna: '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 (as mentioned earlier). 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-pas' in the Leh district but 'Dog-pas' or 'Dukpas' in the Kargil district.

They belong to the Aryan stock and are believed to have come from Dardistan (the Gilgit region) in distant past. There exist two main postulations about the immigration and settlement of Dards. First indicates that they came as invaders, or immigrants driven by conflicts and feuds in ancient times and settled in major cultivated areas. They were at that time either professing pre Buddhist animistic religion '*Bon-chos*', or were already Buddhists, though preserving a lot of their previous traditions. Later on, they had spread to the Drass valley. At some point of time, these people (Dards of Drass valley) were converted to Islam and retained very little of their past, except the language 'Shinna'. The second postulation points out that the Dards of Drass valley might have come later than their Buddhist counterparts, i. e., not so long ago, when the Dards of Gilgit region were already converted to Islam: most probably due to want, oppression, or conflict. The main occupation of Brokpas is agriculture. Their subsidiary occupation is animal husbandry, and negligibly horticultural activities. Because of obvious socio-economic constraints many (mainly menfolk) even venture out for jobs (including various services).

RESULTS AND DISCUSSION

The present study has been concentrated on four major population groups, namely, Bodhs (Buddhist Scheduled Tribe), Baltis (Muslim Scheduled Tribe), Brokpas (Muslim Scheduled Tribe) and Arghuns (Muslim Community).

In all, information on various aspects have been collected from 783 ever-married women respondents (nuclear families) belonging to 650 households (nearly two-thirds of which were rural). Of these, 280 women were Bodhs, 298 where Baltis, 54 were Brokpas and 151 were Arghuns. These primary respondents belonged to 22 villages (rural areas) and Leh and Kargil towns (urban areas) in Leh and Kargil districts of the Ladakh region.

The study villages include: Thiksey, Saboo, Shey, Spituk, Phiyang, Choglamsar, Chuchot

Shama, Chuchot Goma, Mathoo in Leh district and Lotsum, Shargole, Mulbek, Wakha, Thaugdumru, Trespon Minji, Baroo, Chuliskambo/Chanigund, Kharboo, Pandrass, Ranbirpora, Karkit in Kargil district.

POPULATION COMPOSITION

The Ladakh data show a relatively young age structure, typical of developing regions with moderately high fertility and falling mortality. Nearly 39 per cent of the total population is in the age group of 0-14 years with their reproductive years still in the future, thereby indicating potentials for population growth. However, it may be noted that marked inter-population variation exists in the study area. Baltis seem to have the highest percentage of child population (43.2), followed by Brokpas (40.5). And, while the percentage of young population among Bodhs is observed lower (36.5), that among Arghuns appears the lowest (32.1 per cent).

Thus, Baltis as well as Brokpas seem to register younger age composition than Bodhs and Arghuns, attributable probably to higher fertility and various concomitant factors. In Bodhs too, the proportion of young children is not exactly low. In many demographically advanced, but otherwise developing regions/nations (Kerala, Sri Lanka), still lower proportions of children at ages 0-14 years have been noticed. The low percentage of young population among Arghuns, seems akin to the demographically advanced populations, amongst whom fertility has declined in the recent past. However, the Ladakhi Muslims on the whole, seem to have very high proportion of child population (39.9 per cent), due mainly to the higher proportions of children in Baltis and Brokpas, thereby indicating younger age composition than the Buddhists (Bodhs).

In the broad age group of 15-49 years, Arghuns (56.7 per cent) registered the highest percentage, followed by Bodhs, Brokpas and Baltis (48.6 per cent). The total population data have shown that almost half of the population (50.8 per cent) is in the child bearing ages of 15-49 years. This may be attributed to the falling mortality in the region, and *survival* of persons to the age of reproduction. These findings signify potential upward thrust on fertility and population growth, in the finite Ladakh region.

In the peak productive ages of 15-59 years,

the proportion of total study population has been seen 57.2 percent. And persons aged 60 years and above constituted only 4.1 per cent, thereby implying relatively low survival to the old ages (or low life expectancy). Low proportion of population in the old ages is also an indication of young age composition as observed in many developing regions.

The rural-urban composition has shown that rural areas as a whole have larger young population than urban areas attributed partly to higher fertility in the former than in the latter sector. In both sectors, the youngest age composition has been noticed in case of Baltis.

Total Dependency Ratio: The total dependency ratio for the Ladakh study population has been found relatively high at 75. The high ratio of dependants to potential workers broadly indicates possible development drag in Ladakh region for years to come, even if fertility declines in the future. It has also been evident that, in the total dependent ratios, the contribution of young age dependent ratio is overwhelming. This also roughly implies less produce per capita, if not per worker directly, and an economic drain created by the need to rear large numbers of children to adulthood. However, the comparison across individual population groups shows that Bodhs and Arghuns have lower total dependency load while Baltis and Brokpas have higher load.

Sex Composition (Sex Ratio): The sex composition of a population plays a vital role in the population analysis, since it affects the incidence of births, deaths and marriages. The migration rates and almost all population characteristics including socio-economic characteristics, community life are influenced by the sex composition of population and is in turn affected by these attributes. In addition the development of a region also affects the sex composition of population of that area (Jain, 1975).

The sex ratio for the present study population has been found 952 which indicates higher proportion of males than females - a characteristic of developing regions. The inter-population comparison has shown that the sex ratio for Baltis (961) is not much different from that for Bodhs (956), but higher than the estimates for Brokpas and Arghuns. The Muslims on the whole (951) seems to have nearly similar sex ratio as Buddhist Bodhs.

Relatively high sex ratio among Baltis can be

due to the relatively high male-selective out-migration and/or less female-selective out-migration on account of job prospects/marriages (from the study areas). Among the Bodhs, despite higher female literacy, work-force participation, age at marriage and participation in the decision-making process in households, which point to their increased status and economic value, marginally lower sex ratio amongst them than among Baltis may be accidental due to the limited sample size and/or higher male-selective out-migration (which needs further probing). The still lower sex ratio in Brokpas can be due to comparatively high overall female than male mortality. And inadequate educational and medical facilities available to them, poor housing conditions, harsh climate, low status of women, women's early marriage and frequent childbearing, untrained delivery attendance etc. may be the concomitant factors.

Altitude and Fertility: Altitude is an important physical environment of population structure, the effects of which have been widely studied. It must be noted that high-altitude is not an independent entity of the physical environment but actually constitutes several characteristic environmental conditions marked by multiple-stress complexes, such as hypoxia, cold, rugged terrain, high radiation, strong wind and low precipitation (as mentioned earlier), which are the most commonly studied (Clegg et al., 1970). Other typical features, intrinsic to the stress complex are isolation, remoteness, characteristic socio-cultural aspects and relatively low developmental level.

In general, high-altitude physical environmental stresses are believed to exert deleterious effects on human beings resulting in late maturity: low fecundity, fertility; high mortality, particularly foetal, infant and childhood mortality, high morbidity, retardation of pre- and post-natal growth and development, alteration in physiology; which may question the validity of population proliferation (as indicated by the age composition) in these areas. However, some findings, as well as inadequate knowledge of explored/unexplored areas and populations also contest the universality of such viewpoints. [It may be mentioned that the effects of high-altitude stresses on human fertility and mortality have been studied mainly in the Andean region, and only sporadically in the Himalayan region and Ethiopia]. Besides, many studies have also ignored the possible involvement of effects of

economic, socio-cultural, attitudinal, behavioural factors - the confounding factors, on fertility and mortality in the human case. [Much of the historical accounts and later studies on high-altitude human biology including various aspects of population dynamics have been reviewed and discussed by Weihe (1964), Miller (1974), Baker and Little (1976), Baker (1978), Heath and Williams (1981), Goldstein et al. (1983), Basu et al. (1984), Gupta et al. (1987), among others].

It generally appears that high-altitude physical environmental stresses delay female (human) menarcheal age, as observed in the Andean region (Frisancho and Baker, 1970; Frisancho, 1981); and in the Himalayan Region (Lang and Lang 1971; Pawson, 1977; Miklashevskaya, 1979; Bangham and Sacherer, 1980; Beall, 1983). However, Kashiwazaki et al. (1988) did not observe such effect among the Bolivian Japanese; but this could be due to their being non-natives in the high-altitude La Paz in Bolivia. Studies on other reproductive physiological aspects such as, menopause also show detrimental effects of high-altitude stresses. In high-altitude Himalayan populations, Beall (1983) found accelerated age at menopause.

And, since Monge (1948) noted that Spanish settlers of the sixteenth century believed altitude reduced their fertility (although the high-altitude natives were quite fertile), a number of studies have reported the adverse effects of high altitude stresses (mainly hypoxia) on fecundity and fertility in the Andean region (James, 1966; Heer, 1967; Hoff, 1968; Baker and Dutt, 1972; Abelson et al., 1974; Hoff and Abelson, 1976). Similarly, certain studies in the Himalayan region, also generally seem to support the same concept (Bangham and Sacherer, 1980; Gupta, 1980; Weitz et al., 1981). It may be mentioned here that, since, it is extremely difficult to measure fecundity directly in a field situation studies have measured instead fertility at high-altitude assuming that most of the populations are not controlling fertility consciously. But some of these authors as well as others have also pointed out the adverse effects of hypoxia on neonatal and infant mortalities, spontaneous abortions, leading to reduced fertility and lower survival rate of offsprings (James, 1966; Whitehead, 1968; Baker and Dutt, 1972; Abelson et al., 1974; Hoff and Abelson, 1976).

And, in a detailed analysis in Bolivia, Dutt (1980) did not find any significant altitude-related difference in the mean numbers of total

pregnancies and live births, but noticed a significant reduction in number of living children, as a result of significantly increased childhood mortality rates at high altitudes. He stated that differences in neonatal and early childhood mortalities might have biased or complicated the study of the impact of altitude on fertility. However, contradictory reports on altitude infant and child mortality and altitude-prenatal mortality also exist (Cruz-Coke, 1967; Buck et al., 1968; Hoff, 1968; Clegg et al., 1970; Dutt, 1976; Gupta, 1980; Basu et al., 1985; Gupta et al., 1987; Lebedeva and Musuraliev, 1987; Kashiwazaki et al., 1988).

Many studies, however, have doubted the single factor concept of adverse effects of hypoxia on fertility, and pointed out that, apart from the genetic factor, various demographic, economic, sociocultural and other physical environmental factors (like, migration of males to lowland, relatively high age at first birth and average pregnancy gap, higher proportion of women in the labour force, least acculturation, differences in marriage practices and exposure to the risk of conception, rural-urban differences, as well as health differences, under enumeration of children, under reporting of births etc., are responsible for the low fertility at high-altitudes (Stycos, 1963, 1965; Heer, 1964; Heer and Turner, 1965; Whitehead, 1968; Bradshaw, 1969; De Jong, 1970; Goldstein, 1981; Goldstein et al., 1983; Gupta, 1985; Laurensen et al., 1985). Kashiwazaki et al. (1988) in their study in Bolivia, observed that later age at first pregnancy due to later age at marriage, and age at menarche are the major factors explaining fertility performance, while altitude (hypoxic stress) explains only less than 3 per cent of the variance in the same. However, Abelson et al. (1974) earlier mentioned that the differences in marital patterns and socio-economic status, as well as migration in itself did not appear to account for the differences in fertility between the study populations. Basu et al. (1984) have explained the low fertility in Lachen than in Lachung in the Sikkim Himalayas in terms of differential transhumance pattern - a socio-economic attribute, which seems to have led to differential exposure to the high altitude stresses, thereby affecting fecundity/fertility.

Further, contradictory evidence have also been presented. In the Ethiopian study by Harrison et al. (1969), the reproductive capacity seemed similar in both lowland and highland samples. And, relatively high fertility, particularly in reference to the Gupta's (1980) study of

Table 6: Measures of fertility among various population groups of Ladakh regions in Jammu and Kashmir by place of residence

Population group	Place of residence	Measures of Fertility				
		Crude birth rate	General fertility rate	Total fertility rate	Gross reproduction rate	Child woman ratio
<i>Buddhists</i>						
Bodhs	Rural	24.63	99.34	3.00	1.90	543.17
	Urban	24.02	87.30	2.39	1.30	432.20
	Combined	24.46	95.79	2.79	1.70	510.10
<i>Muslims</i>						
Balits	Rural	28.16	118.18	3.72	1.91	699.37
	Urban	14.41	59.88	1.99	0.77	668.83
	Combined	23.57	98.59	3.12	1.53	689.36
Brokpas	Rural	27.17	119.05	3.09	1.55	696.20
	(Combined)					
Arghuns	Rural	5.54	20.62	0.39	-	263.74
	Urban	19.96	67.07	2.19	0.60	420.69
	Combined	14.25	49.81	1.66	0.38	360.17
Muslims (Pooled)	Rural	24.12	99.80	3.10	1.52	617.28
	Urban	16.87	63.44	1.86	0.62	548.50
	Combined	21.44	85.51	2.66	1.18	591.08
<i>Ladakh (Pooled)</i>						
Ladakh (Pooled)	Rural	24.31	99.63	3.06	1.66	590.30
	Urban	18.79	70.02	2.00	0.81	515.59
	Combined	22.44	88.98	2.69	1.36	563.93

completed fertility rate among Khumbu Sherpas have been reported by Goldstein (1981), Goldstein et al. (1983) in the Himalayan region (Nepal, Ladakh). They stated that the low fertility in Khumbu Sherpas (Nepal), as reported by some authors, is not typical of high-altitude Tibetan populations, but rather that the Himalayan (Tibetan) populations generally have moderately high fertility as compared to other Tibetan populations living at moderate altitudes.

It has also been pointed out that the direct effect of hypoxia in reducing fertility in the long-term resident native populations in the Andes and the Himalayas is questionable because of contradictory findings, lack of comparability of samples, methodological shortcomings, serious problems in the quality of the Census and retrospective data, conceptual oversimplification, failure to take account of and control for cultural factors, such as, exposure to the risk of conception, although these do not imply that such an effect does not exist (Goldstein et al., 1983).

In fact, the direct effect of hypoxia in reducing fertility appears rather controversial (Abelson, 1984; Basu and Gupta, 1984; Goldstein et al., 1984a, b; Hoff, 1984), and the relative contributions of hypoxic stress as well as ethnic, demographic and other physical environmental

factors in determining the fertility level in high-altitudes do not seem to be clear as yet. Recently, Gupta et al. (1987) have reported that although their fertility data among Sherpas (mean completed fertility rate, mean number of live births and surviving children, and total fertility rate) do not rule out the possibility of altitude effects per se, concomitant socio-cultural factors may also have important, and perhaps even overriding effects on the same. It may be noted that Lebedeva and Musuraliev (1987) have instead reported higher mean fertility rate per woman and mean number of live births at high-altitudes of Pamir than at low altitudes of Tien-Shan in Kirghizia.

That the effects of high-altitude stresses may not have uniform or universal but varied effects on fertility, and that a host of independent determinants other than hypoxic stress are also influencing the same, can be grasped, when the range of completed fertility rates for high-altitude populations, reported in the literature is considered. The completed fertility rates seem to vary from the low values of 5.8 in Chilean Aymara (Cruz-Coke et al., 1966), or 3.2 in Bhotias of Nepal (Laurenson et al., 1985) to the high values of 8.5 in Chilean Aymara (Cruz-Coke et al., 1966), or 7.4 in Limi, Tibet (Goldstein, 1981). [Bingham and Sacherer (1980) have reported a completed

fertility rate of 7.6 for the Sherpas of Helambu, Nepal, situated at 2600 m, while Goldstein et al. (1983) have presented a rate of 7.2 for the same population]. In a more recent study the completed fertility rate at age 45 years (estimated from the regression equation) for the Japanese married women living at Bolivian high altitudes (3600m) throughout their reproductive period has been found rather low at 2.5 (for their lowland counterparts at 350 m, it is 3.9) [Kashiwazaki et al., 1981].

It may be noted that, in a recent overview of current knowledge, the range of completed family sizes (for all women) among historical and national populations seem to be varying from 5.3 (among rural population of northern China as well as in villages near Bombay) to 9.5 among Hutterites of North America. And, reliable estimates of level of fertility suggest that hunters and gatherers and horticultural populations (inhabiting different parts of the world, having varied physical environment) tend to have values in the lower range of natural fertilities of national populations. For example, the completed family sizes (for all women) for Dobe Kung Bushmen of Africa seems to be about 4.7 (Howell, 1979), and for the Gainj of New Guinea, it appears 4.3 (Wood et al., 1985).

Although Early (1985) has questioned the low fertility estimates reported for forager populations, on the basis of data quality and infanticide, most of the completed fertility values reported by him too, seem to lie within the range of natural fertility mentioned above for historical and national populations, except in case of Kung Subdist (3.5), and N. Territory, Australia (4.2). Besides he seems to have ignored the methodologically rigorous studies.

In relation to these estimates, the completed family sizes among most of the high-altitude populations, reported in the literature, seem to be within the range of natural fertility and are not very low. And, according to another classification of completed fertility rates (Nag, 1968) also, most of the estimates noticed in high-altitude populations, seem to lie in the high category (5.51 and above). Baker (1978) has additionally pointed out that, even though all of the reported completed fertilities are somewhat below the maxima they are providing for rapid population growth and would provide for more than replacement at even the highest of expected mortality rates.

In the present study, the completed family

sizes (for ever-married women aged 45+ years) among Bodhs, Arghuns, Baltis, and Brokpas have been observed 4.1, 4.7, 6.3, 6.8 births, respectively. The estimate for the Muslims as a whole, seem to be 5.8 births. And, for the Pooled Ladakh data, it is 5.2 births. Hence, on the whole, the completed family size for ever-married women in study areas, at the end of their reproductive careers, seem to be 'low' according to the classification by Nag (1968). However, the average number of surviving children to ever-married women aged 45+ years (3.6) broadly indicates potentials for population growth, rather than decline. The age structure for the total study population (39 per cent in ages 0-14 years, as well as broad based pyramid with narrow top), the estimated crude birth rate in conjunction with the crude death rate, and the total fertility rate of 2.7, child-woman ratio of 564 too indicate the same. Individually, Bodhs and Arghuns also seem to have 'low completed family sizes, while Baltis and Brokpas have 'high' ones (as per the categorization by Nag). Muslim evermarried women as a whole, too, seem to have 'high' completed family size.

The total fertility rate among Buddhist Bodhs, and Arghuns, Baltis and Brokpas have been found 2.8, 1.7, 3.1, 3.1 children per woman, respectively. And for the Ladakh Muslims as a whole, the estimate was 2.7 (Table 6).

It may be mentioned here that a host of demographic, economic, socio-cultural and physical environmental determinants (other than the altitude related ones), seem to be influencing the fertility component in study areas as also seen elsewhere, and their differential interplay may be responsible for the observed fertility levels and differentials (Tables 7, 8). But, at the same time, the possible involvement of altitude-related stresses can not also be ruled out per se, particularly in view of relatively low fertility noticed among Bodhs and Arghuns.

It may however be added that, even though the completed family sizes (for ever-married women) in Bodhs and Arghuns seem lower than the estimates in many other high-altitude populations across the world, including Ladakhi Buddhists (6.4) and Ladakhi Muslims (7.2) reported by Goldstein et al. (1983). The estimates reported by Das et al. (1981) for Lachen Bhutias (3.8), by Laurenson et al. (1985) for Muktinath Bhotias (3.2) in the Himalayan region, and by Kashiwazaki et al. (1988) for Japanese women in Bolivian highlands (2.5), appear still lower.

Besides, the scenario in case of Baltis and Brokpas of the high-altitude Ladakh seem different.

In addition, certain 'period' measures of fertility (including CBR, TFR) and even children ever born and surviving estimates for Kashmiri Pandits, Dogra Brahmans, and Dogra Rajputs inhabiting lower altitudes of Jammu and Kashmir Himalayas, have been observed (based on the empirical data collected from Srinagar and Jammu districts during the course of the present study) slightly lower than even the corresponding estimates for Bodhs and Arghuns (Bhasin and Nag, 1999). These findings also point to the involvement of simultaneous effects of several factors including the ethnic factor (which may be socio-cultural and/or genetic factor) other than altitude stresses on fertility. It may also be mentioned that in India, the completed family sizes for women aged 45-49 years, across the major states, having varied physical environment seem to be consistent, 4 to 5 births (Census of India, 1981; NFHS, 1992-93). And, the completed family sizes for currently married women in ages 45-49 years in the Jammu region of Jammu and Kashmir, in the demographically advanced state Kerala, and in India as a whole, have been observed 5.4, 4.3, and 5.2, respectively (NFHS, 1992-93).

The above discussion broadly points out that the effect of high-altitude stresses (mainly hypoxia) on fertility is not uniform and universal across the world, and even within the same region, such as the Himalayas, due to the involvement of several factors as mentioned in many studies, and noticed in present study as well.

The multiple regression analysis employed in case of the present study data have also shown the same. The multiple regression equation estimated for the Ladakh (Pooled) group has shown 8 independent variables as significant predictors of the dependent variable ($p < 0.05$), number of children ever born to ever married women. These variables in the decreasing order of their relative importance (in predicting the dependent variable), as indicated by the Beta values are: (present) age of woman, number of infant deaths experienced by woman, ideal number of children desired, (household) income, place of residence, family structure, age at marriage of wife, and religion. Together, these variables seem to have explained 62.1 per cent of the variation in the dependent variable-number of children ever born. The F (Eqn) statistic - 158.3383, has been found significant ($p < 0.05$),

which points out significant correlation between the dependent and the selected independent variables.

The multiple regression results show that infant mortality is an important determinant of fertility (number of children ever born). It seems people are seeking births, to recompensate for the child loss, and achieve a certain desired number of children. The other important determinants showing positive impact on fertility are, ideal family size desired by woman, age of woman, and (household) income owing to the relatively low level of development of the study area; largely agro-pastoral economy; limited agricultural season and concomitant hardships; relatively high infant and child mortality levels; as well as cultural importance of kinship network; the desire for a certain ideal family size (usually medium to large, *i.e.*, more than the officially recommended norm of two children) is embedded in the perceived values and roles that children perform in their families. And, any increase in this desired ideal number appears to increase fertility. Such a setting may be encouraging the higher income households especially to desire and have more children, so that increase in (household) income seems to increase fertility. However, due to the complex nature of income, a deeper probe into the income - fertility interaction is required. Fertility also increases with the advancement of age of woman.

The religion Islam, as compared to Buddhism, and nuclear family structure, as compared to joint one too, seem to have pronatalist influence. That is, fertility appears relatively high among Muslims, and also when the family structure is nuclear. On the other hand, age at marriage of woman has a negative impact on fertility; *i.e.*, as the age at marriage increases, fertility decreases. This can be due to the delay in exposure to the risk of conception, relatively greater chances of women being educated and/or employed. Education, work force participation enhances the chances of exposure to the outside world, leading to changes in traditional attitude towards family size, sex composition of children, and usage of contraception.

Urban residence as compared to rural one also seems to exert a negative impact on fertility. Existence of certain urban advantages like, relatively better educational, communication, medical facilities, better and diverse employment opportunities, greater exposure to the outside world usually lead to higher literacy, work force

Table 7: Fertility differentials¹ among various population groups of Ladakh region in Jammu and Kashmir; by place of residence

<i>Fertility related variables</i>	<i>Buddhist</i>	<i>Muslims</i>				<i>Ladakh (Pooled)</i>
	<i>Bodhs</i>	<i>Baltis</i>	<i>Brokpas²</i>	<i>Arghuns</i>	<i>(Pooled)</i>	
Rural						
Mean number of children ever born	3.63	4.68	5.00	4.09	4.63	4.25
Mean number of children surviving	3.12	3.23	3.33	3.11	3.22	3.18
Urban						
Mean number of children ever born	3.01	4.37	-	3.47	3.93	3.65
Mean number of children surviving	2.63	3.22	-	3.05	3.14	2.98
Combined						
Mean number of children ever born	3.43	4.57	5.00	3.70	4.36	4.03
Mean number of children surviving	2.96	3.22	3.33	3.07	3.19	3.11

1. Differentials in fertility related variables number of children ever born per woman (ever-married respondent)

2. The sample for Brokpas has been drawn from rural areas only.

Table 8: Fertility differentials¹ (mean number of children ever born) among various population groups of Ladakh region in Jammu and Kashmir; by some independent determinants

<i>Independent Determinants</i>	<i>Buddhist</i>	<i>Muslims</i>				<i>Ladakh (Pooled)</i>
	<i>Bodhs</i>	<i>Baltis</i>	<i>Brokpas</i>	<i>Arghuns</i>	<i>(Pooled)</i>	
Present Age of Woman² (in years)						
15-19	0.67*	0.50*	0.50*	0.60*	0.54	0.56
20-24	1.59	1.33	1.58	1.47	1.42	1.48
25-29	2.37	3.11	4.50*	2.36	3.04	2.79
30-34	3.59	4.32	5.50	3.36	4.15	3.96
35-39	3.93	5.80	6.33*	4.17	5.30	4.88
40-44	4.43	5.90	9.00*	5.15	5.82	5.20
45+	4.06	6.33	6.78	4.70	5.82	5.16
Experience of Fetal Mortalities by Woman						
Not experienced	3.29	4.32	4.64	3.54	4.14	3.81
Experienced	4.08	5.25	6.25	3.79	4.82	4.64
Experience of Infant Mortalities by Woman³						
Not Experienced	3.00	3.38	4.38	3.13	3.38	3.23
Experienced	5.14	6.37	5.91	5.84	6.21	5.91
Experience of Early Childhood Mortalities by Woman⁴						
Not Experienced	3.20	3.65	3.69	3.52	3.61	3.46
Experienced	5.26	7.04	7.42	5.33	6.88	6.51
Economic Characteristics/Occupation of Woman⁵						
Economically inactive	3.49	4.67	5.02	3.61	4.40	4.10
Economically active	3.18	3.74	4.75*	4.32	4.02	3.60
Cultivation, agricultural, unskilled labour	3.61	4.53	8.00*	6.50*	5.24	4.39
Trade/commerce	3.00	4.50*	2.00*	2.80*	3.40	3.14
Service	2.69	2.50	1.00*	4.20	3.17	3.00
Economic Characteristics/Occupation of Husband						
Economically inactive	4.00	5.00*	7.83*	4.64	5.59	5.00
Economically active	3.40	4.56	4.64	3.63	4.30	3.98
Cultivation/ agricultural, unskilled labour	3.79	5.36	5.13	4.26	5.19	4.71
Trade commerce	3.33	4.14	7.80*	3.70	4.13	3.98
Service	3.23	4.04	3.82	3.43	3.80	3.56
Total (Household) Income (in Rupees)						
10000 and less	3.16	4.45	5.00*	2.00*	3.43	3.30
10001-30000	3.16	4.44	4.58	3.54	4.22	3.80
30001-40000	4.06	4.66	5.09	3.84	4.46	4.32
50001 and above	4.42	4.96	7.33*	4.32	4.86	4.77

Table 8: Contd...

<i>Independent Determinants</i>	<i>Buddhist</i>	<i>Muslims</i>				<i>Ladakh</i>
	<i>Bodhs</i>	<i>Baltis</i>	<i>Brokpas</i>	<i>Arghuns</i>	<i>(Pooled)</i>	<i>(Pooled)</i>
<i>Educational Characteristics of Woman¹</i>						
Illiterate	3.55	4.77	5.19	4.14	4.68	4.27
Literate	2.88	2.63	3.71	3.12	3.03	2.98
Primary	3.62	3.00 ^a	3.67 ^a	4.13	3.81	3.76
Middle	3.07	2.40	5.00	2.94	2.97	3.00
Matriculation/ secondary and above	2.29	2.50	0.00 ^a	2.25	2.24	2.26
<i>Educational Characteristics of Husband</i>						
Illiterate	3.64	4.96	5.77	4.97	5.05	4.47
Literate	3.27	4.14	4.54	3.34	3.88	3.69
Primary	3.64	6.59	7.67 ^a	4.14 ^a	6.16	5.51
Middle	3.28	4.90	3.44	3.96	4.32	3.92
Matriculation/ higher secondary	3.23	3.28	4.47	3.02	3.30	3.28
Graduation and above	3.00	1.67	6.00 ^a	2.91	2.87	2.91
<i>Age at Marriage of Woman²</i>						
10-14 years	3.54	5.60	5.90	4.64	5.43	5.02
14-19 years	3.88	4.87	4.12	3.95	4.52	4.33
20-29 years	2.87	3.25	6.82	2.69	3.42	3.13
<i>Family Structure</i>						
Joint Family	3.64	4.19	5.18	3.62	4.12	3.93
Nuclear Family	3.20	4.95	4.88	3.77	4.58	4.12
<i>Age at Menarche of Woman³</i>						
11-12 years	3.41	4.83	4.33	3.36	4.41	4.03
13-14 years	3.66	4.90	5.39	3.61	4.55	4.34
15-16 years	3.64	4.67	4.19	4.08	4.42	4.14
17-20 years	2.99	3.65	6.56 ^a	2.36	3.75	3.37
<i>Type of Educational Facilities Available⁴</i>						
Primary Middle School	3.53	4.75	5.09	3.85	4.71	4.12
Primary/Middle/High School	3.76	4.64	4.94	4.16	4.58	4.34
Primary in Higher Secondary School	3.01	4.37	-	3.47	3.93	3.65
<i>Type of Medical Facilities Available⁴</i>						
Not Available	5.00 ^a	4.38	-	-	4.38	4.40
Medical sub-centre/Dispensary	3.56	5.23	5.64	4.02	4.59	4.18
Primary Health centre Hospital/allopathic dispensary/ tuberculosis clinic	4.52	4.23	4.31	6.00 ^a	4.29	4.33
/family planning centre	3.01	4.39	-	3.47	2.98	3.69
<i>Type of Medical Facilities Availed⁴</i>						
Folk and Modern	3.54	4.85	4.85	3.63	4.60	4.19
Modern	3.21	4.11	5.88	3.75	4.03	3.77
<i>Housing Attributes and Condition</i>						
Poor	2.61	4.25	3.90	3.63	4.08	3.43
Fair	3.73	4.61	5.21	3.39	4.44	4.20
Good	3.67	4.74	6.00	3.94	4.38	4.14

1. Differentials in fertility variables number of children ever born per woman (ever-married respondent)

2. The sample for Brokpas has been drawn from rural areas only.

3. Ever married respondent

4. Facilities available within 5 km of residence.

a. Calculation based on less than 10 cases.

participation, and age at marriage, even in case of women, and also lower infant and child mortality levels. These in turn, often change large family size ideals, offspring gender preference not conducive to fertility.

Altitude and Mortality: As in case of fertility, the interplay between the high-altitude stresses (chiefly hypoxia) and mortality is also fraught

with complexities. Since Grahn and Kratchman (1963) observed positive relationship between neonatal mortality and altitude (in the United States), few other studies also reported adverse effect of altitude on infant, childhood and adolescent mortality (Mazess, 1965; Cruz-Coke et al., 1966; James, 1966; Dutt, 1980). Frisancho and Cossman (1970) however, indicated that poor

medical care might have caused high mortalities in high-altitude areas of the United States (since the association disappears as medical care improved).

Mueller et al. (1981) also pointed out the involvement of socio-cultural factors, geographical isolation, access to medical care, nutrition and other undetermined factors related to living at high altitudes, rather than altitude-related physiological changes *per se* for the differences in illness incidence and mortality rates. Basu et al. (1985) have suggested that high-altitude may not constitute specialized niche and several socio-cultural and other factors may be exerting varying effects on biological traits in high altitude populations. Some studies have also reported no significant difference in the infant and child mortality at low and at high-altitudes (Hoff and Abelson, 1976; Gupta, 1980; Kashiwazaki et al., 1988) and even slightly higher infant mortality at the former than at the latter altitudes (Lebedeva and Musuraliev, 1987).

In the Himalayan region too, Goldstein (1981) observed relatively high infant mortality (infant mortality accounted for 40 per cent of total deaths). But, contrary to the expectation generated by animal experiments, as well as above mentioned studies, the infant mortality rate did not seem to differ significantly between the high altitude Sherpas of Upper Khumbu (Nepal) and low altitude Kalimpong (West Bengal, India) [Basu et al., 1985]. Gupta et al. (1987), while discussing this trend have commented that - hypoxia and such other high altitude stresses, which are generally believed to adversely affect normal growth and development, and consequently survival at pre-and post natal stages, did not operate with any perceptible magnitude, or alternatively similar magnitude of socio-cultural stresses at high altitudes overrode their effects to render the two samples homogenous'.

Das et al. (1981) and Basu et al. (1984) observed high infant mortality in Lachung in Sikkim, India. Weitz (1984) also found high childhood normality in Sherpas of Nepal, but attributed it to their traditional and isolated nature. In a study in some populations of West Bengal, India and neighbouring regions, Basu et al. (1985) point out that - 'while there are no detectable effects of high-altitude physical environmental factors on infant mortality rate, effects of sociocultural and/or ethnic factors are demonstrated in these mountain dwelling

populations residing between 1500 m and 2600 m, one of them being exposed to the high-altitude environment at 4000 m for a large part of the year. Therefore..... claimed "altitudinal" differences in mortality in reality may be attributed to "concomitant socio-cultural" differences'. And, the absence of significant difference in infant and adolescent mortality rates between the high and low altitude Sherpas reported earlier by Gupta (1980) has been suggested to be 'due to the long standing exposure of Khumbu Sherpas (Nepal) to the high-altitude, which has triggered some mechanisms whereby the adverse effects of the environment, especially on infant and adolescent survival have been adequately counteracted'. Interestingly, a study (Lebedeva and Musuraliev, 1987) in the Pamir region, showed lower infant mortality rate in high altitude areas than in low altitude. Though, the reverse was reported in case of the adolescent mortality rate.

It may be mentioned that the low fertility in high altitude can be due to adverse effects of hypoxia not only on fecundity; but also on neonatal, infant mortality and spontaneous abortions leading to low survival (James, 1966; Whitehead, 1968; Baker and Dutt, 1972; Abelson et al., 1974; Hoff and Abelson, 1976; Baker, 1978).

In the present study as well, marked intra- and inter- population differences indicate the possible involvement of effects of economic, socio-cultural, physical environmental factors (other than altitude) on infant and child mortality (Tables 9, 11). However, the possible effects of high-altitude stresses in the study areas, can not also be ruled out completely, as the infant and child mortality levels appear rather high. The infant mortality rate in the present study population have been estimated as 132.8 deaths per thousand live births. And, at the individual population level the estimate varied from 76.9 (among Arghuns) to 200.0 (among Brokpas). Ladakh Buddhists and Ladakh Muslims as a whole have registered rates of 97.6 and 152.8 deaths per thousand live births, respectively (Table 9).

Further, among all the study population groups, out of total child (offspring) deaths experienced by woman (ever married respondent), the percentage of infant deaths appeared the highest [range - 55.3 (among Bodhs) to 63.5 per cent (among Arghuns)]. The percentages of early childhood deaths (1-4 years) were also observed high, so that the percentages of under-5 years

deaths (out of the total offspring deaths) were observed very high ranging from 81.0 (among Arghuns) to 91.0 per cent (among Brokpas). On the other hand, the proportions of offspring reported dead at the ages of 5-14 years and at the older ages seemed very low. Thus, a vast majority of offspring deaths experienced by woman appeared to have occurred before 5 years of age amongst all the study population groups. In case of the Pooled Ladakh data hence, similar pattern regarding the experience of offspring deaths was apparent; i.e., out of all child deaths experienced by (ever-married) woman, 59.8 and 88.1 per cent appeared to be infant and under - 5 years deaths respectively (Table 10).

A number of factors are affecting infant and child mortality too as mentioned above, which have been seen from the multiple regression analysis as well.

In case of the dependant variable number of child loss experienced by (ever-married) woman (an indicator of infant and child mortality), the multiple regression equation estimated for the Ladakh (Pooled) data has included 9 independent variables as significant predictors ($p < 0.05$). These in the order of their relative importance are:

number of children ever born to woman, usage of family planning methods, religion, age of woman, type of medical care availed, (household) income, economic characteristics of husband, (offspring) gender preference. And, the significant F (Eqn) statistic of 47.1630 ($p < 0.05$), indicates significant correlation between the dependent and the selected independent variables.

The multiple regression results, when child mortality is the dependent variable, not only show -that the number of children ever born, or fertility, is an important determinant, but also seem to be exerting statistically significant positive impact on the same. That is, high fertility leads to high child mortality and vice-versa, as already mentioned. Other determinants registering positive impact on child mortality are age of woman, religion, and absence of (offspring) preference. Child mortality seems to increase with the advancement of age of woman. And, Muslims seem to have experienced higher child mortality than Buddhists.

On the other hand, usage of family planning methods, type of medical facilities availed, economic characteristics of husband, and

Table 9: Measures of mortality among various population groups in Ladakh region in Jammu and Kashmir by place of residence

Population group	Place of residence	Measures of Mortality					
		Crude death rate	Under-5 mortality rate	Infant mortality rate	Neonatal mortality rate	Post neonatal mortality rate	Perinatal mortality rate
Buddhists							
Bodhs	Rural	14.78	233.33	133.33	33.33	100.00	93.75
	Urban	13.10	90.91	-	-	-	-
	Combined	14.32	195.12	97.56	24.39	73.17	68.77
Muslims							
Balits	Rural	17.33	256.41	179.48	102.56	76.92	97.56
	Urban	15.85	200.00	100.00	-	100.00	90.91
	Combined	16.84	244.90	163.26	81.63	81.63	96.15
Brokpas ¹	Rural	21.74	300.00	200.00	100.00	100.00	90.91
	(Combined)						
Arghuns	Rural	16.82	500.00	-	-	-	-
	Urban	10.89	90.91	90.91	-	90.91	71.43
Muslims (Pooled)	Rural	17.98	274.51	176.47	98.04	78.43	92.59
	Urban	13.65	142.86	95.24	-	95.24	86.96
	Combined	16.37	236.11	152.77	69.44	83.33	90.91
Ladakh (Pooled)							
(Pooled)	Rural	16.81	259.26	160.9	74.07	86.92	93.03
	Urban	13.51	125.00	92.50	-	62.50	58.82
	Combined	15.69	221.24	132.75	53.10	79.65	83.34

¹The Sample for Brokpas has been drawn from rural areas only.

Table 10: Child mortality differentials among various population groups of Ladakh region in Jammu and Kashmir, India; by place of residence

Child mortality-related variables ¹	Buddhist	Muslims				Ladakh
	Bodhs	Baltis	Brokpas ²	Arghuns	(Pooled)	(Pooled)
<i>Rural</i>						
Mean No. of child deaths ³	0.51	1.45	1.67	0.98	1.41	1.07
Mean No. of under-5 child deaths ³	0.43	1.30	1.52	0.81	1.25	0.94
Mean No. of infant deaths ³	0.30	0.91	0.96	0.61	0.87	0.65
Child loss ratio ⁴	0.140	0.310	0.334	0.240	0.305	0.252
Child survival ratio ⁵	0.860	0.690	0.666	0.760	0.695	0.748
<i>Urban</i>						
Mean No. of child deaths ³	0.38	1.15	-	0.42	0.79	0.67
Mean No. of under-5 child deaths ³	0.32	1.02	-	0.34	0.69	0.57
Mean No. of infant deaths ³	0.17	0.61	-	0.28	0.45	0.36
Child loss ratio ⁴	0.126	0.263	-	0.121	0.201	0.184
Child survival ratio ⁵	0.874	0.737	-	0.879	0.799	0.816
<i>Combined</i>						
Mean No. of child deaths ³	0.47	1.35	1.67	0.63	1.17	0.92
Mean No. of under-5 child deaths ³	0.40	1.21	1.52	0.51	1.04	0.81
Mean No. of infant deaths ³	0.26	0.81	0.96	0.40	0.71	0.55
Child loss ratio ⁴	0.137	0.295	0.334	0.170	0.268	0.228
Child survival ratio ⁵	0.863	0.705	0.666	0.830	0.732	0.772

1. Differentials in child (offspring mortality experience-related variables for woman (respondent)

2. The sample for Brokpas has been drawn rural areas only.

3. Infant/child deaths experienced by woman (respondent).

4. Ratio between children dead and children ever born to woman/proportion of children dead among children ever born (for woman).

5. Ratio between children surviving and children ever born to woman/proportion of survivors among children ever born (for woman).

(household) income have a negative impact on child mortality. When there is child mortality, there is a tendency to replace the dead child and not favouring birth control. Utilization of both folk and modern medical facilities, as compared to only the latter type, tends to increase child mortality. This is because, in the former case, modern medical care is sought, only when all types of folk treatments fail, and the children are brought to practitioners, institutions in a critical condition, when it becomes difficult to save them.

But, husband's occupation in the service sector as, white collar workers, professionals, technicians etc., seems to decrease child mortality, as compared to their occupation in the agricultural sector, or unskilled activities. Child mortality level seems moderate, when the husband is engaged in trade/ commerce. As already mentioned, fertility is lower, when husbands are in the service sector than in other

sectors. And, service sector occupations often require a minimum educational qualification as compared to the agricultural sector. These attributes usually increase the chances of child survival. Child mortality is also low, when the (household) income is high, and vice-versa. High income usually reflects greater consumption of superior goods and services, including nutritious food, modern medical care, which affect positively the health and survival chances of children (Table 11).

Therefore, a variety of demographic, economic, socio-cultural, altitudinal, physical environmental factors seem to be determining the population dynamics of the present study area. And, variations in these determinants may be responsible for the differences in demographic profiles of the study population.

In Ladakh, where ecological constraints are high, socio-cultural factors and economic development have been found to have effect on

the demographic structure. Natural environmental constraints dictate many aspects of traditional life, especially settlement sites and agricultural system. Ladakh's steep mountainous terrain makes ground transportation difficult. The roads connecting the region to the rest of India are closed for six to eight months each year because of snow. The inhabitants live primarily in small villages scattered over a vast region. The region is extremely poor in conventional energy sources (fossils, fuels and wood) and has almost no industrially exploitable resources. Ladakh's subsistence level agro-pastoral economy, traditional, social and religio-cultural systems (extra-somatic medium to counteract environmental stresses) are composite part of the cold desert's ecological system which developed as a totality and a closed system. But, certain significant developments, such as, the accession of Jammu and Kashmir to India in 1947 establishing democratic institutions, uniform laws and regulations; the communist revolution in China bringing an end to the caravan-trade in 1947 and subsequent Chinese occupation of Tibet (leading to the severance of the link with Ladakh); the Indo Chinese war in 1962 leading to closure of the border and occupation of considerable area by China; and constant conflicts with Pakistan giving the zone extreme strategic importance; resulted in a series of rapid changes - unplanned as well as planned, fast altering the ecosystem and also the population homeostasis of 'pristine' Ladakh of yesteryears, when various natural and socio-economic constraints minimized and slowed down any exogenous or endogenous initiatives, inter-fereces towards innovations and expansions.

In recent decades, continuous massive defence investments and improvement in communications, proliferation of government departments; introduction of policy of development activities; provision for basic amenities; alterations in traditional subsistence economy, its commercialisation and extension of technical know-how through government departments and non governmental organisations; changes in political and economic expectations; alterations in food habits and material possessions leading to the overdependence on non local foodgrains and industrial goods; land reclamation and afforestation, etc., are the major moves behind the changing face of Ladakh. Additionally, decline in the temporal role of religion; introduction of the 'Big Land Estate Abolition

Act', the 'Buddhist Polyandrous Marriage Abolition Act', equal inheritance (among siblings) laws, individual rights; and opening of Ladakh to tourism in 1974 (which has led to large tourist influx, predominantly from western countries), are the other major impulses symptomatic of changes in the environment, population dynamics, mobility, economics, socio-cultural values and systems, and communal harmony. Interestingly, the region therefore, evidenced breaking down of traditional systems and regulations of celibate institutions like monasticism, marital systems like fraternal polyandry; estate inheritance modes like primogeniture; as well as family structure; community grouping, co-operation; social stratification; frugality and prudence.

It is also generally perceived that the region has been subjected to frequent conflicts and that the pace of development has been chronically sluggish. Consequently, often the populace have faced considerable impediments, besides being affected by environmental stresses, natural calamities, epidemics and various illnesses. The constraints and difficulties ensued not only from harsh environment or strategic location of the region, but also from the short-sighted planning and policies, delayed implementation of projects and programmes, preoccupation with strategic matters and apathetic attitudes on the part of the authorities, which has brought about serious regional imbalances. Therefore, the changes witnessed currently in Ladakh are in a way, deemed to be inevitable in search of development and well being important and necessary goals for all societies and nations. Also segregating Ladakh from such much-needed pursuits is unreasonable. But side by side, the alarming facts of accelerated development processes, lure of short-term advantages, population surplus and allied issues, which are undoubtedly posing multiple problems in the 'finite' Ladakh today, must not be undermined and require urgent assessment and correction. The problems related to unprecedented and relatively unprecedented expansion of population, previously kept stable by a limited and largely unwitting control of fertility, are much complex and threatening in case of Ladakh; in view of consequent pressure on carrying capacity of the area.

Buddhists of Ladakh used positive restraints to reduce fertility in keeping with the lower mortality they were already beginning to achieve. Family and marital structure and mode of

Table 11: Child mortality differentials (child loss ratios)¹ among various population groups of Ladakh region in Jammu and Kashmir; by some independent determinant.

Independent Determinants	Buddhist	Muslims				Ladakh
	Bodhs	Baltis	Brokpas ²	Arghuns	(Pooled)	(Pooled)
<i>Present Age of Woman³</i>						
15-19	0.000*	0.340*	0.000*	0.000*	0.148	0.107
20-24	0.075	0.226	0.367	0.048	0.211	0.162
25-29	0.097	0.183	0.278*	0.000	0.164	0.143
30-34	0.153	0.218	0.364	0.086	0.205	0.189
35-39	0.087	0.271	0.262*	0.161	0.242	0.203
40-44	0.133	0.300	0.278*	0.252	0.285	0.229
45 +	0.180	0.403	0.353	0.228	0.345	0.297
<i>Economic Characteristics/Occupation of Woman³</i>						
Economically inactive	0.132	0.298	0.339	0.150	0.268	0.229
Economically active	0.154	0.259	0.263*	0.280	0.269	0.217
Cultivation/ agricultural unskilled labour	0.158	0.278	0.250*	0.346*	0.292	0.235
Trade/commerce	0.177	0.500*	0.000*	0.500*	0.471	0.287
Service	0.115	0.068	1.000*	0.167	0.136	0.223
<i>Economic Characteristics/Occupation of Husband</i>						
Economically inactive	0.213	0.520*	0.467*	0.157	0.349	0.308
Economically active	0.133	0.294	0.304	0.169	0.263	0.223
Cultivation/ agricultural unskilled labour	0.153	0.340	0.298	0.270	0.328	0.280
Trade / commerce	0.177	0.300	0.308*	0.146	0.245	0.236
Service	0.111	0.228	0.309	0.155	0.213	0.174
<i>Income (Household) (in Rupees)</i>						
10000 and less	0.266	0.366	0.400*	0.220*	0.332	0.303
10001 - 30000	0.146	0.315	0.321	0.178	0.287	0.249
30001-50000	0.140	0.285	0.393	0.177	0.271	0.229
50001 and above	0.020	0.230	0.295*	0.144	0.206	0.170
<i>Educational Characteristics of Woman³</i>						
Illiterate	0.149	0.306	0.320	0.184	0.284	0.244
Literate	0.073	0.084	0.461*	0.147	0.220	0.131
Primary	0.089	0.110*	0.272*	0.242	0.182	0.186
Middle	0.111	0.125	0.600*	0.078	0.026	0.157
Matriculation and above	0.022	0.000*	-	0.036	0.0158	0.013
<i>Educational Characteristics of Husband</i>						
Illiterate	0.148	0.349	0.331	0.252	0.331	0.268
Literate	0.107	0.242	0.339	0.117	0.214	0.184
Primary	0.151	0.344	0.261*	0.171*	0.310	0.283
Middle	0.116	0.251	0.451	0.121	0.225	0.189
Matriculation/ higher secondary	0.105	0.175	0.299	0.109	0.168	0.152
Graduation and above	0.046 ³	0.253*	0.500*	0.116	0.194	0.130
<i>Age at Marriage of Woman</i>						
10-14 years	0.065	0.371	0.339	0.216	0.331	0.291
15-19 years	0.149	0.306	0.272	0.170	0.265	0.236
20-29 years	0.129	0.200	0.440	0.141	0.231	0.182
<i>Family Structure</i>						
Joint Family	0.132	0.290	0.334	0.124	0.252	0.209
Nuclear family	0.147	0.299	0.334	0.207	0.279	0.251
<i>Type of Educational Facilities Available⁴</i>						
Primary/Middle School	1.300	0.309	0.375	0.200	0.312	0.235
Primary/Middle/ High School	0.157	0.310	0.304	0.250	0.297	0.263
Primary to High Secondary School	0.126	0.263	-	0.121	0.201	0.184
<i>Type of Communication Facilities Available⁴</i>						
Poor	0.171	0.310	-	0.286*	0.308	0.265

Table 11: Contd...

Independent Determinants	Buddhist	Muslims				Ladakh
	Bodhs	Baltis	Brokpas ²	Arghuns	(Pooled)	(Pooled)
Good	0.131	0.290	0.334	0.163	0.260	0.221
<i>Type of Medical Facilities Available⁴</i>						
Not available	0.000*	0.256	-	-	0.256	0.250
Medical	0.154	0.323	0.404	0.229	0.313	0.239
sub-centre/dispensary						
Primary health centre	0.146	0.331	0.232	0.417*	0.305	0.275
Hospital/	0.126	0.264		0.121	0.209	0.190
allopathic dispensary/Tuberculosis clinic/Family planning centre						
<i>Type of Medical Facilities Availed</i>						
Folk and modern	0.141	0.343	0.324	0.174	0.311	0.263
Modern	0.125	0.207	0.383*	0.168	0.201	0.180
<i>Housing Attributes and Condition</i>						
Poor	0.146	0.306	0.396	0.347	0.324	0.265
Fair	0.155	0.312	0.326	0.248	0.288	0.248
Good	0.095	0.251	0.292*	0.171	0.205	0.171

1. Ratio between children dead and children ever born to women/proportion of children dead among children ever born (for woman-respondent)

2. The sample for Brokpas has been drawn from rural areas only.

3. Ever-married respondent.

4. Facilities available within 5 km of residence.

a. Calculations based on less than 10 cases.

inheritance maintained population at a low level. Ladakhi's fraternal polyandry wherein brothers farmed their land in extended families in which a group of brothers ran the estate under the leadership of the eldest who was the prime inheritor. There was only one marriage per generation on the estate. Monogamous system with fraternal polyandry limits population, while maintaining an effective labour force on the estate.

Another population controlling factor among Ladakhi Buddhists was monasticism. Traditionally, a second son born in the family was ordained to monasticism, implying a marked control on reproductive potential. Combined with polyandry, this produced a surplus of unmarried women. There was some input of illegitimate children to the population, but number of such children was small, and these children remained on the estate of their mother's brother. Today polyandrous marriages are becoming rare and since it is not a legal form of marriage, the cohabitation of brothers with a wife of one of them is purely informal arrangement of economic benefit. Pattern of residence that has endured for centuries, has also changed with only traces still evident in certain areas. There is change in inheritance pattern. Primogeniture, i.e., eldest son inheriting house and farm is the thing of the past.

Now-a-days inheritance is associated with neolocal areas, related families may live close by or close together and regularly share both economic activities and meals. The breakdown of the monogamous principle and percentage decrease of monks and nuns mean that Buddhist population is on the increase. In the last decade around 70 per cent increase in Ladakhi Buddhist population has been recorded.

Among Ladakhi Muslims, the different ethnic groups, Baltis, Brokpas and Arghuns, all show different fertility rates. Muslim Brokpas, seem to be comparatively less bothered about small family size, health and sanitary awareness, educational attainments, contraceptive usage thereby registering higher fertility than other groups. Muslims Baltis are more conducive and accommodating towards such issues and are adapting them gradually for their benefits. Muslim Arghuns, being traders are mostly economically well off and show preference for higher educational attainment and do not see children as an economic asset. As they are mixture of Buddhist females and Kashmiri male traders, they share preference for better living conditions and life style. The level of knowledge and usage of family planning methods are also found high amongst them (Tables 12, 13).

As already mentioned, Ladakhis are facing

Table 12: Per cent distribution of women¹ among various population groups of Ladakh region in Jammu and Kashmir; by knowledge of specific family planning methods

Knowledge of Methods	Buddhist	Muslims				Ladakh
	Bodhs	Baltis	Brokpas	Arghuns	(Pooled)	(Pooled)
Total No. of Eligible Women ¹	191	221	33	100	354	545
<i>Knowledge of specific methods</i>						
No method known	2.1	10.9	8.6	1.0	7.8	5.8
Any method known	97.9	89.1	91.4	99.0	92.2	94.2
<i>Permanent method</i>						
Female/male sterilization	97.9	87.3	88.6	99.0	90.2	93.3
<i>Modern Temporary Method</i>						
Intra-uterine device	88.0	54.3	51.4	81.2	61.6	70.9
Oral pill	48.4	39.8	25.7	43.6	39.5	42.6
<i>Conventional Temporary Method</i>						
Condom	93.2	59.7	60.0	91.1	68.6	77.2
Abstinence/rhythm/ withdrawal/any other	74.5	50.2	37.1	82.2	58.0	63.8

1. Currently married women (respondents)/ wife at ages 15-44 years.

2. The sample for Brokpas has been drawn from rural areas only.

Table 13: Per cent distribution of woman¹ among various population groups of Ladakh region in Jammu and Kashmir, India, by usage of family planning methods²

Population group	Place of residence	Never used any method ^a	Ever used any method ^a	Usage of specific methods						
				Temporary method				Permanent method		
				Abstinence rhythm/ others	Intra-uterine Device (IUD)	Con-dom	Oral pill	Sterilization		
								Female	Male	
<i>Buddhists</i>										
Bodhs	Rural	52.6(71)	47.4 (64)	3.0	3.7	11.9	-	24.4	4.4	
	Urban	37.5(21)	62.5(35)	5.4	7.1	28.6	-	21.4		
	Combined	48.2(92)	51.8(99)	3.7	4.7	16.8		23.6	3.1	
<i>Muslims</i>										
Balits	Rural	85.8(127)	14.2(21)	2.0	4.1	3.4	0.7	3.4	0.7	
	Urban	58.9(43)	41.1(30)	2.7	4.1	8.2	-	20.6	5.5	
	Combined	76.9(170)	23.1(51)	2.3	4.1	5.0	0.5	9.1	2.3	
Brokpas ^a	Rural (Combined)	93.9(31)	6.1(2)	-				6.1		
	Arghuns	Rural	42.5(17)	57.5(23)	5.0	10.0	2.5		32.5	7.5
	Urban	38.3(23)	61.7(37)	8.3	6.7	11.7	1.7	26.7	6.7	
Muslim (Pooled)	Combined	40.0(40)	60.0(60)	7.0	8.0	8.0	1.0	29.0	7.0	
	Rural	79.2(175)	20.8(46)	2.3	4.5	2.7	0.5	9.1	1.8	
	Urban	49.6(66)	50.4(67)	5.3	5.3	9.8	0.8	23.3	6.0	
	Combined	68.1(241)	31.9(113)	3.4	4.8	5.4	0.6	14.4	3.4	
Ladakh (Pooled)	Rural	69.1(246)	30.9(110)	2.5	4.2	6.2	0.3	14.9	2.8	
	Urban	46.0(87)	54.0(102)	5.3	5.8	15.3	0.5	22.8	4.2	
	Combined	61.1(333)	38.9(212)	3.5	4.8	9.4	0.4	17.6	3.3	

¹Currently married women (respondents)/wife at ages 15-44 years.

²Ever use of family planning methods by currently married women aged 15-44 years (or by their husbands).

³The Brokpa sample has been drawn from rural areas only.

⁴Figures in brackets indicate number of 'currently' married women aged 15-44 years.

rapid population expansion. It reflects a young population structure associated with high degree of morbidity and high rates of mortality. Infant mortality rates among Buddhists and Muslims are 97.6 and 152.8, respectively against India's IMR

of 104.0. Ladakhis happened for a long time to do many things that reduced their exposure to disease for reasons unrelated to any such goal. They drank hot 'Gur-Gur' tea, brewed with boiled water, and thereby made water safe to drink well

before the germ theory explained that harmful micro-organisms might lurk in unboiled water.

Ladakhis are engaged in a host of practices that protect them from some of the mortality risk. Recycling of human waste by means that moderated the risk of disease is one of those. Human waste is mixed with sand and used as manure in the fields. The clinical tetanus in neonates and adults is absent among Ladakhis. Ladakhis claim that they got natural immunity against tetanus or it is acquired through the habit of keeping new-born baby in *Tsa-nu-a* woollen sack made up of sheep and goat skin. The sack is filled with powdered sieved dung and made warm by placing a hot stone on it. To keep children warm this practise is followed at least for six months. The same dung powder is used repeatedly after drying. Infant mortality rate among Ladakhi Buddhists though seems to be on the higher side, it is lower than Buddhists of Sikkim (77.8) and Buddhists of Nepal (147.4) (Bhasin, 1990). Among Buddhist Ladakhis, the crude death rate (CDR) is 14.3, which is higher than India's CDR of 10.0 in 1994. The economic and social factors which affect mortality are many and complex. They include education, occupation, nutrition, housing conditions, sanitation, public health services, medical services and general living standards. Definitely, the environment the people are living in and the climatic pressures are taking toll of the lives.

The risk of death varies with the age of an individual. Furthermore, improvement in public health and medical services have been found to affect different age groups to a different extent. Age-wise mortality shows a U-shaped curve indicating a high rate up to age of 14 years and after that a very low rate and a steep rise after the age of 55 years. Age specified death rates among Buddhists and Muslims of Ladakh show that mortality rate in the age groups 0-4 years is high being 39.6 and 36.4, respectively. Mortality rates in the age group 60-64 years are 69.0 among Buddhists and 84.1 among Muslims of Ladakh. In the age group 65+ years the mortality rate is 111.1 per thousand among Buddhists and 160.3 per thousand among Muslims of Ladakh.

Infant mortality is considered to be a fairly sensitive index of the health conditions of a region. Though it is difficult to control the endogenous causes like congenital abnormalities the exogenous or environmental causes like nutrition, prenatal care, sanitary conditions, incidence of diseases to which infants are highly

prone can be controlled and reflects the health measures taken by the community government and other agencies. Apart from genetic and endogenous factors, biological factors like the age of mother, order of birth, prematurity and birth, spacing also have a bearing on child survival. Low death rates have been achieved in parts of India, where primary health care procedures, midwifery, maternal education on breast feeding and weaning, vaccinations, oral rehydration of victims of diarrhoea and antibiotics against respiratory infections have been introduced.

Health supporting utilities are supposed to have some direct or indirect effect on health status of the people. It was found that mothers do not generally panic when a child is struck by a diarrhoeal episode, especially when such cases are associated with developmental stages of the child (teething, walking and crawling). Most mothers do not seek treatment outside home until the third day. The decision making process is influenced by traditional values, distance to health facilities, availability of other pharmaceutical products and/or financial resources. However, treatment outside home is sought only when the episode persists and is resistant to home management techniques. Mother's decision to seek health care in modern facilities comes after a complicated process of choices or alternatives. Housing conditions and household attributes, represent health environment at the household level. Type of construction, number of rooms, separate toilet, separate kitchen, cattedshed, bathrooms, chimney in the kitchen rooms, drainage system/sewerage system, ventilation, general sanitary conditions all represent health environment.

Mortality was found to be related to availability of sanitation, piped water supply, utilization of health services and a host of socio-economic and demographic variables at household level.

The area of dwelling is found to have an inverse relation with mortality in general. This is also an economic indicator. The higher social classes are more likely to have larger dwelling areas and people in higher social class have more ability to take curative as well as preventive measures of health factor in bringing down infant mortality. It has been found that presence or absence of sanitary conditions affects the mortality differentials. It was observed that where sanitary conditions were satisfactory, the mortality differentials were low.

General and infant mortality respond favourably to education. It was observed that among Buddhists and Muslims of Ladakh, the educational achievements of both husband and wife affected the infant mortality differentials. As expected, the probability of dying declines with education of mother as well. In Ladakh, the mother's education is more influential factor than father's education and occupation. In the study area in Ladakh where landlordship is an important criterion of social and economic status, the infant mortality differentials were affected by land ownership as well. The infant mortality differentials were high among landless and were minimum among the people who owned less than 10 acres in both the groups. Both the groups, Buddhists and Muslims, classified by income, showed that the infant mortality differentials were high among those whose income was less than Rs. 10,000 per annum and minimum in those households where income was more than Rs. 50,000 per annum. Economic characteristics of husband is strongly correlated with infant mortality as per the multiple regression analysis, as already mentioned.

The study from Ladakh corroborates the theory that social development and various facilities available in the study area attribute to lower mortality rates. Infant mortality is significantly low when there are *pucca road*, bus service and mass media. When the communication facilities index is high, mortality is low.

Other factors such as the presence of *Dai* (traditional birth attendant), number of visits by field workers, occurrence of natural disasters and epidemics also show a systematic pattern with mortality rates. The Maternal and Child Health Programme has not been successful in extending service to the target population. In terms of immunisation, only 46.6 per cent Buddhists and 41.4 per cent Muslims have been immunised. Survey data also show that most of the women prefer to deliver at home.

In view of the difficult means of communication and distance of dispensaries from the villages in Ladakh, medical aid is not availed by Ladakhis except in serious cases. However, in some areas, despite easy accessibility, survey findings show that a sizable proportion of those who were ill did not seek treatment in health centres or hospitals. Ladakhis depend on traditional folk-medicine practitioners who besides relying upon certain occult phenomena

deal with various herbs for preparing herbal medicines for therapeutic use. Throughout Ladakh, the people are obsessed with the uncanny unearthly activities of spirits, ghosts and deities. The diseases are thought to be caused by supernatural, demand magico-religious remedies. Ladakhis resort to various magico-religious practitioners for relieving people of pain and disease caused and delegated by the wrathful supernatural. As already stated, number of child loss seemed to increase among Buddhists and Muslims in the present study while availing of both folk and allopathic medicine. This is because, allopathic medicine was taken as a last resort or in terminal cases and their first choice was traditional folk-medicine.

The Ladakhi's response to problems of health and disease has components from various systems of medicine. Components of Ladakhi medical pluralism are Lamaism, Shamanism (locally known as Lhawaism), scholarly Amchi medicine and allopathy. The study reveals a multiple and simultaneous usage of home remedies and multiple therapy system.

The religious background, particularly the belief in the fear of evil spirits, the influence of Shamanism, healing performed according to Bon rites, means of protecting against evil spirits, amulets, thread crosses, etc., make Ladakhi medicine colourful and multifarious. The plurality enables them to switch from one type of health practitioner to another in search of the best. The Ladakhi who can avail the facility of western (or bio-medicine), do so without being familiar with the theoretical principles of medical system. Although the economic status of the households differ, they show certain similar patterns of illness behaviour. They employ pluralistic strategies not perceiving any conflict among these alternatives, nor do they seem to perceive them as different systems, but rather as a variety of options, among which they can choose.

Most usage is sequential but some is simultaneous. For example, an infant who is being given prescribed medicine for diarrhoea may also be taken concurrently to a Lama for the evil eye. Although certain illnesses such as evil eye, are thought to be cured only by folk curers, this does not preclude the use of modern medicine to treat the symptoms. Gonzales (1966) reports that in Guatemala, the symptoms are treated with modern medicine, while the cause of illness is dealt with through a folk specialist. Traditional (or folk) theories of illness etiology are often multifactorial

and multilevel (e.g., immediate and ultimate levels of causation), which permits the use of different treatment resources for different causal factors and levels (Cosminsky, 1977). As reported by Cosminsky (1980) for Guatemalan plantation, pluralistic behaviour among Ladakhi population groups is pragmatic, often based on trial and error, perceived effectiveness, uncertainty of illness causation and expectation of quick results. In addition to this empirical and pragmatic behaviour however, is the role played by faith in the supernatural (or spiritual) in curing. As a person is simultaneously a body (his *soma*), a self (his psyche) and a social being his *polis*, so are healers corresponding to three different realms of individual functioning. In other words, a person is simultaneously a body, a self and a social being. Ladakhi Shamanism "pursued a dialogic, relational remedy for its patients through reciprocal relationships that encouraged community, such as in gift giving to spirits and etiologies based on real social conflicts" (Adams, 1992). Ladakhi shaman attempts to resolve sickness caused by the disorder of the "social self". Lamas and *Amchis* on the other hand claim to cure diseases which arise from disorders of body and mind originating from individual actions and desires in craving and clinging. Excessive anger, greed and lack of discipline in attachment to the physical and social world result in body disorders. Lamas cure with prayers and rituals while *Amchis* cure through the site of the physical body by means of an elaborate diagnostic system and pharmacopeia. The Ladakhi healers emphasise different aspects of Ladakhis' self: social (*Lhawaism/Lhapaism*), mental (*Lamaism*) and physical (*Amchis*). Bio-medical systems as a rule stand in sharp contrast to the indigenous ones, although a study done in Kerala and Punjab has suggested that there are numerous indigenous medical practitioners who used western medicine, including penicillin injections (Neumann, 1971). Among Ladakhis, no such practitioners exist as *Lhama/Lhapas* are spiritual healers and *Amchis* are traditional herbal doctors who do not use biomedicine.

The pluralistic medical situation in Ladakh provides flexibility and fills different needs of the population. The folk systems are open as manifested by *electicism* of both the clients and practitioners, who adopt and adapt aspects from the array of coexisting medical traditions. This openness of the folk systems, as Press (1978) point out, is manifested by the acceptance of

inputs from other/alternative health systems, and also inputs from institutional sectors such as, relation and the family. According to Landy (1974), the traditional healer role stands at the interstices of religion, magic and the social system and gain its power from this position. This contrasts sharply with the closeness of cosmopolitan medicine, which is discontinuous from ordinary social process (Press, 1978; Manning and Fabrega, 1973) and is unaccommodating to alternative systems.

A general quantitative survey on the utilization of multiple therapy systems among Ladakhis gave an impression that they have inclination towards indigenous type. In Ladakh there are multiple medical systems available to people and the options available to any specific group are many. The acceptance of any or a combination of these forms of therapeutic help depends on a variety of factors.

With their age-old folk medical system, people have been able to survive and maintain the ecological balance. With the advent of western medicine a new system has been introduced and people always react differently to this transplant system. Traditional type of system, which does not allow any scientific exploration, is obviously based on myths and powers that are not within human control, i.e., for such things a supernatural element may be responsible. Consequently, the treatment of the ailment also reflects appeasement of the supernatural powers which are extraneous to the individual (patient). In such a society adoption of new medical therapy obviously will be challenged by the existing system and hence, unless the new system is capable of replacing the traditional values by its efficacy and acceptability, it will not be a success.

From the interviews which were carried out in the health centre, one thing was clear that the patients were coming to health centre only after they had received treatment from their own practitioners. Disease as an area of inquiry and the attitude to curing disease has its special importance *vis-a-vis* other areas like status, political power, because of the personal equation and time factor involved. It is a matter of life and death in case of a critical disease and their range of action pattern is limited. It is a crisis response rather than a calculated response. When the human system is out of order, all types of irrationalities come into play. Since the responses to critical disease are ad-hoc, they do not reflect

the traditional cultural norms.

People modify pre-existing practices if the economic costs are within their reach. People are pragmatic in trying and evaluating new alternatives. In case of health behaviour, the cost benefit mode of analysis and the empirical evidence help in deciding, whether it is to their advantage or not. There is a change in overt behaviour of the people, but it does not necessarily explain or mean changes in the belief system. Among Ladakhis, it was found that although the traditional beliefs about fertility, pregnancy and abortion have remained unchanged, many births in the study area took place in the health centres or government hospital. Ladakhis have their own traditional-folk medical system with traditional beliefs and practices. But when they were offered the western or government sponsored medical services they accepted them and put them to the test even if as a last resort. They do not in all cases continue to use western medical services, but they show openmindedness in trying them out. Among Ladakhis, the situation is like what Wagner found among Navaho. Wagner found that Navaho "have a very open, pragmatic, and non-discriminatory attitude towards various medico-religious options available in time of need. White medicine, traditional *chantways*, peyotism and even various Christian sects on reservation tend to merge in their minds into alternative and somewhat interchangeable avenues for being used" (Wagner, 1978). Ladakhis have a open pragmatic and non-discriminatory attitude towards the multiple medical system available to them and acceptance of any or combination of these depend on the individual or household decision. As far as curative medical services are concerned, these are embraced more readily than preventive services, as was seen in the case of immunization. All were not ready to immunize their children as only 43.2 per cent children were immunized in study area out of which 46.6 per cent were Buddhists and 41.4 per cent were Muslims. The reason for this is that the result of the scientific curative medicine are much more easily demonstrated than the results of preventive medicine. "Cause and effect are easily comprehended when serious illness gives way to no illness in a few hours or days, cause and effect are less easily seen when, in the case of immunization and environmental sanitation programmes, no disease is followed by no disease" (Foster and Anderson, 1978). As there

are multiple medical systems available to Ladakhis to opt for, the course of action to follow depends on the situation and condition of the sick. The strategies that underline these decision-making process have come to be called the "hierarchy of resort in curative practice" (Schwartz, 1969). The way in which people structure their personal hierarchies of resort tell us about their preferences.

Among Ladakhis, a sequence of resort does not seem to exist, although the trend is to begin with home remedies to Lama to *Lhama/Lhapa* to *Amchi* as the course of the illness proceeds and become more serious. However, there is also a back and forth movement between resources, or a shorten approach often based on referrals and advice from relatives and neighbours and her practitioners, which seems to be associated with desperation over the perceived increasing severity of an illness.

In view of the extremely difficult means of communication and distance of dispensaries from the villages in Ladakh, medical aid is not availed by the people except in serious cases. The use of traditional herbs for curing diseases is most common in the area. Percentage distribution of deaths (1986-88) among Buddhists and Muslims of Ladakh was reported the highest by respondents while availing the Allopathic medicine which is taken as a last resort or in terminal cases. It is observed that deaths reported by availing traditional folk medicine is negligible. The reason underlying this is that their first choice is traditional folk medicine.

The area being difficult, the sanctioned posts in most cases remain vacant. Thus, medical facilities are not sufficient to cater to the needs of people. Those who want to avail these facilities often have to travel long distances. This combined with shortage of medicines, results in most of the patients remaining unattended. So the people in interior areas have to depend on their own medical treatment.

In general, the health problems in Ladakh can be grouped into five main categories: a high rate of infectious and water borne diseases, poor environmental sanitation and hygiene, unsatisfactory nutritional status, ignorance about health, and an unsatisfactory health care delivery system. The belief in the interference of a supernatural agency is strong in both the communities. It was seen from the data that when both the facilities (namely modern and traditional) were available in the area people often accepted

and availed of the western medicine. Though they go to the Health Centre, side by side they also perform various traditional rituals. Unfortunately, adequate medical facilities are not available in many areas and people are accused of not accepting these non-existing medical facilities. In areas where medical facilities are not within their reach, people depend on traditional medical care: herbs are used as medicines along with rituals to cure different diseases. The dependence and confidence on traditional medical practitioners *Lhama/Lhapa* and *Amchis*, and Lamas are the result of faith and confidence among the patients. As the traditional practitioners share the common cultural traditions of the patients, naturally the patients have more faith in them. The system of cause, effect and cure, is thus a circular and enclosed system of knowledge. The cause is a spirit, the effect is spirit possession and the cure is controlled spirit possession. This system of knowledge provides the manifest of explanation and control in the face of disorder, chaos and inexplicable circumstances. The social function here described is adaptive, or as described by Spiro (1966), it (spirit possession) is the basis of "social stability" in potentially unstable and disruptive social circumstances. It has the similar function that witchcraft beliefs, as described by Evans-Pritchard (1937) have for many-African societies. The beliefs and institutions surrounding spirit possession fulfil the function as noted by Spiro (1967) of providing a "culturally approved means for the resolution of conflict (between) personal desires and cultural norms" (cited from Jones, 1976). Medical system's degree of productivity depends on the effectiveness of its armamentarium and the technical skills of its practitioners. However, in some cases efficacy have little or no positive effect on the productivity of the medical system. It happens in cases where improvements in efficacy are restricted to a small number of people and have a negligible effect on levels of morbidity and mortality of the total population. Improvements in efficacy are made available to population around urban centres for which they can make a difference. However, this means diverting resources needed for improving the health of a larger segment of the total population. For example, this is the situation in Ladakh where the capital absorbing medical intervention demanded by urban centres siphon resources away from the primary health care needs of a much larger rural at-risk population.

The net effect is no change or even an increase in overall levels of morbidity and mortality.

Despite improvements in health facilities in Ladakh in the past, no significant improvements in health status could be achieved. Morbidity pattern in Ladakh shows that the incidence of the diseases is concentrated more among children and old-age people. Sickness among children aged upto five is due to diarrhoeal, respiratory and skin diseases. Most of the diseases causing sickness are highly associated with crowding widespread poverty, poor housing and sanitation. Low weight at birth is a major cause of child sickness and death. Family size is positively associated with the average number of sick members and the average duration of sickness. High level of dependency in the family and high proportion of females correspond with a higher incidence of sickness. Presence of health facilities in the locality do not have any significant differential effect on the family health status. The findings of study show that the greater the extent of traditionalism in the Ladakhi society, the wider the prevalence of belief in supernatural powers as causing sickness and higher the rate of consulting traditional healers. We also see, however, that the belief in supernatural causes may, exist alongside the belief in natural causes. In case of sickness, Ladakhis first avail the services of a traditional healer and if this treatment is unsuccessful he will turn to bio-medicine. In case the bio-medicine is unsuccessful, he will return to traditional healers. Since traditional Ladakhi medicine draws its strength from the belief in supernatural and all things that happen to man, both good and evil are considered to be the will of God. According to Ladakhis, both health and illness are caused by God with the help of natural and supernatural powers created by him. Powers of strong faith, courage and great patience are the source of healing. The ceremonies of visiting the traditional healers, have established a relationship of psychological-therapeutic dependence on the part of the Ladakhi with regard to healer. This dependence is deeply rooted in their psyche and reinforced and legitimized by the Ladakhi culture. It is important to note the difference between the bodily conceptions in Buddhism and those of bio-medicine. In the former the body is seen as part of the universe, inter connected to all elements of the universe and functionally interdependent, marking high modernism in medical practice. The analysis seems to indicate

that there is some association between ill health and mortality with large family size. However without taking into account many other factors such as life-style and environmental conditions, one can only regard the above conclusion as tentative. The household survey data show that large family size has adverse effects on education and health. In terms of educational achievement, children from large families have lower educational achievements than their counterparts in small families, although the mother's educational level and income are equally important in explaining educational differences. Such children are more likely to participate early in productive (and money earning) activities, which are closely related to educational level achievements. Participation in labour force and employment are restricted to low paying jobs, without much skill requirements. As adults, they are likely to marry off early to someone of the similar economic group. In terms of health those from large families are likely to be badly off because of poor nutrition and inability to afford medical services. Thus, there is a vicious circle difficult to break. The implementation of development programmes is clearly not sufficient to break the cycle. The families themselves need to take positive steps to ensure that they are able to enjoy the benefits of development programmes. Based on the findings of the present study the policy implications are as follows:

General emphasis should be placed on creating public awareness about primary health care both at the household and community level. Indigenous medical practices in comparison to biomedicine therapy are mainly based on the belief system. Hence, the opening of health centres is certainly not enough and the need for cultural factors that tend to encroach on psyche need to be understood for an efficient administering of medicine. Traditional *Amchi* system which has stood the test of time is indeed unique and has proved reliable and effective for Ladakhis, must be protected. Traditional knowledge developed out of usage and current wisdom is a creative trove that needs to be scientifically evaluated and documented. Developed out of centuries of trial and error and handed down the generations, the wisdom about herb based remedies of common diseases as well as serious ones is precious. The integration of scientific and indigenous wisdom would help develop technologies which are intelligible and

credible to local people. Health facilities, especially in rural areas should emphasize the health care of women and children. While immunization against major diseases has already started, diseases which are related with congestion, contaminated drinking water, poor hygiene and sanitation, could be kept under control if educating the public on primary health care becomes a part of the local health care services. Greater emphasis should be placed on creating facilities for the treatment and control of infectious diseases which are closely associated with cramming up of family members in a room during winter months at household levels. Given the inter linkage between health, education and occupation, all are important in their own sphere, emphasis should be placed on improvement in all.

While the control of population should be among the prime objectives of the Government's development programmes, in an effort to redeem the adverse consequences of growing population because of breaking up of monomartial system or polyandrous marriages and decrease in number of monks, greater emphasis should be on creating employment opportunities according to the needs of the population. Emphasis should be placed on creating employment opportunities in the non-agricultural sector particularly. Distribution of educational institutions across different geographical areas should cover, rather on the relative concentration of school age children in the respective localities. Rather than constructing new facilities, under resource constraints, maximum possible effort should be made to maintain properly the existing institutions. Greater emphasis should be placed on creating health awareness about primary health care. Given the inter linkage between health, education and occupation, local institutions could be used for multiple purposes. For instance, the existing school building could be used as health centre, or as a training institute for new technology, new crop variety, cropping pattern and even for development of local skills.

KEY WORDS Tribals. Himalayas. Ecology. Human Settlements. Health.

ABSTRACT People inhabiting high altitude areas have to face environmental hazards like low atmospheric pressure, severe cold, strong winds and solar radiation. In such areas, man-environment relationship is influenced by genetic make-up, eco-sensitivity and socio-cultural factors. High altitude physical environmental stresses are believed to exist deleterious effects on human beings

resulting in later maturity; low fecundity, fertility; high mortality; high morbidity; retardation of pre- and post-natal growth and development, alteration in physiology which may question the validity of population proliferation. In the present study attempt has been made to explore problems and prospects of a high altitude area-Ladakh division in the state of Jammu and Kashmir, India.

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