

A Study of Water Crisis and Occupational Health Hazards among Bidi workers of Purulia, West Bengal

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Abstract: Bidi rolling is a popular small-scale industry in Purulia which provides employment for over 1 lakh women bidi workers, particularly in the Purulia west region. Purulia west is a sub division of the Purulia district which, comes under extended part of Chhotonagpur Plateau, where major population are of low socio-economic status especially in rural area. A large section of population is dependent of bidi rolling for their survival. A descriptive cross-sectional study has been used to assess the impact of access to sanitation facilities and to safe usable water on the occupational health problems among bidi workers.

A total of 124 household containing 663 people were selected by purposive sampling method. We have used a predesigned, pretested questionnaire for collection of data to be analysed by appropriate statistical method. Most of the bidi workers were living in poor environmental and housing conditions. Around 80% of these workers are suffering from water crisis for domestic use and/or drinking purposes. It was observed that almost 70% of the workers developed occupational health problems as reported by the male and female bidi workers. Apart from the musculo-skeletal problems (65%), there are also gastrointestinal (40%), skin diseases (dermatitis) (37%) cough (27%), breathlessness (20%), and tuberculosis (2.8%) among other problems.

Our empirical study shows that the occupational health hazards are lessened by the access to sanitation facilities and to safe usable water among bidi workers.

Keywords: Bidi rolling, bidi workers, Purulia, occupational health problems, water crisis.

Jel Classification: I21, J21, J28, J44

1. Introduction

Bidi rolling is a traditional agro-forest based industry, spread over almost all major states in India. Bidi industry is predominantly a home-based industry in India which employs over 4 million people, the lion share being women. Home based work relies largely on female labour in comparison to the factory or shop where fewer women are employed (GOI, 1988). The organisation and distribution of work within the home-based production offers less protection to workers, and leads to the non-recognition of issues of occupational health of workers. The industry is mostly unorganized. A special feature of the bidi industry is that work is done

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through contractors and by distributing work in private dwelling houses where the workers take the raw material given by the contractor and handover the finished product to him. It is an arduous, labour intensive task because each bidi is rolled individually. Women constitute a very high percentage of labour force in the industry. The reason for this is, firstly, the work is done generally from home and women can do it while at the same time attending to their children and other household chores; secondly, their deft fingers are more suited to the work of bidi rolling, besides, women are considered to be more sincere and hardworking. Thousands of bidi rollers work under conditions that are harmful to their health.

This is an attempt to find out living conditions of bidi workers and the incidence of the occupational health hazards among them in and around Jhalda, located in district Purulia, West Bengal. Jhalda comes under extended part of Chhotonagpur Plateau & is located 45 km. away from Purulia Town and situated on Purulia Ranchi highway. According to 2011 census the total population of Jhalda II was 1.5 lakhs. Large section of its working population is engaged in Bidi rolling. Several Bidi factories are also located in this area. Both men and women are engaged in bidi rolling here. Lack of other employment opportunities often forces them to earn their livelihood from bidi making alone. The area where the bidi workers live is found to be highly congested and full of squalor and also they are suffering from access to safe water for domestic use or drinking purposes. Exploitation, poverty, dirt and diseases seemed to be living in absolute harmony with the bidi roller.

Bidi workers start from early morning and continue up to late night with few breaks. This type of work practice is putting some serious impact on the life style of these people resulting serious health impacts. To earn more money they are putting maximum possible family labour hour resulting less time left for other necessary works and rest. Young ones as well as aged people are also sharing this job regularly. Level of sanitation facilities as toilet, drainage of waste water, disposal of solid wastes etc available in a family and in the neighborhood are in awful situation. Individual toilets are almost unavailable, drainage facilities are there but rarely cleaned, solid wastes are disposed in the common passage in most cases in the roads in front of houses making it a huge common dustbin. This is a drought prone area. Ground water level is very deep and people are dependent on

common water bodies like tanks, ponds, rivers, dug well or bore wells. Through public efforts safe drinking water is available in almost all places but water bodies are very ill maintained and drinking water sources are ill managed. So partly though drinking water sources have increased lack of management of water bodies and drinking water sources usable water availability is still scarce. Accessions of usable water for drinking and household use are inducing health expenditure of these families. Frequency of visit to a doctor is very high among these workers and health workers visit of Labour Welfare Department is very helpful for these people. But as basic medical expertise and medicines only are available in Bidi Workers Health Clinic (SCMMU; Jhalda) they have to go to private clinics and out of stations for treatment.

Against these backdrops, this study was aimed with the following objectives

2. Objectives

- The effect of family income on the expenditure on health
- The effect of family size on the expenditure on health
- The relationship between the sex ratio and the expenditure on health
- The impact of number of children below the age of 14 years in the family on the expenditure on health
- The effect of highest education in the family on the expenditure on health
- The effect of frequency of visiting doctors on the expenditure on health
- The relationship between health and having jobs in addition to the primary job of bidi rolling
- The impact of total hours spent by the family members for bidi rolling on the expenditure on health
- The relation between the access to sanitation facilities and the expenditure on health of the bidi workers
- The relation between the access to safe usable water and the expenditure on health of the bidi workers

3. Literature Survey:

Lot of research works have been made on the bidi workers covering various issues of the workers in different states of India. Important works gone through for this research are listed below.

M.Mohandas,(1980), throws light on the conditions of the workers in the bidi industry all over the country. This work has highlighted the miserable life of workers in specific regions of Maharashtra, Karnataka and West Bengal. This paper explains the economic conditions of bidi workers, and highlights the impact of existing labour legislation in the industries of Kerala. He reported high incidence of occupational diseases owing to exposure to tobacco and postural problems arising out of the monotonous work.

According to Bagwe and Bhisey (1991) and Swami et al. (1995) bidi rollers are exposed to unburnt tobacco, mainly through the cutaneous and nasopharyngeal routes. Ranjitsingh and Padmalatha (1995) reviewed that bidi rollers were affected by respiratory disorders, skin diseases, gastrointestinal illness, gynecological problems, lumbosacral pain and are susceptible to fungal diseases, peptic ulcer, hemorrhoids and diarrhea. Numbness of the fingers, breathlessness and stomach pains including cramps and gas, have also been reported in bidi rollers. Mahimkar Bhisey (1995) in his study found that an increase in frequencies of chromosomal abbreviations have taken place among the exposed group of people who rolls biri. Bagwe Bhisey (1995) pointed out the elevation of mutagenic burden among bidi industry workers. M.Gopal (1999) discussed about the production of bidi, through contracting to home-based workers. The home workers work as housewives, care for children and perform her household tasks at the same time they can use their time in wage work. Women put in long hours to fulfill production targets set by employers but have no idea how their wage rate is determined. Sudarshan R and Kaur R, (1999) envisaged gender perspective on the employment situation in the bidi industry and highlighted the policy issues relating to women's employment in this industry. The estimated number of women in the bidi manufacturing in India vary from 2.2 to over 4 million and 192,000 are girls under the age of 14 years. The bargaining position of bidi workers is weak. Various strategies were suggested by the Government for empowering women bidi workers, organizing the workers to demand their rights, and creating new livelihoods for them. Kaur S, Ratna R (1999); Aghi and Gopal (2001) reported indurations of the hands and complications of pregnancy in women bidi rollers. Kuruvilla *et al.* (2002) investigated on occupational dermatoses in bidi rollers. Occurrences of callosities and nail changes were argued to be associated with the extent of work. Umadevi *et al.* (2003) made a study on the Cytogenetic effects in workers occupationally exposed to tobacco dust. (Dikshit and Kanhere 2000; Mittal et al. 2008), found that postural pains, eye problems and burning sensation in the throat are common ailments in women bidi rollers. Bhisey et al. (2006) recorded that inspirable dust of tobacco in the tobacco factory was associated with chronic bronchitis in workers. The ocular manifestations among bidi rollers were discussed by Mittal *et al.*

(2008). Mandelia *et al.* (2010) analyzed the effects of occupational tobacco exposure on fetal growth and claimed that exposure beyond 6 h per day has trivial but definite adverse effects. Nakkeeran, Pugalendhi (2010) accounted respiratory, gastrointestinal, and osteological problems among bidi rollers in four districts of Tamil Nadu. Yasmin *et al.* (2010) shed some light on the work related health issues of female bidi rollers in Patna, Bihar. The study identified lower haemoglobin levels and SGPT (ALT) enzyme concentration among bidi rollers. Joshi *et al.* (2013) made an epidemiological survey of occupational health hazards among bidi workers of Amarchinta, Andhra Pradesh and noticed that almost 90% of the workers developed pain in various body parts, the prominent among them being shoulder pain, back pain and neck pain. Prakash Vyas (2013) examined the association between occupational tobacco exposure and health risks among women bidi rollers in Ajmer. The tobacco dust contain toxic nitrosamines which is readily absorbed by body tissues giving rise to cough, breathlessness, ocular and dermatological health issues.

1. Econometric Model and Methodology

1.1 Specification of Econometric Models

We have attempted to find out factors which are influencing health of the bidi rollers in our study area. First we have quantified health status of the bidi rollers by assuming annual health expenditure figures of that family. We have taken Annual Household family health expenditure (EXPH) as the dependent variable of our regression analysis. By health expenditure we mean expenditures on doctor fees, investigation charges, cost of medicines, transportation fees of patient and attendant.

Level of sanitation (SANITATION) is very important for a healthy living. In rural areas proper sanitation facilities are scarce. We measured the sanitation facility by looking at three things own toilet, drainage facility for used water and waste/garbage disposal system if any one of these are available to the family we have considered value of this variable is one other wise zero. Water is another source of health hazards. In a drought prone area availability of water is obviously scarce so households spend many hours to collect and /or access safe usable water (ACCESSUSW) for household purposes. It includes both drinking water and water for other household purposes. Now a bidi roller family use his maximum possible time to roll bidis and increase family income so compels to opt for the

water source may not be hygienic for them . If a family uses safe usable water source for both drinking as well as other household purposes then we have assumed its value is one otherwise it is zero. In the bidi roller families almost all the members roll bidies it increases earning and shares total labour time also. A large size family (FAMSIZE) will earn more but it is likely that their health expenditure will be less if work is shared between members of the family. Sex ratio (i.e. number of females to number of males in a family) may induce health expenditure also as it is mainly done by females of the family we tried to find out whether sex ratio (SEXRATIO) is an important determinant of health expenditure or not. Same is the case with number of children. A family with more children is expected to spend more on health so we have taken this variable to test its impact on total health expenditure of the family. Education gives enlightenment and accession to knowledge bank. So it definitely will have an impact on health expenditure. Households with relatively more education will likely to be less susceptible to health problem and thereby spend less on health expenditure. We have calculated the highest education of the family by taking years in school by a member of a family. Frequency of visiting doctor is directly related with health expenditure. We have taken data on last six months visit to the doctor by the family in this variable . It is expected that higher visit imply higher health expenditure of the family. Work opportunities are scarce here so people search for second jobs specially the male members and educated ones. Families with second jobs are spending less time in bidi rolling so likely to be less prone to ill health and health expenditure of these families are likely to be less. Total labour hour devoted in bidi rolling is another important determinant of health expenditure of the family. More hours of this job are likely to create situation responsible for health problems. So it is going to positively influence health expenditure of the family.

Taking all these variables we have fitted two simple regression models and at the first model we have taken family health expenditure (EXPH) as our dependent variable and regressed it by Ordinary Least Squares Technique to find out impacts of family income(FAMINC); family size(FAMSIZE); sex ratio (SEXRATIO); number of children below 14 years(of age(NCHILD_14); highest education of the family(FAMHEDN); Off firm job other than the primary job of rolling bidi (SCNDJOB); frequency of visit to the doctor(FREVID); total family work hour

devoted for rolling bidi(TFAMWH); level of sanitation(SANITATION) and accession to usable water (ACCESSUSW).

Model 1

$$\text{LOG(EXPH)} = \text{C}(1) + \text{C}(2)*\text{LOG}(\text{FAMINC}) + \text{C}(3)*\text{LOG}(\text{FAMSIZE}) + \text{C}(4)*\text{LOG}(\text{SEXRATIO}) + \text{C}(5)*\text{NCHILD}_{14} + \text{C}(6)*\text{LOG}(\text{FAMHEDN}) + \text{C}(7)*\text{SCNDJOB} + \text{C}(8)*\text{LOG}(\text{FREVID}) + \text{C}(9)*\text{LOG}(\text{TFAMWH}) + \text{C}(10)*\text{SANITATION} + \text{C}(11)*\text{ACCESSUSW} + \text{U}$$

All bidi workers are not of same financial strengths so further we have divided our dataset on four subgroups as families with income below poverty line(BPL), Lower Middle Income Group (LRMIDINCG); Middle Income Group (MIDINCG) and High Income Group (HIGHINCG).

In our second Model we have regressed family health expenditure(EXPH) with the income status of different families as BPL; Lower Middle Income Group (LRMIDINCG); Middle Income Group (MIDINCG) and with sex ratio; number of children below 14 years of age; highest education of the family; Off firm job other than the primary job of rolling bidi; frequency of visit to the doctor; total family work hour devoted for rolling bidi; level of sanitation and accession to usable water. This will give us important insights about importance of relative income situation in the society and its impact on health expenditure of the family.

Model 2

$$\text{LOG(EXPH)} = \text{C}(1) + \text{C}(2)*\text{BPL} + \text{C}(3)*\text{LRMIDINCG} + \text{C}(4)*\text{MIDINCG} + \text{C}(5)*\text{LOG}(\text{FAMSIZE}) + \text{C}(6)*\text{LOG}(\text{SEXRATIO}) + \text{C}(7)*\text{NCHILD}_{14} + \text{C}(8)*\text{LOG}(\text{FAMHEDN}) + \text{C}(9)*\text{SCNDJOB} + \text{C}(10)*\text{LOG}(\text{FREVID}) + \text{C}(11)*\text{LOG}(\text{TFAMWH}) + \text{C}(12)*\text{SANITATION} + \text{C}(13)*\text{ACCESSUSW} + \text{U}$$

Further Total family work hour in rolling bidi have been divided in four groups as FWH_1 means families who are working less than twelve hours a day, FWH_2 means families who are working more than twelve hours but less than twenty four hours a day, FWH_3 means families who are working more than twenty four hours but less than thirty six hours a day, FWH_4 means families who are working more

than thirty six hours a day. In our third Model we have regressed family health expenditure(EXPH) with the income status of different families as BPL; Lower Middle Income Group (LRMIDINCG); Middle Income Group (MIDINCG) and with sex ratio; number of children below 14 years of age; highest education of the family; Off firm job other than the primary job of rolling bidi; frequency of visit to the doctor; total family work hours of different categories devoted for rolling bidi; level of sanitation and accession to usable water. This will give us further insight about importance of relative income situation as well as work intensity in the society and its impact on health expenditures of bidi rollers.

Model 3

$$\text{LOG(EXPH)} = \text{C}(1) + \text{C}(2)*\text{BPL} + \text{C}(3)*\text{LRMIDINCG} + \text{C}(4)*\text{MIDINCG} + \text{C}(5)*\text{LOG(FAMSIZE)} + \text{C}(6)*\text{LOG(SEXRATIO)} + \text{C}(7)*\text{NCHILD}_{14} + \text{C}(8)*\text{LOG(FAMHEDN)} + \text{C}(9)*\text{SCNDJOB} + \text{C}(10)*\text{LOG(FREVID)} + \text{C}(11)*\text{LOG(TFAMWH)} + \text{C}(12)*\text{SANITATION} + \text{C}(13)*\text{ACCESSUSW} + \text{U}$$

4.2 Specification and Measurement of the Variables

EXPH: Represents annual family expenditure on health. Value of the variable is measured in rupees.

FAMINC: It represents annual family income. This is also measured in rupees.

BPL: Represents families with income below poverty line (< Rs.18000/-). The variable is qualitative in nature & takes the values “0” if no or “1” if yes.

LRMIDINCG: It represents families with lower middle income group (Rs.18000/- –Rs. 40000/-). It is qualitative in nature too & takes the values “0” if no or “1” if yes.

MIDINCG: It represents families with middle income group. (Rs.40000/- –Rs. 80000/-) takes the values “0” if no or “1” if yes.

HIGHINCG: It represents families with higher income group. (>Rs. 80000/-) takes the values “0” if no or “1” if yes like other income group variables.

FAMSIZE: Represents family size and measured by numbers.

SEXRATIO: It represents female to male ratio of a family and measured by ratios i.e. number of female divided by number of males.

NCHILD_14: Represents number of children below 14 years of age and measured by numbers.

FAMHEDN: Represents highest family education in years also and measured by numbers.

SCNDJOB: Off firm job other than primary job of rolling bidi takes the values “0” if no or “1” if yes.

FREVID: Represents frequency of visit to doctor of the family in last six months, measured by numbers.

TFAMWH: Represents total family work hours of bidi rolling, measured by numbers.

FWH_1: Represents total family work hours of bidi rolling less than 12 hours a day, the values “0” if no or “1” if yes **FWH_2:** Represents total family work hours of bidi rolling more than 12 hours but less than 24 hours a day measured by the values “0” if no or “1” if yes .

FWH_3: Represents total family work hours of bidi rolling more than 24 hours but less than 36 hours a day takes the values “0” if no or “1” if yes.

FWH_4: Represents total family work hours of bidi rolling more than 36 hours a day the values “0” if no or “1” if yes.

SANITATION: Sanitation facility available to the family takes the values “0” if no or “1” if yes.

ACCESSUSW: Access to the usable safe water to the family. This is also a qualitative variable taking values “0” if no or “1” if yes.

U: Error term.

4.3 Hypotheses

Hypothesis-1: Health expenditure is likely to vary in either direction with family income.

Hypothesis-2: Health expenditure is likely to vary directly with family size.

Hypothesis-3: Health expenditure is likely to increase directly with sex ratio.

Hypothesis-4: Health expenditure is expected to increase with the number of children below 14 years in the family.

Hypothesis-5: Health expenditure is likely to vary directly with the frequency of becoming ill or frequency of visiting doctors.

Hypothesis-6: Health expenditure is likely to vary in either direction with the households having secondary jobs in addition to the primary works of bidi rolling.

Hypothesis-7: Health expenditure is likely to be affected with the education of any member of the family.

Hypothesis-8: Health expenditure is likely to increase with the increase in total hours of working of Bidi rolling.

Hypothesis-9: Access to sanitation facilities is expected to reduce the health expenditure.

Hypothesis-10: Access to safe usable water is certain to moderate the health expenditure of the bidi workers' family.

4.4 Data

Research design adopted for this study was descriptive cross-sectional study. With respect to the concentration of bidi workers Purulia district is the fourth highest only after Malda & Murshidabad & Midnapur West. But among the drought prone districts of West Bengal Purulia has got highest concentration of Bidi workers. To study health hazards and impacts of usable water crisis and lack of sanitation practices we have chosen Purulia district. Out of twenty blocks Jhalda II has highest concentration of Bidi workers. More than 60 % of bidi workers are working in this block. We have selected five villages of this block namely Bororalla; Chekya; Bortolia; Majhidih & Matkuma as survey area where participation in bidi rolling is greater than 90%. We have taken sample size proportional to the total households of the village. Number of households selected

using random numbers from Bororalla; Chekya; Bortolia; Majhidih & Matkuma were 46, 28, 20, 16 and 14 respectively. On the basis of pilot study conducted in the study area 124 household (containing 663 people) were selected who are employed in bidi rolling. Questionnaire was prepared with the aid of literature and consultation with experts and doctors for interview purpose. Finally 30 questions are formed under five dimensions:

1. Environment and sanitation condition of bidi workers.
2. Socio-economic status of the bidi workers.
3. Physical health and occupational health profile of bidi workers.
4. Emotional fittings.
5. General awareness.

Door to door survey was conducted for data collection by pre-designed, pre-tested questionnaire and analyzed by appropriate statistical methods.

2. Empirical Estimates

5.1 Summary Statistics

Qualitative status of our sample households are presented in Table 5.1.1. Most of the bidi rollers in our sample belong to lower & middle income groups. In our dataset 4.03% households are BPL, 43.55% households are from lower middle income group, 45.16% households are from middle income group and 7.26% households are from high income group as our specification of different groups. Bidi rolling Households also do other economic activities for earnings as cultivation wage work etc. In our sample 53.23% households are doing such secondary jobs. Bidi rolling is a family work. We have calculated time devoted by members of a family and divided them four categories as families devoting less than twelve hours a day; families devoting 12 to 24 hours a day; families devoting 24 to 36 hours a day and families devoting more than 36 hours a day.

Table-5.1.1: Percentage Distribution of the Qualitative Status of the Sample Households

Name of the Qualitative Status	%age of Sample Households having the status	
	(Yes=1)	(No=0)
Below the Poverty Line (Yes=1)	4.03	95.97
Lower Middle Income Group (Yes=1)	43.55	56.45
Middle Income Group (Yes=1)	45.16	54.84

High Income Group (Yes=1)	7.26	92.74
Secondary Job (Yes=1)	53.23	46.77
Time Devoted less than 12 Hours/day (Yes=1)	15.32	84.68
Time Devoted between 12 and 24 Hours/day (Yes=1)	38.71	61.29
Time Devoted between 24 and 36 Hours/day (Yes=1)	33.87	66.13
Time Devoted more than 36 Hours/day (Yes=1)	10.48	89.52
Access to Sanitation facilities (Yes=1)	39.52	60.48
Access to Safe Usable Water (Yes=1)	58.87	41.13

Author's own computation based on primary data

Out of total 124 sample households 15% of the sample household families are devoting less than 12 hours a day, 38.71% households are working between 12 to 24 hours and another 33.87 % households are working between 24 to 36 hours a day. As much as 10.48 % of households are working more than 36 hours a day. This suggests that most households are working long hours and with many members together. Access to sanitation facilities and safe usable water is poor to the sample households. Only 39.52 % households have access to sanitation facilities and 58.87% households have access to safe usable water.

Table-5.1.2: Socio-Economic-Demographic Profile of Bidi Workers in the District of Purulia (WB), 2014

Income Status	Socio-Economic-Demographic Parameters	Mean	Median	Std. Dev.	C. V.
Below Poverty Level (5)	Expenditure on Health (Rs)	5480	5000	1238	22.59
	Family Income (Rs)	15500	16000	2179	14.06
	Time Devoted by the Family Members (Hours)	11.6	12	0.89	7.71
	Frequency of Visiting Doctors	26.6	24	8.71	32.73
	Family Size	4.4	4	1.52	34.47
	Number of Female Members	2.4	2	1.67	69.72
	Number of Male Members	2	2	1.22	61.24
	Sex Ratio (Female/Male)	1.9	0.5	2.04	107.54
	Number of Children below 14	1.2	1	0.84	69.72
	Highest Education in the Family (Years)	5.4	6	0.89	16.56
Lower Income Group (54)	Expenditure on Health (Rs)	10429	10000	4493	43.08
	Family Income (Rs)	31148	33000	6404	20.56
	Time Devoted by the Family Members (Hours)	16.13	15.5	3.59	22.24
	Frequency of Visiting Doctors	22.20	21	10.54	47.47
	Family Size	4.54	5	1.28	28.31
	Number of Female Members	2.67	2.5	1.52	56.89
	Number of Male Members	2.09	2	0.87	41.79
	Sex Ratio (Female/Male)	1.49	1.5	1.12	75.14
	Number of Children below 14	1.57	2	1.02	64.84
	Highest Education in the Family (Years)	4.69	4	2.60	55.60

Middle Income Group (56)	Expenditure on Health (Rs)	22528	21120	8051	35.74
	Family Income (Rs)	57486	55000	9504	16.53
	Time Devoted by the Family Members (Hours)	30.27	30	4.80	15.84
	Frequency of Visiting Doctors	17.39	15	8.65	49.71
	Family Size	5.93	6	1.54	25.90
	Number of Female Members	3.63	3	1.93	53.09
	Number of Male Members	2.77	3	1.11	40.17
	Sex Ratio (Female/Male)	1.37	1.5	0.59	42.99
	Number of Children below 14	1.80	2	0.96	53.31
	Highest Education in the Family (Years)	4.71	4.5	2.39	50.80
High Income Group (9)	Expenditure on Health (Rs)	34778	28000	18693	53.75
	Family Income (Rs)	89833	88000	6149	6.85
	Time Devoted by the Family Members (Hours)	45.00	45	2.50	5.56
	Frequency of Visiting Doctors	17.56	15	7.84	44.68
	Family Size	7.11	7	2.37	33.31
	Number of Female Members	5.78	6	2.68	46.42
	Number of Male Members	3.11	3	1.05	33.88
	Sex Ratio (Female/Male)	1.49	1.5	0.44	29.55
	Number of Children below 14	2.22	2	1.09	49.18
	Highest Education in the Family (Years)	4.22	4	1.39	33.03

Author's own computation based on primary data

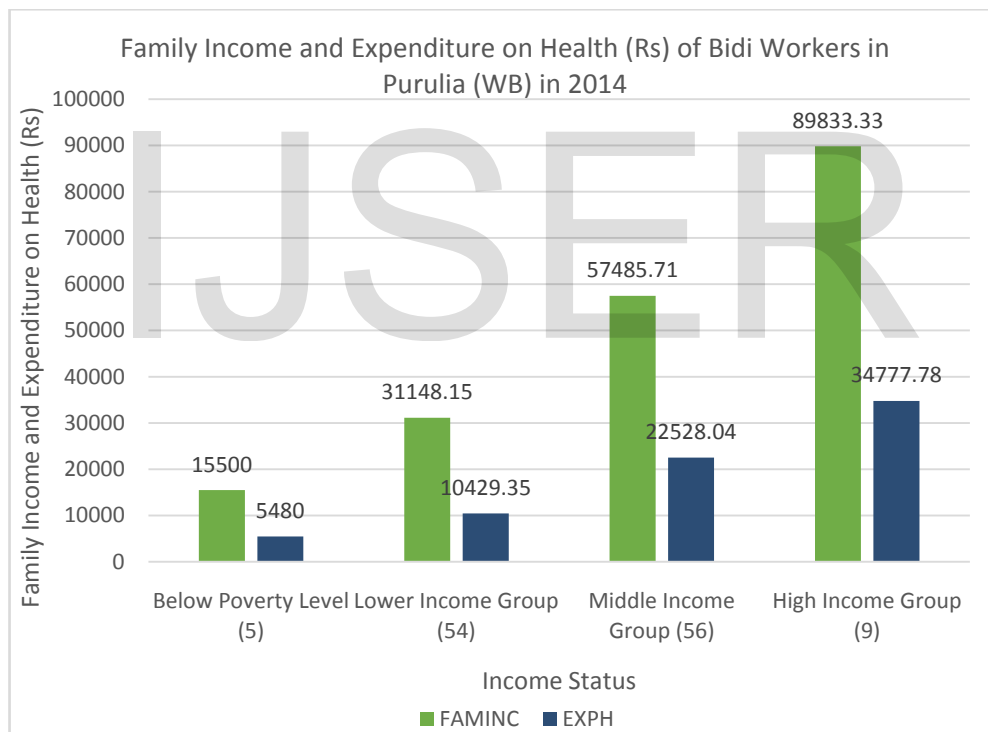
Income group wise socioeconomic and demographic conditions are shown in the 5.1.2 table. Mean annual family level income is only Rs. 15500/- and annual mean health expenditure of BPL households is Rs. 5480/- only with a standard deviation of Rs. 2179/- & Rs. 1238/- respectively. For lower middle income group mean family annual income and health expenditure are Rs. 31148/- and Rs. 10429/- with standard deviation of Rs. 6404/- & Rs. 4493/- respectively. In the middle income group mean annual income and health expenditures are Rs. 57486/- & Rs. 22528/- with standard deviation of Rs. 9504/- & Rs. 8051/- respectively. For the high income group mean annual family income and health expenditures are Rs. 89833/- & Rs. 34778/- with standard deviation of Rs. 6149/- & Rs. 18693/- respectively.

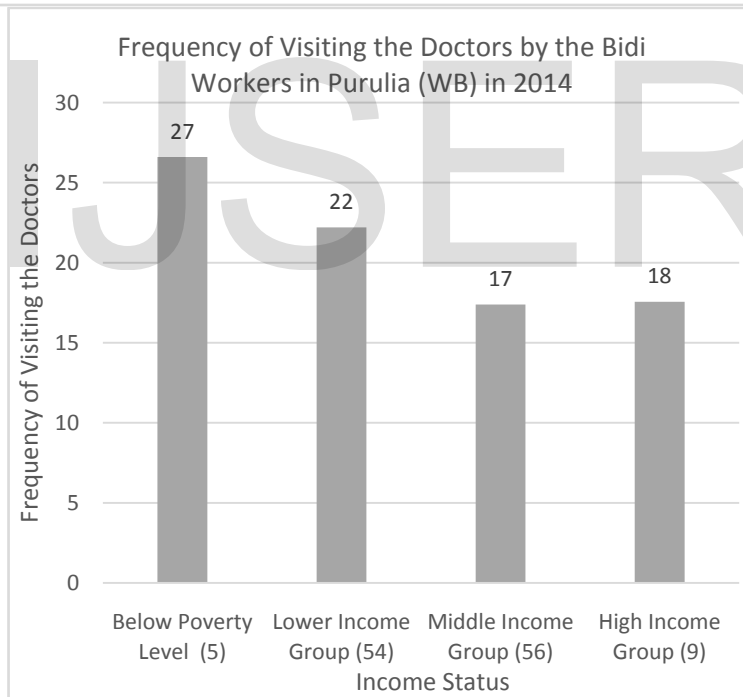
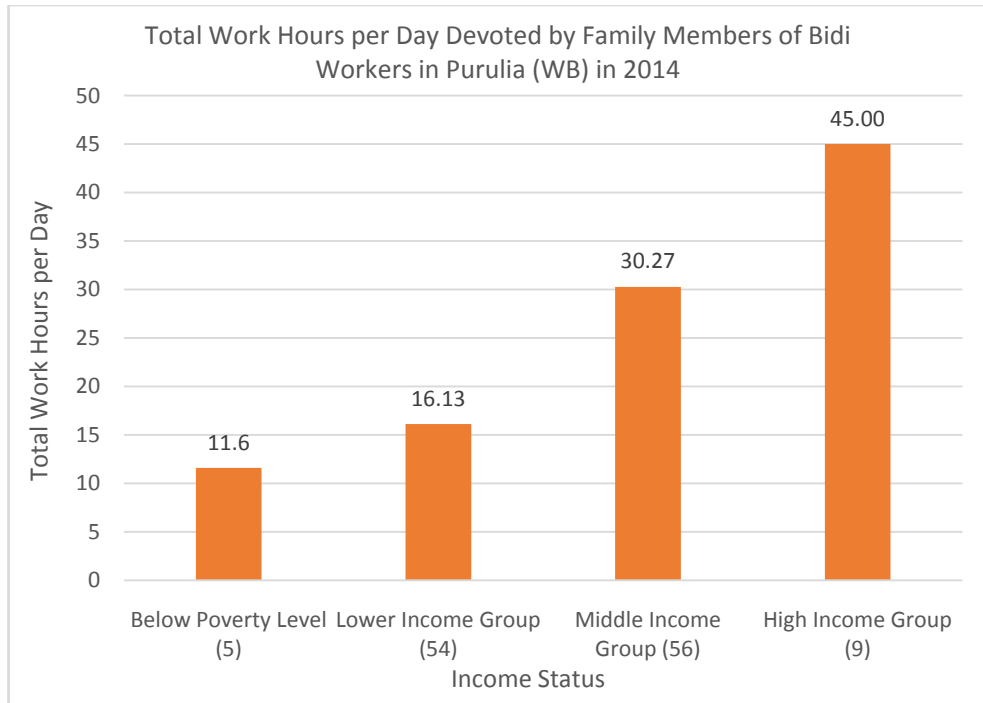
It is seen from our data that all the sample households are spending more than thirty percent of their annual income on health expenditure and percentage health expenditure is higher among relatively rich income categories. This is shown in the figure 5.1.1. Among different income groups higher income group families are devoting highest hours in rolling bidi and the BPL families are devoting least hours in Bidi rolling (figure 5.1.2). So it can be said that families with more family hours on rolling bidi are comparatively richer in the society. This is substantiated by the average family size of different income groups and number of females in the family

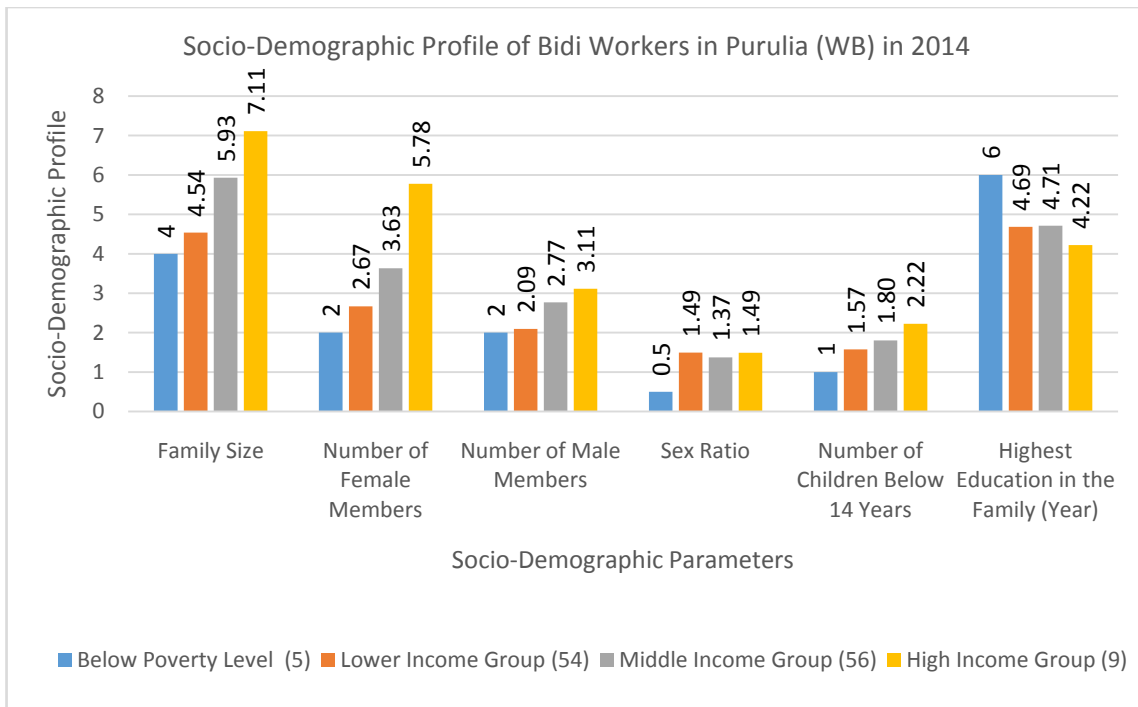
also. Higher income group families are having higher family sizes with more female members (figure 5.1.4). This is so because bidi rolling is mostly done by female members of a family.

Number of male members, sex ratio & number of children below 14 years in a family shows lesser variability among different income groups. Greater family size obviously explains number of male members and number of children but adverse sex ratio may be a cause of poverty of BPL households.

Two more interesting features are seen in our dataset as frequency of visiting doctor in last six months is highest among the BPL families and comparatively low among richer families where as highest family education in a family is higher among poor families than with richer families. With education people become health conscious so visit to doctor is likely to increase but affordability







5.2 Regression Results

Table 5.2.1, Table 5.2.2 and Table 5.2.3 show estimated values of our first & second regression models respectively.

Table-5.2.1: Determinants of Health Expenditure of the Bidi Workers in Purulia (WB), 2014

Model_1: $\text{LOG}(\text{EXPH}) = C(1) + C(2)*\text{LOG}(\text{FAMINC}) + C(3)*\text{LOG}(\text{FAMSIZE}) + C(4)*\text{LOG}(\text{SEXRATIO}) + C(5)*\text{NCHILD_14} + C(6)*\text{LOG}(\text{FAMHEDN}) + C(7)*\text{SCNDJOB} + C(8)*\text{LOG}(\text{FREVID}) + C(9)*\text{LOG}(\text{TFAMWH}) + C(10)*\text{SANITATION} + C(11)*\text{ACCESSUSW} + U;$ Included observations: 124				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.908	1.503	-0.605	0.547
LOG(FAMINC)	0.905	0.192	4.716	0.000
LOG(FAMSIZE)	-0.445	0.101	-4.394	0.000
LOG(SEXRATIO)	-0.006	0.043	-0.136	0.892
NCHILD_14	0.004	0.026	0.170	0.865
LOG(FAMHEDN)	0.013	0.052	0.256	0.799
SCNDJOB	-0.001	0.053	-0.016	0.987

LOG(FREVID)	0.110	0.057	1.936	0.055
LOG(TFAMWH)	0.459	0.209	2.193	0.030
SANITATION	-0.291	0.053	-5.490	0.000
ACCESSUSW	-0.136	0.053	-2.546	0.012
R-squared: 0.81; Adjusted R-squared: 0.80; F-statistic: 49.006; Durbin-Watson stat: 1.933				

Author's own computation based on primary data

In our first estimated model coefficient of family income LOG (FAMINC) is 0.905 which implies that elasticity of family health expenditure of Bidi rollers with their income is close to one that is with increase in income families are spending more on health. With hundred percent increase in family income health expenditure is increasing by 90%. This is obvious because increase in family income increases affordability on health, nutritious food and makes better arrangement for sanitation facilities and usable water sources and its management. Hence increase in family income increasing health expenditure but at a lesser rate. In our study this is an important explanatory variable with 99% confidence interval and found with a significant t value.

Coefficient of family size LOG (FAMSIZE) is -0.445 which implies that elasticity of family health expenditure of Bidi rollers and size of the family is negatively related with hundred percent increases in family size health expenditure is likely to decrease by 44.5%. This is obvious because increase in family size will facilitate sharing the jobs between members and lowering individual further it makes possible to manage household basic amenities to be managed in a better way to make the family less susceptible to health hazards. In our findings this important explanatory variable for explaining family health expenditure with 99% confidence interval and found with a significant t value.

Sex ratio, jobs other than rolling bidi, number of children aged less than 14 years, highest education in the family are influencing health expenditure but not in a significant way. Sex ratio is likely to be correlated with family size so it has become insignificant though decreasing health expenditure with increase in values of sex ratio as expected. It is not possible to disentangle the effect. Number of children below 14 years is increasing health expenditure but insignificantly. It may have two reasons one, people are attending bidi health clinics or local PHCs for

kids or ignoring their problems and treat them with household level knowledge of traditional practices. Availability of second job is reducing health expenditure but not significantly. Second job throughout the year is scarce. Lack of availability of other economic activity perhaps is making this variable so insignificant. It is not bringing enough income in this drought prone area as agriculture is non prosperous here. More visit to doctor will increase health expenditure. In our model the estimated coefficient is 0.110 which is statistically significant at 5.5% level. An increase of 100 per cent to doctors' visit will cause an 11% increase in their health expenditures. This may imply two things one, they are probably falling ill by common diseases and two, they are availing mostly facilities of the BIDI Hospital nearby or that of PHCs nearby which helps a lot to curtail their health expenditures.

It was observed that almost 70% of the workers developed occupational health problems as reported by the male and female bidi workers. Apart from the musculo-skeletal problems (65%), there are also gastrointestinal (40%), skin diseases (dermatitis) (37%) cough (27%), breathlessness (20%), and tuberculosis (2.8%) among other problems. Only 39.52 % households have access to sanitation facilities and 58.87% households have access to safe usable water. Gastrointestinal, skin diseases common cough are regular problems in these families these are draining family income regularly and likely aggravating occupational health problems.

Level of sanitation has negative impacts on health expenditures as expected. The estimated coefficient is -0.291 implies a 100 % increase in sanitation will reduce health expenditure by 29.1 %. It is significant at 97% and with a significant t values. As expected access to safe usable water have also negative impact on health expenditures of these families. The estimated coefficient is -0.136 which is statistically significant at 99% with a significant t values. An improvement in access to the safe useable water is expected to reduce health expenditure by 13.6%. So improvement in sanitation and access in usable safe water can reduce health expenditure of these families by more than 40 %.

Total family work hour devoted to bidi works have positive impact on the health expenditures among these families as people are working more hours they fall ill also when labour is shared between family members work environment near/

within becomes responsible (as concentration of smoke dust & toxicity increases) for ill health. The estimated elasticity is 0.459 which is significant at 95%. It tells that a 100 % increase in work hour increase health expenditure by 45.9 %. As we calculated total work hour of a family by adding total time spending on bidi rolling by all the family members it is clear that high work rate among these workers is very much responsible for their ill health too as it is found in various studies in the literature.

In our second model we found similar results with some extra insights as we have divided the data set with respect to different income groups as below poverty line, lower middle income group, middle income group and high income group. Estimated values of income group coefficients are as follows. Higher income group has been considered as contrast in our model. For high income group estimated value is 6.637. The estimated value is statistically significant at 1% . This implies health expenditures of high income group families are significantly explained by their average annual family income. For the BPL category estimated value is $6.637 - 0.496 = 6.141$, which is also statistically significant at 6.3%. Estimated values for the LRMIDINCG & MIDINCG are $6.637 - 0.118 = 6.519$ & $6.637 + 0.054 = 6.691$ respectively. Estimated coefficients are not significantly explaining variations in health expenditures of these families.

Table-5.2.2: Determinants of Health Expenditure of the Bidi Workers in Purulia (WB), 2014

Model_2: LOG(EXPH) = C(1) + C(2)*BPL + C(3)*LRMIDINCG + C(4)*MIDINCG + C(5)*LOG(FAMSIZE) + C(6)*LOG(SEXRATIO) + C(7)*NCHILD_14 + C(8)*LOG(FAMHEDN) + C(9)*SCNDJOB + C(10)*LOG(FREVID) + C(11)*LOG(TFAMWH) + C(12)*SANITATION + C(13)*ACCESSUSW+U; Included observations: 124				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	6.637	0.593	11.187	0.000
BPL	-0.496	0.264	-1.876	0.063
LRMIDINCG	-0.118	0.189	-0.625	0.533
MIDINCG	0.054	0.124	0.434	0.665
LOG(FAMSIZE)	-0.454	0.108	-4.198	0.000
LOG(SEXRATIO)	0.008	0.046	0.171	0.865
NCHILD_14	0.003	0.028	0.120	0.905
LOG(FAMHEDN)	0.021	0.056	0.378	0.706
SCNDJOB	0.000	0.057	-0.008	0.994
LOG(FREVID)	0.107	0.061	1.771	0.079
LOG(TFAMWH)	1.156	0.159	7.282	0.000
SANITATION	-0.287	0.057	-5.043	0.000

ACCESSUSW	-0.160	0.057	-2.800	0.006
R-squared: 0.79; Adjusted R-squared: 0.77; F-statistic: 35.318; Durbin-Watson stat: 2.026				

Author's own computation based on primary data

Coefficient of family size LOG (FAMSIZE) is -0.454 implies family health expenditure of Bidi rollers and size of the family is negatively related. With hundred percent increase in family size health expenditure is likely to decrease by 45.4%. This is a significant variable with 99% confidence interval and found again with significant t value. Sex ratio, jobs other than rolling bidi, number of children aged less than 14 years, highest education in the family are influencing health expenditure but not in a significant way again.

The estimated coefficient of sanitation which is -0.287 implies that a 100 % increase in sanitation will reduce health expenditure by 28.7 %. Estimated value is significant at 99% and with a significant t value. As expected, access to safe usable water has been found to exert negative impact on health expenditure. The estimated coefficient is -0.160 which is statistically significant at 1% level. An improvement in access to the safe useable water is expected to reduce health expenditure by 16%. So improvement in sanitation and access in usable safe water can reduce health expenditure of these families by more than 44.7 %.

Family work hour on bidi work significantly explains the family expenditure on health. The estimated coefficient shows that family health expenditure elasticity is 1.156 and the result is significant at 99% confidence level.

In our third model we found another set of results. For high income group estimated value is 10.585. The estimated value is statistically significant at 1% level. This implies health expenditures of high income group families are significantly explained by their average annual family income. For the BPL category estimated value is $10.585 - 1.055 = 9.530$, which is also statistically significant at 1% level. Estimated values for the LRMIDINCG is $10.585 - 0.708 = 9.877$, statistically significant & that of MIDINCG is $10.585 - 0.230 = 10.355$,

which is not so significant. Estimated coefficient is not significantly explaining variations in health expenditures of these families. Further, total family work hour devoted to bidi works had given positive impact on the health expenditures among biri roller's families in our first model. But in our second model estimated coefficient are with negative signs for first two categories of families but with positive sign for the next two categories of families. The coefficient of Total Family Work Hour of category 1(FWH_1) i.e., who are working less than twelve hours a day is – 0.647 which is significant at 95%. It tells that a 100 % increase in work hour decreases health expenditure by 64.7 %. It simply tells that with more members engaged in bidi work family gets more work hour and more health benefits from institutional schemes. For other categories results are not so significant but families who are working more hours in biri rolling their health expenditures are increasing with more hours of biri rolling. Occupational health problems as indicated in the literature are greater among these families

Table-5.2.3: Determinants of Health Expenditure of the Bidi Workers in Purulia (WB), 2014

Model_3: LOG(EXPH) = C(1) + C(2)*BPL + C(3)*LRMIDINCG + C(4)*MIDINCG + C(5)*LOG(FAMSIZE) + C(6)*LOG(SEXRATIO) + C(7)*NCHILD_14 + C(8)*LOG(FAMHEDN) + C(9)*SCNDJOB + C(10)*LOG(FREVID) + C(11)*FWH_1 + C(12)*FWH_2 + C(13)*FWH_3 + C(14)*FWH_4 + C(15)*SANITATION + C(16)*ACCESSUSW+U: Included observations: 124				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	10.585	0.399	26.541	0.000
BPL	-1.055	0.311	-3.393	0.001
LRMIDINCG	-0.708	0.252	-2.804	0.006
MIDINCG	-0.230	0.207	-1.112	0.269
LOG(FAMSIZE)	-0.308	0.118	-2.607	0.010
LOG(SEXRATIO)	-0.007	0.053	-0.124	0.902
NCHILD_14	0.004	0.031	0.123	0.903
LOG(FAMHEDN)	0.031	0.062	0.495	0.621
SCNDJOB	-0.019	0.063	-0.294	0.769
LOG(FREVID)	0.069	0.069	0.995	0.322
FWH_1	-0.647	0.294	-2.202	0.030
FWH_2	-0.148	0.272	-0.544	0.587
FWH_3	0.149	0.246	0.606	0.546
FWH_4	0.282	0.293	0.963	0.338
SANITATION	-0.272	0.067	-4.059	0.000
ACCESSUSW	-0.165	0.064	-2.588	0.011

R-squared: 0.75; Adjusted R-squared: 0.72; F-statistic: 21.700; Durbin-Watson stat: 1.955

Author's own computation based on primary data

Coefficient of family size LOG (FAMSIZE) is -0.308 implies family health expenditure of Bidi rollers and size of the family is negatively related. With hundred percent increase in family size health expenditure is likely to decrease by 30.8%. This is a significant variable with 99% confidence interval and found again with significant t value. Sex ratio, jobs other than rolling bidi, number of children aged less than 14 years, highest education in the family are influencing health expenditure but not in a significant way again.

The estimated coefficient of sanitation which is -0.272 implies that a 100 % increase in sanitation will reduce health expenditure by 27.2 %. Estimated value is significant at 99% and with a significant t value. As expected, access to safe usable water has been found to exert negative impact on health expenditure. The estimated coefficient is -0.165 which is statistically significant at 1% level. An improvement in access to the safe useable water is expected to reduce health expenditure by 16.5%. So improvement in sanitation and access in usable safe water can reduce health expenditure of these families by more than 43.7 %.

4. Conclusion and Policy Prescription

Bidi workers and their family members are suffering from various diseases. These families are spending very high percentage of their family income on health expenditure. Family income, frequency of visit to doctors, total work hours devoted to rolling bidi, access to sanitation and availability of usable water resources are important and significant determinants of the bidi workers' family health expenditure. For the improvement of the bidi workers following recommendations are suggested.

1. Rolling biri is not good for health. Bidi rollers also know this but it is chosen as a work opportunity as it uses family labour, requires low skill, no personal investment and can be done throughout a year with some institutional benefits. To take out them from this trap alternative earning opportunities need to be explored. District Industries Centre is regularly

- providing skill development training programmes but special programmes should be designed for bidi workers only.
2. Government will implement minimum wage law strictly.
 3. Family planning benefits would be given to bidi rollers to discourage big family size. The scheme is already there but not properly used by bidi rollers due to lack of awareness.
 4. Living in unhygienic condition (as poor access to usable water, poor sanitation facility etc.) invites diseases. Ensuring access to usable water and sanitation reduces 44% health expenditures of these families. Different schemes of govt. on sanitation and water supply are there but not implemented at Purulia. This is a drought prone area. Usable water sources are scarce. Different government schemes as Jal dhara Jal Bhara, Sajal dhara should be implemented urgently. The schemes are already running successfully at different places of India but not in Purulia.
 5. Existing water bodies are to be monitored by govt. authorities especially at summer and at rainy season and Panchayet should take remedial measures to maintain the usability of water at these places. Regular tap water supply will stop use of contaminated water and that will lead to improvement of the conditions of living.
 6. Different counselling sessions for these workers especially for women should be designed to maintain work life balance and keep their family safe at least from preventive diseases.

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