



**REPORT ON**  
**IMPACT ASSESSMENT OF PILOT PROJECT**  
**ON “BUILDING RESILIENCE THROUGH PROMOTION OF SAFE**  
**DRINKING WATER IN SAMASTIPUR DISTRICT, BIHAR”**



**BY:**

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## **TABLE OF CONTENT**

1. <u>INTRODUCTION</u> .....	1-3
1.1. <u>HOUSEHOLD WATER TREATMENT</u>	
1.2. <u>THE BIOSAND FILTER</u>	
1.3 <u>CASE STUDY</u>	
2. <u>OBJECTIVES</u> .....	4
3. <u>THE STUDY</u> .....	5-11
3.1. <u>STUDY AREA DESCRIPTION</u>	
3.2. <u>STUDY TOOLS</u>	
3.2.1. <u>QUESTIONNAIRES FOR THE SURVEY DONE AT THE STUDY SITE</u>	
3.2.2. <u>TEST KITS FOR WATER SAMPLE ANALYSIS AT THE STUDY SITE</u>	
3.2.3. <u>WATER TESTING REPORT FROM PHEET LAB (SAMPLES BEFORE TREATING I.E. FROM SOURCE WATER &amp; SAMPLES FROM TREATED WATER (JALKALP WATER))</u>	
3.3. <u>METHODOLOGY</u>	
4. <u>RESULT AND DISCUSSION</u> .....	12-26
4.1. <u>LAB RESULT</u>	
4.2. <u>KIT RESULT</u>	
4.3. <u>BIOLOGICAL CONTAMINANTS</u>	
4.4. <u>COMPARATIVE ANALYSIS</u>	
4.4.1. <u>AWARENESS</u>	
4.1.2. <u>BEHAVIOUR</u>	
4.4.3. <u>HEALTH</u>	
5. <u>IMPACT ANALYSIS ON THE BASIS OF JALKALP USERS</u> .....	27-31
5.1 <u>USER ACCEPTABILITY OF JALKALP</u>	
6. <u>SUMMARY AND CONCLUSION</u> .....	32
7. <u>RECOMMENDATIONS AND SUGGESTIONS</u> .....	33
8. <u>REFERENCES</u> .....	34

## **LIST OF TABLES**

TABLE 1: <u>GENERAL INFORMATION</u> .....	5
TABLE 2: <u>LAB ANALYSIS RESULT OF ARSENIC &amp; IRON</u> .....	12
TABLE 3: <u>KIT ANALYSIS RESULT OF ARSENIC AND IRON</u> .....	15
TABLE 4: <u>BIOLOGICAL CONTAMINATION KIT RESULT</u> .....	17
TABLE 5: <u>ORGANIZATIONS RESPONSIBLE FOR INSTALLATION OF JALKALP</u> .....	29
TABLE 6: <u>MATRIX SHOWING USER ACCEPTABILITY OF JALKALP</u> .....	31

## **LIST OF FIGURES**

FIGURE 1: <u>JALKALP</u> .....	3
FIGURE 2: <u>LOCATION MAP</u> .....	5
FIGURE 3: <u>ARSENIC MONITORING KIT</u> .....	7
FIGURE 4: <u>IRON MONITORING KIT</u> .....	8
FIGURE 5: <u>BIOLOGICAL MONITORING KIT</u> .....	9
FIGURE 6: <u>SURVEY FROM THE PEOPLE AT THE STUDY AREA</u> .....	10

## LIST OF GRAPHS

GRAPH 1: <u>ARSENIC (DESIRABLE LIMIT-0.05MG/L) LAB RESULT COMPARISON</u> .....	13
GRAPH 2: <u>IRON (DESIRABLE LIMIT-0.3MG/L) LAB RESULT COMPARISON</u> .....	14
GRAPH 3: <u>ARSENIC (DESIRABLE LIMIT-0.05MG/L) KIT RESULT COMPARISON</u> .....	16
GRAPH 4: <u>IRON (DESIRABLE LIMIT-0.3MG/L) KIT RESULT COMPARISON</u> .....	16
GRAPH 5: <u>BIOLOGICAL CONTAMINATION COMPARISON BETWEEN (MOTOR /HAND PUMP) AND JALKALP SAMPLE</u> .....	18
GRAPH 6: <u>COMPARISON OF WATER QUALITY BETWEEN ALL THE SETS</u> .....	19
GRAPH 7: <u>COMPARISON OF KNOWLEDGE OF METHODS FOR THE PURIFICATION OF WATER</u> .....	20
GRAPH 8: <u>COMPARISON FOR THE SATISFACTION OF WATER QUALITY TEST RESULTS BETWEEN ALL THE SETS</u> .....	21
GRAPH 9: <u>JALKALP SIZE SATISFACTION</u> .....	22
GRAPH 10: <u>USE OF FILTERED WATER FOR DIFFERENT PURPOSES</u> .....	23
GRAPH 11: <u>SATISFACTION LEVEL FOR QUALITY OF JALKALP WATER</u> .....	24
GRAPH 12: <u>COMPARISON FOR THE KNOWLEDGE ABOUT DISEASES BETWEEN ALL THE SETS</u> .....	24
GRAPH 13: <u>COMPARISON FOR THE KNOWLEDGE ABOUT THE METHODS TO PREVENT DISEASES</u> .....	26
GRAPH 14: <u>COMPARISON OF SIZE OF THE JALKALP FOR THE USER SATISFACTION</u> .....	27
GRAPH 15: <u>DETAILS OF USE OF FILTER WATER FOR VARIOUS PURPOSE</u> .....	27
GRAPH 16: <u>SATISFACTION LEVEL OF JALKALP WATER QUALITY</u> .....	28
GRAPH 17: <u>DURATION OF WORKING OF JALKALP</u> .....	29
GRAPH 18: <u>RESPONSES FOR THE QUANTITY OF WATER FILTERED IN A DAY</u> .....	30
GRAPH 19: <u>FREQUENCY OF CLEANING OF JALKALP</u> .....	30

## **ANNEXES**

Annex 1: Lab results .....	35-36
Annex 2: Questionnaires.....	37-49

## ABBREVIATIONS

<b>BIS</b>	Bureau of Indian Standard
<b>GWP</b>	Global Water Partnership
<b>HP</b>	Hand Pump
<b>HWT</b>	Household Water Treatment
<b>IWP</b>	India Water Partnership
<b>NABL</b>	National Accreditation Board for Testing and Calibration Laboratories
<b>PHEET LAB</b>	Public Health Environmental Engineering Trust Laboratory
<b>PPB</b>	Parts Per Billion
<b>RO</b>	Reverse Osmosis
<b>UNICEF</b>	United Nations International Children's Emergency Fund
<b>WTS</b>	Water Treatment System

## **ACKNOWLEDGEMENT**

We are thankful to Regional Office GWP-South Asia Host Institution, International Water Management Institute, Colombo, Sri Lanka, for providing financial support to India Water Partnership (IWP) in 2018 to undertake impact evaluation of Jalkalp filters installed in Samastipur, a flood prone district of Bihar.

We acknowledge support of our network partner; S M Sehgal Foundation for installing Jalkalp filters in 2016-17 under the core project of IWP in Samastipur and East Champaran, the flood prone districts of Bihar and organizing various capacity building programs for awareness generation among local communities towards use of safe drinking water.

We are also thankful to the communities of Samastipur district who supported and cooperated with IWP team during impact evaluation study

We are also grateful to PHEET Lab, Patna, Bihar for testing the water samples collected by IWP from different sources and providing the water quality test results.

## **Executive Summary**

Water treatment technologies provide an interim solution to drinking water. Bio sand filter is one promising household water treatment technology available for this purpose. An impact study was undertaken by India Water Partnership in 2018 in two blocks i.e., Pusa and Samastipur of Samastipur district of Bihar where Jalkalp water filters, a Household Water Treatment equipment were installed by S M Sehgal Foundation (one of the IWP network partners). Samastipur a flood prone district is spread over an area of 2904 sq. kms. The district is bounded on the north by the Bagmati River which separates it from Darbhanga district. On the west it is bordered by Vaishali and some part of Muzaffarpur district, on the south by the Ganges, while on its east it has Begusarai and some part of Khagaria district. Objectives of the impact study was to determine the long-term filtration efficiency and the rate of sustained use of Jalkalp water filter. Field methods included Arsenic, Iron and biological contamination of water testing and interviews with Jalkalp filter users with respect to operation, maintenance and perceptions towards the filters and with non-filter users regarding the sensitization and awareness building sessions conducted in 2016 & 2017 in Samastipur and East Champaran district by S M Sehgal Foundation. For impact study, three sets of questionnaires were administered among the users of Jalkalp filter to determine risk factors for different water borne diseases, and water samples were taken from the household of users who already uses Jalkalp. Sampling was done from the main source of water and Jalkalp water to compare the difference of water quality before and after Jalkalp water filter installation in the user households. This report also reviews the problems identified at the site and the need of the Jalkalp water filter for improving the water quality in the selected villages of two above said blocks of Samastipur district.

**KEYWORDS:** Water Treatment Technology, Bio Sand Filter, Drinking Water, Water Quality, Household Water Treatment, Jalkalp, Biological Contamination, etc.

## **PREFACE**

Jalkalp Filters (a form of Household Water Treatment) were installed in 2016-17 in Samastipur and East Champaran, the two flood prone districts of Bihar by SM Sehgal Foundation (one of IWP network partners) after several awareness building and sensitizations programs.

To determine the rate of sustained use, efficacy and users satisfaction of Jalkalp filter and assess the impact of awareness and capacity building program, an impact evaluation study of Jalkalp Filter was conducted in Samastipur district of Bihar in 2018 by India Water Partnership (IWP)

The research methods used for evaluation included household interviews with the help of structured questionnaires, water sample collection from the sources from which the community fetch water for drinking, and; water quality testing of Iron, arsenic and biological contaminants present in the water sources. The impact evaluation study is focusing on users and non-users of Jalkalp water filter.

The findings of the impact evaluation are presented in this report in following pages.

## **1. INTRODUCTION:**

The incidence of high concentrations of arsenic, iron and biological contamination in drinking-water has emerged as a major public-health problem. Over 200 million people in more than 70 countries are probably affected by arsenic poisoning of drinking water. The problem became serious health concern after mass poisoning of water in Bangladesh. Arsenic contamination of ground water is found in many countries throughout the world, including the US.

Waterborne disease is a global burden which is estimated to cause more than 2.2 million deaths per year and higher cases of illness every day, including diarrhea, gastrointestinal diseases and systematic illnesses. About 1.4 million children die with water borne diseases. It is presumed that waterborne diseases have an economic cost associated of 1 billion dollars annually only in the United States. Worldwide, an economic loss of nearly 12 billion US dollars per year is estimated. Waterborne infections are caused by ingestion, airborne or contact with contaminated water by a variety of infectious agents which includes bacteria, viruses, protozoa and helminths. About 780 million people of the World do not have access to a purified water source, and an estimated 2.5 billion people lack access to improved sanitation worldwide. It is estimated that 3.2% of deaths globally are attributable to unsafe water caused by poor sanitation and hygiene. The World Health Organization has reported that improving water quality can reduce the global disease burden by approximately 4%. Thus, there is an urgent need to undertake all possible measures to overcome this problem.

The state of Bihar in India has emerged as one of the new arsenic and iron hotspots. Arsenic contamination of shallow aquifers in Holocene Ganges River sediments in the State of Bihar was first detected in 2002. An estimated 25% of the 103.8 million population of Bihar is exposed on a daily basis to arsenic-contaminated drinking and indirectly through irrigation water. Shallow irrigation bore wells of Bihar are proving to be major conduits of this metalloid in the environment through which arsenic has entered into the food chain. Arsenic contamination in water occurs through both natural and anthropogenic causes. It can be found in surface and groundwater through dissolution from rocks, minerals and ores or due to industrial effluents. Evidence suggests that consumption of water contaminated with arsenic is associated with development of cancer particularly skin, lung and bladder.

Iron is another abundant metals on earth and vital for living organisms. Presence of iron in water increases the hazard of pathogenic organisms, since many of these organisms require iron to grow. Deficiency and excess of iron in the body leads to health hazards like anaemia and hemochromatosis. Iron content in water over permissible limits is found across 23 districts of Bihar, Rajasthan, Tripura and West Bengal. High iron content in water makes it taste astringent and may stain laundry and utensils. Water borne diseases caused by pathogens have an adverse health impact and leads to malnutrition and low immunity levels.

The project undertaken by IWP with support of its network partner; S M Sehgal Foundation in 2016-17 has been able to sensitize the village communities around the poor quality of water and its impact on the human health. Community Members responded well to these sensitization and awareness building

training programs on behaviour change in terms of water safety and storage practices; and adopting the Jalkalp water filter as a solution for household water treatment for safe drinking water and caring for the safety of water sources.

## **1.1 HOUSEHOLD WATER TREATMENT (HWT)**

Household water treatment is an action that happens at the point of water collection or use, rather than at a large centralized location. HWT methods have proved to be more worthy than centralized treatment. It improves water quality and reduces the burden of waterborne diseases in poor communities in developing countries.

HWT is cheaper and cost effective as they require no operation and maintenance cost and have no recurring expenditure or replacement of parts, these can be developed faster and are easy to maintain than centralized drinking water treatment system (WTS); wide range of simple, low cost HWT technologies are available so people can choose the technologies most appropriate for them.

HWT introduces no chemicals into the water that may affect use due to objections about taste and odour, are easy to use, and improve the water quality, thus encouraging the use without extensive intervention to promote behavioural change.

## **1.2 THE BIOSAND FILTER (JALKALP WATER FILTER)**

Bio-sand filter (known as Jalkalp filters) is a precast concrete, which removes 98.5 per cent of the biological contaminants, iron, and turbidity from water. S. M. Sehgal Foundation (an IWP network partner) further redesigned it to suit Indian conditions by integrating the germicidal properties of copper to remove 100 per cent of the biological impurities and zerovalent iron technology to remove arsenic from water. The stainless steel model, being light in weight, makes it more portable on village roads and hilly locations. It has no operation and maintenance cost, no energy cost and no replacement of the parts neither any chemical required or no any recurring expenditure. Jalkalp filter can treat 18-20 litres of water in each pour and the filtration rate is 0.75 litres/minute. A low cost Jalkalp filter costs Rs 3,000. People who are using Jalkalp filter have realized that it is very cheap and sustainable solution to address the arsenic, iron and biological contamination in water.



**Fig.1:- Jalkalp Filter**

### **1.3 EXAMPLE - CASE STUDY OF BIO SAND FILTER**

To better understand the bio sand filter concept we are sharing here the example of Kovilambakkam village Chennai where, bio sand filters modified with addition of zeolites (clinoptilolite). The complete filter had six zones which plays a role during the filtration process. From the result it was concluded that the concentration of almost all the elements were within the permissible limits as per Bureau of India Standards (BIS). Water samples were tested for biological parameters before filtration from BSF and it was found that the presence of pathogens were very high and after filtration it was found E.coli, Total coliform bacteria and Faecal Streptococcus were completely removed. Unlike other treated water, the water filtered with bio sand filter proved to be safe. The bio sand filter being a low cost technology, can be operated with zero energy is need of the hour for the rural areas where power cuts/shortages are experience.

## **2. OBJECTIVES**

The main objectives of the impact evaluation study were:

- To examine sustained use of Jalkalp water filter;
- To analyse efficacy of Jalkalp water filter as low cost solution to drinking water;
- To determine the users' satisfaction of Jalkalp water filter; and,
- To determine the impact of awareness and capacity building programs conducted in 2016-17 for behaviour change amongst the community of the project area.

### 3. The Study

#### 3.1 Study area description

Samastipur is a district in Bihar which is spread over an area of 2904 sq. kms. Samastipur is located at 25.85° N 85.78° E. It has an average elevation of 39 meters (127 feet). Samastipur is bounded on the north by the Bagmati River which separates it from Darbhanga district. On the west it is bordered by Vaishali district and some part of Muzaffarpur district, on the south by the Ganges, while on its east it has Begusarai district and some part of Khagaria district.

The people of Samastipur mainly speak Hindi. According to the 2011 census, population density in the District is 1465 per sq.km. and the total population is 4.25 million. The district comprises of 4 subdivisions, and 20 blocks. It has one Nagar Parishad (Samastipur) and two Nagar Panchayats (Dalsinghsarai & Rosera).

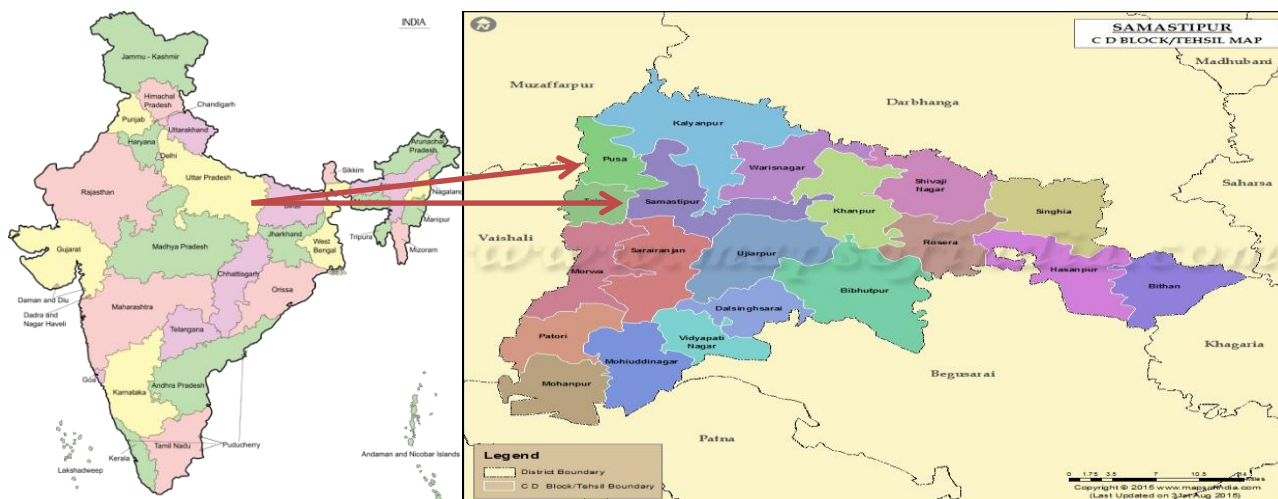


Fig 2: - Location Map

Table 1:- General Information

Sl. No	General Information	Statistics
1	Geographical Area	2905
	1.Administrative Divisions No. of Panchayats/Villages Number of Tehsil/Block	4
	2.Population (As per 2011 Census)	Total: 4261566 Rural: 4113769 Urban: 147797
	3.Average Annual Rainfall (mm)	1142
2	Geomorphology	
	1. Major Physiographic Units	Gangetic Alluvium
	2. Major Drainages	Budhi Gandak, Kosi, Baya, Kamla, Kareh, Jhamwari and Balan

The study area covered two blocks of Samastipur district i.e., Samastipur (37 villages) block and Pusa (99 villages) block with total population of 479,041 as per the Census 2011. The impact evaluation study included 98 beneficiaries of Jalkalp water filters from 12 villages out of 136 villages of above two blocks. They are mainly dependent on agriculture. The source of drinking water in their household is mainly ground water from various sources like hand pump, bore wells or wells. They are also dependent partly upon water supply from the Government sources.

Most of the people accepted that the colour, taste and smell of water is bad and not suitable for drinking or other purposes. They are facing a severe health issues due to bad quality of water. During the survey the people who have accepted Jalkalp told about the benefits in the form of health and other things like saving of monthly cost for the water. 52% of people thought that Jalkalp is very costly. After attending various awareness building programs conducted in 2016-17, they were convinced for the installation of Jalkalp. They were also made aware about the cost benefit of the Jalkalp which saves their monthly expenses on water.

## **3.2 STUDY TOOLS**

- Structured questionnaires (**3 sets.**).
- Test kits for water sample analysis in the field.
- Water testing report from PHEET lab.

The details of study tools are given below:

### **3.2.1 Structured Questionnaires**

For the study of the impact assessment of Jalkalp filter, three sets of questionnaires were prepared and the details of the same are given below:-

- Set-1, Total respondent 32 people (Who did not attend sensitization and awareness building sessions and also not adopted Jalkalp filter)
- Set-2, Total respondent 32 people (Attended sensitization and awareness building sessions but not adopted Jalkalp filter)
- Set-3, Total respondent 34 people (Attended sensitization and awareness building sessions and adopted Jalkalp filter)

### **3.2.2 Test kits for water sample analysis at the study site.**

Iron, Arsenic and Biological Contamination of the water quality were performed at the site by the help of field kits (based on the base-line survey earlier undertaken by S M Sehgal Foundation).

These kits are handy and useful for the field analysis of water sample. Arsenic monitoring kit for the analysis of arsenic in the water, Jal-TARA mini test kit for the analysis of iron and TARA Aqua check vial for the analysis of biological contamination were used. Descriptions of the kits are given below:-

### 3.2.2.1 Arsenic Monitoring Kit

Arsenic monitoring kit is a hand held kit for the analysis of arsenic in water at the study site.

#### Instruction For use

1. Insert filter plug into the cavity (change the plug after every 10 test).
2. Put 2 drops of reagent C in the filter plug (only when filter plug is changed).
3. Add 50 ml measured water sample into the bottle.
4. Insert detector tube into the rubber tube such that the arrow mark points upwards.
5. Add reagent A (Blue cap).
6. Gently swirl bottle for one minute.
7. Add reagent B (Red cap).
8. Immediately close with screw cap till finger tight (do not shake the bottle).
9. Pink stain formed on the detector tube within 10 minutes, indicates the arsenic concentration of the sample.
10. Read arsenic concentration directly in PPB.

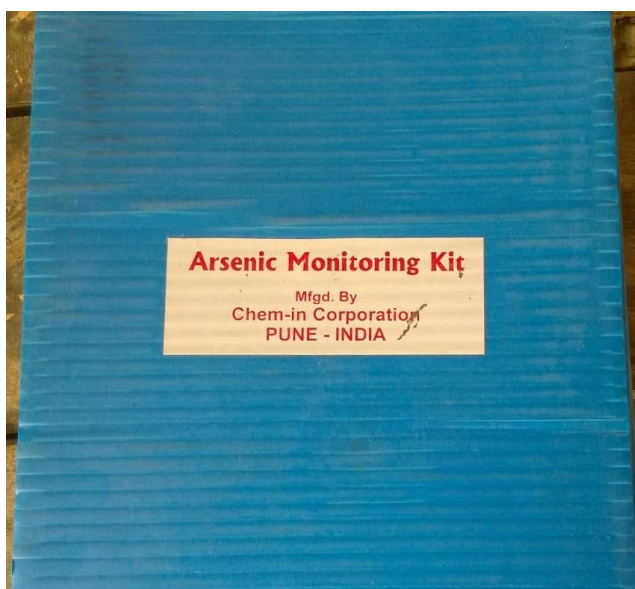


Fig 3: Arsenic Monitoring Kit

### 3.2.2.2 Jal- TARA Mini Test Kit

Jal- TARA Mini Test Kit is a hand held kit for the analysis of iron in water at the study site. Kit Contains: - One glass cylinder, two small spoon, Reagent Fe- A (Red spoon) Reagent Fe-B (White spoon).

#### Instruction for use

1. Rinse the glass cylinder with sample water before starting the test twice.
2. Take 20 ml sample in graduated cylinder.
3. Add half spoon of reagent Fe-A with red spoon. Mix well to dissolve the reagent.
4. Add half spoon of reagent Fe-B with white spoon. Mix well to dissolve the reagent.
5. Wait for five minutes and compare the developed colour with standard colour chart. Colour match has to be done vertically i.e. from above the test tube.
6. Record the corresponding value.

#### Precautions

1. Rinse the glass cylinder with sample water before starting the test twice
2. After adding each reagent, mix well by shaking glass cylinder
3. If the sample is turbid, make it clear by filtering it through the filter paper.
4. Take one full spoon of both reagents( keep reagent level flat in spoon to get accurate quantity
5. Please note if ambient sample temperature is below 15 degree centigrade wait for 15 minutes for full colour development
6. Use separate colour spoon for reagent ( Fe-A-Red & Fe-B- White)
7. Keep reagents bottle with closed lids to prevent from air moisture.



Fig 4: Iron monitoring kit

### 3.2.2.3 Tara Aqua check Vials

TARA Aqua check is highly reliable and very simple to use, and can be utilised to taste water quality even at household level, to test the presence of pathogenic bacteria in the water supply. TARA Aqua check has been prepared as per the quality control guidelines of UNICEF, New Delhi.

#### Procedure

Fill water in the aqua check vial up to the mark given on the bottle.

Left it for 24-48 hours at room temperature (between 25-44°C).

If the colour of water turns black, the water will be contaminated with pathogenic bacteria and not used for drinking.



Fig 5: Biological monitoring kit

### 3.2.3 Water testing report from PHEET lab

For the water quality analysis of arsenic and iron, samples were collected and sent to the PHEET Laboratory<sup>1</sup> Patna (Bihar) for testing and lab results were obtained. These lab reports are very important study tools for the impact study.

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<sup>1</sup> PHEET Laboratory is a Public Health Environmental Engineering Trust, an ISO 9001-2008 Certified & NABL-T-3829 Accredited & Consultant Lab for State / Central Government/ COMFED & other Several Cooperate Bodies. Recognized by Central pollution Control Board, New Delhi vide Order No B-15015/1/2004-AS/3902 March 3-2004.

### **3.3 METHODOLOGY**

The methodology adopted for the impact evaluation study is as under:

- Survey of samples are based on three sets of questionnairesComparative analysis of results.
- Analysis of water sample by test kits at the study site.
- Analysis of water sample in an approved laboratory (PHEET Lab.)

#### **3.3.1 Survey of samples through three sets of questionnaires**

For the impact assessment of Jalkalp filter at the study site, three sets of questionnaires were administered with the respondents. These questionnaire were developed for the survey related with various factors like health, behavioural changes, water quality, awareness and convincing level. These surveys were very effective and clearly show the current situation of water quality and awareness of people regarding the health and, knowledge about the Jalkalp filter as observed at the study site.

#### **3.3.2 Comparative analysis of results**

Comparative analysis of result were done by the datasheet prepared with the help of filled-in questionnaires. On the basis of datasheet all the parameters like health, behavioural changes, water quality, awareness and convincing level were analysed. The result from the comparative analysis shows that people who were less aware regarding the Jalkalp are more aware now and also know the health benefits from the Jalkalp. The study also observes that in the study area 30-40% people are still not aware about the Jalkalp and its benefits. So there is need to provide awareness generation programs for these people.



Fig 6:- Survey from the people at study area

#### **3.3.3 Analysis of water sample in an approved laboratory (samples before treating i.e. from source water & samples from treated water (Jalkalp water)).**

For the impact assessment study sampling of water from the households of Jalkalp users were done at the study site. Total 30 samples were collected from the households, 15 from Jalkalp water and 15 from source water (i.e., Hand pump or motor) and were provided to the PHEET Lab,

Patna for testing Iron and Arsenic contained in the sample. The methods used for the testing of Arsenic was **IS: 3025(P-37)-1988/2003** and for Iron was **IS: 3025(P.53)-1964 /2**. The details of the lab reports are given in the result and discussion.

#### **3.3.4 Analysis of water sample by test kits at the study site.**

For the impact assessment study, sampling of water from the households of Jalkalp users were done at the study site. Total 38 samples were collected from the households, 19 from Jalkalp water and 19 from source water (i.e., Hand pump or motor) and tested by the help of kits at the study site for Arsenic and iron contained in the sample. The details of the kits are already given in the study tools.

## 4 RESULT AND DISCUSSION

From the water quality result of the study area, it was observed that the presence of Biological contamination, Arsenic and Iron in ground water is higher than the desirable limit but in the Jalkalp water the concentration of biological contamination, arsenic and iron is very less and under the desirable limit. It shows that Jalkalp is 100% efficient for the removal of iron from the water. Details for the arsenic and iron concentration in water based on lab result is given below:

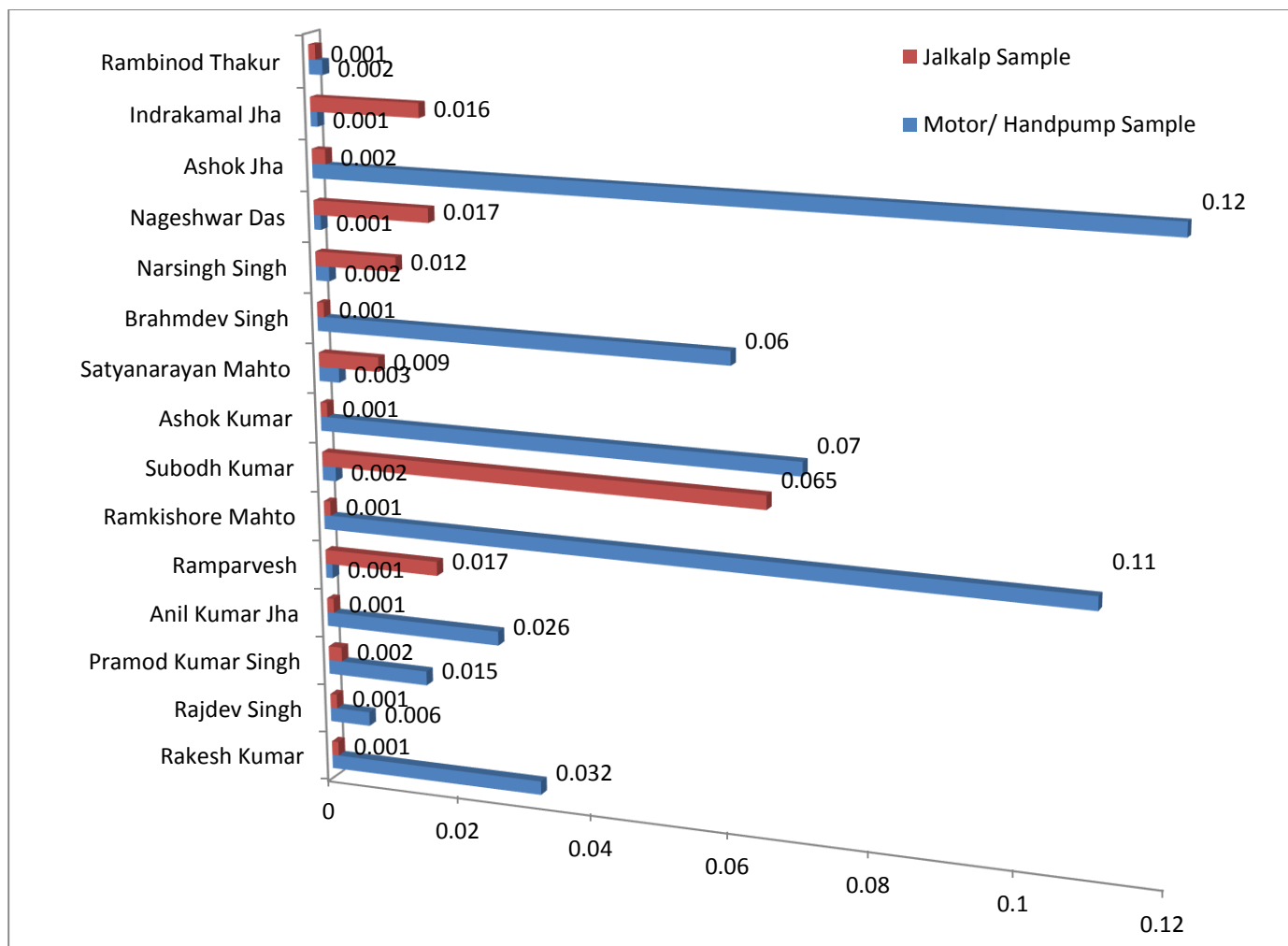
### 4.1 LAB RESULT

Lab test results of sample collected from users of Jalkalp filter indicates that, concentration of Arsenic & Iron in hand pump water is higher than the permissible limit whereas the sample taken from Jalkalp has very less concentration. Thus, it shows that Jalkalp is 100% efficient for the removal of Arsenic & Iron from the water. Details of the lab result are given below:-

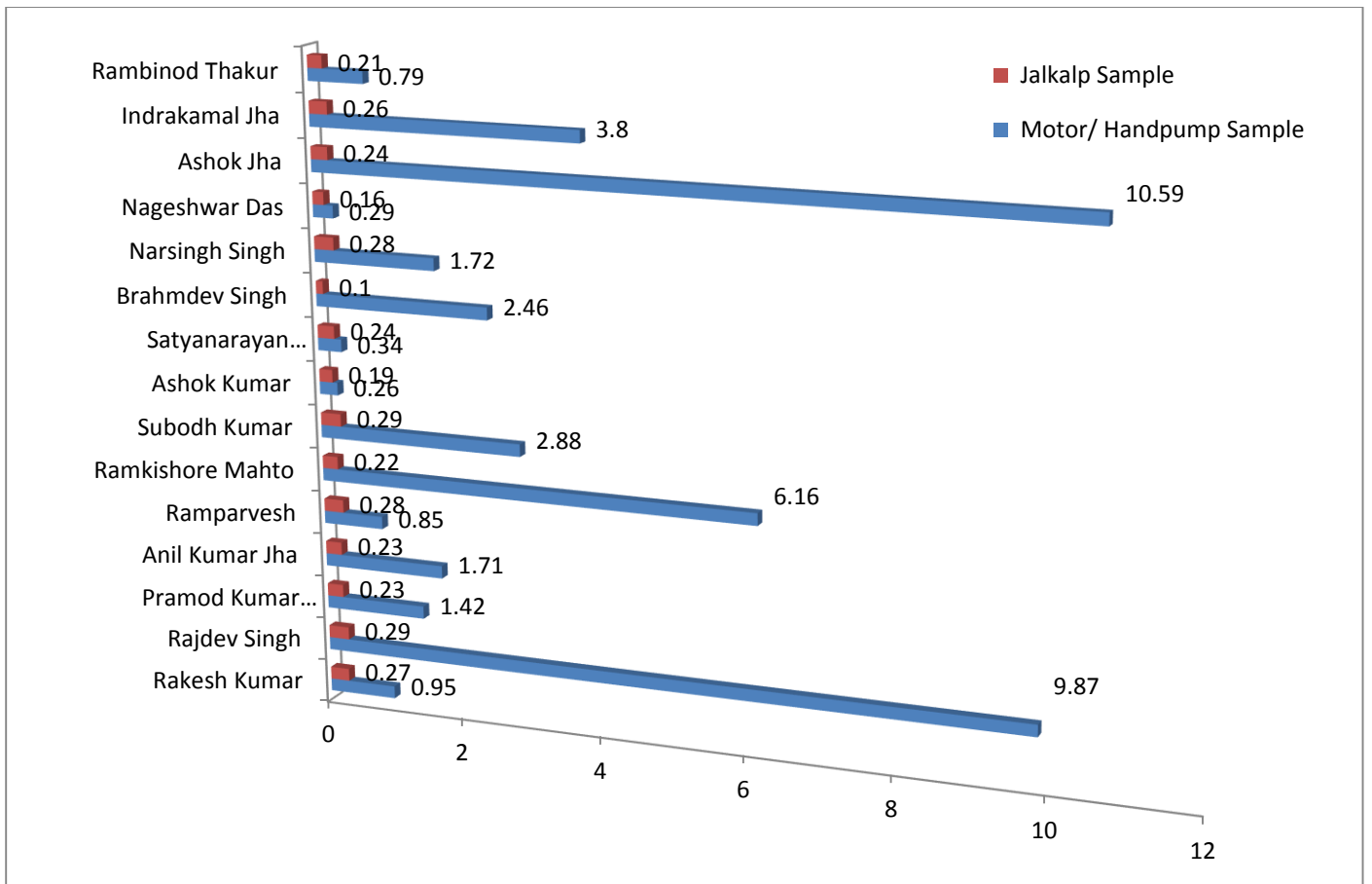
Table 2:- Lab Analysis Result of Arsenic & Iron

S.No	Beneficiary name	Village	source (1)	Depth (In Feet)	Result(Iron) Desirable limit (0.3mg/l)	Result (Arsenic) Desirable limit (0.01-0.05mg/l)	Source (2)	Result (Iron)Desirable limit (0.3mg/l)	Result (Arsenic) Desirable limit(0.01-0.05 mg/l)
1	Rakesh Kumar	Chak Haji	Motor	280	0.95	0.032	Jalkalp	0.27	0.001
2	Rajdev Singh	Chandouli	Chapakal	60	9.87	0.006	Jalkalp	0.29	0.001
3	Pramod Kumar Singh	Kumhada	Chapakal	95	1.42	0.015	Jalkalp	0.23	0.002
4	Anil Kumar Jha	Gopalpur	Chapakal	85	1.71	0.026	Jalkalp	0.23	0.001
5	Ramparvesh	Thahra	Motor	80	0.85	0.017	Jalkalp	0.28	0.001
6	Ramkishore Mahto	Patepur	Chapakal	80	6.16	0.011	Jalkalp	0.22	0.001
7	Subodh Kumar	Patepur	Motor	120	2.88	0.065	Jalkalp	0.29	0.002
8	Ashok Kumar	Morsand Malpur	Motor	100	0.26	0.009	Jalkalp	0.19	0.001
9	Satyanarayan Mahto	Morsand Chowk	Chapakal	90	0.34	0.009	Jalkalp	0.24	0.003
10	Brahmdev Singh	Morsand Karmila	Motor	80	2.46	0.06	Jalkalp	0.1	0.001
11	Narsingh Singh	Morsand Karmila	Chapakal	60	1.72	0.017	Jalkalp	0.28	0.012
12	Nageshwar Das	Rupnarayanpur Bela	Motor	72	0.29	0.002	Jalkalp	0.16	0.001
13	Ashok Jha	Raghunathpur Bela	Chapakal	70	10.59	0.12	Jalkalp	0.24	0.002
14	Indrakamal Jha	Raghunathpur Bela	Motor	90	3.8	0.016	Jalkalp	0.26	0.003
15	Rambinod Thakur	Jagdishpur Rami	Motor	0	0.79	0.002	Jalkalp	0.21	0.001

Graph 1 and 2 for the concentration of arsenic & iron in hand pump water and Jalkalp water is given below.



**Graph1:- Arsenic Concentration (Desirable limit-0.05mg/l) comparison between Motor/Hand pump and Jalkalp sample**



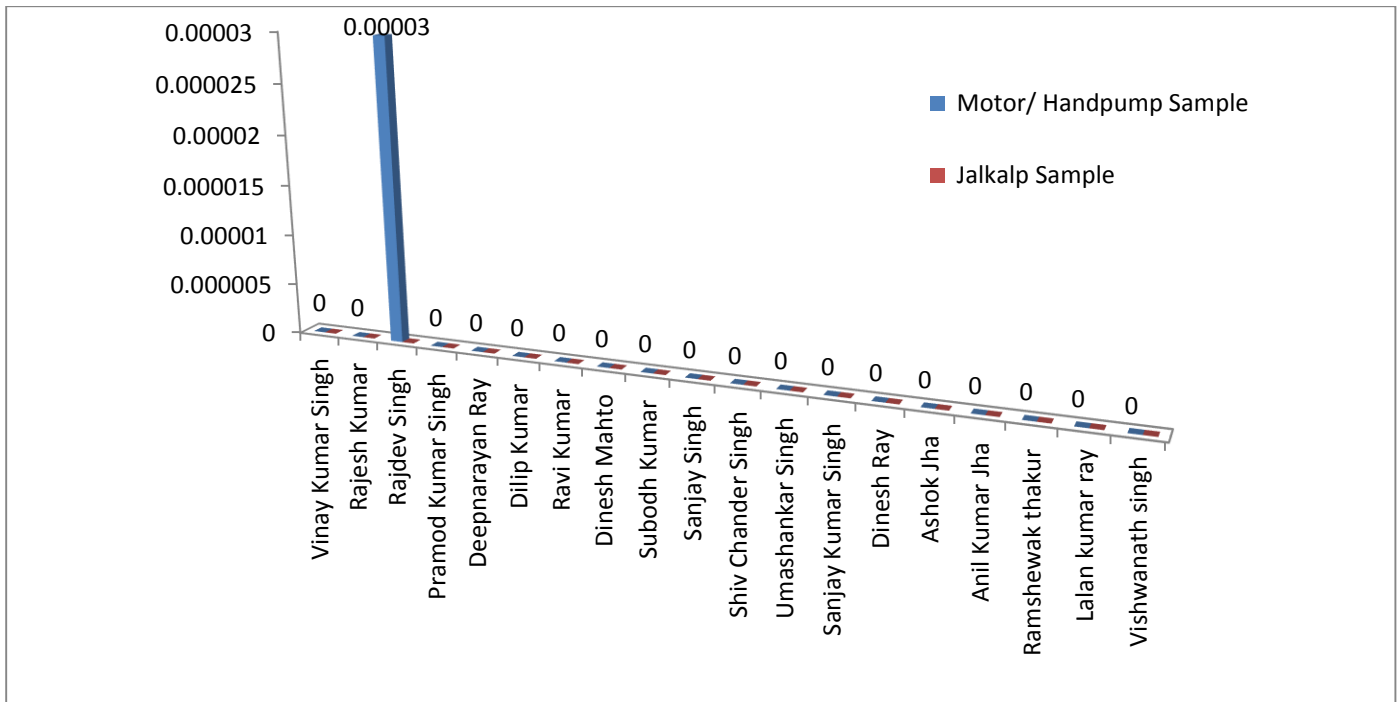
**Graph 2:- Iron (Desirable limit-0.3mg/l) comparison between Motor/Hand pump and Jalkalp sample**

## 4.2 KIT RESULT

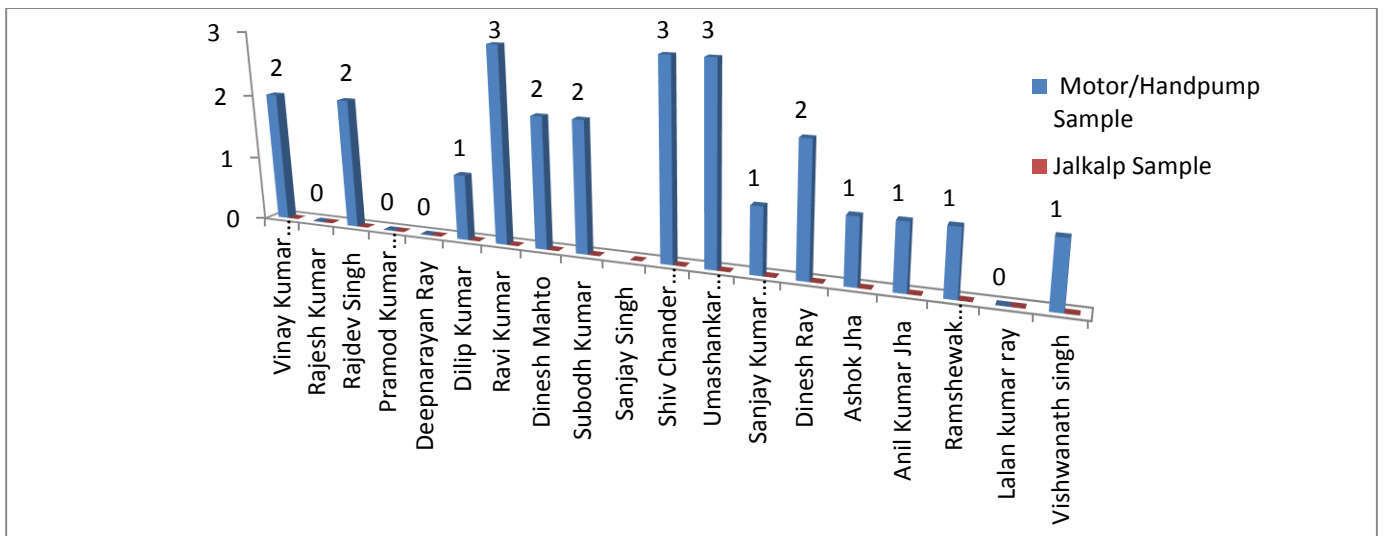
For the analysis of Arsenic, iron and biological contamination in water, 38 sample were taken from the 19 beneficiary's households. Hand held Arsenic monitoring kit for the analysis of arsenic & Jal-TARA mini test kit for iron were selected for the analysis of sample. On the basis of presence and absence of colour, iron was identified in the water sample. In Motor or hand pump sample both Arsenic and iron were found to be present but in the Jalkalp sample, both arsenic and iron was found absent. Results are given in Table 3 and Graph 3 and 4 below.

**Table 3: - Kit analysis Result of Arsenic and Iron**

S.No.	Village/Tolla	Beneficiary Name	Source 1	Depth (Feet)	Arsenic ppb	in ppm	Iron mg/l	Source 2	Arsenic ppb	in ppm	Iron mg/l
				Source-1 : Hand Pump (HP) & Motor)				Source 2: Jalkalp			
1	Chaka Haji	Vinay Kumar Singh	HP	130	0	0	2	Jalkalp	0	0	0
2	Chaka Haji	Rajesh Kumar	Motor	120	0	0	0	Jalkalp	0	0	0
3	Chandouli	Rajdev Singh	HP	70	0.03	0.00003	2	Jalkalp	0	0	<0.3
4	Kumhada	Pramod Kumar Singh	HP	95	0	0	0	Jalkalp	0	0	0
5	Gopalpur	Deepnarayan Ray	HP	70	0	0	0	Jalkalp	0	0	0
6	Thahra	Dilip Kumar	HP	80	0	0	1	Jalkalp	0	0	0
7	Thahra	Ravi Kumar	Well	110	0	0	3	Jalkalp	0	0	0
8	Patepur	Dinesh Mahto	HP	85	0	0	2	Jalkalp	0	0	0
9	Patepur	Subodh Kumar	HP	55	0	0	2	Jalkalp	0	0	0
10	Morsand Malpur	Sanjay Singh	HP	30	0	0		Jalkalp	0	0	0
11	Morsand Karmila	Shiv Chander Singh	HP	120	0	0	3	Jalkalp	0	0	0
12	Morsand Karmila	Umashankar Singh	HP	60	0	0	3	Jalkalp	0	0	0
13	Rupnarayanpur Bela	Sanjay Kumar Singh	HP	80	0	0	1	Jalkalp	0	0	0
14	Rupnarayanpur Bela	Dinesh Ray	HP	75	0	0	2	Jalkalp	0	0	0
15	Ragunathpur bela	Ashok Jha	HP		0	0	1	Jalkalp	0	0	0
16	Raghunathpur Bela	Anil Kumar Jha	HP	80	0	0	1	Jalkalp	0	0	0
17	Jagdishpur Rami	Ramshewak thakur	HP	80	0	0	1	Jalkalp	0	0	0
18	Jagdishpur Rami	Lalan kumar ray	HP	90	0	0	0	Jalkalp	0	0	0
19	Jagdishpur Rami	Vishwanath singh	HP	80	0	0	1	Jalkalp	0	0	0



Graph 3:- Arsenic (Desirable limit-0.05mg/l) Comparison between Motor/Hand pump and Jalkalp sample



Graph 4:-Iron (Desirable limit-0.3mg/l) Comparison between Motor/Hand pump and Jalkalp sample

### 4.3 BIOLOGICAL CONTAMINANTS

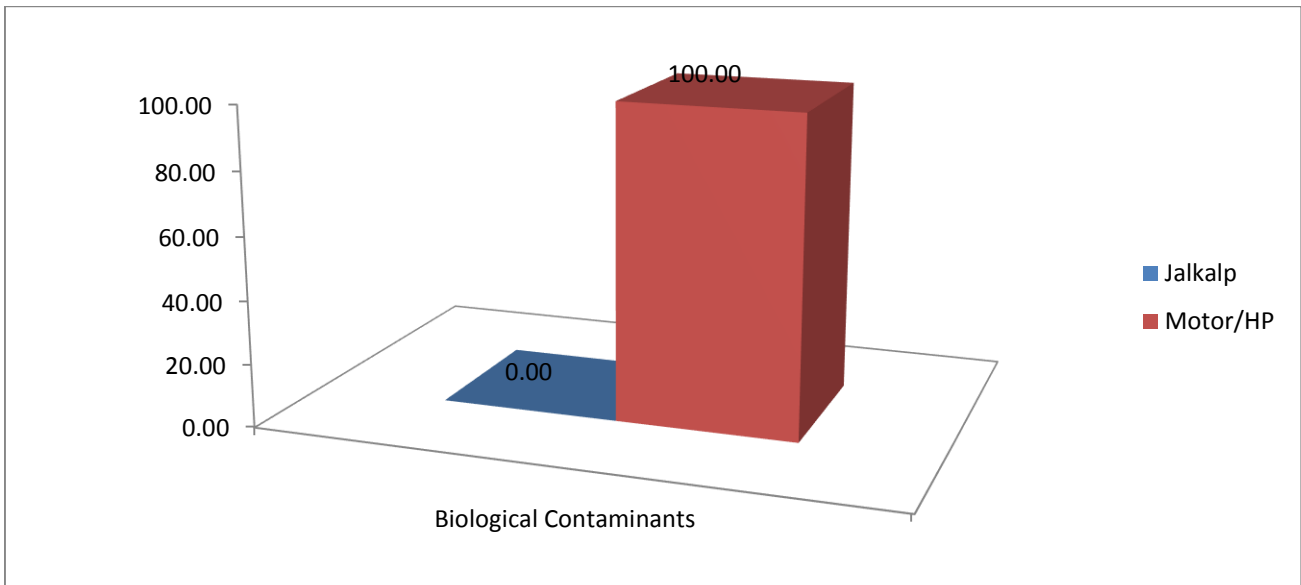
For the biological contamination TARA Aqua check Vial were used. For this the samples were taken in the vials and were kept for 24 hours. After 24 hours the samples showed only count presence and absence of the contaminants (as per the BIS standard) from the beneficiary’s households. The table and graph below shows that there are 100% biological contaminants in Source-1 (HP, Motor & well), whereas no

(0%) biological contaminants were found in Jalkalp water. The details for the biological contamination is given below in Table 4 and Graph 5:-

**Table 4:- Biological Contamination Kit Result**

S.No.	Beneficiary name	Village	Block	Source (1)	Depth (In Feet)	Biological Contaminants	Source (2)	Biological Contaminants
1	Rakesh Kumar	Chak Haji	Samastipur	Motor	280	Yes	Jalkalp	No
2	Rajdev Singh	Chandouli	Pusa	HP	60	Yes	Jalkalp	No
3	Pramod Kumar Singh	Kumhada	Pusa	HP	95	Yes	Jalkalp	No
4	Anil Kumar Jha	Gopalpur	Pusa	HP	85	Yes	Jalkalp	No
5	Ramparvesh	Thahra	Pusa	Motor	80	Yes	Jalkalp	No
6	Ramkishore Mahto	Patepur	Pusa	HP	80	Yes	Jalkalp	No
7	Subodh Kumar	Patepur	Pusa	Motor	120	Yes	Jalkalp	No
8	Ashok Kumar	Morsand Malpur	Pusa	Motor	100	Yes	Jalkalp	No
9	Satyanarayan Mahto	Morsand Chowk	Pusa	HP	90	Yes	Jalkalp	No
10	Brahmdev Singh	Morsand Karmila	Pusa	Motor	80	Yes	Jalkalp	No
11	Narsingh Singh	Morsand Karmila	Pusa	HP	60	Yes	Jalkalp	No
12	Nageshwar Das	Rupnarayanpur Bela	Samastipur	Motor	72	Yes	Jalkalp	No
13	Ashok Jha	Raghunathpur Bela	Samastipur	HP	70	Yes	Jalkalp	No
14	Indrakamal Jha	Raghunathpur Bela	Samastipur	Motor	90	Yes	Jalkalp	No
15	Rambinod Thakur	Jagdishpur Rami	Samastipur	Motor	80	Yes	Jalkalp	No
16	Vinay Kumar Singh	Chaka Haji	Samastipur	HP	130	Yes	Jalkalp	No
17	Rajesh Kumar	Chaka Haji	Samastipur	Motor	120	Yes	Jalkalp	No
18	Rajdev Singh	Chandouli	Pusa	HP	70	Yes	Jalkalp	No
19	Pramod Kumar Singh	Kumhada	Pusa	HP	95	Yes	Jalkalp	No
20	Deepnarayan Ray	Gopalpur	Pusa	HP	70	Yes	Jalkalp	No
21	Dilip Kumar	Thahra	Pusa	HP	80	Yes	Jalkalp	No
22	Ravi Kumar	Thahra		Well	110	Yes	Jalkalp	No
23	Dinesh Mahto	Patepur	Pusa	HP	85	Yes	Jalkalp	No
24	Subodh Kumar	Patepur	Pusa	HP	55	Yes	Jalkalp	No
25	Sanjay Singh	Morsand Malpur	Pusa	HP	30	Yes	Jalkalp	No
26	Shiv Chander Singh	Morsand Karmila	Pusa	HP	120	Yes	Jalkalp	No
27	Umashankar Singh	Morsand Karmila	Pusa	HP	60	Yes	Jalkalp	No
28	Sanjay Kumar Singh	Rupnarayanpur Bela	Samastipur	HP	80	Yes	Jalkalp	No
29	Dinesh Ray	Rupnarayanpur Bela	Samastipur	HP	75	Yes	Jalkalp	No
30	Ashok Jha	Raghunathpur Bela	Samastipur	HP		Yes	Jalkalp	No
31	Anil Kumar Jha	Raghunathpur Bela	Samastipur	HP	80	Yes	Jalkalp	No
32	Ramshewak Thakur	Jagdishpur Rami	Samastipur	HP	80	Yes	Jalkalp	No
33	Lalan kumar ray	Jagdishpur Rami	Samastipur	HP	90	Yes	Jalkalp	No
34	Vishwanath Singh	Jagdishpur Rami	Samastipur	HP	80	Yes	Jalkalp	No

NOTE: - Biological contaminants as per BIS standard.



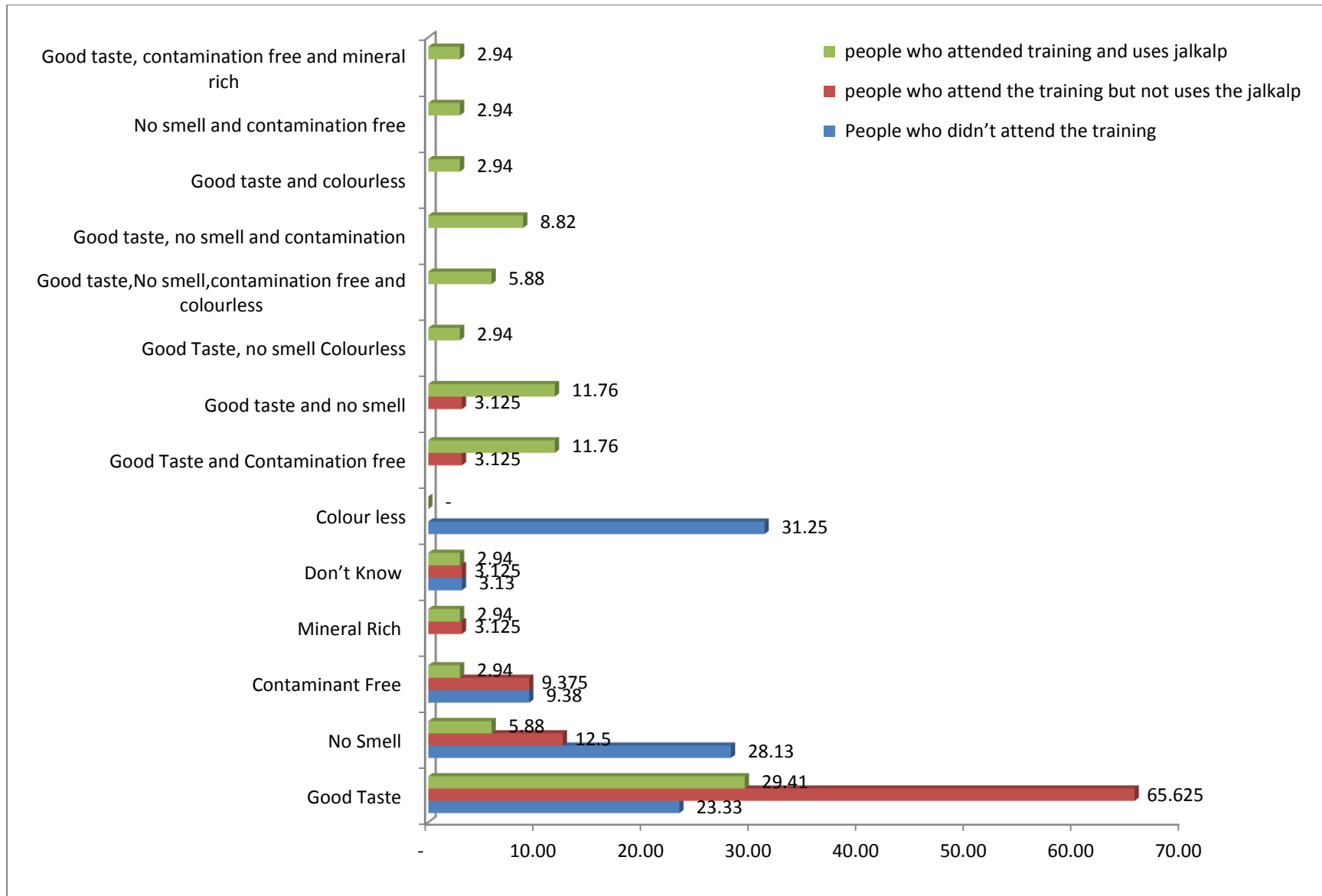
**Graph 5:- Biological Contamination comparison between (Motor /Hand pump) and Jalkalp sample**

#### **4.4 COMPARATIVE ANALYSIS**

For the comparative analysis of data based on the questionnaires some parameters were selected like awareness, behaviour and health for detailed analysis. These parameters were common between all the three sets of respondents. On the basis of the interviews and result from all the sets, percentage of the people were calculated for the impact study.

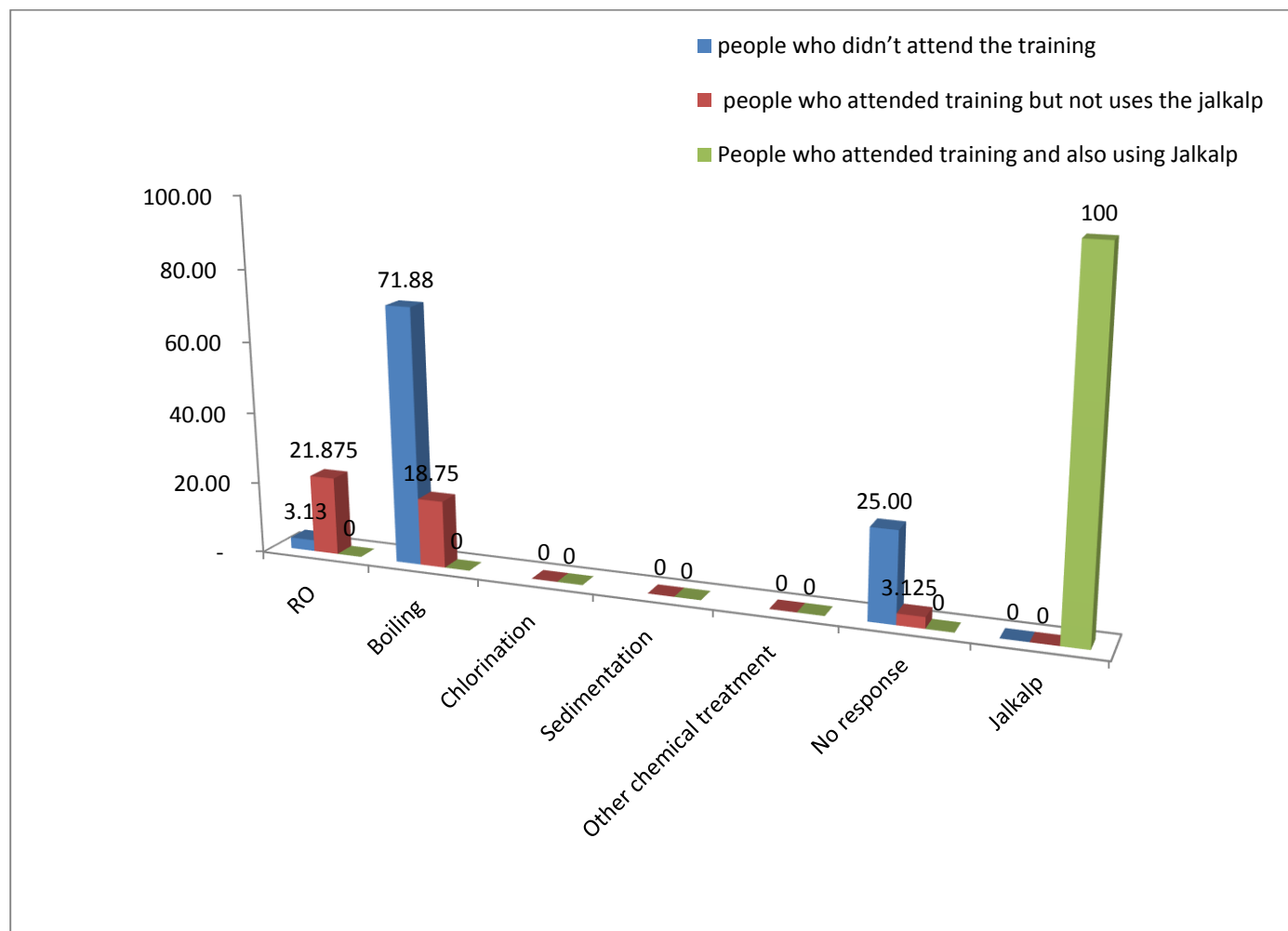
##### **4.4.1 AWARENESS**

For the comparative analysis of awareness level in the people, all the three sets were compared. Comparison shows that 31.25% of the people from set-1 who did not attend the training considered only colourless water as a safe drinking water whereas 66% people from set-2 who attended training sessions considered good taste for water to be safe and people from set-3 who also attended training and using Jalkalp have given multiple response indicated that all parameters for water are safe. Details are given below in the Graph-6:-



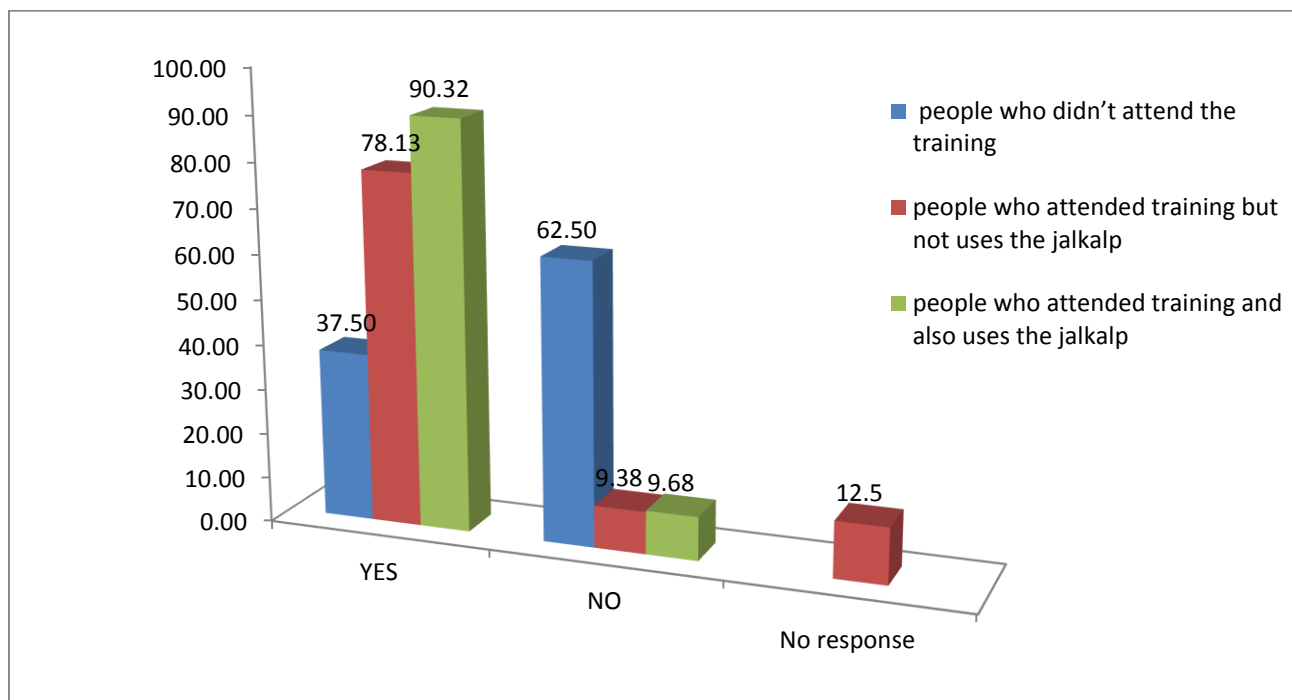
Graph 6:-Comparison of water quality between all the sets

Graph-7 below shows that 71.88% from set 1 (respondents who did not attend any training of awareness building program) uses boiling for purification of water and only 3.13% uses R.O whereas 21.87% of people from set-2 (the people who attended the training but not adopted Jalkalp) are using the R.O and only 18.75% of people are using boiling. 100% of respondents of set-3 indicated that they use only Jalkalp Filter for water purification.



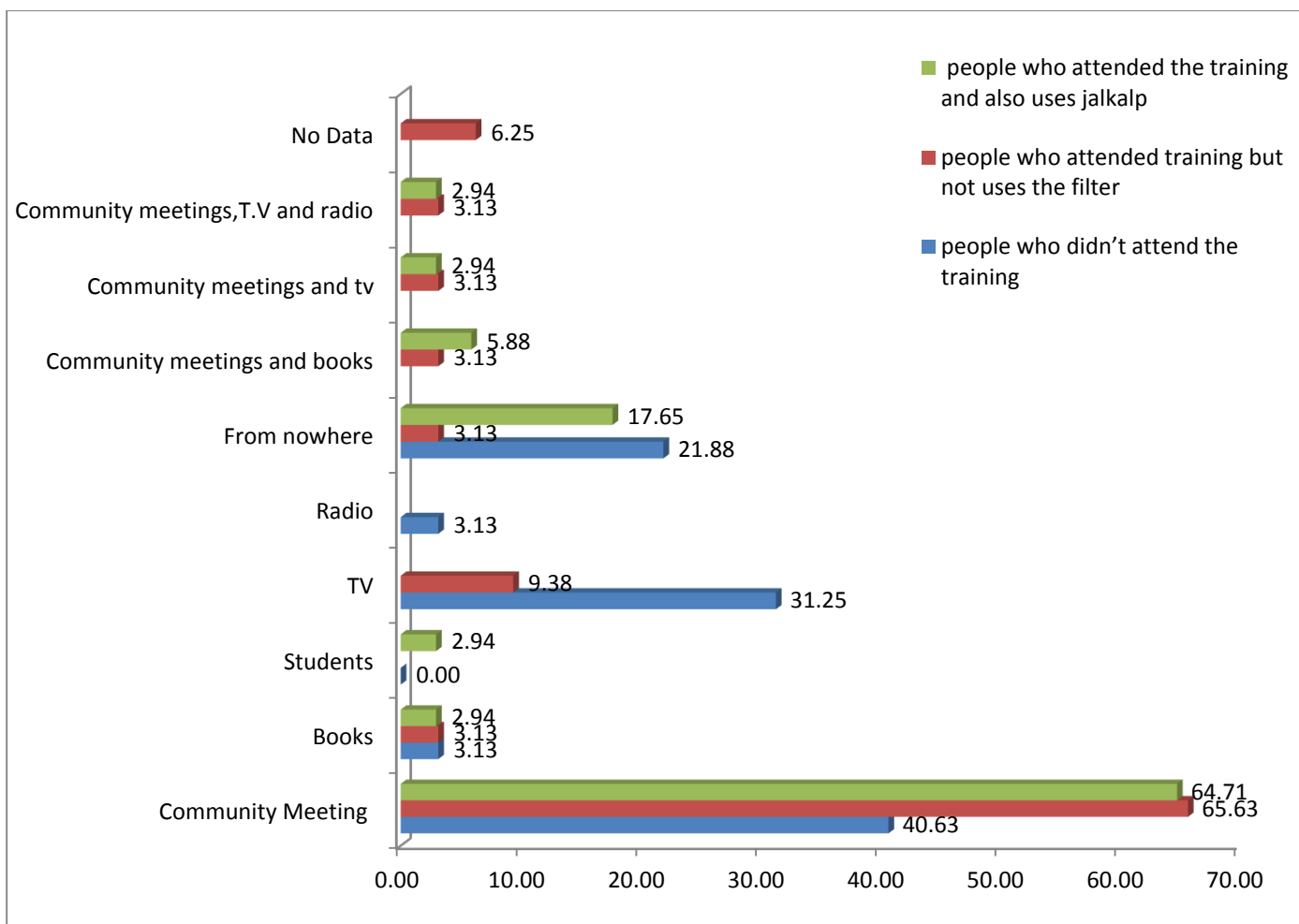
**Graph 7:-Comparison of knowledge of methods for the purification of water**

As per the Graph-8 below 90.32% of respondents who had adopted Jalkalp filters were satisfied with the result of their water test whereas 62.50% of respondents were not satisfied because they didn't attend any awareness training. But 12.5% people had no any response.



**Graph 8:- Comparison for the satisfaction of water quality test Results between all the sets**

Graph-9 shows that during the survey 64.71% respondents from set-3 (people who attended the training and also uses Jalkalp), 65.63% respondents from set- 2 (people who attended training but not uses the filter) and 40.63% respondents set-1 (people who didn't attend the training) informed that the community meeting was the source of knowledge for the awareness where as 31.25% respondents (people who didn't attend the training) informed that the source of knowledge was TV.



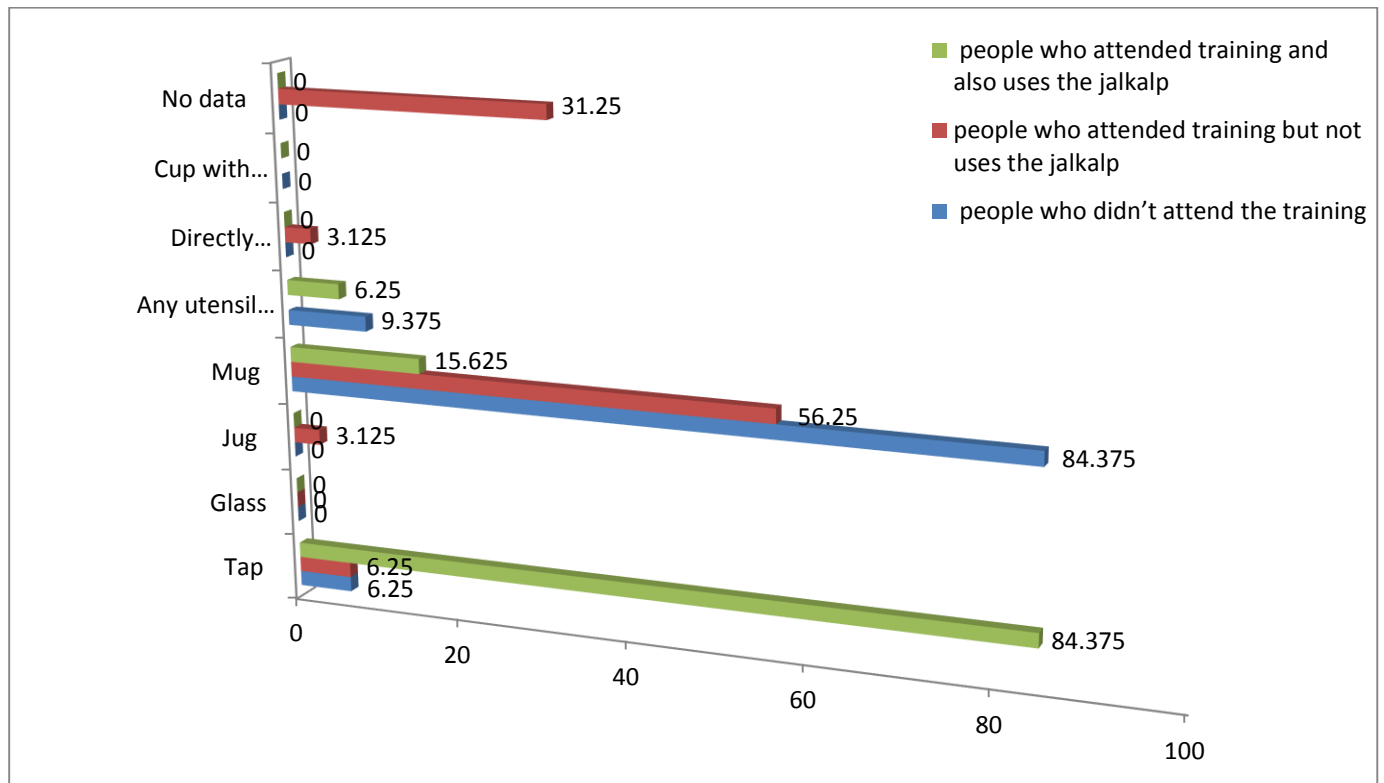
Graph 9:- Comparison for the source of Knowledge between all the sets

“**Brahmdeo Mahto**, village Gopalpur, District Samastipur told that through the training conducted by S M Sehgal Foundation, he learnt that biological contamination can cause waterborne diseases. He himself was suffering from dysentery and gastric trouble for a few months. After training, he started drinking boiled water which improved his health condition. Later on he installed the Jalkalp water filter at his home and after that his sufferings-have reduced. Now he keeps talking to other villagers about the importance of safe drinking water and water filter.”

“**Ashok Kumar Singh**, village Morsand Malpur, District Samastipur told that he used to suffer from gastric and other digestion related issues frequently. During the training he got to know that this could be because of water quality. He also learnt about the different types of contamination and their ill effects on human health after that he installed Jalkalp filter at his home. Now he does not have any stomach related issues. He also says that the food cooked with filtered water taste is better than earlier.”

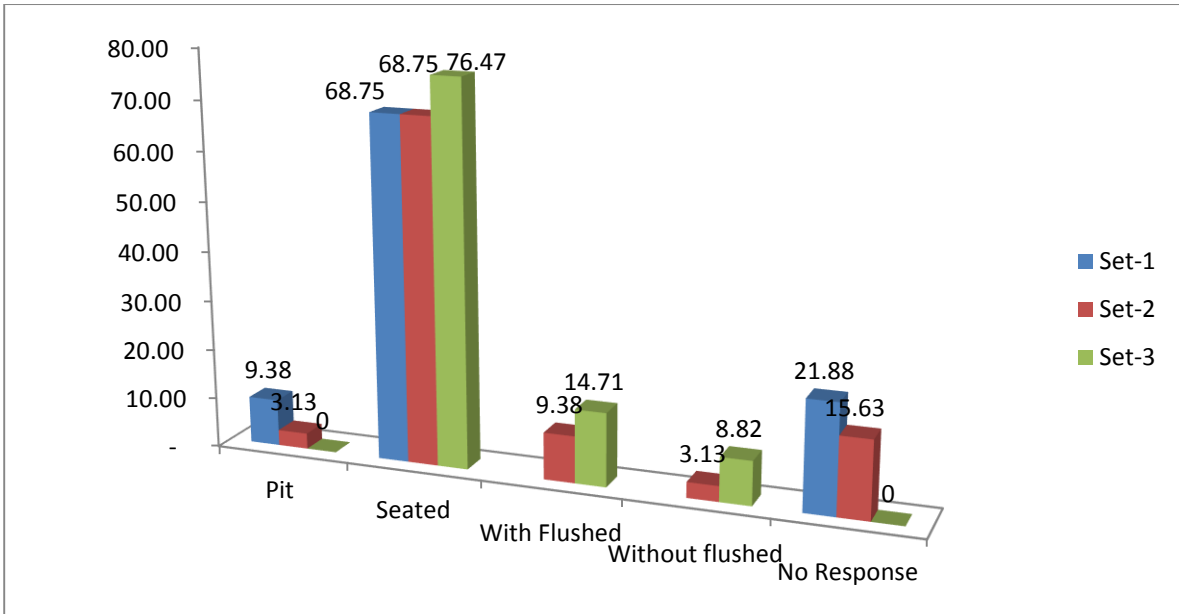
#### 4.4.2 BEHAVIOUR

As per the Graph-10 below 84.37% people from set 3 uses tap to take out water because they are using Jalkalp and are aware about the contamination of water due to unsafe handling. They directly take the water from the tap whereas 84.37% people from set 1 uses mug to take water directly from the storage tank because they don't have Jalkalp and not aware about the safe handling and use of water.



Graph 10:- Comparison for the safe handling of water between all the sets

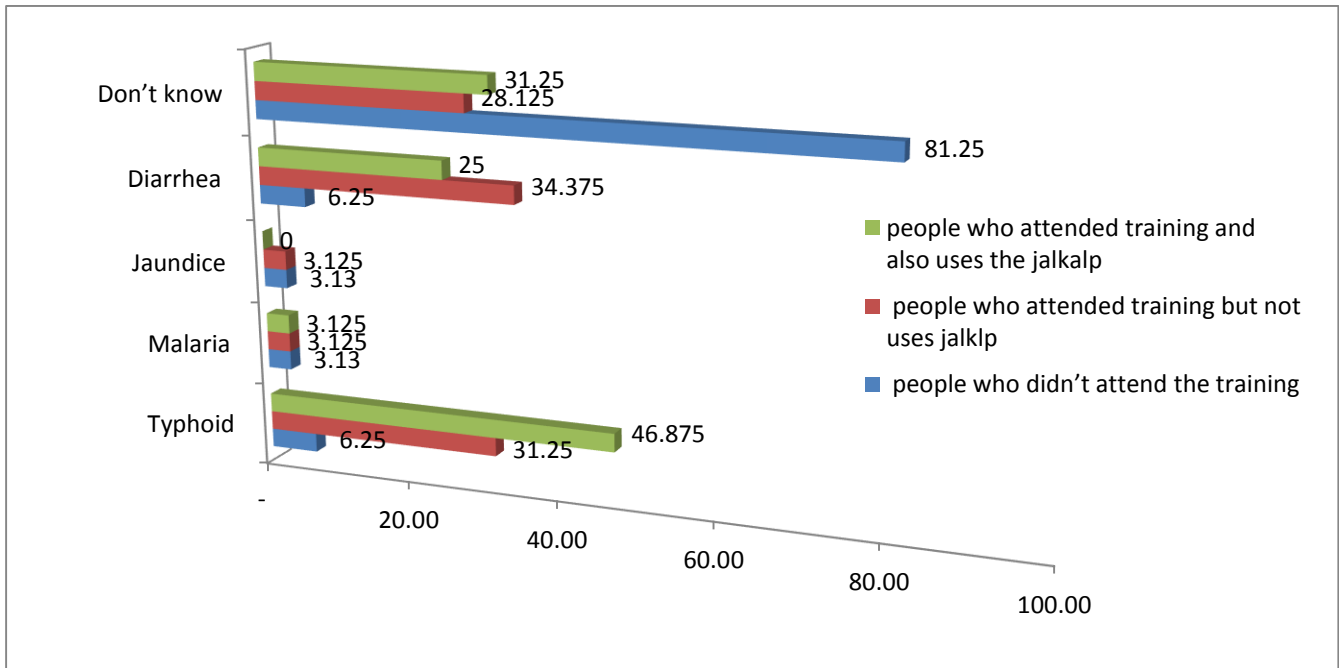
As per the Graph-11, 76.47% people from set 3 uses seated toilet whereas from set 1 & 2 only 68.75% people uses the seated toilet. This data clearly shows that people from set 3 who attended awareness and capacity building training and using Jalkalp are more aware about health and hygiene.



Graph 11:- Comparison for the toilet use between all the sets

### 4.4.3 HEALTH

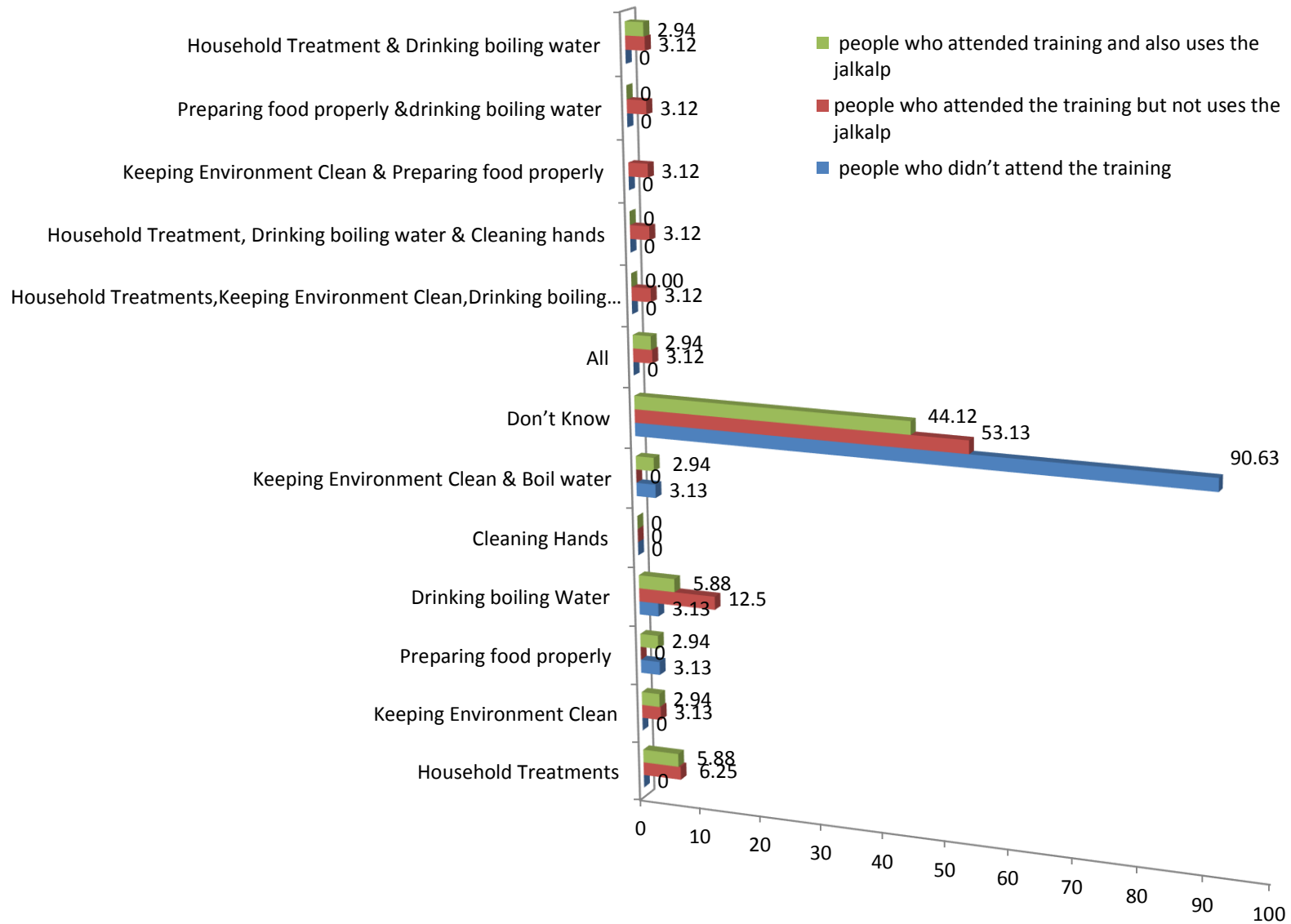
Graph-12 shows that 81.25% of people from the set 1 who did not attend any awareness and capacity building training have no idea about the prevailing diseases due to unsafe water and their reasons whereas the other people from set 2 and set 3 who attended the training have multiple response about the diseases because they have idea about all the diseases and their reasons.



Graph 12:- Comparison for the knowledge about diseases between all the sets

Graph-13 shows that 90.63 % of people who did not attend any awareness and capacity building training have no idea about the methods to prevent the diseases whereas the other people who attended the training and also uses Jalkalp have knowledge about various methods to prevent the diseases.

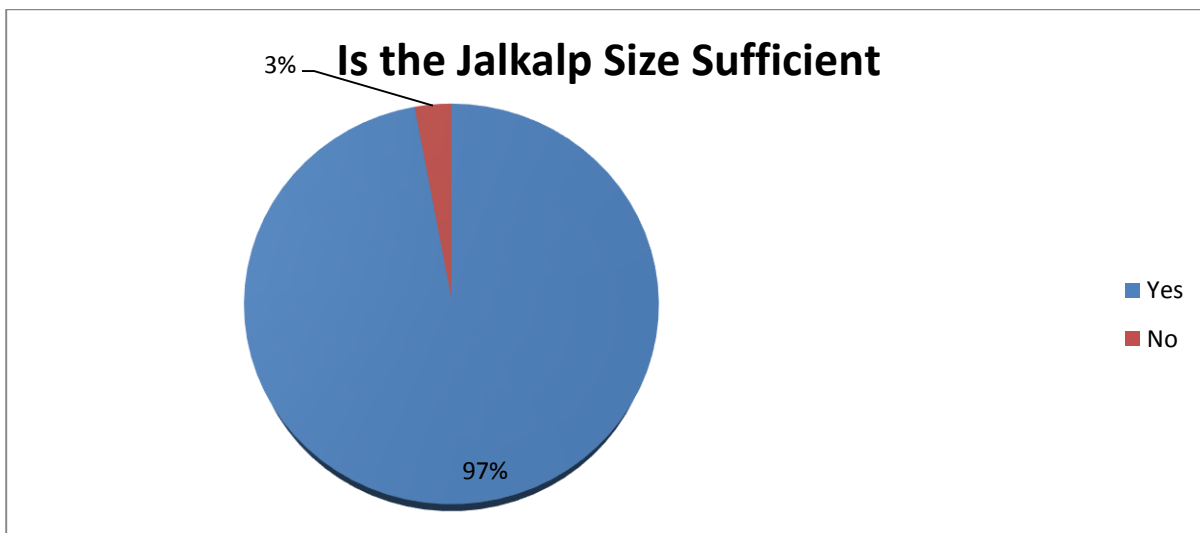
**“Subodh Kumar Mahto**, village Patepur, District Samastipur says during the training we came to know about the biological, chemical and physical impurities in water that can make us sick. I bought a Jalkalp water filter and have been using filtered water for last two months. The taste of water is much better than I used earlier from other sources and the stomach problems which were very common earlier have reduced drastically.”



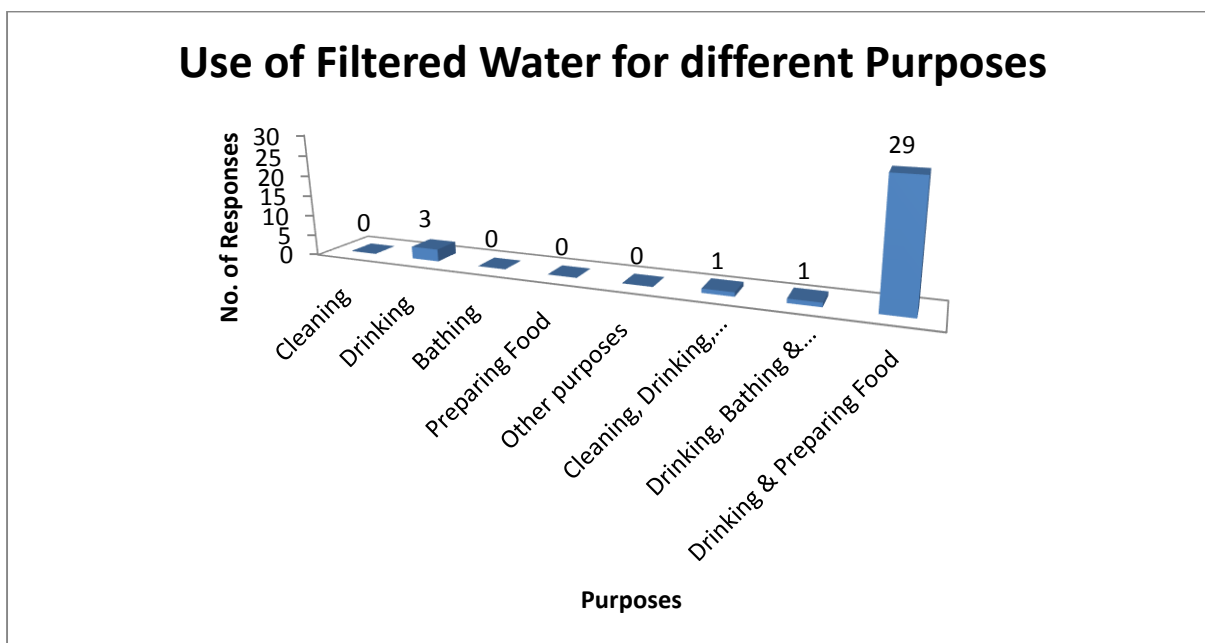
Graph 13:- Comparison for the knowledge about the methods to prevent diseases

## 5 IMPACT ANALYSIS ON THE BASIS OF JALKALP USERS

- Out of the 98 respondents who participated in the survey, 34 adopted the Jalkalp. Out of 100 % of the Jalkalp filter users (97%) are satisfied with the size of Jalkalp, While 3% said that it should be bigger because they use Jalkalp water for various purposes like cleaning, drinking, bathing and other purposes. For more details graph 14 and 15 are given below:-

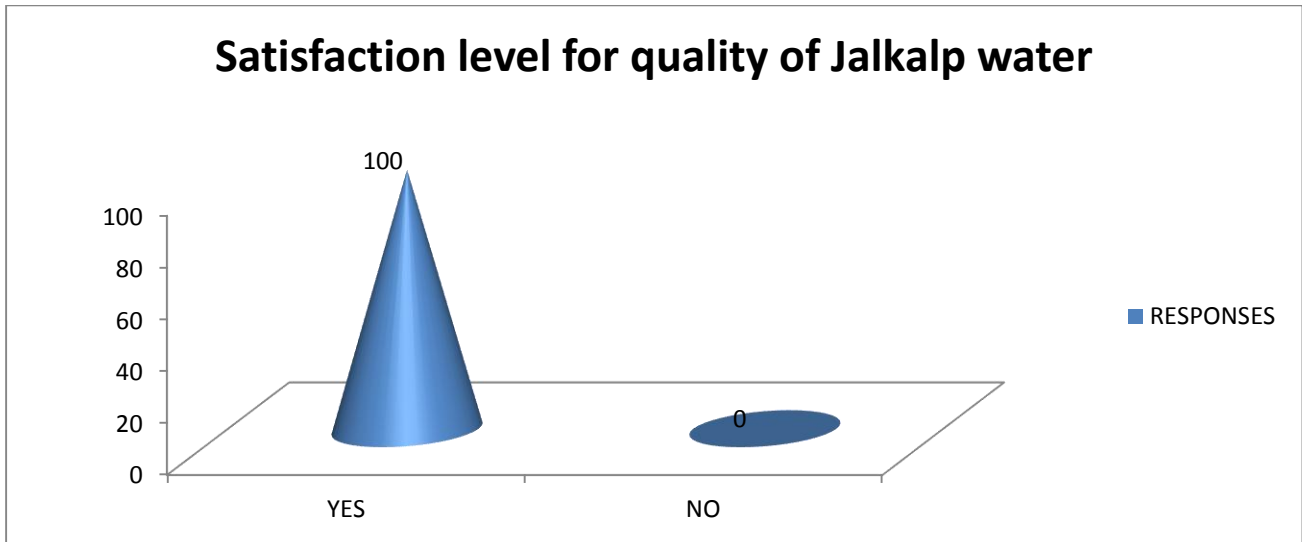


Graph 14:- Comparison of size of the Jalkalp for the user satisfaction



Graph 15:- Details of use of filter water for various purpose

- 100 % users are satisfied with the quality of Jalkalp water and recommended for use by others. Details are given below in Graph 16:-

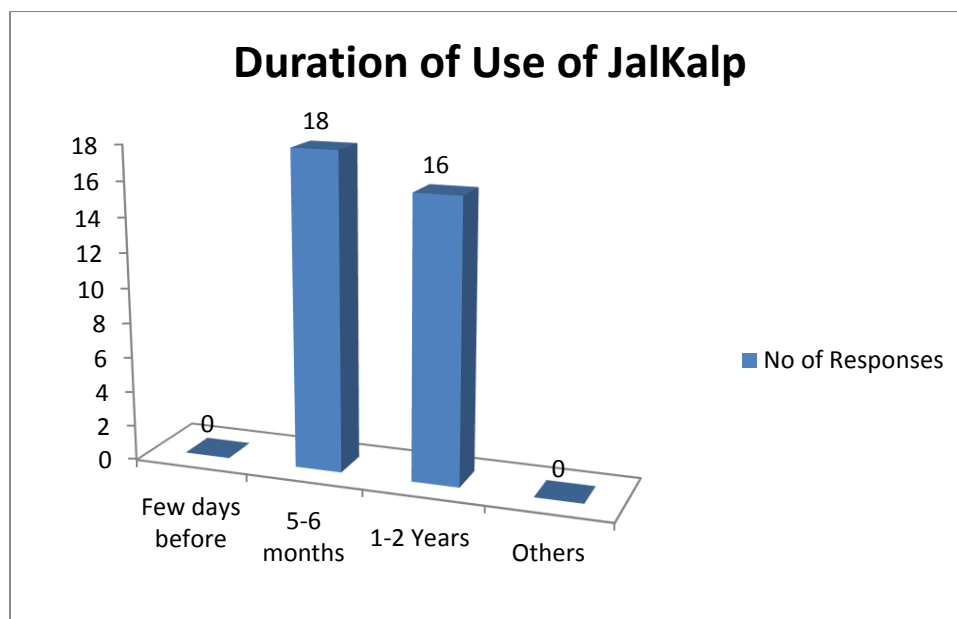


Graph 16:- Satisfaction level of Jalkalp water quality

“**Reema Devi**, Jagdishpur Rami, District Samastipur told that before using Jalkalp she was suffering from acidity and stomach pain but after using Jalkalp water her gas problem was reduced automatically and her health condition improved. She is 100% satisfied with the Jalkalp filter. According to her the maintenance of this filter is very easy and there is no operational cost involved in it.”

## 5.1 WORKING OF JALKALP

52.94 % (18 people) out of 100% (34 people) respondents are using the Jalkalp from 5-6 months while, 47.05% respondents (16 people) are using it from years (1-2 years). According to them Jalkalp is working properly in their households. Due to its steel body there is no any chances of damage or rusting in the filter body.



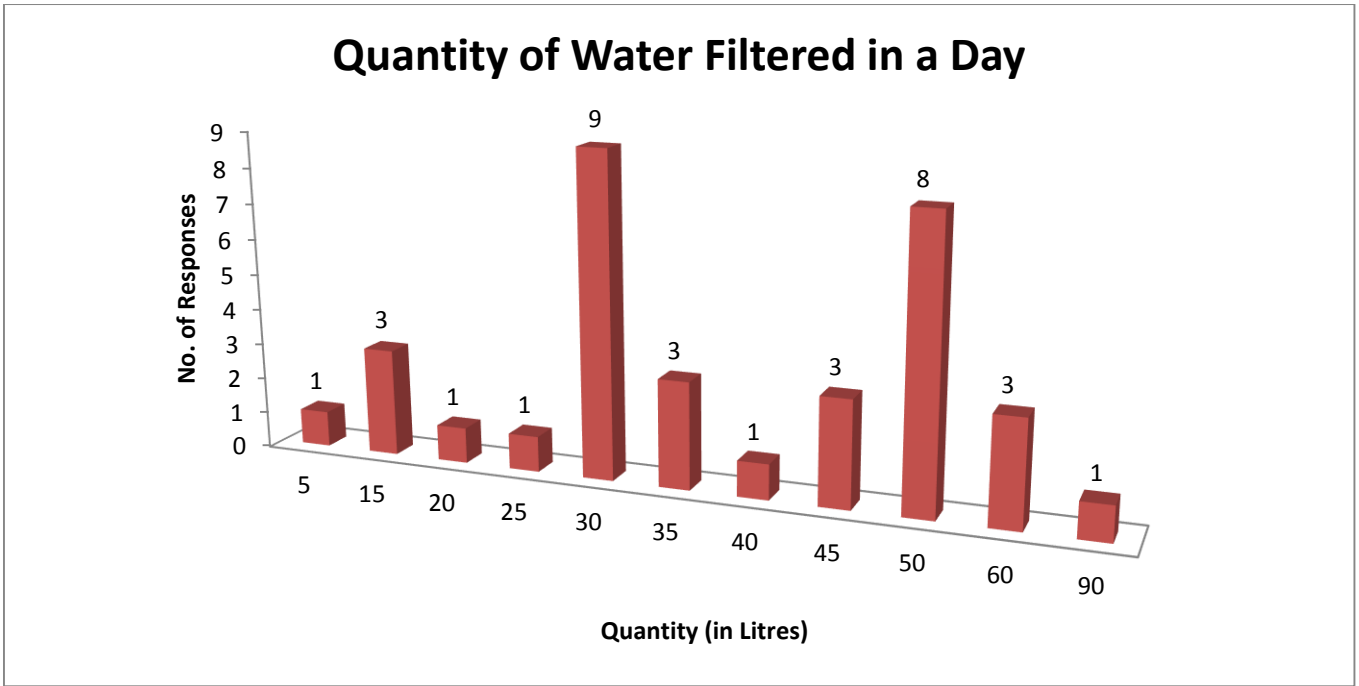
Graph 17:- Duration of working of Jalkalp

- All the respondents confirmed that the Jalkalp filters were installed by the Organization member (i.e. SM Sehgal Foundation & IWP) details are given below in the table:

Table-5 Organizations responsible for Installation of Jalkalp

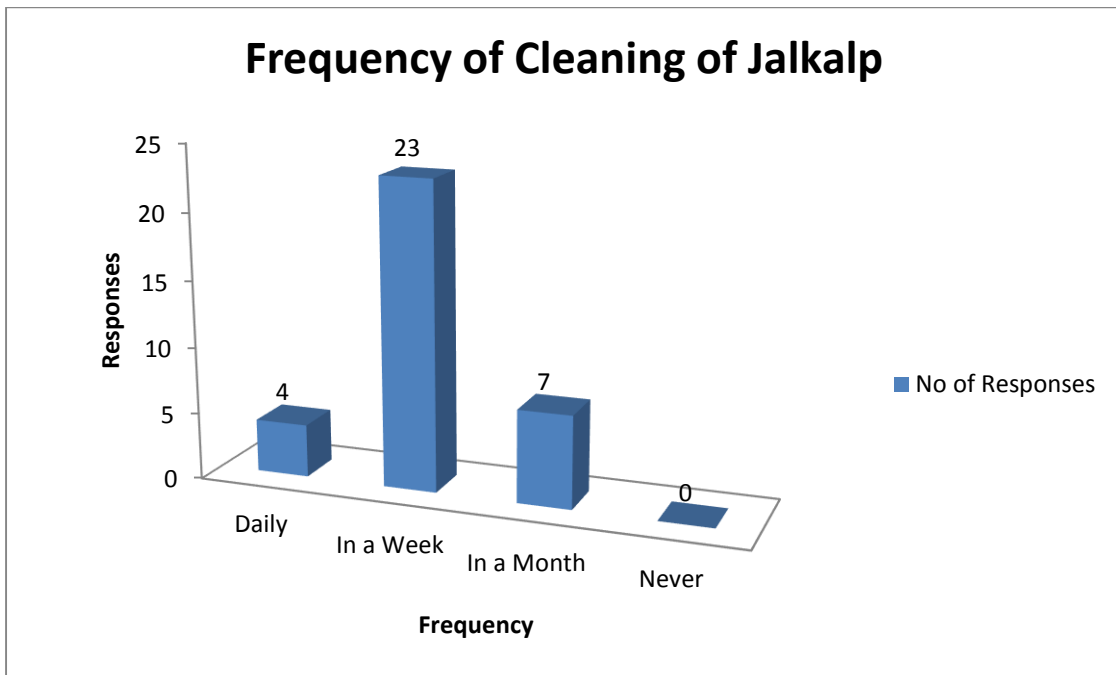
Who installed Jalkalp in your House?	Responses
Self-installed	0
Community member	0
Organization Member	34
Any plumber from the community	0

- According to the respondents Jalkalp can filter minimum 5 litres water in a day whereas maximum 90 litres of water can filter by the Jalkalp in a day. For more details table and graph is given below:-



**Graph 18: Responses for the quantity of water filtered in a day**

Out of 34 users of Jalkalp 23 informed that they clean their filter in a week whereas 7 informed that they clean their filter in a month and 4 users clean their filter daily which increases the quality of water as well as the filter. For more details table and graph is given below.



**Graph 19:- Frequency of cleaning of Jalkalp**

## 5.2 USER ACCEPTABILITY OF JALKALP:

As per the remarks of the users the weightage or percentage of the various parameters for the acceptability of Jalkalp was calculated by IWP.

**Table-6 Matrix showing user acceptability of Jalkalp**

MATRIX SHOWING USER ACCEPTABILITY OF JALKALP																						
Category	Good/Tasty water	Reduction in gastric problems	Less illness reported	Low cost	No maintenance cost	Safe/Pure water	No electricity required	Good health	Food is more tasty when prepared with this water	Water is cool when filtered	Performance is better than the previous filter	Ease of storage of water	Satisfied with the results	Easy processes	Mineral rich	Good arrangement for rural area	Reduction in skin diseases	Water feels lighter (less hard)	Relief from Pyria	No loose motions	Total	Weightage (%)
Health	0	10	7	0	0	0	0	3	0	0	0	0	0	0	0	0	1	0	1	1	23	29.87
Quality	18	0	0	0	0	5	0	0	3	0	0	0	0	0	1	0	0	1	0	0	28	36.36
Performance	0	0	0	0	0	0	0	0	0	2	2	0	2	0	0	0	0	0	0	0	6	7.79
Efficacy	0	0	0	0	0	0	4	0	0	0	0	2	0	2	0	1	0	0	0	0	9	11.69
Economical	0	0	0	6	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	14.29

- It is clear from the matrix that quality is the major reason for the acceptability of Jalkalp in the study area (with the highest weightage of 36.36%) followed by Health (weightage 29.87%), efficacy (weightage 11.69% and economical (weightage 14.29%) have also been considered for acceptability. So on the basis of the user acceptability and user satisfaction survey, the other people of the study area can be made aware to adopt the Jalkalp.

## **6 SUMMARY AND CONCLUSION**

From the whole study, it is concluded that the sensitizing and awareness building sessions conducted in selected villages of two blocks of Samastipur district of Bihar i.e., Samastipur and Pusa was a successful attempt to change the behaviour of people towards the safe drinking water. While on the other hand those who did not attend the training session were not much aware about use of safe drinking water. Through the training programs, people did not only get aware about the health issues related to water borne diseases but also changed their daily lifestyle by using safe drinking water.

From the survey conducted, it was found that Jalkalp was a sustainable and appropriate technological solution. From remarks given by people of the project area, it was seen that Jalkalp offers increased filtration rate, better portability and quality control. Jalkalp filter can treat 18-20 litres of water in each pour and the filtration rate is 0.75 litres/minute. The water quality tests demonstrate its effectiveness against biological contaminants, arsenic and iron contamination. 100% satisfaction level of people was seen for the quality of water filtered from Jalkalp. As per the Jalkalp users, Jalkalp is a long term investment which reduced their economic burden as members of the family were not getting ill due to waterborne diseases or contamination and they did not have to buy packed water from other sources which is much expensive.

People who are using Jalkalp water filter have realized that it is a very cheap and sustainable solution to address the turbidity, biological, and iron contamination in water. Many households who used to purchase bottled water earlier have adopted Jalkalp water filter and they are very happy to save up to Rs 1000/- per month.

**“Rakesh Kumar, of Chakhari, District Samastipur told that the quality of their water was not good so he used to buy bottled water for Rs 25 every day. Through the training he got to know about the Jalkalp water filter. He bought a filter and installed at his home. He found that the filtered water is as good as bottled water. His family now uses the filtered water for cooking and drinking. He now saves Rs 750 every month. Many other households close to him are also now interested to buy Jalkalp water filter.”**

### **OUTCOMES**

- Significant reduction in the incidences of water borne diseases, and its related expenses;
- Behaviour change towards water handling and storage practices;
- Better taste and color of the food cooked with Jalkalp filtered water; and;



## **7 RECOMMENDATIONS AND SUGGESTIONS**

- From the impact assessment study it was observed that many of the people who attended training or who did not attend training were also interested in the adoption and installation of Jalkalp filter but they couldn't afford it due to the high cost as per their economic condition. Thus, it is recommended that cost of the Jalkalp should be reasonably reduced or it should be given as a fund by Government or some organisations to poor communities at free of cost or on some discounted price to install Jalkalp filter in their houses.
- Frequency of training should be increased at community level so that more people can get benefit of the training and adopt Jalkalp in their houses.
- The size of filter should be increased to have more storage capacity because many of the Jalkalp users were not satisfied with the size of the Jalkalp filter as they use Jalkalp water for the other purposes also.
- As 100% satisfaction level was observed from Jalkalp filter users during the impact study, installation of Jalkalp filter can be scaled-up to other flood prone districts of Bihar and any other parts of the country facing similar kind drinking water problem.

## 8 REFERENCES

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- Amitava Mukherjee, Mrinal Kumar Sengupta, M. Amir Hossain, Sad Ahamed, Bhaskar Das, Bishwajit Nayak, Dilip Lodh, Mohammad Mahmudur Rahman, and Dipankar Chakraborti June 2006  
*[https://www.researchgate.net/publication/6604366\\_Arsenic\\_Contamination\\_in\\_Groundwater\\_A\\_Global\\_Perspective\\_with\\_Emphasis\\_on\\_the\\_Asian\\_Scenario](https://www.researchgate.net/publication/6604366_Arsenic_Contamination_in_Groundwater_A_Global_Perspective_with_Emphasis_on_the_Asian_Scenario)*
- Flor Yazmín Ramírez-Castillo, Abraham Loera-Muro, Mario Jacques, Philippe Garneau, Francisco Javier Avelar-González, José Harel, and Alma Lilián Guerrero-Barrera1 May 2015  
*<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4493476/>*
- S.P.Saravanan, R.Gobinath January 2015  
*[https://www.researchgate.net/publication/290045803\\_Drinking\\_Water\\_Safety\\_through\\_Bio\\_Sand\\_Filter\\_-\\_A\\_Case\\_Study\\_of\\_Kovilambakkam\\_Village\\_Chennai](https://www.researchgate.net/publication/290045803_Drinking_Water_Safety_through_Bio_Sand_Filter_-_A_Case_Study_of_Kovilambakkam_Village_Chennai)*
- PHEET Laboratory, Patna
- Census 2011
- Sehgal Foundation Report
- Chem-in Corporation Pune
- Taralife Sustainability Solutions Pvt. Ltd

## ANNEX-I LAB REPORT

					
NABL Certificate no:C/T/M-/6752/3829-old		PHEET Emblem	OHSAS Certified	ISO Certified	
<b>EXECUTIVE SUMMARY of the Test Report of all Collected 30 Water Samples on Dated 29/3/18 from Different Areas of Samastipur District vide order number - nil dated 28/3/18 , India water Partnership, New Delhi</b>					
Public Health Environmental Engineering Trust( PHEET), An ISO 9001-2008 Certified & NABL-T-3829 Accredited & Consultant Lab for State / Central Government/ COMFED & other Several Cooperate Bodies, Bhagirathi Lane, opp. Malaria Control Office, Mahendru, Patna-800006, <b>Recognized by &amp; in NGO Sector by Central pollution Control Board, New Delhi vide No B-15015/1/2004-AS/3902, March-3-2004, M09546991814, Email: sharma.chandrabhan9@gmail.com &amp; web.site:www.pheet-environment.com</b>					
<b>Result in ppm,except pH, otherwise mentioned</b>					
Sl. No.	Location(CDS)	Source	PHEET ID No	Iron (0.3-NR)	Arsenic (0.01-0.05)
1	Rakesh Kumar Kushwah, Motor(D.F 280) Chak Haji, Rupnarayanpur Bela, Samastipur	Motor	phheet/ 18-19/W/2723	<b>0.95</b>	<b>0.032</b>
2	Rakesh Kumar Kushwah, Jalkalp(D.F 280) Chak Haji, Rupnarayanpur Bela, Samastipur	Jalkalp	phheet/ 18-19/W/2724	<b>0.27</b>	<b>0.001</b>
3	Rajdev Singh, Chapakal, (D.F 60) Chandouli, Chandouli, Pusa	Chapakal	phheet/ 18-19/W/2725	<b>9.87</b>	<b>0.006</b>
4	Rajdev Singh, Jalkalp, (D.F 60) Chandouli, Chandouli, Pusa	Jalkalp	phheet/ 18-19/W/2726	<b>0.29</b>	<b>0.001</b>
5	Pramod Kumar Singh, Chapakal, (D.F 95) Kumhada, Morsand, Pusa	Chapakal	phheet/ 18-19/W/2727	<b>1.42</b>	<b>0.015</b>
6	Pramod Kumar Singh, Jalkalp, (D.F 95) Kumhada, Morsand, Pusa	Jalkalp	phheet/ 18-19/W/2728	<b>0.23</b>	<b>0.002</b>
7	Anil Kumar Jha, Chapakal (D.F 85) Gopalpur, Thahra, Pusa	Chapakal	phheet/ 18-19/W/2729	<b>1.71</b>	<b>0.026</b>
8	Anil Kumar Jha, Jalkalp, (D.F 85) Gopalpur, Thahra, Pusa	Jalkalp	phheet/ 18-19/W/2730	<b>0.23</b>	<b>0.001</b>
9	Ramparv, Motor (D.F 80) Thahra Thahra, Pusa	Motor	phheet/ 18-19/W/2731	<b>0.85</b>	<b>0.017</b>
10	Ramparv, Jalkalp, (D.F 80) Thahra Thahra, Pusa	Jalkalp	phheet/ 18-19/W/2732	<b>0.28</b>	<b>0.001</b>
11	Ramkishore Mahto, Chapakal (D.F 80) Patepur, Thahra, Pusa	Chapakal	phheet/ 18-19/W/2733	<b>6.16</b>	<b>0.011</b>
12	Ramkishore Mahto, Jalkalp (D.F 80) Patepur, Thahra, Pusa	Jalkalp	phheet/ 18-19/W/2734	<b>0.22</b>	<b>0.001</b>
13	Subodh Kumar, Motor, (D.F 120) Patepur, Thahra, Pusa	Motor	phheet/ 18-19/W/2735	<b>2.88</b>	<b>0.065</b>
14	Subodh Kumar, Jalkalp (D.F 120) Patepur, Thahra, Pusa	Jalkalp	phheet/ 18-19/W/2736	<b>0.29</b>	<b>0.002</b>

*Sharma*  
30/06/18  
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15	Ashok Kumar ,Motol, (D.F 100) Morsand Chowk,Morsand,Pusa	Motor	pheet/ 18-19/W/2737	0.26	0.009
16	Ashok Kumar,Jalkalp (D.F 100) Morsand Chowk,Morsand,Pusa	Jalkalp	pheet/ 18-19/W/2738	0.19	0.001
17	Satyanarayan Mahto, Chapakal (D.F 90) Morsand Chowk,Morsand,Pusa	Chapakal	pheet/ 18-19/W/2739	0.34	0.009
18	Satyanarayan Mahto, Jalkalp, (D.F 90) Morsand Chowk,Morsand,Pusa	Jalkalp	pheet/ 18-19/W/2740	0.24	0.003
19	Brahmdev Singh, Motor (D.F 80) Morsand Karmila,Morsand Pusa	Motor	pheet/ 18-19/W/2741	2.46	0.06
20	Brahmdev Singh, Jalkalp (D.F 80) Morsand Karmila,Morsand Pusa	Jalkalp	pheet/ 18-19/W/2742	0.10	0.001
21	Narsingh Singh,Chapakal(D.F 60) Morsand Karmila,Morsand Pusa	Motor	pheet/ 18-19/W/2743	1.72	0.017
22	Narsingh Singh,Jalkalp (D.F 60) Morsand Karmila,Morsand Pusa	Jalkalp	pheet/ 18-19/W/2744	0.28	0.012
23	Nageshwar Das,Motol (D.F 72) Rupnarayanpur Bela, Rupnarayan pur Bela,Samastipur	Motor	pheet/ 18-19/W/2745	0.29	0.002
24	Nageshwar Das,Jalkalp,(D.F 72) Rupnarayanpur Bela, Rupnarayan pur Bela,Samastipur	Jalkalp	pheet/ 18-19/W/2746	0.16	0.001
25	Ashok Jha,chapakal (D.F 70) Raghunathpur Bela, Rupnarayanpur Bela,Samastipur	Chapakal	pheet/ 18-19/W/2747	10.59	0.12
26	Ashok Jha,Jalkalp (D.F 70) Raghunathpur Bela, Rupnarayanpur Bela,Samastipur	Jalkalp	pheet/ 18-19/W/2748	0.24	0.002
27	Indrakamal Jha, Motor,D.F 90)Raghunathpur Bela,Rupnarayanpur Bela,Samastipur	Motor	pheet/ 18-19/W/2749	3.8	0.016
28	Indrakamal Jha,Jalkalp (D.F 90)Raghunathpur Bela,Rupnarayanpur Bela,Samastipur	Jalkalp	pheet/ 18-19/W/2750	0.26	0.003
29	Rambinod Thakur, Motor (D.F 80)Jagdispur Rami, Rupnarayanpur Bela,Samastipur	Motor	pheet/ 18-19/W/2751	0.79	0.002
30	Rambinod Thakur,Jalkalp,(D.F 80)Jagdispur Rami, Rupnarayanpur Bela,Samastipur	Jalkalp	pheet/ 18-19/W/2752	0.21	0.001

**Remarks**

- Parameters found exceeding their max permissible limits have all been marked in RED
- These parameters need to be brought down within permissible limit as per IS:10500-2012 by adopting appropriate treatment methodologies which can be had from PHEET on demand or may be from anywhere else.

Tested by  
Jr Chemist

Checked by  
Deputy Quality Manager

Approved & Issued by  
CMD QM, PHEET, Patna  
30/06/18

**PHEET LAB**  
PATNA

## ANNEX-II QUESTIONNAIRES

**Set-I (Control Not adopted Filter and also not attended meetings)**

**Impact Assessment -2018**

**Questionnaire for Project on Building Resilience through Safe Drinking Water in flood prone areas of Bihar**

Name of the Interviewer: \_\_\_\_\_ Date: \_\_\_\_\_

Location (Name of village/district): \_\_\_\_\_

Name of the Respondent: \_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_

**1. Education, Occupation and Income of family (fill the below table)**

No. of Members in the family	Gender	Age	Education				Occupation [primary(1) and secondary(2)]										Annual Income in Rs	
			Illiterate	< 10 <sup>th</sup>	>10 <sup>th</sup>	Graduate	PG	Govt . job	Agriculture	Private job	Animal Husbandry	Daily wager	Others (define)	Agri	Animal Husbandry	Others		Total
	M/F																	

## 2. Water Quality (Tick Mark)

What is the source of drinking water in your house?	Hand pumps	Wells	Ponds	Supply Water (from Govt. sources)	Rivers	Canals	Remarks, If any
How your drinking water taste?	Sweet	Salty	Bitter	Sour	No taste	Remarks, If any	
How your drinking water smell	Rotten egg	Musty	Pungent	No Smell	Don't Know		
What is Color of water from source	Pale Yellow	Grey	Red	Blackish	Colorless	Any other	
What is Color after storing water for few hours	Pale Yellow	Grey	Red	Blackish	Colorless		

## 4. Awareness

What are the characteristics of safe drinking water?	Good Taste	No Smell	No color	Contaminant Free	Mineral Rich	Don't Know	Remarks, If any
Do you know whether your water is pure or impure?	Yes	No	If Yes, then what?				
What are the ways to store your water in your household?	In open and dark place	in cold place	Anywhere in the house	In kitchen	Outside the house	Don't Know	
Are you using any means of water Purification	Yes			No			
If Yes then what	RO	Boiling	Chlorination	Sedimentation	Other chemical treatment		
Have you ever got tested your water?	Yes			No			
If Yes, From Where? (specify)	Govt. Organization	School Children		Researchers	Others		
Are you satisfied with result of tests conducted?	Yes			No			
If No, why?	Test Kit was not appropriate	It was fake test		Result was not satisfied	Don't Know		Result was not shared
Have you observed impact of water quality on your day to day life?	Yes			No			
Source of Knowledge (From Where do you get to know all this information?)	Community Meeting	Books		Students	TV	Radio	Other sources

#### 4. Behavioral Change

Do you wash your Hands?	Yes			NO			Comment
If Yes, When (after what all key activities)	Before Meal	After Meal	After cleaning Fecal of baby	After defecation	Before Cooking	After caretaking	
Do you store your drinking water?	Yes			No			
Which type of container do you use to store drinking water?	Plastic/Steel/glass container with lid	Plastic/Steel/glass container without lid	Clay container with lid	Clay container without lid	Any Container with lid	Any container without lid	
For How many days do you store drinking water?	Less than a day	1-2 days	One week	Two weeks	For months	Depend on use of water	
What utensil do you use to take water out of storage tank?	Tap	Glass	Jug	Mug	Any utensil available at home	Directly from the container	Cup with long handle
Frequency of storage Vessel Cleaning	Daily	1-2 days		One week	Two weeks		After months
Do you dry it after cleaning?	Yes			No			
Do you use toilets for sanitation?	Yes			No			
What type of toilets do you use?	Pit	Seated		With Flushed		Without flushed	
Is there water supply in your toilets?	Yes			No			
What use to wash their hand?	Soap	Sand/soil		Ash		Other material	

Have you opted for any filter in your house?	Yes		No
If Yes (Tick mark the type of filter you use)	Jalkalp	RO	Other Filter Available in market

### 5. Health Impact

What are the causes of following disease prevalent in your village						
Typhoid	Bacteria/Virus	Poor Hygiene	Stale Food	Water Contamination	Work load	Weather/Season
Malaria	Bacteria/Virus	Poor Hygiene	Stale Food	Water Contamination	Work load	Weather/Season
Jaundice	Bacteria/Virus	Poor Hygiene	Stale Food	Water Contamination	Work load	Weather/Season
Diarrhea	Bacteria/Virus	Poor Hygiene	Stale Food	Water Contamination	Work load	Weather/Season
How do you get prevented from these diseases?	Household Treatments	Keeping Environment Clean	Preparing food properly	Drinking boiling Water	Cleaning Hands	Don't Know

### 6. Training Program

Have you heard about the community meetings on safe drinking water in your locality?	Yes/No	If Yes, Have you attended?	Remarks			
Do you think drinking safe and clean water is good for health?	Yes	No	Remarks			
Do you know the solutions to purify the drinking water?	Yes	No	If Yes, then solutions			
Why have you not adopted filter so far?	High cost	Increases Work load	Lack of space	Not useful	Customary belief	
				Not useful		

Remarks of the Field Investigator:

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**Set-II (Attended Sensitization Meeting but not adopted Jalkalp)**

**Impact Assessment -2017**

**Questionnaire for Project on Building Resilience through Safe Drinking Water in flood prone areas of Bihar**

Name of the Interviewer: \_\_\_\_\_ Date: \_\_\_\_\_

Location (Name of village/district): \_\_\_\_\_

Name of the Respondent: \_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_

**1. Education, Occupation and Income of family**

No of Family Member	Gender	Age	Education					Occupation [primary(1) and secondary(2)]									Annual Income in Rs	
			Illiterate	< 10 <sup>th</sup>	>10 <sup>th</sup>	Grad	PG	Govt job	Agriculture	Private job	Animal Husbandry	Daily wager	Others	Agri	Animal Husbandry	Others		Total
	M/F																	

**2. Water Quality**

What is the source of drinking water in your house?	Hand pumps	Wells	Ponds	Supply Water	Canals	Remarks, If any
How your drinking water taste?	Sweet	Salty	Bitter	Sour	No taste	Remarks, If any

How your drinking water smell	Rotten egg	Musty	Pungent		No Smell	
What is Color of water from source	Pale Yellow	Grey	Red	Blackish	Colorless	Any other
What is Color after storing water for few hours	Pale Yellow	Grey	Red	Blackish	Colorless	

### 3. Awareness

What are the characteristics of safe drinking water?	Good Taste	No Smell	No color	Contaminant Free	Mineral Rich	Don't Know	Remarks, If any
What are the contaminants in your water?	Arsenic	Iron	Lead	Biological	Muddy/sand	Don't Know	
What are the ways to store your water?	In open and dark place	in cold place	Anywhere in the house	In kitchen	Outside the house	Don't Know	
Are you using any means of water Purification	Yes			No			
If Yes then what	RO	Boiling	Chlorination	Siltation	Other chemical treatment		
Have you ever got tested your water?	Yes			No			
If Yes, From Where?	Govt.Organization	School Children		Researchers	Others		
Are you satisfied with result of tests conducted?	Yes			No			
If No, why?	Test Kit was not appropriate	It was fake test		Result was not satisfied	Don't Know		Result not shared
Have you observe impact of water quality on your day to day life?	Yes			No			
Source of Knowledge (From Where do you get to know all this information?)	Community Meeting	Books		Students	TV	Radio	Other sources

### 4. Behavioral Change

Do you wash your Hands?	Yes			NO			Comment
If Yes, When (after what all key activities)	Before Meal	After Meal	After cleaning Fecal of baby	After defecation	Before Cooking	After caretaking	
Do you store your drinking water?	Yes			No			
Which type of container do you use to store	Plastic/Steel/glass container with lid	Plastic/Steel/glass container without lid	Mud container with lid	Mud container without	Any Container with lid	Any container without lid	Cup with long handle

drinking water?				lid			
For How many days do you store drinking water?	Less than a day	1-2 days	One week	Two weeks	For months	Depend on use of water	
What utensil do you use to take water out of storage tank?	Tap	Steel	Plastic	Any utensil available at home	Directly from the container		
Frequency of storage Vessel Cleaning	Daily	1-2 days		One week	Two weeks	After months	
Do you dry it after cleaning?	Yes			No			
Do you use toilets for sanitation?	Yes			No			
What type of toilets do you use?	Pit	Seated		With Flushed	Without flushed		
Is there water supply in your toilets?	Yes			No			
What use to wash their hand?	Soap	Sand/soil		Ash	Other material		

## 5. Health Impact

What are the causes of following disease						
Typhoid	Bacteria/Virus	Poor Hygiene	Stale Food	Water Contamination	Work load	Weather/season
Malaria	Bacteria/Virus	Poor Hygiene	Stale Food	Water Contamination	Work load	Weather/season
Jaundice	Bacteria/Virus	Poor Hygiene	Stale Food	Water Contamination	Work load	Weather/season
Diarrhea	Bacteria/Virus	Poor Hygiene	Stale Food	Water Contamination	Work load	Weather/season
How do you get prevented from these diseases?	Household Treatments	Keeping Environment Clean	Preparing food properly	Drinking boiling Water	Cleaning Hands	Don't Know

## 6. Training Program

Have you heard about the community meetings on safe drinking water in your locality?	Yes		No		Remarks
If Yes, Have you attended?	Yes, Many times	Yes, few times	Not attended	Not interested	
Were these meetings useful?	Yes/No		If Yes, How?		
How many times this type of program was conducted?	Frequently	Many times	Once	Not remember	
Who are the participants of the meetings program?	Women	Men	Youth	All the three	
Type of training	Participatory	Lecture based	Discussions	Both Participatory and lecture based	
How Training Program help you to maintain health and hygiene in your households?	Through Behaviour Change	Through Knowledge and Practice	Learnt Wash Practices	No Change	

## 6. Convincing level for Adoption of filter

Do you think drinking safe and clean water is good for health?	Yes		No		Remarks
Do you know the solutions to purify the drinking water?	Yes (Jalkalp filter/Ro filter/Others) Specify		No		If No, then why
Why you have not adopted Jalkalp filter so far?	High cost	Increases Work load	Lack of space	Not useful	Customary belief

### Remarks of the Field Investigator:

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**Set-III (Adopted Jalkalp Filter)**

**Impact Assessment -2017**

**Questionnaire for Project on Building Resilience through Safe Drinking Water in flood prone areas of Bihar**

Name of the Interviewer: \_\_\_\_\_ Date: \_\_\_\_\_

Location (Name of village/district): \_\_\_\_\_

Name of the Respondent: \_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_

**1. Education, Occupation and Income of family**

No. of Members in the family	Gender	Age	Education			Occupation [primary(1) and secondary(2)]											Annual Income in Rs	
			Illiterate	< 10 <sup>th</sup>	>10 <sup>th</sup>	Graduate	PG	Govt job	Agriculture	Private job	Animal Husbandry	Daily wager	Others	Agri	Animal Husbandry	Others		Total
	M/F																	

**2. Water Quality (Tick Mark)**

What is the source of drinking water in your house?	Hand pumps	Wells	Ponds	Supply Water (from Govt. Resources)	Canals	Remarks, If any
How your drinking water taste?	Sweet	Salty	Bitter	Sour	No taste	Remarks, If any
How your drinking water smell?	Rotten egg	Musty	Pungent	No Smell	Don't Know	

What is Color of water from source?	Pale Yellow	Grey	Red	Blackish	Colorless	
What is Color after storing water for few hours?	Pale Yellow	Grey	Red	Blackish	Colorless	

### 3. Awareness

What are the characteristics of safe drinking water?	Good Taste	No Smell	No color	Contaminant Free	Mineral Rich	Don't Know	Remarks, If any
What are the contaminants in your water?	Arsenic	Iron	Lead	Biological	Muddy/sand	Don't Know	
What are the ways to store your water?	In open and dark place	in cold place	Anywhere in the house	In kitchen	Outside the house	Don't Know	
Are you using any means of water Purification	Yes			No			
If Yes then what	RO	Boiling	Chlorination	Siltation	Other chemical treatment	Filter	
Have you ever got tested your water?	Yes			No			
Specify if yes	Govt. Organization		School Children	Researchers	Others		
Are you satisfied with result of tests conducted?	Yes			No			
If No, why?	Test Kit was not appropriate		It was fake test	Result was not satisfied	Don't Know		
Have you observed impact of water quality on your day to day life?	Yes			No			
Source of Knowledge (From Where do you get to know all this information?)	Community Meeting		Books	Students	TV	Radio	Other sources

### 4. Behavioral Change

Do you wash your Hands?	Yes		NO (if No, why)		Comment		
If Yes, When (after what all key activities)	Before Meal	After Meal	After cleaning Fecal of	After defecation	Before Cooking	After caretaking	

			baby				
Do you store your drinking water?	Yes		No				
Which type of container do you use to store drinking water?	Plastic/Steel /glass container with lid	Plastic/Steel/glass container without lid	Mud container with lid	Mud container without lid	Any Container with lid	Any container without lid	Cup with long handle
For How many days do you store drinking water?	Less than a day	1-2 days	One week	Two weeks	For months	Depend on use of water	
What utensil do you use to take water out of storage tank?	Tap	Glass	Jug	Mug	Any utensil available at home	Directly from the container	
Frequency of storage Vessel Cleaning	Daily	1-2 days	One week	Two weeks	After months		
Do you dry it after cleaning?	Yes		No				
Do you use toilets for sanitation?	Yes		No (If No than where you go for defecation?)				
What type of toilets do you use?	Pit	Seated	With Flushed		Without flushed		
Is there water supply available in your toilets?	Yes		No				
What use to wash their hand?	Soap	Sand/soil	Ash		Other materials		

### 5. Jalkalp Working (Tick Mark any one)

Have you opted for any filter in your house?	Yes		No		Why Not
If Yes than	Jalkalp	RO	Community Filter	Other Filter Available in market	
From When are you using Jalkalp?	Few days before	Months	Years	Other	
Who installed Jalkalp in your House?	Self-installed	Community member	Organization Member	Any plumber from the community	
Is the Jalkalp Size is sufficient for your use?	Yes		No		
How Many Times in a day you fill water in Jalkalp?	One Time in a day	Two-Three times in a day	Frequently when needed	Rarely	
To whom you complain about the dis functioning of the	CWP	Plumber	To no one	Don't know to whom we need to consult	

filter?					
How much water do you filter in a day?					
For what all purposes do you use filtered water?	Cleaning	Drinking	Bathing	Preparing Food	Other purposes
How do you clean your filter?	Through Mechanism told by CWP	In a Common way as clean our utensils	Through Detergent n soap	We Don't Clean	
Were you trained how to use filter	yes		No		
What is frequency of cleaning Jalkalp Filter	Daily	In a Week	In a Month	Never	
Is the quality of Jalkalp water is satisfactory to you?	Yes		No		
Frequency of cleaning the Jalkalp Filter	Externally		Internally		
Have you observe any health impact of the Jalkalp water?	Yes		No		
Problem Related to Jalkalp	Functioning	Not Filter Properly	Structure	Processing	Any Suggestions
Are you going to use Jalkalp in the long run?	Yes	No	May be	Don't Know	
If No then reason for not using of the Jalkalp	Not durable	Inadequacy of filter water quantity	Will use boil water	Maintenance Difficult	Other

## 6. Monitoring

How many times Community Wash Promoter (CWP) visited your house for observing the Jalkalp filter impact (since installation of the Jalkalp filter in your household)?	Frequently	Once in a Month	Once in a year	Not fixed
Are they helpful to you in assisting	Yes		No	

## 7. Health Impact (Tick Mark)

What are the causes of following disease						
Typhoid	Bacteria/Virus	Poor Hygiene	Stale Food	Water Contamination	Work load	Weather/season

Malaria	Bacteria/Virus	Poor Hygiene	Stale Food	Water Contamination	Work load	Weather/season
Jaundice	Bacteria/Virus	Poor Hygiene	Stale Food	Water Contamination	Work load	Weather/season
Diarrhea	Bacteria/Virus	Poor Hygiene	Stale Food	Water Contamination	Work load	Weather/season
How do you get prevented from these diseases?	Household Treatments	Keeping Environment Clean	Preparing food properly	Drinking boiling Water	Cleaning Hands	Don't Know

### 8. Training Program (Tick Mark)

Have you heard about the community meetings on safe drinking water in your locality?	Yes		No		Remarks
If Yes, Have you attended?	Yes, Many times	Yes, few times	Not attended	Not interested	
Were these meetings useful?	Yes/No		If Yes, in what way?		If No, Why?
How many times this type of program was conducted?	Frequently	Many times	Once	Not remember	
Who are the participants of the meetings program?	Women	Men	Youth	All the three	
Type of training	Participatory	Lecture based	Discussions	Both Participatory and lecture based	

### Remarks of the Field Investigator:

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