



# Effects of Water, Sanitation, and Hygiene on the School Absenteeism of Basic Level Students in the Government School of Nepal

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### Specialty section:

This article was submitted to  
Educational Psychology,  
a section of the journal  
Frontiers in Education

Received: 05 February 2022

Accepted: 31 May 2022

Published: 04 August 2022

### Citation:

Sharma MK and Adhikari R (2022)  
Effects of Water, Sanitation,  
and Hygiene on the School  
Absenteeism of Basic Level Students  
in the Government School of Nepal.  
Front. Educ. 7:869933.  
doi: 10.3389/feduc.2022.869933

This study assesses the effect of improved water, sanitation, and hygiene (WASH) services on students' absenteeism in government basic schools for 10–19 years old in Nepal. This study applied an *ex post facto* research design on two groups of students: with and without improved school WASH services. This study showed that students in schools with improved WASH services were more likely to be regular in attendance (80%) compared to those without (58%),  $p < 0.001$ . There was an association between students' school absenteeism and student grades,  $p < 0.05$ . Moreover, the caste, religion, and grades of students were also associated with students' school absenteeism,  $p < 0.001$ . The analysis further showed that students with improved WASH were more likely to be regular [crude odds ratios (COR) = 0.353; 95% confidence interval (CI); 0.256–0.487,  $p < 0.001$ ] than those without. This trend was maintained across all demographics. It was significant even after the inclusion of all sociodemographic characteristics and increased rapidly [adjusted odds ratio (AOR) = 0.508; 95% CI; 0.334–0.773,  $p < 0.01$ ]. The Brahmin/Chhetri-Terai and the Dalit students were more likely to be absent (COR = 0.315; 95% CI; 0.153–0.648,  $p < 0.01$  and AOR = 0.274; 95% CI; 0.139–0.542,  $p < 0.001$ , respectively) than Brahmin/Chhetri-Hill, Janajati, and other castes. This study underscores the importance of WASH services in schools in reducing students' school absenteeism. Access to WASH services is recommended with several awareness programs to reduce absenteeism and increase students' school regularity.

**Keywords:** effect, water, sanitation, hygiene, student, absenteeism, Nepal

## INTRODUCTION

Absenteeism is one of the major barriers to achieving quality education (Monse et al., 2013). Among school-age children, approximately 75% of all absences are attributed to illness (Kathleen, 2002). Marriage is the most common reason for girls in low- and middle-income countries for quitting school. Dropouts due to marriage range from the 5th to 10th grade, and married girls are 10 times more likely to quit school compared to unmarried girls (Sekine and Hodgkin, 2017). However, illness-related absences have been shown to lead to adverse educational and economic outcomes; for instance, a sick child may fall behind in his or her coursework and suffer academically

(Miller et al., 2008). As hands are a crucial mode of infectious disease transmission among school-going children, hand hygiene with water and soap is critical to reduce illness-related absences (Goldmann, 2021). Moreover, handwashing has been recognized as one of the most cost-effective health interventions to reduce the burden of disease (Bartram and Cairncross, 2010) and as the most effective process that is considered as the key measure to trim down the potential transmission of infection through contact with people and things (Sharma et al., 2022).

Information regarding absenteeism was defined and collected differently in several studies. Its duration was defined as the “number of days absent due to a single cause, with at most 2 days of attendance or a weekend between events and was recorded based on the number of absences due to infectious causes as reported by students, teachers, and parents” (Joshi and Amadi, 2013). The number of absences caused by illness per 100 studentweeks was recorded based on the number of illness-related absences as reported by parents and school records (Talaat et al., 2011) and the number of illness- and non-illness-related absences from both parents and teachers (Nandrup-bus and Visitor, 2009). Overall, illness-related absenteeism among children constitutes about 75% of all school absences (Kathleen, 2002), which is largely attributed to respiratory and gastrointestinal infections (Lau et al., 2012).

Grant et al. (2015) concluded that one-third of female students missed at least 1 day of school during their menstrual period. Further, menstruation accounts for only a small proportion of all female absenteeism and does not create a gender gap in absenteeism. An impact study in Nyanza province, Western Kenya, by O’Reilly et al. (2008) concluded that the provision of safe drinking water, handwashing facilities, and hygiene education in primary schools reduced student absenteeism by 35%. A study in the USA by Guinan et al. (2002) showed a reduction in absenteeism following the implementation of the use of hand sanitizers, hygiene education, or a combination of these interventions. The baseline study in Kenya illustrated that fecal contamination of the school environment was high because many schools have few latrines, inadequate water supplies, poor quality of water sources, water storage in containers that permit hands to touch and contaminate the stored water, and a lack of handwashing facilities. The research further revealed that, in addition to impacting school attendance, the burden of diarrheal diseases and parasitic infections harms students’ growth, nutritional status, physical activities, cognition, concentration, and school performance.

Several studies have been carried out to assess school absenteeism caused by specific illnesses, such as the prevalence of diarrhea, acute respiratory infections (ARI), asthma, headache, and abdominal pain (Saps et al., 2009), and social and physical causes, such as social pressures, family responsibility, poverty, parental occupation, and physical and mental disability (Besculides et al., 2005; Uppal et al., 2010). However, research on the effect of water, sanitation, and hygiene (WASH) services in schools on students’ absenteeism is scarce. Therefore, we undertook a causal-comparative study in schools to assess the effect of school-based WASH facilities on students’ school absenteeism.

In this study, absenteeism accounts for at least a full day of absenteeism from school. It was not retained if students bunked or left school after half a day even after a class. Furthermore, according to the GoN Flash-I Report 2076 (2019–2020), the promotion rate to the lower basic level (1–5) was 90%, with 89.4% boys and 90.7% girls. The dropout rate was 3.6–4.1% for boys and 3.3% for girls. There was a slightly lower promotion and a slightly high dropout rate for boys compared to girls. Similarly, at the basic upper level (6–8), the promotion and dropout were 92.5% and 3.8%, respectively. A slight difference was noted: boys had a 91.9% and girls had a 93.1% promotion rate. Similarly, boys had a higher dropout rate of 4.1% compared to that of 3.3% for girls. Thus, girls had a higher promotion rate and lower dropout rates at the upper basic level than boys (MoE, 2019). In this context, research is oriented to examine the effect of WASH services on student absenteeism using *ex post facto* research.

## MATERIALS AND METHODS

### Research Design

This is quantitative research, which applied a nonexperimental *ex post facto*/causal-comparative research design. It was conducted between January and March 2021 in four basic Governmental schools in the Dhanusha and Chitwan districts of Nepal. Each district consists of two schools: one with improved WASH facilities and another without.

The study population constituted the total number of students  $n = 1,342$  from four basic schools studying in grades 6–8 in two districts: Dhanusha and Chitwan of Nepal. The data were collected in person by administering paper-and-pencil survey questionnaires to the students in a single phase.

### Sample Size and Sampling Techniques

The sample size was calculated using the standard statistical formula  $S = \frac{z^2 \times p \times (1-p)}{e^2}$  for an infinite population (Sharma et al., 2021). So, the calculated sample size was 384; however, to make a more representative sample and minimize sampling errors (Sharma and Adhikari, 2022), the calculated sample size was multiplied by the design effect of two. Hence, the final sample size for this study was 768. These respondents were equally distributed in each stratum: improved and unimproved schools. The intent of this distribution was to obtain optimum results from a larger number of respondents. For the selection of schools, whether they are considered improved or unimproved WASH facilities, the researchers consulted closely with the Education Development Coordination Unit (EDCU) in the study area. In close consultation with the EDCU, we purposively selected two schools: one improved and another without improved WASH facilities from Janakpurdhm sub-metropolitan city of Dhanusha and Ratnanagar municipality of Chitwan district in Nepal. Thereafter, it was verified through the researcher’s self-observation based on the Joint Monitoring Program (JMP, 2018) guidelines (Sharma and Adhikari, 2022). Based on the JMP (2018) guidelines, schools are divided into two strata: improved and without improved WASH facilities. Hence, four schools were purposively selected from the study area. The number of students

was proportionally calculated from each of the grades from 6 to 8 in the selected basic level schools through a stratified sampling method, while students were randomly selected.

## Data Collection and Analysis

The researcher collected data using survey research tools from students through the face-to-face method. Absenteeism of at least 1 day was measured. The data were carefully checked, rechecked, coded, and analyzed by applying Statistical Package of Social Science (SPSS) version 25.00. Three types of analysis, viz., univariate, bivariate, and multivariate, were used in this study. The univariate analysis was performed to show the frequency and percentage of the respondents' participation in this study. The bivariate analysis was performed through the Chi-squared test to show the association between two variables (Sharma, 2020), and all variables were entered into the multivariate analysis to show the effect between more than two variables.

## Ethical Consideration

Ethical approval was obtained from the Nepal Health Research Council (NHRC), Nepal and 8541-2020 PhD. Initially, written consent was obtained from school authorities like the school administration to conduct this study in the school. Initially, written consent was obtained from school authorities like school administration to conduct this study in the school. In addition, the researcher took written consent from all students over 18 years of age. For those under 18 years of age, assent/consent was received from the school head teacher as she/he is the legal guardian while students are at the school. No incentives, such as money or any goods, were offered to the students, and only those who agreed to be a part of this study voluntarily participated (Van Teijlingen and Hundley, 2001). Confidentiality was maintained by providing a unique code to each of the schools and students instead of their actual identity.

## RESULTS

This section depicts students' school absenteeism by background characteristics. In addition, it examines whether there is an association between sociodemographic variables of the respondents; school WASH situations, age, sex, grade, caste, and religion with students' school absenteeism.

### Sociodemographic Characteristics of Students

The total sample size of 768 consists of an equal number of students in two groups, i.e., 384 (50%) participated in schools with improved WASH facilities and an equal number participated from schools without improved WASH facilities. **Table 1** shows that the majority (82%) of students aged 10–14 (47%) were from improved school WASH facilities. The largest number of respondents were girls (53%) and 28% were from unimproved school WASH facilities. Respondents fairly equally represented grades six to eight. Brahmin/Chhetri-Hill (29%) and Brahmin/Chhetri-Terai (27%) castes had higher respondents than Dalit (19%), Janajati (16%), and other castes (9%). The

improved school had a quarter of Brahmin/Chhetri-Hill and a few (2%) other caste respondents. The majority (20%) of Brahmin/Chhetri-Terai and a few (4%) Brahmin/Chhetri-Hill respondents were found in unimproved school WASH facilities. The majority (82%) were Hindus, fairly equally represented in the improved and unimproved school WASH facilities (**Table 1**). In this study, the non-Hindus consist of Buddhists, Christians, and Muslims.

### School Absenteeism by Students' Background Characteristics

**Table 2** showed that students in schools with improved WASH services were less likely to be absent (20%) than those in schools without improved school WASH services (42%,  $p < 0.001$ ). One-third of respondents aged 15–19 years were found to be absent in the school while less than one-third of them (30%) between the ages of 10–14 years were found to be absent in the school,  $p = 0.517$ .

Overall, respondents were fairly equally represented from grades six to eight and there was an association between school grade and students' school absenteeism,  $p < 0.05$ . There was a strong association between the caste of the respondents and school absenteeism,  $p < 0.001$ . Next, the religion of the respondents had a statistical association with students' school absenteeism,  $p < 0.01$ .

### Logistic Regression Analysis

**Table 3** illustrates the prediction of students' school absenteeism based on sociodemographic characteristics through multilevel modeling. As shown in the first model, school WASH services had a statistically significant association with students' school absenteeism. The result depicts that students who came from schools with improved WASH services were more likely to be regular [crude odds ratios (COR) = 0.353; 95% confidence interval (CI); 0.256–0.487,  $p < 0.001$ ] than those who came from schools without improved school WASH services. In the same way, students' regularity in terms of school attendance was significant even after the inclusion of all sociodemographic characteristics in model 2, and [adjusted odds ratio (AOR) = 0.508; 95% CI; 0.334–0.773,  $p < 0.01$ ] it increased rapidly after the inclusion of sociodemographic covariates. Furthermore, in model 2, students with Brahmin/Chhetri-Terai (COR = 0.315; 95% CI; 0.153–0.648,  $p < 0.01$ ) and Dalit identities (AOR = 0.274; 95% CI; 0.139–0.542,  $p < 0.001$ ), respectively, were more likely to be absent in school than other castes, including Brahmin/Chhetri-Hill, Janajati, and other castes.

## DISCUSSION

This study assesses the effects of school WASH services on basic level students' school absenteeism in urban Nepal. This study found that students' school absenteeism was higher in schools that did not have improved WASH services compared to those that had. The findings of this study were similar to those of a study in China, which showed that the school WASH

**TABLE 1** | Sociodemographic characteristics of students.

Variables	School WASH facilities				Total	
	Improved		Unimproved			
	n = 384	%	n = 384	%	n = 768	100%
<b>Age group</b>						
10–14	360	46.9	273	35.5	633	82.4
15–19	24	3.1	111	14.5	135	17.6
<b>Sex</b>						
Boys	190	24.7	170	22.1	360	46.9
Girls	194	25.3	214	27.9	214	53.1
<b>Grade/Class</b>						
Grade six	183	23.8	49	6.4	232	30.2
Grade seven	117	15.2	135	17.6	252	32.8
Grade eight	84	10.9	200	26.0	284	37.0
<b>Caste/Ethnicity</b>						
Brahmin/Chhetri-Hill	190	24.7	34	4.4	224	29.2
Brahmin/Chhetri-Terai	54	7.0	152	19.8	206	26.8
Janajati	73	9.5	52	6.8	125	16.3
Dalit	49	6.4	95	12.4	144	18.8
Other castes	18	2.3	51	6.6	69	9.0
<b>Religion</b>						
Non-Hindu	73	9.5	65	8.5	138	18.0
Hindu	311	40.5	319	41.5	630	82.0
Total	384	50.0	384	50.0	768	100

**TABLE 2** | School absenteeism by students' background characteristics.

		Absenteeism at school				Total		$\chi^2$	P
		Yes		No		n	%		
		n	%	n	%				
School WASH situation***	Improved	78	20.3	306	79.7	384	100.0	40.93	0.000
	Unimproved	160	41.7	224	58.3	384	100.0		
Age group	10–14	193	30.5	440	69.5	633	100.0	0.42	0.517
	15–19	45	33.3	90	66.7	135	100.0		
Sex	Boys	111	30.8	249	69.2	360	100.0	0.08	0.930
	Girls	127	31.1	281	68.9	408	100.0		
Grade of the student*	Grade 6	61	26.3	171	73.7	232	100.0	7.08	0.029
	Grade 7	73	29.0	179	71.0	252	100.0		
	Grade 8	104	36.6	180	63.4	284	100.0		
Ethnicity/Caste of the students***	Brahman/Chhetri-Hill	38	17.0	186	83.0	224	100.0	63.81	0.000
	Brahman/Chhetri-Terai	78	37.9	128	62.1	206	100.0		
	Janajati	21	16.8	104	83.2	125	100.0		
	Dalit	68	47.2	76	52.8	144	100.0		
	Other castes	33	47.8	36	52.2	69	100.0		
Religion of the students**	Hindu	199	31.6	431	68.4	630	100.0	16.1	0.001
	Budhhism	7	13.7	44	86.3	51	100.0		
	Muslim	21	51.2	20	48.8	41	100.0		
	Christianity	11	23.9	35	76.1	46	100.0		
Total		238	31.0	530	69.0	768	100.0		

\*\*\* $p < 0.001$ , \*\* $p < 0.01$ , and \* $p < 0.05$ .

program reduced the number of missed school days by 54% per year and reduced absenteeism by 42% (Bowen et al., 2007). Another study in Philippines found that school WASH services

reduced school absenteeism by 27% (Bella et al., 2008); in India, a sanitation program helped increase girls' enrolment by one-third and enhanced boys' and girls' academic performance

**TABLE 3** | Adjusted odds ratios (AOR) from a multivariate logistic regression assessing school absence by students predicting the school's WASH services and other socio-demographic covariates.

Selected predictors	Model I			Model II		
	cOR	95% CI		aOR	95% CI	
<b>School WASH services</b>						
Without improved	1.00			1.00		
With improved	0.353***	0.256	0.487	0.508**	0.334	0.773
<b>Age group</b>						
10–14				1.00		
15–19				1.481	0.945	2.320
<b>Sex of students</b>						
Boys				1.00		
Girls				1.027	0.740	1.427
<b>Class/Grade of students</b>						
Six				1.00		
Seven				0.839	0.524	1.342
Eight				0.709	0.476	1.056
<b>Caste/Ethnicity</b>						
Brahmin/Chhetri-Hill				1.00		
Brahmin/Chhetri-Terai				0.315**	0.153	0.648
Janajati				0.689	0.359	1.323
Dalit				0.274***	0.139	0.542
Other castes				1.086	0.603	1.892
<b>Religion</b>						
Non-Hindu				1.00		
Hindu				1.068	0.603	1.892
Constant	0.722**			0.858		
Cox & Snell $R^2$	0.054			0.103		
2 Log likelihood	909.895			868.620		

\*\*\* $p < 0.001$  and \*\* $p < 0.01$ . Non-Hindus consist of Buddhists, Christians, and Muslims.

by 25% (United Nations Children's Fund Regional Office for South Asia, 2015). UNICEF highlighted a beneficial effect of hygiene intervention, significantly reducing absenteeism due to infectious causes during and after the intervention (United Nations Children's Fund, 2013).

Additionally, our analysis found that students' school grade, caste, and religion have a significant association with students' school absenteeism. Even among students in the same school WASH facilities, the prevalence of school absenteeism varies as a function of home environment, WASH handling behavior, food consumption behavior, family economic status, and individual and family perception toward the school and education in different caste and religion groups. Further, different interests of students and parents may have contributed to the low attendance rate. In support of the present study, Nandrup-bus and Visitor (2009) concluded that female students were more likely to be absent from school compared to male students in schools with inadequate WASH services. A systematic review by Joshi and Amadi (2013) concluded, in line with the present findings, that school-based WASH programs, especially hygiene facilities and hand hygiene instruction in the school, improved student attendance in public elementary schools during the flu season. Furthermore, the benefits of school WASH services were

more pronounced for girl students. Consistent with the present findings, United Nations Children's Fund (2013) stated that adequate school WASH services significantly reduce students' school absenteeism, especially for girls of menstruating age and that have hygiene-related diseases. The same UNICEF report further noted that WASH in schools promotes equity as all children are entitled equal access to WASH facilities; all children benefit from improved hygiene practices promoted by WASH in schools' activities (United Nations Children's Fund, 2013).

The present study found no strong statistical evidence to support the existing narrative claiming an association between students' age and sex to students' school absenteeism. The research further noted that improved schools are equipped with separate sanitation facilities for girls including menstrual hygiene management (MHM) rooms that have running water and a dustbin for disposal of used sanitary materials. However, other materials required during the period like sanitary materials, hooks for hanging the clothes/table, soap for cleaning, lighting within the room, and healthcare facilities within the schools, were not found. Improved schools are served with some WASH packages, whereas unimproved schools have a fair to poor level of services. Toilets have no running water in unimproved schools; students should bring water outside toilets if they

desire to use toilets. Furthermore, toilets are not suitable for the disabled and children, and cleaning materials like brush and toilet cleaners, such as Harpic or detergent, are scarce. Though toilets are separate for girls and boys, no MHM rooms were found in unimproved schools. In addition, there were no fixed handwashing stations in unimproved schools. A study by Sharma et al. (2019) in the Rukum district reported identical findings that almost toilets in all schools had no running water and handwashing facilities with soap, including separate MHM rooms. Due to these inadequacies, most girls avoided using school toilets or avoided even going to the school during the period.

Differently, but in line with the findings of the present study, the US CIVIL Rights and Data Collection (CRDC) 2020–2021 reported that children with disabilities are more likely to have chronic absenteeism than children without disabilities, where sex and age of the children had no role in absenteeism. Similarly, children and youth with special healthcare needs were found to have more school absences than children without (Reuben and Pastor, 2013). In a similar vein to the present findings, Graitcer (2011) and Johnson et al. (2015) concluded that students' health condition is closely associated to absenteeism instead of students' age and sex. Thus, the causes of students' school absenteeism vary depending on the specific communities. However, in line with the findings of this study, there is no sufficient evidence to support the claim that students' age and sex have much to do with absenteeism.

We found evidence that students with Brahmin/Chhetri-Terai and Dalit identities were more absent from school than those from Brahmin/Chhetri-Hill, Janajati, and other castes. In contrast to the present findings, Ranabhat et al. (2019) presented no association between caste/ethnicity and school absenteeism in the Kalikot district of Nepal. However, the same study revealed that disadvantaged Janajati adolescent girls were nearly three times more likely and relatively advantaged Janajatis girls were almost two times more likely to be absent from school during the menstruation period than upper caste groups. The higher proportion of school absenteeism among these groups might be due to poor socioeconomic status and perceptions of education within these ethnic groups.

## Limitations and Strengths of This Study

In a truly scientific spirit, we would like to disclose the known limitations of this study. The researcher obtained self-reporting information from the respondents, and the underreporting of school absenteeism by teachers and parents may have an important limitation. Similarly, the incidence of absence was lost based on the socioeconomic status of the family and family structure of the students. Another limitation of this study may be the generalization of the findings obtained in only four schools. A unique strength of this study was that it was an adequate assessment of school-based WASH facilities: with and without improved WASH facilities in 768 students from grades 6–8 in Nepal. We were also able to use a causal-comparative/*ex post facto* research design; controlling for several critical matching variables is important from the nonexperimental designs of this study.

## CONCLUSION

This study found that school absenteeism was significantly higher among students who were fortunate to enjoy an improved WASH system. This is true for all sociodemographic characteristics. While the school grade, caste, and religion of students have an association with school absenteeism, the findings underscore the importance of access to WASH services and compulsory instruction and practices of WASH behavior in government schools. Therefore, the school needs to ensure access to WASH services throughout the school day and avail handwashing and sanitation lessons at least one time a month.

## DATA AVAILABILITY STATEMENT

The original contributions presented in this study are included in the article/**Supplementary Material**, further inquiries can be directed to the corresponding author.

## ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Nepal Health Research Council (NHRC), Nepal. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

## AUTHOR CONTRIBUTIONS

MKS led the manuscript. RA did overall supervision for the research. Both authors contributed to the article and approved the submitted version.

## FUNDING

This work was carried out as part of the Ph.D. study of MKS, supported by the UGC, Nepal; Ph.D./075/076-Edu-2, Young.

## ACKNOWLEDGMENTS

We thank the University Grants Commissions (UGC) of Nepal for providing research grants. We further thank all study participants. We would like to thank the management and staff of all four schools in the study area of Nepal for their technical support and for allowing us to conduct this study. Our sincere gratitude also goes to Uttam Gaulee, for his intensive language editing.

## SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/feduc.2022.869933/full#supplementary-material>

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