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# Rationalising the problem of diarrhoea among the rural tribals in the North-eastern region of India: A district-wise study of Assam based on National Family Health Survey-4

**John Basumatary[1a], Dhanmani Medhi[2], Gulrukh Begum [1b], Manash Pratim Barman [3a]; Krishnarjun Bora [3b]**

*[1a] Assistant Professor, Department of Anthropology, Gurucharan College, Silchar, Assam, India, [1b] Professor, Department of Anthropology, Gauhati University, Guwahati, Assam*
*[2] Assistant Professor, Department of Anthropology, Dibrugarh University, Dibrugarh, Assam, India*
*[3a] Associate Professor, Department of Statistics, Dibrugarh University, Dibrugarh, Assam, India, [3b] Research Scholar, Department of Statistics, Dibrugarh University, Dibrugarh, Assam, India*

## Abstract

*Background*: Diarrhoea is a major public health concern in the North-eastern region of India. The present study aims to find out the district-wise prevalence of diarrhoea among the children of under 5 years of age of the state of Assam, using nationally representative NHFS-4 data. The study also focuses on examining some of the contextual factors affecting the occurrence. *Material and methods*: The data used in this study is from the fourth series of National Family Health Survey (NFHS-4) 2015-16. A total of 10309 samples of children under 5 years of age were used for this study. Data was arranged, analysed and presented with the help of IBM SPSS version 26.0 and MS Excel 2021 version. BACKWARD stepwise logistic regression analysis model was used for determining predictability of variance all the variables in occurrence of diarrhoea among the children. *Results*: It is evident that ten district are showing higher prevalence of diarrhoea than the state average. The prevalence diarrhoea was found to be significantly higher among the tribals. It is also significantly higher among the younger age groups. Religion was the strongest predictor of diarrhoea among the children under 5. The probability of a child belonging to the religion of Christian, Buddhist, Jain, Sikh and others is 75.14% (OR 3.023) is higher than a Hindu child. *Conclusion*: The rural tribals who are socioeconomically poor and religiously recognises themselves other than Hindu or Muslim are significantly associated with the prevalence of diarrhoea among children under 5 years.

Key words: North-east India, tribal, Assam, diarrhoea, NFHS.

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## INTRODUCTION

According to the National Health Profile (NHP) 2019 report developed by the Ministry of Health and Family Welfare (MoHFW) of the Government of India, diarrhoea is a major health concern in the North-Eastern states. Assam saw a rise of more than 83 percent in the diarrhoeal deaths in the last one year and a rise of more than 40% in the number of diarrhoea cases. North-East is collectively responsible for about 4.24 percent of the total number of diarrhoea cases in the country which was almost 1.3 crore (1, 31, 94, 775) in 2018 [1].

Launching of the National Diarrheal Diseases Control Programme in 1978, has reduced child mortality from diarrhoea by 50% between 1981 and 1990 in India. In 1985-1986, the focus shifted to strengthening case management of diarrhoea for children under age of 5 years and national ORT (Oral Rehydration Therapy) program was introduced. Subsequently, it became part of child survival and safe motherhood program in 1992 and reproductive and child health (RCH) programme in 1997 [2]. From 2001 to 2012 the under 5 mortalities has declined by an average of 3.7% per year and the 2015 Millennium Development Goal for under-5 mortality (MDG4) for India records 38 deaths or fewer in children younger than 5 years per 1000 live births [3].

Diarrhoea remains the second leading cause of mortality among children under five worldwide. Nearly one in five child deaths – about 1.5 million each year – is due to diarrhoea. It kills more young children than AIDS, malaria and measles combined. Africa and South Asia are home to more than 80 per cent of child deaths due to diarrhoea. Just 15 countries account for almost three quarters of all deaths from diarrhoea among children under five years of age annually, with India being at the top of the list [4].

Moreover, diarrhoea disease is the major cause of malnutrition that contributes towards third major cause of under 5 mortalities especially in the developing countries according to UN Children's Fund and World Health Organization. In Assam (India), 36 percent of children under age five years are stunted, too short for their age, which indicates that they have been undernourished for some time [5]. About 36% of children below age five and 46% of women in the age group 15-49 years are anaemic as well.

The major programmes implemented by the government for nutritional and child health care in the North-Eastern region of India are the National Rural Health Mission (NRHM) and the Integrated Child Development Scheme (ICDS). Apart from this, Janani Suraksha Yojana

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(JSY), Accredited Social Health Activists (ASHA) at grassroots level, free ambulance services and Mobile Medical chief are also some of the initiatives to improve health care in the North-East region.

Healthwise the North eastern region has witnessed double burden morbidity of both NCDs (non-communicable diseases) and infectious diseases specially in terms of the treatment [6]. The healthcare facilities mostly utilised by the people are the primary health centres (PHC). The rural marginalised populations of Northeast opt for public healthcare facilities over private healthcare [7]. The utilisation of the healthcare facilities hugely influenced on factors like self-assessed necessity and severity of the particular disease as well as the socio-economic and sociodemographic profile of individuals [8].

North-eastern states in India are completely different from the rest of the country not only in terms of geography, culture and ethnicity but is also beset with many challenges unique to this region in terms of health. So assessing and expecting a balanced regional development of the Northeast at par with other states of India could be misleading. The remoteness and scattered nature of tribal villages, hilly terrains, sparse population along with poor connectivity and road networks in the Northeast has always been a hindrance in availing the health care services on their part.

This disease is a major public health issue in the North-eastern region of India. The present study therefore was undertaken with an objective to find out the prevalence of diarrhoea among the children under five years of age across districts of Assam using widely accepted nationally representative data. The study focuses National Family Health Survey- IV (NFHS-4) data of India, 2015-16. The study also focuses on examining some of the contextual factors affecting the occurrence. It is always an efficacious strategy to target the hotspots and then go forward with any interventions.

**MATERIAL AND METHODS**

The data used in this study is from the fourth series of National Family Health Survey (NFHS-4) 2015-16. It was conducted under the stewardship of Ministry of Health and Family Welfare (MoHFW), Government of India. International Institute of Population Sciences (IIPS), Mumbai acted as the nodal agency and it was funded by the United States Agency for International Development (USAID), the United Kingdom Department for International Development (DFID), the Bill and Melinda Gates Foundation (BMGF), UNICEF, UNFPA,

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the MacArthur Foundation, and the Government of India. The technical assistance was by ICF, Maryland, USA.

*Exclusion and inclusion criteria*

For this study the data was acquired from the Demographic and Health Survey Programme (DHS) of United States Agency for International Development (USAID). The data was collected and arranged specifically for child related issues. The samples for the different districts of the state of Assam was further extracted from the national sample. A total of 10309 samples of children under 5 years of age were used for this study. The highest sample was collected from the district of Karimganj (514) and the lowest from Kamrup Metropolitan (227).

A total of 11 more variables were used for the study. They are, type of residence, religion of the family head, caste/tribe of the family head, wealth index of the family, birth order of the child, age of the child, sex of the child, birth weight, had diarrhoea recently, height of the child, weight of the child. Those with missing responses for the said variables were not included for analysis. For the caste/ tribe variables, only those specifying caste or tribe were included and those with responses like no caste/ tribe and don't know were excluded from analysis. Similarly for religion, no religion and don't know responses were excluded. Further, the religion category were rearranged in three sub categories, i.e. Hindu, Muslim and Others. Hindu and Muslim alone constituted three fourth of the total sample and the religions like Christian, Sikh, Buddhist, Jain and others were put in the category 'others' as their number was very less.

The district wise percentages of prevalence are visualised in a Choropleth map in figure 1. The map is drawn using the software Adobe Illustrator. The opacity of the colour is split into three levels (25%, 63% and 100%) in order to visualize the three intervals of prevalence - Below 1.50, 1.50-2.90 and Above 2.90. Accordingly, the colour is distributed to each of the districts of the state. 2.9 was taken as upper level as it is the state average and above 2.9 is considered high prevalence for the state of Assam.

*Statistical analysis*

Data was arranged, analysed and presented with the help of IBM SPSS version 26.0 and MS Excel 2021 version. All the categories in the nominal variables are coded in ascending order. For type of residence urban is coded first followed by rural. Similarly, for caste/tribe status

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caste is coded first followed by tribe. The district-wise prevalence of diarrhoea is presented in bar diagrams in descending order for the variables type of residence and caste/tribe. Pearson's correlation and coefficient test was applied to assess any association among all the 11 variables. Further, BACKWARD stepwise logistic regression analysis model was used for determining predictability of variance all the variables in occurrence of diarrhoea among the children.
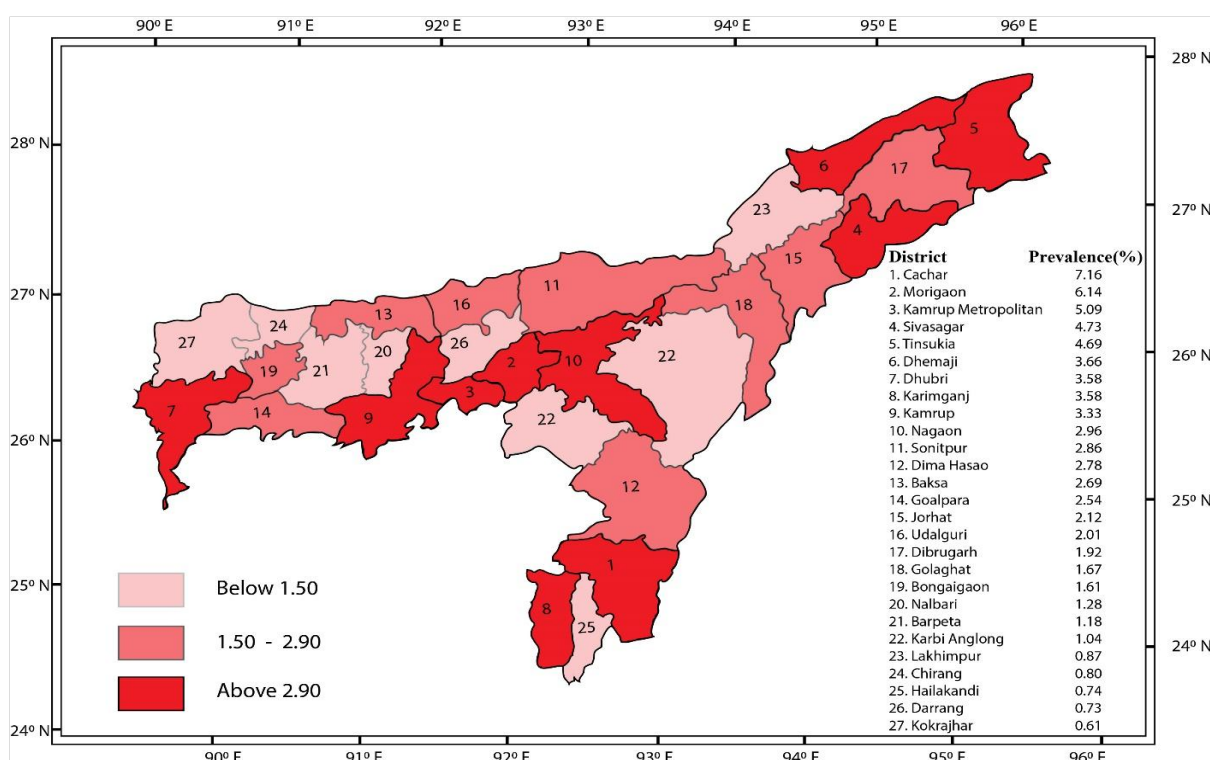
**RESULTS**



**Figure 1: Choropleth map of Assam showing the district wise percentage of prevalence (map not for scale)**

It is evident that ten district are showing higher prevalence of diarrhoea than the state average (2.9%). Cachar, Morigaon, Kamrup Metropolitan, Sivasagar, Tinsukia, Dhemaji Dhubri, Karimganj, Kamrup and Nagaon in a descending order showing higher percentage of children under 5 years having diarrhoea. Kokrajhar has the lowest percentage of children having diarrhoea according to NFHS-4. In urban and rural comparison Kamrup metropolitan and Cachar district respectively has the highest prevalence of diarrhoea respectively. Morigaon and Tinsukia are the other two districts showing second and the third highest prevalence of diarrhoea in rural population. For the caste/tribe category, those identifying themselves as none of the two or who doesn't know what they belong to were not considered for the

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analysis. The prevalence of diarrhoea among the tribal population is comparatively higher than the caste population. Among the caste populations Cachar has the highest prevalence of children under 5 having diarrhoea. Dima Hasao and Morigaon has the second and third highest prevalence of diarrhoea among the caste population. Among the tribal populations
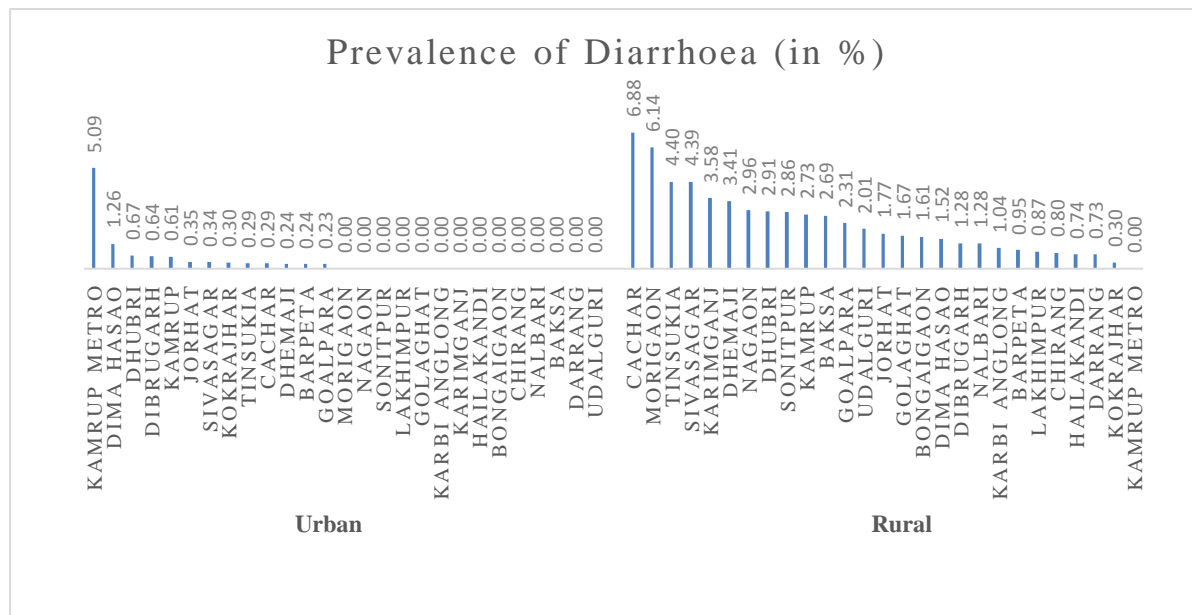


Morigaon, Baksa, Goalpara are the top three districts having high prevalence of diarrhoea among the tribal populations [Figure 1-3].

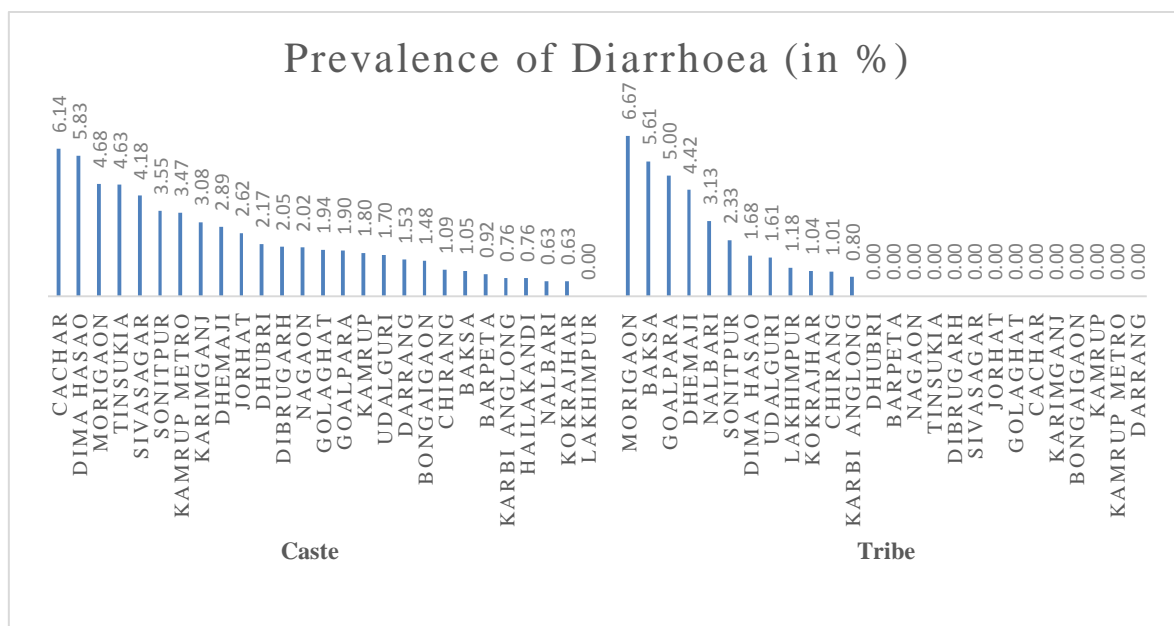**Figure 2:  District-wise prevalence of diarrhoea according to place of residence.**

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**Figure 3: District-wise prevalence of diarrhoea according to caste/tribe status.**

**Table 1: Pearson's correlation and coefficient test.**

|  | TRSC | RELI | CT/TB | WLIN | BTOR | SECH | AGCH | BTWT | DIAR | WTCH | HTCH |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TRSC | 1 | .046** | .048** | -.334** | .099** | .025* | -0.016 | .094** | -0.008 | -.025* | .046** |
| RELI | .046** | 1 | .085** | -.060** | .073** | 0.019 | -0.002 | .052** | 0.001 | -0.006 | 0.015 |
| CT/TB | .048** | .085** | 1 | -.099** | .063** | .022* | -0.003 | .084** | .023* | 0.006 | 0.001 |
| WLIN | -.334** | -.060** | -.099** | 1 | -.150** | -0.003 | -0.018 | -.289** | -0.012 | .054** | -.025* |
| BTOR | .099** | .073** | .063** | -.150** | 1 | 0.011 | .046** | .138** | 0.008 | -0.013 | 0.014 |
| SECH | .025* | 0.019 | .022* | -0.003 | 0.011 | 1 | -0.012 | 0 | -0.002 | -0.006 | 0.012 |
| AGCH | -0.016 | -0.002 | -0.003 | -0.018 | .046** | -0.012 | 1 | .106** | -.022* | .171** | -.030** |
| BTWT | .094** | .052** | .084** | -.289** | .138** | 0 | .106** | 1 | 0.019 | 0.017 | -.021* |
| DIAR | -0.008 | 0.001 | .023* | -0.012 | 0.008 | -0.002 | -.022* | 0.019 | 1 | 0.001 | -0.007 |
| WTCH | -.025* | -0.006 | 0.006 | .054** | -0.013 | -0.006 | .171** | 0.017 | 0.001 | 1 | .115** |
| HTCH | .046** | 0.015 | 0.001 | -.025* | 0.014 | 0.012 | -.030** | -.021* | -0.007 | .115** | 1 |

*Note: Here, *=p value<.05, **= p value<.001. TRSC= type of residence, RELI= religion, CT/TB= caste/tribe, WLIN= wealth index of the family, BTOR= birth order of the child, SECH= sex of the child, AGCH= age of the child, BTWT= birth weight of the child, DIAR= had diarrhoea recently, WTCH= weight of the child, HTCH= height of the child*

The wealth index has a significant negative association with type of residence (i.e., urban and rural), which means the wealth index significantly goes up in urban areas than in rural areas. The birth weight of a child has a significant positive association with type of residence, which means among the rural areas the birth weight is higher than the urban areas. Similarly, among

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the tribe the wealth index is lower than the caste population. The birth weight and the prevalence of diarrhoea is significantly and positively associated with the caste and tribe status. That means among the tribe the prevalence of diarrhoea is more significantly common than caste population, as well as the birth weight of the children below 5 years belonging to tribal origin are significantly higher than the caste. However, birth weight of the child is negatively related with wealth index, meaning those with high birth weight children are significantly found more among the poorer families. It has also been found that the prevalence of diarrhoea is significantly more present among the younger children [Table 1].

Backward stepwise model has drawn out a total of six possible models for the sample. All the socio-economic categorical and numerical variables, i.e., ten variables were included in the model in the beginning and in each step the variables have been decreased. The sixth model predicts the prevalence of diarrhoea most significantly. That means religion, caste/tribe and the age of the child most significantly predicts the prevalence of diarrhoea. The strongest in the model is the religion, most specifically the category others. The probability of a child belonging to the religion of Christian, Buddhist, Jain, Sikh is 75.14% (OR 3.023) is higher than a Hindu child. However, it isn't statistically significant. The only statistically significant variable is the second strongest predictor of the model, i.e., tribe. The chances of having diarrhoea of a tribal child are 60.11% (OR 1.507) more than that a child belonging to a caste [Table 2a-b].

**Table 2a: Model summary**

| | | Chi-square | df | Sig. |
|---|---|---|---|---|
| Step 1 | Step | 37.584 | 17 | .003 |
| | Block | 37.584 | 17 | .003 |
| | Model | 37.584 | 17 | .003 |
| Step 2[a] | Step | -.163 | 1 | .686 |
| | Block | 37.421 | 16 | .002 |
| | Model | 37.421 | 16 | .002 |
| Step 3[a] | Step | -.266 | 1 | .606 |
| | Block | 37.155 | 15 | .001 |

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|          |       |         |    |      |
|----------|-------|---------|----|------|
|          | Model | 37.155  | 15 | .001 |
| Step 4[a] | Step  | -1.030  | 2  | .597 |
|          | Block | 36.125  | 13 | .001 |
|          | Model | 36.125  | 13 | .001 |
| Step 5[a] | Step  | -3.371  | 3  | .338 |
|          | Block | 32.753  | 10 | .000 |
|          | Model | 32.753  | 10 | .000 |
| Step 6[a] | Step  | -1.973  | 1  | .160 |
|          | Block | 30.780  | 9  | .000 |
|          | Model | 30.780  | 9  | .000 |

**Table 2b: Backward stepwise model**

| Predictors | B      | S.E.  | Wald  | df | Sig.  | Exp(B) |
|------------|--------|-------|-------|----|-------|--------|
| Hindu      | -0.355 | 0.184 | 3.736 | 1  | 0.053 | 0.701  |
| Muslim     | 0.182  | 0.3   | 0.369 | 1  | 0.544 | 1.200  |
| Others     | 1.106  | 0.744 | 2.212 | 1  | 0.137 | 3.023  |
| Caste      | -0.297 | 0.207 | 2.068 | 1  | 0.150 | 0.743  |
| Tribe      | 0.41   | 0.196 | 4.374 | 1  | 0.036 | 1.507  |
| age(1yr)   | 0.263  | 0.186 | 1.99  | 1  | 0.158 | 1.301  |
| age(2yrs)  | 0.048  | 0.193 | 0.062 | 1  | 0.804 | 1.049  |
| age(3yrs)  | -0.449 | 0.216 | 4.317 | 1  | 0.038 | 0.638  |
| age(4yrs)  | -0.561 | 0.23  | 5.967 | 1  | 0.015 | 0.571  |

**DISCUSSION**

All total ten districts in the state of Assam are found to be having higher prevalence of diarrhoea than the state average. Cachar district is the one with the highest prevalence of diarrhoea in the state. It has also the highest prevalence of diarrhoea in children under 5 years

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among the rural caste population. At the same time in India, the state of Assam has the least diarrhoea prevalent districts or geographical hotspots according to NFHS-4 data [9]. But within the state, Cachar presents a different picture. In 2012, six deaths were reported from Binnakondi Tea Estate where it has taken an epidemic form during that time. The breakout was attributed to the intake of polluted and contaminated water by the people of the area and of the tea estate. The water consumed by them mainly came from natural sources and from the river Cachar [10]. Again in 2016, at least six people were reported to have died of diarrhoea in Lakhipur area of Cachar district by the health department [11].

The prevalence of diarrhoea is also found to be significantly higher among the tribals than the caste population. The wealth index among the villagers is significantly low, however, the birth weight of the children is significantly higher among them. This indicates the fact that the tribal even though from poor economic conditions, are having heavier born babies. At the same time, they have 60% more chances of occurrence of diarrhoea as well, at a significant level in the lower age group.

Poor socioeconomic status is found to be one of the factors associated with diarrhoea incidence [12]. It has also been found that the prevalence of recurrent diarrhoea is significantly more common among children belonging to lower socioeconomic class and residing in houses having poor sanitary conditions [13]. Poor socioeconomic status and poor sanitation are important factors responsible for high diarrhoea morbidity due to ease of transmission of infection [14].

In the present study since the birth weight of the babies is higher in spite of being from lower socioeconomic class; so the hygienic conditions and sanitation prevalent in the villages is important to be pondered upon. It is already established that the poor hygiene practices maintained by the mother are also associated with higher incidences of diarrhoea among children in younger age group [2]. In the present study the birth weight is found to be significantly higher among the tribal families, clearly implying that the mothers not only have a good nutritional status during pregnancy but also are well cared during pregnancy period. Hence, the significantly higher chances of having diarrhoea among the children could be because of hygiene maintenances with daily activities.

In the present study it has been found that the odds of a younger child having diarrhoea is significantly higher. It has been established that the occurrence of childhood diarrhoea is correlated with the characteristics and infrastructural facilities of the house, like type of

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house, source of drinking water, sanitation facility, month of interview, stunting, caste, and religion [15].

In Assam, most of the tribal people found in various districts are not only rural but they also reside in remote areas from the rest of the population. They stay together in close bound societies and hardly avail the benefits from any of the governmental schemes made for their health improvement just because of their remoteness and distance from the health centres. The special multi-sectoral development programme for the marginalised communities of India known as PMJVK (Pradhan Mantri Jan Vikas Karyakram) has adopted the bottom-up implementation approach, starting from blocks and villages to state and central. However, Assam has the least completion rate comparatively across all sectors than other sample states [16]. The remote access of their villages makes them reluctant to visit the various health centres of the government.

Diarrhoea is found to be one of the most important reasons among the children to visit hospitals in India [17]. According to the published NFHS-4 state report of Assam, however, only 51% of the diarrhoea cases are taken to a health facility or a health provider. The health care infrastructure sometimes is so remote to the physically scattered tribal populations that seeking treatment is covering far distances usually by foot. It has also been pointed out that the tribal communities seek medical treatments from traditional healers due to non-availability of modern health facilities in their vicinities [18].

The National Rural Health Mission (2005-12) aimed to provide effective health care facilities throughout the country with special reference to eight of the North-Eastern states and ten other states who are termed as comparatively weak in public health sector by the government of India. The 11th Common Review Mission (CRM) of National Health Mission mentioned that Assam has no shortage in the number of PHCs (Primary Health Centre) as one of the key findings [19]. However, studies are yet to be taken up to evaluate how these PHCs are actually running and their coverage in India in general [20]. Since the problem in the tribal areas of Assam is lack of availing the health facilities on the part of the villagers, thereby strengthening their belief in traditional folk medicine practices for the treatment of various ailments. Healthcare among the tribal always have a cultural connotation. The tribal population rely on traditional medicine for primary healthcare due to its low cost, and age-old cultural belief and practices.  it has been found that the tribal populations of Northeast are the

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one who are very less likely to seek healthcare facilities to treat any morbidities than the caste populations [21].

So for the people of Assam this can be taken as one of the shortfalls of the operationalisation of the health care providers which may be in some ways associated with a cultural connotation and remoteness of their habitation.

Another important finding in the present study is that religion has the highest probability of predicting the prevalence of diarrhoea among the children under five years of age, specifically the "others" category which excludes the caste Hindu and Muslim section of the society. Thereby this approves the fact that diarrhoea is significantly prevalent among the tribal in Assam, as in the present study they are amongst those who are representing the religious category of "others". Although, Hindu and Muslim contribute more than three fourth of the sample population, a new born recognised as Christian, Jain, Sikh, Buddhist, and others has more chance of having diarrhoea than a Hindu/Muslim child. The tribal of Assam who do not recognise themselves as Hindu are mostly either Christian or have their own religion based on different sacred beliefs. Therefore, it can be speculated that their own beliefs and rituals which are socio-culturally distinct enough to affect their daily activities relating to health and hygiene could be one of the factors of prevalence of diarrhoea. These findings are quite contrary to what has been found in published literatures [9,22] where children from Muslim community were found to be more affected by diarrhoea as compared to other religious community.

The traditional child rearing practices specifically attached with the rural tribal populations involves a lot of rituals related to the concept of pollution and purification and numerous food taboos associated with it [23-24]. Sometimes it is the vicious circle of malnutrition that contributes to infections and infections contribute to malnutrition. So, addressing the social determinants of health is crucial in any study. The determinants like clean drinking water, environmental sanitation, health promoting practices like breastfeeding and most important the weaning foods and hygienic ways of preparing food also are very important. Selection of the right food, handling and storage of weaning food also adds to the problem. Mothers education may therefore effectively reduce the incidences of diarrhea along with educating the villagers of availing the services of government's three pillars of rural health care infrastructure – Sub-Centers (SC), Primary Health Centers (PHC), Community Health Centers (CHC). Inadequate access to essential healthcare services in the northeast region of

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India has always been an issue of concern. Sometimes it is also the taboos and social barrier that prevents the utilisation of available health care services. So this health seeking behaviour may reflect a varied picture and perception among the tribals of Northeast.

**CONCLUSION**

The prevalence of diarrhoea is found to be significantly higher among the tribal than the caste population. At the same time, the tribal have heavier born babies even though being from poor economic conditions. They have 60% more chances of occurrence of diarrhoea as well. The health care infrastructure sometimes is so remote to the physically scattered tribal populations that seeking treatment is covering far distances usually by foot. So for the people this can be one of the shortfalls of the operationalisation of the health care providers which may be in some ways associated with a cultural connotation and remoteness of their habitation. Mothers education may therefore effectively reduce the incidences of diarrhea along with educating the villagers of availing the services of government's three pillars of rural health care infrastructure.

**CONFLICT OF INTEREST**

None

**AUTHORS CONTRIBUTION**

JB and GB came up with the concept and design, DM prepared and arranged the data, JB, MPB and KB analyzed the data, JB prepared the manuscript and final editing was done by GB.

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