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*Original scientific paper*

# Baseline Water, Sanitation and Hygiene (WASH) Survey at Primary Schools in the Republic of Srpska, Bosnia and Herzegovina

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**Abstract:** Within the goals of the Protocol on Water and Health, Bosnia and Herzegovina (Federation of Bosnia and Herzegovina and Republic of Srpska) has set the goal on improving WASH (Water, Sanitation and Hygiene) in primary schools. The baseline WASH survey at primary schools is planned as the first activity in its achievement. The overarching goal of school-based WASH is to improve sustainability of hygiene, sanitation and water supply services. Such services are a core component of infection prevention and control. The aim of the research is to examine the state of WASH in primary schools in the Republic of Srpska. The research is a cross-sectional epidemiological study conducted from September 2019 to March 2020 in the Republic of Srpska, Bosnia and Herzegovina. Conditions of WASH were assessed in 67 primary schools. The results of a survey showed that all investigated schools provided basic water services, 75.7 % of toilets provided basic sanitary services and 61.2 % of hand washing facilities provided basic hygiene services. The results revealed that there is a need for increased awareness and efforts to ensure basic provisions for sanitation, hygiene and drinking-water safety. Such measures are essential to achieving the Sustainable Development Goals (SDGs) by 2030.

**Key words:** hygiene, sanitation, schools, water, WASH.

## INTRODUCTION

Access to safe water, sanitation, and hygiene (WASH) is a basic human right and primary schools play a critical role in ensuring students' health and holistic welfare (UN General Assembly, 2010). The World Health Organization (WHO) and United Nations Children's Fund (UNICEF) Joint Monitoring Programme (JMP) for Water Supply, Sanitation and Hygiene is responsible for monitoring the Sustainable Development Goal (SDG) through targets 6.1 and 6.2 (WHO & UNICEF, 2023). The goal of school-based WASH is to improve the sustainability of hygiene, sanitation, and water supply services, and promote lifelong health for children and their families (UNICEF, 2011). Improving WASH conditions in schools constitutes a significant catalyst for fostering healthier, better educated, and more sustainable communities. It not only promotes consistent school attendance and academic achievement, but also affords students, particularly adolescent girls, an essential element of privacy (McMichael, 2019). WHO conducted a comprehensive evaluation of both the economic viability of WASH program implementation and its health impact, affirming its efficacy in averting mortality attributed to diarrheal syndrome among a vulnerable demographic of schoolchildren. It has been estimated that 1.4 million deaths could be reduced by WASH interventions (Wolf et al., 2023). The most effective way to ensure safe water supply from a source to a tap is the Water Safety Plan (WSP). In the continuous supply of safe drinking water, the primary objectives of the WSP are to prevent or minimize source contamination, reduce or remove contamination through treatment processes, and prevent contamination during the storage, distribution, and handling of drinking water (WHO, 2017). Washing hands with soap and water (water, soap, and towels), hand dryers, a clean environ-

ment, and proper waste disposal are essential for ensuring good hygiene practices in schools (WHO, 2019). Hand hygiene is one of the most fundamental and effective personal hygiene measures for safeguarding children against infectious diseases (Klar et al., 2022). Facilities must consider the specific needs of girls and women concerning menstrual health and hygiene. Girls are more affected than boys because the lack of sanitary facilities may lead them to refrain from attending school during their menstrual periods (McMichael, 2019). Special needs of children with disabilities must also be considered in facility design plans (UNICEF, 2016). The aim of this study was to assess the current state of WASH facilities in primary schools in the Republic of Srpska, Bosnia, and Herzegovina.

## MATERIAL AND METHODS

This research was conducted from September 2019 to March 2020 in the Republic of Srpska. The Republic of Srpska, with 1,142,495 citizens (mid-year estimate for 2019), is one of the two entities in Bosnia and Herzegovina (Republika Srpska Institute of Statistics, 2020). We assessed the conditions of the WASH in 67 of the total number of 203 primary schools. The study sample was identified from the registry of the Republic Pedagogical Institute RS as representative, including urban and rural sites (The Republic Pedagogical Institute of the Republic of Srpska, 2020). All schools included in the research were public, providing education mainly from the first to the ninth grade. In some rural areas, schools only provide education up to fifth grade.

Data collection. For this study, surveillance instruments developed by the WHO and UNICEF to monitor WASH in schools were used (WHO, 2019b). We used two primary instruments for data collection: a survey questionnaire administered to school administration staff and a questionnaire (checklist) focusing on the hygienic and sanitary attributes of individual toilets and handwashing facilities. The questionnaire focused on key WASH issues, including general information on the school, main water sources, functionality and quality, accessibility for youngest children and physical disabilities, handwashing facilities, cleanliness and accessibility of toilets and availability of soap, operation, and maintenance of systems, and disposal waste. The questionnaire consisted of six blocks divided into: general information about the school; water management (17 questions); sanitation (13 questions); hygiene (14 questions); waste disposal (9 questions); and operation and maintenance (10 questions). The instruments were translated into the local language and adapted to best reflect conditions, terminology, and national requirements in the Republic of Srpska. The questionnaire was administered to authorized representatives of the schools during pre-scheduled visits. Face-to-face interviews with school administrators were conducted in their respective offices, with each interview lasting for approximately 45 minutes. A total of 67 questionnaires were successfully completed and 67 school administrators were interviewed. During these site visits, we inspected all sanitary facilities and handwashing facilities while simultaneously completing questionnaires to assess their current state. The collected data were subjected to statistical analysis using IBM SPSS Statistics software (version 22). The analytical procedures included descriptive statistics such as graphical representations, statistical inferences, and dynamic statistics. Categorical data were summarized using frequencies and percentages, whereas numerical variables were represented using standard measures of central tendency, including the mean and standard deviation (SD).

## DATA ANALYSIS

The WASH assessment was made using several tools for collecting valid information on water, sanitation, and hygiene services. Questions on drinking water aimed to determine the type of source and availability of the school's main and were based on JMP definitions of "improved" and "unimproved"

sources. These criteria are sufficient to calculate the "basic" water service in schools. Tables 3 and 4 show how the questions in the questionnaire were grouped to calculate the percentage of basic and advanced WASH services (drinking water, sanitation and hygiene) in schools, considering human rights indicators such as accessibility, quality, and safety. Sanitation questions are designed to determine whether schools have restrooms and whether the school's sanitation facilities are usable, functional, and separated by gender. Data were tabulated using the Excel 2019 software for Windows.

### Drinking water

The infrastructural provision for water supply was available at all the schools at the time of observation. The most of the visited schools had access to drinking water, provided through an improved source, distributed by the public (municipal or local) water supply system of all schools (95.52 %; 90.56-100 95% CI). Of the total number of visited schools, 3.97% relied on individual water supply systems. **Figure 1** illustrates the type of water supplay in all schoos, as well as by school location (urban vs. rural). The research showed that urban schools predominantly use muncipal water supplay (81.39 % of urban schools), and only one urban school (2.33 %), relied on a protected dug well as its source of drinking water. The water supply in schools is functional throughout the year, and the available water is used for drinking, hand washing, and toilet flushing. According to the survey, approximately 67% of schools were subject to regular drinking water quality monitoring conducted by competent authorities. In contrast, around 33% of schools lacked routine water quality assessments. Rulebook on health and safety of water intended for human consumption (Rulebook on health and safety of water intended for human consumption, 2017), prescribes at least four basic water tests to be conducted during the school year in the water supply facilities at school, with one of these tests taking place 15 days before the start of the school year. **Table 1** presents data on the number and range of drinking water analyses conducted in rural primary schools in the Republic of Srpska during the 2019–2020 period. Microbiological analysis revealed that six out of 163 drinking water samples were contaminated: three samples contained *Escherichia coli*, two had total coliform bacteria, and one exhibited elevated colony counts at 22 °C. Residual chlorine levels were below the recommended reference values in two samples, while four samples showed increased turbidity. Elevated iron concentrations were identified in one sample.

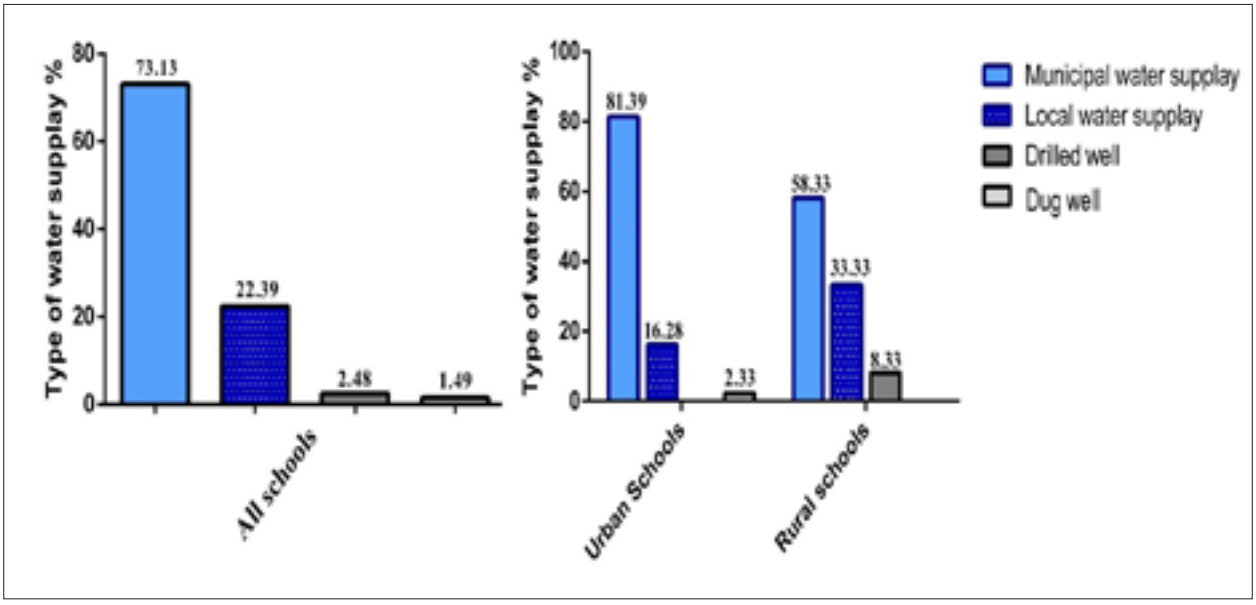



**Figure 1.** The type of water supply in school of Republic of Srpska (RS)

**Table 1.** The results of drinking water quality analyses in schools (2019-2020.)

| Region | Microbiological analysis | | | Physical-chemical analysis | | |
|---|---|---|---|---|---|---|
| | Schools N | Analyses N | Not in accordance N (%) | Schools N | Analyses N | Not in accordance N (%) |
| Banja Luka | 11 | 101 | 5 (4.95) | 11 | 101 | 7 (6.93) |
| Zvornik | 5 | 26 | 0 | 5 | 26 | 0 |
| Trebinje | 3 | 9 | 1 (11.10) | 3 | 10 | 2 (20.0) |
| I.Sarajevo | 5 | 27 | 0 | 5 | 27 | 0 |
| **All samples** | **24** | **163** | **6 (3.68)** | **24** | **164** | **9 (5.49)** |

### Sanitation

All of the assessed schools had sanitation facilities, however only 28 schools (41.79 %) had toilet facilities completely separated by gender, 46.51 % of urban schools, and 33.33 % of rural school. Additionaly, in the Republic of Srpska 16 schools used shared toilet (23.88 %) (18.61 of urban schools, and 33.33 of rural schools **(Table 2).** The data from survey reveals that, on average, 33.84 students share one toilet (39.84 girls share one toilet, while 29.53 boys use one toilet or one urinal, respectively) **Figure 2**. An evaluation of compliance with WHO guidelines (Grossi, Klimschak, Rechenburg, Shinee & Schmoll, 2016) regarding the number of students per toilet, the following observations were made: in accordance with WHO recommendations, only 27.9% of urban schools meet the required standards. Furthermore, 58% of urban schools fail to comply with these recommendations, while 14% of urban schools meet requirements for boys only. Additionally, 75% of rural schools fulfill the required standards **(Figure 3).**

**Table 2.** Distribution of Toilet Facilities by Gender Separation in schools in RS

| Toilets facilities | All Schools (N=67) | | Urban Schools (N=43) | | Rural Schools (N=24) | |
|---|---|---|---|---|---|---|
| | N | % (95% CI) | N | % (95 % CI) | N | % (95 % CI) |
| Completely separated by gender | 28 | 41.79 (29.95-53-63) | 20 | 46.51(30.92-62.10) | 8 | 33.33 (14.48-52.18) |
| Partially separated by gender | 23 | 34.33 (22.96-45.70) | 15 | 34.88 (20.08-49.68) | 8 | 33.33 (14.48-52.18) |
| Only shared toilets | 16 | 23.88 (13.67-34.09) | 8 | 18.61 (6.44-30.76) | 8 | 33.33 (14.48-52.18) |

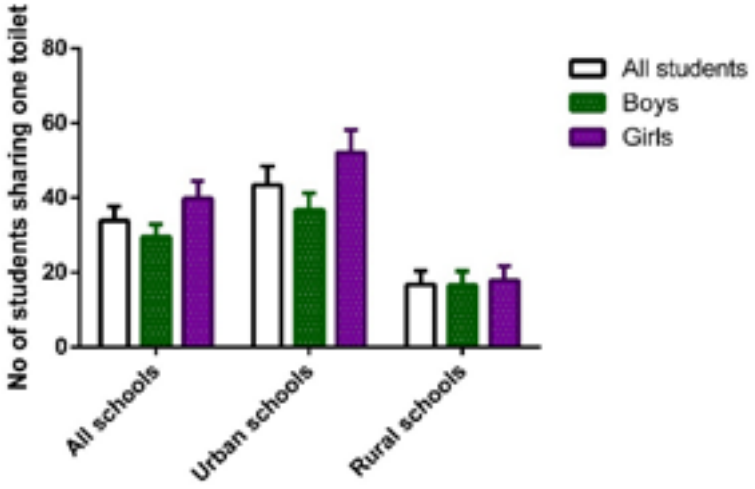
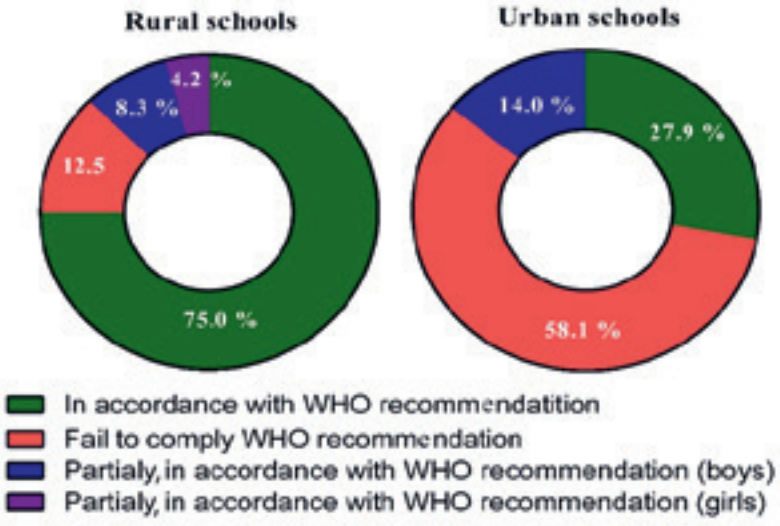



**Figure 2.** Number of students sharing one toilet in the schools in the Republic of Srpska.

Data are presented as Mea n ±SE

**Figure 3.** Distribution of urban and rural schools according to compliance with WHO recommendations on the number of toilets for male and female students




In all 67 schools included in the survey, an inspection of on-site toilets was carried out. **Notably,** 98.9 % of urban and 98.1 % of rural toilet cubicles were clean. Also**, signs of vandalism were rare,** affecting only 7.4 % of urban toilets and none in rural settings (6.2% overall). **Gender separation** was significantly more common in urban schools (79.7%) than in rural schools (55.6%). **Access for persons with disabilities** remained low in all schools (7.7% overall) underscoring a significant gap in the infrastructure needed to support inclusive education. Moreover, the results showed that a substantial proportion of toilet cubicles lacked toilet paper (45.5% of all schools). Additionally, all schools had notable deficiencies in waste disposal: 72.3% did not provide trash bins inside each cubicle**. Table 3** presents the number and percentage of toilets exhibiting selected characteristics. Regarding sanitary wastewater disposal, 55.2% schools have central wastewater disposal (74.41% of urban school and 20.83 % rural school), 44.8% of schools are connected to a septic tank. Additionally, 92.4% of schools have a management and maintenance plan in place. In terms of waste management practices, 78.8% of schools had centralized waste disposal, while 37.9% had centralized waste removal.

**Table 3.** Number and percentage of toilets with selected sanitation facilities in urban and rural schools

| Questions | Urban schools Number of toilets N (%) | | Rural schools N (%) Number of toilets N (%) | | All schools Number of toilets N (%) | |
|---|---|---|---|---|---|---|
| | Present | Absent | Present | Absent | Present | Absent |
| Toilets with signs of vandalism | 20 (7.4) | 251 (92.6) | 0 (0.0) | 54 (100.0) | 20 (6.2) | 305 (93.8) |
| Gender-separated toilets | 216 (79.7) | 55 (20.3) | 30 (55.6) | 24 (44.4) | 246 (75.7) | 79 (24.3)* |
| Clean toilet cubicles | 268 (98.9) | 3 (1.1) | 53 (98.1) | 1 (1.9) | 321 (98.7) | 4 (1.2) |
| Toilet paper | 148 (54.6) | 123 (45.4) | 29 (53.7) | 25 (46.3) | 177 (54.5) | 148 (45.5) |
| Trash bins in the toilet area | 206 (76.0) | 65 (24.0) | 38 (70.4) | 16 (29.6) | 244 (75.1) | 81 (24.9) |
| Trash bins in each toilet cubicle | 70 (25.8) | 201 (74.2) | 20 (37.0) | 34 (63.0) | 90 (27.7) | 235 (72.3) |
| Accessibility for persons with disability | 23 (8.5) | 248 (91.5) | 2 (3.7) | 52 (96.3) | 25 (7.7) | 271 (83.4) |

Data are presented as N (%).$\chi$ 2 Chi-Square test:* $p < 0.001$ .

### Hygiene

During the research in schools in Republic of Srpska, it was found that WASH infrastructures were available in schools, but menstrual management facilities in schools are neglected. Results show that 62.1% (n=41) of all schools provide education on menstrual hygiene, while 27.3% (n=18) do not include menstrual education in the curriculum, and 10.6% (n=7) did not provide response. Schools that reported lacking education on menstrual hygiene are predominantly in rural areas. They mentioned that their students are of a younger age group, as they only provide education up to the fifth grade. Within the school curriculum, 86.5% (n=58) of educational institutions offered education on the importance of handwashing. All toilets were in the building and have pipe water available at all time when children felt the need to use them. Figure 4 illustrates number of students sharing one tap in the schools of Republic of Srpska.

The results revealed several deficiencies, including the lack of soap, towels, and hot water availability. Notably, only 93 toilets (28.4 %) had hot water availability **Table 4**.

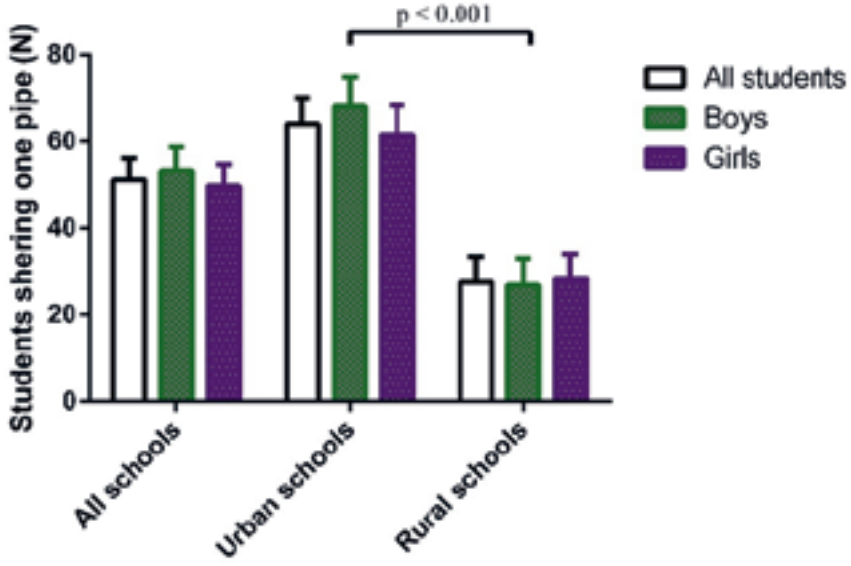



**Figure 4.** Number of students sharing one tap in the schools of Republic of Srpska

**Table 4** . Number and percentage of toilets with selected hygiene facilities in urban and rural schools

| Questions | Urban schools Number of toilets N (%) | | Rural schools N (%) Number of toilets N (%) | | All schools Number of toilets N (%) | |
|---|---|---|---|---|---|---|
| | Present | Absent | Present | Absent | Present | Absent |
| Water availability 24/7 | 274 (100) | 0 (0.0) | 53 (100) | 0 (0.0) | 327 (100) | 0 (0.0) |
| Hand dryers / towels | 165 (60.2) | 109 (39.8) | 28 (52.8) | 25 (47.2) | 193 (59.0) | 134 (41.0) |
| Soap availability | 166 (60.6) | 108 (39.4) | 34 (64.2) | 19 (35.8) | 200 (61.2) | 127 (38.8) |
| Good hygiene | 269 (98.2) | 5 (1.8) | 53 (100) | 0 (0.0) | 322 (98.5) | 5 (1.5) |
| Hot water availability | 87 (31.8) | 187 (68.2) | 6 (11.3) | 47 (88.7) | 93 (28.4) | 234 (71.6)* |

Data are presented as N (%).$\chi$ 2 Chi-Square test:* $p < 0.01$.

## DISCUSSION

This research was conducted to examine the state of WASH in primary schools in the Republic of Srpska. The results indicated that WASH infrastructure was generally available in schools; however, several important areas require improvement, including the lack of toilets for younger students, the absence

of facilities for students with disabilities, and the insufficient provision of menstrual hygiene management facilities. The study revealed that 3.97% of the schools visited relied on individual water supply systems. It is noteworthy to contrast these findings with those from Croatia, where only 0.63% of the schools were not connected to the public water supply system (Capak et al., 2015). To achieve Sustainable Development Goal (SDG) 6 – clean water and sanitation – service providers should prioritise efforts towards schools and communities that depend on individual or local water supply systems. A total of 22.39% of schools relied on local water supply systems. The primary issue stems from the use of local water supply sources, which are more susceptible to breakdown and contamination than larger utility systems. The assessment and expansion of access to sustainable, lasting water and sanitation infrastructure remains a global health challenge (Bolatova et al., 2021). Waterborne diseases are a significant global health concern. Diarrhoeal diseases, primarily stemming from water contamination and inadequate sanitation, result in 829 000 WASH-attributable deaths annually and contibute to over 49.8 million Disability Adjusted Life Years (DALY's) (Prüss-Ustün et al., 2019). In the Republic of Srpska, during the research period (2019–2020), no officially registered waterborne diseases were reported, based on collected, processed, and publicly available data (PHI RS 2019, 2020).

One of the issues we found concerning sanitation facilities was absence of facilities for pupils with disabilities. The pupils with disabilities receive primary education in regular schools through inclusive practice and their unique needs must be carefully considered in facility design plans. Only 25 toilets (7.7%) were adapted for students with disabilities, highlighting a substantial shortfall in infrastructure for inclusive education. Globally, more than a billion people live with some form of disability, with nearly 240 million of them being children (Long & Guo, 2023).

During the research in schools in Republic of Srpska we found that menstrual management facilities in schools are neglected. Several previous studies have also shown that menstrual hygiene management facilities in schools have been neglected in low- and middle-income countries (McMichael, 2019., Shrestha et al., 2022, Poague et al., 2022). Gender equality issues often arise when girls reach puberty, as menstruation remains a taboo subject in many cultures, leading to stigma and shame among girls (Baird et al., 2022). Adolescent girls and women in most countries have access to materials and a private place to wash and change, but often don't participate in school, work and social activities during menstruation (Wolf et al. 2023). Education on menstrual hygiene management is essential for primary school-aged girls. According to the data obtained in the research published by Jovanović and colleagues in 2022, it is evident that 50% of schools in the surveyed rural schools in Serbia lack menstrual hygiene education, and that in 79% of schools there is a lack of appropriate facilities for the disposal of menstrual hygiene products (Jovanović, Karadžić, Paunović, Ranković & Vasić, 2022). Most girls experience their first menstruation during the age of 10–14 years old which is school going age. A survey conducted among students in Nepal, revealed that out of 126 participants, 106 reported taking days off during menstruation in the past three months, with an average of 2.6 days per student (Shrestha et al. 2022). In 2012, WHO/UNICEF Joint Monitoring Programme for Drinking Water, Sanitation, and Hygiene defined menstrual hygiene management as „women and adolescent girls using a clean menstrual management material that can be changed in privacy as often as necessary, using soap and water for washing the body as required, and having access to facilities to dispose of used menstrual management materials" (UNICEF, 2019). The study of WASH in schools was also conducted during the COVID-19 pandemic by Pague and colleagues through a systematic review of peer-reviewed literature, encompassing 65 studies that covered 18,465 schools across 30 different developing countries, and the results indicate a lack of adequate WASH conditions in all countries (Pagou et al., 2022). The COVID-19 pandemic serves as a significant reminder that hand hygiene constitutes a fundamental cor-

nerstone for effective infection prevention. Reports indicate that appropriate hand hygiene can reduce the incidence of diarrhea by as much as 33% and respiratory infections, including common cold and influenza, by up to 20% (Xun et al., 2021). School age is seen as the most favorable age for the adoption of positive habits (Khan, Ashraf, Iftikhar & Baig-Ansari, 2021). Insufficient and inadequate school infrastructure hinders students from practicing healthy hygiene habits, particularly handwashing (Pagou et al. 2022). Improving access to sanitation not only addresses needs, but also enhances safety, dignity, and self-esteem in the school environment (Hutton & Chase, 2017). In 2020, approximately 1.7 billion people lacked access to fundamental sanitary facilities such as toilets equipped with sinks or squat toilets. Substantial disparities persist, with the most disadvantaged populations, particularly those residing in rural areas, having the lowest utilization of basic sanitation services. Worldwide, 494 million individuals still resort to open defecation because they lack access to toilet facilities. The prevalence of open defecation is most pronounced in sub-Saharan Africa, Central and South Asia, and Oceania, as reported by the World Health Organization (Mothiba, Khabo-Mmekoa, Ngobeni-Nyambi & Momba, 2023).

## CONCLUSION

Our study reveals that while WASH infrastructure is generally available in most schools in the Republic of Srpska, there are notable areas requiring improvement. Schools relying on local water supply systems or independent facilities face potential health risks. Our research underscores that children with disabilities face significant barriers in accessing appropriate toilet facilities, and girls encounter inadequate menstrual hygiene management. Addressing these deficiencies is crucial for advancing Sustainable Development Goals, particularly Goal 10 (reducing inequality) and Goal 4 (achieving gender equality). Effective solutions require collaboration between public health initiatives and local communities to foster a supportive and inclusive school environment that meets the diverse needs of all students.

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