

## **A Baseline Health Profile with Respect to Air Quality in Airshed of CGPL Power Plant**



**Submitted to**



**Coastal Gujarat Power Limited (CGPL)  
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## *Preface and Acknowledge*

*Coastal Gujarat Power Limited (CGPL), a TATA Power Company has initiated a study entitled “Develop a Baseline Profile of Public Health with Respect to Emissions in Mundra Taluka (Kutch), Gujarat” to generate a baseline health statistics as regards the health status of chosen population in the villages located within 10 km. zone. This study will help reveal any associated adverse impact of the emissions attributable to thermal power plant emissions in future.*

*TALEEM Research Foundation as a research agency carried out this study in seven villages around CGPL and two villages chosen as controls. The main aim of the study is to assess the prevalence of disorders likely to arise in consequence of exposure to emissions. This includes asthma, chronic obstructive pulmonary disease (COPD) and heart diseases in project villages.*

*TALEEM Research Foundation, Ahmedabad sincerely thanks Coastal Gujarat Power Limited (CGPL), Mundra, for giving an opportunity to undertake this study and facilitating its execution. My special thanks are due to Mr. Somnath Basu, Mr Pradeep Ghosal, Dr. Amit Tyagi and Mr. Saurabh Sharma in particular for their unflinching cooperation and support during the study period and providing necessary information regarding the project, suggestions and research inputs in conducting the study. Contribution of Dr. Tushar Joshi, Consultant, for technical support in designing, implementation and regular monitoring of activities is highly appreciated.*

*I am grateful to Dr. Md. Irfan Khan, Director, TALEEM Research Foundation for extending full cooperation and support through the study period.*

*I extend special gratitude to Dr. Sapan Pandya and his team for carrying out clinical investigation of children and adults reported having respiratory problem and heart diseases after completion of household survey. Dr. Mahesh Chauhan, Research Coordinator and Mr. Chandu Jadav, Research Supervisor highly deserve due recognition and appreciation for their unwavering zeal, knack for quality data collection and completion of field work in stipulated time schedule, due to their able coordination and field management.*

*My sincere thanks are due to Mr. Vijay Uttekar, Manger (Data Processing Unit) for data processing and analysis as well as to all team members who were engaged in data coding and entry. I also thank Ms Aruna Parmar, Ms Hiral Dave and Mr. Mayur Vaghela for their office assistance. I am very much thankful to all the field research supervisors and investigators who worked hard for collecting quality data and successful completion of field work.*

*Last but not the least, I express my deep sense of gratitude to all the respondents for their cooperation and sharing useful information with us to shape up this report.*

*Dalip Bora  
(Project Director)  
TALEEM Research Foundation, Ahmedabad*

## ACRONYMS

ABBREVIATIONS	FULL FORM
APL	: Above Poverty Line
AQM	: Air Quality Monitoring
BPL	: Below Poverty Line
CGPL	: Coastal Gujarat Power Limited
CHC	: Community Health Centre
COPD	: Chronic Obstructive Pulmonary Disease
CSR	: Corporate Social Responsibility
ECG	: Electrocardiogram
LRTI	: Lower Respiratory Tract Infection
OBC	: Other Backward Classes
PFT	: Pulmonary Function Test
PHC	: Primary Health Centre
SC	: Scheduled Castes
SLI	: Standard Living Index
ST	: Scheduled Tribes

## EXECUTIVE SUMMARY

The present study aims to create a baseline profile of public health indicators and prevailing morbidity and mortality of population with reference to emissions in a 10 km radius of CGPL unit, in Mundra. The study attempts to assess the prevalence of anticipated adverse outcomes such as asthma and frequency of lower respiratory tract infections among children less than five years of age and COPD and heart diseases in population 50 years and above.

The survey was carried out in seven villages within 10 kms of CGPL, (henceforth referred to as project villages) and two control villages (outside 10 kms. of CGPL's catchment area) during April-May, 2016. A total of 349 out of 2731 households listed in project villages and 66 out of 746 listed households in control villages were surveyed.

The survey reveals that 66.8 percent of the households in project villages are Hindu and 30.1 percent are Muslim as against 78.8 percent Hindu households and 21.2 percent Muslim households in control villages. In terms of castes composition both project and control villages are found to be more or less similar. Almost equal proportions (32.3 percent in project and 32.5 percent in control villages) of household population aged 5 years and above are illiterate. The other socio-economic parameters like sources of drinking water, electricity, use of cooking fuel, toilet facilities, possession of household assets, livestock remain more or less same in both project and control villages.

The study demonstrates that daily cleaning of houses and surrounding is practiced evenly in both the areas. The use of dustbin for waste disposal within the premises is, however, more prevalent in project villages than in control villages.

Initial discussion with respondents revealed about their belief of having some health impact due to emissions attributable to the poor air quality.

Overall 3.7 percent households (13 out of 349 households) in project villages and 3.0 percent households (2 out of 66 households) in control villages reported prevalence of respiratory problem among children less than five years of age. Prevalence rate of respiratory illness among children less than five years of age is estimated to be around 4.7 percent (14 out of 299 children) in project and 5.1 percent (2 out of 39 children) in control villages. However, the prevalence rate

of respiratory problem among adults aged 50 years and above is 12.1 percent (49 out of 406 adults) in project villages and 10.8 percent (7 out of 65 adults) in control villages.

After the survey, clinical assessment of children less than five years, who were having respiratory problem and adults 50 years and above, who were afflicted with respiratory problems and/or heart disease, was carried out by a competent physician.

Similarly 3.7 percent (15 out of 406) adults aged 50 years and above reported heart disease in project villages against 4.6 percent (3 out of 65) adults in control villages. The data indicates that the prevalence of COPD and heart disease is unlikely in consequence of exposure to the emissions of thermal power plant. A total of 59.2 percent in project and 57.1 percent adults having COPD had a prolonged history of over five years, predating commissioning of CGPL unit. The survey further reveals that SLI, smoking habit, high blood pressure and family-history of diabetes are not associated with heart disease in majority of the prevalence.

Pulmonary Function Test (PFT) carried out on study subjects in project villages indicate that more number of children 3, (42.9 percent) is having respiratory problems than control villages (0). Similarly, more number of adults (20, 50.0 percent) in project villages is having severe COPD than control villages (2, 40.0 percent).

Similarly, Electrocardiogram (ECG) performed on nine subjects suspected of having heart disease in project villages and three patients in control villages again indicates a similar pattern of persistence (2, 22.2 percent) in project and (1, 33.3 percent) in control villages.

The household survey data on mortality causing a large number of deaths from among the death occurring during January 1, 2015 to December 31, 2015 has been gathered for future comparison.

# CHAPTER I

## INTRODUCTION

### 1.1 Background

Air pollutants (particulate matters) are released by activities such as transportation and combustion that could occur either in mobile or stationary situations, burning of fossil fuels, e.g. coal and biomass, wood, crop residues and construction activity.

On the request of CGPL, TALEEM Research Foundation carried out a survey to create a baseline profile of the health status of the chosen population in seven villages located within 10 km radius and 2 control villages outside this 10 km zone). The main aim of the study was to create a database in project villages by assessing the prevalence of outcomes such as asthma, chronic obstructive pulmonary disease (COPD) and heart diseases that may be associated with air emissions over a period of time (chronic and long term exposure).

### 1.2 Objectives of the Study

The main objectives of the study were:

- To create health baseline data
- To assess the prevalence of asthma and lower respiratory tract infection (LRTI) among children under five years (U<sub>5</sub>) and asthma and COPD in subjects who are 50 years and above.
- To find out the prevalence of cardiovascular diseases among population 50 years and above.
- To understand the possible reasons of symptoms leading to death among under 5 and 50 years and above population.
- To be able to measure in future the health impact of emissions from nearby operating plants, particularly the impact on cardiovascular morbidity and mortality as well adverse respiratory outcomes such as asthma and COPD in project villages.

### 1.3 Survey Design

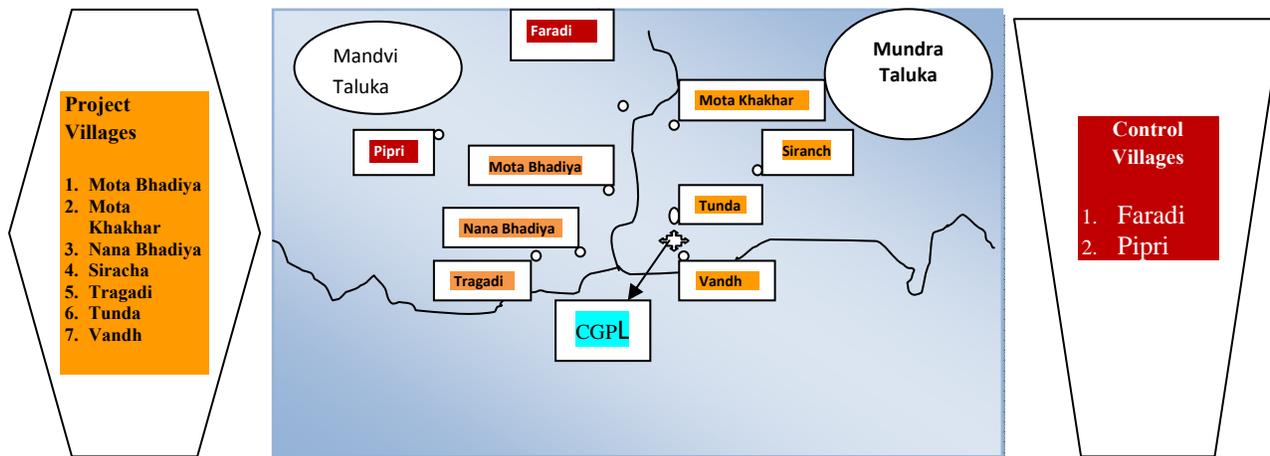
A pre-test - post-test only quasi-experimental design<sup>1</sup> was adopted in this study to assess the health impact of emissions on project villages around CGPL, (hereafter referred to as CGPL).

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<sup>1</sup> Pre-test Post test design is the most common quasi-experimental design and is the same as the classic controlled experimental design except that the subjects cannot be randomly assigned to either the intervention/experimental or the control group. In Pretest-post test design one group is given the treatment or exposed to a condition while the other group (control group) receives no treatment/exposure, over the same period of time, but undergoes exactly the same tests and the results are gathered at the end. This design uses two waves of observation before and after the introduction of the independent (treatment) variable.

For this purpose, seven project villages within a 10 km radius of CGPL and two control villages located outside this 10 km zone were selected. The control villages, located in coastal region and having more or less similar socio-economic characteristics were selected from Mandvi block.

**Picture 1: Project Villages and Control Villages**



#### 1.4 Method of Data Collection

A sample survey research methodology with quantitative data collection method was applied for this longitudinal study. In six out of seven project villages around the CGPL in Mundra and Mandvi Talukas (blocks) of Kutch district air quality monitoring stations (AQMS) have been established and air quality monitoring (AQM) as prescribed by the Central Pollution Control Board is underway. (CGPL is doing all ambient air quality parameters which have been notified by MoEF&CC/CPCB. Environmental monitoring has been outsourced and the agency is recognized from MoEF&CC and NABL accredited.)

Out of nine villages, seven project villages are within 10 km zone of CGPL. Two villages namely, Faradi and Pipli selected as control villages are beyond 10 kms from CGPL. Data collection for the study was carried out in following three stages;

##### Stage 1: Houselisting Survey

In the first stage, houselisting of all households (households staying in village at the time of houselisting) in all seven selected project villages as well as two control villages was carried out in April 2016. Subjects, no more staying in the villages or migrated from the villages were not included in the houselisting. During the houselisting, information about head of the household, address and children less than five years of age and adults aged 50 years and above was recorded. Houselisting was used as a sampling frame for selecting households to be interviewed during household survey.

## Stage 2: Household Survey

The sample size from each village was decided by taking into account the proportionate population of children less than five years and adults aged 50 years and above to the total population of Gujarat (*Proportion of children and adults is estimated as per state average (rural) of 11.1% for age under 5 and 13.4% for age 50 years and above as per Census 2011*). Subsequently, 5.0 percent of the estimated proportionate population of children less than five years and adults aged 50 years and above was curled out as sample size of households to be interviewed during household survey in villages for children and adults. Systematic circular random sampling technique was applied to select stipulated number of household (sample size for children and adults) in each village for household survey.

All together, 415 respondents were interviewed in the second stage, 66 from two control villages and 349 from seven project villages (Table 1.1). A person from selected household, having complete information about his/her household, was interviewed during the survey. The in-depth interview schedule included information on the socio-demographic parameters like background characteristics of household ; i) Religion ii) Caste of head of household, iii) Type of family, iv) Mean household size, v) Households having BPL card, vi) Household mean monthly income, Population profile i) Age distribution, ii) Sex ratio, iii) Marital status, iii) Education, iv) Occupation; Socio-economic characteristics of household i) ownership of household, ii) Type of house, iii) Main source of drinking water, iv) Household electricity connection, v) Type of cooking fuel used, vi) Type of toilet facility used; Household Possessions/Assets; Land ownership and Household owning livestock; Hygiene Practices; Prevalence of Respiratory problem and heart disease and symptoms leading to death that has occurred in last one year.

<b>Table 1.1: Village-wise Sample Size Proposed and Covered</b>								
Sr No	Villages	House-Listing Carried out	Children < 5 years		Adult age 50 and Above		Total (< 5 yr and 50 and above)	
			Proposed	Actual Covered	Proposed	Actual Covered	Proposed	Actual Covered
<b>Project Villages</b>								
1	Moti Khakhar	523	12	12	14	14	26	26
2	Nana Bhadiya	375	24	24	29	29	53	54
3	Siracha	270	10	10	13	13	23	23
4	Tunda	748	69	69	84	84	153	155
5	Tragdi	195	7	7	8	8	15	15
6	Vandh	240	9	9	11	11	20	21
7	Mota Bhadiya	380	25	25	30	30	55	55
<b>Control Villages</b>								
8	Faradi	418	23	23	28	28	51	51
9	Pipri	328	7	7	8	8	15	15
<b>Total</b>		<b>3477</b>	<b>186</b>	<b>186</b>	<b>225</b>	<b>225</b>	<b>411</b>	<b>415</b>

*Note: Proportion of children and adults is estimated as per state average (rural) of 11.1% for age under 5 and 13.4% for age 50 years and above as per Census 2011, subsequently 5.0 percent of estimated population of children or adults was curled as sample size in each village.*

Respondent households were selected by using systematic circular random sampling after completing listing of households in each village. Size of sample from each village was determined on the basis of proportionate population of children less than 5 years and adults 50 years of age and above, that are about 11.0 percent and 13.5 percent respectively in the state. Finally, five percent of the population of estimated children less than five years and adults 50 years of age and above was taken as sample size of households in each village.

The household survey facilitated identifying (on the basis of symptoms of diseases as reported by their household) children less than five years, reported having from respiratory problem and adults 50 years and above reported having both respiratory problem and/or heart diseases in each village.

**Picture 2: Investigating a Male Respondent**



Data collected during the initial assessment in stage 2 revealed that a total of 90 persons were suspected of having either respiratory problem or heart diseases or both on the basis of symptoms narrated by the respondents and the clinical assessment that followed. Sixteen children (14 project and 02 control villages) for respiratory problem and 56 adults (49 project and 07 control villages) for respiratory and 18 adults (15 project and 03 control villages) for heart disease were identified on the basis of information provided by the respondents.

### **Stage 3: Clinical Assessment**

Clinical assessment of reported subjects (those present at the clinic) was carried out by a competent physician (who has experience in identifying common illnesses and in their management) immediately after the in-depth interview was over. In the third round, clinical assessment of nine children (7 in project and 2 in control villages), less than 5 years of age and 45 adults (40 project and 05 control villages), 50 years and above for respiratory problem and 12 adults (09 project and 03 in control villages), 50 years and above for heart diseases was carried out. Seven (7) out of 16 children and 11 out of 56 adults reported having respiratory problem did not avail clinical assessment. Clinical assessment made on examination of the records also suggests that 6 out of 18 adults identified for heart diseases did not turn up for clinical evaluation (Table 4.0).

Health screening was carried out in a convenient and comfortable location in each of the nine villages keeping in mind the privacy of the subjects. The selected subjects were informed in advance and mobilized to undergo the clinical assessment on a fixed day and time.

Out of 90 (children and adults) persons reportedly having respiratory problems and/or heart diseases, 66 persons were clinically assessed. They were interviewed in-depth using semi-structured interview schedule prior to the clinical assessment carried out by a competent physician.

**Picture 3: Blood Pressure of an Old Woman is being Monitored**



The clinical assessment (PFT and ECG) performed on subjects is given in Table 1.2. All together 66 (09 children and 57 adults) persons (07 children in project villages and 02 children in control villages) and 49 adults (40 adults in project villages and 05 in control villages for respiratory problem) and 09 adults in project villages and 03 in control villages for heart diseases were assessed and prevalence of chronic obstructive pulmonary disease (COPD) (Mild, Moderate and Severe) among the adults of 50 years and above was found (See flow diagram: 1).

**Table 1.2: Health Assessment Modalities**

<b>Children &lt; 5 years</b>	<b>Male/Female Age 50 years and above</b>
1. History taking	1. History taking including occupational history in detail to elicit exposures
2. General Examination (Built/Tongue/conjunctiva/cyanosis)	2. General Examination including cognitive functions (Built/Tongue/conjunctiva)
3. Heart rate (regular/irregular)	3. Heart rate (regular/irregular)
4. Chest Examination (for lungs)	4. Examination of respiratory system (for lungs)
5. Auscultation of lungs	5. Auscultation of lungs-for adventitious sounds
6. Auscultation of heart	6. Auscultation of heart-abnormal sounds
	7. PFT (FEV <sub>1</sub> FVC and ratio)
	8. ECG

### 1.5 Review of Health Facility Records

Last one year statistics of PHC serving Project villages and the control villages were reviewed. Medical doctor and project coordinator visited ADANI hospital/CHC/PHC located in the area for collecting mortality data for last one year. The secondary data from ADANI hospital in Mundra has been procured.

### 1.6 Coverage for the Proposed Study

The coverage for the study is summarized in Table 1.3.

**Table 1.3: Workload Summary**

<b>Workload</b>	<b>Project Villages</b>	<b>Control Village</b>	<b>Total</b>
1 Review of health facilities records	CHC/ Hospital	CHC/ Hospital	3
2 Households Listed	2731	746	3477
3 In-depth interviews	349	66	415
4 Clinical Assessment performed	57	09	66
5 Investigation/test			
(i) PFT (elderly persons, 50 years and above)	47	7	54
(ii) ECG (elderly persons, 50 years and above)	10	2	12

## **1.7 Field Approach**

Two days intensive training was conducted at Mandvi to acquaint and orient two field supervisors and 12 field investigators for data collection.

In addition to orientation on the inventions carried out the field teams were trained on each question of survey tools. Techniques of data collection, establishing rapport with the respondents, collection of good quality data and maintaining confidentiality of data collected was discussed at length during the training. One day was exclusively devoted to classroom training and one day for field practice and field testing for validating the interview schedule in the nearby non-sampled villages. Project Director and Project Coordinator imparted the training.

Assignment specific training was organized to acquaint field investigators and supervisors to know more about the mock and other techniques of interview and get familiar with questionnaire. In this session investigators were able to identify their problem areas and strengthened them by putting in more efforts before proceeding for field practice.

Field practice was conducted to further enhance the skills of investigators by interviewing respondents in actual field situations. Observations were made by the field coordinators and supervisors and the same was discussed in an interactive session subsequently to clear doubts and maintain standardization of subject matter.

## **1.8 Field Deployment Plan**

For this specific assignment, a core team of TALEEM Research Foundation was constituted where Director of the Foundation acted as a Project Administrator and Research Advisor. He provided required guidance and support to survey team to carry out the study.

Four TALEEM faculty and/or research staff was involved in the study. Data collection work lasted about four weeks in which all three phases of data collection were completed. Two teams each consisting of one supervisor and six investigators were deployed to interview selected household respondents after training. All data collected was sanitized and entered in the computer before carrying out data analysis.

Consultant of Asian Development Bank (ADB), Tushar Joshi was also involved in designing, implementation and monitoring of study activities. He provided technical inputs while designing research tools and sample size. He also visited study villages while the clinical assessment was underway.

**Picture 4: Investigator is interviewing a Respondent**



Project Director led the research team for implementation of activities according to the scheduled plan. He deliberated with other members of research team and officials of CGPL for designing research tools. He also monitored field teams for pre-testing of research tools and finalization after carrying out necessary modifications. Project Director

along with Project Coordinator organized two days training for field investigators and supervisors to orient them for assigned task i.e. data collection, monitoring and verification of data for maintaining good quality of data during field work.

Project Coordinator was assigned the task of ensuring the quality and supervision during data collection work. He was also actively involved in training of field staff and data management. Project Coordinator also assisted Project Director in data analysis with the assistance of Computer Analyst and in preparing the draft report. Project Coordinator interfaced with CGPL team during the course of each activity and conducted spot checks and back checks to verify and maintain quality of data collected by the investigators. He also worked closely with medical team under the direct supervision of the Project Director for arranging makeshift assessment units in village Panchayat building/primary schools or health clinics and other logistics for conducting clinical assessment.

### **1.9 Data Analysis:**

Double data entry was done using FoxPro software and data analysis was carried out using SPSS version (12).

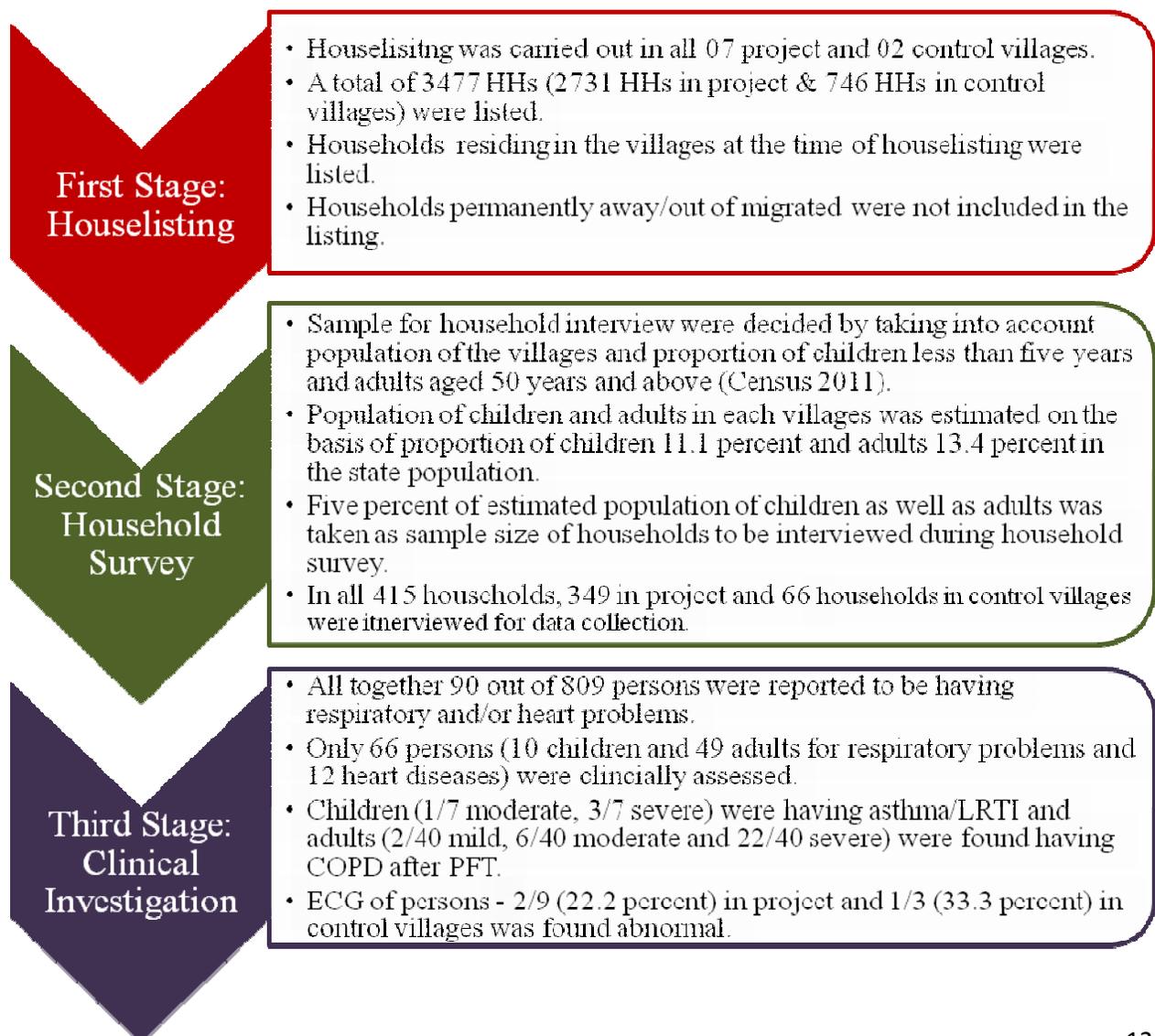
### 1.10 Triangulation of the Findings

Findings from household survey, in-depth interviews of the subjects and clinical assessment were triangulated to ascertain the prevalence and severity of respiratory and cardiovascular morbidity and mortality, creating baseline profile, to be able to assess an impact in future on the population within the same area.

### 1.11 Proposal for Future Health Survey

The present survey establishes the baseline on morbidity and mortality among the studied population. This information will be used to assess any change in health profile among the studied population after a period of 3 years.

#### Flow Diagram 1: Various Stages of Data Collection



## CHAPTER – II

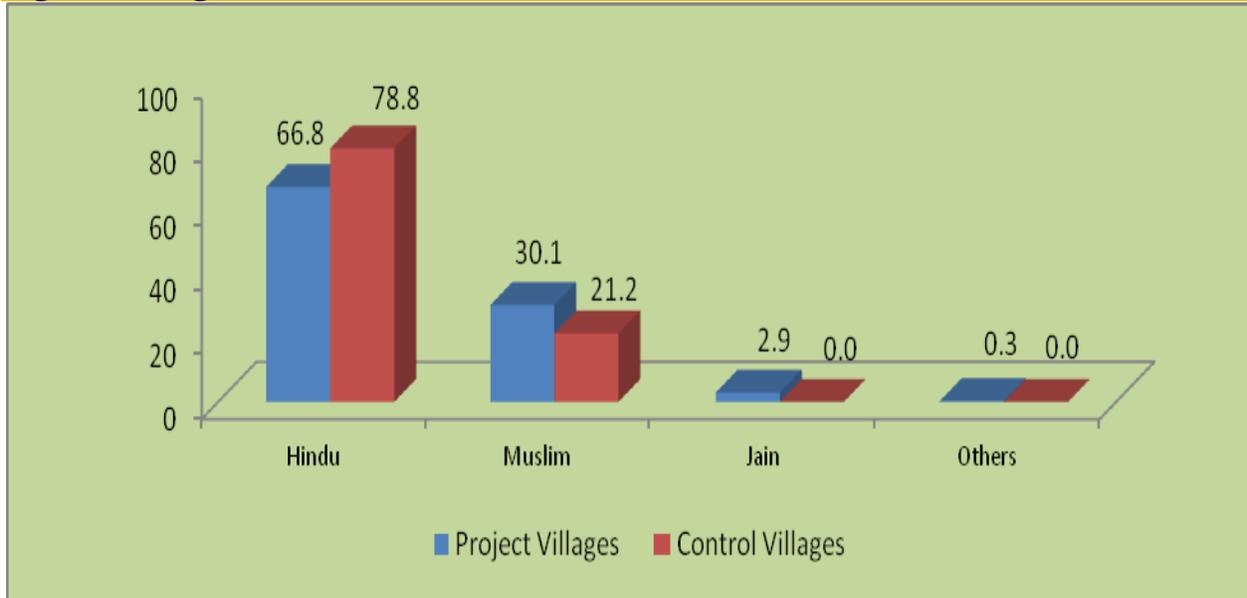
### POPULATION AND HOUSEHOLD CHARACTERISTICS

A socio-economic profile of respondents and households is presented in this chapter. All together 415 household respondents, 349 in seven project villages and 66 households in two control villages were interviewed during household survey. Number of respondents interviewed during household survey varied from one village to another according to the population of the villages where 2011 census has been taken as base for socio-demographic data.

#### 2.1 Background Characteristics of Households

Demographic data shows that a large portion of population covered in project as well as control villages is Hindu followed by Muslim.

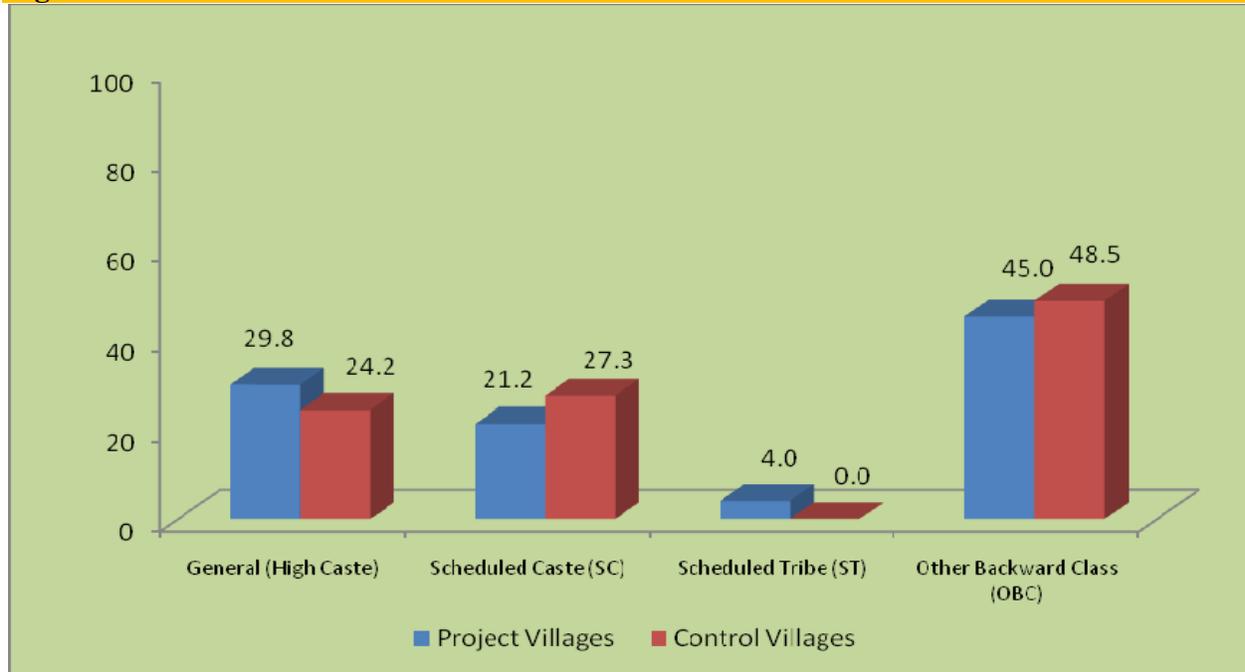
**Figure 1: Religion of Head of the Household**



Almost two-thirds (66.8 percent) of households in project villages are headed by a person practicing Hinduism whereas 78.8 percent head of the households in control villages are Hindu. This is followed by 30.1 percent Muslim Head of the households in project and 21.2 percent in control villages respectively (Figure 1 and Table 2.1).

Other Backward Class (OBC) is a dominating category as 45.0 percent households in project and 48.5 percent households in control villages belong to this category.

**Figure 2: Caste of Head of Households**



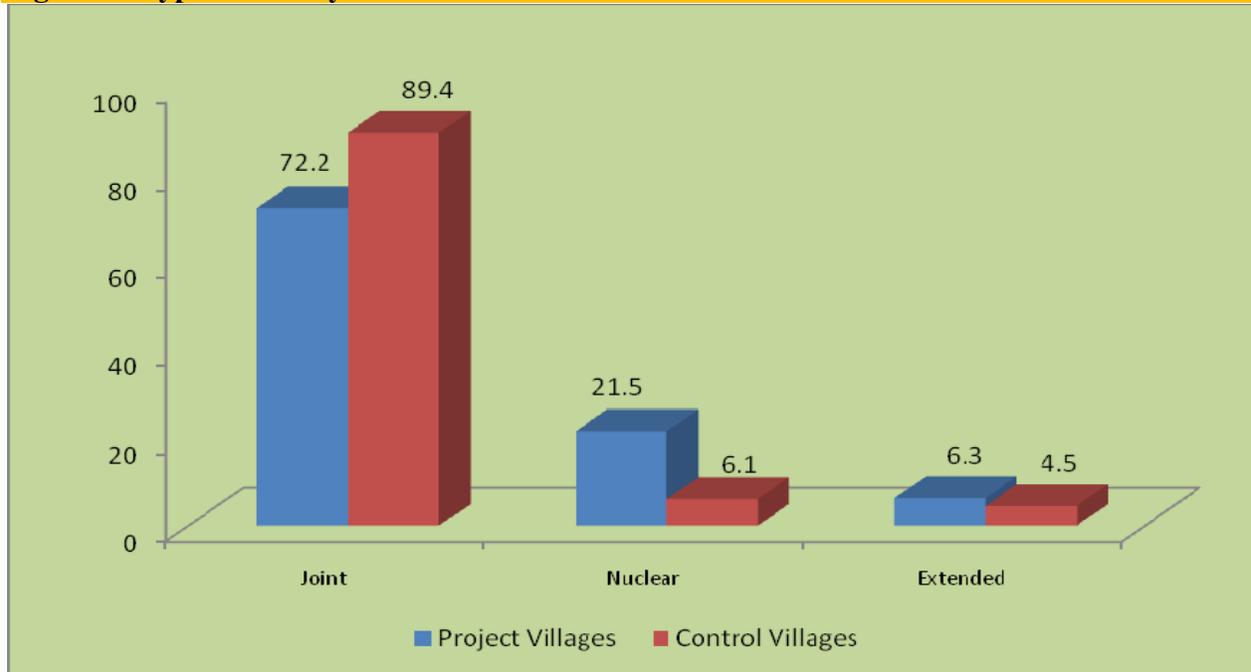
General caste category also known as Forward caste/class in India (*to denote groups of people who do not qualify for reservation benefits*<sup>2</sup>) constitutes 29.8 percent head of households in project and 24.2 percent head of households in control villages, closely followed by Scheduled Castes head of 21.2 percent households in project villages and 27.3 households (higher than general category) in control villages respectively (Figure 2 and Table 2.1).

Joint family system is being practiced by a large majority of households as 72.2 percent households in project villages and 89.4 percent households in control villages live in joint families (Figure 3 and Table 2.1).

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<sup>2</sup> [https://en.wikipedia.org/wiki/Forward\\_caste](https://en.wikipedia.org/wiki/Forward_caste)

**Figure 3: Type of Family**

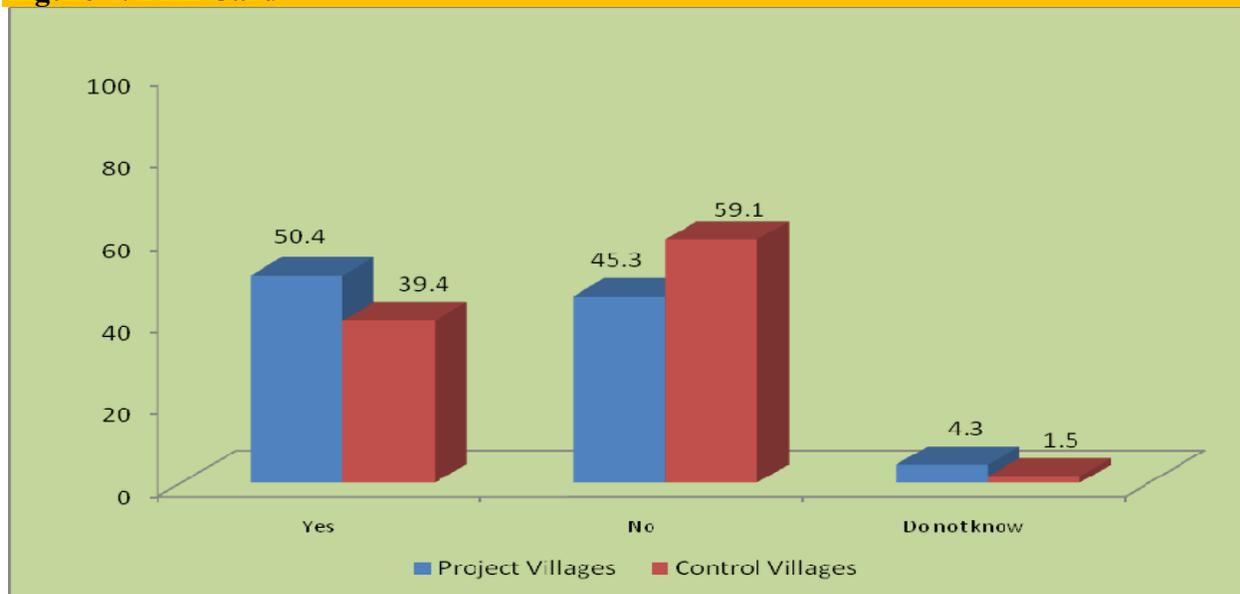


Barring 21.5 percent households in project villages living in nuclear families, very small proportion of 6.3 percent of households in project and 4.5 percent in control villages constitute extended families. Mean household size in project villages (5.9) is higher than control villages (5.0).

More number of households in project villages (50.4 percent) than control villages (39.4 percent) are having BPL card (The number of people living on less than \$1.9 per day<sup>3</sup>) (Figure 4 and Table 2.1).

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<sup>3</sup> <http://povertydata.worldbank.org/poverty/home/>

**Figure 4: BPL Card**

In contrast, mean monthly income of households in project villages is Rs. 10,103, more than Rs. 7,576 in control villages (Table 2.1), indicating comparatively higher income equality in the control villages.

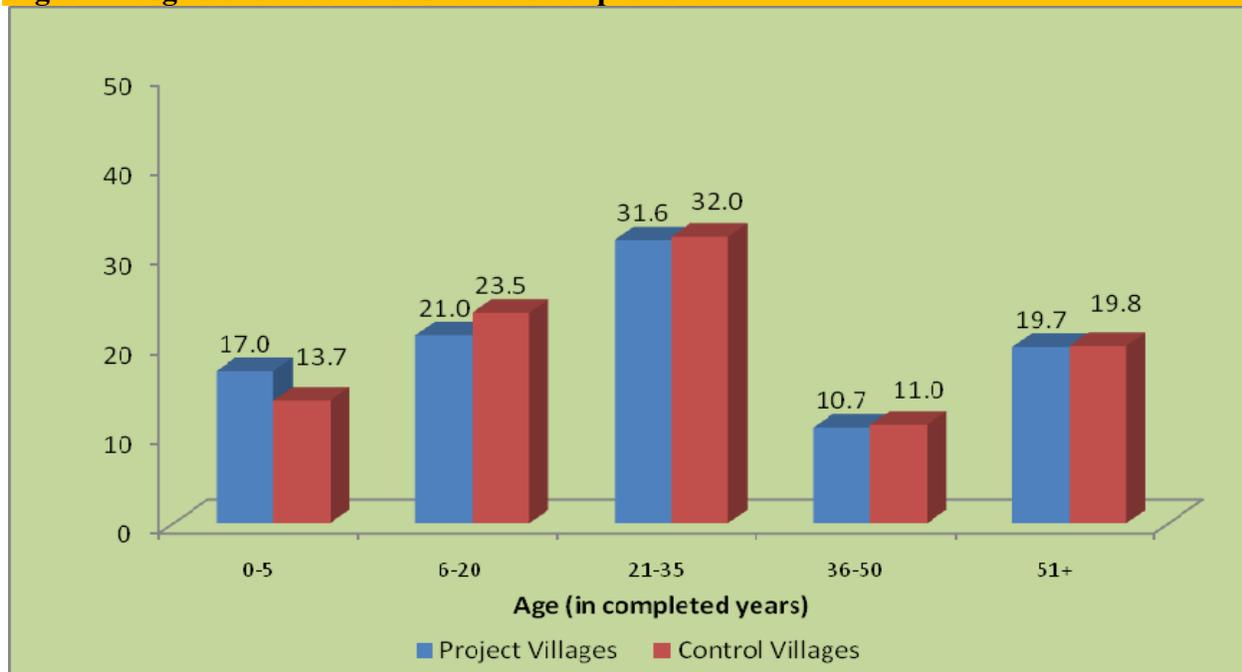
**Table 2.1: Background Characteristics of Households**

Background Characteristics	Project Villages	Control Villages
<b>Religion</b>		
Hindu	66.8	78.8
Muslim	30.1	21.2
Jain	2.9	0.0
Others	0.3	0.0
<b>Caste of Head of Household</b>		
General (High Caste)	29.8	24.2
Scheduled Castes (SC)	21.2	27.3
Scheduled Tribes (ST)	4.0	0.0
Other Backward Class (OBC)	45.0	48.5
<b>Type of family</b>		
Joint	72.2	89.4
Nuclear	21.5	6.1
Extended	6.3	4.5
<b>Mean Household Size</b>	5.9	5.0
<b>Households having BPL card</b>	50.4	39.4
<b>Household Mean Monthly Income</b>	Rs. 10,103	Rs. 7,576
<b>Total number of Households</b>	<b>349</b>	<b>66</b>

## 2.2 Profile of Population

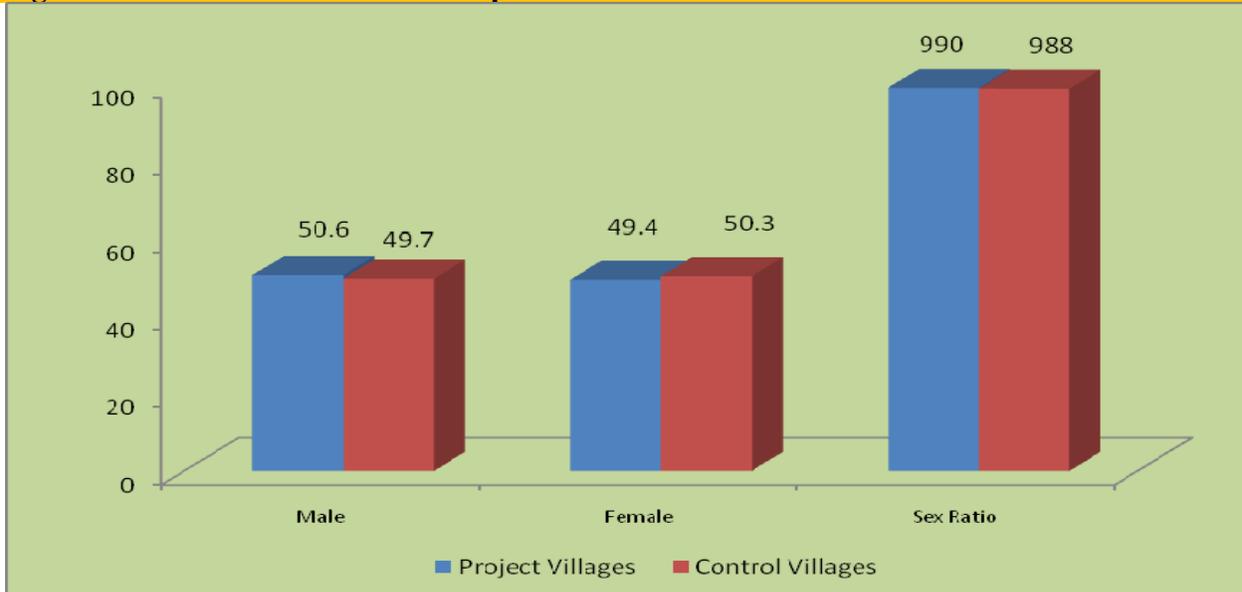
A profile of population reveals that about one-third population (31.6 percent in project villages and 32.0 percent in control villages) represents to 21-35 age group, followed by little more than one-fifth population (21.0 percent project and 23.5 percent control villages) representing 6-20 years age group (Figure 5 and Table 2.2). Children in the age group of 0-5 years (17.0 percent project and 13.7 percent control) and adults above 51 years of age contribute to about 15.0 percent and 20.0 percent of population respectively.

**Figure 5: Age Distribution of Household Population**



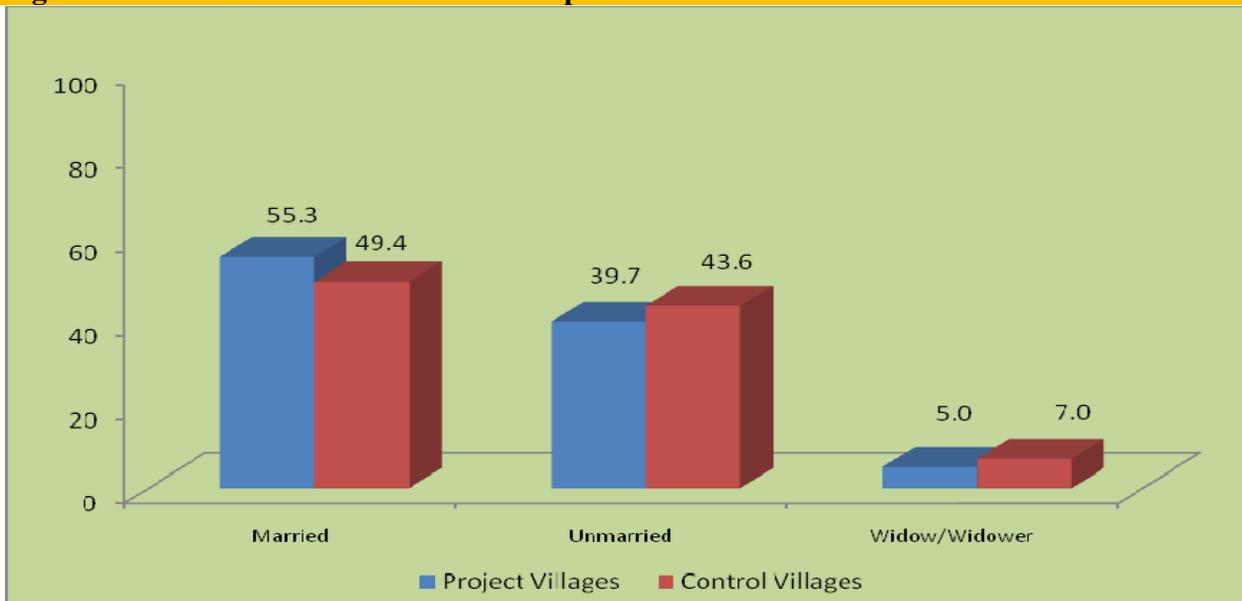
Male and female comprise almost equal proportion of the population in the households interviewed in project as well as control villages (Figure 6 and Table 2.2).

**Figure 6: Gender Distribution of Population**



Among the populations, 55.3 percent in project villages and 49.4 percent in control villages respectively are married. Widow/widower comprises 5.0 percent and 7.0 percent of ever married population in project and control villages respectively (Figure 7 and Table 2.2).

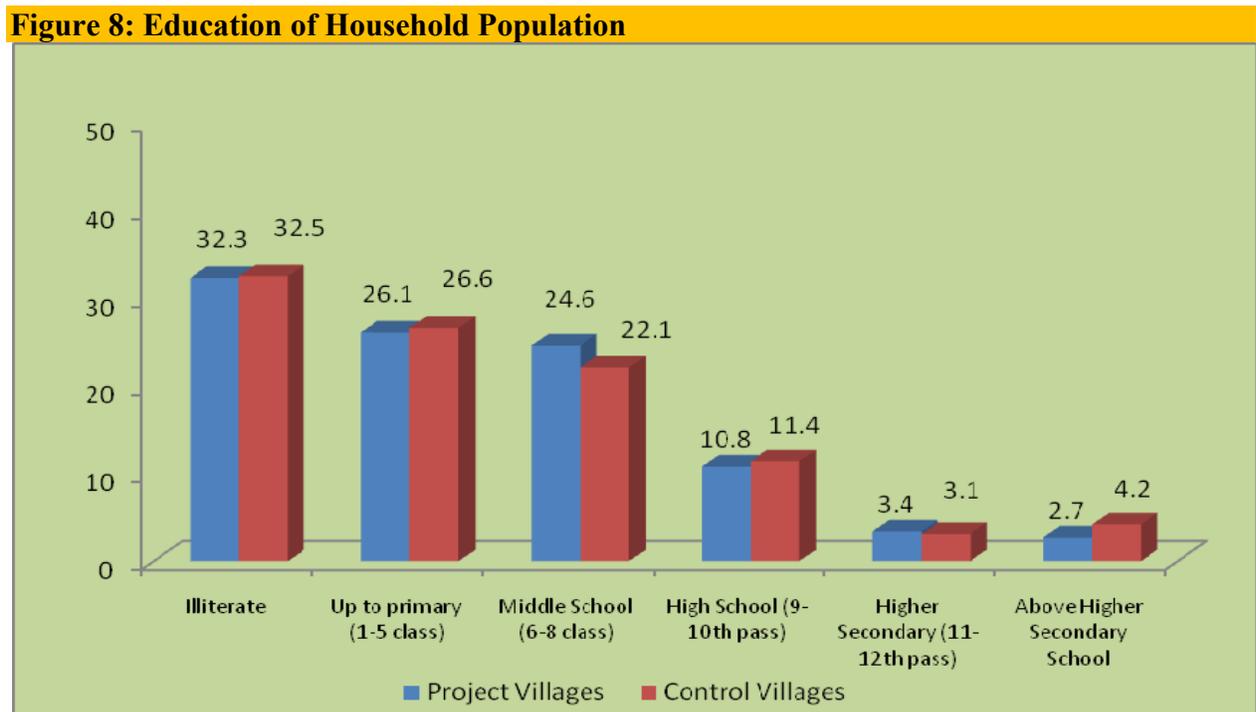
**Figure 7: Marital Status of Household Population**



Higher education has not been recognized as an asset as only 2.7 percent population in project villages and 4.2 percent population in control villages have education above higher secondary. Almost one-third population, 32.3 percent in project villages and 32.5 percent in control villages is found to be illiterate (unable to read and write).

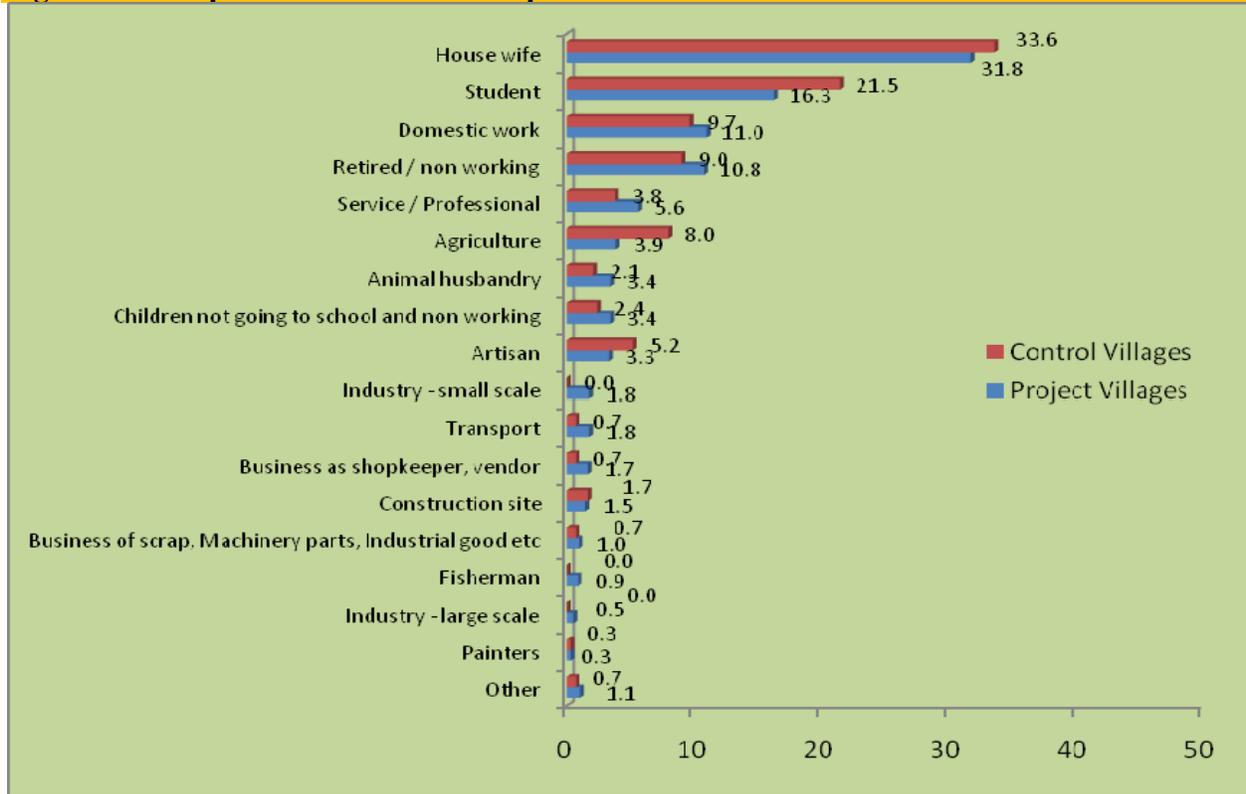
<b>Table 2.2: Profile of Population</b>		
<b>Profile</b>	<b>Project Villages</b>	<b>Control Villages</b>
<b>Age distribution of Household Population</b>		
0-5	17.0	13.7
6-20	21.0	23.5
21-35	31.6	32.0
36-50	10.7	11.0
51+	19.7	19.8
<b>Sex</b>		
Male	50.6	49.7
Female	49.4	50.3
<b>Sex Ratio</b>	990	988
<b>Marital Status</b>		
Married	55.3	49.4
Unmarried	39.7	43.6
Widow/Widower	5.0	7.0
<b>Education</b> <i>(*Percentage based on population age 5 years and above)</i>		
Illiterate	32.3	32.5
Up to primary (1-5 class)	26.1	26.6
Middle School (6-8 class)	24.6	22.1
High School (9-10 <sup>th</sup> pass)	10.8	11.4
Higher Secondary (11-12 <sup>th</sup> pass)	3.4	3.1
Above Higher Secondary School	2.7	4.2
<b>Occupation</b>		
Agriculture	3.9	8.0
Industry - large scale	0.5	0.0
Industry - small scale	1.8	0.0
Transport	1.8	0.7
Construction site	1.5	1.7
Business of scrap, Machinery parts, Industrial good etc	1.0	0.7
Business as shopkeeper, vendor	1.7	0.7
Animal husbandry	3.4	2.1
Painters	0.3	0.3
Fisherman	0.9	0.0
Service / Professional	5.6	3.8
Artisan	3.3	5.2
House wife	31.8	33.6
Domestic work	11.0	9.7
Student	16.3	21.5
Retired / non working	10.8	9.0
Other	1.1	0.7
Children not going to school and non working	3.4	2.4
<b>Total population</b>	<b>2,056</b>	<b>328</b>

Education up to middle and high school together, comprise almost one-third of the population, 35.4 percent in project villages and 33.5 percent in control villages. Middle school education (24.6 percent in project villages and 22.1 percent in control villages) is having an edge over high school (10.8 percent in project villages and 11.4 percent in control villages) (Figure 8 and Table 2.2).



Data from Table 2.2 shows that among the important occupations, home makers (housewife) contribute to about one-third (31.8 percent in project villages and 33.6 percent in control villages) of the population, followed by students (16.3 percent in project and 21.5 percent in control villages), domestic work (about 10.0 percent) and retired/non working class (slightly less than 10.0 percent). Barring above mentioned occupations, service/professional (5.6 percent project and 3.8 percent control respectively), agriculture (3.9 percent project and 8.0 percent control), animal husbandry (3.4 percent and 2.1 percent respectively) and artisan (3.3 percent and 5.2 percent respectively) are other occupations of the populations (Figure 9 and Table 2.2).

**Figure 9: Occupation of Household Population**

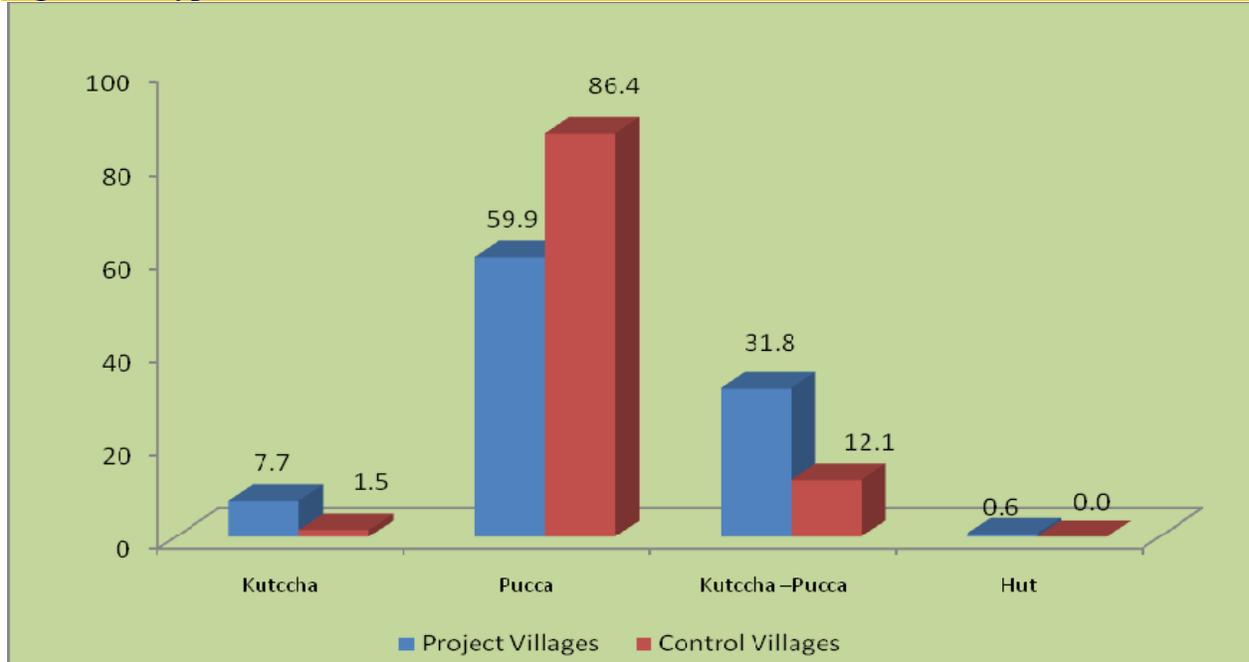


### 2.3 Socio-Economic Characteristics of Households

So far as ownership of house is concerned, a large proportion of households (85.4 percent in project and 95.5 percent in control villages) own a house. Renting a house has been in practice, especially in villages close to CGPL and ADANI thermal power plants, as 12.9 households in project villages and 4.5 percent households in control villages are living in rented houses. Constructed pucca<sup>4</sup> houses is an important feature of the housing as 59.9 percent houses in project and even larger proportion (86.4 percent) households in control villages are having pucca houses (Figure 10 and Table 2.3).

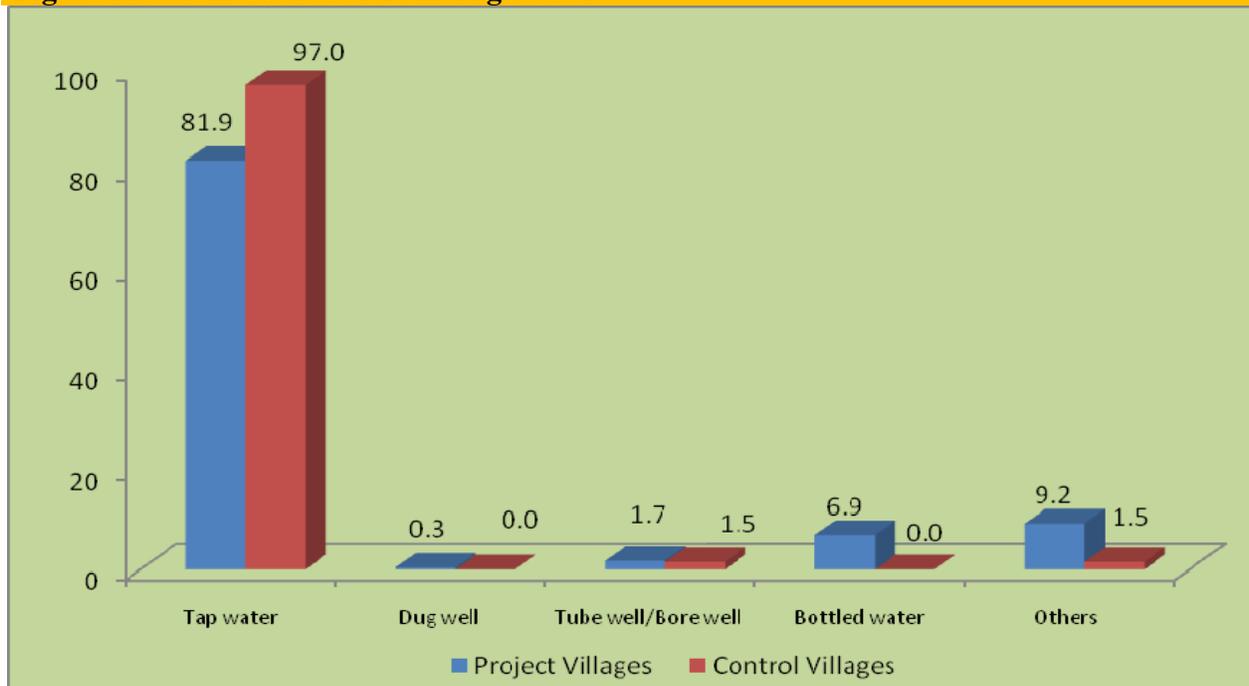
<sup>4</sup> Pucca houses are strong houses. They are made up of wood, bricks, cement, iron rods and steel. Flats and bungalows are pucca houses. Such houses are called permanent houses.

**Figure 10: Type of House**



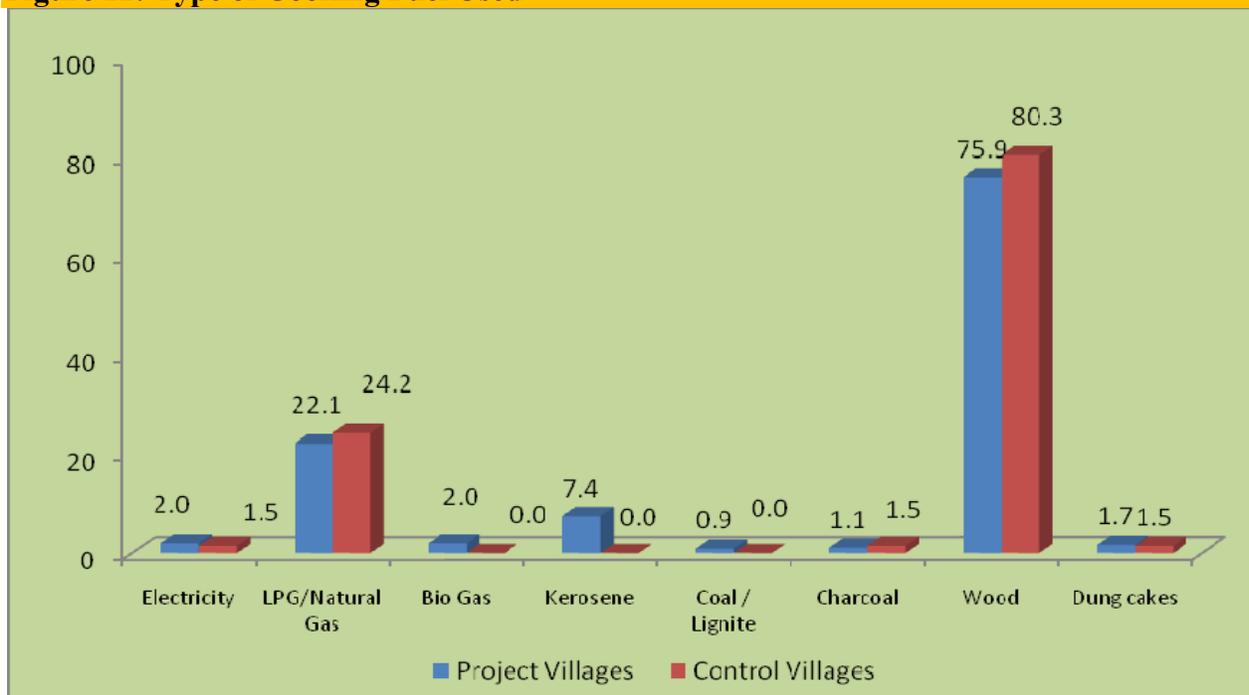
Overwhelming majority of households (81.9 percent in project and 97.0 percent in control villages) have tap water available in their houses and at least 6.9 percent households in project villages are using bottled water as reported by the households (Figure 11 and Table 2.3).

**Figure 11: Main Source of Drinking Water**



*Responding to a multiple answer question about the use of fuel for cooking, 75.9 percent respondents in project villages and 80.3 percent respondents in control villages state that firewood is being used for cooking in their households. This is followed by 22.1 percent respondents in project villages and 24.2 percent in control villages saying LPG is being used as fuel for cooking (Figure 12 and Table 2.3).*

**Figure 12: Type of Cooking Fuel Used**



A very small proportion of households (7.4 percent) in project villages are using kerosene as a fuel for cooking whereas only 2.0 percent households use biogas. No household in control villages uses either kerosene or biogas, survey data reveals.

A detailed investigation needs to be carried out to establish any association of exposure to smoke and other constituents of combustion with COPD (respiratory problem).

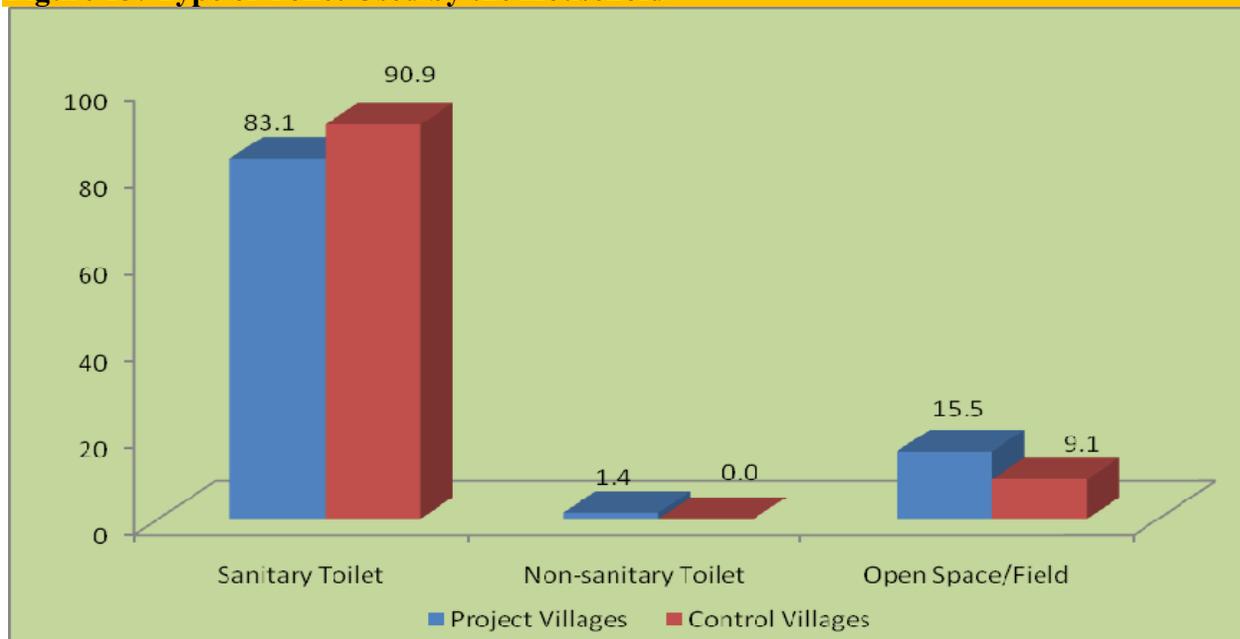
<b>Table 2.3: Socio-Economic Characteristics of Households</b>		
<b>Characteristics</b>	<b>Project Villages</b>	<b>Control Villages</b>
<b>Ownership of house</b>		
Own House	85.4	95.5
Rented House	12.9	4.5
Living in relative/friends house without paying rent	1.7	0.0
Other	0.0	0.0
<b>Type of house</b>		
Kutccha	7.7	1.5
Pucca	59.9	86.4
Kutccha –Pucca	31.8	12.1
Hut	0.6	0.0
<b>Main source of drinking water</b>		
Tap water	81.9	97.0
Surface water (pond, river, sea, lake etc)	0.0	0.0
Dug well	0.3	0.0
Tube well/Bore well	1.7	1.5
Bottled water	6.9	0.0
Others	9.2	1.5
<b>Household with Electricity Connection</b>	<b>94.3</b>	<b>97.0</b>
<b>Type of Cooking Fuel used*</b>		
Electricity	2.0	1.5
LPG/Natural Gas	22.1	24.2
Biogas	2.0	0.0
Kerosene	7.4	0.0
Coal / Lignite	0.9	0.0
Charcoal	1.1	1.5
Wood	75.9	80.3
Dung cakes	1.7	1.5
<b>Type of toilet facility used</b>		
Sanitary Toilet	83.1	90.9
Non-sanitary Toilet	1.4	0.0
Open Space/Field	15.5	9.1
Others	0.0	0.0
<b>Total Number of Households</b>	<b>349</b>	<b>66</b>

\* A multiple answer question, hence percentage may go beyond 100%

A good feature of household characteristics in these villages is availability of sanitary toilets in the household. Sanitary toilet here refers to flush/pour flush to piped sewer system or to a septic tank. The flushing toilet provides a comfortable, safe and hygienic method of sewage disposal. The force of the water from the flushing mechanism, which is called the cistern, washes the urine, faeces and toilet paper out into the septic tank or sewage system. Proper sanitation prevents human being from various diseases which are transmitted via the faecal - oral route.

The survey reveals that 83.1 percent households in project villages and 90.9 percent households in control villages use sanitary toilets. Rest of the households, 15.5 percent in project villages and 9.1 percent in control villages use open space/field for defecation (Figure 13).

**Figure 13: Type of Toilet Used by the Household**



## 2.4 Household Possessions

Same pattern is observed in both projects as well as control villages for important household possessions, though with varying degree of percentages (Table 2.4). In descending order of percentages, as given in the parenthesis for project and control villages respectively, electric fan (94.8 percent in project villages and 98.5 percent in control villages), mobile telephone (89.7 percent and 87.9 percent), colour television (75.6 percent and 77.3 percent), motorcycle/scooter (48.1 percent and 39.4 percent), refrigerator (31.5 percent and 27.3 percent) and bicycle (17.5 percent and 21.2 percent) are the assets possessed by the households.

*It is worth mentioning that 30.4 percent household in project villages and 27.3 percent household in control villages have LPG Stove (Table 2.4). Data reveals that more number of households is having LPG stove than those stated using LPG for cooking (22.1 percent respondents in project villages and 24.2 percent in control villages, Table 2.3.). This indicates that though households are having LPG in their houses but may not be using it for regular cooking.*

<b>Table 2.4: Household Possessions/Assets</b>		
<b>Household Assets</b>	<b>Project Villages</b>	<b>Control Villages</b>
Radio/Transistor	2.3	0.0
Electric Fan	94.8	98.5
LPG Stove	30.4	27.3
Sewing Machine	8.0	12.1
Black and White Television	4.9	9.1
Colour Television	75.6	77.3
Washing Machine	4.9	0.0
Refrigerator	31.5	27.3
Mobile Telephone	89.7	87.9
Any other Telephone	2.0	1.5
Computer	2.9	1.5
Bicycle	17.5	21.2
Motorcycle/Scooter	48.1	39.4
Three wheeler/Auto/Chhakhada	6.0	4.5
Jeep/Toofan	3.2	0.0
Small car (Maruti 800/Alto/Indica)	1.4	0.0
Luxurious car (Honda city, Skoda, BMW, Mercedes)	1.4	0.0
Fishing Boat	0.6	0.0
Heavy earth machine/dumper/JCB/Hydra crane etc.	0.6	1.5
Tractor	2.0	3.0
Water Pump	0.9	0.0
Thresher	0.0	0.0
<b>Total Number of Households</b>	<b>349</b>	<b>66</b>

Among other assets that might be used for economic gains by the households are sewing machine (8.0 percent and 12.1 percent), three wheeler/auto/chhakhada (6.0 percent and 4.5 percent) and Jeep/Toofan (3.2 percent and 0.0 percent), tractor (2.0 percent and 3.0 percent) and heavy earth machine/dumper/JCB/Hydra crane etc (0.6 percent and 1.5 percent).

## **2.5 Land Ownership**

Data points out that agriculture is not an important occupation (Table 2.2) as only 21.2 percent households in project villages own land with average land holding of 4.9 acre and average size irrigated land of 1.2 acre (Table 2.5).

<b>Table 2.5: Land Ownership (in Acres)</b>		
<b>Land Ownership</b>	<b>Project Villages</b>	<b>Control Villages</b>
% Households own land	21.2	21.2
Average land holding (in Acres)	4.9	5.6
Average irrigated land	1.2	1.6
Average non-irrigated land	3.5	3.7
Average non- agricultural land	0.2	0.0
<b>Total Number of Households</b>	<b>349</b>	<b>66</b>

On the other hand, same proportion of household (21.2 percent) own land in control villages with average size land holding of 5.6 acre and average irrigated land size of 1.6 acre.

## 2.6 Household Livestock

Livestock in project as well as control villages mainly comprise cow/bull, buffaloes and goats. Out of those households reportedly having livestock, 89.9 percent in project villages and 87.8 percent households in control villages have cow/bulls.

<b>Table 2.6: Household Owning Livestock</b>		
<b>Percent of household owning livestock</b>	<b>Project Villages</b>	<b>Control Villages</b>
% Households own live stocks	57.0	62.1
<b>Type of livestock*</b> <i>(Based on those household having livestock)</i>		
Cows/Bulls	89.9	87.8
Buffaloes	25.6	9.8
Camel	1.0	0.0
Horses/Donkeys/Mules	2.5	2.4
Goat	18.1	14.6
Sheep	1.5	2.4
Chicken/Ducks	1.5	0.0
Others	0.0	0.0
<b>Total number of households</b>	<b>349</b>	<b>66</b>

About one-fourth households (25.6 percent) in project villages have buffaloes whereas only 9.8 percent households in control villages own buffaloes. Goat is another main livestock as 18.1 percent households in project villages and 14.6 percent households in control villages have this livestock.



## CHAPTER – III

### HYGIENE PRACTICES

Hygiene and health have a direct relationship. Practicing good hygiene habits prevent people from many health problems and thus save tremendous amount of resources such as time and money. Good hygiene practices also save people from lot of diseases that are preventable otherwise. This chapter describes hygiene practices of the households in project as well as control villages covered in the study. This includes cleaning of houses, cleaning of surroundings, dumping of domestic waste, disposal of solid waste and child faeces.

#### 3.1 Hygiene Practice

Cleaning of house is an essential activity that has been performed by almost each household. Out of 349 households interviewed in seven project villages, almost all (98.0 percent) households clean their houses daily, a good hygiene habit practiced by the villagers. Likewise, all 66 households (100.0 percent) interviewed in two control villages also clean their houses daily (Figure 14 and Table 3.1).

Similarly, a large majority of households in project villages (85.4 percent), though less than households cleaning houses daily (98.0 percent), cited cleaning surrounding of their houses daily. There are 10.0 percent households in project villages and 12.1 percent households in control villages that do not clean surrounding of their houses daily or every alternate day (Figure 14 and Table 3.1).

**Figure 14: Hygiene Practices including Waste Disposal**



Table 3.1 illustrates that majority of households (78.8 percent in project and 83.3 percent households in control villages respectively) neither have dustbin inside nor outside the boundary of their houses. In other words, a major chunk of households in these villages dump household solid waste/litter directly in a dumping yard outside their house. However, better hygiene habits are being practiced in project villages as 32.7 percent households have dustbin inside and 17.5 percent households have dustbin outside the boundary of their houses for collecting solid waste/litter as compared to control villages, 12.1 percent households having dustbin inside and 10.6 percent households having dustbin outside the boundary of their houses.

<b>Table 3.1: Hygiene Practices</b>		
<b>Hygiene Practices</b>	<b>Project Villages</b>	<b>Control Villages</b>
<b>Cleaning of House</b>		
Daily	98.0	100.0
Every alternate day	1.4	0.0
Twice a week	0.3	0.0
Once a week	0.3	0.0
<b>Cleaning of Surrounding</b>		
Daily	85.4	86.4
Every alternate day	4.6	1.5
Twice a week	3.7	9.1
Once a week	2.3	0.0
Sometime/not regularly	4.0	3.0
<b>Dumping of Waste*</b>		
Dustbin inside the boundary of house	32.7	12.1
Dustbin outside the boundary of house	17.5	10.6
In a dumping yard outside the house	78.8	83.3
Others	0.6	0.0
<b>Practice of Disposal of Solid Waste/Litter*</b>		
Throwing in a dumping ground	90.3	97.0
Burning litter/solid waste regularly	27.5	51.5
Leaving to its natural decay/perishing	10.0	4.5
Burying underground	2.3	1.5
Composting the waste/litter	24.6	9.1
Others	4.3	0.0
<b>Practice of Disposing of Child Faeces*</b>		
Washing it into Septic tank	13.8	9.1
Washing/throwing it into an open pit	12.0	53.0
Throwing in a dumping ground	79.4	84.8
Burying underground	6.9	21.2
Leaving to its natural decay/perishing	3.2	1.5
Composting it	13.2	6.1
Others	3.2	6.1
<b>Total number of households</b>	<b>349</b>	<b>66</b>

\* A multiple answer question, hence percentage may go beyond 100%

*Data from a multiple answer question reveals that so far as disposal of solid waste/litter is concern a vast majority of 90.3 percent households in project villages and even more, 97.0 percent households in control villages throw their household waste/litter in a dumping ground for disposal as a most preferred practice. The second most preferred practice followed in project villages (27.5 percent households) and about half (51.5 percent households) in control villages is burning litter/solid waste regularly.*

Composting the waste/litter is the third most preferred practice as about one-fourth (24.6 percent) households in project villages reported to have practiced this method of disposal of solid waste/litter. Contrary to this, only 9.1 percent households in control villages practice composting the waste/litter as a method of disposal.

Child faeces in India are disposed in an unhygienic manner by a large population. Similar practices of disposal of child faeces have been reported in project as well as control villages during household survey. Responding to a multiple options question, about 80.0 percent households reported (79.4 percent project and 84.8 percent control villages) disposing off child faeces in most unhygienic manner, throwing it in a dumping ground. Exposed in a dumping ground, child faeces may add to health hazards. Washing it into septic tank, a good disposal habit is practiced by only 13.8 percent households in project villages and 9.1 percent households in control villages. Use of open pit for throwing child faeces is preferred by 53.0 percent households in control villages. On the other hand, only 12.0 percent households in project villages wash child faeces into an open pit (Table 3.1).

### **3.2 Perception about Industrial Activities Causing an Impact on Air Quality**

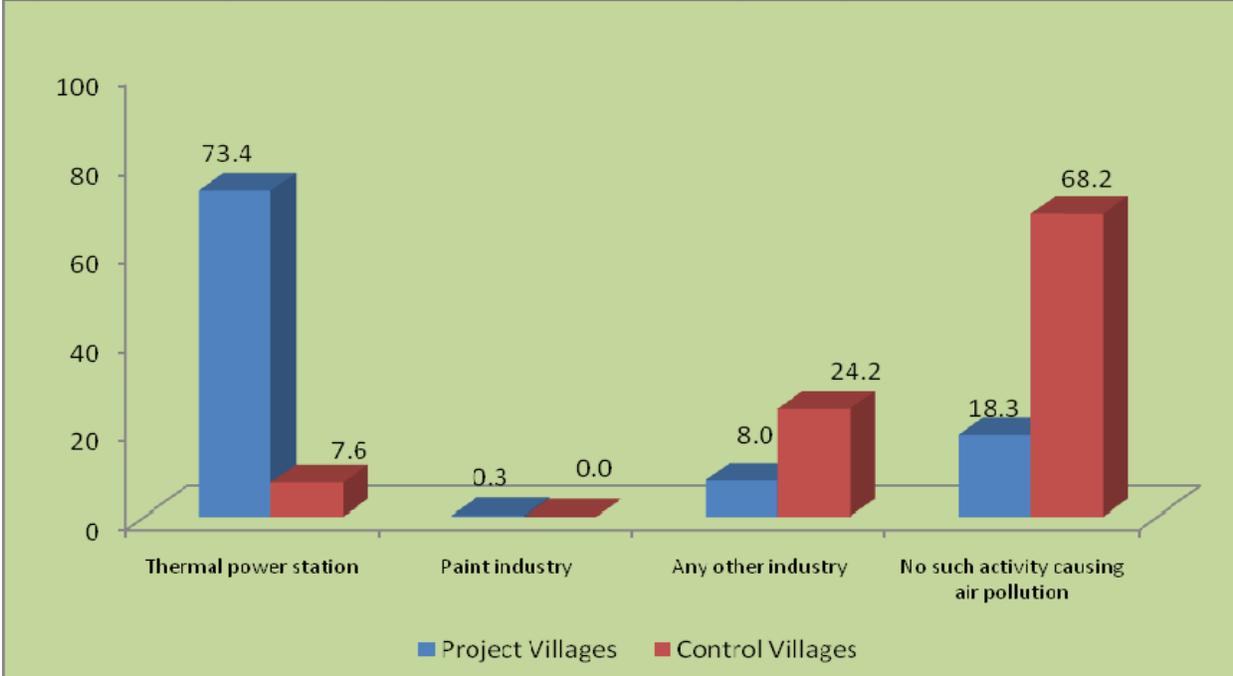
Industrial activities may sometimes pose significant health hazards, if not checked. Such activities may enhance risk of causing adverse health impact and serious harm. Information is sought through this question to know whether any industrial emissions are impacting the population in these villages.

About three-fourths households (73.4 percent) in project villages had the perception that thermal power stations) are resulting in hazardous emissions in their assessment. Only 7.6 percent household respondents in control villages mention that thermal power stations are causing air pollution (Table 3.2). The response of small percentage of households in control villages to this question appears to be justified as distance of control villages from thermal power stations is large as compared to project villages. Hence perception of households in control villages is different than project villages.

<b>Table 3.2: Perception about Industrial Activities Causing Air Pollution</b>		
<b>Industrial Activities Causing Air Pollution</b>	<b>Project Villages</b>	<b>Control Villages</b>
Thermal power station	73.4	7.6
Paint industry	0.3	0.0
Any other industry (construction work)	8.0	24.2
No such activity causing air pollution	18.3	68.2
<b>Total number of households</b>	<b>349</b>	<b>66</b>

On the other hand, 18.3 percent households in project villages and 68.2 percent households in control villages are of the opinion that no such activity is causing air pollution in their villages (Figure 15).

**Figure 15: Perception of People about Activity Causing an Impact on Air Quality**



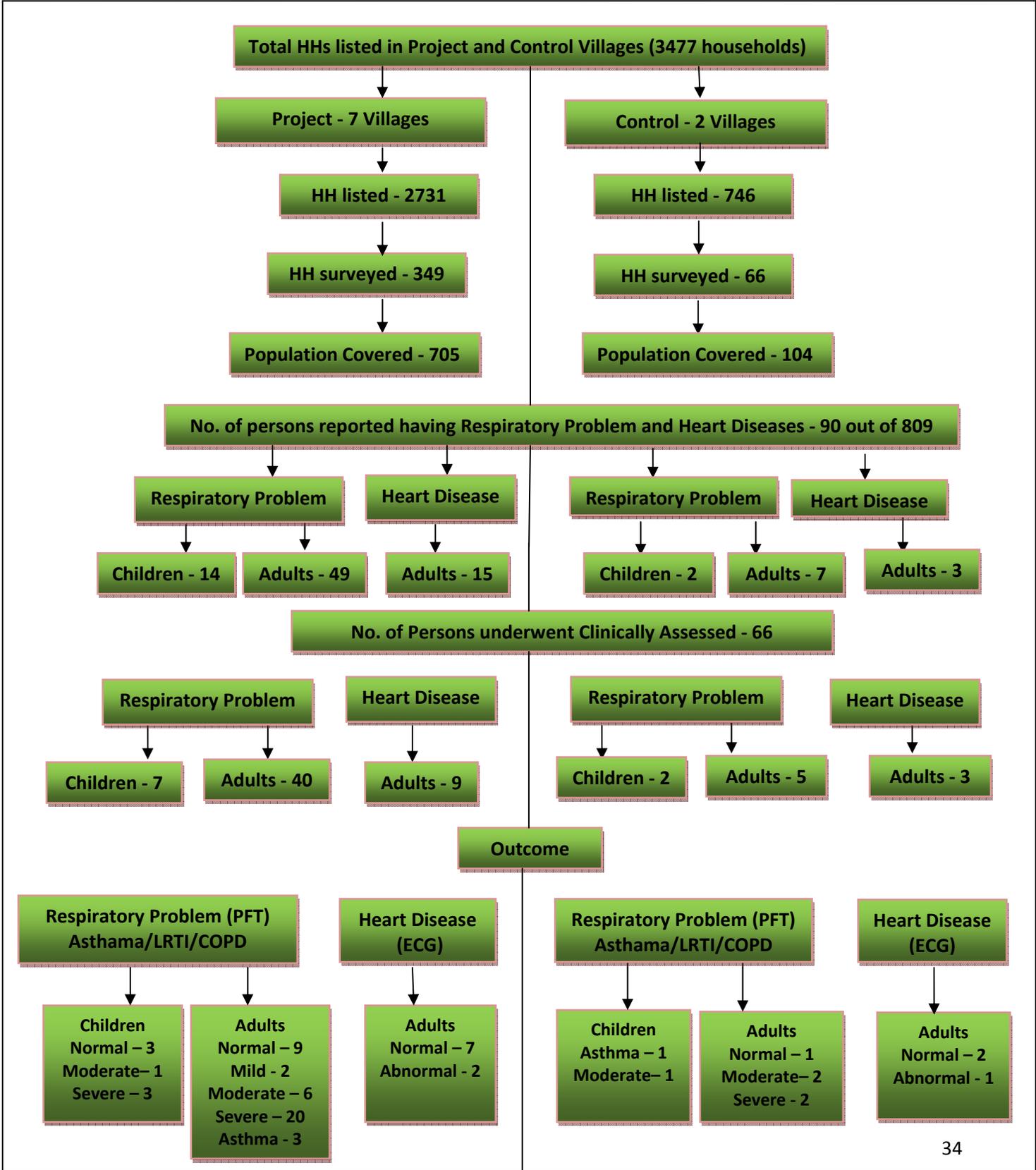
## CHAPTER – IV

### PREVELANCE OF RESPIRATORY PROBLEMS AND HEART DISEASES

In an attempt to develop a baseline profile of public health with respect to emissions, a survey was carried out to record persons reported by their households to be having respiratory problem and heart diseases. For this purpose 415 households (349 in seven project villages and 66 in two control villages) were surveyed. On the basis of information provided by the respondents interviewed at the time of household survey, 90 out of 809 persons were reported having either respiratory problem or heart diseases or both.

After household survey in which 415 households were covered (186 for children less than 5 years and 229 for adults aged 50 years and above), 90 persons including 16 children less than 5 years (14 project and 02 control villages), 56 adults having respiratory problem (49 project and 07 control villages) and 18 adults having heart diseases (15 project and 03 control villages) were identified for clinical assessment to be carried out for respiratory problem and/or heart diseases on the basis of symptoms reported by their households (Table 4.0). Out of 90 identified persons, only 66 persons (9 children for respiratory problem, 45 adults for respiratory problem and 12 adults for heart diseases) were clinically assessed. A flow diagram clearly depicts various processes of data collection; children and adults reported having respiratory problem and heart diseases and number of children and adults clinically assessed.

## Flow Diagram 2: Summary of Survey



<b>Table 4.0: No. of Households Reported Respiratory Problem and Heart Diseases During Household Survey and Clinical Assessment Performed</b>			
<b>Study Villages</b>	<b>Project Villages</b>	<b>Control Village</b>	<b>Total</b>
<b>Sample Covered in Household (HH) Survey</b>			
Children Age < 5 years	156	30	186
Adults aged >50 years	193	36	229
<b>Total sample covered</b>	<b>349</b>	<b>66</b>	<b>415</b>
<b>No. of Persons Identified with Respiratory and Heart Related Problem Children &lt; 5 Years and Adults &gt; 50 Years and Above</b>			
Children having Respiratory problem	14	2	16
Adult having Respiratory problem	49	7	56
Adult having Heart problem	15	3	18
<b>Persons identified with respiratory and Heart Related problem</b>	<b>78</b>	<b>12</b>	<b>90</b>
<b>No. of Persons Clinically Assessed for Respiratory and Heart Related Problem Children &lt; 5 Years and Adults &gt; 50 Years and Above</b>			
Children having Respiratory problem	7	2	9
Adult having Respiratory problem	40	5	45
Adult having Heart problem	9	3	12
<b>No. of Persons clinically investigated</b>	<b>56</b>	<b>10</b>	<b>66</b>

Clinical assessment was conducted for persons identified with respiratory problems and heart diseases. Apart from physical check up, pulmonary function test (PFT) for people having respiratory problem and electrocardiogram (ECG) for persons reported having heart diseases was carried out. The outcome of tests carried out during clinical assessment is described in the following section 4.1.

**Picture 5: Doctor Assessing a Child Reported having Respiratory Problem**



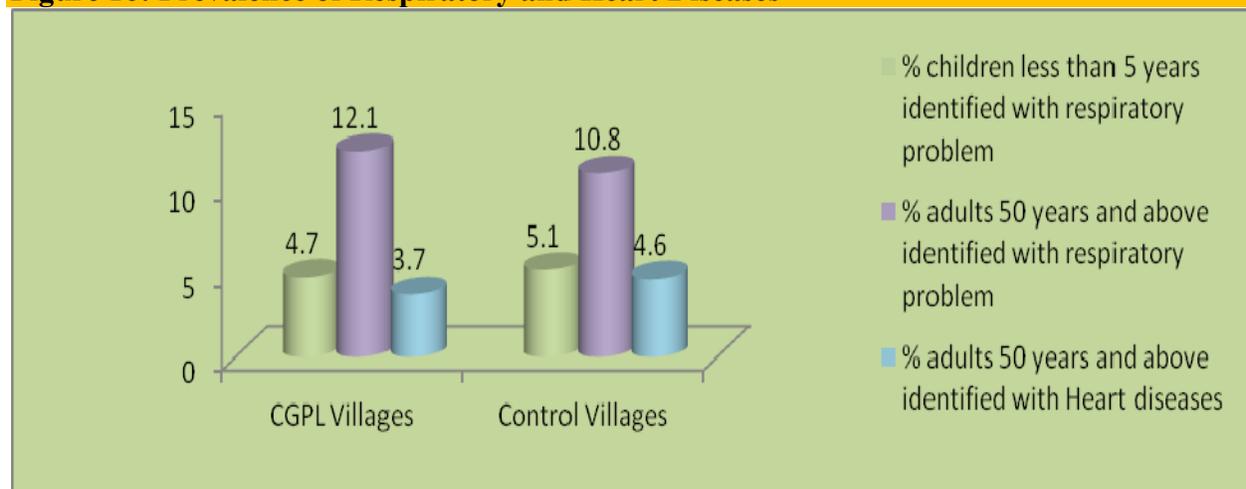
#### **4.1 Prevalence of Respiratory Problems among Children Less than Five Years of Age**

As per data presented in the Table 4.1, only 3.7 percent households (13 out of 349 households in project villages and almost same percentage (3.0 percent) i.e. 2 out of 66 households in control villages report children less than 5 years of age having respiratory problem. In terms of population estimated from those households having reported persons suffering from respiratory problem and/or heart disease covered during household survey, 4.7 percent (14 out of 299) children less than five years of age in project villages and 5.1 percent (2 out of 39) children in control villages were reported having respiratory problem on the basis of symptoms mentioned by the respondents.

<b>Table 4.1: Prevalence of Respiratory Problem Among Children under Five Years (U<sub>3</sub>) of age</b>		
<b>Prevalence</b>	<b>Project Villages</b>	<b>Control Villages</b>
<b>% HH reported incidence of Respiratory Problems</b>	3.7	3.0
<b>Total no. of households</b>	<b>349</b>	<b>66</b>
<b>Total no. of children in surveyed households</b>	<b>299</b>	<b>39</b>
% of Children less than 5 years of age reported having Respiratory Problem	4.7	5.1
<b>Experiencing since</b>		
< 30 days	0.0	1 (50.0)
30-60 days	1(6.7)	1 (50.0)
61-90 days	4(26.7)	0.0
Above 90 days	10 (66.7)	0.0
<b>No of episodes reported in last 30 days</b>		
1	8 (53.3)	1 (50.0)
2	4 (26.7)	1 (50.0)
3 <sup>+</sup>	3 (20.0)	0.0
<b>No of times treatment taken</b>		
1	8 (53.3)	1 (50.0)
2	5 (33.3)	1 (50.0)
3 <sup>+</sup>	2 (13.3)	0.0
<b>Total number of children &lt; 5 years reported to be suffering from Respiratory Problem</b>	<b>14</b>	<b>2</b>

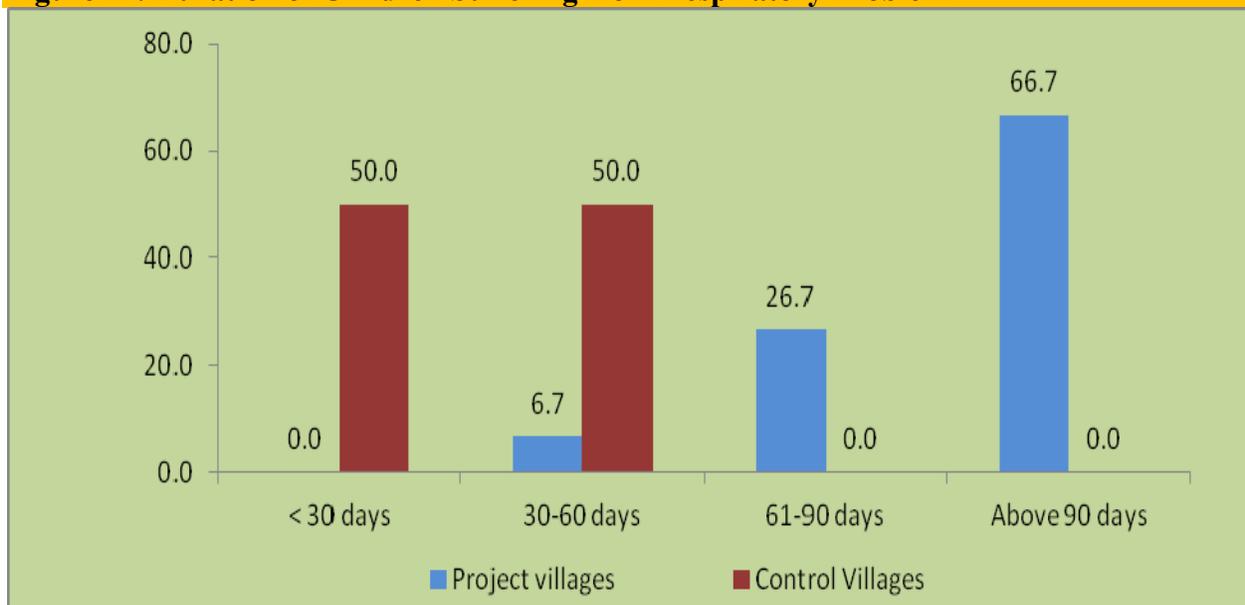
In other words, prevalence of respiratory problem among children less than 5 years of age is estimated to be 4.7 percent (14 out of 299) in project villages and 5.1 percent (2 out of 39) children in control villages (Figure 16 and Tables 4.1 and 4.2). However, the percentage of incidence should be interpreted cautiously as the number of reported cases is very small (14 cases in project and 2 in control villages only).

**Figure 16: Prevalence of Respiratory and Heart Diseases**



Among the children, it is noted that a high proportion (66.7 percent, 10 out of 14) of subjects in project villages have been having respiratory problem for a longer duration, above 90 days (Table 4.1). About one quarter of prevalence of respiratory problem in project villages existed for 61 to 90 days. In other words, nine out of ten subjects with respiratory problem (93.4 percent) in project villages are children less than five years of age experiencing for more than 60 days (Table 4.1). Contrary to this, prevalence of respiratory problem in control villages are reported to be of shorter duration (less than 60 days), half of the total prevalence of respiratory problem falling in each category of duration i.e. < 30 days and 30-60 days. In about half of the prevalence, 8 out of 15 children (53.3 percent) in project villages and one out of 2 (50.0 percent) in control villages, only 1 episode of respiratory problem is reported to have occurred in last 30 days (Figure 17 and Table 4.1).

**Figure 17: Duration of Children Suffering from Respiratory Problem**



Occurrence of two as well as three and more episodes of respiratory problem in children in last 30 days is more or less equally spread in project villages. Slightly more than one-fourth (26.7 percent) i.e. four out of 14 subjects have two episodes of respiratory problems whereas three out of 14 (20.0 percent) subjects have three and more episodes of respiratory problem in project villages. On the other hand, half of the children (one out of two) in control villages has been reported having one episode of respiratory problem while another 50.0 percent children (one out of two) reported having two episodes of respiratory problem in last 30 days' duration (Table 4.1).

Almost similar pattern is repeated in taking treatment for respiratory problem as is observed in occurrence of number of episodes in last 30 days. It is revealed that little more than half (53.3 percent, 8 out of 14) children having respiratory problem in project villages have taken treatment only once. About one-third children (5 out of 14) having respiratory problem and a very small

proportion (13.3 percent, 2 out of 14) children having respiratory problem have taken treatment twice and three and more times respectively, as reported by the households. In control villages, 50.0 percent (1 out of 2) subjects of respiratory problem have reported taking treatment once and in case of another 50.0 percent (1 out of 2) subjects, treatment was taken twice (Table 4.1).

#### **4.2 Prevalence of Respiratory Problems and Heart Diseases among Population 50 years and above**

Prevalence of respiratory problem among adults 50 years of age and above is found to be more in project as well as control villages. Precisely, prevalence of respiratory problem among adults, 50 years and above is estimated to be 12.1 percent (6 out of 49) in project villages and 10.8 percent (1 out of 7) in control villages. Again, these percentages are based on a very small number (56 adults) of subjects with respiratory problem (49 in project villages and 07 in control villages), hence the result should be interpreted cautiously (Table 4.0).

**Picture 6: Pulmonary Function Test (PFT) of a Woman is being Carried out**



Respiratory problem pattern in project villages as well as control villages reveals that slightly more than two-fifths (42.9 percent, 21 out of 49) subjects of respiratory problems in project villages and 57.1 percent (4 out of 7) subjects in control villages have been affected for more than six years. Only 6.1 subjects (3 out of 49) in project villages have reportedly been affected for less than one year. This reflects that most of the prevailing morbidity (71.4 percent, 03 to 06 years and above duration) reported by respondents in project villages is chronic in nature (suffering for more than 3 years). Like wise 57.1 percent (4 out of 7) households in control villages have reported persons having respiratory problems for six and more years whereas 42.9 percent (3 out of 7) cases in control villages are reported to have occurred within last two years. Concisely, 59.2 percent morbidity (29 out of 49) attributable to respiratory problem in project

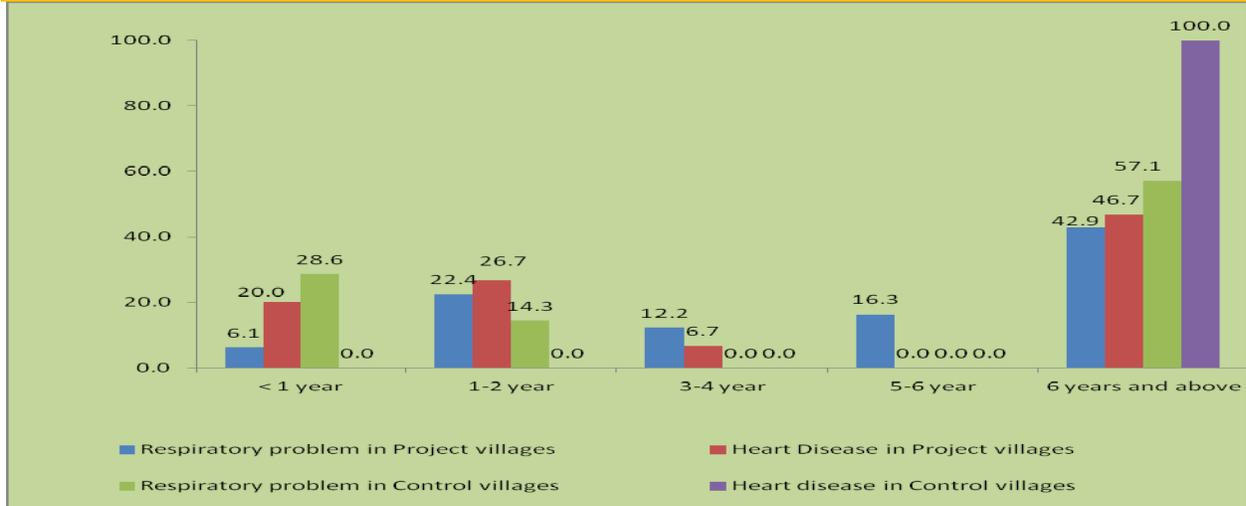
villages are chronic, having been present for more than five years whereas 57.1 percent morbidity (4 out of 7) in control villages occurred five and more years ago (Table 4.2).

<b>Table 4.2: Prevalence of Respiratory Problem and Heart Diseases among Population 50 Years and Above</b>				
<b>Prevalence of Respiratory Problem and Heart Diseases</b>	<b>Project Villages</b>		<b>Control Villages</b>	
	<b>Respiratory Problem</b>	<b>Heart Diseases</b>	<b>Respiratory Problem</b>	<b>Heart Diseases</b>
<b>% HH reported prevalence of Respiratory Problem and Heart Disease</b>	13.8	4.3	10.6	4.5
<b>Total Number of Households</b>	349	349	66	66
<b>Total No. of Adults in Surveyed Households</b>	<b>406</b>		<b>65</b>	
<b>% of Adults 50 Years and above Reported having Respiratory Problem and Heart Disease</b>	6 (12.1)	3.7	10.8	4.6
<b>Suffering since</b>				
< 1 year	3 (6.1)	3 (20.0)	2 (28.6)	0.0
1-2 year	12 (22.4)	4 (26.7)	1 (14.3)	0.0
3-4 year	6 (12.2)	1 (6.7)	0.0	0.0
5-6 year	8 (16.3)	0.0	0.0	0.0
6 years and above	21 (42.9)	7 (46.7)	4 (57.1)	3 (100.0)
<b>Treatment Continuing</b>	<b>46 (93.9)</b>	<b>13(86.7)</b>	<b>6 (85.7)</b>	<b>3 (100.0)</b>
<b>Total number of adults reported having respiratory problem</b>	<b>49</b>	<b>15</b>	<b>7</b>	<b>3</b>

Only three (4.6 percent) incidence of heart disease have been reported by respondents interviewed in control villages. Nevertheless, 15 persons in project villages and 03 persons in control villages are reported having heart disease (Table 4.2).

Out of this, 46.7 percent (7 out of 15) incidence of heart disease in project villages and all persons in control villages are chronic, having for more than six years and above. An equal percentage (46.7 percent, 1 to 2 years duration) of persons having heart disease in project villages are reported to have been afflicted for last two years only (Figure 18 and Table 4.2).

**Figure 18: Duration of Population 50 years and above having Respiratory and Heart Diseases**



It has been found that a large proportion of those having respiratory problem in project (93.9 percent, 46 out of 49 reported persons) as well as control villages (85.7 percent, 6 out of 7 reported persons) have been continuing with treatment. Similarly 86.7 percent (13 out of 15) persons in project villages and all (100.0 percent; 3 out of 3) persons in control villages, having heart diseases, are also continuing with the treatment (Table 4.2).

**Picture 7: Electrocardiogram of an Elderly Person is being Performed**



### 4.3 Clinical Assessment Outcomes

As mentioned earlier in section 4.1, during the household survey, a total 90 persons were reported to be having respiratory problems and/or heart diseases. This includes 16 children (14 project and 2 control villages), 56 adults (49 project and 7 control villages) for respiratory problems and 18 persons (15 project and 3 control villages) for heart diseases. Out of these, 66 persons (9 children and 45 adults for respiratory problems and 12 adults for heart diseases) underwent clinical assessment (Table 4.2A).

<b>Table 4.2A: No. of Persons Reported having Respiratory Problem and Heart Diseases Clinically Assessed</b>							
<b>Description</b>	<b>Project Villages</b>			<b>Control Village</b>			<b>Total</b>
	<b>Respiratory Problems</b>		<b>Heart Diseases</b>	<b>Respiratory Problems</b>		<b>Heart Diseases</b>	
	<b>Children</b>	<b>Adults</b>	<b>Adults</b>	<b>Children</b>	<b>Adults</b>	<b>Adults</b>	
Persons reported	14	49	15	2	7	3	90
Persons underwent clinical investigation	7	40	9	2	5	3	66

According to the information received from the persons who were clinically assessed and their detailed history was recorded at the time of the clinical assessment, no specific factor barring presence of allergy in children less than 5 years of age, 57.1 percent, (4 out of 7 children) in project villages and 50.0 percent, (1 out of 2 children) in control villages is found to be responsible for causing the respiratory problem. Only 14.3 percent (1 out of 7) children, in project villages and 100.0 percent (2 out of 2) children in control villages, having respiratory problem, were identified as having low standard of living index (SLI). Barring this, in majority of instance of respiratory problem among the children (less than 5 years) as well as adults (50 years and above), factors affecting respiratory problem remain obscure. Little more than 85.0 percent persons in project villages (children 85.7 percent and adults 87.5 percent) do not report presence of respiratory problem in the family whereas none of the clinically assessed persons in control villages has family history of respiratory problem. All but 20.0 percent adults in control villages are not exposed to any occupational hazard the data reveals (Table 4.3).

### 4.4 Lung Function Measurement

Pulmonary Function Test (PFT) results reveal 42.9 percent (3 out of 7) children and 22.5 percent (9 out of 40) adults in project villages have uncompromised lung functions. However, 14.3 percent (1 out of 7) children and 15.0 percent (6 out of 40) adults in project villages have a moderate alteration in lung functions). Yet, half of children (50.0 percent, 1 out of 2) and two-fifths of adults (40.0 percent, 2 out of 5) clinically assessed in control villages, are found to be moderately affected by respiratory problem (Asthma/LRTI/COPD). About half of the adults (50.0 percent, 20 out of 40) in project villages and 2 out of 5 adults (20.0 percent) in control villages are found having severe chronic obstructive pulmonary disease (COPD) (Table 4.3).

**Table 4.3: Prevalence of Respiratory Problem among Children U<sub>5</sub> and adult 50 years and Above**

Prevalence of Respiratory Problem	Project Villages		Control Villages	
	Children Under Five	Age 50 years and above	Children Under Five	Age 50 years and above
<b>Standard of Living Index (SLI)</b>				
Low	1 (14.3)	12(30.0)	2(100.0)	2(40.0)
Medium	6 (87.7)	24(60.0)	0.0	3(60.0)
High	0.0	4(10.0)	0.0	0.0
<b>Occupational Hazard</b>				
Exposed	0.0	0.0	0.0	1(20.0)
Non-Exposed	7(100.0)	40(100.0)	2(100.0)	4(80.0)
<b>Family History</b>				
Yes	1(14.3)	5(12.5)	0.0	0.0
No	6(85.7)	35(87.5)	2(100.0)	5(100.0)
<b>Allergy</b>				
Presence	4(57.1)	9(22.5)	1(50.0)	0.0
Absence	7(42.9)	31(77.5)	1(50.0)	5(100.0)
<b>Suffering Since</b>				
< 1 year	0.0	1(2.5)	0.0	1(20.0)
1-2 year	0.0	9(22.5)	1(50.0)	1(20.0)
3-4 year	0.0	6(15.0)	0.0	0.0
5-6 year	0.0	6(15.0)	1(50.0)	0.0
6 years and above	7(100.0)	18(45.0)	0.0	3(60.0)
<b>PFT</b>				
Normal	3(42.9)	9(22.5)	0.0	1(20.0)
Asthma	0.0	3(7.5)	1(50.0)	0.0
Mild COPD	0.0	2(5.0)	0.0	0.0
Moderate COPD	1(14.3)	6(15.0)	1(50.0)	2(40.0)
Severe COPD	3(42.9)	20(50.0)	0.0	2(40.0)
<b>Total number of patients</b>	<b>7</b>	<b>40</b>	<b>2</b>	<b>5</b>

Clinical assessment (ECG) data reveals that majority of subjects (77.8 percent, 7 out of 9 persons) in project villages and (66.7 percent, 2 out of 3 persons) in control villages, are suspected having cardio vascular disorder. Only 22.2 percent (2 out of 9) subjects in project villages and 33.3 (1 out of 3) subjects in control villages have abnormal ECG. To conclude, in majority (66.7 percent, 6 out of 9 persons) of subjects in project and as well as in control villages (66.7 percent, 2 out of 3 persons), having heart diseases, blood pressure is found to be normal and in the rest one-third subjects blood pressure was found to be abnormal after clinical assessment Table 4.4).

<b>Table 4.4: Prevalence of Heart Diseases by Associated Factors</b>		
<b>Prevalence of Heart Diseases</b>	<b>Project Villages</b>	<b>Control Villages</b>
<b>Standard of Living Index (SLI)</b>		
Low	1(11.1)	0.0
Medium	5(55.6)	3(100.0)
High	3(33.3)	0.0
<b>Smoking Habits</b>		
Smoking	3(33.3)	1(33.3)
Non-Smoking	6(66.7)	2(66.7)
<b>Blood Pressure</b>		
High	3(33.3)	1(33.3)
Normal	6(66.7)	2(66.7)
<b>Family History of Heart Diseases</b>		
Yes	0.0	1(33.3)
No	9(100.0)	2(66.7)
<b>Diabetes</b>		
Yes	0.0	0.0
No	9(100.0)	3(100.0)
<b>Suffering Since</b>		
< 1 year	1(11.1)	0.0
1-2 year	1(11.1)	0.0
3-4 year	1(11.1)	0.0
5-6 year	0.0	0.0
6 years and above	6(66.7)	3(100.0)
<b>ECG</b>		
Normal	7(77.8)	2(66.7)
Abnormal	2(22.2)	1(33.3)
<b>Total number of Patients reported Heart Diseases</b>	<b>9</b>	<b>3</b>

The primary data on mortality collected at the time of household survey from seven project villages and two control villages do not establish any specific disease causing a large number (majority) of deaths occurred during January 1, 2015 to December 31, 2015 (Table 4.5A).

<b>Table 4.5A: Mortality and Causes of Death (January 1, 2015 to December 31, 2015) (Primary Data)</b>		
<b>Mortality and Causes of Death</b>	<b>No.</b>	<b>Major Causes of Death</b>
No. of neonatal death	1	Respiratory infection
No. of infant death	0	-
No of U <sub>5</sub> child death	0	-
No. of death above five years	5	Diabetes, Asthma, Hypertension, COPD Unknown/sudden death
<b>Total No. of death</b>	<b>6</b>	

Source: Adami Hospital, Mundra

However, secondary data (April 1 2015 to March 31, 2016) received from ADANI Hospital at Mundra reveals six out of 12 (50.0 percent) mortality occurring from cardio respiratory arrest. Data available in Table 4.5B clearly brings out the fact that none of the deaths reported during April 1, 2015 to March 31, 2016 is neither from project nor from control villages.

<b>Table 4.5B: Mortality and Causes of Death (April 1, 2015 to March 31, 2016 (Secondary Data)</b>						
<b>Sr. No.</b>	<b>Patient Name</b>	<b>Age\Sex</b>	<b>Treating Dr.</b>	<b>Diagnosis</b>	<b>Patient address</b>	<b>Date of death</b>
1	B\o Nutanben Oza	2month\ mch	Dr.Triyank	Detail of death not available	Bihar	4/25/2015
2	Jkha Vishram Shakhra	56\m	Dr.Maulik	Cardiorespiratory arrest	Zarpara	4/28/2015
3	Madarsing Shivubha Jadeja	65\m	Dr.Maulik	Right lower zone collapse,type-2dm,htn,ihd	Gundala	7/4/2015
4	Ranbai Madan Sakhra	70/f	Dr.Mukul	Head injury,sudural collection, left temporal fracture	Zarpara	8/25/2015
5	Asmal Juma Sodhra	89/m	Dr.Maulik	Accute coronary syndrome, copd, anaemia	Gundala	11/20/2015
6	Narubha Kalubha Jadeja	95\m	Dr.Maulik	Cardiorespiratory arrest	Bhadreshwar	12/22/2015
7	Dhaneshbhai Ratanshankar Vyas	71/m	Dr.Maulik	Cardiorespiratory arrest,lvf,crf,ihd	Mundra	1/7/2016
8	Usmanbhai Ilyas Sumra	50/m	Dr.Maulik	Cardiorespiratory arrest,MI,ihd	Nana kapaya	1/28/2016
9	Dinumati Madhvjibhai Rathod	92\m	Dr.Maulik	Cardiorespiratory arrest	Bhavnagar	2/28/2016
10	Sonbai Samra Gadhvi	86/f	Dr.Maulik	As per pm report (brought dead)	Mundra	3/21/2016
11	Kanubhai Chalubha Jadeja	75/m	Dr.Maulik	Cardiorespiratory arrest,anterior wall mi,arf	Mundra	3/31/2016
12	Maniben Hirajibhai Mamniya	85/f	Dr.Maulik	As per pm report(brought dead)	Mundra	3/31/2016

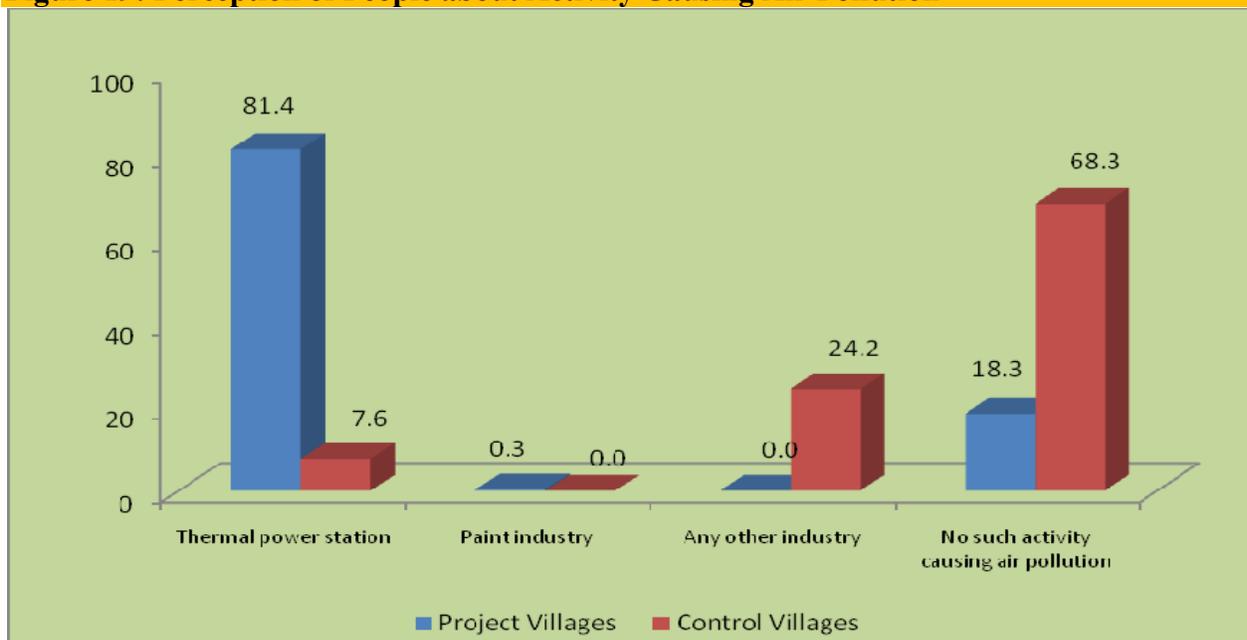
#### 4.5 Respiratory Problem and Associated Factors

It is scientifically proved that respiratory problems are associated with pollutants present in the air (caused by transportation, fuel combustion in stationary sources, burning of fossil fuels like coal, wood, crop residues and various construction activities). The data presented in the Table 4.6 illustrates that majority of households (54.2 percent, 32 out of 59 households) having reported cases of respiratory problems among children and adults in project villages and 77.8 percent households (7 out of 9 households) in control villages have stated using firewood for cooking whereas 37.3 percent (22 out of 59) households in project villages and 11.1 percent (1 out of 9) households use LPG for cooking. Almost all households (96.6 percent, 57 out of 59) in project villages and all households (100.0 percent) in control villages have adequate ventilation in kitchen.

Hence, use of firewood as fuel alone may not cause respiratory problem. Similarly, more number of households, 62.7 percent (37 out of 59) in project and 66.7 percent (6 out of 9) in control villages, reporting respiratory problems have medium standard of living index.

Seventeen (17) out of 59 households (28.8 percent) in project villages and three (3) out of 9 households (33.3 percent) in control villages, reported having respiratory problems, have low standard of living index (SLI). From this, it appears that though a majority households are using firewood for cooking yet, reported respiratory problems in these households may not directly relate to it as almost all households have ventilated kitchens. Similarly, majority of households, reported having respiratory problem have medium standard of living index, hence low level of SLI does not relate to respiratory problems as well (Figure 19 and Table 4.6).

**Figure 19: Perception of People about Activity Causing Air Pollution**



**Table 4.6: Type of Fuel used for Cooking and Ventilation Provision in the Households Reported having Respiratory Problems**

Type of Fuel and Ventilation Facility	Project Villages	Control Villages
<b>Main type of fuel mainly use for cooking</b>		
LPG	22(37.3)	1(11.1)
Wood	32(54.2)	7(77.8)
Other cooking fuel	5(8.5)	1(11.1)
<b>Ventilation available in Kitchen</b>		
Yes	57(96.6)	9(100.0)
No	3.4	0.0
<b>Standard of Living Index (SLI)</b>		
Low	17(28.8)	3(33.3)
Medium	37(62.7)	6(66.7)
High	5(8.5)	0.0
<b>Total number of households reported respiratory related problem among Children and Adults</b>	<b>59</b>	<b>9</b>



## CHAPTER V

### SUMMARY AND CONCLUSION

The present survey was undertaken on the request of CGPL, a TATA Power Project in seven project (within 10 km. radius of the plant) and two control villages. The study was based on the quantitative data and clinical assessment of children less than five years and adults 50 years and above. Under the study 156 households with children under five years of age and 193 households having population aged 50 years and above were covered in project villages. In case of control villages a total of 30 households having children less than five years and 36 households having population aged 50 years and above were covered. In all, 54 PFT and 12 ECG were carried out by a competent physician in makeshift clinics in each of the study villages.

The broad aim of the study was to assess the prevalence of pneumonia and respiratory morbidity among children less than five years age and COPD and heart diseases among adults 50 years and above to have a baseline data for future evaluation of health scenario with respect to air pollution. The broad observations of the study are highlighted below:

- The project villages and control villages selected for baseline profile of public health study are quite similar in terms of demographic and socio-economic parameters.
- More number of households is having LPG stove than those reported using LPG for cooking.
- The study reveals that hygiene practices like cleaning of houses, disposal of solid waste and child faeces are evenly followed in project as well as control villages. However, the use of dustbin for disposal of household waste is reported to be more in project villages than in control villages.
- There is common perception in project villages that Thermal Power Plants are causing air pollution affecting health of the people.
- The prevalence of respiratory problem among children less than five years remains more or less same in project (4.7 percent) and control villages (5.1 percent). Almost all of them have sought treatment also.

- The prevalence rate of respiratory illness among adult aged 50 years and above is higher as compared to the children less than five years in both project and control villages. Overall 12.1 percent population of adult in project and 10.8 percent in control villages have been reported having respiratory illness.
- A total of 18 cases of heart disorders among adults, 15 cases in project and three cases in control villages are reported during the survey.
- The history of heart disease and COPD in subjects indicates that a significant proportion have had problems for more than five years even whereas the operation function of CGPL was not there.
- The clinical assessment and morbidity history taken for the patients suffering from respiratory illness (COPD) suggests no specific factor responsible for causing respiratory problem barring presence of allergy among children less than five years (57.1 percent project and 50.1 percent control villages).
- Pulmonary Function Test (PFT) results reveal that nearly half of the children are having respiratory afflictions and adults having severe COPD.
- The result of ECG Test confirms that majority (77.8 percent project and 66.7 percent control villages) of the subjects in project and control villages are normal.
- Though a majority of households, having reported cases of respiratory problems (54.2 percent in project and 77.8 percent in control villages), using firewood as fuel for cooking yet, more than 95.2 percent household (57 out of 59 in project and 9 out of 9 in control villages) have reported having adequate ventilation in their kitchen.
- Standard of Living Index (SLI), smoking habit, high blood pressure, family history and diabetes are not found associated with heart disease in majority of the incidences though high blood pressure and smoking habit are found to be present among subjects in both project and control villages.
- Mortality data do not establish any specific disease responsible for large number of death occurring during January 1, 2015 to December 31, 2015.

Table 1.1: Sample Coverage of Target Population							
Study Villages	Population and Household (Census 2011)		Children Age < 5 years		Population age 50 years and above		Total Sample
	Population	Household	Estimated Population*	Proposed Sample (5%)	Estimated Population*	Proposed Sample (5%)	
1	2	3	4	5	6	7	(5+7)
<b>Project Villages</b>							
1 Moat Bhadiya	3284	624	365	25	440	30	55
2 Moti Khakhar	2139	436	237	12	287	14	26
3 Nana Bhadiya	4318	1011	479	24	579	30	54
4 Siracha	1879	429	208	10	252	13	23
5 Tragdi	1238	216	137	7	166	8	15
6 Tunda	12471	3134	1384	69	1671	86	155
7 Vandh	1671	340	185	9	224	12	21
<b>Total</b>	<b>27000</b>	<b>6190</b>	<b>2995</b>	<b>156</b>	<b>3619</b>	<b>193</b>	<b>349</b>
<b>Control villages</b>							
1 Faradi	4200	933	466	23	563	28	51
2 Pipri	1200	267	133	7	161	8	15
<b>Total</b>	<b>5400</b>	<b>1200</b>	<b>599</b>	<b>30</b>	<b>724</b>	<b>36</b>	<b>66</b>
<b>Grand Total</b>	<b>32400</b>	<b>7390</b>	<b>3594</b>	<b>186</b>	<b>4343</b>	<b>229</b>	<b>415</b>

\* Estimated as per state average (rural) of 11.1% for age under 5 and 13.4% for age 50 years and above as per Census 2011

Table 1.2B: Sample Covered in Household Survey and Clinical Investigation									
Study Villages	Sample covered in Household (HH) Survey		Children > 5 years and adults < 50 years identified with respiratory and heart related problem			Children > 5 years and adults < 50 years clinically assessed for respiratory and heart related problem			Total Sample (clinically assessed)
			Children	Adults		Children	Adults		
	Children Age < 5 years	Adults aged >50 years	Respiratory problem	Respiratory problem	Heart problem	Respiratory problem	Respiratory problem	Heart problem	
<b>Project Villages</b>									
1 Mota Bhadiya	25	30	2	5	2	1	3	1	5
2 Moti Khakhar	12	14	1	6	1	0	5	0	5
3 Nana Bhadiya	24	30	2	10	4	0	7	2	9
4 Siracha	10	13	1	2	1	1	2	1	4
5 Tragdi	7	8	0	3	0	0	3	0	3
6 Tunda	69	86	8	18	5	5	17	4	26
7 Vandh	9	12	0	6	2	0	3	1	4
<b>Total</b>	<b>156</b>	<b>193</b>	<b>14</b>	<b>50</b>	<b>15</b>	<b>7</b>	<b>40</b>	<b>9</b>	<b>56</b>
1 Faradi	23	28	2	6	3	2	4	3	9
2 Pipri	7	8	0	1	0	0	1	0	1
<b>Total</b>	<b>30</b>	<b>36</b>	<b>2</b>	<b>7</b>	<b>3</b>	<b>2</b>	<b>5</b>	<b>3</b>	<b>10</b>
<b>Grand Total</b>	<b>186</b>	<b>229</b>	<b>16</b>	<b>57</b>	<b>18</b>	<b>9</b>	<b>42</b>	<b>12</b>	<b>66</b>

## A Baseline Health Profile with Respect to Air Quality in Airshed of CGPL Power Plant

### House-listing Form

Village Name .....				Taluka Name .....				
Date of House-listing .....				Name of House listers .....				
Checked By .....				Date of Checking .....				
Sr. No. of Household	Name of Head of Household	Address/ Landmark	Status of HH 1. Open 2. Locked	Child (ren) Less than 5 years 1. Yes 2. No	Adult 50 years and above 1. Yes 2. No	No. of Death(s) since Jan 1 to Dec 31, 2015 (Write in actual number, if no death code "0")	Leave Blank for Sampling Purpose	
							Sr. No. of HH with Child < 5 years	Sr. No. of HH with adult ≥ 50 years



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## A Baseline Health Profile with Respect to Air Quality in Airshed of CGPL Power Plant

### Village Profile

Village Name:	Taluka Name:
Date:	Name of Investigator:
Checked By:	Date of Checking :

Q No.	QUESTIONS AND FILTERS	CODING CATEGORIES		
Q 1	Current population of the village:	Census Figure (2011)	<input type="text"/>	<input type="text"/>
		Current Population (Reported by Panchayat)	<input type="text"/>	<input type="text"/>
Q 2	Total number of households in the village:	(Reported by Panchayat)	<input type="text"/>	<input type="text"/>
Q 3	Is the drainage facility available in the village?	1. Yes 2. No		
Q 4	The type of drainage facility in the village: <b>(RECORD ALL MENTION)</b>	Options	Yes	No
		A. Underground Drainage	1	2
		B. Open with Outlet	1	2
		C. Open without outlet	1	2
Q 5	Types of Roads within the village	1. Paved 2. Brick Road 3. Cemented Road 4. Kutcha Road 5. Any other (specify)		



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Q 6	Whether village is connected by all-weather road to the health facility?						YES	NO	
						Sub Center	1	2	
						Primary Health Center	1	2	
						Community Health Center/Rural Hospital	1	2	
Q 7	Educational facilities available in the village:					Education facilities: If not in the village, distance to nearest govt. facility available			
	facilities	GOVT		PVT					
		YES	NO	YES	NO				
	Primary School	1	2	1	2	Primary School		KM	
	Middle School	1	2	1	2	Middle School		KM	
	Secondary School	1	2	1	2	Secondary School		KM	
	Higher Secondary School	1	2	1	2	Higher Secondary School		KM	
	College	1	2	1	2	College		KM	
	Madarasa	1	2	1	2	Madarasa		KM	
	Non-formal education	1	2	1	2	Non-formal education		KM	
Q 8	Health facility available in the village:				Health facilities: If not in the village, distance to nearest facility available				
	Health facility		YES	NO	Health facility		Distance to nearest health facility in K.M.	Whether accessible throughout the year	
	A) ICDS (Anganwadi)		1	2	A) ICDS (Anganwadi)			1	2
	B) Sub-Centre		1	2	B) Sub-Centre			1	2
	C) PHC _____		1	2	C) PHC _____			1	2
	D) BLOCK PHC _____		1	2	D) BLOCK PHC _____			1	2
	E) CHC/RH _____		1	2	E) CHC/RH			1	2
	F) District/ Govt. Hospital		1	2	F) District/ Govt. Hospital			1	2
	G) Govt. Dispensary		1	2	G) Govt. Dispensary			1	2
	H) Private Clinic		1	2	H) Private Clinic			1	2
	I) Private Hospital / Nursing Home		1	2	I) Private Hospital / Nursing Home			1	2
	J) AYUSH Health Facility		1	2	J) AYUSH Health Facility			1	2
	K) NGO/Trust		1	2	K) NGO/Trust			1	2

Q 9	Availability of health service provider in the Village (staying and/or visiting):											
	Health provider	Yes	No	If Yes, Number								
	A) Integrated Child Development Scheme/Aaganwadi Worker	1	2									
	B) Village Health Guide (VHG)	1	2									
	C) Accredited Social Health Activist (ASHA)	1	2									
	D) Trained Birth Attendant (TBA)	1	2									
	E) Auxiliary Nurse Midwife (ANM)	1	2									
	F) Lady Doctor	1	2									
	G) Private Doctor	1	2									
	H) Unani Doctor	1	2									
	I) Ayurvedic Doctor	1	2									
	J) Homeopathic Doctor	1	2									
	K) Sidha Doctor	1	2									
	L) Registered Medical Practitioner –Alternative Medicines	1	2									
	M) Traditional Healer	1	2									
	N) Untrained Dai	1	2									
	O) Other _____ (Specify)	1	2									
Q 10	Facilities available in the village:		Facilities: If not in a village, distance to nearest facility available									
	Facilities	YES	NO	Facilities								
	A. Post / Telegraph office	1	2	A. Post / Telegraph office								
	B. STD Booth	1	2	B. STD Booth								
	C. Pharmacy/medical shop	1	2	C. Pharmacy/medical shop								
	D. Bank	1	2	D. Bank								
	E. Adult Education Center	1	2									
	F. Youth Club	1	2									
	G. Mahila Mandal	1	2									
	H. Self Help Groups	1	2									
	I. Paan Shop	1	2									
	J. Haat/Market	1	2									
	K. Kirana/ general provision shop	1	2									
	L. Credit Cooperative Society	1	2									
	M. Agricultural Cooperative Society	1	2									
	N. Milk Cooperative Society	1	2									
	O. Fishermen's Cooperative Society	1	2									
	P. Computer Kiosk/ e-chaupal	1	2									
	Q. Mills / Small Scale Industries	1	2									
	R. Community Television Set	1	2									
	S. Other ____ (specify)	1	2									
Q11	During the last six months how many times cleaning, fogging drive was undertaken in the village?	CLEANING <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> </table> FOGGING <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> </table>										
Q 12	Evidence of Pollution in the Village	Evidence	1. YES	2. NO/								
		1. Burning of Waste in open										
		2. Cotton dust										
		3. Open waste dumping ground										
		4. Cremation Ground										
		5. Others										
Q 13	Do you see any industrial/occupational activity that causes air pollution (smoke/dust/chemical fumes etc)	1. Chemical industry 2. Thermal power station 3. Paint industry 4. Food processing industry 5. Stone crusher plant 6. Rice/grain/flour/cotton mills 7. Any other industry (specify)/_____										

## A Baseline Health Profile with Respect to Air Quality in Airshed of CGPL Power Plant

### Household Schedule

Name of villages	1. Tunda 2. Vandh 3. Mota Bhadiya 4. Nana Bhadiya 5. Tragdi 6. Siracha 7. Moti Khakhar 8. Pipri 9. Faradi
Serial No of Household	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
Name of the Head of the Household	
Name of the Respondent	
Name of the Investigator	_____
Signature of the Investigator	_____
Name of the Supervisor	_____
Signature of the Supervisor	_____
Date of Interview	<input type="text"/>



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### Informed Consent

My name is \_\_\_\_\_ and I am working with TALEEM Research Foundation, Ahmedabad. We are conducting a health survey in Mundra Taluka. This information will be used for public health purposes.

All houses selected for this survey were chosen from a scientific sample and your household has been selected to participate. The survey usually takes about 20 minutes to complete. Whatever information you provide will be kept strictly confidential and will not be shown to any other person. The survey will not harm any member of your household directly or indirectly.

Participation in this survey is voluntary, if you choose not to participate and you may withdraw at any time. However, we hope that you will take part in this survey since your participation is important.

Do you agree to participate?

1. Yes                  Continue
2. No                  End the interview

## 1. Background Information

No	QUESTIONS AND FILTERS	CODING CATEGORIES
1.1	What is the present age of the respondent?	Age (in completed years) _____ <input type="text"/> <input type="text"/>
1.2	What is the religion of the Head of the household?	1. Hindu 2. Muslim 3. Christian 4. Jain 5. Other (Specify)...
1.3	What is caste or tribe of the head of the household?	1. General 2. Scheduled Caste 3. Scheduled Tribe (ST) 4. Other Backward Caste( OBC)
1.4	Does this household have a BPL Card?	1. Yes 2. No 3. Don't Know
1.5	Types of Family	1. Joint 2. Nuclear 3. Extendend
1.6	Total Number of usual residents of this household	Male <input type="text"/> <input type="text"/> Female <input type="text"/> <input type="text"/> Total <input type="text"/> <input type="text"/>
1.7	Have you been living here most of the time since 2013?	1. Yes 2. No

**Table No 1**

1.8 Household Members: we would like to know some information about each of the usual members of this household

Sr. No.	Name of Household Member	Age	Sex 1.Male 2.Female	Marital status 1. Married 2. Unmarried 3. Widow/Widower/ Divorcee	Highest Education Standard Completed ( for all Age 5 years or older)	Occupation / Activity status during last 365 days (for age 5 years and above)
1	2	3	4	5	6	7
01						
02						
03						
04						
05						
06						
07						
<b>Code for Col.3 Age</b>		<b>Code for Col.6 Education standard: `</b>		<b>Code for Col.7 Occupation</b>		
00-Age less than one year 95- Age 95 years and more		Code in completed years of education  00-less than 1 year 98- Don't know		1. Agriculture	10. Painters	
				2. Salt worker	11. Fisherman	
				3. Industry – Large Scale	12. Service/professional	
				4. Industry – Small Scale	13 . Artisan	
				5. Transport	14. Housewife	
				6. Construction Site	15. Domestic works	
				7. Business of Scrap, Machinery parts, industrial goods etc.	16. Students	
				8. Business as Shopkeeper, Vendor	17. Retired/non working	
				9. Animal Husbandry	18. Other (Specify)	
1.9 What is the total monthly income of your household from all sources (in Rs.) ?				_____ Rs.		

## 2. Household Amenities

No	QUESTIONS AND FILTERS	CODING CATEGORIES
2.1	Does this household own this house or any other house?	1. Own House 2. Rented House 3. Living in relative/friends house without paying rent 4. Other (Specify)
2.2	Types of House (Record by Observation)	1. Kutcha 2. Pucca 3. Kutcha –Pucca 4. Hut
2.3	How many rooms are there in your household including kitchen?	Total Number of Rooms <input type="text"/> <i>if only ONE Room</i> → Q.2.5
2.4	Do you have a separate room which is used as kitchen?	1. Yes 2. No
2.5	Is ventilation available in the kitchen?	1. Yes 2. No
2.6	What type of fuel does your household mainly use for cooking?	1. Electricity 2. LPG/Natural Gas 3. Biogas 4. Kerosene 5. Coal/Lignite 6. Charcoal 7. Wood 8. Straw/Shrubs/Grass 9. Agricultural Crop Waste 10. Dung Cakes 11. Others .....
2.7	What is the main source of drinking water in your house?	1. Tap water 2. Surface water (pond, river, sea, lake etc) 3. Dug well 4. Tube well/Bore well 5. Bottled water 6. Any other, specify.....
2.8	Are you consuming treated water? (Multiple response possible)	1. Community R.O. 2. Household R.O 3. Boiling 4. Sieving 5. Alum/Chlorination 6. Not consuming treated water 7. Othes, specify .....
2.9	Does this household have electricity connection?	1. Yes 2. No
2.10	What kind of toilet facility do members of your household usually use?	1. Sanitary Toilet 2. Non-sanitary Toilet 3. Open Space/Field 4. Others, specify.....

2.11	Does your household have the following		<b>1. Yes</b>	<b>2. No</b>	<b>If yes. Write number</b>
	1. Radio/Transistor		1	2	
	2. Electric Fan		1	2	
	3. LPG Stove		1	2	
	4. Sewing Machine		1	2	
	5. B & W Television		1	2	
	6. Colour Television		1	2	
	7. Washing Machine		1	2	
	8. Refrigerator		1	2	
	9. Mobile Telephone		1	2	
	10. Any other Telephone		1	2	
	11. Computer		1	2	
	12. Bicycle		1	2	
	13. Motorcycle/Scooter		1	2	
	14. Three wheeler/Auto/Chhakhada		1	2	
	15. Jeep/Toofan		1	2	
	16. Small car (Maruti 800/Alto/Indica		1	2	
	17. Luxurious car (Honda city, Skoda, BMW, Mercedes)		1	2	
	18. Fishing Boat		1	2	
	19. Heavy earth machine/dumper/JCB/Hydra crane etc.		1	2	
	20. Tractor		1	2	
	21. Water Pump		1	2	
	22. Thresher		1	2	
2.12	Does this household own land?	1. Total Agricultural Land _____Acre 2. Irrigated agricultural Land _____Acre 3. Non-irrigated agricultural Land _____Acre 4. Non- agricultural Land _____Acre 5. No land			
2.13	Does your household own any of the Livestock? If yes Write total number.				
	<b>Type of live stocks</b>	<b>1. Yes</b>	<b>2. No</b>	<b>If 'yes' write total Number</b>	
	1. Cows/Bulls	1	2	<input type="text"/>	<input type="text"/>
	2. Buffaloes	1	2	<input type="text"/>	<input type="text"/>
	3. Camel	1	2	<input type="text"/>	<input type="text"/>
	4. Horses/Donkeys/Mules	1	2	<input type="text"/>	<input type="text"/>
	5. Goat	1	2	<input type="text"/>	<input type="text"/>
	6. Sheep	1	2	<input type="text"/>	<input type="text"/>
	7. Chicken/Ducks	1	2	<input type="text"/>	<input type="text"/>
	8. Others (specify)	1	2	<input type="text"/>	<input type="text"/>
2.14	How frequently do you clean your house?	1. Daily 2. Every alternate day 3. Twice a week 4. Once a week 5. Sometime/not regularly 6. Any other (specify)/ _____			

2.15	How frequently do you clean your surrounding?	<ol style="list-style-type: none"> <li>1. Daily</li> <li>2. Every alternate day</li> <li>3. Twice a week</li> <li>4. Once a week</li> <li>5. Sometime/not regularly</li> <li>6. Any other (specify)/ _____</li> </ol>
2.15	What do you use to dump/collect residential/surrounding waste/litter?	<ol style="list-style-type: none"> <li>1. Dustbin inside the boundary of our house</li> <li>2. Dustbin outside the boundary of our house</li> <li>3. In a dumping yard outside the house</li> <li>4. Any other (specify)/ _____</li> </ol>
2.16	How do you dispose off solid waste/litter of the house?	<ol style="list-style-type: none"> <li>1. Throwing in a dumping ground</li> <li>2. Burning litter/solid waste regularly</li> <li>3. Leaving to its natural decay/perishing</li> <li>4. Burying underground</li> <li>5. Composting the waste/litter</li> <li>6. Any other (specify)/ _____</li> </ol>
2.17	How do you dispose off child fasces or solid waste from the house?	<ol style="list-style-type: none"> <li>1. Washing it into Septic tank</li> <li>2. Washing/throwing it into an open pit</li> <li>3. Throwing in a dumping ground</li> <li>4. Burying underground</li> <li>5. Leaving to its natural decay/perishing</li> <li>7. Composting it</li> <li>8. Any other (specify)/ _____</li> </ol>
2.18	Do you see any industrial/occupational activity nearby your house that causes air pollution (smoke/dust/chemical fumes etc)?	<ol style="list-style-type: none"> <li>1. Chemical industry</li> <li>2. Thermal power station</li> <li>3. Paint industry</li> <li>4. Food processing industry</li> <li>5. Stone crusher plant</li> <li>6. Rice/grain/flour/cotton mills</li> <li>7. Any other industry (specify)/_____</li> <li>8. No such activity causing air pollution</li> </ol>

### 3. Morbidity Details

3.1 Does any child less than 5 years suffer from respiratory problem in the household? 1. Yes 2. No → **Q. 3.2**

3.2 If yes take details about each child									
Sr. No.	Name of Child	Serial no of Child	Age ( In Months)	Name of Mother	Serial number of mother from table 1	Suffering since when (in days)? Code 99 if more than 90 days	No. of episodes in last 30 days	No. of times Treatment taken in last 30 days	Source of treatment 1. Government Doctor/Hospital 2. Private Doctor/ Hospital 3. AYUSH 4. Others
1	2	3	4	5	6	7	8	9	10
1		<input type="text"/>	<input type="text"/>		<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
2		<input type="text"/>	<input type="text"/>		<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
3		<input type="text"/>	<input type="text"/>		<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
4		<input type="text"/>	<input type="text"/>		<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
5		<input type="text"/>	<input type="text"/>		<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

3.2 Does any usual resident age 50 years and above suffer from respiratory problem and/ or heart disease?

1. Yes 2. No —→ **Q. 4.1**

**(INS: if a person is suffering from both respiratory and heart diseases record details in a separate row)**

3.3 If yes take details of each person							
Sr. No.	Name of person	Serial no of person from table 1	Age in completed years	Suffering from 1 Respiratory problem 2 Heart disease	Suffering since when (in Month)? If more than 96 months code 97	Treatment Continue 1. Yes 2. No	Source of treatment 1. Government Doctor/Hospital 2. Private Doctor/Hospital 3. AYUSH 4. Others
1	2	3	4	5	6	7	8
1		<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
2		<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
3		<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
4		<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
5		<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

#### 4. Mortality details

No	QUESTIONS AND FILTERS	CODING CATEGORIES							
4.1	Did any usual resident of this household die between <b>January 1, 2015 to December 31, 2015?</b>	1. Yes 2. No → <b>Terminate the Interview</b>							
4.2	If yes, how many persons died?	Male <input type="text"/>	Female <input type="text"/> Total <input type="text"/>						
4.3 We would like to know few more details of the deceased persons who died between <b>January 1, 2015 to December 31, 2015</b>									
Sr. No.	Name of the deceased person	Date of Death			Age at the time of death			Place of Death	Symptoms leading to death
		Date	Month	Year	If age less than one month record in Days	If age between 1 -11 months record in Months	If age 1 year and above record in Year		
1	2	3			4	5	6	7	8
1					2	0	1	5	
2					2	0	1	5	
3					2	0	1	5	
4					2	0	1	5	
<b>Code for Column 7</b>		<b>Code for Column 8</b>							
1. At home 2. In transit 3. In health facility(Govt or Pvt Hospitals) 4. Other places		01. Asphyxia 02. Hypothermia 03. Infections 04. Birth Injuries 05. Convulsions soon after birth 06. Jaundice 07. Fever with jaundice 08. Bleeding from Umbilical Cord and elsewhere 09. Congenital/Birth defects 10. Pre-term/Low birth weight baby not thriving 11. Diarrhea /dysentery 12. Fever with rashes 13. Fever with convulsions 14. Diabetes 15. Kidney failure 16. Liver failure			17. Cancer (Any type) 18. Pregnancy related causes 19. Respiratory infection 20. Stroke 21. COPD 22. Asthma 23. Ischemic Heart Disease / Dyslipidemia 24. Hypertension 25. Valvular Heart Disease 26. Cardiac Failure 27. Heart Attack 28. Tuberculosis 29. Malaria 30. Accidental Death 31. Unknown / sudden death 32. Others/ _____				

Thank you

## A Baseline Health Profile with Respect to Air Quality in Airshed of CGPL Power Plant

### Clinical Investigation Schedule

Serial No of Household	<input style="width: 20px; height: 20px;" type="text"/>
Name of villages	1. Tunda 2. Vandh 3. Mota Bhadiya 4. Nana Bhadiya 5. Tragdi 6. Siracha 7. Moti Khakhar 8. Pipri 9. Faradi <div style="float: right; margin-top: 10px;"><input style="width: 30px; height: 20px;" type="text"/></div>
Type of subject	1. Respiratory Disorder 2. Heart Disease
Serial No of Patient (From table 1 of HH)	<input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/>
Name of the subject _____	Sex:    1 Male                      2 Female
Date of Birth _____	Age _____ Years
Weight _____ kg	Height _____ cm.                      BMI _____
SPO <sub>2</sub>	Reparatory Rate _____/Minute
Occupation _____	Exposed to Occupational Hazard 1 Yes                      2 No
Diabetic History	Polyuria/Polyphagia/Polydipsia/Fatigue/Multiple infections/sudden weight gain/sudden weight loss
Name and signature of the Investigator	
Signature of Medical Doctor	
Date of Clinical Investigation	<input style="width: 20px; height: 20px;" type="text"/>



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## 1. Personal History

No	QUESTIONS AND FILTERS	CODING CATEGORIES	
1.1	Do you currently smoke tobacco?	1. Yes 2. No	<input type="checkbox"/>
1.2	If yes, how many bidis/cigarettes/hooka/chilam, do you smoke in a day?	_____ Number	
1.3	How old were you when you first started smoking tobacco?	_____ Year	<input type="text"/>
1.4	Do you currently use chewing tobacco?	1. Yes 2. No	<input type="checkbox"/>
1.5	How old were you when you first started using chewing tobacco?	_____ Year	<input type="text"/>
1.6	Presence of Wheezing?	1. Yes 2. No	<input type="checkbox"/>
1.7	Presence of Shortness of Breath (SOB)?	1. Yes 2. No	<input type="checkbox"/>
1.8	Presence of Cough?	1. Yes 2. No	<input type="checkbox"/>
1.9	Presence of Frank Blood in Sputum/Cough	1. Yes 2. No	<input type="checkbox"/>
1.10	Personal History of Asthma?	1. Yes 2. No	<input type="checkbox"/>
1.11	Personal History of Allergy?	1. Yes 2. No	<input type="checkbox"/>
1.12	Personal History of Heart Disease?	1. Yes 2. No	<input type="checkbox"/>
1.13	Personal History of Congenital Heart Disease?	1. Yes 2. No	<input type="checkbox"/>
1.14	Personal History of Valvular Heart Disease?	1. Yes 2. No	<input type="checkbox"/>
1.15	Personal History of Hypertension?	1. Yes 2. No	<input type="checkbox"/>
1.16	Personal History of Chest pain?	1. Yes 2. No	<input type="checkbox"/>
1.17	Personal History of Cancer?	1. Yes 2. No 3. Specify	<input type="checkbox"/>

## 2. Family History

No	QUESTIONS AND FILTERS	CODING CATEGORIES	
2.1	Family History of Asthma?	1. Yes 2. No	<input type="checkbox"/>
2.2	Family History of Allergy?	1. Yes 2. No	<input type="checkbox"/>
2.3	Family History of Heart Disease?	1. Yes 2. No	<input type="checkbox"/>
2.4	Family History of Congenital Heart Disease?	1. Yes 2. No	<input type="checkbox"/>
2.5	Family History of Valvular Heart Disease?	1. Yes 2. No	<input type="checkbox"/>

2.6	Family History of Hypertension?	1. Yes 2. No	<input type="checkbox"/>
2.7	Family History of Cancer?	1. Yes 2. No 3. Specify	<input type="checkbox"/>

### 3. Clinical Assessment

No	QUESTIONS AND FILTERS	CODING CATEGORIES
3.1	SOB:	1. Absent 2. On Severe Exertion 3. On Moderate Exertion 4. On Mild Exertion 5. At Rest
	Symptom variability	1. Diurnal variation 2. Constant
3.2	Wheezing:	1. Absent 2. On Severe Exertion 3. On Moderate Exertion 4. On Mild Exertion 5. At Rest
	Symptom variability	1. Diurnal variation 2. Constant
3.3	Dypnoea:	1. Absent 2. On Severe Exertion 3. On Moderate Exertion 4. On Mild Exertion 5. At Rest
	Symptom variability	1. Diurnal variation 2. Constant
3.4	Allergy:	1. Symptom variability 2. Diurnal variation 3. Constant 4. Known Trigger, if any _____
3.5	Chest Pain:	1. Absent 2. On Severe Exertion 3. On Moderate Exertion 4. On Mild Exertion 5. At Rest
3.6	Symptom variability	1. Diurnal variation 2. Constant
3.7	Menstrual History (For Females only):	1. Regular 2. Irregular 3. Cessation from _____

#### 4. General Examination

4.1	Built	1. Small 2. Medium 3. Large
4.2	Tongue	1. Pale 2. Pink
4.3	Conjunctiva	1. Pale 2. Pink
4.4	Nail	1. Pale 2. Pink
4.5	Heart rate	1. Regular _____ / Min 2. Irregular
4.6	Blood Pressure:	1. Diastolic _____ mm of Hg 2. Systolic _____ mm of Hg
4.7	Chest Examination (for lungs) Shape	1. Regular 2. Pigeon-Shaped
<b>Auscultation of lungs:</b>		
4.8	Bilateral Air Entry:	1. Normal 2. Abnormal Left/Right/Both
4.9	Expiratory Polyphonic Wheeze	1. Presence Left/Right/Both 2. Absence
4.10	Cough quality:	1. None 2. Dry 3. Productive _____ White _____ Yellow
4.11	Adventitious Sounds	1. Presence 2. Absence 3. Specify
<b>Auscultation of heart:</b>		
4.12	Heart Sounds:	1. S1-S2 2. Regularly Irregular 3. Irregularly Irregular
4.13	Murmur:	1. Absent 2. Present Diastolic _____ Systolic _____
4.14	Cyanosis	1. Present 2. Absent
4.15	Clubbing	1. Present 2. Absent
4.16	Jugular veins:	1. Normal 2. Dilated
<b>Lymph Node Palpation</b>		
4.17	Supra-clavicular	1. Palpable 2. Not-Palpable
4.18	Axillary:	1. Palpable 2. Not-Palpable

#### 5. Medical Investigation / Test

5.1	PFT Done	1. Yes    2. No FEV <sub>1</sub> _____ FVC _____ FEV <sub>1</sub> /FVC _____
5.2	ECG Done	1. Yes    2. No

**Thank you.**

### **TALEEM Research Foundation**

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