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SANITATION AND HAND HYGIENE FACILITIES IN PRIMARY SCHOOLS IN BOSNIA AND HERZEGOVINA ASSESSED BY PUPILS USING WHO INDICATORS

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Abstract: Numerous studies have demonstrated that students attending schools with adequate sanitary and hygienic conditions achieve better academic performance, experience lower rates of illness, and consequently have reduced absenteeism. This study aimed to assess students' perceptions of sanitation and hand hygiene facilities in schools using World Health Organization (WHO) indicators. The research was conducted as a cross-sectional epidemiological study from September 2019 to March 2020 in the Republic of Srpska, Bosnia and Herzegovina. A total of 2,508 students, aged 11 to 15 years, participated in the study. The survey results indicated that 48.6% of students were dissatisfied with school toilets, while 30.1% reported dissatisfaction with handwashing facilities. Additionally, 83.2% of students expressed dissatisfaction with the availability of toilet paper, and 72.4% were dissatisfied with the supply of soap. Consequently, 66.8% of students reported avoiding school toilets on a daily basis. Furthermore, approximately half of the students reported receiving education on proper hygiene practices. Ensuring access to safe water, adequate sanitation, and comprehensive hygiene education is essential for reducing morbidity and mortality related to unsafe water and poor sanitation. Such improvements contribute to better overall health, reduced poverty, and enhanced socio-economic development.

Keywords: hygiene, education, pupils, sanitation, water

JEL classification: M31, M14, J16, I38, L20

INTRODUCTION

Safe drinking water, sanitation, and hygiene (WASH) are crucial for health and development, especially in low and middle-income countries where WASH-related diseases are prevalent. Acute infectious diseases remain among the most prevalent health issues in the school-aged population. Their occurrence is influenced by inadequate hygiene practices, insufficient access to clean water, and poor sanitation. Additionally, the high density of children in confined spaces and frequent close contact facilitate the rapid spread of infections (Nabi MH et al., 2025). Globally, diarrheal diseases, malaria, and lower respiratory tract infections are among the leading causes of child mortality (UN IGME, 2025). Children spend a significant portion of their day at school, where WASH services can impact pupil learning, health, and dignity, particularly for girls. Water, Sanitation, and Hygiene (WASH) are fundamental human and child rights, and ensuring proper WASH facilities is essential for creating a safe school environment that promotes equal opportunities for high-quality education and the healthy development of children (WHO, 2019a). Schools should provide a comfortable and supportive setting that fosters appropriate cultural norms and values (WHO, 2019 b). Approximately 75% of school absenteeism is linked to illness, highlighting the importance of personal and environmental hygiene in reducing disease-related absences. Proper hygiene practices help lower the

burden of disease, thereby improving school attendance and positively impacting students' academic performance (WHO, 2019b). However, a significant proportion of students do not use school toilets regularly due to various factors, including lack of privacy, poor hygiene conditions, unpleasant odors, inadequate supplies of toilet paper, soap, and hand towels, as well as insufficient ventilation. As a result, students may neglect their physiological needs, leading to dehydration, digestive issues, urinary tract infections, and other infectious diseases, which can further contribute to school absenteeism (WHO, 2019b). Still, 2.1 billion people lacked safely managed drinking water, 1.5 billion had basic services, 287 million had limited services, 302 million relied on unimproved sources, and 106 million collected water directly from surface water sources such as rivers and lakes. Also, 3.4 billion people still lack safely managed sanitation services, 1.9 billion have only basic services, 560 million have limited services, 555 million use unimproved facilities, and 354 million continue to practise open defecation (UN IGME, 2025). Ensuring access to safe water, proper sanitation, and hygiene education can significantly reduce morbidity and mortality associated with unsafe water and inadequate sanitation, ultimately leading to improved health, poverty reduction, and socio-economic development (CDC, 2025). This study aims to assess pupils' perceptions of sanitation and hand hygiene facilities in schools, providing insights into the current state of WASH infrastructure and its impact on students' well-being and academic performance.

MATERIAL AND METHODS

This study is part of the WASH baseline research conducted in the Republic of Srpska, Bosnia and Herzegovina. The Ministry of Education and Culture of the Republic of Srpska granted approval for the research (07.041/052-4149/19). Before visiting the schools, the responsible school staff were informed, and they conveyed this information to parents and children, who were thereby informed and provided their consent to participate in the survey. The study was conducted between September 2019 and March 2020. At the beginning of the 2019/2020 school year, the total number of students in higher grades was 39,225 (Republic of Srpska Institute of Statistics, 2020). A total of 2,508 students participated in the research, of whom 51.4% ($n = 1,289$) were girls and 48.6% ($n = 1,219$) were boys. To assess the hygiene and sanitation conditions in schools, a questionnaire based on WHO indicators was used (WHO, 2019a). The questionnaire was translated into the local language and adapted to best reflect conditions, terminology, and national requirements in the Republic of Srpska. The survey targeted students aged 11–15, with a sample size of 50 students per school (25 girls and 25 boys), selected randomly. Students received the questionnaire in written form and completed it voluntarily and independently, with the option to ask researchers for clarification if needed. The questionnaire was anonymous, collecting only age and gender in addition to responses related to hygiene, sanitation, and water supply satisfaction. The survey was conducted in 43 primary schools, with an average of 58 students per school (29 girls and 28 boys). In accordance with methodological requirements, only schools with a sufficient number of students above the fifth grade were included, while no surveys were conducted in schools with fewer or younger pupils. The traffic light model was used to interpret the answers of pupils about hygiene, sanitation and access to water (Wendland, 2013):

- If 0-33% of pupils are satisfied, the situation is unsatisfactory and requires significant improvements (**red**)
- If 34-66% of pupils are satisfied, the situation is better but still requires significant improvements (**yellow**)
- If 67-100% of pupils are satisfied, the situation is satisfactory and requires small improvements (**green**)

The collected data were statistically analyzed using IBM SPSS Statistics (version 22). Statistical procedures included descriptive statistics with graphical data representations, statistical inference, and dynamic statistics. Categorical variables were summarized as frequencies and percentages, while numerical variables were presented using measures of central tendency, including arithmetic mean (mean) and standard deviation (SD).

RESULTS

Table 1 shows the characteristics of surveyed pupils in primary schools. Table 1 shows that 94.7% of the participants were aged 12, 13, and 14 years. Considering that the surveyed pupils were from the 6th to the 9th grade, this age structure is expected. The mean age of the participants was 13.1 years. The questionnaire included items assessing satisfaction with hygiene, sanitation, and water supply.

Table 1. Demographic Characteristics of the Participants

Age	Boys N (%)	Girls N (%)	All N (%)
11	14 (60.9)	9 (39.1)	23 (0.92)
12	311 (44.3)	391 (55.7)	702 (28.0)
13	417 (49.0)	434 (51.0)	851 (33.9)
14	413 (50.2)	409 (49.8)	822 (32.8)
15	64 (58.2)	46 (41.8)	110 (4.4)
ALL	1289 (51.4)	1219 (48.6)	2508 (100.0)

Data collection activities are summarized in **Table 2**.

Approximately 90% of pupils reported that water was consistently available. Most pupils reported that toilets were easily accessible (70.1%). However, nearly half of the pupils expressed dissatisfaction with the existing toilet facilities (Table 2). The primary source of dissatisfaction was the lack of toilet paper. The next reason for dissatisfaction was toilet hygiene, actually, about 40% of pupils were dissatisfied with toilet hygiene. Consequently, only 32.8% of pupils reported using school toilets on a daily basis. Approximately one-third of the pupils were dissatisfied with handwashing facilities. The main reason for dissatisfaction was the lack of soap, reported by 72.4% of pupils.

Table 2. Results of Pupil Questionnaire Surveys on Sanitation and Hygiene

Questions	Results of Pupil Questionnaire Surveys			
	Yes N (%)	No N (%)	Do not know N (%)	No answer N (%)
Sanitation				
Can pupils complain about the poor condition of the toilet?	988 (39.4)	484 (19.3)	974 (38.8)	62 (2.5)
Do school staff take action on pupils complaints?	534 (21.3)	281 (11.2)	612 (24.4)	1081 (43.1)
Do pupils use toilet every day?	824 (32.8)	1675 (66.8)	-	9 (0.4)
Do toilets provide privacy?	1051 (41.9)	851 (33.9)	583 (23.3)	23 (0.9)
Are toilets easily accessible?	1759 (70.1)	363 (14.5)	361 (14.4)	25 (1.0)
Is toilet paper being provided in the toilet booths?	206 (8.2)	2088 (83.2)	200 (8.0)	14 (0.6)
Are toilets clean?	1012 (40.4)	1025 (40.9)	445 (17.7)	26 (1.0)
Are pupils satisfied with toilets?	726 (29.0)	1220 (48.6)	554 (22.1)	8 (0.3)
Hygiene				

Have pupils been taught good hygiene practice at schools?	1259 (50.2)	495 (19.7)	652 (26.0)	102 (4.1)
Do you wash your hands at school?	2172 (86.6)	313 (12.5)	-	23 (0.9)
Is there enough soap?	488 (19.5)	1817 (72.4)	187 (7.5)	16 (0.6)
Do you use soap to wash your hands?	1200 (47.8)	890 (35.5)	-	418 (16.7)
Is there always enough water?	2202 (87.8)	184 (7.3)	110 (4.4)	12 (0.5)
Are hand washing areas clean?	1402 (55.9)	710 (28.3)	375 (15.0)	21 (0.8)
Are pupils satisfied with hand washing area?	1230 (49.0)	754 (30.1)	348 (13.9)	176 (7.0)

Boys were significantly more dissatisfied with toilet conditions compared to girls (**Table 3**). Also 86,6% of the pupils stated that they regularly washed their hands at school and 47.8% use soap “if available“, which speaks of their good hygiene knowledge. In terms of education on good hygiene practice, about half of the examined pupils answered “yes” while 26% of pupils answered “don’t remember”.

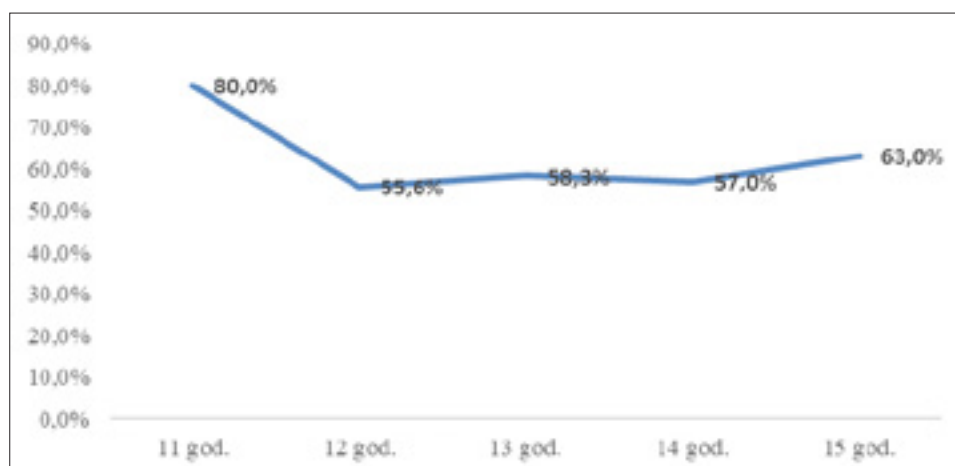
Table 3. Results of Pupil Questionnaire Surveys on Sanitation and Hygiene by gender

Questions	Boys			Girls		
	Yes N (%)	No N (%)	Do not know N (%)	Yes N (%)	No N (%)	Do not know N (%)
Sanitation						
Can pupils complain about the poor condition of the toilet?	461(37.8)	258 (21.7)	471 (38.6)	527 (40.8)	226 (17.5)	503 (39.0)*
Do pupils use toilet every day?	467 (38,3)	748 (61,4)	-	357 (27,7)	927 (71.9) *	-
Do toilets provide privacy?	467 (38.3)	487 (39.9)	252 (20. 7)	584 (45.3)	364 (28.2)	331 (25.7)***
Is toilet paper being provided in the toilet booths?	112 (9.2)	986 (80.9)	115 (9.5)	94 (7.3)	1102 (85.5)	85 (6.60)**
Hygiene						
Is there enough soap?	234 (19.2)	863 (70.8)	112 (9.2)	254 (19.8)	954 (74.01)	75 (5.7)***
Are pupils satisfied with hand washing area?	638 (52.3)	339 (27.8)	157 (12.9)	592 (45.9)	415 (32.2)	191 (14.8)*

χ^2 Chi-Square test: * $p < 0,05$; ** $p < 0.01$; *** $p < 0,001$.

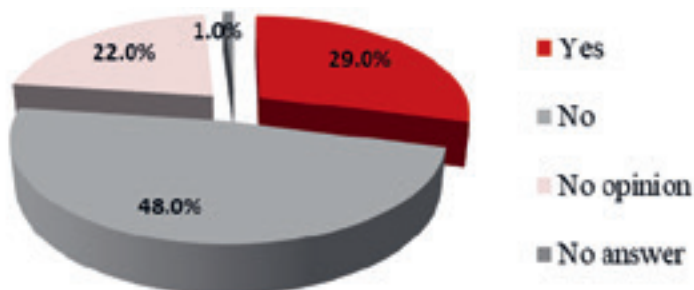
Figure 1 presents the percentage of pupils who use soap when washing their hands.

Figure 1. Percentage of pupils using soap for handwashing



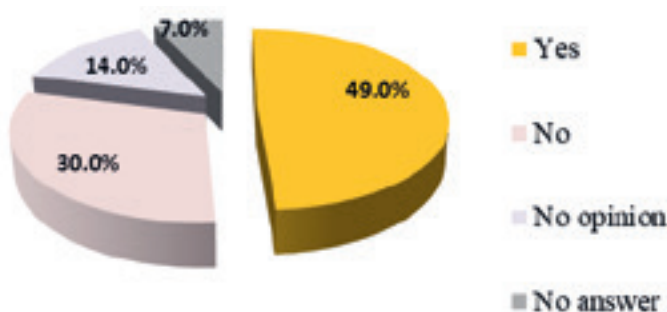
According to the traffic light model, toilet conditions were classified as unsatisfactory (red), indicating a need for substantial improvements. Only 29% of pupils reported being satisfied with school toilets (**Figure 2**).

Figure 2. Pupils' satisfaction with toilet



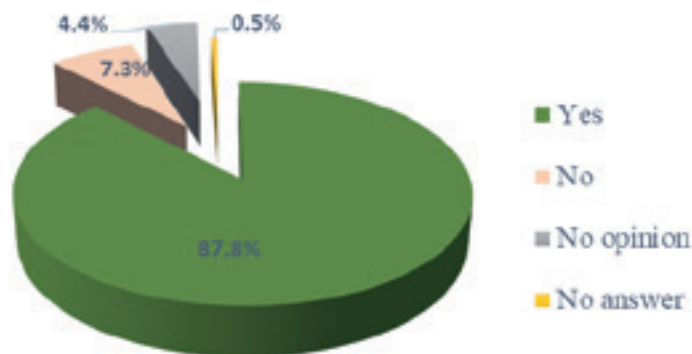
Pupils' satisfaction with handwashing facilities was classified as requiring minor improvements (yellow), as 49% of pupils stated that they were satisfied with the handwashing area (**Figure 3**).

Figure 3. Pupils' satisfaction with handwashing facilities



According to the traffic light model, satisfaction with access to water was classified as satisfactory (green). Approximately 87.8% of pupils reported that water was always available (**Figure 4**).

Figure 4. Pupils' satisfaction with access to water



DISCUSSION

The survey shows that most children are not satisfied with their school toilets, and many of them avoid using toilets. as a result, 66.8% of pupils reported not using school toilets on a daily basis. The fact that

a large number of students avoid using school toilets highlights the behavioral consequences of inadequate WASH conditions, indicating that infrastructural deficiencies directly translate into unhealthy practices with potential for long-term health implications. The same study conducted in Croatia showed that 44.5% of students do not use the toilet, with the most common reason being the lack of toilet paper (Capak et al., 2015). Dissatisfaction with school toilets is also related to bladder and bowel dysfunction in schoolchildren, regardless of age and gender (Jørgensen, Breinbjerg, Rittig, Kamperis, 2021). Sometimes, girls and female teachers are more affected than boys because the dissatisfaction with school toilets means that they cannot attend school during menstruation (Adams J, Bartram J, Chartier Y, Sims J, 2009). If such facilities are not available, adolescent girls may be unable to remain comfortably in class (UNICEF, 2012). The Government of Republika Srpska adopted a conclusion in August 2019 on the implementation of reform processes in the field of upbringing and education, according to which schools should provide a healthy, safe, and stimulating environment where the child is at the center of the educational process (Cvijanović, 2020).

Children receive information by seeing, smelling, hearing and touching. Spaces they encounter, including water, sanitation and hand-washing facilities, can provide a range of positive and negative experiences related to colours, smells, shapes and sounds (UNICEF, 2012). Hand hygiene is one of the most fundamental and effective personal hygiene measures for safeguarding children against infectious diseases (Klar et al., 2022). The pupils were dissatisfied with handwashing facilities. The main reason was the lack of soap, with 72.4% of pupils reporting dissatisfaction with the soap supply. The importance of these results lies in the fact that they clearly indicate that inadequate sanitation and hygiene conditions in schools represent a significant public health problem. Poor availability of basic resources such as toilet paper and soap can increase the risk of infectious diseases, which ultimately affects school attendance and academic performance. In a study conducted in Croatia, the same problem was reported by 74.59% of students (Capak et al., 2015). Facilities should stimulate children's learning and development and be age appropriate. According to the World Health Statistics 2016, 69% of schools provided water and soap in the hand washing facilities, 12% of schools provided water but no soap while 19% of schools had no water supply at all. About 620 million children worldwide do not have access to sanitary services in schools (WHO, 2018). Each school should work to develop adequate knowledge, attitudes and skills on hygiene through life skills-based hygiene education and child participation (UNICEF, 2012). Facilities must be close to the schools, have sufficient capacity, with enough toilets, be sized appropriately and simple to use and have water and soap available at all times for hand washing. The facilities must provide sufficient capacity and minimal waiting time (UNICEF, 2012). In all schools surveyed, toilets are located within the school building and are available to pupils. The physical environment and cleanliness of a school facility can significantly affect the health and well-being of children. Disease spreads quickly in collectives, where hand-washing facilities or soap are not available, and where toilets are in disrepair. Too often, schools are places where children become ill (UNICEF, 2012). About three billion people worldwide, do not have access to handwashing facilities with soap. People living in rural areas and low-income countries are the most vulnerable and the most affected (UNICEF, 2026). In bad hygienic conditions, children are exposed to diseases and risk infection. There is a direct link between diarrhoea and hygiene in schools. A high percentage of diarrheal disease (88%) is caused by unsafe water supply, inadequate sanitation, and poor hygiene. Diarrhoea is a significant reason why children are absent from school. Diarrhoea is also behind chronic undernutrition and growth retardation (UNICEF, 2012). Access to safe water, adequate sanitation, and adequate hygiene education can reduce morbidity and mortality from unsafe water and sanitation-related diseases, leading to improved health, poverty reduction, and socio-economic development (CDC, 2025).

CONCLUSION

The main findings of the survey conducted in primary schools indicate that 66.8% of pupils do not use school toilets on a daily basis, while 83.2% reported a lack of toilet paper and soap. Additionally, 72.4% of pupils reported the absence of soap. Also, half of the pupils stated that they regularly washed their hands at school with soap “if available“, which speaks of their good hygiene knowledge. Their comment “if available” indicates that students would use soap to wash their hands if the school provided it, which means that students are aware of the importance of hygiene practices. The results of this study are particularly relevant for policy and practice, as they indicate that relatively simple and inexpensive interventions, such as ensuring the constant availability of soap and toilet paper, can significantly improve hygiene habits and reduce health risks among school children. Public health policies should focus on improving WASH in schools to ensure that students stay healthy, primarily handwashing and toileting conditions.

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