

Recent public health concerns of the high-altitude tribal population of Lahaul and Spiti, Himachal Pradesh

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ABSTRACT

Objective: India has a tribal population of 8.6%. Health concerns of the high-altitude tribal population in India play a vital role in overall socio-economic development and health transformation of the country. Therefore, the aim of this study was to determine the current health problems among the tribal population of Lahaul and Spiti district of Himachal Pradesh. **Material and Methods:** The study area encompasses one regional hospital (RH) in Keylong (the district headquarters), three community health centers (CHCs), and 16 primary health care centers (PHCs). In addition, the district has 37 sub-centers (SCs) and 21 Ayurveda dispensaries to serve the district. The data for this study were gathered over a 4-year period from records of daily out-patient department registration from the various health centers (RH, CHCs, and PHCs) from 2017 to 2020. **Results:** In terms of communicable diseases, the population in the concerned region was more likely to have acute respiratory infection, enteric fever, tuberculosis, and typhoid. Hypertension, asthma, bronchitis, and diabetes mellitus type II were determined to be the most common non-communicable diseases. **Conclusion:** Acute respiratory disease, hypertension, diarrhea, accidental injuries, and eye problems were shown to be prevalent in the study area. The population's position in relation to these five diseases indicates the community's sensitivity to a variety of common conditions. There is a need to review the needs and priorities of the concerned population and create goals and targets to meet those needs using validated public health measures.

Keywords: High-altitude, Himachal Pradesh, Lahaul-Spiti, tribal health

Introduction

India is home to one-third of the world's tribal and indigenous population or approximately 104 million tribal people (8.6%). They are spread over 705 localities and represent a wide range of ethnic backgrounds.^[1] The gap with respect to health care between tribal and non-tribal populations is at a concerning level,

and it is a challenging task to bridge the gap to reduce health disparities. The triple or quadruple burden of disease exists in the tribal population when it comes to communicable disease, non-communicable diseases, malnutrition, mental health, and addictions.^[2] It should come as no surprise that the frequency of health-related concerns is higher among tribal women and children because of their biophysical characteristics and state of fragility, making them an even more vulnerable category among tribal people.^[3] According to National Family Health Survey 5 (NFHS-5) (2019-2020), 91% of children aged 6–59 months and 82.3% of women aged 15–49 years were anemic.^[4] The tribal population's health situation is further exacerbated by low access to health care services.

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Tribal people have distinct cultural, social, and environmental characteristics as well as terrains, geography, and climate.^[5] Most tribals live in a hilly or forested area where pertaining to education is tough, physical environments are harsh, malnutrition is common, access to potable water is limited, and personal hygiene and sanitation are lacking, making them more susceptible to diseases and resulting in worse health indicators than the general population.^[6] The majority of Indian tribes live in a high terrain where health care facilities or systems are inaccessible, making it rugged for health care workers to reach them.

Inadequate planning and policy relating to tribal health care, lack of availability of contemporary health services in these areas, and low utilization of provided services are the key concerns facing tribal health care. Because of a paucity of high-quality research in certain locations, there is limited information concerning the health of tribal people. In the absence of private health care, public health care facilities are the sole means of obtaining modern treatment, and they are frequently unavailable owing to personnel shortages, geographic inaccessibility, and a language barrier.

The availability of a health care system and facilities within a community's reach can be used to determine the health of that community. Moreover, the tribal health care is largely influenced by the traditional health care system. Their reliance on traditional medicinal systems stems from a lack of health care resources in the villages as well as their centuries old belief and conviction in traditional treatment.^[7]

It is critical to design a health care delivery system that is appropriate, accessible, acceptable, and economical for the tribal people, making it even more critical to establish a health system that promotes indigenous population equity over equality.^[2] Even though tribal people have long been suspected of having unmet health needs, their health care has remained subjugated in rural health care settings. It was anticipated that tribal people face similar health issues and have similar demands, but the assorted terrain and environment in which people reside as well as their different social systems, cultures, and hence their health care demands were not fully addressed.^[8] In a recent article, the need to address the health concerns or disease burdens in different tribal populations of India was highlighted.^[9] At high elevations, the interactions between individual, genetic, lifestyle, environment, and socio-economic factors as well as adaptation and acclimatization processes are exceedingly complicated.^[10] Therefore, the present study aimed to bring out the major health issues prevailing in the Lahaul and Spiti region as well as to ascertain their probable attributes.

Materials and Methods

Study area and population

Lahaul and Spiti district of Himachal Pradesh is located at an altitude of 4,270 m with heavy snowfall in the winters which begin in mid-October and last till mid-April. The temperature falls up

to -30°C in winters, thereby reflecting this region as one of the most difficult, remote inaccessible districts of the state. As per census 2011, a population of around 31,528 (Lahaul = 10,199, Udaipur = 8,884, Spiti = 12,445) has been scattered over this difficult terrain with the majority being a tribal population and dependent mainly on government medical setup for health facilities. The district has one regional hospital (RH) at Keylong (district headquarter), three community health centers (CHCs), and 16 primary health care centers (PHCs). Besides, 37 sub-centers and 21 Ayurvedic dispensaries are running in the district to facilitate the general population.

ICMR Field station Keylong is dedicated entirely to work upon health problems in different marginalized areas of Himachal with focus on Lahaul and Spiti. The data used in this study have been collected based on the records of daily out-patient department (OPD) registration in the various health centers (RH, CHCs and PHCs) of the region over a period of 4 years (2017 to 2020). The data of the patients were recorded in the tabular form. The number of the cases reported for each health problem and prevalence was then depicted using Microsoft Excel. For comparative analysis, search engines such as Google scholar, PubMed, and Science Direct were explored and attempt was made to include recent research studies at higher-altitude regions.

Results

The tribal population in the Lahaul and Spiti district of Himachal was more likely to have acute respiratory infection (ARI), enteric fever, tuberculosis (TB), and typhoid with respect to the communicable diseases. The prevailing non-communicable diseases (NCDs) were found to be hypertension, asthma, bronchitis, and diabetes mellitus type II [Figure 1]. Respiratory infections were observed to be the most prevalent ranging from 14,000 to 29,000 cases for a period of 4 years in the district probably because of cold climate. The second most prevalent disease was dysentery with average reported cases of 4 years as 4800 and hypertension affecting around 4100 individuals of the district. Apart from the above-mentioned diseases, the other medical help provided by the health centers (RH, CHCs, and PHCs) included accidental injuries, dog bite, acute dysentery, and eye diseases. Based on the data analyzed by utilizing the daily out-patient registrations in RH, CHCs, and PHCs of the district for the period from 2017 to 2020, a higher prevalence of acute respiratory diseases was observed followed by hypertension, acute dysentery, and accidental injuries [Figure 2].

Interestingly, in the years 2018–2019, cases of all these five health problems were reported to be drastically higher (1.1 to 1.2 folds high) than the previous year report, but eventually in the year 2020, the cases decreased even below than those reported in 2017 [Figure 2]. The possible attribute to this drop may be the onset of coronavirus disease 2019 pandemic that restricted most of the patients (unless serious) not to visit the hospitals to avoid severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection.

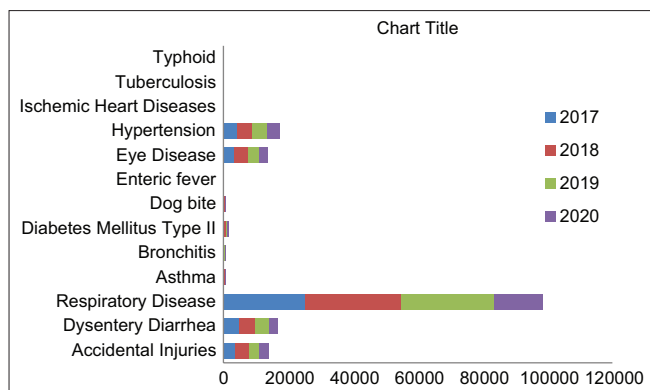


Figure 1: Major health issues of Lahaul and Spiti district of Himachal Pradesh plotted against number of patients treated and recorded at various health centers (RH, CHCs and PHCs) during past 4 years (2017–2020)

Discussion

The present study was carried out to examine the prevalence of various communicable, non-communicable, and other diseases among the tribal people of Lahaul and Spiti. The burden of the five prevalent health issues (ARI, hypertension, acute dysentery, accidental injuries, and eye diseases) among the targeted population is at the concerning state and needs to be addressed. These results corroborate with the previous studies carried out at high altitudes in China, US, and India.

Acute respiratory tract infections

Respiratory infections are common at the high-altitude region and evident from the current study results with the highest prevalence of acute respiratory diseases. The air density, humidity, and temperature all decrease as altitude rises. Airway reactivity, insensible water losses, ventilatory changes, and changes in pulmonary hemodynamics may all be caused by these causes.^[11] Also, mountain valley systems have the ability to trap pollution from urban areas, and heavily travelled regions near roads may be susceptible to the accumulation of heavy-duty automotive emissions, and local air quality is frequently poor because of smoke from wood- and animal dung-burning stoves used by local residents.^[12,13] Another essential physiologic reaction to acute hypoxia exposure is hypoxic pulmonary vasoconstriction. This response, which varies among individuals and is mediated by decreasing alveolar oxygen tension, raises pulmonary vascular resistance and pulmonary artery pressure.^[14,15]

A recent study in the United States reported positive association between altitude and mortality rate from respiratory diseases.^[16] The distinctiveness in the high-altitude environment can have a detrimental impact on the human body, which is also observed in the results of the current study. This could be related to the fact that a high altitude encompasses dry and cold weather, hypoxia, strong ultraviolet (UV) radiation, and prolonged snow cover.^[17] Up to 5–10% of high-altitude dwellers in certain parts of the world develop one of two types of chronic high-altitude illness – chronic mountain sickness (CMS) and high-altitude

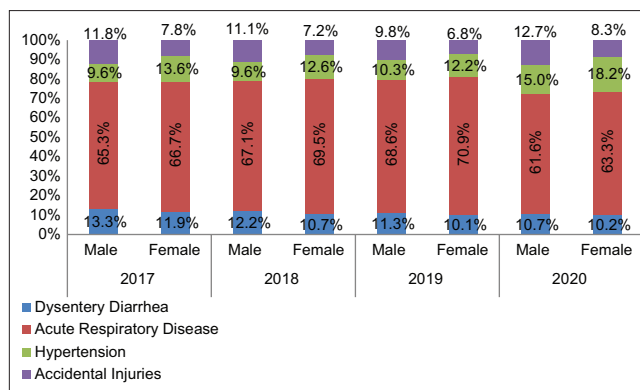


Figure 2: Prevalent health issues recorded in the past 4 consecutive years (2017–2020) at various health centers (RH, CHCs, and PHCs) of Lahaul and Spiti, Himachal Pradesh

pulmonary hypertension (HAPH) – because of maladaptive responses to persistent (months to years) hypobaric hypoxia.^[18] Impaired gas exchange, airway blockage, and increased work of breathing characterize chronic obstructive pulmonary disease, a very prevalent respiratory condition. Hypobaric hypoxia at a high altitude may modify these parameters, perhaps aggravating the illness state already present. Other respiratory disorders that might adversely get affected by the high-altitude environment are pulmonary hypertension, thromboembolic disease, asthma, cystic fibrosis, interstitial lung disease, obstructive sleep apnea, neuromuscular disorders, abnormal ventilatory drive, and so on.^[19] Contrary to this, recent articles reported that residents living at a high altitude may be protective with regard to SAR-CoV-2 infection.^[20,21] To better understand whether living at a high altitude gives any protection against SARS-CoV-2 infection and severity, further epidemiological research is needed.

People with genetic adaptations can survive permanently at heights of up to 5000 meters (16,400 feet).^[22] The high-altitude populations in the Swiss^[23] and Austrian Alps,^[24] as well as the western United States^[25] had decreased mortality from cardiovascular illnesses, stroke, cancer, and Alzheimer's disease, whereas mortality from pulmonary morbidities (e.g., emphysema, chronic obstructive pulmonary disease) seemed to rise^[25,26].

Hypertension

The prevalence of hypertension decreased from 40.6% to 20.4% from the lowest to the highest altitude range, according to a survey on Tibetans living at three different height ranges between 2700 and 4505 meters associated with a decreasing body mass index (BMI).^[27] A study conducted in the Spiti valley revealed the prevalence of hypertension higher in the population residing at an altitude of 3100–3500 meters (27.5%) and 3500 meters and above (19%).^[28] Lower BMI and reduced risk of hypertension at a high altitude are likely related to decreased appetite and caloric intake as well as higher energy expenditure because of a low ambient temperature.^[27,29] Contrary to this, a meta-analysis on Tibetans living at 2400 meters stated that with each 1000 meters gain in elevation, there is an increase

in systolic and diastolic blood pressure by 17 and 9.5 mmHg, respectively.^[30] In Nainital district of Uttarakhand, having an altitude of around 2000 meters, hypertension is 54.5% prevalent in geriatric subjects with advancing age and BMI being major risk factors.^[31] Pre-hypertension (an indicator of hypertension in near future if not controlled) has been reported to be 41.5%, whereas hypertension prevailed at the rate of 28.1% in the Chinese population working at a high altitude.^[32] Another cross-sectional study from China (Qinghai province) also witnessed the positive correlation of high altitude and hypertension with 36.3% prevalence in highlanders as well as related complications, for instance, kidney or heart diseases.^[33] Therefore, the impact of the cardiovascular adaptive response to hypobaric hypoxia and extreme temperature on the development of hypertension in high-altitude natives has generated conflicting results.

Gastro-intestinal disorders

At high altitudes, gastro-intestinal (GI) issues are also prevalent. Short-term visitors, long-term residents, and native highlanders all have different manifestations.^[34] Apart from diarrhea, the highlanders also experience other GI disorders such as anorexia, epigastric discomfort, flatus expulsion, dyspepsia, severe acidity, infectious diarrhea, and so on.^[35,36] To understand the grounds of infectious diarrhea in this study, it may be taken into consideration that during winters, when fresh vegetables are not available in the area, sun-dried vegetables or non-vegetarian diets are the only option left. As the temperature is quite low, people prefer non-vegetarian diets (particularly mutton) that sometimes result in acute dysenteries if consumed in a large amount. Moreover, the climatic conditions favor the propagation of viral diseases.^[37]

Ophthalmic disorders

The effects of a high altitude on the eyes are both short- and long-term. High-altitude retinopathy, corneal thickness changes, and photokeratitis are some of the short-term consequences, whereas pterygium, cataracts, and dry eye disease are all long-term complications.^[38] Residents of high-altitude places experience a reduction in oxygen supply. This leads to greater levels of hypoxia-inducible factor 1, which boosts vascular endothelial growth factor expression. As a result, abnormal neovascularization occurs, leading to the progression of eye disorders including age-related macular degeneration.^[39] Factors such as limited air oxygen, low humidity, and strong UV radiation can cause a number of pathophysiologic events in a high-altitude environment, resulting in ocular diseases.^[40] Therefore, it is important to comprehend the prevalence of high-altitude eye disease and, ultimately, to use this knowledge for the prevention and treatment of the ailment.

Accidental injuries

Regarding the accidental injuries, heavy snowfall during winters poses a serious challenge in commuting. Roads are covered with snow that turns slippery after 12–15 hours of deposition that affects local transport. Although in winters people usually equip the vehicles with metallic chains in the tires to ensure

gripping while driving in snow, still the risk remains high. Pedestrians also face difficulty walking on the snow as slipping often leads to orthopedic or head injury. Several reports are documented in the literature regarding orthopedic morbidities at a high altitude because of fall. A study conducted on pilgrims of “Shri Amarnath shrine” reported fractures, aggravation of back pain, and knee pains as the most common problems.^[41] Another longitudinal study in the United States reported the unintentional injuries positively associated with the high-altitude region.^[42] Snow avalanches, tree wells, cliffs, glacier crevasses, natural impediments, difficult travelling conditions that can lead to injuries from unintentional falls, and harsh environmental conditions that can lead to hypothermia, frostbite, or dehydration are examples of other accidental injuries.^[43]

Dog bites

Dog bites and associated rabies are also a major public health issue, accounting for over 96% of all rabies-related deaths and morbidity.^[44] India solely is responsible for 35% of the global rabies load.^[45] Animal bites are estimated to be 1.7% in India (17.5 million per year).^[44] Dog bites increased from 4.2 million in 2012 to 7.4 million in 2018, according to the Integrated Disease Surveillance Programme.^[46] Establishing preventive interventions requires a thorough grasp of the existing state of dog-bite injuries in the study area. To the best of our knowledge, as of now, there has been no study conducted on the dog bite injuries. Understanding the dog bite and rabies burden would aid in making informed decisions, allocating resources and funding appropriately, and, as a result, formulating and implementing the best-suited interventions at the district level.^[47]

Diabetes

Diabetes is a public health concern in most of the tribal dominated regions, especially in India. Several studies in the literature advocate the prevalence of the disease, and recently, through meta-analysis, it was reviewed that like the urban population, even the tribal population is getting affected by life style diseases.^[48] Also, an association incidence of diabetes was established with cold temperature residence.^[49]

Need of the hour

The tribal population lives in far-flung places, transportation is more difficult for them, and there is a dearth of mobile transportation in case of an emergency. Moreover, the traditional health care system, in particular, is in jeopardy. The tribal people have a lot of faith on the traditional healers, but there is a lot of knowledge gap about diseases and how to handle them.^[5] The modern health care system, particularly primary health centers, should be equipped with all modern facilities, and health staff should be appointed in these areas to the national health policy's minimal standard, with their regular services taken into consideration.^[3] Also, traditional knowledge has its own value in the context of tribal health. Therefore, the modern health system and old traditional methods must be integrated and merged into a new health care system.

Conclusion

In the present study, 13 health issues were identified, which include communicable diseases (acute respiratory diseases, TB, typhoid, enteric fever), NCDs (hypertension, asthma, bronchitis, diabetes mellitus type II, and ischemic heart diseases), and others (accidental injuries, dog bites, acute dysentery, and eye diseases). Out of them, the prevailing health issues were ARIs, followed by hypertension, acute dysentery, accidental injuries, and eye diseases. The health issues ascertained in the current study need to be addressed with an approach considering the geographical location and the tribal population of the region. Considering the tribal population of all states, within a period of 2012–2018, Himachal Pradesh was observed to have the highest shortfall of health care personnel, although it is a tribal dominated area.^[50] Therefore, the need of the hour is to prioritize the implementation of public health strategies which can bring in positive change in the health profile of the tribal population. The challenges of social marginalization as well as the loss of indigenous knowledge must be addressed.

Relevance of the article to the practice of primary care physicians

- Major disease burdens of the region have been ascertained through OPD registrations that clearly reflect the type of medications/treatment to be focused upon in the area.
- As the area is snow-bound, medical supplies need to be stocked for winters, so identification of tentative public health concerns will definitely succor.
- Probable causes have also been discussed in the article, which may serve as preventive guidelines for caregivers to patients in the area.
- Ultimately, it can pave a way toward elimination of these diseases by strategizing public health care policies.

Key message

Considering the major public health concerns of Lahaul and Spiti, there is a need to explore the combined effect of a low temperature, a high altitude, and lifestyle of the tribal population on different health issues to have a better understanding which will further be helpful in the identification, prevention, and control of the diseases prevailing in the region.

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Conflicts of interest

There are no conflicts of interest.

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