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ASSOCIATION OF SOCIO-ECONOMIC FEATURES, HYGIENIC STATUS, AGE GROUPS AND GENDER WITH PREVALENCE OF WATERBORNE DISEASES IN RAWALPINDI AND ISLAMABAD

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Abstract

Prevention of waterborne illness is of great concern all over the world. Waterborne diseases represent significant burden of diseases in the globe. Nearly 4% of diseases are attributable to water, sanitation and hygiene, and approximately 2.2 million people die every year due to diarrheal diseases worldwide. This study was carried out to find association of socio-economic features, hygienic status, age groups and gender with prevalence of water borne diseases in Rawalpindi and Islamabad.

A research questionnaire was designed with questions related to demographic data, drinking water data and prevalence of water borne disease. The research questionnaire was interviewed to different respondents above 18 years of age randomly selected from different settings of Rawalpindi and Islamabad belonging to different socio-economic statuses. Data was analysed by employing cross tabulation and chi-square test with help of statistical software.

The more frequent age group (47%) was 30 to 45 years. Proportion of diarrhea in females and males of middle age group were calculated as 36.11% and 11.11%, respectively. The second more frequent reported disease was jaundice with 15.9% of the target population being males and 16.7% females. Diarrhea was observed to be the major waterborne disease constituting 41% of the population with poor hygiene practices. The hygienic practices were significantly associated with waterborne diseases ($P = <0.001$). Waterborne diseases were also associated with financial status ($P=0.02$) and literacy rate ($P=0.03$).

The current study concludes that improvement in the hygienic conditions and hygienic practices will play a pivotal role to prevent faeco-oral infections and reduce the waterborne disease burden. In targeted areas due to poor economic conditions, the population failed to achieve better hygienic practices and therefore there is a need to strengthen water filtration system and awareness of hygienic routine practices in these areas.

Keywords: Waterborne diseases, Hygienic status, Socio-economic features.

Introduction

Drinking water is a major source of infectious and noninfectious agents in the developing countries. Waterborne medical conditions represent significant global burden of illnesses. Children under-five years of age are more likely to get ill because of waterborne pathogens as compared to adults (Rana, 2009). Pathogens present in drinking water like *Salmonella spp.*, *Shigella spp.*, *enterovirulent Escherichia coli*,

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Vibrio cholera, *Yersinia enterocolitica*, *Campylobacter jejuni* and other bacteria are the main cause of waterborne diseases. Similarly, there are pathogens that occur naturally in the environment but can cause disease opportunistically like *Pseudomonas aeruginosa*, *Klebsiella spp.*, *Aeromonas* and certain slow-growing *Mycobacteria spp.* (Borrego and Figueras, 1997; Kehr and Butterfield, 1943).

Illnesses caused by major waterborne pathogens are of greater concern. Gastroenteritis is a common disease caused by *Salmonella* spp, *Shigella* spp and *Campylobacter jejuni*. The outcome of gastrointestinal diseases becomes more severe due to malnutrition and lack of intervention strategies (Nicholas, 2004). *E.coli* and *Vibrio cholera* poses major health risk to human population causing range of gastroenteric diseases and is also a source of pandemics in human infant population (Olaniran et al., 2011). *Salmonella typhi* causes typhoid fever; *Shigella* causes dysentery and shigellosis. Viruses like Poliovirus, Hepatitis A and E virus, and protozoan like *Giardia Lamblia* may also present in drinking water and cause serious illness (CDC, 1996).

In 2001, infectious diseases accounted for approximately 26% deaths all over the world (Kindhauser, 2002). Nearly 14,000 – 30,000 people, mostly young children and the elderly, die every day from water related diseases worldwide (IHRO, 2007). Waterborne disease related mortalities reported per year are estimated to be more than 5 million (Johannesburg Summit, 2002). Approximately 3.1% of the deaths and 3.7% of the health burden (disability adjusted life years [DALYs]) annually around the globe are attributable to unsafe water, sanitation and hygiene (Martins et al., 1983; Jimenez et al., 2002).

The most egregious consequence of failure in prevention of water-related diseases is high rate of mortality among young children (Gleick, 2002). The total number of drinking water-related illness in the USA has been estimated at 19 million/year (Reynolds et al., 2008). Nearly 75% of all diseases in developing countries arise from polluted drinking water and this contribute to a major reason that safe drinking water is of paramount concern (TWAS, 2002).

Nearly 4% of the global burden of illnesses is attributable to water, sanitation and hygiene (Prüss et al., 2002). Approximately 2.2 million people die every year because of diarrhea worldwide and out of these 1.8 million deaths occur in low-income countries (WHO, 2004). Furthermore one out of ten leading causes of deaths is related to diarrhea in low and middle-income countries (Murrary and Schaller, 2010). In globe, diarrhea alone kills more children in comparison to both malaria and tuberculosis (Odi, 2006). Another research elaborates that more than half of acute illnesses are because of water, sanitation and hygiene-related concerns across all age groups (BRAC, 2008).

The main objective of the present study was to evaluate the attitude and practices of respondents with reference to hygienic practices and waterborne diseases. The study was carried out to determine association of factors such as age groups, gender, socio-economic features and hygienic status with prevalence of water borne diseases in Rawalpindi and Islamabad.

Materials and Methods

Sample size

Response data from 130 persons (N=130) was included in this study considering the estimated proportion of waterborne disease with precision value of 0.05 and confidence interval of 95%.

Sampling technique

Random sampling technique was employed for this study and respondents were from different communities of Rawalpindi and Islamabad.

Inclusion criterion

Respondent above 18 years of age from Rawalpindi and Islamabad were included in the study.

Exclusion criterion

Respondent below 18 years were excluded from the study areas.

Data collection method

A research questionnaire was developed to record demographic data, drinking water data and prevalence of waterborne diseases. A research questionnaire was used to interview to the included respondents of the study area.

Data analysis

Data was analysed using SPSS 16 by employing cross tabulation and chi-square test and association between different variables were found out.

Results and Discussion

Total 130 No. of the respondents from different settings of Rawalpindi and Islamabad belonging to different socio-economic statuses were included in this study. The proportion of male and female respondent were 67.7% (n=88), 32.3% (n=42), respectively. The proportions of respondents in different age groups are shown in Table 1. The proportions of different diseases are shown in Table 2, whereas proportion of socioeconomic features is shown in Table 3 and that of hygienic status is shown in Table 4.

Table 1. Frequency distribution of age groups and gender

Gender	Age			Total
	18-29	30-45	46-65	
F	25	48	15	88
	28.4%	54.5%	17.0%	100.0%
M	19	14	9	42
	45.2%	33.3%	21.4%	100.0%
Total	44	62	24	130
	33.8%	47.7%	18.5%	100.0%

Table 2. Frequency distribution of waterborne diseases among gender

Gender	Waterborne Disease							Total
	No Infection	Diarrhea	Fever	Jaundice	Eye Infection	Skin Infection	Malaria	
F	13	25	21	14	6	4	5	88
	14.8%	28.4%	23.9%	15.9%	6.8%	4.5%	5.7%	100.0%
M	11	11	6	7	5	1	1	42
	26.2%	26.2%	14.3%	16.7%	11.9%	2.4%	2.4%	100.0%
Total	24	36	27	21	11	5	6	130
	18.5%	27.7%	20.8%	16.2%	8.5%	3.8%	4.6%	100.0%

Table-3: Frequency distribution of socioeconomic features

Socio-economic features	Frequency	Percent
Financially strong + Literate	34	26.2
Financially strong + Illiterate	7	5.4
Financially average + Literate	22	16.9
Financially average + Illiterate	19	14.6
Financially poor + Literate	21	16.2
Financially poor + Illiterate	27	20.8
Total	130	100.0

Table 4. Frequency distribution of hygienic status

	Frequency	Percent
Excellent hygiene	**47**	**36.2**
Poor hygiene	**83**	**63.8**
Total	**130**	**100.0**

Association between gender and waterborne diseases

Association between gender and waterborne diseases in the study group showed that females (n=88) were more prone to waterborne diseases as compared to males (Figure-1). The data clearly indicated that diarrhea (n=36) was observed to be the major disease amongst waterborne diseases. Proportion of diarrhea in male and female was distributed as 28.4% (n=25) and 26.2% (n=11) respectively, followed by jaundice as a second major waterborne ailment with 15.9% (n=14) proportion of males and 16.7% (n=7) of females. The reason for this distribution was hypothesised to be the fact that women's activities involve water usage in many ways, e.g. cooking and washing, etc. It can be further reasoned that females mostly stay inside their homes so they are not widely exposed to different types of environmental immunogens and consequently their immunity level is low as compared to males. Hence whenever they are exposed to pathogens or water contaminants of a minute level they suffer ill as a consequence. These results are supported by a study carried out by Bangladesh Rehabilitation Assistance Committee report (BRAC, 2008).

Association of age groups and waterborne diseases

Associations between age groups and waterborne diseases showed that diarrhea was major water-borne ailment amongst middle-aged respondents, i.e., those respondents with in the 30-45 years of age group. Figure-2 clearly indicated the proportion of diarrhea (n=36) amongst the middle age group respondents to be 27.4% followed by jaundice at 21%. Following a similar line of assumptions, the reason for this difference can be attributed to the fact that ages between 18 to 29 years have relatively active and stronger immunity whereas that of the middle age group is an age of stress and mobility with variable immune statuses.

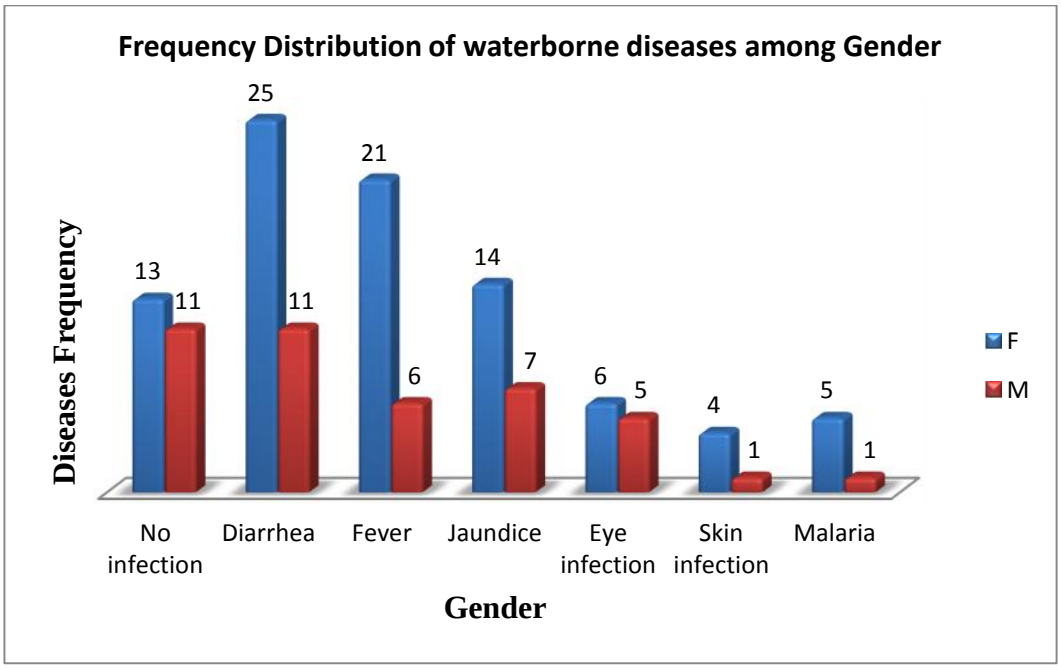

Figure 1. Cross tabulation between gender and waterborne diseases

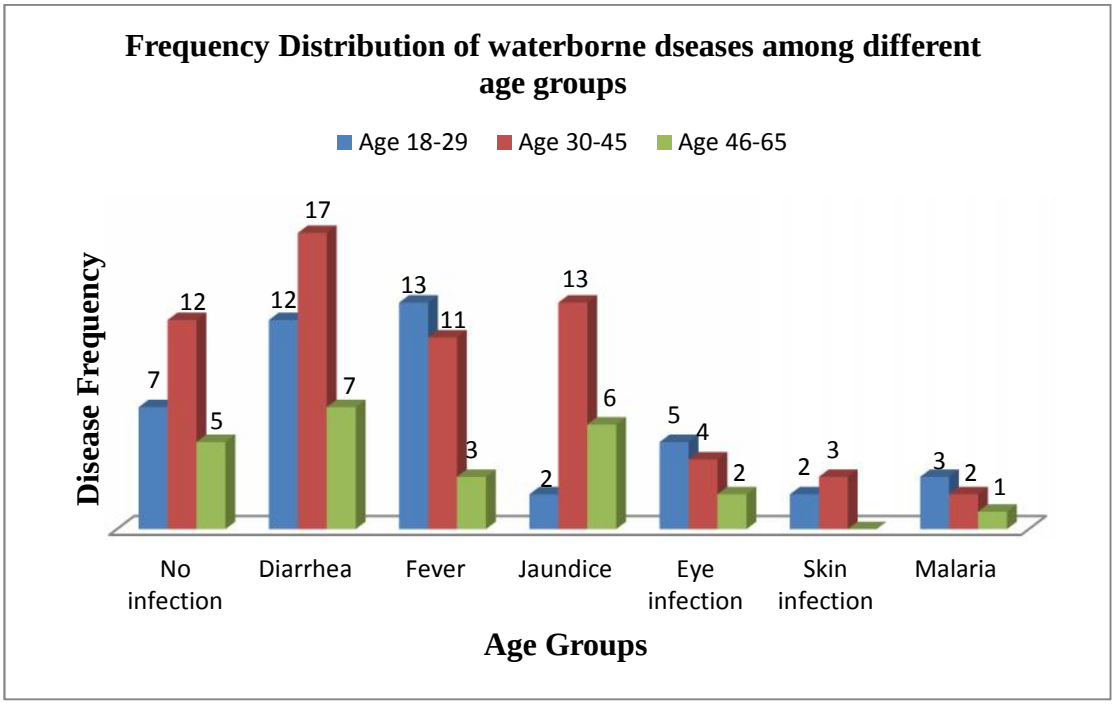

Figure 2. Cross tabulation between age groups and waterborne diseases

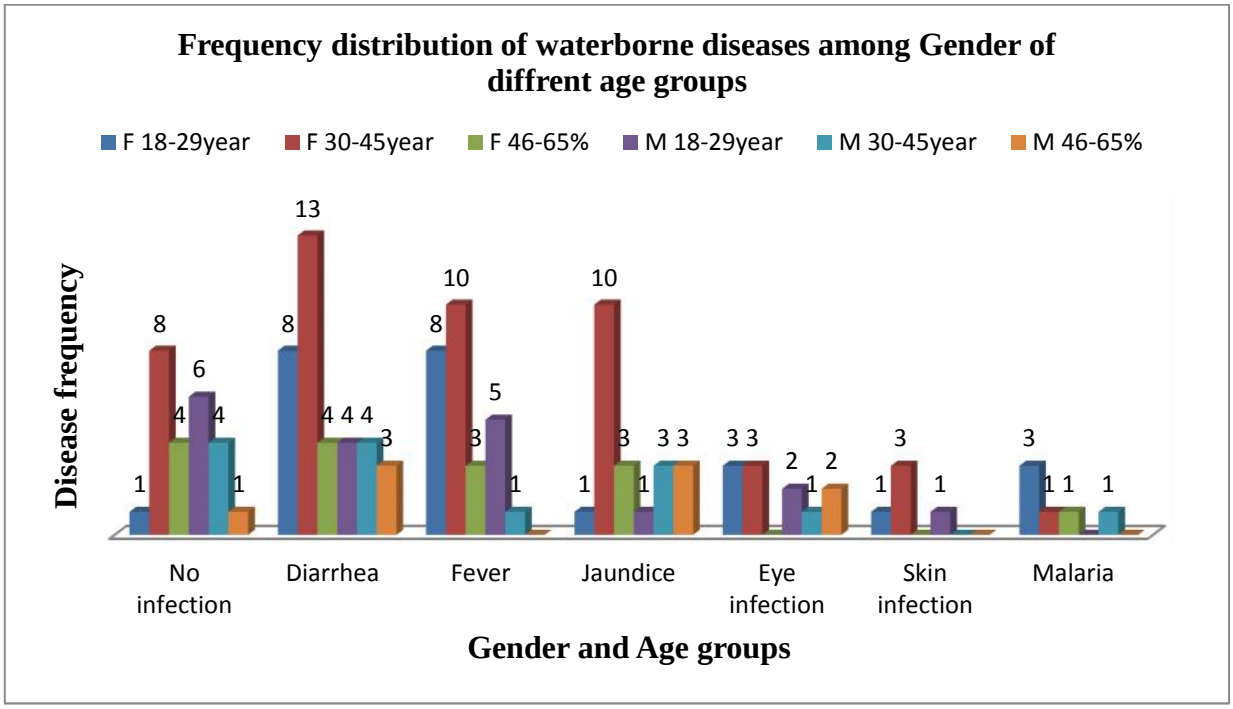

Figure 3. Multi variable graph among gender, age group and waterborne diseases

The multi variable in Figure 3 clearly indicated the prevalence of different waterborne diseases amongst different age groups and gender. This figure clearly indicates that the waterborne diseases are found to be more prevalent in females (n=48) of the middle age group (30-45 years of age) (n=62). Waterborne diseases like diarrhea, jaundice, and fever contributed 13.03%, 10%, 8.46% out of the total waterborne diseases respectively.

Association between hygiene and waterborne diseases

Data of this study regarding association between hygiene and waterborne diseases were analysed and presented in Figure 4. The data indicated that the study populations with poor hygienic conditions with respect to drinking water treatments and types of water container used were more prone to waterborne diseases as compared to the population having excellent hygienic condition. Diarrhea was observed to be the major waterborne disease contributing 41% of population with poor hygiene, whereas least waterborne diseases burden was observed in population with excellent hygiene.

The analysis of data indicated that there is a strong association between hygienic condition and waterborne diseases (Table 5). These results are supported by a study carried out by Bangladesh Rehabilitation Assistance Committee (BRAC, 2008).

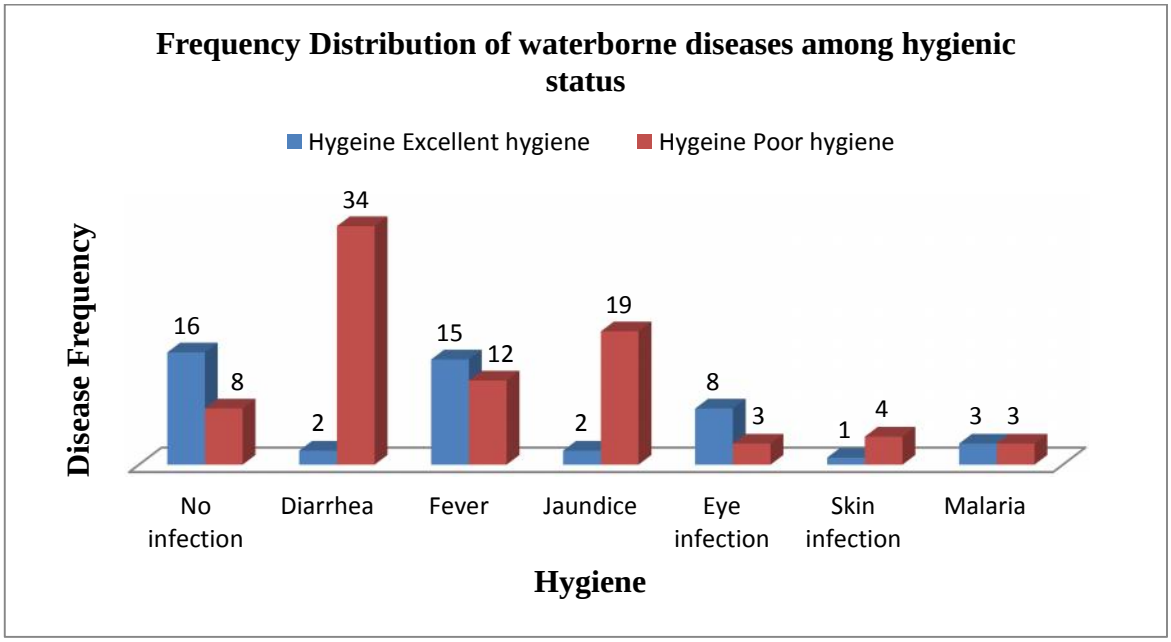

Figure 4. Cross tabulation between hygiene and waterborne diseases

Table 5. Chi-square test showing association between hygienic status and waterborne diseases (P = <0.001)

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	42.575[a]	6	< 0.001
Likelihood Ratio	47.599	6	< 0.001
N of Valid Cases	130		

Cross tabulation between socioeconomic features and waterborne diseases

Figure 5 illustrates that the waterborne diseases are also associated with socioeconomic features (financial position and literacy rates) and waterborne diseases are more prevalent in respondents having poor financial position and low literacy rate. Diarrhea contributes 92.6% in the study population who are socio-economically poor as well as illiterate. It can be concluded that socioeconomic features have significant effect or have strong association with waterborne diseases (Table 6). These results are supported by a study carried out by Bangladesh Rehabilitation Assistance Committee (BRAC, 2008).

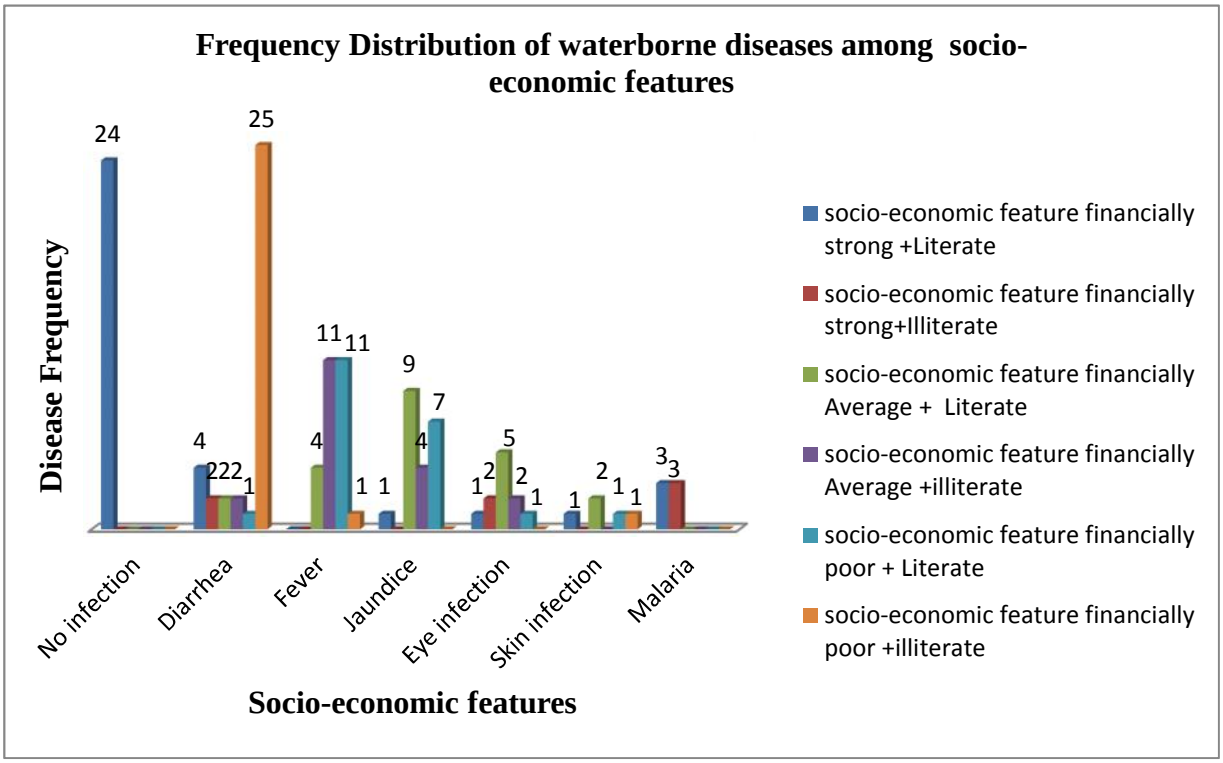

Figure 5: Cross tabulation between socioeconomic features and waterborne diseases

Table 6. Chi-square showing association between the waterborne diseases and socio-economic features i.e., economic statuses and literacy rate (P=0.02)

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	**220.291**	**30**	**.02**
Likelihood Ratio	**203.005**	**30**	**.02**
N of Valid Cases	**130**		

The results of current study conclude that improvement in the hygienic conditions and hygienic practices will play a pivotal role to prevent faeco-oral infections and reduce the waterborne disease burden. In targeted areas due to poor economic conditions, the population failed to achieve better hygienic practices and therefore there is a need to strengthen water filtration system and awareness of hygienic routine practices in these areas.

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