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Study on the Effect of Socio-demographic Parameters on Disease Prevalence among Tribal Communities in West Bengal, India

Anindita Goswami[1], Soumendranath Chatterjee[2] and Paramita Mandal[1#]

[1]Biomedical Genetics Laboratory, Department of Zoology, The University of Burdwan, Burdwan 703 104, West Bengal, India
[2]Microbiology and Parasitology Laboratory, Department of Zoology, The University of Burdwan, Burdwan 713 104, West Bengal, India

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ABSTRACT *Santhals* are the third largest tribal population in India and they vary from other ethnic groups in terms of socio-economic status and disease prevalence. The study was undertaken to evaluate the impact of socio-demographic parameters on disease prevalence among *Santhals*. Total 250 adult people were selected from five villages of Purba Burdwan, West Bengal randomly. Various socio-demographic data were collected through oral questionnaire and blood samples were collected and examined by appropriate methods. Older aged people were more prone to various diseases like vision problem, dental problem, liver disease and arthritis. Use of alcohol and tobacco was very common among *Santhals* in both males and females. Use of alcohol and tobacco aggravated dental problem. Skin rash was common among this community due to unhygienic living conditions. The study revealed the health status of the *Santhals*' community and may be useful for implementing the health services to these vulnerable population.

INTRODUCTION

The tribal populations in India are a geographically, socially and economically marginalised community. They vary among themselves in respect of language and linguistic traits, socio-economic status, physical features, size of the population, etc. A majority of the Scheduled Tribe population is spread over the India but mostly is concentrated in the eastern, central and western belt covering the nine states of Odisha, Madhya Pradesh, Chhattisgarh, Jharkhand, Rajasthan, Maharashtra, Gujarat, Andhra Pradesh and West Bengal. About twelve percent tribal populations inhabit the northeastern region, about five percent are in the southern region and about three percent in the northern states, according to Census of India (2011). The Census of India (2011) enumerated 10,42,81,034 persons of Scheduled Tribes, constituting 8.6 percent of the population of the country. The tribal communities in India are a genetically diverse and heterogeneous group. There are wide ranging diversities among them in respect of languages spoken, size of population and mode of livelihood as reported by Census of India (2011).

Among all tribes, *Santhals* are the third largest tribe in India, live in many states such as Bihar, Orissa, Tripura, Jharkhand and West Bengal. In West Bengal *Santhals* represented 54.27 percent of the total tribal population in Census of India (2011). The *Santhals* belong to the proto astraloid racial group and linguistically they belong to the Mundari group of Austro-Asiatic linguistic family as reported by Lewis (2009). Their language is known as *Santhali*. They have their own script known as *Olchiki*. It was developed by Dr. Raghunath Murmu in 1925. The *Santhali* language is part of the Austro-Asiatic family, which is distantly related to Vietnamese and Khmer.

Education is one of the important tools for man making and nation building. Education imparts knowledge, skills, character and decision making ability. Various studies on tribal education suggested that the policymakers paid attention to culturally linked education. This policy can help to decrease school dropouts and

#Address for corresopondence:
Paramita Mandal, PhD
Biomedical Genetics Laboratory,
Department of Zoology,
The University of Burdwan,
Burdwan 713 104,
West Bengal, India
E-mail: paramita.mandal2@gmail.com

directly impacted their overall educational status as illustrated by Brahmanandam and Bosu Babu (2016). Since they are materially and economically backward, attempts had been made by the government to develop them. The governments in all countries are paying special attention to development of the tribes as depicted by Nithya (2014). Recent study by Ahmed and Tattwasarananda (2018) explored the views of parents, students and villagers of this community regarding the various aspects of education.

The impact of socio-economic status of the *Santhal* population plays an important role in their daily life (Santhosam and Samuel 2013; Dhargupta et al. 2017). Previous studies identified that alcohol use in tribal people has been a part of their culture and tradition. The tribal consume alcohol unrestrictedly, as it is made in every household and therefore both men and women consume it as reported by Ho and Mishra (2017). Most of the males begin to consume alcohol at a very young age and most females start to drink alcohol after marriage at the middle age. The older aged people above 60 years, and middle aged males and females consumed alcohol more as depicted by De and Kundu (2015). Rice beer (*handia*) is a very popular drink among the *Santhals*. The women usually prepare *handia* from fermented rice. During festivals and rituals both males and females love to drink *handia*. Besides *handia*, they also drink *mahua* liquor and fermented date-palm juice. The *Santhal* males and females like to chew tobacco and males preferred smoking by rolling the tobacco inside a sal leaf locally known as *pungi*. Nowadays, the young *Santhals* like to smoke beedies or cigarettes available in the market.

Nutrition is one of the most important factors affecting human health and working capacity. It is important for the attainment of normal growth and development in the maintenance of health throughout life. It is also important for the promotion of health and prevention of diseases. Tribal population is generally at risk for under-nutrition owing to their dependence on primitive agricultural practices, poverty, illiteracy, unsafe drinking water, bathing water, poor personal and environmental hygienic practices. Lack of communication facility, traditional beliefs and healthcare services aggravate the situation. Several studies documented that the nutritional status of tribal population was influenced by their habitat and socio-economic conditions (Rao and Rao 1994; Rao et al. 1994; Rao et al. 2006; Mitra et al. 2007; Ghosh and Rama 2015). Prevalence of various diseases are very common among *Santhal* tribes due to lack of awareness. Dental caries were very common among this society due to alcohol and tobacco intake as reported by Mandal et al. (2015). Recent study by Sadath et al. (2019) showed that alcohol consumption was more prevalent among tribal people of India and it is associated with socio-cultural rituals and practices. Another study by Shrivastav et al. (2018) also documented higher prevalence of periodontal diseases and poor oral hygiene status due to tobacco intake.

Objectives of the Study

In the present study an attempt was made to throw light upon the socio-demographic parameters of *Santhals* population of Purba Bardhaman district, West Bengal. Socio-cultural rituals and some practices influence the health status and disease burden among tribal people. Therefore, the researchers undertook the current study to understand the impact of socio-economic condition on disease prevalence among the adult people of *Santhals* community.

METHODOLOGY

Selection of Survey Area

An extensive survey on *Santhals* was conducted in five villages of Purba Bardhaman, namely, Jamalpur, Surekalna, Gramkalna, Chakdighi and Atpara. The areas selected were exclusively dominated by *Santhali* community. The survey was undertaken to know about the health status of these people for adoption of healthcare strategies in future.

Ethical Statement

The study was reviewed and approved by the Institutional Clinical Ethical Committee of the University of Burdwan.

Subjects and Samples

Total 250 adult peoples were selected from five villages using the random sampling meth-

od. Patients received verbal and written information about the study from the investigators and a written consent was obtained.

Data Collection

Socio-demographical data such as age, bathing water source, drinking water source, prevalence of tobacco and alcohol use in both sex, prevalence of different diseases such as vision problem, skin rash, liver disease, arthritis, etc., literacy rate, work pattern, food pattern were collected through a questionnaire. Their blood samples were collected and examined for different clinical parameters of human blood profile.

Statistical Analysis

The association of epidemiologic variables with disease prevalence among *Santhals* community were determined by logistic regression analysis. Chi-square test was performed wherever necessary, and p-values were determined to interpret the significance of the findings. For all the cases, $p<0.05$ was regarded as statistically significant. All statistical analyses were performed using the R-software package, SPSS version 16.0 and Microsoft Excel, Windows 7 version. All the results were reproduced in a table format and no copyright materials were used for the representation of tables.

RESULTS

Association of Demographic Parameters

Several demographic factors were evaluated among the *Santhal* community across different areas and variations were observed among the parameters. Male to female ratio was almost same in Jamalpur, Gramkalna and Chakdighi (1, 0.79 and 0.79 respectively). Surekalna showed the highest ratio and Atpara shows the lowest ratio of male and female, which further portrayed that there was an unequal gender distribution across the villages (Table 1). Analysis of drinking water sources revealed that sixty-six percent people in Jamalpur used tap water as a source of drinking water, which is the highest of tap water usage among five villages surveyed for the study, whereas in other areas people used tube well water as the drinking water source over tap water (Table 2). It may be due to the installation of tap water system in the Jamalpur block and this system of water supply was lacking in the other villages. These findings merit attention towards the improvement of water supply in the other areas. Among the *Santhals* community, heavy workers (95.9%) preferred to bathe in the pond compared to moderate workers and the difference is statistically significant ($p < 0.01$) (Table 3). As heavy workers spend most of their working time outside the home, they mostly prefer ponds as their bathing water source. In terms of literacy, it was also found that literacy rate was higher at the age of below 50 years (Table 3), which is a good signature of upgradation of educational status among the community. It was also identified that males significantly more literate than females ($p <0.001$), which require further attention about the improvement of education system among females of these community in future. The percentage of literate individuals was more in Gramkalna and Surekalna compared to other geographical areas explored because of the presence of schools in the near vicinity of these villages (Table 4).

Table 1: Male and female ratio distribution in different geographical areas of Purba Burdwan

Area	*Male: Female*
Atpara	3:7
Chakdighi	11:14
Gram Kalna	11:14
Jamalpur	1:1
Sure Kalna	33:17

Table 2: Distribution of drinking water users in different geographical areas of Purba Burdwan

Area	*Percentage of tube well users (Number of Users/ Total number of individuals (Percentage))*	*Percentage of tap water users (Number of Users/Total number of individuals (Percentage))*
Atpara	49/50 (98%)	1/50 (2%)
Chakdighi	42/50 (84%)	8/50 (16%)
Gram Kalna	50/50 (100%)	0/50 (0%)
Jamalpur	17/50 (34%)	33/50 (66%)
Sure Kalna	44/50 (88%)	6/50 (12%)

Table 3: Association of different demographic parameters among *Santhals* population

a. Association of work pattern and bathing water source among Santhals population

Categories of work pattern	*Total number of individuals*	*Pond water users*	*Percentage of pond water users (%)*	*P value*
Heavy worker	217	208	95.9	**0.01**
Moderate worker	33	28	84.8	

b. Association of gender and literacy among Santhals population

Gender	*Total number of individuals*	*Total number of literate individuals*	*Percentage of literate individuals (%)*	*P value*
Males	117	54	46.15	**<0.001**
Females	133	21	15.78	

Table 4: Distribution of literate individuals in different geographical areas of Purba Burdwan

Area	*Percentage of literate individuals (Number of literate individuals/ Total number of individuals (Percentage))*
Atpara	10/50 (20%)
Chakdighi	6/50 (12%)
Gram Kalna	28/50 (56%)
Jamalpur	5/50 (10%)
Sure Kalna	26/50 (52%)

Association of Age with Different Demographic Parameters

Association of the studied demographic parameters was evaluated with age and there was a strong correlation of age with many parameters. According to the survey, it was also found that both males and females were tobacco users in *Santhal* community (Table 5). Females preferred tobacco chewing significantly more than smoking [p= 0.002], whereas males preferred both tobacco chewing and smoking (Table 5). It was also identified that people more than 50 years of age were significantly more addicted to tobacco and alcohol [p<0.001] compared to younger people (Table 6) due to depression associated with old age. Alcohol intake was very common among *Santhal* community like the other tribal communities in India. They mainly preferred homemade rice beer. Females also preferred homemade alcohol but they did not consume any commercial product available in market. In contrast, males consumed commercial products occasionally due to the easy access to the local market for males. Due to this fact, it was identified that percentage of females using homemade alcohol was significantly higher compared to the percentage of males consuming homemade alcohol [p<0.001] (Table 7).

Association of Age and Disease Prevalence

Age related disease prevalence was also documented among the community like any other people. For example, vision problem and dental problem were more common among old aged people (>50 years) [p<0.001] compared to younger people (Table 6). Similarly, arthritis and acidity were mainly found among old aged people (>50 years) [p < 0.001] compared to younger

Table 5: Distribution of tobacco users

Gender	*Total Numbers*	*Percentage of tobacco users (%)*	*Percentage of smokers (%)*	*P value*	*Percentage of tobacco chewers (%)*	*P value*
Male	117	117/117 (100%)	117/117 (100%)	**<0.05**	79/117 (67.52%)	**<0.05**
Female	133	124/133 (93.22%)	13/124 (10.48%)		112/124 (90.33%)	

Table 6: Association of age and different demographic parameters among *Santhals* population

a. Association of age and tobacco use among Santhals population

Age group	*Total number of individuals*	*Total number of tobacco users*	*Percentage of tobacco users (%)*	*P value*
Age<50 years	42	34	80.95	**<0.001**
Age>50 years	208	208	100	

b. Association of age and alcohol use among Santhals population

Age group	*Total number of individuals*	*Total number of alcohol users*	*Percentage of alcohol users (%)*	*P value*
Age<50 years	42	28	66.66	**<0.001**
Age>50 years	208	199	95.67	

c. Association of age and literacy among Santhals population

Age group	*Total number of individuals*	*Total number of literate individuals*	*Percentage of literate individual (%)*	*P value*
Age<50 years	42	27	64.28	**<0.001**
Age>50 years	208	48	23.07	

d. Association of age and vision problem among Santhals population

Age group	*Total number of individuals*	*Total number of individual with vision Problems*	*Percentage of individual with vision problem (%)*	*P value*
Age<50 years	42	21	50	**<0.001**
Age>50 years	208	170	81.73	

e. Association of age and dental problem among Santhals population

Age group	*Total number of individuals*	*Total number of individual with dental Problems*	*Percentage individual with arthritis (%)*	*P value*
Age<50 years	42	32	76.19	**<0.001**
Age>50 years	208	200	96.15	

f. Association of age and arthritis problem among Santhals population

Age group	*Total number of individuals*	*Total number of individual with arthritis*	*Percentage individual with arthritis (%)*	*P value*
Age<50 years	42	0	0	**<0.001**
Age>50 years	208	77	37.01	

Table 6: Contd....

g. Association of age and acidity among Santhals population				
Age group	*Total number of individuals*	*Total number of individual with acidity*	*Percentage individual with acidity (%)*	*P value*
Age<50 years	42	20	47.61	**<0.001**
Age>50 years	208	158	75.96	

people (Table 6), which again proved that old aged people are more vulnerable to diseases.

Association of Demographic Parameters and Disease Prevalence

The study also evaluated the impact of the demographic parameters on disease prevalence among the *Santhal* community. Correlation of alcohol intake with dental problem was found in these people and alcoholics suffered from dental problem more often than non-alcoholics [p<0.001] (Table 8). Analysis on tobacco usage and dental problem also revealed that dental problem is common for all tobacco users but tobacco chewers are more prone to dental problem than non-tobacco chewers [P<0.05] (Table 9). It probably due to more exposure of Buccal area towards tobacco during tobacco chewing compared to tobacco smoking.

Analysis of bathing water sources on health problems revealed that skin rash is more common among pond water users. Skin rash was less common among those people who use tap water or tube well water as a bathing water source and the difference is statistically significant [p<0.001] (Table 8). Probably, open pond water is the reservoir of many microbiota and therefore it was commonly associated with skin rash.

It was also identified that people in Jamalpur block suffer less from liver disease, as they mostly use tap water as drinking water (Table 10). Prevalence of liver disease was less common among those people who use tap water as drinking water than tube well water and the difference is statistically significant [p<0.001] (Table 8). Analysis of the effect of alcohol consumption on liver diseases also revealed that alcoholics are more prone to liver disease than non-alcoholics and the difference is statistically significant (p<0.001) (Table 11). Analysis of the effect of tobacco usage on liver diseases also revealed that tobacco users are more prone to liver disease than non-tobacco users and the difference is statistically significant (p<0.001) (Table 11).

Analysis on prevalence of arthritis and acidity in various block revealed that people in Chakdighi and Surekalna suffered mostly from arthritis and acidity whereas people in Jamalpur block suffered less from those problems, which evaluated the differential disease prevalence across the areas (Table 10). These findings may be useful for adoption of improvement of health status of these people with special emphasis to those diseases. Prevalence of acidity was less common among those people who use tap water as, drinking water than tube well water and the difference is statistically significant [p=0.001] (Table 8). Analysis of the effect of alcohol consumption on acidity revealed that alcoholics were more prone to acidity than non-alcoholics and the difference is statistically significant (p<0.001) (Table 8).

Table 7: Association between sources of alcohol and percentage of alcohol users

Gender	*Total Numbers*	*Percentage of alcohol users (%)*	*Percentage of home made alcohol users (%)*	*P value*	*Percentage of home made or low cost commercial alcohol users (%)*	*P value*
Male	117	110/117 (94.02%)	71/110 (64.55%)	**<0.05**	39/110 (35.45%)	**<0.05**
Female	133	117/133 (87.97%)	117/117 (100%)		0/117 (0%)	

Table 8: Association between demographic parameters and disease prevalence among *Santhals* population

a. Association of alcohol and dental problem among Santhals population

Categories	*Total number of individuals*	*Dental problem*	*Percentage of individuals with dental problem (%)*	*P value*
Alcoholics	227	216	95.15	**<0.001**
Non alcoholics	23	16	69.56	

b. Association of bathing water and skin rash among Santhals population

Sources of bathing water	*Total number of individuals*	*Skin rash*	*Percentage of individuals with skin rash(%)*	*P value*
Pond	227	223	98.23	**<0.001**
Tap and tubewell	24	10	41.66	

c. Association of drinking water source and liver disease among Santhals population

Sources of drinking water	*Total number of individuals*	*Liver disease*	*Percentage of individuals with liver disease (%)*	*P value*
Tap water	48	23	47.91	**<0.001**
Tubewell	202	178	88.11	

d. Association of drinking water source and acidity among Santhals population

Sources of drinking water	*Total number of individuals*	*Acidity*	*Percentage of individuals with acidity (%)*	*P value*
Tap water	48	25	52.08	**0.001**
Tubewell	202	153	75.74	

e. Association of alcohol and acidity among Santhals population

Categories	*Total number of individuals*	*Dental Problem*	*Percentage of individuals with dental problem (%)*	*P value*
Alcoholics	227	170	74.88	**<0.001**
Non alcoholics	23	8	2.47	

f. Association of alcohol and blood neutrophil count among Santhals population

Categories	*Total number of individuals*	*Dental Problem*	*Percentage of individuals with dental problem (%)*	*P value*
Alcoholics	227	137	60.35	**0.012**
Non alcoholics	23	20	86.95	

Table 9: Association of tobacco users and dental problem

Categories of tobacco users	*Total Numbers*	*Percentage of individuals with dental problem (Number of individuals with dental problem/Total number of individuals (%))*	*P value*
Tobacco chewers	112	108/112 (96.43%)	**<0.05**
Non tobacco chewers	59	46/59 (77.97%)	
Smokers	130	187/191 (87.97%)	**Not significant**
Non smokers	120	109/120 (90.83%)	

Table 10: Association between area and disease prevalence

Area	*Percentage of individuals with liver disease (Number of individuals with liver disease/ Total number of individuals (%))*	*Percentage of individuals with arthritis (Number of individuals with arthritis/ Total number of individuals (%))*	*Percentage of individuals with acidity (Number of individuals with acidity/Total number of individuals (%))*
Atpara	48/50 (96%)	6/50 (12%)	26/50 (52%)
Chakdighi	46/50 (92%)	19/50 (38%)	43/50 (86%)
Gram Kalna	42/50 (84%)	14/50 (28%)	36/50 (72%)
Jamalpur	16/50 (32%)	23/50 (46%)	29/50 (58%)
Sure Kalna	49/50 (98%)	14/50 (28%)	44/50 (88%)

Table 11: Association between tobacco and alcohol with liver disease

Categories of alcohol and tobacco users	*Total Numbers*	*Percentage of individuals with liver disease (Number of individuals with liver disease/Total number of individuals (%))*	*P value*
Tobacco users	241	197/241 (81.74%)	**<0.05**
Non tobacco users	9	4/9 (44.44%)	
Alcoholics	227	194/227 (85.46%)	**<0.05**
Non alcoholics	22	7/22 (31.82%)	

Analysis of the effect of alcohol consumption on different blood parameters revealed that blood neutrophil count was significantly lower (p=0.012) among alcoholics compared to non-alcoholics, which further confirmed that alcohol consumption could deteriorate a healthy life at the cellular level.

DISCUSSION

Santhals are largest tribal community in West Bengal. They are considered as the most vulnerable section of the society with low socio-economic background. The *Santhals* community prefered pond water as bathing water source as reported by this study. Lack of education was also identified as one of the important risk factors among the tribal population. They believe in various taboos due to lack of education. According to this study, majority of *Santhals* population were deprived of education than other populations. Literacy rate was higher among male than female populations. Female literacy rate might be lower because of early marriage, early pregnancy, superstitions, low economic status, poor communication facilities and gender differentiation. Early marriage resulted in early pregnancy, which had adverse effects on the health status of these people as depicted by Brahmanandam and Bosu Babu (2016).

Maximum people in the *Santhals* community preferred pond water for the purpose of bath-

ing as found in this survey. Specifically, heavy workers keep away from home for maximum time. In some remote areas there are no options of a bathing source except ponds. Hence, heavy workers bathe in ponds. Pond water can be contaminated by microorganisms (blue-green algae and other bacteria, viruses, parasites) or other pollutants. People can also contaminate pond waters with their secretions. In villages, a pond is also use for bathing of domestic animals. As a result of this contamination, skin rash was very common among *Santhals* community. The chances of contamination of tap water and tube well water are comparatively lower than pond water.

Old aged people in *Santhals* community belief that alcohol drinking is good for their health and it helps pass the urine clearly as depicted by this survey. Liquor (rice-beer) and its impact on various diseases is a great public health issue in the present society as well as in the tribal society. Additionally, use of rice beer in tribal communities has been part of the cultural tradition. Daily intake of alcohol was another cause of various diseases among *Santhals* community as reported by Choudhury (2018). Alcoholics generally have a high incidence of decayed teeth. Khairnar et al. (2017) also reported that alcoholics suffer from more number of missing teeth as compared to non-alcoholics. Similarly, this study also pointed towards the association of dental problem with alcohol intake. Though they believe that they get nutritional value from alcohol but there are many adverse effects of alcohol consumption. Liver disease is also common among *Santhals* population due to excessive alcohol intake as reported by this study and a previous study like Mitra et al. (2017). Like alcohol *Santhali* community also preferred to use tobacco as a chewing and smoking by this study. Females prefer tobacco chewing to smoking. Previous studies also revealed the association between dental problem and tobacco usage like Lee et al. (2016). *Santhals* community use tobacco in two ways, that is, tobacco smoking and tobacco chewing. Tobacco chewing and smoking affect oral health. The present study showed that tobacco chewers were most vulnerable to dental problem compared to non-tobacco chewers. Previous study by Zahiruddin et al. (2012) also showed high prevalence of tobacco use among tribal adolescents in India. Another study by Khanna (2012) also evaluated the impact of tobacco on oral health of tribes in Central India. This study also demonstrated the impact of tobacco use on dental problem among *Santhals* population. In tobacco chewing, teeth are more exposed to tobacco for a long time. As a result, tobacco chewers are more prone to dental problem than non-tobacco chewers.

Results revealed the association of prevalence of various diseases with area and age. The risk of developing arthritis increased with age due to osteopenia (decrease in bone mineral content). Maximum people in *Santhals* community engage in heavy manual work. Some jobs require repetitive movement and heavy lifting. This can cause stress in the joints, which leads to arthritis. In females, arthritis is due to menopause because oestrogen production is lower during this time. The study showed differential distribution of incidence of arthritis across different geographical area, which points towards the differential distribution of workload in the areas. Like bone, the digestive tract might not work as efficiently with aging. With aging, gastrointestinal muscles in the digestive tract become less efficient and stiffer. Therefore, acidity was commonly found in older age than younger in this study.

CONCLUSION

The study focused on *Santhals* population, which is one of the largest tribal communities in India. The tribal populations have been considered as the most backward educationally, economically and socially. The study revealed the association of socio-demographic factors and disease prevalence among this community. Use of tobacco may induce dental problem. Alcoholic *Santhal* people were more prone towards liver diseases and dental problem.

RECOMMENDATIONS

The results of the survey pointed towards the health status of this population and suitable treatment policies need to be undertaken for these people especially on dental problem and liver diseases.

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