



## IMPACT OF SANITATION AND ACCESS TO SAFE WATER ON OCCUPATIONAL HEALTH HAZARDS A CASE STUDY OF BIDI WORKERS IN PURULIA OF WEST BENGAL

**Dr. Maniklal Adhikary**

Professor of Economics, Burdwan University, Burdwan, West Bengal, India - 713104

**Chandrashankar Hajra\***

Assistant Professor of Economics, Nistarini College, Purulia, West Bengal, India  
\*Corresponding Author

### 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

Issues of occupational health and concern for workers' health and safety are discussed in literature mostly for factory or industry based workers. However, 93% of India's workforce is within the unorganised sector (GOI, 2012). In the manufacturing sector 87.7 per cent of the workers are unorganized. In the unorganized manufacturing sector, usually levels of technology are low, processes of production are mostly decentralised and conditions of work are deplorable. In order to reduce the costs production within the factory sector, there has been a tremendous growth of home-based work in the last two decades. Entrepreneurs, decentralise production by subdividing the entire production process into elements that need not be carried on at one place. Big companies sub-contract their work to smaller units or contractors who distribute the work to the workers who work at home according to the requirements of the employers and hand over the finished products to them. 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.

Bidi industry is predominantly a home-based industry in India which employs over 4 million people, the lion share being women. Bidi rolling is a traditional agro-forest based industry, spread over almost all major states in India. Bidi is cheapest form of tobacco smoking especially for rural people. The industry is mostly unorganized. Work is done 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 unhygienic, dingy and

overcrowded places having little facilities for safe usable water, toilet, washing and first aid. The working hours are often indeterminable and at times child workers are made to slog for long hours in violation of the law. Common occupational health problems faced by the bidi workers are Skeleto-Muscular; Respiratory; Gastrointestinal; Neurological and Others

This is an attempt to find out 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. Eight 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. Using family labour bidi workers are working for long hours resulting less time left for other necessary works and rest. This type of work practice is putting some serious impact on the life style of these people resulting serious health impacts. Young ones as well as aged people are also sharing this job regularly. The education scenario is very weak among these people. Jhalda II block is with lowest women literacy rate in India. Male people are also doing other works like cultivation and wage work but not regularly as work opportunities are very poor.

Bidi rollers spend second highest amount of their earnings on health only after food. Frequency of visit to a doctor is very high among these workers. A Static Cum Mobile Medical Unit of Central Government is there at Jhalda Town and health workers visit different mobile points around Jhalda thrice weekly. On the other days patients come to the Clinic at Jhalda town. This Clinic offer basic medical advices with medicines only to the Bidi Workers and their families. Two primary health care centers are there which also provides medical facilities. But for serious and critical problems they

have to go to out of station medical centers at Purulia Town, Ranchi, and Jamshedpur or at Kolkata.

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.

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

## 2. OBJECTIVES

- The effect of family income on the expenditure on health: We know that with increase in income, better lifestyle and hygiene practices and intake of nutritious food family expenditures on health usually decreases.
- The effect of family size on the expenditure on health: As number of family members increases family expenditure on health also increases.
- The relationship between the sex ratio and the expenditure on health: Higher female to male ratio is likely to increase health expenditure.
- The impact of number of children below the age of 14 years in the family on the expenditure on health. More children imply higher family expenditure on health.
- The effect of highest education in the family on the expenditure on health: Education improves consciousness and access to knowledge and so likely to reduce health expenditure.
- The effect of frequency of visiting doctors on the expenditure on health: More visits to doctors indicate more expenditure on health.
- The relationship between health and having jobs in addition to the primary job of bidi rolling: Other jobs reduce the time on bidi work so it is expected that it will lessen the family health expenditure.
- The impact of total hours spent by the family members for bidi rolling on the expenditure on health: Bidi rolling is a family work so if total hours devoted by family members increase it is likely to increase family income but increase health expenditure of the family too.
- The relation between the access to sanitation facilities and the expenditure on health of the bidi workers: Availability and use of basic sanitation facilities reduces the chances to fall ill so likely to reduce health expenditure of a bidi rollers family.
- The relation between the access to safe usable water and the expenditure on health of the bidi workers: Usable water availability within reach reduces many health problems. Water is collected and managed mostly by female members of a family but when females are busy to fulfil targets of rolling fixed number of bidis then they are left with few chances but to use sources which are nearby and overlook usability of the water sources. But this is expected that availability of usable water will reduce health expenditure.

## 3. Literature Survey:

Lot of works have been made on the bidi workers covering various issues of the workers in Murshidabad & Malda of West Bengal as well as in various other states of India but no significant research has so far been made on the Bidi workers of Purulia. However important works gone through for this research are given below.

M.Mohandas,(1980), throws light on the conditions of the workers in the bidi industry all over the country. The conditions are deplorable he 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.

M.Gopal,(1999) discussed about the production of bidi, through contracting to home-based workers. The bidi rolling allows a woman to earn and to care for children and perform her household tasks. Women put in long hours to fulfill production targets set by employers but also have no idea how wage levels are set.

Sudarshan R and Kaur R, (1999) envisages a gender perspective on the employment situation in the bidi industry and highlights the policy issues relating to women's employment in this industry. The bargaining position of bidi workers is weak. Various strategies were suggested for empowering women bidi workers, as organizing the workers to demand their rights, and creating new livelihoods for them etc. This study discussed how tobacco industry attracts businesses, trade agents, factoring and transport companies and several scientific research and development projects.

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 hemoglobin 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. The ocular manifestations among bidi rollers were furthermore discussed by Mittal *et al.* (2008). Umadevi *et al.* (2003) made a study on the Cytogenetic effects in workers occupationally exposed to tobacco dust. An increase in frequencies of chromosomal abbreviations was observed among the exposed group. Mahimkar Bhisey (1995) made similar inferences.

Bagwe Bhisey (1995) pointed out the elevation of mutagenic burden among bidi industry workers. Kuruvilla *et al.* (2002) investigated on occupational dermatitis in bidi rollers. Occurrences of callosities and nail changes were argued to be associated with the extent of work. 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. According to Bagwe and Bhisey (1991) and Swami *et al.* (1995) bidi rollers are exposed to unburnt tobacco, mainly through the coetaneous 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 (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. Kaur S, Ratna R (1999); Aghi and Gopal (2001) reported indurations of the hands and complications of pregnancy in women bidi rollers.

## 4. Econometric Model and Methodology

### 4.1 Specification of Econometric Models

Frequency of falling ill by members of a bidi roller's family is high due to his/her nature of occupation and so they spend high percentage of their family income on health. We are of the opinion that occupational health problems escalating health expenses at the same time nature of this job (bidi rolling) indirectly inviting some

health problems due to time management on work and household duties. We have attempted to find out factors which are influencing health expenditure of bidi rolling families in our study area. First we have quantified health status of the bidi rollers by assuming annual family health expenditure.

We have fitted two simple regression models, 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 access to usable water (ACCESSUSW).

#### Model 1

$$\text{LOG(EXPH)} = C(1) + C(2)*\text{LOG(FAMINC)} + C(3)*\text{LOG(FAMSIZE)} + C(4)*\text{LOG(SEXRATIO)} + C(5)*\text{NCHILD\_14} + C(6)*\text{LOG(FAMHEDN)} + C(7)*\text{SCNDJOB} + C(8)*\text{LOG(FREVID)} + C(9)*\text{LOG(TFAMWH)} + C(10)*\text{SANITATION} + C(11)*\text{ACCESSUSW} + U$$

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 access to usable water. This will give us further insight about importance of relative income situation in the society and its impact on health expenditure of the family.

#### Model 2

$$\text{LOG(EXPH)} = C(1) + C(2)*\text{BPL} + C(3)*\text{LRMIDINCG} + C(4)*\text{MIDINCG} + C(5)*\text{LOG(FAMSIZE)} + C(6)*\text{LOG(SEXRATIO)} + C(7)*\text{NCHILD\_14} + C(8)*\text{LOG(FAMHEDN)} + C(9)*\text{SCNDJOB} + C(10)*\text{LOG(FREVID)} + C(11)*\text{LOG(TFAMWH)} + C(12)*\text{SANITATION} + C(13)*\text{ACCESSUSW} + U$$

It is obvious that a healthy family is likely to have less health expenditure than that of a disease prone family. Affordability is a concern but in case of serious problems people gives first priority to health concerns curtailing other expenditures. We have taken Annual 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 which increases propensity to fall ill and health expenditures also. So level of sanitation facility available in the family is an important determinant of the health expenditure of the family. 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 otherwise 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. A high sex ratio is likely to reduce health expenditure as work will be divided among females of the family.

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. Poor people spend on child health only when no other option is left otherwise they control it using traditional practices hereditarily learnt. It's impact may or may not be so significant in our study.

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.

As 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.

#### 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 we have

chosen Purulia district. Out of twenty blocks Jhalda II has highest concentration of Bidiworkers. Our sample is collected from first five villages according to the concentration of bidi workers namely 1. Badarolan; 2. Chekya; 3. Bortolia; 4. Jhilinglahar & 5. Tatuara. In the year 2011, total population of these villages was 11,273 and out of it, about 9878 people (89%) were involved in bidi rolling work. We have taken sample size proportional to the population of the village. Number of households selected from 1. Badarolan; 2. Chekya; 3. Bortolia; 4. Jhilinglahar & 5. Tatuara were 34, 30, 24; 20 & 14 respectively using random numbers. 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.

**5. Empirical Estimates**

**5.1 Summary Statistics**

Table 5.1.1 summarizes qualitative status of our sample households. 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. Most of the bidi rollers in our sample belong to lower & middle income groups. Bidi rolling Households also do other economic activities for earnings as cultivation wage work etc. 53.23% workers are doing such secondary jobs also. Bidi rolling is a family work. We have calculated time devoted by members of a family and divided them in four categories.

**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**

We have presented the estimates of regression model s in this section. Table 5.2.1 & Table 5.2.2 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:  $LOG(EXPH) = C(1) + C(2)*LOG(FAMINC) + C(3)*LOG(FAMSIZE) + C(4)*LOG(SEXRATIO) + C(5)*NCHILD\_14 + C(6)*LOG(FAMHEDN) + C(7)*SCNDJOB + C(8)*LOG(FREVID) + C(9)*LOG(TFAMWH) + C(10)*SANITATION + C(11)*ACCESSUSW+U;$   
 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

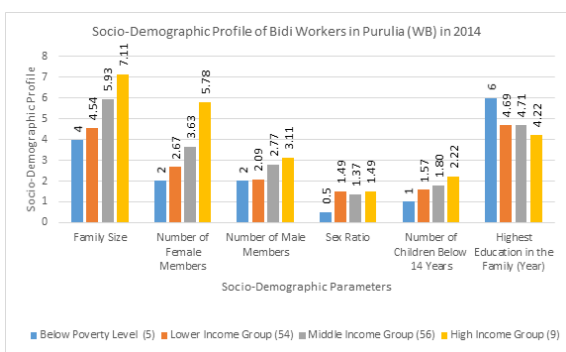
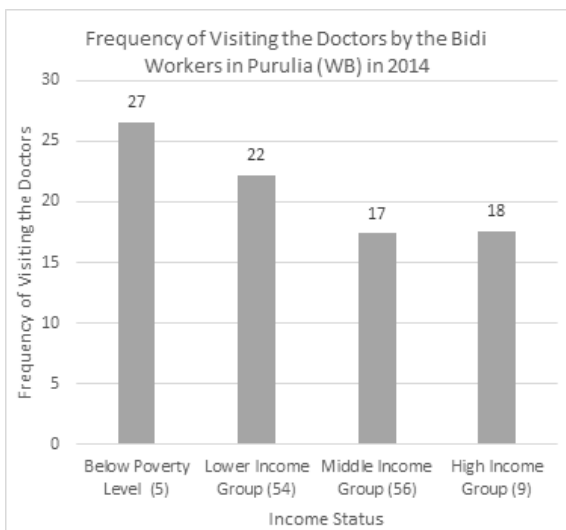
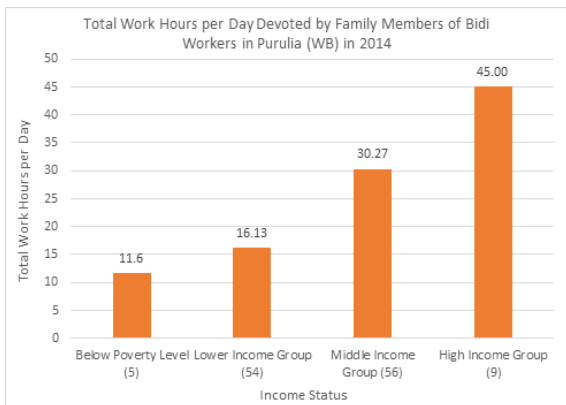
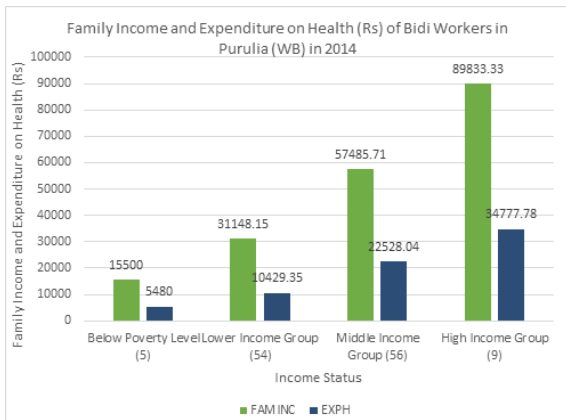
R-squared: 0.81; Adjusted R-squared: 0.80; F-statistic: 49.006; Durbin-Watson stat: 1.933

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.

**6. Conclusion and Policy Prescription**

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. New income earning opportunities other than bidi work can improve income status of these bidi rollers. Different skill development training and entrepreneurial incentive schemes would be designed for these bidi workers. District Industries Centre is regularly providing such training programmes but special programmes would 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 40% 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.

## 7. REFERENCES

1. Mohandas (1980) Mohandas M (1980), "Beedi Workers in Kerala: Conditions of Life and Work", *Economic and Political Weekly*, Vol. 15, No. 36, pp. 1517-1523.
2. Nakkeeran S K and Pugalendhi S B (2010), "A study on occupational health hazards among women beedi rollers in Tamilnadu India", *Munich Personal RePEc Archive*, No. 27278, Available at: <http://mpra.ub.uni-muenchen.de/27278/>.
3. Yasmin S, Afroz B, Hyat B and D'Souza D (2010), "Occupational Health Hazards in Women Beedi Rollers in Bihar, India", *Bull Environ Contam Toxicol*, Vol. 85, pp. 87-91
4. Prakash B and Vyas U (2013), "Association between occupational tobacco exposure of health hazards in women laborers of bidi industry of Ajmer", *International Journal of Pharma Medicine and Biological Sciences*, Vol. 2, No. 1.
5. Mittal S, Mittal A and Rengappa R (2008), "Ocular manifestations in bidi industry workers: Possible consequences of occupational exposure to tobacco dust", *Indian J Ophthalmology*, Vol. 56, pp. 319-22.
6. Umadevi B, Swarna M, Padmavathi P, Jyothi A and Reddy P (2003), "Cytogenetic effects in workers occupationally exposed to tobacco dust", *Mutation Research*, Vol. 535, pp.147-154.
7. Mahimkar M B and Bhisey R A (1995), "Occupational exposure to bidi tobacco increases chromosomal aberrations in tobacco processors", *Mutation Research*, Vol. 334, pp. 39-144.
8. Bagwe A N and Bhisey R A (1995), "Occupational exposure to un burnt bidi tobacco elevates mutagenic burden among tobacco processors", *Cardnoeogenesis*, Vol. 16, No. 5, pp. 1095-1099.
9. Kuruvila M, Mukhi S, Kumar P, Rao G, Sridhar K S and Kotian M S (2002), "Occupational dermatoses in Beedi rollers", *Indian J Dermatol Venereol Leprol*, pp. 68:10-2. Available at: <http://www.ijdvl.com/text.asp?2002/68/1/10/12833>.
10. Mandelia C, Subba S H and Yamini (2010), "Effects of Occupational Tobacco Exposure on Fetal Growth, among Beedi Rollers, in Coastal Karnataka", *International Student Congress of (bio) Medical Sciences (ISCOMS)*. Kasturba Medical College, Manipal University. Available at: <http://cdn.f1000.com/posters/docs/249430345>
11. Bagwe, A.N. and Bhisey, R.A. 1991. Mutagenicity of processed bidi tobacco: Possible relevance to bidi workers. *Mutat. Res.* 261(2):93-99.
12. Swami, S., Suryakar, A.N. and Katkam, R.V. ; 1995; Absorption of nicotine induces oxidative stress among bidi workers. *Toxicol. Lett.* 18(2): 259-265.
13. Ranjit Singh, A.J.A. and Padmalatha, C. ; 1995; Occupational illness of bidi rollers in south India. *Environ. Econ.* 13(4):875-879.
14. (Dikshit and Kanhere 2000
15. Bhisey, R.A., Bagwe, A.N., Mahimkar, M.B. and Buch, S.C. 2006. Biological monitoring of beedi industry workers occupationally exposed to tobacco. *Ind. J. Public Health.* 50(4):231-235.
16. Kaur, S. and Ratna, R. 1999. The tobacco industry and women's employment: Old concerns and new imperatives. *Ind. J. Labour Econ.* 42:675-685.
17. Aghi, M. ;2001; Exploiting women and children: India's bidi industry; *Lifeline: A publication of the World Health Organization, South East Asia Region Office.* 6: 8-10.
18. Bagwe et al. (1992);
19. M.Gopal, (1999); Disempowered despite wage work – women workers in bidi industry
20. Chattopadhyay, B.P, Kundu, S., Mahata, A. and Jane Alam SK. (2006); A Study to Assess the Respiratory Impairments among the Male Beedi Workers in the Unorganized Sectors, *Indian Journal of Occupational and Environmental Medicine*, Vol-10, No-2, pp. 69-73.
21. Kundu, K.S. and Chakraborty, A. (2012); An Empirical Analysis of Women Empowerment within Muslim Community in Murshidabad district of West Bengal, India; *Research on Humanities and Social Sciences*, Volume-2, Number-6, pp. 1-11.
22. Mitra, S. (2010) A Study to Identify Barriers to Institutional Delivery in Rural West Bengal, *Journal of Community Medicine*, Volume-6, No.-1, January-June, 2010.
23. Muninarayanappa, M. and Kumari, S. M. (2012); An empirical Study on Child Labour in Unorganized Sector in Kurnool City, *International Journal of Physical and Social Sciences*, Volume-2, Number-8, pp. 366-386.
24. Sarkar, S. (2004); Women Workers in Beedi Rolling; *Indian Journal of Labour Economics*, Volume-47, Number-1, pp. 102-110.
25. Senthil, N. and Bharathi, S. (2010) A Study on Occupational Health Hazards among Women Beedi Rollers in Tamilnadu, India; *International Journal of Current Research*, Volume-11, No. 4, pp: 117-122.
26. Yashmin, S., Afroz, B., Hyat, B. and D'Souza, D. (2012) Occupational Health Hazards in Women Beedi-Rollers in Bihar, India, *Bulletin of Environmental Contamination and Toxicology*, Volume:85, No. 1, Springer, New York, USA, pp: 87-91.
27. Government of India, 2012, Report of the Committee on Unorganised Sector Statistics, National Statistical Commission; New Delhi.