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Demographic Fluctuation among Himalayan Populations

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Abstract

Background: Himalayas constitute vast mountain range in Asia spreading over 2500 Km (from east to west) at a high altitude along the northern fringes of the Indian subcontinent. The population dynamics in Himalayan domain has been immensely influenced by the variations in climatic and topographic conditions. As a result, population trends in relation to several demographic parameters are observed as population growth varies across this immense geographical contour. *Objective*: The present study attempts to assess and compare several crucial demographic parameters of select population groups (tribes and caste groups) residing in Himalayan province so as to provide a comprehensive picture of their demographic profile. The variation in demographic variables has also been addressed in relation to socio-economic and biological attributes. *Materials and Methods:* Multiple demographic determinants viz., sex-ratio, index – of – ageing, age at marriage and menarche, crude birth rate, total fertility rate, crude death rate and infant mortality rate are utilized to address demographic diversity in Himalayan population groups. *Results:* The sex ratio has been observed to be higher among reported population groups in Central Himalayas in comparison to Western and Eastern Himalayas. The measures of fertility – CBR, GFR and TFR – depict high values in certain population groups of Central Himalayas (Johar Bhotia, Rang Bhotia and Raji) in comparison to Western and Eastern province. *Contribution:* The present paper provides a comprehensive picture of the demographic profile among select Himalayan population groups. This will aid to understand the trend in demographic characteristics in the Himalayan province.

Keywords: Himalayas; Population Dynamics; Demographic Profile; Index-of-Ageing; Environmental Stress; Physiographic Drought.

Introduction

Himalayas (mean: "abodes of snow") constitute highest mountain ranges on the globe and spread across five countries: Bhutan, India, Nepal, China, and Pakistan. It stretches in an arc 2,400 Km (1,500 mi) long from Afghanistan-Pakistan in the west and Namcha Barwa in the east. Himalayan mountain range is constituted by three parallel ranges namely Himadri, Himachal and Siwalik. The Himadri (or Greater Himalayas) range, with the average height of 6100 m (from sea level), consists of snow clad peaks. The Himachal (or lesser/ middle Himalayas) range is uneven and dissected and the height varies from 1000-4500m. Siwalik (Outer Himalayas) range is the southern-most range of Himalayas at an average height of 600m. In general, Himalayan mountain range is characterized by rugged mountain terrain interrupted occasionally by broad valleys.

It experiences great variations in climatic attributes- ranging from the arctic conditions of the high altitude regimes to the sub-tropical climate of the *terai* (the swampy forested belt at the mountain foothills abutting the Indo-Gangetic plain).

On the basis of human settlement pattern and geographic diversity, the Himalayan province can be subdivided into three major domains: Eastern, Western and Central Himalayas; where Eastern Himalayas covers Darjeeling Hills, Sikkim, Bhutan, Arunachal Pradesh and the eastern arc of Himalayas covering Nagaland, Manipur, Mizoram and Tripura, Western Himalayas covers Jammu and Kashmir and Himachal Pradesh and Central Himalayas stretches over Uttarakhand and Nepal.

The high altitude geographic domains in Himalayan mountain range are characterized by physical inaccessibility, limited resources and settlement areas. The major proportion of Himalayan province is defined by a very low economic growth rate in association with subsistence agriculture and lack of modern industries. Further, the population groups, inhabiting the 'high altitude' regime of the mountain range, experience multitude of environmental stresses- low atmospheric pressure and oxygen availability, strong winds, cold and dry environment. This high altitude geographic domain is therefore characterized by *cold desert environment* as it experiences physiographic *drought* due to lack of oxygen availability and drinking water. Consequently, in such areas, humans progressively acclimatize and adapt owing to modifications in their bio-chemical, physiological and anatomical attributes. Several ethnic groups with distinct economic and socio-cultural tradition inhabiting these zones; constantly reside in stressful conditions, where stresses are the various natural and cultural environmental forces, which potentially reduce the population's ability to function in a given environment (Baker, 1984).

Thus 'man-environment' relationship in such geographical domain is governed by genetic make-up, eco-sensitivity and socio-cultural attributes. The variation in climate and relief, therefore, significantly affects the population groups inhabiting the mountain range. The population structure, settlement and economic patterns of these population groups are principally influenced by variation in topographic and climatic attributes. This phenomenon further restricts population movement and communications.

The diverse climatic conditions have a profound influence upon demographic characteristics of population groups and thereby modifying their population structure. Consequently, population trends in relation to several demographic parameters are observed as population growth varies across this immense geographical contour. The aim of the present study is to assess and compare demographic parameters of select population groups inhabiting the Himalayan province. This will depict a comprehensive picture of their demographic profile.

Objective

In the present paper the prime motive is to study and compare population structure of selected tribal and non-tribal groups inhabiting Himalayan mountain range. The demographic profile of population groups is analyzed to depict trend in demographic characteristics. The diversity in demographic characteristics has been addressed in association with socio-economic and biological attributes.

Methodological Framework

The data was collected from several secondary sources of information such as government, non-government publications and research publications. AKK collected data in different phases in Uttarakhand using structured schedules and through genealogies.

Following demographic variables were examined in order to assess the population structure:

- *Measure of population composition*: Sex-ratio, Total Dependency Ratio, Index of Aging

  Sex ratio= (Pf/Pm)*100;

  where

  Pf= number of females in a population,

  Pm= number of males in that population

  Total Dependency Ratio (TDR) = Young Age Dependency Ratio (YADR) + Old Age Dependency Ratio (OADR);

  where

  YADR= (Population aged 0-14 yrs/ Population aged 15-59 yrs)*100

  OADR= (Population aged 60+ yrs/ Population aged 15-59 yrs)*100

  Index of Aging= (Population aged 60+ yrs/ Population aged 0-14 yrs)*100

- *Measures of fertility:* Crude Birth Rate, General Fertility Rate and Total Fertility Rate

  Crude Birth Rate= (B/P)*K;

  where

  B=number of live births in a specified year in a

population,

P = Total Population and K is 1000

General Fertility Rate= (B/ W_{15-49})*K;

where

B= number of live births in a specified year in a population,

W_{15-49}=women aged 15-49 yrs in that population; K is 1000

Total Fertility Rate= Summation of Age-specific Fertility Rate (ASFR) over all ages.

ASFR= (B_x/W_x) *K,

where

B= number of live births during a specified year to women aged x years in a population,

W_x=women aged x years in that population; K is 1000

- *Measures of Mortality* – Crude Death Rate, Infant Mortality Rate and Neonatal Mortality Rate

Crude Death Rate= (D/P) *K;

where

D= number of deaths during a specified year in a population,

P = Total population and K=1000

Infant Mortality Rate= (Number of children death under 5 years of age during a specified year in a population/ Number of live births during that specified year in that population) *1000

Neonatal Mortality Rate = (Number of infant death under 1 year of age during a specified year in a population/ Number of live births during that specified year in that population) *1000

Trend in Demographic Characteristics: Overview

Selected demographic parameters are examined and compared among the reported population groups inhabiting Himalayan province so as to exhibit population trends in relation to these parameters as population growth varies across this immense geographical contour. Different researches point towards inter-population variation in demographic characteristics in Himalayan province.

Table 1 exhibits a comparative account of population composition attributes among different

Table 1: Measures of Population composition among selected population groups in Himalayan region

Himalayan Domain	Population Group	Measures of Population Composition			Author(s)
		Sex ratio	Total Dependency Ratio (TDR)	Index of Ageing	
Western Himalayas					
Himachal Pradesh	Brahmins	890	77.94	10.05	Bhasin &Bhasin (1993)
	Rajput	870	75.44	8.31	
	S.C.	850	91.16	6	
	Gaddis	870	81.16	7.95	
Jammu & Kashmir	Bodhs	956	72.78	15.36	Bhasin & Nag (2000)
	Baltis	961	85.63	6.91	
	Brokpas	947	80.39	10.07	
	Arghuns	928	55.92	11.6	
Eastern Himalayas					
Manipur	Mao	1012	73.34		Maheo (1999)
Sikkim	Lepchas	849	81.63	4.88	Bhasin &Bhasin (1995)
	Bhutia	996	88.21	7.65	
	Sherpas	744	78.95	0	
	Tamangs	984	72.02	8.42	
	Buddhists	921	83.22	6.12	
Central Himalayas					
Uttarakhand	Tharu	_	103.9	_	Chauhan et al. (1991)
	Buksa	_	95.52	_	
	Rang Bhotia	1209	_	_	Kapoor (1996)
	Marchha Bhotia	1168	_	_	
	Marcha Bhotia	1005	53.75	9.67	Chachra & Bhasin
	Dharchula Bhotia	993	83.88	4.86	(1998a)
	Kumaoni Brahmin	1019	69.74	9.42	
	Kumaoni S.C.	940	82.70	3.38	
	Kumaoni Rajput	1042	85.43	3.63	
	Raji	858	80	8.53	Patra & Kapoor (2009)

population groups in Himalayan domain. The study of population composition with reference to age and sex is basic theme of demographic dynamics in a region. The age-sex structure of a community is related to its fertility and mortality rates and migration pattern and thereby reveals the relative level of development in the region.

The sex ratio provides crucial information related to sex composition of a population and influences the incidence of births and deaths and migration pattern in a region. Sex ratio is influenced by the magnitude of development (access to basic facilities such as education and health care infrastructure) in a region and therefore the trend in sex ratio differs in developed and developing countries.

The sex ratio in Himalayan region varies from 744 (Sherpas, Eastern Himalayas) to 1209 (Rang Bhotia, Central Himalayas). It has been strikingly observed that sex ratio among the reported population groups of Western Himalayan region is found to be low (850-960). In contrast to it, sex ratio among the reported population groups of Central Himalayan region is found to be high (940-1200) (except Rajis (858)). The sex ratio among Rang Bhotia (1209) of Uttarakhand is found to be highest in Himalayan province (in comparison to all the reported population groups) followed by Marchha Bhotia (1168) and Johari Bhotia (1132) of Uttarakhand.

On the other hand, Dependency ratio assesses the influence of age composition on the livelihood activity of population and indicates that economically active members of society support dependency load. Total Dependency Ratio (TDR) (depends upon YADR and OADR) is found to be highest among Tharus (103.9) of Uttarakhand (Central Himalayas) followed by Buksa (95.52) of

Table 2: Measures of fertility among selected population groups in Himalayan region

Himalayan Domain	Population group	Measures of fertility			Author(s)
		Crude Birth Rate (CBR)	General Fertility Rate (GFR)	Total Fertility Rate (TFR)	
Western Himalayas					
Jammu & Kashmir	Bodhs	24.46	95.79	2.79	Bhasin & Nag (2000)
	Baltis	23.57	98.59	3.12	
	Brokpas	27.17	119.05	3.09	
	Arghuns	14.25	**49.51**	**1.66**	
Himachal Pradesh	Bods (High Altitude)	_	_	4.11	Prakash & Malik (1990)
	Bods (Low Altitude)	_	_	3.63	
	Gaddis (Middle Altitude)	28.4	110.5	3.51	Bhasin &Bhasin (1995)
	Brahmins	25.8	93.3	3.29	
	Rajputs	21.7	83.9	3.27	
	S.C.	48.8	201.5	5.91	
Eastern Himalayas					
Manipur	Mao	**12.07**	65.3	4.97	Maheo (1999)
Sikkim	Lepchas	20.87	92.19	3.07	Bhasin &Bhasin (1995)
	Bhutia	22.22	93.22	3.15	
	Sherpas	19.61	90.91	3.01	
	Tamangs	24.39	92.31	3.1	
	Buddhists	21.81	92.59	3.08	
Central Himalayas					
Uttarakhand	Buksa	**61.14**	_	5.7	Saxena (1990)
	Johari Bhotia	48.21	175.2	6.2	Kapoor (1996)
	Rang Bhotia	53.61	186.4	5.8	
	Marcha Bhotia	35.98	162.41	6.3	
	Jaunsaris	32	125	3.84	Kshatriya et al. (1997)
	Marcha Bhotia	24.16	128.44	4.2	Chachra & Bhasin
	Dharchula Bhotia	15.64	95.23	2.69	(1998b)
	Juhar Bhotia	29.64	56.49	1.93	
	Kumaoni Brahmin	29.86	78.65	2.36	
	Kumaoni S.C.	19.04	126.21	3.83	
	Kumaoni Rajput	_	117.37	2.96	
	Raji	46.03	**213.2**	**7.4**	Patra & Kapoor (2009)

same province. In Central Himalayan province TDR varies from 53.75 (Marcha Bhotia) to 103.9 (Tharus) of Uttarakhand. S.C. (91.16) population of Himachal Pradesh, characterized with lowest sex ratio in Western Himalayas, has been found to have highest TDR among all the reported populations of Western Himalayan province.

The index of ageing is usually low when the proportion of population under 15 years is high and therefore the index is generally low in developing countries (characterized with high fertility rate). It is found to vary from 0 (Sherpas, Sikkim) to 15.36 (Bodhs, Jammu and Kashmir) in Himalayan province. It has been found to be lowest among Sherpas (0) of Sikkim followed by Kumaoni S.C. (3.38) and Kumaoni Rajput (3.63) of Uttarakhand. The index of ageing among the reported population groups inhabiting Western Himalayas is found to be high (7-15) (except S.C. (6) of Himachal Pradesh).

Table 2 reveals a comparative account of measures of fertility among different population groups in Himalayan domain. Although fertility is a biological phenomenon, but in demographic terminology, it relates to actual reproductive performance or actual bearing of children or live births, and also understood as 'a tremendous social, economic and social-

Table 3: Measures of mortality among selected population groups in Himalayan region

Himalayan Domain	Population group	Measures of mortality			Author(s)
		Crude Death Rate (CDR)	Infant Mortality Rate (IMR)	Neonatal Mortality Rate (NMR)	
Western Himalayas					
Jammu & Kashmir	Bodhs	14.32	97.56	24.39	Bhasin & Nag (2000)
	Baltis	16.84	163.26	81.63	
	Brokpas	21.74	200	100	
Punjab & Himachal Pradesh	Muslim	13.3	_	_	Balgir (1992)
	Gaddis (Middle Altitude)	14	170.1	_	Bhasin &Bhasin (1993)
Himachal Pradesh	Brahmins	12.9	125.4	_	
	Rajputs	11.8	113.3	_	
	S.C.	26	263.2	_	
Eastern Himalayas					
Manipur	Mao	**3.1**	43.5	_	Maheo (1999)
Sikkim	Bhutia (Lachen)	_	76.3	_	Das (1982)
	Bhutia (Lachen)	_	220.34	_	Das (1982)
	Buddhists	19.8	177.8	66.7	Bhasin &Bhasin (1995)
Nagaland	Zemi	_	86.1	_	Malhotra (1994)
Meghalaya	Pnar	_	119.2	_	Khongsdier (1992)
	Hajong	_	182	_	Barua (1982)
	Jantia	_	126.3	_	Deka (1978)
	Khasi			17.2	Adak (2001)
	Mizo	_	_	**3.5**	
Central Himalayas					
Uttarakhand					
	Jaunsaris	11.8	81	_	Garg et al. (1980)
	Johari Bhotia	12.79	152.8	_	Kapoor (1996)
	Marcha Bhotia	13.12	158.7	_	
	Rang Bhotia	16.11	212	_	
	Kumaoni Brahmin	7.61	**28.57**	_	Chachra & Bhasin
	Kumaoni S.C.	12.54	38.46	30.96	(1998c)
	Kumaoni Rajput	8.08	**28.57**	16	
	Juhar Bhotia	10.01	150	50	
	Marchha Bhotia	8.22	142.8	14.28	
	Raji	29	192	_	
	Raji	**47.6**	**344.8**	**137.9**	Patra & Kapoor (2009)

psychological force' (Ryder, 1959), involving human behaviour and decisions; or 'a statistical concept with social relevance' (Sauvy, 1969). It is influenced by interplay between socio-economic, environmental, biological and attitudinal attributes.

Crude birth rate (CBR) is the simplest and common measure of fertility as it reveals the general magnitude of the fertility level of a population/ region at a specified time (Bhasin and Nag, 2002). Buksas (61.14) of Uttarakhand (Central Himalayas) has been found to have highest CBR (among all the reported population groups of Himalayan Province) followed by Rang Bhotia (53.61) of Uttarakhand. The CBR among Johari Bhotia (48.21) of Uttarakhand has been found to be higher in comparison to all the tribal and non tribal groups from Eastern and Western Himalayan province (except S.C. (48.8) from Himachal Pradesh).

In comparison to CBR, the General Fertility Rate (GFR) of a population is 'more refined' attribute to measure fertility because it links births (in a specified time) more strictly to the population at risk of child-bearing, i.e., to the females at reproductive ages of 15-49 years. The GFR among S.C. (201.5) of Himachal Pradesh (Western Himalayas) has been found to be high in comparison to all the reported population groups from Western and Eastern Himalayas. But it has been found to be less than Rajis (213.2) of Uttarakhand (Central Himalayas).

Total fertility rate (TFR) is most commonly used standardized fertility measure and summates the pattern of fertility indicated by age-specific Fertility Rate (ASFR) over all ages and presents a single index of total fertility. The TFR among Johari Bhotia (Central Himalayas) has been reported to be 6.2 (Kapoor, 1996). It has been found to be higher than TFR of all studied population groups in Western and Eastern Himalayan province. The TFR in Central Himalayan province varies from 1.93 (Juhar Bhotia) to 7.4 (Raji). The Rajis (7.4) of Uttarakhand are characterized with highest TFR in comparison to other studied population groups of Himalayan Province. Some of population groups with low TFR in Himalayan province are Arghuns (1.66), Juhar Bhotia (1.93) and Bodhs (2.79).

Most of the reported population groups with high CBR, GFR and TFR have been found to inhabit Central Himalayan province.

Table 3 exhibits a comparative account of measures of mortality among different population groups in Himalayan province. Mortality is a crucial biological event whereby deaths occur in a population. The levels of mortality delineate fitness, survival and growth of a population (Bhasin and Nag, 2002).

Mortality is crucial indicator of level of development in an area because it is linked with socio-economic status and well being of individuals in the area. Previous researches have emphasized that mortality components are influenced by interaction within socio-economic, environmental, biological and attitudinal factors and are often high among tribal population groups (Murthy, 1987; Sharma and Khan, 1990; Kshatriya and Kapoor, 2005).

The Crude Death Rate (CDR) is the simplest and widely used measure of mortality that reflects a population's age structure and describing the frequency with which deaths occur in a population at a specified time/ period. The CDR has been found to be highest among Rajis (47.6) of Uttarakhand in comparison to other reported population groups of Eastern, Western and Central Himalayas. The Mao (3.1) of Manipur (Eastern Himalayas) has been found to have lowest CDR, followed by Kumaoni Brahmin (7.61) and Kumaoni Rajput (8.08) of Uttarakhand.

The Infant Mortality Rate (IMR) caters to the mortality of live-born infants who have not reached their first birthday. The S.C. (263.2) of Himachal Pradesh has been found to have high IMR in comparison to all other reported population groups of Eastern and Western Himalayas. The IMR in Central Himalayan province varies from 28.57 (Kumaoni Rajput) to 344.8 (Rajis). Few population groups with low IMR are Bhutia Lachen (76.3) of Sikkim, Kumaoni Brahmin (28.57) and Kumaoni S.C. (38.46) of Uttarakhand.

The Neonatal Mortality Rate (NMR) has been found to be highest among Rajis (137.9) of Uttarakhand (Central Himalayas) followed by Brokpas (100) of Jammu and Kashmir (Western Himalayas). Mizo tribe (3.5) of Meghalaya has been found to have lowest NMR in Himalayan province.

Discussion

Dynamics of population components as well as population growth itself differ across geographical/ ecological regimes and communities (Pearl, 1939; Bogue; 1969; UN, 1973). The demographic dynamics in Himalayan domain reinforce the above statement.

Sex-ratio, index of ageing and TDR are basic measures used to assess age-sex structure of selected population groups in Himalayan province. The sex ratio has been found to be higher among reported population groups in Central Himalayas in comparison to Western and Eastern Himalayas. Inappropriate medical and health infrastructure,

lower educational status, strong male preference, sex-selective male in-migration, poor socio-economic status and relatively limited role of female in decision making could be the reasons attributed to lower sex-ratio in Western and Eastern Himalayan province.

The measures of fertility – CBR, GFR and TFR- depict high values in certain population groups of Central Himalayas (Johar Bhotia, Rang Bhotia and Raji) in comparison to Western and Eastern province. High fertility measures among reported population groups in Central Himalayan province could be associated to poor literacy level and socio-economic status, lack of awareness, transitional lifestyle (from food gathering to food production through agricultural work), absence of family planning measure (such as use of contraceptives) and high infant mortality rates. A decline in high fertility measures could be achieved by improving socio-economic status of women, increased employment opportunities, improved maternal and child healthcare facilities, proper awareness and educational and public intervention programmes.

The measures of mortality – CDR, IMR and NMR- exhibit significant variation among reported population groups of Central Himalayas in comparison to Western and Eastern province. This variation could be associated with lack of proper nutrition and health care infrastructure, diverse climatic conditions and physical terrain and absence of maternal and child health care facilities.

Thus a review on determinants of demographic dynamics indicate that fertility and mortality components in a population/ region are affected by multiple factors such as socio-economic development, status of women, migration, literacy level, health care infrastructure, type and patterns of morbidity, age at marriage and menarche and birth and death in the society. It is thus emphasized that further researches need to be conducted in this domain to discern different dimension of the demographic issues along with inter-relationship with the developmental programme initiatives.

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Conflict of Interests

None to declare

References

1. Adak, DK. Child Mortality in Three Tribal Populations of Shillong. *J. Hum. Ecol.* 2001;12(2):147-152.
2. Baker, PT. The adaptive limits of human populations. *Man.* 1984;19(1):1-14.
3. Balgir, RS. Fertility and mortality differentials among the Gujjars of Sub-Himalayan and Himalayan Regions. *J. Hum. Ecol.* 1992;3(4):285-290.
4. Barua, S. Biodemographic factors associated with offspring mortality among the Hajongs of Meghalaya. *J. Ind. Anthropol. Soc.* 1982;17(2):143-146.
5. Bhasin, MK, & Bhasin, V. *Sikkim Himalayas: Ecology and Resource Development*. Delhi: Kamla-Raj Enterprises, 1995.
6. Bhasin, MK, & Nag, S. A Demographic Profile of the People of Jammu and Kashmir 3. Estimates, Trends and Differentials in Mortality. *J. Hum. Ecol.* 1995;13(1-2):113-140.
7. Bhasin, V. & Bhasin, MK. Ecology, population dynamics among Transhumants of Himalayas: A case study of Gaddis of Himachal Pradesh. *J. Hum. Ecol.* 1993;4(3):171-219.
8. Bhasin, V, & Nag, S. Population dynamics, problems and prospects of high altitude area: Ladakh. In M. K. Bhasin and V. Bhasin (eds.) *Man-Environment Relationship.* Human Ecology (Special Issue). New Delhi: Kamla- Raj Enterprises. 2000;6:21-53.
9. Bogue, DJ. *Principles of Demography*. New York: John Wiley and Sons. 1969.
10. Chachra, SP, & Bhasin, MK. Anthropo-Demographic Study among the Caste and Tribal Groups of Central Himalayas: 1. Population Structure. *J. Hum. Ecol.* 1998a;9(5):405-416.
11. Chachra, SP, & Bhasin, MK. Anthropo-Demographic Study among the Caste and Tribal Groups of Central Himalayas: 2. Fertility Differential and Determinants. *J. Hum. Ecol.* 1998b;9(5):405-416.
12. Chachra, SP, & Bhasin, MK. Anthropo-Demographic Study among the Caste and Tribal Groups of Central Himalayas: 3. Mortality Differential and Determinants. *J. Hum. Ecol.* 1998c;*9*:431-439.
13. Chauhan, AS, Saseendran, PP & Singh, KK. Demographic Profile of Tribal Population of Uttar Pradesh. In R.N. Pati and Lalit Jagatdeb. *Tribal Demography* (eds.). New Delhi: Ashish Publishing House. 1991.
14. Das, SK. Demography and Demographical Genetics of Two Isolated Mountain Villages of Northern Sikkim. *J. Ind. Anthropol. Soc.* 1982;17:155-162.

15. Deka, R. Selection Potential among the Sonwal Kachari of Upper Assam. Proceedings of the Seminar on Genetical Demography in India. Anthropological Survey of India, Calcutta (cited by Reddy and Chopra, 1990). 1978.

16. Garg, SK, Sankayan, AR & Tyagi, D. Selection intensity in the Bhoksa of Doon valley, Uttar Pradesh, India. *Bulletin of the Anthropological Survey of India*. 1980;28:12-16.

17. Kapoor, AK. Ecology, Demographic Profile and Socio-Economic Development of a Tribe of Central Himalayas. In P. K. Samal (ed.), Tribal Development: Options (Proceedings of a National Seminar). Nainital: Gynoday Prakashan. 1996.p.118-138.

18. Khongsdier, R. Some demographic traits among the Pnar of Sutnga and Moopala in Jaintia Hills District of Meghalaya. *Man in India*. 1992;72:491-495.

19. Kshatriya, GK. & Kapoor, AK. Demographic Structure and Health Care Practices of Dhodia Tribal Population of District Valsad, Gujarat. In Ajit K. Dalal & S. Roy (Eds.). Social Dimensions of Health. Jaipur: Rawat Publications. 2005.p.107-135.

20. Kshatriya, GK, Sing, P. & Basu, S. Anthropo-Demographic features and Health care Practices among the Jaunsaris of Jaunsar- Bawar, Dehradun, U.P. *J. Hum. Ecol.* 1997;8:347.

21. Maheo, LM. *A Study of Demographic Dynamics of the Mao Naga Tribe of Senapati District, Manipur with Special Reference to Birth Control Measures.* Unpublished Ph.D. Thesis submitted to the University of Delhi, Delhi. 1999.

22. Malhotra, KC. Genetico-Environmental Disorders and their Impact on Mortality and Morbidity Profile among the Tribal Populations. In S.K. Basu (ed.), Tribal Health in India. Delhi: Manak Publication. 1994.

23. Murthy, VG. The Soligas of B. R. Hills, *J. Fam. Welf.*, 1987;34(1):54.

24. Patra, PK, & Kapoor, AK. *Demography and Development Dynamics in a Primitive Tribe of Himalayas*. Dehradun: International Book Distributors. 2009.

25. Pearl, R. *The National History of Population*. Oxford: Oxford University Press. 1939.

26. Prakash, M. & Malik, SL. Difference in Fertility in High Landers and Lowlander Bods of Himachal Pradesh. *J. Hum. Ecol*. 1990;1:175-180.

27. Ryder, N. Fertility. In: *The Study of Population: An Inventory and Appraisal.* P.M. Hauser and O.D. Duncan (Eds.). Chicago: University of Chicago Press. 1959.

28. Sauvy, AA. *General Theory of Population.* London: Weidenfield and Nicolson. 1969.

29. Saxena, DN. Family Building, Fertility and Family Welfare among Two Tribal Communities of UP. In *Demography of Tribal Development.* A Bose, U.P. Sinha and R.P. Tyagi (eds.). 1990.p.249-269.

30. Sharma, KKN & Khan, AS. Fertility and Mortality Trends of the Khairwar Tribal Women of Madhya Pradesh, *Man in India*. 1990;*70*(4):446.

31. United Nations. *The Determinants and Consequences of Population Trends.* Vol.-I, Population Studies, No. 50. United Nations, New York. 1973.