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Impact Of Water, Sanitation And Hygiene (WASH) On The Health Of Mayo Elementary School Children (Boys) In 2019-2020

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Abstract:
Justification:
Sanitation and hygiene are critical to health, survival, and development. A significant amount of disease could be prevented through better access to adequate sanitation facilities and better hygiene practices. Improved sanitation facilities (e.g., toilets and latrines) allow people to dispose of their waste appropriately, which helps break the infection cycle of many diseases.
Methods :
An Educationnel Facility-based, mixed type cross-sectional survey was conducted in six schools in Mayo neighborhood, Khartoum, Sudan. A multi-stage sampling technique was used to select the participants fulfilling the inclusion criteria. This sampling technique enabled to distribute the participants proportionally. The data entry and analysis was performed through the statistical package for social sciences. Graphical and numerical summaries were conducted as well as chi-square tests to find either associations or differences where appropriate. All the statistical tests were performed under a decision rule set at 0.05, with a decision for rejecting the null hypothesis whenever $p<0.05$.
Results:
The total number of students was 227 students, divided into six schools where four of those schools were low risk and two of them were high risk. In this study most respondents understood the importance of hand washing and harm of open defecation. However, regarding their practices, 43% of students practiced open defecation, 7% of them did not wash their hands before eating and 15% didn't wash their hands after using toilets. Moreover, 81.4% were absent from school due to illnesses. Regarding prevalence of diseases, the study showed that 68% of respondents contracted diseases in the last month. 2% students contracted typhoid, 12.3% contracted dysentery, 22.6% contracted cholera, 29% contracted malaria, 3.9% contracted UTI, 0.6% contracted trachoma, 0.6% suffered from dental problems, 3.2% suffered from allergies and 25.8% contracted other infections like upper tract respiratory infections.
Recommendations
To improve estimates of health benefits from WASH there is a need for well-designed trials that evaluate the effectiveness of safely managed water and sanitation services, access to essential hygiene conditions and practice of essential hygiene behaviour that reach high coverage and use in the schools.
Conclusion
In conclusion, WASH remains an important determinant of disease burden, especially among young children. Prevention of diarrheal diseases and other WASH-related diseases in those young children will require improvements of drinking water and sanitation services and increased hand washing with soap.
Keywords: *Water, hygiene, sanitation, defecation, awareness.*

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I. Introduction

The situation of water, sanitation and hygiene in schools have been the concern of the largest health responsible body`s for decades. In the erea of the millennium developmental goals (MDGs) the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF), through the WHO/UNICEF Joint Monitoring Program for Water Supply, Sanitation and Hygiene (JMP), have produced regular updates on water, sanitation and hygiene (WASH) since 1990. Together, they continue to monitor Sustainable Development Goal (SDG6) about ensuring availability and sustainable management of water and sanitation for all, targets 6.1 and 6.2 and also supported monitoring of other WASH-related targets (1). Cross cutting WASH related targets were identified in SDG4, ensure inclusive and quality education for all and promote lifelong learning. A goal which cannot be reached unless its specific targets are established which are building and upgrading education facilities that are child, disability and gender sensitive and providing safe, non-violent, inclusive and effective

learning environments for all. A sub target concerned with schools having access to electricity; internet and computers. As well as the proportion of schools with basic drinking water; single-sex basic sanitation facilities; and basic hand washing facilities (as per the WASH indicator definitions) (2). It is clear that the above mentioned ambitious goals and related indicators need collaboration of more than one sector, which are health and non-health related like education, irrigation, and sanitation.

It was declared that all peoples have the right to access to drinking water in quantities and quality equal to their basic needs since 1977 Mar del Plata conference in Argentina which created an Action Plan on "Community Water Supply". Upon reviewing the history in chronological order, the importance of water was further raised in the International Drinking Water Supply and Sanitation Decade from 1981 to 1990 and in 1992 at the UN Conference on Environment and Development in Rio de Janeiro (Agenda 21, Chapter 18), as well as at the International Conference on Water and the Environment (ICWE) in Dublin. In 1993 the World Water Day was designated on 22 March by the UN General Assembly, and in 2013 World Toilet Day on 19 November. In 2000 the Millennium Development Declaration called for the world to halve by 2015 the proportion of people without access to safe drinking water as well as the proportion of people who do not have access to basic sanitation and in 2003 the International Year of Freshwater was declared by the General Assembly, followed by the "Water for Life" Decade from 2005 to 2015 (3).

Despite all international efforts the availability of safe water is a challenge in many African countries. Billions still lack safely managed drinking water and sanitation. Water scarcity could displace 700 million people by 2030. Three billion people still lack basic hand washing facility at home (2017), and the situation is even worse in health care facilities were 2 in 5 lack soap and water or alcohol based hand rub (2016) (4).

Unsafe WASH is linked to many communicable and non-communicable diseases. More seriously at a global level is the connection between COVID-19 transmission and cleanliness. Nearly 2 million preventable deaths and 123 million preventable Disability Adjusted Life Years (DALYs) annually are attributed to unsafe WASH conditions. Sub-Saharan Africa remains the region with the largest disease burden from inadequate WASH: 53% of all WASH-attributable deaths and 60% of all WASH-attributable DALYs occur in this region, and nearly one fifth of all deaths of children under 5 years could be prevented with adequate WASH (5). As stated by when estimating the global burden of diseases, WASH remains an important determinant of global disease burden, especially among young children. Despite all efforts to accurately estimate the WASH related burden of disease, it could not capture disease burden from, for example, water-borne disease outbreaks, flooding and droughts or disease burden in certain vulnerable populations such as refugees, internally displaced persons, and the homeless or certain settings such as healthcare facilities, schools, workplaces and other public places (6).

Our study was to explore the students' knowledge about WASH related diseases, investigate the school's infrastructure and identify WASH- related diseases as a cause of absenteeism among school children in Mayo region, an outskirt underprivileged neighborhood of Khartoum State.

Achieving a basic level of WASH in all schools will require a renewed effort to raise awareness among students, parents, teachers, governments and donors of the importance of WASH for student health and welfare and to ensure that WASH continues to be recognized as an essential foundation and integral component of an inclusive and effective learning environment.

Statement of Research Problem:

Research question: What is the WASH risk profile in primary schools in Mayo, Khartoum State 2020?

II. Objectives:

General Objectives: To evaluate schools risk profile regarding WASH related diseases in Mayo region, Khartoum State

Specific Objectives:

1. To determine the prevalence of WASH related diseases among primary school students
2. To estimate schools WASH risk profile.
3. Perception and attitude and practice of WASH related diseases among primary school students
4. To evaluate schools WASH infrastructure.

III. Literature Review

Wash services:

A cross sectional study was done by Agol D in 2017 to determine the gender differences related to WASH in schools and educational efficiency.The results showed that more than half of all the schools surveyed had no toilets (57%) and the majority were community- managed and were found in Northern, Eastern, North-Western and Southern provinces. Schools which reported toilets without indicating the exact numbers were

21%. Approximately 17% of schools indicated having adequate toilet facilities (20 or fewer students per toilet) and these institutions were found across all the provinces. The remaining (5%) had 100 or more students per toilet and were mostly located in areas of Lusaka and Central provinces.

Approximately 45% of the schools reported point water sources on site including hand-pump-equipped boreholes or protected wells. The proportion with piped water systems was 22% of which the majority were privately owned. Unprotected wells were reported in 21% of the schools while 12% had no water source and were community-managed (7).

Another cross sectional study was done by Antwi A in 2017 to assess the intermediate outcomes of the Tanzania National Sanitation Campaign (NCS) for schools. Seventy out of the 84 primary schools in 10 districts were included in the study. All but one of the schools were day schools. On average, there was similar enrollment for male and female students (305 males vs. 312 females). Within the past year from the survey implementation, 69 of the 70 schools had benefited from at least one WASH-related activity. The most common WASH activities implemented in the schools were development of hygiene education packages (70% of schools), construction or rehabilitation of latrines (53%), and provision of water sources (36%).

The study results also showed that all surveyed schools had access to at least one toilet facility, though the survey could only provide limited information on the functionality of these toilets at the time of field data collection. Almost all the facilities surveyed (97%) could be classified as improved based on the JMP classification (Figure 2). The most common type of toilet facility used in the schools was the ventilated improved pit latrine (47%) and the least was the traditional pit latrine (3%) (8).

Wash related disease:

While another study published by J Mwai in 2018 to determine the factor associated with practices towards water, sanitation and hygiene with occurrence of diarrhea among people in schools with a feeding program in Ganze Sub Countu Kenya. The results showed the distribution was 114 (47.9%) for the males and 124 (52.1%) for the females. Gender and disease occurrence were statistically significant at $\chi2= 7.979$, df = 1, $P<0.005$. Hand washing was also not associated with disease occurrence with 218 (94.0%) indicating that they wash their hands and 14 (6.0%) reporting that they did not wash their hands at $\chi2 = 0.556$, df = 1, $P>0.05$. Frequency for hand-washing at 68 (30.1%) washed before feeding, 156 (69.0%) after visiting toilet and 2 (0.9%) others reasons did not have statistical significance at $\chi2= 2.098$, df = 2, $P>0.05$ with disease occurrence, friends at school washing hands after visiting the toilet ($\chi2 = 0.184$, df = 1, $P>0.05$), Latrine/toilet usage ($\chi2=2.088$, df = 1, $P>0.05$), Availability of soap $\chi2= 0.401$, df = 2, $P>0.05$) and hand-washing with soap ($\chi2= 2.219$, df = 2, $P>0.05$) revealed no significant association with disease occurrence. The results on availability of drinking water was 106 (45.7%) for drinking water always being available, 104 (44.8%) sometimes and 22 (9.5%) for water not being available at all. There was however no significance association with availability of water ($\chi2= 0.836$, df = 2, $P>0.05$) as well as school's source for drinking water(9).

While another cross- sectional study was done by Eriso F in 2014 to determine intestinal parasitic infections in elementary schools children at Dilla Town and its peripheral villages. The results revealed the The list of the most important diagnostic stages of intestinal parasites represented the actual parasitic protozoan and helminth species that were experimentally observed and recorded. This was done by way of randomized diagnostic tests. Out of 710 student children examined, the exact numbers of infected ones and the corresponding infection rates with each specific species of the pathogenic intestinal parasites was directly recorded. The analysis by the statistic of correlation coefficient had proved that the relation among the intestinal parasites investigated, due to various factors, in this study was very strong. The relation was nearly a perfect correlation, i. e., +,-1. In this particular study the computed value of correlation coefficient was almost a perfect positive correlation (+1), because it was 0.99984, whereas the tabulated critical values are 0.754 & 0.874 at alpha = 0.05, and alpha = 0.01 levels of significance respectively for 5 degrees of freedom. (10).

A study that aims to describe the situation of water supply, sanitation and hygiene (WASH) in Nepal by analyzing secondary data and information obtained from published and unpublished literature. About 97 of the total population have access to basics sanitation facilities and 87 percent access to basic water supply facility. Sanitation coverage is 95 percent in six Provinces and below 90 percent in Province no. 2 of Nepal. The momentum of sanitation coverage was accelerated immediately after internalization and implementation of the Sanitation and Hygiene Master Plan in 2011 and Nepal reaches at close to the elimination of open defecation. The gap between rich and poor in accessing to and using toilet facility has been narrowing down due to the nationwide sanitation campaigns. But there is disparity in accessing and using piped water between rich and poor. Only 25 percent of water supply systems are well functioning and 68 percent can supply water to water taps throughout year. One-fourth of the existing toilet facility across the country are poorly constructed that needs to be upgraded. The government should make consolidated and integrated efforts to reduce existing inequity in the WASH sector and enhance the sustainability of water supply and sanitation services (11.)

One paper aims to assess the costs and health benefits of sanitation interventions undertaken by the National Rural Drinking Water Security Pilot Project in India between 2012 and 2015. Full software and infrastructure costs were included as well as health endpoints, sourced from primary health centers. In Karnataka, latrine coverage of households increased from 16% to 59% in villages with high level of interventions, and from 7% to 18% in villages with lower levels of intervention. In Uttar Pradesh, coverage increased from 33% to 70% in high intervention villages and from 27% to 39% in the low intervention villages. We found health-related net benefits of USD 13 and USD 10 per person per year and benefit/cost ratios of 2.5 and 5.0 in Karnataka Uttar Pradesh, respectively. Given the positive economic returns on the intervention in culturally heterogeneous sites of southern and northern India, this intervention has potential for bringing significant benefits to the Indian population (12).

An article aimed to assess the extent to which, and how, UN-Water's Global Analysis and Assessment of Sanitation and Drinking Water (GLAAS) has tracked governments' efforts to reach the poor since the inception of this global monitoring effort. Results showed that he dimensions of pro-poor governance and number of questions related to pro-poor governance in GLAAS surveys have increased from 2008 to 2016. While the majority of countries report taking actions to promote equity, many countries did not provide information about specific actions they were taking to provide better services to the poor. Moreover, several actions countries reported taking (e.g. implementing an increasing block tariff) are likely to be ineffective (13)

A study sought to investigate the predisposing, enabling and reinforcing factors that are causally related to water- and sanitation- related hygiene practices among school going children. A random sample of 400 primary school children (196 males, 204 females) in four schools in Chitungwiza town, Zimbabwe was interviewed. Behavioural factors were assessed through cross examination of the PROCEED PRECEDE Model. The respondents had been stratified through the random sampling where strata were classes. A structured observation checklist was also administered to assess hygiene enabling facilities for each school. Children's knowledge and perceptions were inconsistent with hygienic behaviours. The family institution seemed to play a more important role in life skills training and positive reinforcement compared to the school (50% vs 27.3%). There was no association between a child's sex, age and parents' occupation with any of the factors assessed (P=0.646). Schools did not provide a hygiene enabling environment as there were no learning materials, policy and resources on hygiene and health (14).A paper aimed to document the characteristics and effectiveness of approaches to improve WASH systems that promote the health and education of girl students, and students with disability in Pacific Island Countries and Territories (PICTs). This systematic scoping review comprehensively searched peer-reviewed and grey literature about WASH, PICTs, schoolgirls and students with disability. At best, there are only fleeting mentions in the grey literature about WASH and disability in schools in PICTs. Inclusion and exclusion criteria resulted in 12 publications being included: 1 review; 7 original research; 4 commentaries/project reports. A holistic approach to WASH in schools in PICTs must consider how the entire school WASH system can be inclusive of girls and children with disability. Incorporating local PICT learning epistemologies (ways of knowing) and local PICT pedagogies (ways of learning) are required to ensure new WASH systems reduce existing inequalities for girls and students with disability (15).

IV. Methodology:

Study Design:
Educational Facility-based, mixed type cross-sectional survey.

Study Area and Population:

Mayo neighborhood is located at the southern part of Khartoum State (South of the belt), it was called Mayo after the month of May (Arabic name), which was the month of the coup against the government of General Jafar Nimiri at 1969. General Nimiri was the first to order the removal of the slums and conversion of the sewage dump into a residential area. Mayo neighborhood is characterized by high population density and is a neighborhood for peaceful living in Sudan with a number of ethnic backgrounds. Total area is 40km and the total population1

Sample Size & Sampling Technique:

A multi-stage sampling technique was used, at first level Mayo was divided into two geographical areas North and South, then total school numbers was determined in each area based on gender. To be able to get the complete lists of school we paid a visit to the statistics office of the locality authority office. In the second level the sample size was calculated from the total number of schools using the equation below*. Due to the large sample size(ns=65) and lack of time and financial feasibility the number was adjusted(ns/5=nsA) to be 13 schools, which were divided as follows, 6 primary schools for girls, and similar number for boys, while for the mixed we chose one school. The exact school name and location was selected randomly from the available list of school using simple random sampling technique.Upon reaching the school, the geographical coordinates were recorded using Google Maps application (LONG/LAT). Regarding the total number of students to be interviewed, 40 students were selected randomly from each school, i.e.: five students randomly selected per class (grdade1-grade8). In order to be efficient and due to the short time frame as the study was conducted during the short month of February2020, during which the schools were preparing for final year exam, we recruited 6 data collectors, trained and supervised to collect the different types of data described below.

The sampling technique used for the qualitative part of the study was convenient sample, where by available students who are willing to participate were selected.

Region				Selection of the school				
		School	Number	ns	1+Nd2	Nd2	d2	nsA
South	Boys	11	6512	11	1.0275	0.0275	0.0025	2
	Girls	12	7528	12	1.03	0.03	0.0025	2
	Mixed	5	3040	5	1.0125	0.0125	0.0025	1
North	Boys	19	9201	18	1.0475	0.0475	0.0025	4
	Girls	21	11320	20	1.0525	0.0525	0.0025	4
	Total	68	37601	65				13

*Using the equation of the finite population size

$n=N/1+N\ (d)2$

Where n= sample size

N: total number of schools

d= degree of accuracy

Data Collection Tools:

Tools used were multiple due to the different type of data, the tools for qualitative data were as follows:

- School general environment checklist (observation of school): documented in papers, photo.
- FGD: documented in voice records which were then scripted manually.

For the Quantitative data:

-standardized questionnaire, which was completed through face to face interviews.

-Google Maps "mobile application", used for determining the exact school location coordinates (longitude/latitude).

Plan of Data analysis:

The collected data was entered directly into the Statistical Package of Social Sciences (SPSSversion23) downloaded, cleaned and analyzed. The data were first summarized numerically (mean, standard deviation, median) and graphically (frequency tables and graphics). The frequency table with school

names and coordinates was used to map the spatial distribution of the schools with high and low risks. The risk profile was built using the data of 8 variables:

Student: latrine ratio, Latrine available (yes, no), Latrine function (yes, no), Sink available (yes, no), sink function (yes, no), Latrine condition (safety, light source, privacy, cleanliness), Water Source, Sanitary supplies (soap, sanitizer). Each variable got a score of one or zero according to its condition. Total score was calculated, whereby any school with profile <=4 was classified as Poor School WASH Profile. While schools scored >4 were classifies as Good School WASH Profile. Association between the dependent variable and the independent was tested using chi-square tests, the level of significance was stated at p=0.05.

Qualitative data

The WASH project, was approached in a mixed way, where a qualitative data were collected to be able to visualize the context, highlight school children WASH-related diseases, knowledge, behaviors, access to facility and perception of need to. This approach really facilitated the understanding of the quantitative part (Grounded Theory). The approach used for qualitative data collection was focus group discussion, where students were gathered in groups of 10 pupils. Each group contained 5pupils of 2 different classes, for e.g: year 1&2, 3&4,5&6..and so on. We intended to take the views of younger and older pupils as they varied in their behavioral component. Pupils of either sex who were willing to participate were asked to join, those who were dismissed by the time we reached the school and those who were not able to communicate their ideas were replaced. A total number of 26 FGDs were intended to be carried out, but since we reached saturation at FGD number 10, we decided to stop. The FGD were carried out by a trained moderator, using a standard set of questions both closed and open ended. A voice recorder was used to record all reflections.

The recorded files were transcribed word by word and documented in MS word and thematically analyzed using framework analysis method.

Five main questions discussed, the main point was to elaborate on the knowledge of pupils about the school environment and how they perceived a healthy environmental condition. What their perception about personal hygiene, and why it's important. Finally we viewed the use and accessibility to school latrines.

Ethical Consideration:

Approval was sought from the graduate college ethical review board, then it was sought from the Ministry of Education. The locality administration office at Gebel Awlia was informed and a copy of ethical forms submitted to facilitate the researcher work and allow access to data regarding school numbers location and distribution. They issued a letter to each school principle to allow research team entry, full observation and documentations of school infrastructures both in writing and pictorial formats. Each class teacher gave permission to interview students during break time, and facilitated interview of younger classes. Any students who was not comfortable talking was eliminated. Research objectives were well explained before the start of the study to all responsible bodies; voluntary participation and respect were insured. As no harm or body materials were involved, verbal consent was taken from older students. To guarantee benefit of the study the research team promised to submit research recommendations to MOE-responsible body.

Quantitative analysis: Surveys:

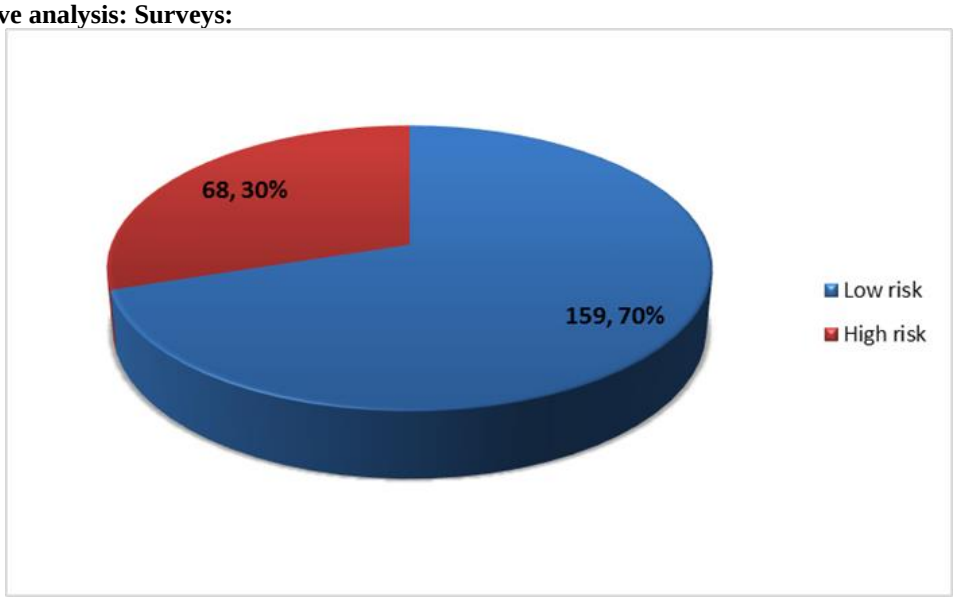

Figure 1: Distribution of the school according to risk profile. (n=227)

The figure above shows the percentage of the risk of the school which 68.30% with high risk while 159.70% of the schools with low risk.

Table 1: Distribution of the school according to risk profile.

School ID	School Name	Gender	Number of student		Age		Profile
			Number	%	Mean	Range	
1	Al-Andalus 3(Anasr South	Boys	39	17	11 ± 2.3	8	low risk
2	Nour Alrahman	Mixed	27	11	10 ± 1.79	6	high risk
3	Bilal Ibn Rabah(Anasr North)	Boys	40	18	10.5 ± 2.29	7	low risk
4	Alsultan Tairab(Anasr North	Boys	41	18	11 ± 2.24	7	high risk
5	Al-Itihad Altawni(Anasr North	Boys	40	18	10.4 ± 2.27	7	low risk
6	Alwehda(Anasr North	Boys	40	18	10.7 ± 2.49	8	low risk

The table above reflects the total number of students was 227 students, divided into six schools where four of those schools were low risk and two of them were high risk.

Table 2: Distribution of the students according to their knowledge.

Variable	Number	%
Importance of washing hands(n=227)		
Yes	224	99
No	3	1
Not Washing hands can Predispose to Diseases(n=227)		
Yes	217	96
No	8	3
I don't know	2	1
Harm from Open Defecation(n=227)		
Yes	179	79
No	38	17
I don't know	10	4
Why do you Think You Should Wash your Hands(n=227)		
Not To Have Dirty Hand	28	12
Not to get diseases	127	57
Not to have germs	60	26
I don't know	12	5

The table above shows the students perception on the importance of hand hygiene. 224 (99%) said its important, and 3 (1%) said no it's not, And shows the students perception on the predisposition to diseases when hands aren't 217 (96%) said yes while 8 (3%) said no 2(1%) did not answer, and show the student perception on the harm from open defecation, most of the student179 (79%) said (yes) there is the harm from open defecation while 38(17%) said no and the other 10(4%) of the student they didn't know. And show the perception of student about the reason of washing hand most of them 127(57%) said not to get a diseases and 28 (12%) of the student said not to have a dirty hand, and 60(26%) said not to have a germs. And 12(5%) they didn't know.

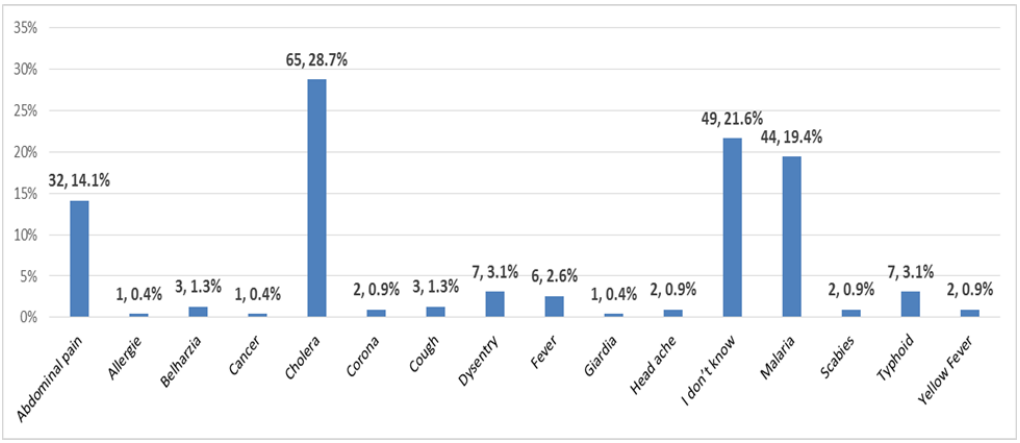

Figure 2: Distribution of student perception about Diseases could be contracted in Case of Poor Hygiene (n= 227

The figure above shows the student perception about diseases occurred in case of poor hygiene.

Practice:

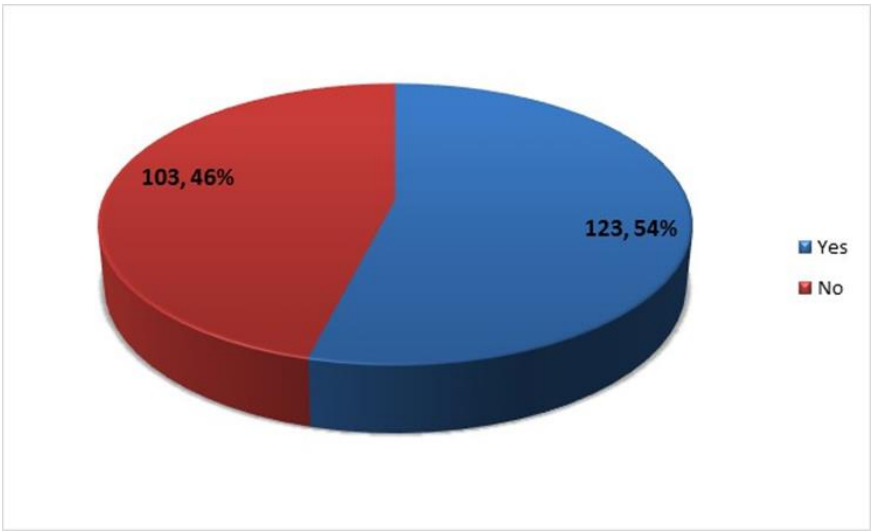

Figure 3: Distribution of student according to Using School Latrines (n=226).

The figure above shows 123.54% of the student they using school latrine while103.46% are not using the latrines.

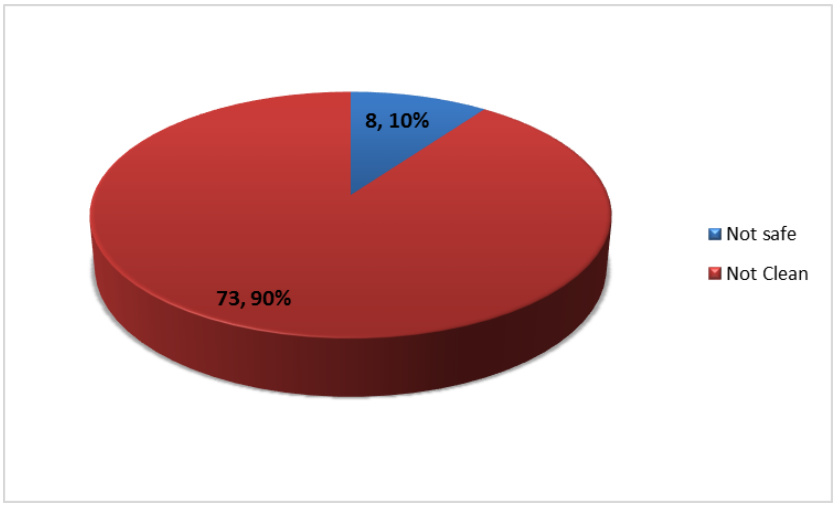

Figure 4: Distribution of student according to Why they did not Use School Latrine (n=81)

The figure above shows the reason the prevent the students from using the school lartrine 8.10% of the students said it's not safe while 73.90% said it's not clean.

Table 3:Distribution of the student according to their practice.

Variable	Number	%
Practicing open defecation (n=227)		
Yes	97	43
No	130	57
Washing hands Before Eating(n=227)		
Yes	205	90
No	16	7
I don't know	6	3
Washing hands after using Toilet(n=227)		
Yes	192	84.6
No	34	15
I don't know	1	0.4
Buying Breakfast or any food from school food handlers(n=226)		
Yes	184	81.5
No	41	18
I don't know	1	0.5

The table above reflects the practices of open defecation and results showed that 97 (43%) students defecate openly while 130 (57%) do not. And shows 205(90%) they washing hands before eating and 16 (7%) do not. And shows 192(84.6%) they washing hands after using toilet while34(15%)of the student do not.

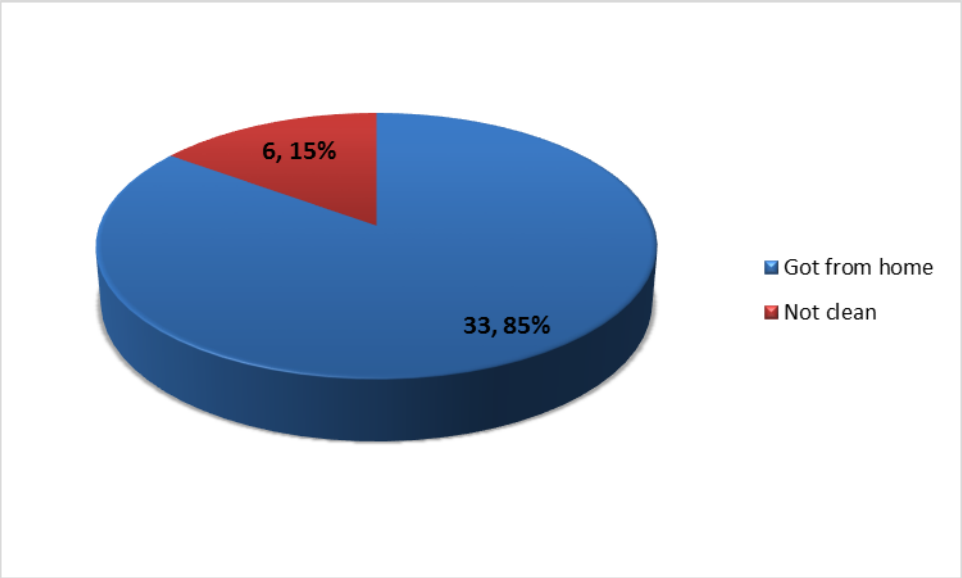

Figure 5: distribution of student according to Why they don't buy breakfast or any food from school food handlers (n=39).

The figure above shows student perception about the reason of didn't buy breakfast or any food from school food handlers, however 6.15% said they got food from home and 33.85% said food is not clean.

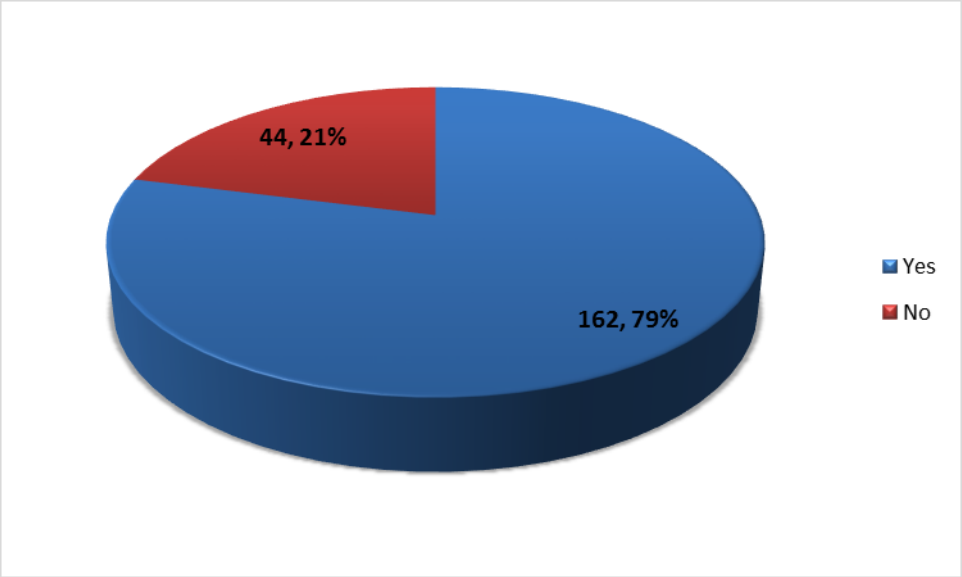

Figure 6: Distrubution of student according to Absent from the School (n=206).

The figure above shows absenteeism of student from the school 44.21% said no while 162.79% said yes.

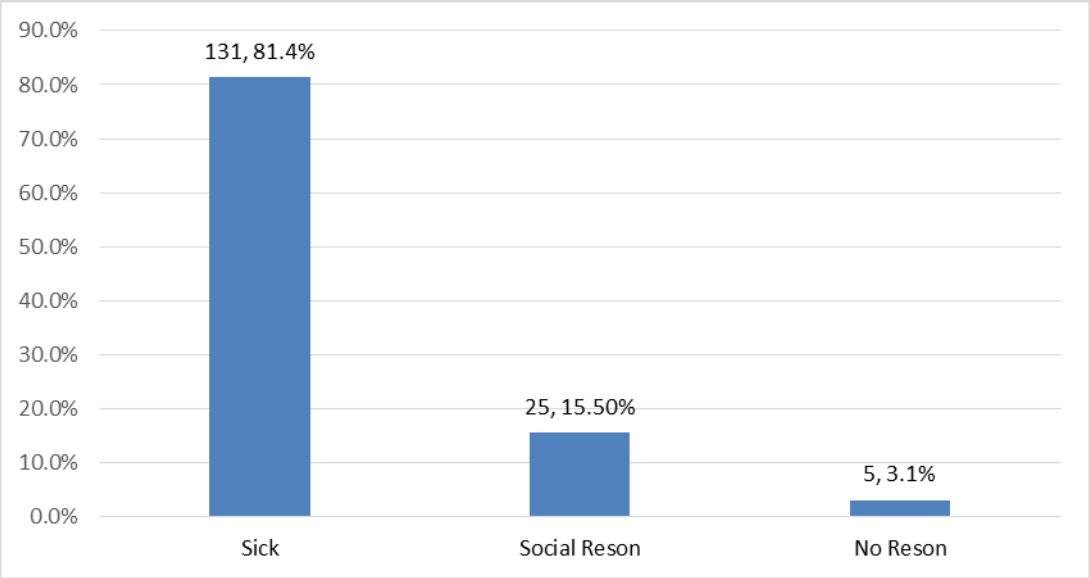

Figure 7: Distribution of student according to their perception on Reason for absent from school(n=161).

The figure above shows the perception of the student on Reason for absent from school 131.81.4% said they was sick and 25.15% said there is social reason and 5.3% said there is no reason.

Table 4: Distribution of the student according to their attitude.

Variable	Number	%
What Do you Use to Wash Your Hands(n= 226)		
Water	181	80
Water and Soap	44	19
Other	1	1
IF use a Soap from where you get it(n=)		
From Home	31	82

From Teacher	6	16	
Others	1	2	

The table above reflected the perception of student about what they use to wash their hand, most of the student 181(80%) said they using water for washing their hand and 44(19%) said they using water and soap. However 31(83%) they get the soap from home and 6(16%) from teacher.

Table 5: Distribution of students according to the presence diseases contracted in the last 6 months?

Variable	Number	%
Diseases in last Month(n=507)		
Yes	155	68
No	72	32

The table above shows Distribution of students according to the presence diseases contracted in the last 6 months, most of student 155(68%) said they got diseases in the last 6 months
While 72(32%) of the student they didn't have a diseases.

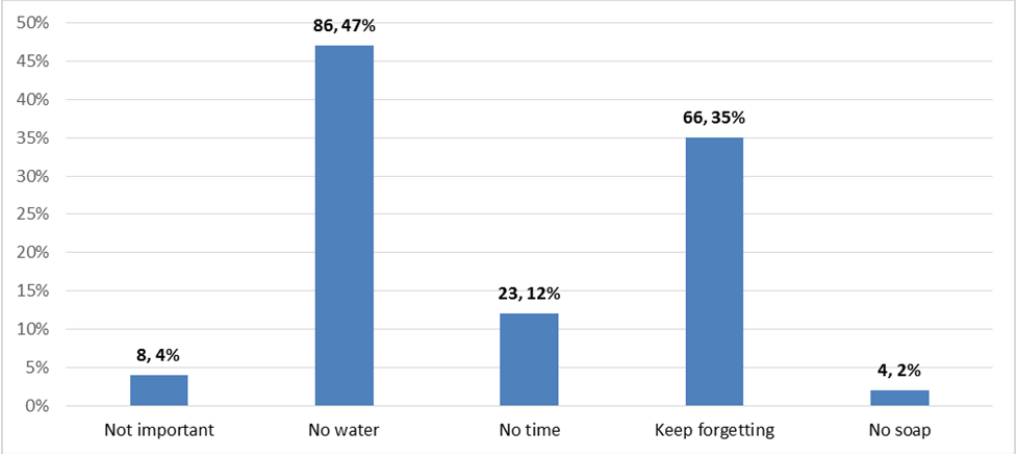

Figure 8: Distribution of student according to their perception on Reason for skipping hand wash (n = 187)

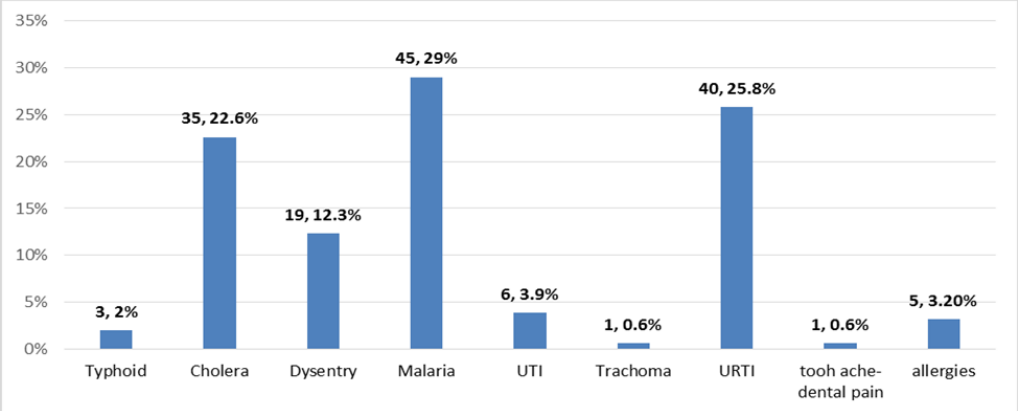

Figure 9: Distribution of student according to their perception on diseases contracted in case of poor hygiene (n=155

Associations:

Table 6: Association between diseases contracted in the last 6 months and risk profile.

Diseases	Risk Profile	Total	P-value

	high risk	low risk		
Yes	48	107	155	0.625
No	20	52	72	
Total	68	159	227	

The table above shows Association between diseases contracted in the last 6 months and risk profile which divided into high risk and low risk; there is no significant relation between a diseases and risk profile.

Table 7: Association between risk profile and student absentism.

Absent	Risk Profile		Total	P-value
	high risk	low risk		
Yes	49	113	162	0.000
No	1	43	44	
Total	50	156	206	

The table above shows Association between risk profile and student absentism , thier is significant relation between the risk profile and absentism.

Table 8: Associations between student Knowledge and diseases contracted in last 6 month.

Variable	Diseases		Total	P-value
	Yes	No		
Importance of washing hands				
Yes	153	71	224	No Relationship
No	2	1	3	
Not Washing hands can Predispose to Diseases				
Yes	149	68	217	0.614
No	5	3	8	
I don't know	1	1	2	
Harm from Open Defecation				
Yes	122	57	179	No Relationship
No	26	12	38	
I don't know	7	3	10	
Why do you Think You Should Wash your Hands				
Not To Have Dirty Hand	20	8	28	0.639
Not to get diseases	85	42	127	
Not to have germs	42	18	60	
I don't know	8	4	12	

The table above shows there is no relationship between diseases and important of washing hands, And there is no significant relation between diseases and the perception of student about Not Washing hands can Predispose to Diseases, and there is no relationship between a diseases and student perception about harm from open defecation , and there is no significant relation between a diseases and student perception about Why do you Think You Should Wash your Hands

Table 9: Associations between student practice and diseases contracted in the last 6 month.

Variable	Diseases		Total	P-value
	Yes	No		
Using School Latrines				
Yes	77	46	123	0.034
No	78	25	103	
Practicing open defecation				
Yes	76	21	97	0.005
No	79	51	130	
Washing hands Before Eating				
Yes	141	64	205	0.169
No	12	4	16	
I don't know	2	4	6	
Washing hands after using Toilet				
Yes	128	64	192	0.101
No	27	7	34	
I don't know	0	1	1	
Buying Breakfast or any food from school food handlers				
Yes	123	61	184	0.106
No	32	9	41	
I don't know	0	1	1	

The table above shows there is significant relation between diseases student using school latrines ,and also shows there is is significant relation between diseases and student practicing open defecation, and also reflect there is no significant relation between diseases and student Washing hands Before Eating, and there is no significant relation between diseases and student Washing hands after using Toilet ,and also shows there is no significant relation between diseases and student Buying Breakfast or any food from school food handlers.

Table 10: Associations between student attitude and diseases contracted in the last 6 month.

Variable	Diseases		Total	P-value
	Yes	No		
Absent				
Yes	132	30	162	0.000
No	16	28	44	
What Do you Use to Wash Your Hands				
Water	126	55	181	0.638
Water and Soap	28	16	44	
Other	1	0	1	
Reason for skipping hand wash				
Not important	6	2	8	0.241

No water	65	21	86	
No time	16	7	23	
Keep forgetting	40	26	66	
No soap	4	0	4	

The table above reflected the associations between student attitude and diseases contracted in the last 6 month, firstly there is a significant relation between diseases contracted in the last 6 month and student absentism ,also there is no a significant relation between diseases contracted in the last 6 month and What Do you Use to Wash Your Hands, and also there is no a significant relation between diseases contracted in the last 6 month and Reason for skipping hand wash**.**

Qualitative data

Conception about hygiene facility, perception about hygiene itself, what are the barriers and facilitators for use. From student perceptive what should be done to improve situation and encourage use

The WASH project, was approached in a mixed way, where a qualitative data were collected to be able to visualize the context, highlight school children WASH related, knowledge, behaviors, access to facility and perception of need to. This approach really facilitated the understanding of the quantitative part (Grounded Theory).

The approach used for qualitative data collection was focus group discussion, where students were gathered in groups of 10 pupils. Each group contained pupils of 2 different classes, for e.g.: year 1&2, 3&4, 5&6...and so on. We intended to take the views of younger and older pupils as they varied in their behavioral component. Pupils of either sex who were willing to participate were asked to join, those who were dismissed by the time we reached the school and those who were not able to communicate their ideas were replaced. A total number of 26 FGDs were intended to be done, but since we reached saturation at FGD number 10, we decided to stop. The FGD were carried out by a trained moderator, using a standard set of questions both closed and open ended. A voice recorder was used to record all reflections.

The recorded files were transcribed and thematically analysed using framework analysis method.

Five main questions discussed, the main point was to elaborate on the knowledge of pupils about the school environment and how they perceive a healthy environmental condition. What their perception about personal hygiene, and why it's important. Finally the use and accessibility to school latrines.

Question	FGD source	
	Younger classes(1,2-3,4), age(6-10yr)	Older class(5,6-7,8)
1.what is the school environment	The majority of pupils knew that school environment includes water, air, playground, greenery	Majority gave similar responses Few added that good teachers & good friends are part of school environment
2. What do you think about school environment(poor/good)? If poor what is missing	Good coolers for drinking water	Majority said its Poor, as we need windows, fans, supplies, clean latrines &tab water. Few said they want paintings on the wall, desks, air con. Over-crowded classes Few said it's good. One student mentions daily education during school assembly and punishment for misbehaving "open def."
3.what is personal hygiene	Clean cloths, body, and hair	Similar and some added clean nails. One added to come from clean house
4.why personal hygiene is important	To avoid getting diseases	Similar responses, more details of diseases: germs, skin allergies, cholera, malaria, abdominal pain, yellow fever,
5. What do you think about school latrines	Majority said its dirty	Similar response, few said it's clean, the teacher latrine is clean.
6. Do you use school latrines	Yes	No, majority said we use nearby houses or mosques latrines

Gender and age differences

Disparities between schools funded by NGO, schools in better neighborhoods were parents contribute. One school mentioned about life boy soap company sponsorship which stopped during last year due to revolution

According to senior classes they complained about misuse by younger ones.

Open defecation is widely practiced, behind toilets for fear of going inside, for safety, dirtiness, or don't know how to use it.

Also open defecation is practiced out side he school, behind the wall, it's like a daily routine to tweeze teachers and break rules. They know it's wrong, but think of human excreta as safe component of earth.

Seasonal issues, with fall season latrines fall; school yard is fludded due to its poor infrastructure and low ground level.

Latrines which are built correctly and kept clean are for teachers.

Few sewage channels (ground channels which are present cannot accommodate) i.e. large number of students use it.

Since the schools are built if wide land-escapes, which re usually at the periphery of the household, we noticed dumping areas nearby.

Some of the Girls schools were more clean and beautiful.

Disparities based on individual differences and efforts, motivated school principle with good communication skills managed to draw attention to school needs and bring fund.

Some students at schools in remote neighborhood with IDP communities and minorities, prefer to stay at school than going home

V. Discussion

The aim of this paper is to evaluate schools risk profile regarding WASH related diseases in Mayo region, Khartoum State, with a goal of making future efforts improve target interventions for young people. Personal hygiene among the youth is essential as it forms part of their developmental stages and contributes to the general well-being and health of the individual.

WASH-related indicators including not using soap when hand washing, using an unimproved sanitation facility, heavy toilet sharing, and higher water consumption for all purposes were identified as risk factors.

This paper showed that 2% of students contracted typhoid, 22.6% contracted cholera, 12.3% contracted dysentry, 29% contracted malaria, 3.9% contracted UTI, 0.6% contracted dental problems and 3.2% contracted allergies. In comparison to a paper done to examined the prevalence of some common infectious diseases/disease symptoms of childhood among under-five children in Nigeria, where results showed that the prevalence of diarrhoea, fever and cough was respectively 10.5%, 13.4%, and 10.4%. In the regression analysis, children in the households that lacked all three types of facilities were found to have respectively 1.32, 1.24 and 1.43 times higher odds of suffering from diarrhea, fever and cough.(16)

In this study we found that the perception on importance of hand washing had no relation with the disease occurrence. On the other hand, there was no significant relation on perception of if hand washing predisposes to diseases or not and disease occurrence. There was also no significant relation between washing hands before eating and after using toilet as well as buying breakfast from food handlers with disease occurrence where p-value was 0.169, 0.101 and 0.106 respectively. Whereas another. Article was done to determine the factor associated with practices towards water, sanitation and hygiene with occurrence of diarrhea among people in schools with a feeding program in Ganze Sub Countu Kenya, and the results showed that the distribution was 114 (47.9%) for the males and 124 (52.1%) for the females. Gender and disease occurrence were statistically significant. Hand washing was also not associated with disease occurrence with 218 (94.0%) indicating that they wash their hands and 14 (6.0%) reporting that they did not wash their hands. Frequency for hand-washing at 68 (30.1%) washed before feeding, 156 (69.0%) after visiting toilet and 2 (0.9%) others reasons did not have statistical significance at $P>0.05$ with disease occurrence, friends at school washing hands after visiting the toilet, Latrine/toilet usage, Availability of soap and hand-washing with soap revealed no significant association with disease occurrence. The results on availability of drinking water was 106 (45.7%) for drinking water always being available, 104 (44.8%) sometimes and 22 (9.5%) for water not being available at all. There was however no significance association with availability of water as well as school's source for drinking water. (9)

Limitations:

• Absence of students from school due to unavailability of clean water.

• Lack of honesty by some students in certain questions.

• Due to some students not fully understanding the questions, some students didn't know how to answer some questions.

• Some of the study participants would answer questions of the other study participants.

Data collected from these findings indicate that there needs to be improvements in the WASH activities and knowledge in schools to avoid many diseases. WASH diseases were proven to cause absence of students from school

VI. Conclusion:

In conclusion, WASH remains an important determinant of disease burden, especially among young children. Prevention of diarrheal diseases and other WASH-related diseases in those young children will require improvements of drinking water and sanitation services and increased hand washing with soap. Through these simple but powerful measures, the number of absences due to illness can decline and the burden of these diseases, with their health, economic, and social costs, can prevent the full achievement of health and highlights the need to step up disease elimination efforts.

Clean water is thus a pre-condition for development, but so is sanitation which facilitates not just Heath but also dignity, and empowering hygiene education.

Recommendations

1. The primary focus should be on ensuring all people are empowered to live healthy lives.
2. Improved access to WASH.
3. Improving behavior (such as hand washing with soap), improved information (such as hygiene and sanitation promotion or access to health animators and other healthcare workers), and improved environments (sanitation and access to safe water).
4. Health systems should move beyond providing healthcare facilities to address the social and environmental determinants of health .
5. Health systems should also address infrastructure deficits affecting the social and environmental determinants of health.

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