

Is Rh Factor is Behind the Moderate Life Expectancy of Uttarakhand Tribals? A Brief Review

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Abstract

Indigenous communities and tribes are diverse and distributed all over the Indian subcontinent. While tribal communities are unique, many share characteristics that can affect the ability to prepare for, respond to and cope with the impact of environment on their health, living in different ecological and geo-climatic conditions ranging from hills to plain. It is evident that, health of different tribal communities influenced by not only the environmental forces but also their varied ways of life including their socio-economic condition, nutrition, dietary habit, literacy, hygiene and sanitation, socio-religious beliefs etc. This review article purposively deals with such a health monitoring indicator- life expectancy from sample representatives of tribal groups from a specific geographical zone called Terai (interior forested mountainous region) of Uttarakhand. After analysing the data from secondary sources, it has been revealed that the life expectancy of rural Uttarakhand (71.0%) is comparatively higher than the national level (66.7%). Besides that, the findings regarding life expectancy of Uttarakhand (54.53% for Raji, Buxa, Tharu and Khasa) also corroborate with the other states of same ecological setting specifically Arunachal Pradesh (56.7%) and Jammu Kashmir (59.7%). In this regard, it has also been confirmed from different studies that the frequency of immunogenic Rh-positive antigen is significantly higher among different communities of Terai region of Uttarakhand. Therefore, it can be proposed that this higher prevalence of Rh positive may provide immunity against environmental hazards to maintain a moderate rate of life expectancy as the health of these tribal groups is the outcome of the interaction between socio-cultural practices, genetic characteristics and their environmental conditions.

Keywords: Uttarakhand; Life expectancy; Rh factor; Tribe

Introduction

The tribal or ethnic population of India has its presence in almost all the states and union territories. These populations are diverse in nature and vary from each other in respect of ecological environs, livelihood strategies, population size, language, physical features and level of development attained. After the adoption of Indian constitution particularly article 342, these populations, based on some criteria, are enlisted as scheduled tribes. As per the Census of 2011, the scheduled tribe population in this country is 84,326,240 which accounts for 8.2% of the total population of country [1]. The Report of the High-Level Committee on Socio-Economic, Health and Educational Status of Tribal Communities of India [2], categorized Indian tribes in five major regional grouping based on ecological, social, economic, administrative and ethnic factors. These are;

- **Himalayan Region:** a. North East Himalaya, b. Central Himalaya and c. North West Himalaya
- **Middle Region:** Bihar, Jharkhand, West Bengal, Odisha and Madhya Pradesh.
- **Western Region:** Rajasthan, Gujarat, Maharashtra, Goa, Dadra and Nagar Haveli.
- **Southern Region:** Andhra Pradesh, Tamil Nadu, Karnataka and Kerala.

- **Island:** Andaman and Nicobar island in the Bay of Bengal and Lakshadweep in the Arabian Sea.

Larger number of scheduled tribe concentration is distributed mostly in middle and western region of the country in association with states from other regions. Madhya Pradesh, Jharkhand, Odisha, Chattisgarh, West Bengal, Rajasthan, Gujarat, Maharashtra, Andhra Pradesh and Karnataka shares 83.2% of the total scheduled tribe population. Another 15.3% scheduled tribe population is shared within the states of Assam, Meghalaya, Nagaland, Jammu and Kashmir, Tripura, Mizoram, Bihar, Manipur, Arunachal Pradesh and Tamil Nadu. The rest of the scheduled tribe population is shared by remaining states and union territories [3].

Tribal population of Uttarakhand

Uttarakhand, formerly known as Uttaranchal, is a state of Northern part of India. The total area of state is 53,483 sq. km., which is largely covered by ranges of Himalayas and forests. Located in the foothills of Himalayas, the state is divided into two administrative divisions, viz. Kumaon and Garhwal [4]. In 2001 census, the total population of Uttarakhand is 8,489,349 of which the number of Scheduled tribe population is 256,129 which constitutes 3 percent of the total population [3]. There are total 5 notified ST populations in Uttarakhand, viz. Tharu, Jaunsari, Bhotia, Buxa and Raji (Table 1).

Among these five populations, Tharu has highest concentration of 33.4 per cent followed by Jaunsari (32.5 per cent), Buxa (18.3 per

cent), Bhotia (14.2 per cent) and Raji (0.2 per cent). These populations, largely, subsists in the forested Terai and hilly regions of Uttarakhand where living is a matter of hardship. The objective of this article is to make a comparative analysis on health of these communities with the communities of other states sharing same ecology on the basis of life expectancy (Figure 1).

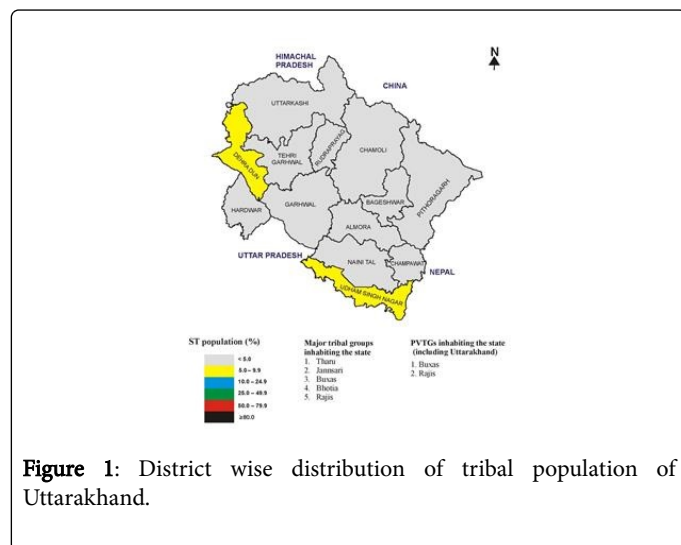


Figure 1: District wise distribution of tribal population of Uttarakhand.

Distribution of Different Tribal Population in Uttarakhand [1]		
Population	N	%
Tharu	85665	33.4
Jaunsari	83262	32.5
Buxa	46771	18.3
Bhotia	36438	14.2
Raji	517	0.2
Total	256129	100%

Table 1: Population and percentage of scheduled tribes in Uttarakhand.

People, ecology and health issues

The geographical area of Uttarakhand in the northern province of India extends from 28°43' N and 31°27' N latitude to 77°34' E and 81°02' E longitudes. The total geographical area of the state is 53483 sq. km., which comprises of hill area (46035 sq. km.) and plain (7448 sq. km). A large proportion of plain and hill is covered with forested regions (34651 sq. km) [5]. The state Uttarakhand administratively divided into two parts, viz. Garhwal and Kumaon. Further on the basis of eco-cultural differences, the state is categorized into four zones, viz. Jaunsar; Kumaon; Jaunsar-Bawar; Bhabar, terai and plains and Garhwal. The tribal populations of Uttarakhand live in all 13 districts of the state, though, on the basis of their concentration, their habitat can be categorized in different geographical regions. Maximum number of tribal population dwells in the rural areas of Dehradun, Udham Singh Nagar, Pithoragarh, Chamoli, Uttarkashi, Pauri and Tehri [1]. The distribution of tribal groups in Uttarakhand can be plotted in particular eco-cultural zone, which is as follows:

The typical habitations of these populations were chiefly limited in remote hilly, forested and foot hill areas in earlier times. They practiced a livelihood close to nature by traditional means, which is greatly altered today due to serial transformation over time since the colonial period (Table 2).

Tribes	District	Eco-cultural zones
Tharu	Dehradun, Pauri, Nainital, Udham Singh Nagar	Garhwal and Kumaon
Buxa	Dehradun, Haridwar, Pauri, Nainital, Udham Singh Nagar	Garhwal, Kumaon and Bhabar
Raji	Pithoragarh and Champawat	Kumaon
Khasa	Dehradun	Jaunsar-Bawar
Bhotia	Chamoli, Uttarkashi and Pithoragarh	Garhwal and Kumaon

Table 2: Distribution of tribal groups according to their eco-cultural zones in Uttarakhand.

S. No.	Districts	Total Tribal Population
1	Uttarkashi	3512
2	Chamoli	12260
3	Rudraprayag	386
4	TehriGarhwal	875
5	Dehradun	111663
6	Garhwal	2215
7	Pithoragarh	19535
8	Bageshwar	1982
9	Almora	1281
10	Champawat	1339
11	Nainital	7495
12	Udham Singh Nagar	123037
13	Haridwar	6323

Table 3: Distribution of scheduled tribe population by districts of Uttarakhand [6,7].

Tharu is the largest among the ethnic groups of Uttarakhand living in the plots of alluvial plain with South-East slope [8] also known as Terai. The Terai in Uttarakhand stretches from East to West to the South of Sivalik ranges and most of it situated in the district Udham Singh Nagar [9]. The Buxa also inhabits in the Terai region and their presence can also be traced in Bhabar areas of Uttarakhand [10]. Unlike Terai, Bhabar is arid land formed of coarse gravels [9] and dry Sal forest. As per the Buxa people, they are living in this region since ancient times and claim a Rajput connection from Rajasthan [11]. Raji is little known tribal community of Kumaon Himalaya and largely distributed in two districts of the state namely, Pithoragarh and Champawat. Maximum population of them can be found in the hilly and forested area of Darchula and Didihat tehsils of Pithoragarh

district [12]. Buxa and Raji were declared as Primitive Tribal Group (PTG) of the state in year 1981 [13]. Khasis or Khasas are living in Jaunsar-Bawar region of Uttarakhand and commonly known as Jaunsaries. Jaunsar-Bawar is actually comprised of two parts; the high altitude snowy region is Bawar and lower half is Jaunsar. This region is densely forested and comprised of rough mountains and gorges [14]. Besides these populations there is another ethnic group, Bhotia, lives in the hilly regions of Garhwal and Kumaon. The valleys of seven rivers (Bhagirathi, Alakananda, Dhauliganga, Goriganga, Das ma, Kali and Kati Yankti) to the north of the Indian central Himalayan region

constitute the homeland of Bhotia community. Administratively, these region falls within districts of Chamoli, Uttarkashi and Pithoragarh [15] Bhotia is different from the other ethnic populations of Uttarakhand in terms of economy and thereby habitat. They are trader community and practice seasonal migration or transhumance, if said anthropologically. This traditional pastoral community spends winter in lower altitudes and summer in higher, which ranges from 1200 metres to 3500 metres [15]. In the view of the above, Bhotia is excluded from the further discussion in the present research article (Table 3).

Community	Place	Rh Positive		Rh Negative		Total	Reference	X ²	P Value
		Observed Frequency	Expected Frequency	Observed Frequency	Expected Frequency				
Tharu	Uttar Pradesh	400(97.56)	383.57	10(2.43)	26.42	410	Srivastava, 1965[40]	125.61	0
Khasa-Rajput	Jaunsar	107(72.79)	137.52	40(27.21)	9.47	147	Srivastava, (1984) [23]		
Buksa	Dehradun	214 (98.16)	203.95	4(1.83)	14.04	218	Singh A. et al. 2013[23]		
Raji	Uttarakhand	92(97.87)	87.9	2(2.12)	6.05	94	[Blood Group frequency among Raji tribe of Uttarakhand]. Unpublished raw data. [41]		
(X ²) =125.61 df=3,P<0.0.									

Table 4: Distribution of Rh positive and Rh negative among different tribal population of in Uttarakhand.

Discussion regarding the health status or factors of Uttarakhand tribal groups will surely have two different point of departure. Migratory or transhumant groups have distinct health related factors and issues because of their ecological habitat and way of living. Because of oscillatory lifestyle, these populations utilize ecological resources in different manner and their exposure to disease causing threats is different too. Thus, the epidemiology of diseases of transhumant and sedentary groups is dissimilar and matter of separate research.

In general, tribal populations have distinctive health problems that depend and vary on their habitat, difficult terrain and ecological variations. Because of these factors, these peoples are exposed to kinds of behavioural and pathogenic threats. Vulnerability increases with illiteracy, malnutrition, absence of safe drinking water, poor sanitary condition and lack of personal hygiene [16]. Because of these factors, an array of communicable diseases, such as, malaria; hepatitis; tuberculosis; filariasis; diarrhoea; dysentery; sexually transmitted diseases (STDs), parasitic infections; viral and fungal infections; conjunctivitis; scabies; measles; leprosy; cough and cold, etc. shows high occurrence among these groups [17]. Malaria is a major endemic disease among the forest dwellers. 54 million tribal population (various origin), that is 8 per cent of total Indian population, resides majorly in forested areas contributed 30 per cent of total malaria cases, 60 percent of total Plasmodium Falciparum cases and 50% of malaria deaths in the country [18]. Diarrhoeal diseases are other major issues causing health hazards to tribal peoples, occurs chiefly due to drinking water from unprotected sources, poor sanitation facility and poor personal

hygiene. Administrative negligence, ignorance of disease causing factors, blind dependency on magic/sorcery and local treatment, less or no access to medical facilities and low literacy are another reason behind tribal health misery [19,20]. As a natural Protective measure, found among these populations, presence of Rh positive antigen in their blood is very high [21-25]. Presumptively, this high concentration of Rh D+ antigen is expected to provide greater immunity against certain diseases [26-28].

Health status and incidence of Rh factor

The Rh blood group system is the most important and complex blood groups, along with ABO system. The Rh system is expressed with the gene symbols RHD and RHCE on chromosome 1 and associated with the erythrocyte cell membrane. So far, the presence of 49 antigens has been recorded in this system among which D, C or c, E or e is most important [28-30]. Rhesus-positive and Rhesus-negative persons differ in the presence-absence of highly immunogenic RhD protein on the erythrocyte membrane [26]. The D antigen is regarded as most immunogenic and has important role in immunohematology [30]. Though, the biological function of Rh complex is still unknown [31,32] but studies have suggested that Rh negative individuals are more prone to allergic, digestive, heart, hematological, immunity, mental health and neurological problems [26]. RhBG and RhCG are two non-erythrocyte proteins in Rh system, found in liver and kidney. These proteins functions as ammonium (NH₃, NH₄) transporter across the cell membrane [33,34]. Studies by Le van Kim [33] have suggested that Rh complex probably take part in intercellular pH regulation and

regulation of local oxygen tension which influence the functioning of immune system [26]. Few studies indicate that Rh positive individuals, unlike the Rh-negative individuals, are better lenient to certain biological factors, including, Toxoplasma infection, aging and fatigue [26]. Apart from that, the Rh blood group contains the D antigen which differs from the C/c and E/e antigens by 35 amino acids. This large difference in amino acids is the reason why the Rh antigens are potent at stimulating an immune response [27,28].

Studies on Rh positive around the world in different population show a high incidence of D antigen. A study conducted by Tulika Chandra et al. [35] on north Indian population (Lucknow) showed the prevalence of Rh positive blood groups by 95.4% and she compared this output with international data from Kenya (96.10%); Nigeria (95.67%); Saudi Arabia (93.0%); United States of America (85.00%); Britain (83.00%) and Bangladesh (96. 8%). Indigenes of Abuja, Nigeria are recorded with 95.67% (n-305) Rh positive incidence [25]. Bhutia (n-297), Lepcha (n-688) and Nepali (n-4113) population of Nepal showed the dominance of Rh positive by 100%, 99.7% and 99.39% respectively [36]. Another study on tribals, viz. Chakma (n-3690),

Marma (n-183), Tanchangya (n-123) and Tripura (n-109) of Bangladesh showed the dominance of Rh positive in the following manner – 99%; 99%; 97% and 100% respectively [21] followed by the Bishnupriya (95.14%, n-658); Meitei (99.13%, n-460); Meitei-Pangan (98.105%, n-316) and Khasia (100%, n-204) of Bangladesh [37]. A number of studies on Rh incidence have also been done in India. The Nomadic tribes of Western India (BanjaraNatt, Sapara, Bawariya, Sansui, Bhopa and Gujjar) accounts for 98.6% (n-1286) Rh positive incidence cumulatively [38]. Ethnic Mao population of Manipur has a 99.5% (n-775) Rh positive frequency [22] but interestingly Naga tribe Maram (n-180) showcased only 65% Rh positive incidence, much less than other populations [39]. The significance of discussion on Rh factor in this context is that, few studies on the tribals of Uttarakhand have recorded with high Rh-positive frequency in their blood. The Buksa tribe of Uttarakhand has been recorded with 98.6% (n-568) Rh positive frequency [23] followed by Tharus' 93% Rh positive frequency [24]. Therefore, the distribution of Rh blood group among the populations of Uttarakhand has been demonstrated in table 4.

State		Male						Female					
		Age group (years)						Age group (years)					
		0-14	15-29	30-44	45-59	60 & above	All	0-14	15-29	30-44	45-59	60 & above	All
Uttarakhand	Rural	6.1	3.9	1.1	3.9	16.5	5.4	2.3	4.9	8.3	2.2	13.5	4.9
	Urban	9.3	1.8	1.9	4.0	33.6	6.5	4.0	3.5	6.7	11.1	15.5	6.5
UttarPradesh	Rural	8.7	5.5	8.7	11.9	2.86	9.6	7.2	8.1	11.8	16.2	26.6	10.4
	Urban	8.8	5.3	6.9	14.9	29.8	9.3	8.1	7.7	13.8	23.8	37.1	12.6
Himachal Pradesh	Rural	4.4	5.1	5.0	10.9	28.8	7.3	3.8	4.1	15.1	17.3	26.1	10.1
	Urban	4.2	0.5	1.4	5.9	31.7	3.9	5.3	4.3	9.5	10.4	31.0	7.8
Jammu Kashmir	Rural	6.8	1.8	3.6	8.6	33.8	7.0	5.1	2.9	7.2	8.2	35.3	6.9
	Urban	8.6	3.4	1.7	10.3	38.3	7.5	7.0	1.8	5.6	19.6	31.2	8.1
Punjab	Rural	9.5	6.9	9.9	15.7	30.3	11.4	7.8	9.9	20.2	26.1	41.7	16.0
	Urban	8.2	7.6	9.0	11.9	28.8	10.0	7.2	4.8	11.3	26.0	34.1	11.5

Table 5: Incidence of morbidity among the rural and urban populations of Uttarakhand and the neighboring states [50].

The above Table 4 demonstrated the prevalence of Rh Blood group among different tribal population of Uttarakhand. The percentages were mentioned in parenthesis in this table. Tharu of Uttar Pradesh showed Rh positive 97.56% and Rh negative 2.43%, Khasa – Rajput of Jaunsar showed Rh positive 72.79% and Rh negative 27.21%, Buksa of Dehradun have Rh positive 98.16% and Rh negative 1.83% and Raji of Uttarakhand have Rh positive 97.87% and Rh negative 2.12%. It is evident that all these tribal population of Uttarakhand showed higher frequency of Rh positive blood group in comparison to Rh negative blood group which is statistically significant ($P < 0.05$).

Life expectancy, morbidity and mortality

A major component of calculating Human Development Index (HDI) is life expectancy. HDI is a summary measure of average achievement in dimensions of human development [40-42]. Life expectancy stands for the average number of years that a newborn can

expect to live in “full health” by taking into account years lived in less than full health due to disease and/or injury [43,44]. The life expectancies determined by the incidence or prevalence of a disease or of all diseases (morbidity) and number of deaths by place, time and cause (mortality) (Table 5) [45].

There are several factors that affect life expectancy, such as, family history, marital status, economic status, physique, exercise, diet, drug use, disposition, education, environment, sleep, climate and health care. India is a developing country with huge multi ethnic population, diverse environmental set ups and a dominant rural-urban division.

Because of the conditions, peculiar to itself, India has some specific factors affecting life expectancy, viz. malnutrition, high infant mortality, diseases, poor sanitation, unavailability of safe drinking water, less awareness of health care [46], size of the family, exposure to mass media, standard of living and literacy composition of household

[47]. Nearly 2/3rd or 68.84% [6] of the Indian population lives in rural areas. A large section of this rural population is tribal; nearly 89.96% of total tribal population resides in rural areas of India [7].

Tribal populations are historically relegated to a lower position and not easily accessible because of their remote location. Due to these reasons, a very little amount and scattered information is present about their condition [48], especially health status. The tribal conception of health has remained primitive and defined on the basis of body functioning and physical vigour on account of isolation from rest of the society, their group consciousness and life style [48]. A number of infectious diseases are negatively affecting the life expectancy of these tribal populations.

Tribes	Mean	f-value	p-value	Ecology
RAJI	50.93	108.776	0.000	Interior forested mountainous regions (terai) of Uttarakhand.
BUXA	54.95			
THARU	54.56			
KHASA	57.69			
(f - 108.776 df=3 p<0.05)				

Table 6: Life expectancy of different tribal population of Uttarakhand [9].

Life Expectancy by sex and residence, India, 2010-14 (e00) [53]				
Rural		Urban	Total	
66.7		71.5	69.1	
Life expectancy by sex and residence, Uttarakhand, 2010-14 (e00) [53]				
Rural		Urban	Total	
71.0		74.1	72.5	
Life expectancy of Raji, Buxa, Tharu and Khasa of Uttarakhand				
Raji	Buxa	Tharu	Khasa	Total
50.93	54.95	54.56	57.69	54.53

Table 7: Comparison of life expectancy of Uttarakhand tribals with state and national level.

The major contributors for these diseases are poor environmental sanitation, poor hygiene and lack of safe drinking water. The risk is amplifying due to lack of access to health care facilities and/or social taboos preventing utilization of available health care services [17]. But notwithstanding these facts, the reported morbidity prevalence among the scheduled tribe populations is considerably lower than other social groups; demonstrating a rate of 58/1000, much lower than other groups' 106/1000 [49]. In a study by Suryanarayana [50] on morbidity profiles of Kerala in comparison to India, the incidence of morbidity in major rural population is much lower than their urban counterparts. From the perspective of health scenario of Uttarakhand tribes, the data of morbidity incidence is demonstrated below with its neighboring states.

The reported lower prevalence of morbidity among the scheduled tribe population is, anyway, surprising because various studies has indicated about the presence of a number of infectious diseases in

tribal morbidity [17,48,51,52] in association with other factors. The highlighted low prevalence of morbidity among tribals/rurals is due to poor awareness about health problems and resulting poor/less reporting of diseases [50-53]. This poor reporting, coupled with lifestyle diseases of urban rich peoples contributed to high morbidity among urban population. This incident of rural urban difference in disease reporting specifies the poorer health status of rural/tribal people than urban peoples [49].

The above Table 6 demonstrated the life expectancy of different tribal sharing same ecological habitat in Uttarakhand. Khasa of Uttarakhand (57.69) showed the highest life expectancy, followed by Buxa (54.95), Tharu (54.56) and Raji (50.93). The analysis of variance (ANOVA) yield significant ($p < 0.05$) result, which stands that the populations are close to each other.

Jammu Kashmir	Himachal Pradesh	Assam	Arunachal Pradesh
59.7	65.1	66.3	56.7

Table 8: Life expectancy of scheduled tribes of other states sharing similar ecology [2].

The above Table 7 enumerated the comparative Life Expectancy at birth by sex and residence of India, Uttarakhand for years 2010 -14 and also different tribal population (Raji, Buxa, Tharu and Khasa) of Uttarakhand. Generally, tribal population lives in rural areas as compared to urban areas. So, here Life expectancy of rural population is prerequisite. The Urban population of India and Uttarakhand had shown greater life expectancy (71.5 and 74.1 respectively) than the rural areas (66.7 and 71.0 respectively). Life expectancy of rural Uttarakhand (71.0) is comparatively higher than national rural life expectancy (66.7). Among the four tribal populations of Uttarakhand, Khasa (57.69) is showing highest life expectancy followed by Buxa (54.95), Tharu (54.56) and Raji (50.93), is the lowest. Life expectancy of these populations are way low than the state and national expression of the same.

The above table 8 demonstrated the Life expectancy of Schedule Tribes of other states sharing similar ecology i.e., Interior forested mountainous region. The highest Life expectancy had shown by Schedule Tribes of Assam (66.3) followed by Schedule Tribes of Himachal Pradesh (65.1), Schedule Tribes of Jammu and Kashmir (59.7) and Schedule Tribes of Arunachal Pradesh (56.7). In comparison, all these expressions are higher than the life expectancy of Uttarakhand scheduled tribes.

Discussion

It is apparent from the above discussion that the tribal population of India residing in the areas which are remote and still largely out of reach of the government provided necessary modern health care facilities through community intervention programmes. Because of sharing similar ecologies, their strategies of livelihood are often follows the same pattern and hence, they fall susceptible to similar environmental hazards, especially, infectious diseases. The intensity of these hazards increases because of their lifestyle which put less emphasis on hygiene and sanitation. But still, the life expectancy of the concerned tribal populations is showing a moderate value in comparison to national level reference. In this paper, the life expectancy of Uttarakhand tribals are compared with other state level and national level data and with other tribal groups from similar

ecological settings showed that the tribal population of Uttarakhand and other states are not so behind than the national value. This is a surprising phenomenon because the populations are isolated from standard healthcare system and exposed to every possible environmental threat.

Conclusion

This phenomenon constitutes the fact that, only environmental factors are not playing the key role behind health status of tribal people, rather, genetic characteristics may have some important contributions. From the above discussion it may be concluded that all these populations of Uttarakhand have shown higher prevalence of immunogenic Rh-positive antigen in their blood, which may provide natural immunity to them. Therefore, the authors are intended for further potential research to find out the reasons in the context of health conditions of, not only the tribals of Uttarakhand, but also the different communities representing similar ecological habitation, where they are showing standard life expectancy despite of loosely connected with standard health care system.

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