Perceptive assessment of water, sanitation and hygiene amenities in some secondary schools in Benin city, Southern Nigeria

ABSTRACT

The provision of safe water supplies and sanitation amenities in schools is a necessity in attaining a healthy learning setting. The aim of this study was to determine the perception of consenting students and teaching staff with respect to the state and availability of the water and sanitary facilities in four secondary schools located in Benin city. A pre-tested structured water, sanitation and hygiene (WASH) status questionnaire was administered to 200 consenting respondents. The distributed questionnaire had inquires which included; Number and type of usable toilets and separation of toilet facility by gender. Duplicate water samples were collected from the various schools and the pH and nitrate parameters were determined using relevant procedures. The mean pH values for samples obtained from school A varied from 4.71 ± 0.1 to 5.35 ± 0.2. The difference between the mean pH values for the public schools and the privately owned schools was significant ($P < 0.05$). A majority (52.5%) of the respondents opined the availability of separate toilets for both males and females with a lower proportion (47.5 %) stating otherwise. A higher proportion of the respondents (52.5%) indicated the non-availability of dedicated personnel responsible for cleaning of the toilets while a lower number of participants (47.5%) opined otherwise. The respective school management should also be financially empowered by the owners to employ dedicated personnel to maintain the toilet facilities in the schools and the school management should do more with regards to adequate provision of MHM amenities in these institutions.

KEY WORDS: Egor LGA; School management; Secondary schools; Toilet facility; Water, sanitation and hygiene (WASH)

INTRODUCTION

Several profound impacts affecting children's health, learning aptitudes and the overall teaching environment have been directly attributed to the implementation of water, sanitation and hygiene (WASH) education initiatives in schools (Egbinola and Amanambu, 2015). It has been estimated by UNICEF (2004) that more than half of the world's schools do not have clean toilets, drinking water and hygiene lessons for school children. Generally, schools, especially those located in rural environments, are often bedeviled by inadequate supply of drinking water and have sanitation amenities that are insufficient in both quality and quantity. It has been documented by the WHO (1997) that schools with inadequate supply of water coupled with poor sanitation and hygiene conditions as well as elevated frequencies of close individual to individual contact are high-risk settings where aliments are easily spread and transmitted. Also, in settings where sanitation and hygiene education is taught, it is sparingly implemented practically and usually disseminated *via* the

distribution of printed handouts to tutors or the display of posters on wall surfaces of the school (Adukia, 2013). It has been opined that the direct effects of educational interventions with respect to sanitation and hygiene often fade out as time progresses (Adukia, 2013), but long-term gains can be sustained for students (Chetty *et al*., 2011).

Worldwide, the objectives of school-focused WASH interventions have been noted to encompass: (i) reduction in the prevalence of diarrhoea and other hygiene associated ailments; (ii) boost school enrolment and student academic performance levels as well as attendance and lastly influence hygiene related behavioral practices of parents and siblings with the school children effectively acting as change agents or ambassadors in their respective households and localities (McMichael, 2019). However, earlier reviews of researches focused on the effect of school-based WASH interventions have revealed a mix of positive and negative trends with respect to a variety of measured outcomes which include; knowledge, attitudes and practices, school attendance as well as health profiles (Joshi and Amadi, 2013).

It has been documented that about 88% of diarrhoeal ailments is caused by the consumption of water emanating from unsafe supply coupled with inadequate sanitation and hygiene practices (WHO, 2004). High cases of other preventable ailments such as typhoid fever, dysentery, hepatitis, poliomyelitis and cholera have continued to occur across the African region as a consequence of the lack of access to clean water supplies coupled with a poor understanding of the effectiveness of proper hygiene (WHO/ UNICEF /WSSCC, 2004).

The provision and availability of safe WASH amenities has had a sizable positive influence on individual's health profile and livelihood, but the availability of these amenities has remained an issue of concern across the length and breadth of Nigeria particularly in the rural environments (Lukman *et al.,* 2016). It has been observed that an appreciable proportion of residents living in rural areas do not have access to safe WASH amenities (Obeta, 2018). This scenario has invariably caused

these populace to utilize raw water collected from water bodies such as rivers, ponds, and streams for drinking and domestic purpose as well as engaging in the unwholesome practice of open defecation which has led to morbidities and mortalities coupled with the spread of waterborne ailments (Forstinus *et al.,* 2016).

The few improved water amenities which vary from boreholes and wells with available hand pumps are largely inadequate; women and children usually travel far distances to access water supplies, and this activity is normally energy demanding and time consuming, as such impacting the children's education and women's domestic as well as economic productivity (Adeleye *et al.,* 2014). Also, numbers of hygiene amenities exemplified by toilets have been known to be insufficient for usage at communities and public places which include; schools, markets as well as medical facilities. This trend has left individuals with no option but engage in open defecation and sometimes in and around water sources without utilizing soap or any cleaning agents for disinfection purposes (Shrestha *et al.*, 2018). Moreover, available toilet amenities are improperly maintained and mainly shared amongst several persons without considering the need for gender segregation (Eremutha *et al.,* 2016).

Formal education of school aged children is an critical investment, any nation can make for its future human resource development, and as such, the provision of safe water supplies and sanitation amenities in schools is a necessity in attaining a healthy learning setting wherein socio-economic development is impacted positively in the long-run (WHO, 2022). Hygiene, sanitation and water supply are developmental priorities; however with reference to developing nations like Nigeria, implementation of relevant policies for greater anthropogenic access to safe drinking water supplies and sanitation education has remained inadequate (Ugwu *et al*., 2021).

This study was therefore aimed at determining the perception of consenting stakeholders (students and teaching staff) with respect to the state and availability of the water and sanitary facilities in selected public and privately owned schools located in Benin city. An objective of this research was

to ascertain the pH and nitrate content of stored piped ground water sampled from the visited schools.

MATERIALS AND METHODS

Study area

This study was conducted in two publicly and two privately owned Secondary Schools located in Benin city, Edo State. The section of the municipal area where the schools were located was within the administrative jurisdiction of Egor Local Government Area (LGA) with the headquarters sited at Uselu quarters also within Benin City. The visited public secondary schools owned and managed by the Edo State Ministry of higher education was codified as A and B whilst the privately owned secondary schools were codified as C and D. The GPS coordinate for school A is along latitude 6^{o} 38' 1.7813"N and longitude 5^{o} 62' 3.3192"N, at an altitude of 339.60 ft above sea level. GPS coordinate for school B is along latitude 6^{o} 36' 5.9368"N and longitude 5^{o} 6' 1.15467"N at an altitude of 306.96 ft above sea level. The coordinates for school C and D are 6°18'53.4" N, 5°36'72.44" S) and 6°25'54.00" N, 5°36'27.54" S) all located in Egor LGA.

Collection of water and physico-chemical analysis

Water samples were obtained in duplicates from two locations (a tap and a covered well) within the respective schools. Samples were collected using clean 2 liter plastic bottles and taken to the laboratory for physico-chemical studies. The pH of the samples was determined using a calibrated bench Hanna^{TM} pH meter. The dissolved nitrate content of the water samples was evaluated using ultraviolet visible spectrophotometry procedure as described by Radojevic and Bashkin (1999). The samples from each school was collected once monthly for a period of two months (April to May, 2022)

Questionnaire administration to consenting student and staff

This research utilized a well-structured WASH status questionnaire designed by WHO/UNICEF (2016). Most of the inquires in the questionnaire were clarified after being pre-tested and supplementary explanations were provided in pidgin English as the questions were being read to the survey participants by the interviewer. The questions included; age and gender, type and distance of main water supply, number and type of usable toilets, separation of toilet facility by gender and availability of water and soap within the toilets. A total of 240 individuals across the respective schools were approached for their participatory consent. However, only 200 persons gave their oral consent to participate in the survey and as such, 200 copies of questionnaire were administered to the consenting participants. The completed copies were then retrieved from the respondents in the 4 secondary schools.

Statistical analysis

The average physico-chemical values obtained for the public schools (A and B) and privately owned schools (C and D) were subjected to unpaired student T test at a confidence level of 95% using Microsoft excel version 10. The completed questionnaire were codified and entered into Microsoft excel and exported to SPSS version 22 software. The percentage frequency of the codified survey data was then determined.

RESULTS AND DISCUSSION

The mean physico-chemical values recorded for the water samples collected from the schools is presented in Table 1. The mean pH and nitrate values for samples obtained from school A during the sampling period varied from 4.71 $\pm$ 0.1 for sample collected at point 1 to 5.35 $\pm$ 0.2 for sample obtained at point 1 and 1.13 $\pm$ 0.2 mg/l for sample collected at point 2 to 2.41 $\pm$ 0.1 for sample

collected at point 2. The mean pH and nitrate values for samples obtained from school B in the sampling period ranged from 0.63 ± 0.1 for sample collected at point 2 to 5.68 ± 0.1 for sample obtained at point 2 and 1.13 ± 0.2 mg/l for sample collected at point 2 to 2.41 ± 0.1 for sample collected at point 2.

The mean pH and nitrate values for samples obtained from school C in the sampling period varied from 6.22 ± 0.4 for sample collected at point 1 to 7.57 ± 0.1 for sample obtained at point 2 and1.27 ± 0.2 mg/l for sample collected at point 1 to 1.56 ± 0.2 for sample collected at point 2. For school D, the average pH and nitrate values varied from 7.30 ± 0.2 for sample collected at point 2 to 7.79 ± 0.1 for sample obtained at point 2 and 0.82 ± 0.1 mg/l for sample collected at point 1 to 1.78 ± 0.1 for sample collected at point 2 (Table 1). The difference between the mean pH values for the public schools (A and B) and the privately owned schools (C and D) was significant (t=9.81176, $p < 0.05$) whilst the difference between the average nitrate values between the Government owned schools and the privately owned schools was insignificant (t= 0.19406, $p > 0.05$). All the examined water samples collected from schools A and B were acidic while the pH status of samples collected from schools C and D varied from mild acidity to neutral ratings. The observed mean pH readings of the water samples could be reflective of the geological features of the underlying rock layers associated with the aquifer basin. It has been opined that the pH levels of abstracted groundwater is directly impacted by the nature of the mineralogical and geochemical properties directly associated with the underlain rocks in a specific location (Adesakin *et al*., 2020). The acidity of some of the examined samples was in agreement with a report of Ogbeifun *et al.* (2019) which indicated the acidity of groundwater sampled from different parts of Benin city. The range of mean nitrate values recorded for all the water samples were much lower than the permissible value limit recommended by SON with respect to drinking water. The mean nitrate values recorded in this study contrasted with values reported by Ogbeifun *et al.* (2019) recorded for groundwater samples collected from several areas within Benin city.

Table 1: Physico-chemical properties of the water samples

Schools	pH	Nitrate (Mg/l)
School A $(APR)_1$	*4.71 ± 0.1	1.43 ± 0.1
School A $(APR)_2$	5.14 ± 0.1	2.41 ± 0.1
School A $(MAY)_1$	5.35 ± 0.2	1.66 ± 0.1
School A $(MAY)_2$	5.20 ± 0.1	1.13 ± 0.2
School B $(APR)_1$	5.27 ± 0.1	1.79 ± 0.2
School B $(APR)_2$	4.79 ± 0.1	0.81 ± 0.1
School B$(MAY)_1$	4.56 ± 0.3	0.63 ± 0.1
School B $(MAY)_2$	5.68 ± 0.1	1.51 ± 0.3
School C $(APR)_1$	6.84 ± 0.1	1.48 ± 0.2
School C $(APR)_2$	7.30 ± 0.3	1.36 ± 0.2
School C $(MAY)_1$	6.22 ± 0.4	1.27 ± 0.2
School C$(MAY)_2$	7.57 ± 0.1	1.56 ± 0.2
School D$(APR)_1$	7.50 ± 0.1	0.82 ± 0.1
School D $(APR)_2$	7.30 ± 0.2	1.54 ± 0.2
School D $(MAY)_1$	7.32 ± 0.2	1.21 ± 0.2
School D$(MAY)_2$	7.49 ± 0.1	1.78 ± 0.1
SON (2007) allowable limits	6.5-8.5	50

KEY: * mean value ± std. deviation, APR; April

The socio-demographic and educational attributes of the survey respondents are shown in Table 2. Majority (57.0%) of the participants was aged between 14 – 16 years and a higher preponderance (96.5%) of the respondents was students (Table 2). The dominance of the age group (14 -16 years) inferred that most members of the consenting survey population were junior secondary school (JSS) students. All the respondents were single (100%) as at the period of the survey and a higher proportion were females (63.0%). This observation was at variance with a report of Xuan *et al.* (2012) which indicated a dominance of males in a survey population of school age children in rural areas in Northern Vietnam. All the participants had attained primary level of education (100 %) whilst a low proportion of the participants (3.5%) had obtained both secondary and tertiary educational qualification (Table 2). This group of respondent was Government employees working as tutors or teachers in the respective schools as at the timeline of the survey.

Table 2: Demographic and educational characteristics of the participants (N=200)

Characteristic	Response	Frequency (Percentage %)
Age group	11 - 13 years	52 (26.0)
	14 - 16 years	114 (57.0)

	17 - 18 years	26 (13.0)
	19 – 20 years	1 (0.5)
	25 – 35 years	7 (3.5)
Position	Teacher	7 (3.5)
	Student	193 (96.5)
Gender	Male	74 (37.0)
	Female	126 (63.0)
Educational level	Primary Education	200 (100.0)
	Secondary Education	7 (3.5)
	Tertiary Education	7 (3.5)
Marital status	Single	200 (100.0)
	Married	0 (0.0)

The respondent's opinions with respect to the characteristics of the water and toilet amenities present in the respective schools were shown in Table 3. All the respondents (100%) affirmed the presence of piped ground water stored in overhead tanks at all the schools. All the participants opined that the water source was sited within the school premises and a higher proportion (53.5 %) reported the availability of water from the primary source within the premises. The complete reliance of the respective school authorities on piped and stored ground water abstracted from boreholes installed within the premises of the schools is not surprising given the complete absence of functional public water supply system in Benin city. It is worthy to note that the groundwater supply system in the respective schools was not utilized as a source of drinking water as the respective groups of students and school staff were completely dependent on commercially available sachet and bottled water sold within the school premises as drinking water source. The groundwater supplies in each school were mainly used for sanitation purposes and maintenance of toilet facilities.

An equal proportion (50% each) opined that either 3 or 5 toilets were present in the respective schools and all the respondents (100%) indicated that the only type of toilet present in each school was the pour-flush to tank or pit. Although, specific inquires to ascertain the adequacy of toilet facilities to cater for the student and staff population of the respective schools were absent in the distributed survey form, the number of functional toilets in the respective schools is grossly inadequate to cater for the overall population of both students and teaching staff observed in all the visited schools. The complete absence of other forms of toilets such as pit toilets in the visited

schools contrasted with a previous report by Agbo *et al.*, (2012) which revealed the presence of different types of pit toilets in several secondary schools in Jos North Local Government area (LGA) of Plateau State, North Central Nigeria. A majority (52.5%) of the respondents opined the availability of separate toilets for both males and females with a lower proportion (47.5 %) stating otherwise. The availability of separate toilet facilities for the genders especially in a mixed secondary school is the ideal scenario but the reported perception of the non-availability of designated toilet facilities for the genders might indicate that some of the toilet amenities in these schools were not clearly demarcated on gender basis. An identical observation has been documented by Agbo *et al.* (2012) with respect to visited schools in Jos North LGA, Plateau State. A higher number of participants (73.0%) indicated the non-availability of menstrual hygiene amenities in the toilets whilst a lower number of respondents (27.0%) reported the presence of such amenities (Table 3). This observation is worrisome as schools have been described as likely essential settings with respect to menstrual health management (MHM) and the absence of relevant facilities such as; gender segregated improved toilet amenities, sufficient supply of safe water in schools for washing of hands and soiled clothes as well as facility for drying of clothes and absence of sanitary menstrual materials can hinder female students from practicing safe hygienic management of their menstruation (UNICEF, 2015). These situation can lead to absenteeism, lower level of concentration in class as well as reduced involvement in extracurricular activities such as sports and school clean-up (UNICEF, 2015). The inadequacies in MHM in the visited schools in the current study is similar to an earlier observation by Magayane and Meremo, (2021) which indicated identical deficiencies MHM practices in some public schools located in Kibondo District, Tanzania.

Table 3: Characteristics of water and toilet facilities in the respective secondary schools (N=200)

Characteristic	Option	Frequency (Percentage %)
Presence of piped ground water stored in overhead tanks	Yes	200 (100.0)
	No	0 (0.0)
Location of the water source	Within the school premise	200 (100.0)

	Outside the school premise	0 (0.0)
Availability of water from the main source	Yes	107 (53.5)
	No	93 (46.5)
Number of usable toilets	3	100 (50.0)
	5	100 (50.0)
Type of toilet facility	Pour-flush to sewer	0 (0.0)
	Pour-flush to tank or pit	200 (100.0)
Separate toilet for males and females	Yes	105 (52.5)
	No	95 (47.5)
Availability of menstrual hygiene amenities in the female toilet	Yes	54 (27.0)
	No	146 (73.0)

The participant's opinions with regards to practiced sanitation and solid waste management in the respective schools are presented in Table 4. A majority of the respondents (49.5%) affirmed the availability of soap and water within the toilets whilst a lower proportion (28.5%) opined that these items were absent at the available toilets (Table 4). This observation might indicate that the availability of soap and water was not consistent at all times during the school session, but it is difficult to postulate likely reasons as the management staff of the respective schools did not participate in the survey. Given that the management staff comprising of the school principal and vice principal are administratively responsible for the day to day affairs of the respective schools, their consensual participation in the survey would have provided adequate information pertaining to the variations in the supplies of these items as indicated by the responses of the survey participants. Majority of the respondents (49.5%) opined that soap and water were available at a very close distance (around 5m) to the toilet and number of the participants (44.0%) opined that these items were not available at/in the toilets. A higher proportion of the respondents (52.5%) indicated the non-availability of dedicated personnel responsible for cleaning of the toilets while a lower number of participants (47.5%) opined otherwise. The absence of employed staff to take care of the toilet facilities at some of the visited schools is most likely a school management decision that could have been primarily influenced by the financial implications associated with the employment of dedicated personnel to maintain the toilet facilities.

A majority of the participants (55.0%) opined that safe segregation of solid wastes was not conducted in the schools whilst a lower number (32.0%) stated otherwise. A larger proportion (60.5 % each) opined that solid wastes were centrally collected and burnt in the open whilst a lower number of respondents (20.5%) opined that the centrally collected waste were burnt in an enclosed space. Majority of the participants (66.0%) reported the inability of the State owned waste manager (Edo State waste management board) to regularly evacuate accumulated solid waste generated by the school but a lower proportion (34.0%) indicated otherwise. The inability of the State Government owned municipal waste manager to conduct regular evacuation of the accumulated wastes at these schools could have resulted in the decision of the respective school management to conduct burning of the solid wastes which is not an environmentally friendly option given the deleterious effects, waste incineration can have on both indoor and outdoor air quality and human health as well as the aesthetics of the school settings. A larger proportion of respondents (90.0%) opined the non-evacuation of accumulated solid waste by human scavengers whilst a smaller proportion (10.0%) stated otherwise. This observation would indicate that the accumulated wastes generated within the school premises that were not subjected to incineration were taken and deposited outside of the respective premises which were fenced and gated respectively.

Table 4: Sanitation and solid waste management in the respective secondary schools (N=200)

Characteristic	Option	Frequency (Percentage %)
Availability of soap and water around toilet facility	Yes	99 (49.5)
	No	57 (28.5)
	Partially	44 (22.0)
Availability in terms of distance of soap and water around the toilet facility	Yes, within 5m around the toilet	99 (49.5)
Availability of water from the main source	Yes, >5m around the toilet	13 (6.5)
	No soap and/or water	88 (44.0)
Staff employed to clean the toilet	Yes	95 (47.5)
	No	105 (52.5)
Safe segregation of solid wastes in the schools	Yes	64 (32.0)

	No	110 (55.0)
	Somewhat (bins fill/only 1 or 2 bins available	26 (13.0)
Central collection and burning of wastes in the open	Yes	121 (60.5)
	No	79 (39.5)
Central collection and burning of wastes in an enclosed space	Yes	41 (20.5)
	No	159 (79.5)
Evacuation of collected waste by Edo State waste management board	Yes	68 (34.0)
	No	132 (66.0)
Evacuation of collected waste by human scavengers	Yes	20 (10.0)
	No	180 (90.0)

CONCLUSION AND RECOMMENDATIONS

Documented perceptions pertaining to the state of available water, sanitation and hygiene amenities by consenting students and teaching staff of four secondary schools located in Egor LGA, Benin city was presented in this study. Based on some of the observations, it is recommended that the owners of the schools should do more in terms of providing more gender designated toilet facilities and ensuring regular availability of soap and water in these WASH facilities. The respective school management should also be financially empowered by the owners to employ dedicated personnel to maintain the toilet facilities in the schools and the school management should do more with regards to adequate provision of MHM amenities in these institutions.

REFERENCES

Adeleye B, Medayese S, Okelola O. (2014). Problems of water supply and sanitation in Kpakumgu area of Minna (Nigeria). Glocal.: J. Cult. Pol. Innovat. 10: 1-2.

Adesakin AT, Oyewale TA, Bayero U, Mohammed NA, Aduwo AI, Ahmed ZP, Abubakar DN, Barje BI. (2020). Assessment of bacteriological quality and physico-chemical parameters of domestic water sources in Samaru community, Zaria, Northwest Nigeria. Heliyon https://doi.org/10.1016/j.heliyon.2020.e04773.

Adukia A. (2013). Sanitation and Education. Harvard Graduate School of Education, Cambridge.

Agbo HA, Envuladu EA, Adah UG, Zoakah AI. (2012). An assessment of toilet facilities in secondary schools in Jos North Local Government Area of Plateau State. Greener J. Educat. Res. 2 (4): 091 – 094.

Chetty R, Friedman J, Hilger N, Saez E, Schanzenbach D, Yagan D. (2011). How does your kindergarten classroom affect your earnings. Evidence from Project STAR. Quarter. J. Econo. 126(4): 1593-1660.

Egbinola CN, Amanambu AC. (2015). Water supply, sanitation and hygiene education in Secondary Schools in Ibadan, Nigeria. Bullet. Geograph. 29: 31-46.

Eremutha F, Taiwo BH, Sridhar MK, Olufemi AA. (2016). Evaluation of sanitary conditions in Kuje market in Abuja, Nigeria with diverse cultural practices and provision of a dry ecological toilet system. Sociol. Anthropol. 4(11): 1011-1019.

Forstinus N, Ikechukwu N, Emenike M, Christiana A. (2016). Water and waterborne diseases: a review. Inter. J. Trop. Dis. Health 12(4): 1-14.

Joshi A, Amadi C. (2013). Impact of water, sanitation, and hygiene interventions on improving health outcomes among school children. *J. Environ. Public Health* 220: 12-18.

Lukman S, Ismail A, Asani MA, Bolorunduro KA, Foghi PU, Oke IA. (2016). Effect of Selected factors on water supply and access to safe water in Nigeria. *Ife J. Sci.* 18: 3-9.

Magayane, R. and Meremo, J. (2021). Menstrual hygiene management practices for adolescent girls among Public Secondary Schools in Kibondo District, Tanzania. *East Afr. J. Educat. Soc. Sci.* 2 (3):107-115.

McMichael C. (2019). Water, Sanitation and Hygiene (WASH) in Schools in Low-Income Countries: A Review of Evidence of Impact. *Inter. J. Environ. Res. Pub. Health* 16(3):359.

Obeta MC. (2018). Rural water supply in Nigeria: policy gaps and future directions. *Water Policy* 20(3): 597-616.

Ogbeifun DE, Archibong UD, Chiedu IE, Ikpe EE. (2019). Assessment of the water quality of boreholes in selected areas in Benin City, Edo State, Nigeria. Chem. Sci. Inter. J. 28(2): 1-13.

Radojevic M, Bashkin VN. (1999). Practical Environmental Analysis. The Royal Society of Chemistry. Cambridge.

Shrestha MV, Manandhar N, Joshi SK. (2018). Study on knowledge and practices of water, sanitation and hygiene among Secondary School students. J. Coll. Med. Sci.-Nepal 14(3): 160-165.

Standards Organization of Nigeria. (SON). (2007). Nigerian industrial standard: Nigerian standards for drinking water quality. SON. Abuja.

Ugwu NP, Obodoechi ND, Agu, CS, Olisa DE. (2021). Does economic policy in Nigeria enhance sustainable water and sanitation facilities? J. Water Sani. Hyg. Develop. 12(1):23.

UNICEF (2015). An Assessment oF Menstrual Hygiene Management in Secondary Schools; Anambra, Katsina and Osun States, Nigeria, UNICEF.

WHO/UNICEF/WSSCC (2004). Global water supply and sanitation assessment 2000 report, Geneva: World Health Organization/United Nations Children's Fund Water Supply and Sanitation Collaborative Council.

WHO/UNICEF (2016). Scaling up group handwashing in schools - Compendium of group washing facilities across the globe. WHO/UNICEF, New York, USA.

WHO (2022). Delivering safe sanitation for all: areas for action to improve the situation in the pan-European region. WHO Regional Office for Europe, Copenhagen.

Xuan TL, Hoat NL, Rheinländer T, Dalsgaard A, Konradsen K. (2012). Sanitation behavior among schoolchildren in a multi-ethnic area of Northern rural Vietnam. BMC Pub. Health 12:140.