Research Article

# Knowledge, Perception, and Behaviour Concerning Impact of Climate Variability on Health: A Cross-sectional Study in the Tribal-dominated Kalahandi District of Odisha, India

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**DOI:** https://doi.org/10.24321/0019.5138.202269

## I N F O

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**How to cite this article:**
Mishra MM, Sahu N, Mallick G, Pani B. Knowledge, Perception, and Behaviour Concerning Impact of Climate Variability on Health: A Cross-sectional Study in the Tribal-dominated Kalahandi District of Odisha, India. J Commun Dis. 2022;54(2):39-48.

## A B S T R A C T

*Background:* Kalahandi district of Odisha is a well-known place on the world map for its poverty, starvation, diseases, and deaths. The population of the district is dominated by the tribals and marginalised schedule caste population. Combing all these factors, this district has become one of the most sensitive and vulnerable districts of the country concerning climatic variability and human health.

*Objective:* The objectives of this study were to explore the knowledge and perception of people from 13 blocks of Kalahandi towards climate change/ variability and its relationship with human health, its footprints, and coping strategies available to them.

*Methodology:* A cross-sectional study using a questionnaire was carried out among the respondents from 13 blocks. A total of 208 respondents were selected through a simple random sampling method through convenience sampling.

*Result:* The majority of the respondents (86%) were not aware of the terms like climate change/ variability and belonged to the vulnerable class (44% ST and 20% SC) of the society. Most of them agreed to the fact that there are changes in all three (summer, monsoon, and winter) seasons of a year. The most significant finding of the survey is the increase in the "diseases of affluence" in a tribal-dominated district. An increase in hypertension, diabetes, joint pain, and skin diseases in the last 10 to 15 years was mentioned by 41%, 32%, 28%, and 24% of participants respectively.

*Conclusion:* The study will be very helpful in comprehending the ground realities of their understanding of climate variations and the impact on health, and further aid in better policy formations.

**Keywords:** Kalahandi, Climate Change/ Variability, Human Health, Knowledge, Perception, Behaviour

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## Introduction

Variability in the climatic pattern has become the biggest threat of the 21st century.[1,2] Changing patterns of the climate and extreme weather events (heatwaves, drought, and flood) have serious consequences on human health both at the local as well as global levels.[3,4] Anthropogenic activities are considered the most significant contributor to climate change[5] which further accelerates the rate of diseases and related deaths. It is now widely accepted that climate change has an interconnection with human health,[5-8] but still, understanding the correlation between human health risks and climate change is a challenging task.[9] The ramification of climate change on the geographical distribution of diseases has become an area of prime concern for scientists and policymakers. Climate change has an immense impact on the health of the population of less developed and socio-economically backward regions. These changes play an important role in disturbing the environment which leads to several waterborne, vector-borne, and airborne diseases. The major social contributors which increase this impact of climate change are lack of knowledge about the phenomena, low level of literacy and per capita income, and poor health infrastructure.

Climate change has become an added concern for the health department of a country like India where the available health infrastructure is not sufficient for its enormous population.[10] Though several pioneer works have been done to understand the role of climate change and its link with diseases, illness, and mortality, these studies are either done on a large scale or are mainly limited to the developed nations.[11,12] Keeping these issues in mind, this study seeks to address the knowledge, perception, attitude, and practices of the most socially and economically backward population of this country towards climate change, its impact on their health, and their adaptive strategies. This survey study has been conducted in the blocks of the Kalahandi district of Odisha. Odisha is a state of India, lying in the eastern part of the country with 3% of the country's population and 4% of the land area.[10] The state of Odisha is struggling for decades to find a solution for vector-borne (malaria) and waterborne (typhoid and cholera) diseases majorly prevalent in the Kalahandi district.[13] These diseases have a high correlation with the weather and climatic pattern. Kalahandi district of Odisha is well known in the country for its tribal population, malaria issues, poverty among the population, lack of education, poor sanitation, and unavailability of healthcare infrastructure. This district is considered one of the most vulnerable districts of the country due to the above-mentioned reasons and therefore we have conducted a field survey in the Kalahandi district.

## Materials and Method

### Study Area and Population

The cross-sectional study has been carried out in September-October, 2019 in the 13 blocks of the Kalahandi district of Odisha (Figure 1), which is highly prone to malaria. The district of Odisha is located between 19.30 °N and 21.50 °N latitudes and 82.20 °E and 83.47 °E longitudes with 28.5% of the population belonging to the scheduled tribe (ST) community. The district is divided into two sub-divisions namely Bhawanipatna and Dharmagarh which are further divided into seven and six blocks respectively. The economy of the district is agrarian-based and the district received funds from the Backward Regions Grant Fund Programme (BRGFP). According to the census 2011, the district has a literacy rate of 59.22% and a sex ratio of 1003 females per 1000 males. The majority of the population i.e., 95.22% spoke Odia in the district.
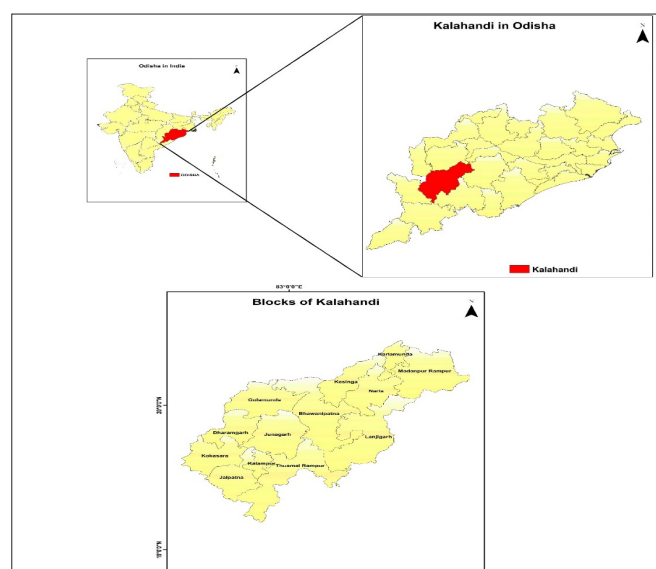


**Figure 1.Study Area Map showing Blocks of Kalahandi in Odisha, India**

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## Survey Design

A well-framed structured draft of the questionnaire was developed after a review of literature available on knowledge, perception, and attitude towards climate change and its relationship with human health.[14-22] Data were collected by simple random sampling method through convenience sampling in which the targeted population at the community health centres (CHCs), primary health centres (PHCs), and medical shops were interviewed face to face. One well-educated (MA in Anthropology) local student was hired during the collection of primary data with his consent. The questionnaire was originally designed and was approved by the PhD thesis guide after a concrete discussion on different aspects of climate, climate change/ variability and health relationship, and human health vulnerabilities. Later, the questionnaire was translated into Odia for a better understanding of the population. The questionnaire included questions with multiple options, and closed and open-ended questions. The questionnaire contained four major sections:

- Personal information about the respondents
- Spatial-temporal corroboration of climate variability in the Kalahandi district
- The health impacts by focusing on direct and indirect footprints
- Vulnerability assessment of the population in changing climatic

## Data Analysis

A total of 208 (response rate, 87%) questionnaires were filled out by the participants out of 237 questionnaires distributed. Nearly 13% of the questionnaires either lacked information or were not correctly filled. We had taken 16 participants from each block to understand the holistic viewpoints from each corner of the district. The data collected from the field were entered into Statistical Package of the Social Sciences Software (SPSS, 22.00) and Microsoft Excel, 2010 for further interpretation. Data were analysed and expressed in terms of percentages and proportions. The figures were drawn on ArcGIS 10.2. Different types of graphs including colour scale, treemap, sunburst, and funnel were used to show the responses of the participants.

## Result

### Respondents' Demographic and Socio-economic Characteristics

A total of 208 respondents from 13 blocks of the Kalahandi district had completed the questionnaire and detailed interview. Out of 208 individuals surveyed, 76.4% were male respondents and 23.6% were female respondents. At the district level, we found that the maximum number of participants in this study belonged to the age group between 20 and 40 years, followed by the age group of 40-60 years. About 44.7% of the respondents belonged to the ST category, 20.2% to the schedule caste (SC) category, 21.2% to the general category, and 13.9% to the OBC category. The majority of the respondents were illiterate (20.7%) or had primary (19.7%), secondary (22.6%), and higher secondary (23.1%) levels of education. Out of the total respondents, we found that graduates (9.6%) and postgraduates (4.3%) comprised a very small percentage. The participants of the Kalahandi district lived in pucca houses (48.1%), kuchcha houses (34.1%), and huts (17.8%) respectively. A majority (64.9%) of the respondents had a large family comprising of eight or more members, 26.0% of the participants had a median family of 4-8 members and only (9.1%) belonged to a small family. Most of the people who were interviewed (62.5%) had a monthly income of less than 5000 INR, followed by 24.5% who had a monthly income between 5000 and 10,000 INR. 1.9% of the respondents had a monthly income above 40,000 INR. It has been noted that nearly 45.2% of the residents had a monthly expenditure of less than 500 INR on health issues in the district (Table 1).

**Table 1.Demographic and Socio-economic Characteristics of the Survey Respondents (n=208)**

|  | Category | Number | Percentage |
|---|---|---|---|
| Gender | Male | 159 | 76.4 |
|  | Female | 49 | 23.6 |
| Age | < 20 | 7 | 3.4 |
|  | 20-40 | 93 | 44.7 |
|  | 40-60 | 66 | 31.7 |
|  | > 60 | 42 | 20.2 |
| Categories | General | 44 | 21.2 |
|  | OBC | 29 | 13.9 |
|  | SC | 42 | 20.2 |
|  | ST | 93 | 44.7 |
| Education | Illiterate | 43 | 20.7 |
|  | Primary | 41 | 19.7 |
|  | Secondary | 47 | 22.6 |
|  | Higher secondary | 48 | 23.1 |
|  | Graduation | 20 | 9.6 |
|  | Post-graduation | 9 | 4.3 |
| Types of houses | Hut | 37 | 17.8 |
|  | Kuchcha | 71 | 34.1 |
|  | Pucca | 100 | 48.1 |

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| Number of family members | ≤ 4 | 19 | 9.1 |
|---|---|---|---|
| | 4-8 | 54 | 26.0 |
| | ≥ 8 | 135 | 64.9 |
| Occupation | Farmer | 129 | 62.0 |
| | Agricultural labourer | 7 | 3.4 |
| | Student | 6 | 2.9 |
| | Housewife | 37 | 17.8 |
| | Service | 29 | 13.9 |
| Household monthly income (INR) | < 5000 | 130 | 62.5 |
| | 5000-10,000 | 51 | 24.5 |
| | 20,000-40,000 | 23 | 11.1 |
| | ≥ 40,000 | 4 | 1.9 |
| Monthly expenditure on health in the family (INR) | < 500 | 94 | 45.2 |
| | 500-000 | 61 | 29.3 |
| | ≥ 1000 | 53 | 25.5 |

## Understanding of Phenomena of Climatic Variability

Figure 2a shows the responses of the interviewers regarding their perception and knowledge of climatic variability and related phenomena. Most of the respondents (86.1%) from the district had never heard of terms like climate change or changing patterns of climate, but it was interesting to observe that most of the respondents agreed with and were aware that there is change and variability during the summer (91.83%), rainy (85.10%), and winter season (93.37%) as shown in Figure 2b. During the summer season, 80.3% of the respondents mentioned an increase in temperature, whereas 69.23% identified that there was an increase in the heatwave in the last 10-15 years (Figures 2c and 2d). Over 47.1% of the respondents reported an increase in rainfall and 28.4% reported a decrease in rainfall (Figure 2e). Almost 1/4th of the district respondents did not have any idea regarding the changing pattern of rainfall in the district (Figure 2e).

More than half of the respondents had experienced a decrease in temperature and 32.2% had mentioned an increase in rainfall in the winter session (Figure 2f).
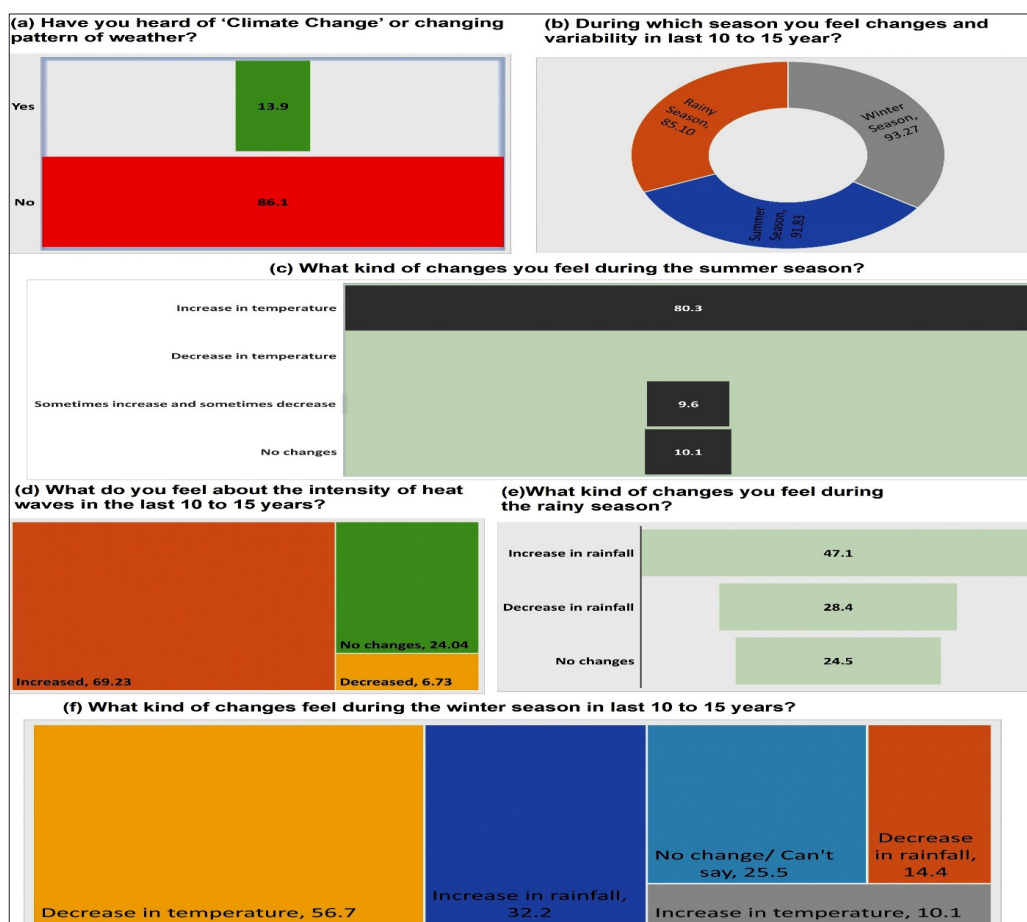


**Figure 2.Respondents' Perceptions and Knowledge about Climatic Variability/ Changes in Kalahandi**

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## Perception regarding Diseases and Seasonality

Our second aim of the study was to understand the perception of the interviewers about the relationship between seasonality and diseases. For better understanding, we had categorised them into three major categories i.e., vector-borne diseases, waterborne diseases, and other diseases. During the pilot survey, the authors understood that during all the seasons, vector-borne and waterborne diseases are common, but other diseases are different for each season. A list of diseases was prepared with the help of available literature and a pilot survey. In the district, majority of the respondents (72.1%) reported having fever, followed by heatstroke (33.2%), and typhoid (21.2%) as the main disease of the summer season (Figure 3a). Most of the survey respondents had perceived that during the rainy season, malaria (76.4%) followed by typhoid fever (51.9%), diarrhoea (45.2%), and viral fever (38.9%) were the major diseases. It is interesting to note here that 2.4% of the respondents mentioned dengue fever in the district (Figure 3b). During the winter season, except for malaria, no major disease was mentioned by the respondents (Figure 3c).

Further, we wanted to understand the incidences of diseases that have increased in the last 10 to 15 years. Nearly 42% of the respondents mentioned that they had observed an increase in cases of hypertension whereas, 32.2% and 28.8% mentioned an increase in diabetes and joint pain respectively (Figure 3d). One-fourth of the residents agreed to the fact that there was an increase in skin disease in the district (Figure 3d). In the last 10 to 15 years, malaria had been a major cause of mortality of family members of respondents during all three seasons (Figures 3e and 3f). Out of the total respondents, 64.4% agreed with the fact there is an increase in health issues/ diseases and mortality in the last decade (Figure 3g). It was mentioned by the respondents that 13% of younger ones between the ages of 0 and 10 years had died due to diseases followed by the age group of 50-70 years (Figure 3h). Nearly, 65% of the respondents had mentioned that their visit to the hospital was less than 10 times in a year and about 35% had a higher frequency of visits to the hospital (Figure 3i).

In the district, 80.8% and 73.6% of the respondents agreed with the fact that their visits to the hospital and health expenditure respectively had increased in the last 10 to 15 years (Figures 3j and 3k).
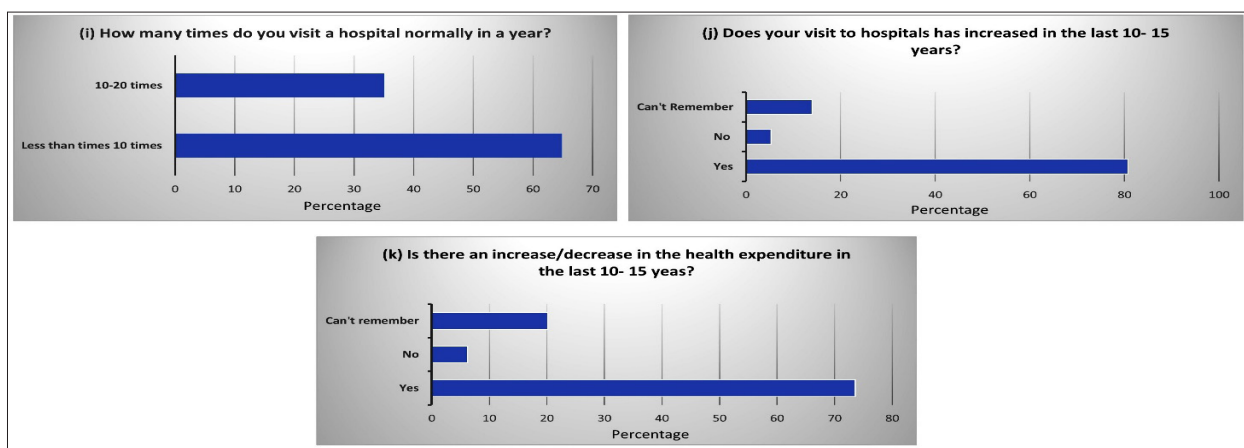
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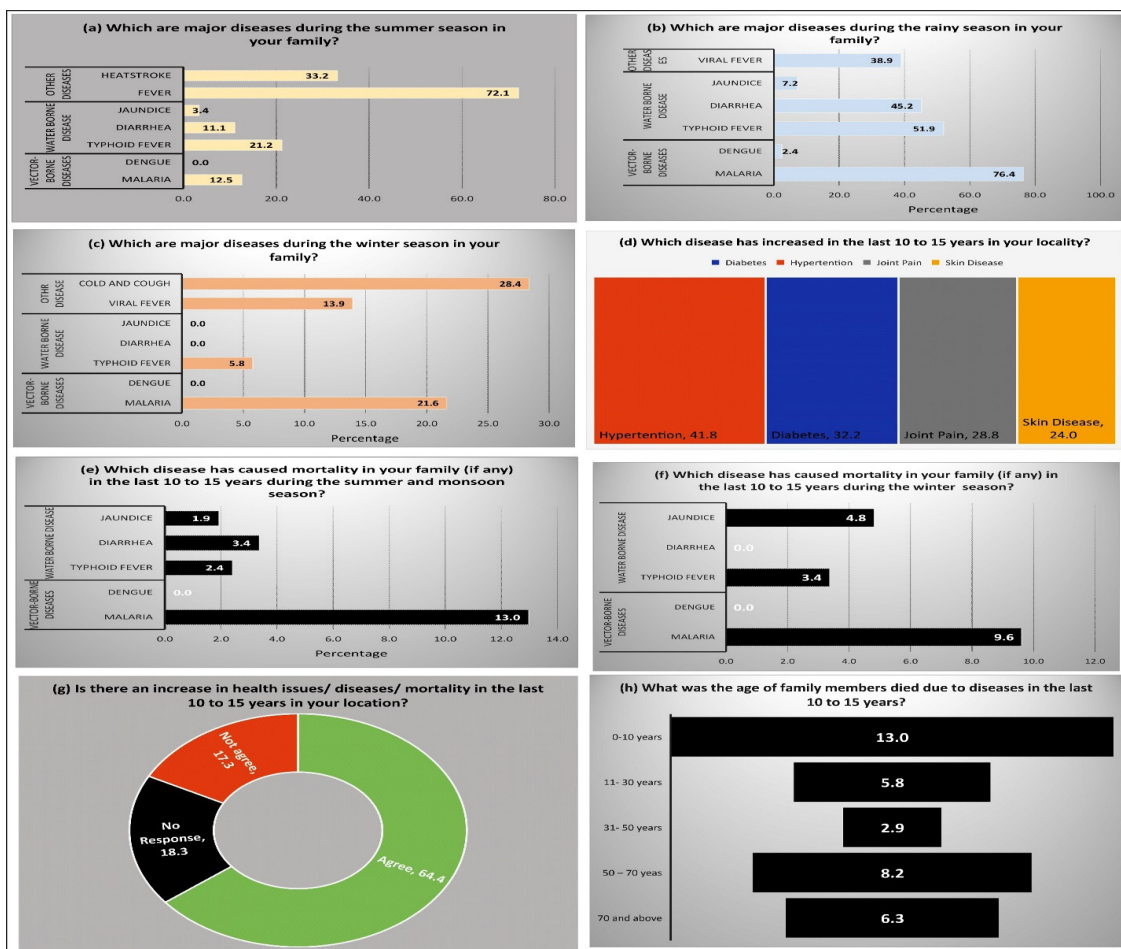
**Figure 3.Perceptions of Respondents about the Seasonality of the Diseases and Related Mortality in Kalahandi**

## Understanding the Perception regarding the Available Healthcare Facilities

The majority of the respondents agreed with the viewpoint that they don't have the issue of unavailability of doctors, medicines, basic test centres, and emergency facility of ambulances. Out of the total respondents, 38.5% mentioned that they faced the problem of non-specialised doctors at the CHCs. The majority of female respondents mentioned that they didn't face any challenges in discussing their problems and had no restrictions from their families. Nearly 40% of female respondents mentioned the non-availability of a specialised female doctor in the district at the CHCs. Among the older population, 70.3% were less interested in visiting the hospital whereas 5% of the respondents mentioned the issue of accompanying the person (Table 2).

In the last phase of the study, we focused on the two important questions i.e., related to their visit to places during the health issues and the source of their expenditure.

We divided the place of visit of the respondents into two major categories, namely local and professional support. These two categories were further divided into four sections respectively. Among the local support, people mostly (41.2%) believed in the treatment of uneducated doctors (Kaviraaj) followed by consultation from the medical stores (26.3%) and tantrism (21.9%). CHCs were the most preferred destination among professional support. Only 18.1% of respondents mentioned the visit to the district hospital when their family members suffered from a disease. We categorised the source of expenditure on health into two major categories i.e., loans and selling their property. In normal cases, the respondents used the available money (47.1%) with them followed by taking medicines on loan from the drug stores (35.6%). When the respondents had to travel outside of the district for medical help and support, they were generally dependent on selling their land (14.9%), ornaments (12.5%), and domestic animals (10.1%) (Table 2).

**Table 2.Health Vulnerabilities and Coping Strategies of the Survey Respondents**

| What kinds of healthcare facility problems are normally faced by patients? | | Unavailability of Doctors | | Unavailability of Medicines | | Unavailability of Basic Test Centres | | Lack of Emergency Facility | | Unavailability of Ambulances | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Option | Yes | No | Yes | No | Yes | No | Yes | No | Yes | No |
| | Percentage | 30.3 | 69.7 | 24.5 | 75.5 | 38.5 | 53.8 | 48.1 | 51.9 | 29.3 | 70.7 |
| What kinds of problems are faced by children at the primary centre? | | The problem of non-specialised doctors | | | | | | | | | |
| | Option | Yes | No | | | | | | | | |
| | Percentage | 38.5 | 61.5 | | | | | | | | |

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| What kinds of problems are faced by women patients at the Community Health Centre? | | Non-availability of female doctors | | Discussing their problems/ diseases | | Family restrictions on going to hospitals | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Option | Yes | No | Yes | No | Yes | No | | | | |
| | Percent-age | 40.8 | 59.2 | 6.1 | 93.9 | 26.5 | 73.5 | | | | |
| What kinds of problems are faced by old age patients at the primary centre? | | Practice local healing without visiting hospitals | | Accompanying person | | | | | | | |
| | Option | Yes | No | Yes | No | | | | | | |
| | Percent-age | 70.3 | 29.7 | 5.0 | 95.0 | | | | | | |
| Where do you go when your family member suffers from a disease? | | Local support | | | | | | | | | |
| | | Self-medi-cation | Tant-rism | Unedu-cated village doctors | Medical stores | | | | | | |
| | Percent-age | 10.5 | 21.9 | 41.2 | 26.3 | | | | | | |
| | | Professional Support | | | | | | | | | |
| | | Primary health centres | Block-level hosp-itals | District-level hospitals | Private hosp-itals | | | | | | |
| | Percent-age | 3.2 | 70.2 | 18.1 | 8.5 | | | | | | |
| What is the source of money for expenditure on diseases? | | Took loan | | | | | | | | | |
| | | With available money | From money lender | Neigh-bours | Relat-ives | Drug stores | | | | | |
| | Percent-age | 47.1 | 6.7 | 28.4 | 4.3 | 35.6 | | | | | |
| | | By selling | | | | | | | | | |
| | | Crops | Dom-estic animals | Land | Trees | Orna-ments | | | | | |
| | Percent-age | 2.4 | 10.1 | 14.9 | 4.8 | 12.5 | | | | | |

## Discussion

Due to the backwardness, prevalence of poverty, starvation, diseases, and deaths, social scientists used the term "Kalahandi Syndrome" to designate this district during the mid-1980.[21] The survey provides an important insight into the general population's understanding of climate change, its footprint on their health, and the available health infrastructure not on paper but in reality, to combat the prevailing diseases in the district. To our best knowledge, this is the first kind of qualitative study that has been conducted in the Kalahandi district to understand the people's perception regarding climate change and human health. In our study, majority of the participants were from the tribal or marginalised section of the society who are

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considered to be the vulnerable population.[22] Since we interviewed the people who visited the health centres at the block level and district level, and medical stores, we found that majority of the respondents were male. The other reason for the majority of the male population is that females were not that educated and comfortable in discussing their health issues. As the district is dominated by the tribals (ST)[23] and marginalised (SC) population, in our survey we found most of the respondents belonged to the same section of society. The educational background of the participants was also matching nearly with the district average as the majority of the population was socially and economically backward. Due to the lack of education and involvement of participants in agriculture, the majority of the respondents had a very low level of monthly income which forced them to live in huts and kuchcha houses. A low level of knowledge regarding the preventive measures of population control is the most important reason behind the bigger families of the respondents putting a further financial burden on the family.

A sincere concern for climate change and climatic variability is a missing concept among the participants as they were more concerned about their everyday bread through primary activities. They felt the variability in the climate pattern over the decade but didn't want to understand the principles behind this phenomenon due to their lack of awareness, poverty, and education. Though we found that respondents were not aware of climate change and human health interconnections, most of them were well aware of the seasonality of the diseases. They mentioned malaria as a major disease existing in almost all seasons as also mentioned in many pioneer works.[24] We visited Ladugaon situated in the Kokasara block of the district where there was an outbreak of dengue in August 2018 to understand the actual cause of the spread, but respondents were not aware of it. Dengue is not a common vector-borne disease in the district like malaria but the incidences were recorded in the past in Kokasara and Bhawanipatna blocks of the district.

We were highly surprised when we found that the participants were aware of diseases like hypertension, diabetes, joint pain, and skin diseases. They mentioned that these diseases had increased in the last 10-15 years. It's rare to find these diseases in an area that is highly dominated by the tribal and marginalised population due to their physical built-up and work culture in which there is the involvement of physical strength. Changes in the environment, food intake, alcoholism, and above all mental stress were the reason for the growth of these kinds of diseases in the district. Due to the increase in these diseases, the number of visits to the hospital had also increased which further led to an increase in expenditure. Infants were considered the most vulnerable concerning vector-borne and waterborne diseases and related deaths,[25-28] which is also evident from the response of the interviewers.

The majority of the respondents agreed to the fact that they didn't face any challenge regarding the basic health infrastructure facility as Kalahandi became so infamous due to the "Kalahandi syndrome" that government and world organisations provided extra incentives for the healthcare infrastructural development in the district. However, due to the backwardness and economic issues, people in the district still preferred to get their treatment from the local uneducated doctors, who didn't have any formal education in medical sciences. Tantrism was still dominant in the district due to the tribal population. This study provided a snapshot of the participants from one of the most disadvantaged districts of India regarding their knowledge about climate, disease, and available health infrastructure.

## Conclusion

In a recent pioneer work, it has been mentioned that "with a low level of education and least available basic amenities, the tribals of Kalahandi require awareness regarding the healthcare infrastructure, to improve their health situations".[29] This study about people's perception at the local level towards climate and human health is of immense help to understand the ground reality and will help the policymakers to frame the policies accordingly.

## Acknowledgement

**Conflict of Interest:** None

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