



Impact Assessment of School WASH Programme on Students' Health and Hygiene Conditions in Rural Mardan, Pakistan

Shams Ali Baig^{1†}, Zarish Khan^{1†}, Muhammad Qasim¹, Muzaffar Ali Baig²,
Dilawar Farhan Shams¹, Attaullah Khan¹, and Muhammad Idress³

¹Department of Environmental Sciences, Abdul Wali Khan University, Mardan 23200, Pakistan

²Department of Statistics, Abdul Wali Khan University, Mardan 23200, Pakistan

³Water Quality Monitoring Department, Integrated Rural Support Programme, Mardan 23200, Pakistan

Abstract: The implementation of water, sanitation and hygiene (WASH) programme in schools with true its spirit can largely solve the issues related to poor water quality, sanitation, health and hygiene conditions, which resultantly improve children attendance and hygienic environment in schools. In the present study, an attempt has been made to investigate the impacts of WASH programme on student health and hygiene condition in selected schools in district Mardan, Khyber Pakhtunkhwa, Pakistan. Social surveys including questionnaire, personal interview, focus group discussion (FGD) and personal observation were carried out to collect the data related to WASH activities. Drinking water samples were collected and analyzed from the targeted schools for different physical, chemical and bacteriological parameters including electrical conductivity (EC), pH, total dissolved solids (TDS), turbidity, *E. coli*, and *total coliform*. Statistical analyses, like descriptive statistics (i.e. ANOVA) were applied to analyze the data. The data collected using different social survey methods showed that the hygiene conditions in schools were not up to the standard, number of latrines in each school was not enough and no hand washing with soap was found practicing in each school. As a result, the number of children suffering from water borne diseases including diarrhea was higher as compared to other diseases. Water quality descriptive statistical analysis revealed that all the parameters were significantly different ($P < 0.05$) and uniformly contribution to the overall contaminant loads in the water samples, except the water pH values. Findings from the present study suggested that WASH programme is effective for promoting health and hygiene education in school going children.

Keywords: WASH programme; Water quality; Health and Hygiene; Sanitation; Social survey

1. INTRODUCTION

Water Sanitation and Hygiene (WASH) in schools is related with water, sanitation and hand washing facilities in schools along with basic hygiene education. Availability of WASH services in schools has a positive impact on children health and education [1]. Having access to clean and safe drinking water and sanitation facility is one of the basic human rights which must be fulfilled at any cost, because lack of access to basic WASH facilities is known to be one of the major causes of child mortality [2]. It has been reported that 2.5 billion people living globally do not have access to proper sanitation facilities as a result of which one billion people are forced to practice open defecation

[3], which contaminate the environment badly and causes about 0.577 million deaths annually [4]. Recently, it has been estimated that infections which children contract in schools will lead to infections in up to half of their household members and that 88% of diarrheal diseases are caused by unsafe water supply, inadequate sanitation and inappropriate hygiene [1].

The presence of school sanitation service and proper hygiene facilities is very important for child attendance, particularly for girls' students during natural cycle days [5, 6]. The use of improved sanitation facilities can reduce the rate of diarrhea cases by 34%, hand washing with soap after toilet use can reduce the incidence of diarrhea by nearly

40% [7]. Also, Rabie and Curtis [8] compared the results from different countries and found that hand washing with soap can eliminate the risk of respiratory infections by 16%. The ratio of absenteeism caused by gastrointestinal related diseases in developed nations revealed that the number of days lost can drop up to 50% due to improved hygienic environment in schools [9]. Globally, 25% students of the school dropout were reported even before the completion of primary schooling and in sub-Saharan Africa region most of the girls are not even enrolled [10]. Thus, the access to safe drinking water, proper sanitation facility is basic human right, which must be fulfilled for every human being [7, 11].

In Pakistan, nearly 15 million people drinks unsafe water and over 93 million people do not proper sanitation facilities, which resulted of promoting open defecation and the transmission of pathogens [12]. Due to lack of proper WASH facilities in Pakistan the mortality rate cause to death of 110 children every day particularly school going children are more vulnerable to WASH related diseases [13]. Therefore, it is necessary to ensure that schools children have proper improve access to WASH facilities for better children growth, reduce school dropout ratio and subsequently better performance [14]. Unfortunately, many schools in rural areas still lack proper WASH facilities affecting the health of children [13].

Integrated Rural Support Program (IRSP), a local Non-Governmental Organization (NGO) in district Mardan (Pakistan) has gained distinctive position and is a national level developmental agency for successful completion of Community Led Total Sanitation (CLTS) projects in District Mardan in the year 2004. Afterward, IRSP has taken a great step to work for WASH at different schools in rural Mardan and after detailed surveys of the area and interviews with school head and teachers, a school WASH programme was introduced in selected schools mainly in girls and carried out different activities for the better health promotion and hygiene. The impacts of these interventions on rural children's health and hygiene conditions in district Mardan have not been reported in literature so far. So, the purpose of this study was to evaluate the impact of school WASH programme on the overall health and hygiene conditions of the students. Also, to evaluate the role of school WASH

activities on students' attendance and dropout ratio and the status of schools water quality available in schools.

2. MATERIALS AND METHODS

2.1. Study Area

Tehsil Takhtbhai in district Mardan is located in Khyber Pakhtunkhwa Province of Pakistan having latitude and longitude of 34°16'54.83" and 71°55'41.88", respectively. It is 15 kilometers away from Mardan city and is famous for wheat, maize and sugarcane growth. After detailed survey and physical visits the following Union Councils (UCs) of Takhtbhai were selected for this study: Madhay Baba, Naray, Saroshah, and Takkar. Figure 1 presents the detailed location of the targeted UCs.

2.2. Secondary Data Collection

Data related to number of schools in each union council in which WASH interventions were carried out by IRSP, which were collected through surveying and from District Education Office Mardan. After having complete school profile, need assessment of schools and different practices e.g. hand washing and latrine usage was considered for comparative analysis.

2.3. Questionnaire Survey

Detailed questionnaire about WASH facilities at schools, and to assess the student's knowledge level about health and hygiene was assessed using pre-designed questionnaire. The questionnaire contained both close and open ended questions to gather information about the role of school WASH club, pamphlets, brochures, school trainings, hygiene walks and other associated activities to improve the health and hygiene conditions of the students especially girls.

2.4. Focus Group Discussion

In every school, focus group discussion (FGD) was organized for the students to know the impacts of health and hygiene related activities on the hygiene conditions of students. FGD related to the WASH facilities at different schools were discussed in detail with the students. The students participated and responded in a very positive way by sharing

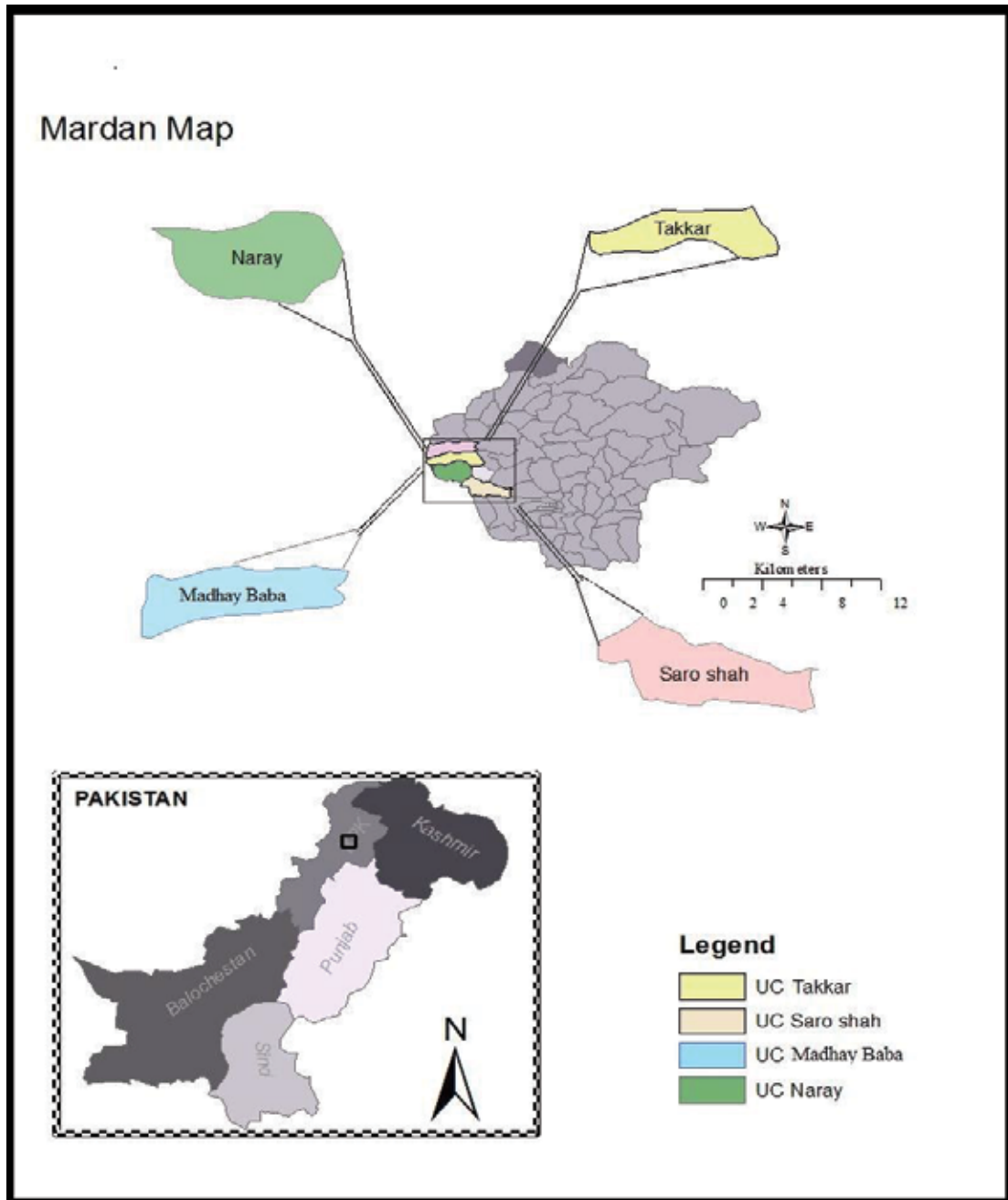


Fig. 1. Location map of district Mardan and also highlighted the targeted UCs

their problems related to hygiene conditions persisting in their schools.

2.5. Personnel Interviews

Interviews with the teachers and students about their opinions on the impact of the above mentioned health and hygiene activities on student's health and attendance was carried out inside the schools. Similarly, interviews with the NGO workers were held about their criteria of selecting school for

WASH programme and what they are expecting from this project and what they achieved so far.

2.6. Water Quality Analysis

For children's safety and for better health promotion the drinking water used by children at targeted schools were sampled using sampling bottles and tested for contamination at IRSP lab in Mardan. Water quality parameters including E. coli, total coliforms, pH, turbidity and conductivity

were analyzed through pH meter (HI 98129), electric conductivity meter (HI 98130 combo Hanna instrument) and turbidity meter (2100 P ISO HACH) by taking 100 mL water in cuvette and placing it inside the meters, while E.coli and total coliforms were detected by using filter machine (SIMCO model # 800). For this purpose, water sample was analyzed for E. Coli and total coliform detection needs to be filtered using filter machine. After filtration the Milli pore filter paper is placed in the EC plates which needs 2 mL distilled water for activation and are shifted to the incubator, where the temperature and timing of the incubator is set at 37 °C for about 24 hours. After incubation the colonies formed were counted to know total number of E. coli and total coliforms formation.

2.7. Statistical Analysis

The data collected from the present study were tabulated in MS Excel and graphs were made in Origin 5.0 software. Descriptive statistics (i.e. ANOVA) and inferential statistics were applied to the collected data and the results were presented accordingly.

3. RESULTS

The results of both social survey (personal interview, questionnaire survey and personal observation) and water quality analysis obtained to know the impacts of “WASH intervention” implemented by IRSP in the targeted schools.

3.1. Sanitation Facilities

Latrine facility was the main problem in most schools, even each school had either one or hardly two latrines for huge of number of children. For instance, in one of the school with the strength of 70 students and two teachers only one latrine was available, which most of the time reserved for teachers and guests. However, the concern officials of IRSP reiterated that in the second phase two more latrines are planned to be constructed and that can be only reversed for the students. Still question a raised that how the two latrines can facilitate 70 students? As per guideline, there should be one latrine for every 25 students in girls' school and 30 students in boys' schools [3]. Also, in some schools in the targeted UCs few numbers of dysfunctional latrines were available, which had

been constructed by the Government at the time of school's construction. In Figure 2, we calculated the number functional latrines in each UCs, which demonstrated an alarming low number of functional latrines as per school's requirements.

3.2. Hygiene Conditions of Targeted Schools

Environmental hygiene conditions and latrine cleanliness were another important issue, which were highlighted and extensively studied in the present study. Hygiene conditions of the schools in UC Takkar, Saroshah and Naray were observed to be highly alarming; wrappers were found in school's grounds and vicinity areas due to non-availability of dustbins or poor solid waste management mechanism. Other targeted areas have similar situation. However, schools in UC Madhay Baba were well maintained, classes were neat and clean, children were found using dustbins for throwing wrappers or plastics. Personal observation and social survey results revealed that existing sanitation facilities (i.e. latrines) were not maintained well in any of the UCs' targeted schools except Madhay Baba. Latrines usually produced bad smell, if they are not properly washed and maintained on daily basis. During the field visits and even in social survey, questions regarding latrine's cleanliness were asked. On site observations were done at different timings of schools showed that the situation of the latrine remained unhygienic throughout the day as they were hardly cleaned once in a day while few teachers shared their views through questionnaire that the latrine cleanliness activities were carried out on monthly basis in true spirit. However, the children had different opinions and they reflected that the latrine usually cleaned on daily basis, but their usages were so huge and cannot be seen clean every time in a day. Figure 3 shows the reply of the respondents about the cleanliness of latrines on daily basis in all the targeted UCs.

In addition, social survey and personal observation about the availability of dustbins facility showed that 50% schools in UC Takkar, Madhay Baba and Saroshah had classroom dustbins, while 80% schools of UC Naray was found to have dustbins within the classrooms. Environmental hygiene situation of schools in UC Naray and Madhay Baba was much better than schools in UC Takkar and Saroshah, which showed teachers as well as school management priority. Almost 80%

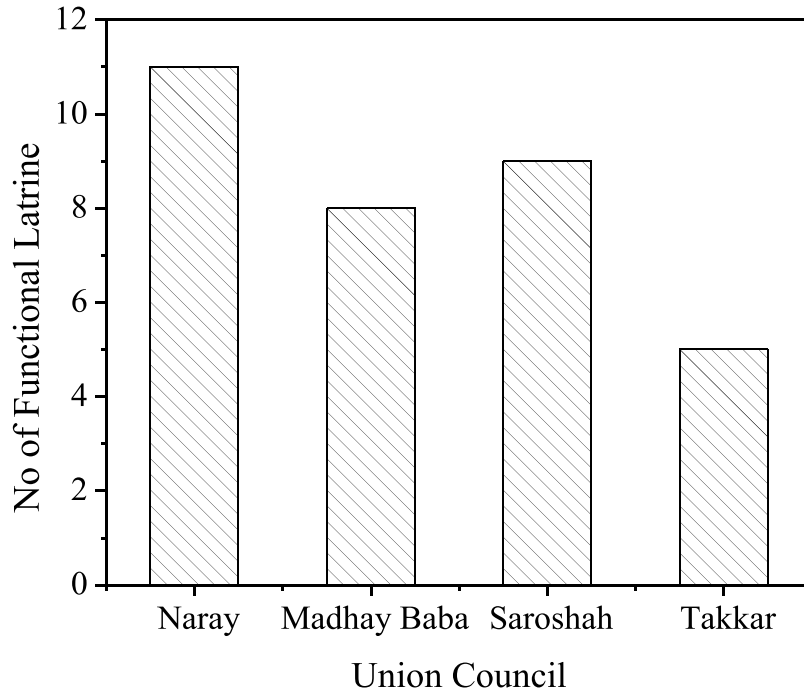


Fig. 2. No of functional latrines in each UC's

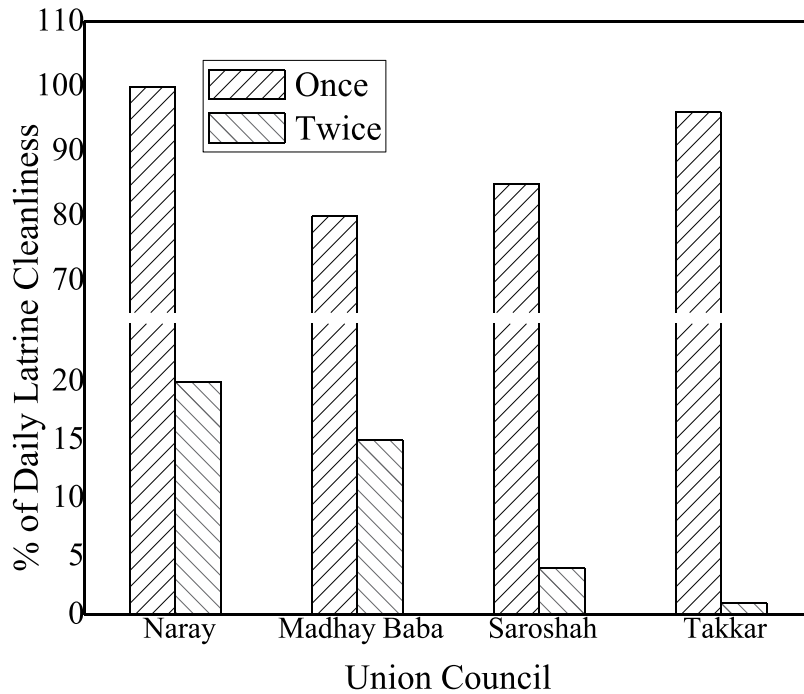


Fig. 3. Percentage of daily latrine's cleanliness (Once or Twice) in targeted UCs

of targeted schools in studied UCs were observed for children cleanliness monitoring in the morning assembly (gathering) and the data collected during FDGs showed that 85% of all the schools were taught hygiene lessons on daily basis.

3.3. Water Availability

Water availability in the washroom was a major issue in most of the targeted schools. All the targeted schools did not have proper water facility in their

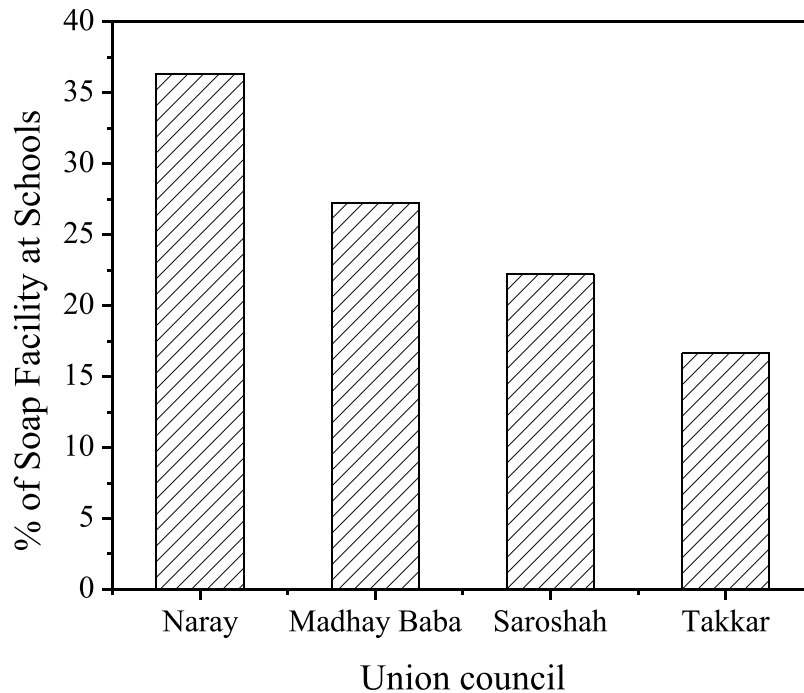


Fig. 4. Shows the % age of soap availability in different UCs for the users

latrines. Thus, the students were reluctant in using latrine due the non-availability of water for latrine flushing. Also, the available latrine cleanliness was one of the major issues in providing enabling environment for the students to use the latrines. In some cases, students fetch water from nearby homes or other places to fulfill the call of nature, especially for the girls students it was a major problem, which often forced them not to go schools and remain absent during nature cycle days.

3.4. Hand Washing Facility

Hand washing facility did not exist in any of the school in targeted UC neither hand washing was practiced by the students after latrine usage. No wash basin existed in any of the latrines in targeted UC, where children could wash their hands. Another important finding was the non-availability of soaps in the school latrines which was the main cause of not washing hands by the students after attending the latrines. Some of the schools in targeted UCs were reported to have soap facility for teachers only. Figure 4 shows the percentage of soap availability in different UCs for the users. Results demonstrated that UC Naray has high number of hand washing facility as compared to other UCs and which followed the order of Naray < Madhay Baba < Saroshah < Takkar. The reason of lowest

hand washing facility in UC Takkar could be the result of lower number of WASH intervention in this UC as compared to other areas. Another reason could be the variations in WASH implementation by Government and NGOs, and also the old or new construction approaches, where the new construction requirements need such facility should be installed near the latrine.

3.5. Absentees and Drop out Ratio

There is a close linkage between the availability of WASH facilities in schools and students absenteeism. The school heads in many schools did not allow to take photos of their daily attendance registrar and restricted to only get verbal inquiry, which showed that many girls students in upper middle class left school due to the absent of latrine facilities and again many remained absent due to the non-availability of WASH facilities in schools. However, in some schools especially primary schools the level of schools attendance was quite satisfactory. The FGDs and personal interviews with the key respondents also revealed that there is close link between students' absenteeism and the availability of WASH facility. Many of the growing students reiterated that they will leave schools if the facility will not be installed and available to them and they may not go other vicinity homes to attend

latrines and call of nature.

3.6. Common Health Problems

In Pakistan, the numbers of people affected by the water borne diseases are in huge number, besides being on the track to achieve the Millennium Development Goals (MDGs) [3]. Many studies [15, 16] revealed the association of higher of diarrheal diseases and the poor water quality. In the present study, questionnaire survey, personal interview and the local BHUs (Basic Health Units) visits to get the daily OPD (Out Patient Department) list to know the number of daily patients with different diseases. The obtained results revealed the prevalence of higher number of diarrheal cases in all the targeted schools, as shown in Figure 5. Thus, the results showed that diarrhea was most common among the students of all the targeted UCs then other diseases followed by fever, flu and headache (Figure 5). Among the targeted UCs, UC Naray was higher number of diarrheal cases and the reason could be the non-availability of enough number of WASH facilities in schools. Also, hygiene practices of the students were not up to the mark and the basic facilities for keeping good hygiene environment was not satisfactory.

3.7. Water Quality Results

The assessment of drinking water quality by analyzing some of the selected water quality parameters is important to know the overall water quality conditions in the targeted schools. In general, the provision of clean drinking water to the children can help them to fight against the pathogenic water borne diseases. In the present study, water samples were collected from all the schools' tap stand and tested for different parameters such as pH, turbidity, electrical conductivity (EC), total dissolved solids (TDS), E. coli and total coliforms in IRSP Lab, Mardan. The results obtained after analyzing the water samples collected from different schools were used for statistical analysis using descriptive ANOVA. Results revealed that all the samples had no E. coli or other harmful bacteria resultantly the E. coli results were not mentioned in Table 1 and subsequently analyzed using statistics like descriptive ANOVA test. There was no treatment facility for drinking water available and drinking water provided from the local source was safe for drinking. The results showed that all the samples collected from different schools had no E. coli and each samples showed different number of total coliforms.

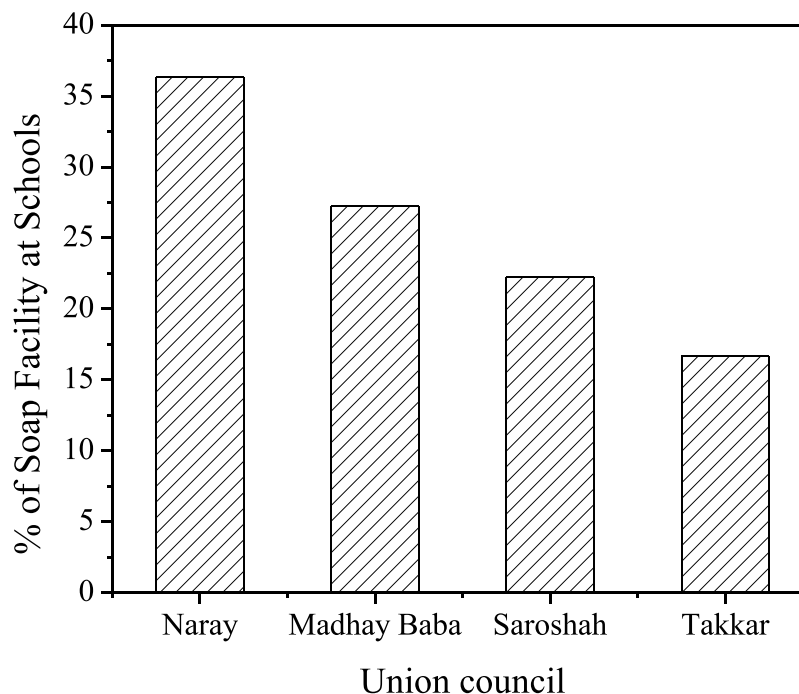


Fig. 5. Presents the %age of children suffering in the top four common diseases in the study area

Table 1. ANOVA test results of the selected water quality parameters

ANOVA		Sum of Squares	df ^a	Mean Square	F ^b	Significance
pH	Between Groups	1.118	12	0.093	1.108	0.395
	Within Groups	2.187	26	0.084		
	Total	3.306	38			
Turbidity (NTU)	Between Groups	6.296	12	0.525	6.042	0.000^c
	Within Groups	2.258	26	0.087		
	Total	8.554	38			
Electric Conductivity (μ S/cm)	Between Groups	7287051.897	12	607254.325	571.278	0.000
	Within Groups	27637.333	26	1062.974		
	Total	7314689.231	38			
TDS (mg/L)	Between Groups	3114902.103	12	259575.175	666.937	0.000
	Within Groups	10119.333	26	389.205		
	Total	3125021.436	38			
Total Coliform (CFU/100 mL)	Between Groups	140083.641	12	11673.637	119.275	0.000
	Within Groups	2544.667	26	97.872		
	Total	142628.308	38			

The mean difference is significant at a level of 0.05.

^a Degree of freedom

^b F-statistic

^c Bold values are significant

Table 1 presents the results analyzed using ANOVA test of the selected parameters. The water quality results after descriptive ANOVA analysis revealed that all the parameters were significantly varied ($P < 0.05$), except the water pH values. It can be seen from the descriptive ANOVA table that pH value has a p value greater than 5%, which showed that pH has no such effect, while the remaining other parameters showed that there was a significant effect or they have varied effects.

4. DISCUSSION

The provision of clean drinking water is a basic human right and according to the Pakistan National Drinking Policy of 2009, its supply to the entire Nation comes under the responsibility of the state [16-18]. Pakistan, like many other developing countries is plagued by insufficient provision of sanitation facilities and dysfunctional water supply systems. However, surprisingly the latest figures

provided by the Joint Monitoring Report [3, 19] reveals that Pakistan has met the target of attaining improved sanitation and is making well progress in achieving safe drinking water supplies. However, the personal observation in every corner of the country presented completely different scenarios and water quality and environmental sanitation conditions are quite worse and increasing number water borne diseases have been reported across the country [16]. In the few decades, international donor agencies including UNICEF invested billions of dollars to provide the WASH facilities in order to meet the Sustainable Development Goals (SDGs) or agenda 2030. In the light of such donor intervention, the present initiative taken up by IRSP (a local NGO in Mardan district) from donor support to implement WASH programme at Takhtbhai, which was no doubt a positive step and different schools in Takhtbhai were surveyed and the provision of WASH programme related activities were undertaken. The present study was carried out in

order to evaluate the impact of WASH programme in schools implemented by IRSP to promote the health and hygiene conditions of rural students in district Mardan. The results for different schools in the targeted council were obtained through different methodologies and measured the effectiveness of the project activities. An international research organization (i.e. Center for Affordable Water and Sanitation Technology (CAWST)) developed methodology for evaluating education activities [20], which has been implemented and replicated in many other countries. However, in Pakistan no such follow up or performance evaluation was carried out for WASH activities carried out in different organizations.

The sanitation facility for students in each UC was not sufficient for students and even the teachers and did not even meet WHO standards (1 toilet per 25 girls and 1 toilet per 30 boys) [3, 13]. Therefore, teachers and students had to share the same latrine some times while in other schools students had to wait for their turns for longer time. Latrine cleanliness was another important issue which was common among the schools of all the targeted UCs, because majority of the students were not aware of sanitation or hygiene education neither the type of sanitation facilities existed in their schools was improved. The students in primary schools were not trained for proper using of latrines; therefore it was found that education gap existed regarding WASH programme different components, which could be overcome by more focusing on the hygiene education component and awareness rising. For such activities participatory involvement of all the students can bring positive changes in students' attitude towards hygiene education and development [21]. Previous studies carried out on WASH impact on absentees and drop out ratio among school going children had shown significant effect unlike the present study. The existing poor WASH conditions in different targeted schools had impact on the child attendance or drop out ratio through the examination of children attendance registers. Therefore, absentees and drop out ratio among the children of targeted schools was too low and no such impact on attendance or drop out was recorded. However, Tarrass and co-workers [22] reported that many low income countries lack basic WASH facilities, which affect school going children's health and performance and subsequently increase the schools drop out ratio.

Hygiene practices by the students in the targeted schools was very rare such as availability and use of class room dustbins, use of soaps for washing hands was not common in all the schools though 80% targeted school children were given hygiene lesson on weekly basis while 85% of the targeted school were reported to have cleanliness monitoring of children in morning on daily basis. The access to inadequate WASH facilities causes nearly 1.5 million deaths of children under the age of five and also leads to over 272 million days loss due to diarrhea [23]. Similarly, in the present study it was found that children of Takhtbhai were more likely affected by diarrhea than other common health problems such as fever, flu and headache. Drinking water collected for the analysis of different parameters recorded that no E. coli was detected in any of the sample collected and was according to the standards set up by WHO and Pakistan National Environmental Quality Standards [18], which means that the water had no bacterial contamination while diarrhea was still common among the targeted school which may be due to their unhygienic conditions in schools, lack of healthy hygiene practices by the students and non-availability of soaps for washing hands. In social survey and interaction, children of different schools also came up with very good suggestions which could bring positive change to the school environment. Children from different schools during FGDs were able to openly share their views and problems related to hygiene due to the absences of different facilities at schools. They even shared their learning experiences related to hygiene lessons taught at schools and gave their suggestions as well in order to overcome problems related to WASH facilities at school.

5. CONCLUSIONS

This study was carried out to evaluate the impacts of WASH programme on student's health and hygiene conditions in different targeted schools in selected UCs of Takhtbhai, district Mardan. Results of social study revealed that none of the schools in UC Takkar and Saroshah followed up WASH programme implemented at their schools, neither the children were encouraged to take the initiative for improving the hygiene conditions of their schools. The data collected after testing the drinking water samples for physical and chemical parameters

was evaluated through descriptive statistical analysis using ANOVA, which revealed that all the parameters showed significant variations and affect each other except pH. While water samples tested for bacteriological analysis showed that none of the water sample collected from the targeted schools in the targeted schools of all UCs, which showed that the bacteriologically water quality is safe for human consumption. Findings from the present study suggested that the implementation of WASH programme with true its spirit can bring positive changes in schools going children.

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