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Posted Date: 9 April 2026

doi: 10.20944/preprints202604.0649.v1

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Article

Evaluation of Sustainable Water, Sanitation and Hygiene (WASH) Practices and Infrastructure in Primary Schools in eThekweni District, South Africa

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Abstract

Water, sanitation, and hygiene (WASH) services are essential for learner health and equitable education. Persistent gaps in WASH infrastructure and hygiene provision, particularly those affecting girls, remain a major challenge in low- and middle-income countries. We assessed WASH interventions, learner knowledge and perceptions, and implementation challenges and opportunities in primary schools in eThekweni District, South Africa. We conducted a cross-sectional study among Grade 7 learners using a structured questionnaire adapted from the WHO Surveillance of WASH in Schools Tool, complemented by observational checklists. Stratified random sampling yielded 129 participants (76 girls, 53 boys); 72% response rate. Quantitative data were analysed using Chi-square, Fisher's exact, and Kruskal-Wallis tests as appropriate. Although drinking water access was generally reliable, significant gaps were observed in sanitation privacy, soap and toilet paper availability, cleanliness, and menstrual hygiene facilities. Female learners consistently reported poorer conditions than males ($p < 0.05$). The Hygiene Access Index differed significantly across gender and age groups ($p < 0.05$), reflecting inequitable provision of hygiene materials. Despite educational initiatives, substantial shortcomings persist in school WASH infrastructure and hygiene provision, disproportionately affecting girls' dignity, well-being, and school participation. Sustaining gender-responsive WASH systems is essential for improving learner health and promoting equitable educational environments.

Keywords: water; sanitation and hygiene (WASH); sustainable WASH practices; sustainable development; primary schools; South Africa; Africa

1. Introduction

Safe water, adequate sanitation, and appropriate hygiene (WASH) services are foundational to public health and sustainable development, particularly within educational settings where children form lifelong habits [1]. Schools are the best entry points for influencing hygiene-related behaviour and reducing the risk of disease transmission [2]. Inadequate WASH leads to diarrhoea, malnutrition, dehydration, dracunculiasis, schistosomiasis, trachoma, and intestinal helminth infections. Globally, it was estimated that 1.4 million deaths in 2019 were caused by inadequate access to safe water, poor sanitation, and unsatisfactory hygiene. Approximately 1,240,000 deaths were due to unsafe water sources, 820,00 deaths were due to poor sanitation, and 520,000 deaths were because of unsatisfactory hygiene [3].

Inadequate WASH is a major issue in schools in low and middle-income countries. Although certain students possess knowledge regarding waterborne illnesses, there are still gaps in their

understanding of the routes of transmission and ways to prevent them [4]. Gender equality further compounds this challenge. Girls frequently encounter barriers related to menstrual hygiene management, insufficient privacy, lack of disposal facilities, and social stigma; factors that negatively affect attendance, comfort, and academic engagement [5]. For example, if a learner’s cycle ends after 5 days, that learner could be away from school for the whole week, and that could lead to inconveniences of teaching and learning, and infringement on their rights to education [5]. Addressing these disparities requires a nuanced understanding of both infrastructural deficits and learner experiences.

While several initiatives have incorporated hygiene promotion into school curricula, evidence remains limited on how learners perceive and practice WASH behaviours in contexts where infrastructure and resources are inconsistent [6,7]. In the eThekweni District of KwaZulu-Natal Province in South Africa, primary schools vary widely in their WASH environments, yet little empirical evidence exists on the effectiveness of WASH educational interventions or the daily realities facing learners.

This study, therefore, aimed to evaluate WASH educational interventions implemented in primary schools in the eThekweni District, assess learners’ knowledge and perceptions of core WASH components, and identify key challenges affecting water access, sanitation conditions, hygiene practices, and menstrual hygiene management. By integrating learner perspectives, observational assessments, and composite indices, our analyses provide a comprehensive overview of school WASH environments and highlight priority areas for sustaining equity, health, and learning outcomes in the district.

2. Materials and Methods

2.1. Study Design and Setting

We conducted a descriptive cross-sectional study to determine WASH educational interventions, learner knowledge and perceptions, and school-level WASH conditions in primary schools in the eThekweni District, KwaZulu-Natal Province, South Africa. Data collection involved a survey of learners and teachers and an observational assessment of WASH infrastructure across five purposively selected primary schools participating in WASH education activities. The study targeted Grade 7 learners, as they are typically exposed to Life Orientation lessons that include WASH content and are developmentally able to provide reliable self-reports.

2.2. Study Population

The study population consisted of Grade 7 learners and Life Orientation teachers from selected primary schools. The inclusion and exclusion criteria are provided below.

2.2.1. Inclusion Criteria

- One Grade 7 Life Orientation teacher per school
- Grade 7 learners who have received WASH training
- Grade 7 girls who have reached menarche.

2.2.2. Exclusion Criteria

- Grade 7 learners without prior WASH training
- Grade 7 girls who have not reached menarche
- General workers and school staff not involved in WASH teaching.

2.3. Sampling Method and Sample Size

A stratified random sampling method was used to ensure gender representation and comparability across learner groups. A total of 180 Grade 7 learners were selected, and consent forms

were distributed to them. In the end, 138 learners returned consent forms, 9 of whom were absent on the day of data collection, so 129 learners were interviewed, representing a 72% response rate. The final sample comprised 76 female and 53 male learners.

2.4. Data Collection and Study Tools

We adapted the learner questionnaire from the publication “Surveillance of Water, Sanitation and Hygiene in Schools: A Practical Tool” by the World Health Organization (WHO) [8]. The instrument (Appendix G and H). The research instrument consisted of a structured questionnaire comprising 21 items. These included two demographic questions (age and gender) and 19 items covering water access, sanitation conditions, and hygiene knowledge and practices. Items were grouped into thematic WASH domains to enable the construction of composite indices for analysis.

In addition, a school-level WASH checklist—aligned with WHO and United Nations Children Fund (UNICEF) guidance—was used to document infrastructure, including drinking water points (total and functional); toilet facilities, cleanliness, privacy, and gender separation; availability of soap, sanitary bins, and disposal facilities; and hygiene promotion materials and maintenance systems. This enabled triangulation of learner-reported data with observed conditions.

2.5. Development of Composite WASH Indices

To quantitatively evaluate WASH conditions, composite indices were constructed for seven domains:

- Water Access Index
- Sanitation Access Index
- Sanitation Privacy Index
- Sanitation Education Index
- Hygiene Access Index
- Hygiene Practice Index; and
- Menstrual Hygiene Index (for female learners).

Each index was derived from multiple questionnaire items conceptually aligned with the domain, as shown in Tables 1 and 2. Response options were assigned numerical scores based on adequacy or favorability:

- “Yes, always” = highest score (e.g., 3)
- “Most of the time” = moderate score (e.g., 2)
- “Rarely” = low score (e.g., 1)
- “No, never” = lowest score (e.g., 0); and
- “Not applicable” or “I don’t know” responses were excluded from scoring.

Index scores were calculated by summing item scores, dividing by the maximum possible score, and converting them to a percentage. Higher values reflect more favorable WASH conditions or practices.

Table 1. Questions included in the WASH composite indices.

PW1	Do you usually drink water while at school?
PW2	Is water available for drinking at school?
PS1	Do you ever visit the toilets/latrines while at school?
PS2	Are toilets/latrines separate for boys and girls?
PS3	If toilets/latrines are not separated for boys and girls, is that a problem for you and your classmate?
PS4	Can pupils use toilets/latrines at school without feeling disturbed by others?
PS5	Think about today and yesterday. Was toilet paper provided in the toilet cubicles?
PS6	What would you say about the cleanliness of the school toilets?

PS7	Have you ever talked about toilet hygiene and proper hygiene behaviours when using toilets at school?
PH1	Investigations have shown that many pupils do not wash their hands while at school for various reasons. Do pupils in your school wash their hands after using the toilet?
PH2	If you want to wash your hands at school after using the toilet, is water available for handwashing?
PH3	If you want to wash your hands at school after using the toilet, is soap available for handwashing?
PH4	If both water and soap are available, how do you wash your hands?
PH5	Have you ever talked about the importance of handwashing at the school?
PH6	Have you ever practiced handwashing with your teachers and/or in a group with other pupils?
PH1_G	Sometimes girls are ashamed to talk about menstruation or keep it as a secret. Can girls openly talk about menstruation in this school?
PH2_G	Girls miss classes or leave school early when they are menstruating. Do girls regularly come to your school when they are menstruating?
PH3_G	If girls need to change menstrual hygiene products during a school day, can they do it in a private, discrete manner?
PH4_G	Is there a place in the girls' toilet facilities or cubicles to throw away used menstrual hygiene products?
PH5_G	If yes, are bins emptied often enough to prevent them from becoming over-full and smelly?

Table 2. Questions and themes *per* WASH index.

Index Name	Relevant Questions	Theme
Water Access Index	PW1, PW2	Availability and usage of drinking water
Sanitation Access Index	PS1, PS2, PS3	Access to and structure of sanitation facilities
Sanitation Privacy Index	PS4, PS5, PS6	Privacy, cleanliness, and provision in toilets
Sanitation Education Index	PS7	Toilet hygiene education
Hygiene Access Index	PH1, PH2, PH3	Access to handwashing facilities and supplies
Hygiene Practice Index	PH4, PH5, PH6	Handwashing behaviour and education
Menstrual Hygiene Index	PH1, PH2, PH3, PH4, PH5	Menstrual hygiene management

2.6. Statistical Analysis

Quantitative data were analysed using IBM SPSS Statistics version 29.0. Analyses included descriptive statistics (frequencies, percentages, means, and standard deviations) and inferential statistical tests (Chi-square and Fisher’s exact tests for associations between categorical variables, and the Kruskal-Wallis test for non-parametric comparisons of continuous variables). We applied the significance threshold of $p < 0.05$. We presented index scores and demographic comparisons using tables and figures to illustrate patterns and disparities.

2.7. Ethical Considerations

This study was approved by the Institutional Research Ethics Committee (IREC) of Durban University of Technology (Ethics Clearance Number: IREC 226/24). Permission to conduct the study was obtained from the KwaZulu-Natal Department of Education (Ref. No. 2/4/8/302). Written informed consent was obtained from parents or guardians, and assent was obtained from learners before participation. Anonymity and confidentiality were ensured throughout the study.

3. Results

3.1. Participant Characteristics

A total of 129 Grade 7 learners participated in the study (response rate: 72%), including 76 females (58.9%) and 53 males (41.1%). Ages ranged from 11 to 16 years, with a mean age of 12.47 years (standard deviation 0.88). Most learners (80 out of 129; 62%) were aged 12 years or younger. Age distribution differed significantly by gender, with a higher proportion of males older than 12 years compared to females (49.1% versus 30.3%; $p = 0.043$).

3.2. Water Access

Two items assessed drinking water access at school, that is, water consumption and reliable availability of drinking water in schools, as shown in Tables 1 and 2. Most learners reported drinking water at school either always or most of the time (82.8%), and 94.6% indicated that drinking water was available in school. The mean Water Access Index score across the schools was 53.75%, with confidence intervals (CI) suggesting generally adequate but variable access (Table 3). There were no significant differences between female and male learners in water access ($p = 0.433$; Table 4).

Observations showed substantial variability across schools in the number of drinking-water points (range 4–36; median 13), though at least one water point accessible to younger learners was present in all schools. None of the schools displayed educational materials on water quality or hydration.

3.3. Sanitation Access

Sanitation access was assessed using three questions as shown in Tables 1 and 3. Most learners reported using school toilets when needed(58.9%). Gender-separated toilets were nearly universal in schools (99.2%). Among learners for whom shared facilities were applicable, over a quarter (28.1%) perceived a lack of separation as problematic.

The mean Sanitation Access Index was 56.50%, indicating moderate access (Table 3). There were no significant differences between female and male learners in sanitation access (Table 4; $p = 0.341$).

3.4. Sanitation Privacy

Sanitation privacy was assessed using three questions, as shown in Tables 1 and 2. Privacy and cleanliness concerns emerged prominently. Almost all the toilets in the primary schools were unlockable. Only 38% of learners felt they could use the toilet without disturbance and 69.8% reported that toilet paper was never available. Finally, only 20% described the toilets as “always clean”.

The mean Sanitation Privacy Index score was 53.34%; 95% confidence intervals 50.43% to 56.24%. There were no significant differences between female and male learners in sanitation privacy (Table 4; $p = 0.683$). These findings suggest significant privacy and dignity concerns.

3.5. Sanitation Education

Sanitation education was assessed using one question (Tables 1 and 2). Most learners (65.9%) had discussed toilet hygiene or proper sanitation behaviours at school. The resulting Sanitation Education Index scored the highest among all WASH domains (mean score 70.25%; 95% CI 61.98% to 78.51%, with no significant differences by gender ($p = 0.149$)).

3.6. Hygiene Access

Hygiene access was assessed by two questions (Tables 1 and 2). Access to handwashing facilities was uneven, as 96.1% reported availability of water for handwashing, and 60.5% reported that soap was never available. The Hygiene Access Index had the lowest overall mean score of all WASH indices at 41.90% (Table 3). Significant disparities were observed for gender (Table 4), with male

learners scoring higher at 46.75% and female learners at 39.10% ($p = 0.008$). There were also significant age differences as younger learners scored higher (44.07%) than older learners (38.27%); $p = 0.010$.

3.7. Hygiene Practice

Hygiene practice was assessed with through four questions (tables 1 and 2). Only 32.6% of learners believed all pupils wash their hands after toilet use, while 61.7% said that they use both water and soap when available. Discussions on the importance of handwashing were reported by 60%, and 35.2% had participated in group handwashing activities. Overall, the Hygiene Practice Index averaged 56.14% (Table 3), with no significant age and gender differences (Table 4).

3.8. Menstrual Hygiene

Menstrual hygiene was assessed only in female learners using five questions (Tables 1 and 2). The assessment revealed significant challenges:

- 76.3%. reported that girls avoid talking openly about menstruation
- Only 24% reported that girls always attend school during menstruation
- Only 15.8% reported access to private changing facilities
- 69.7%. reported there was no proper place for disposal of menstrual products
- Only 19.7% stated that bins, where present, were emptied regularly.

The Menstrual Hygiene Index averaged 69.89% (95% CI 51.97% to 60.32). though specific items revealed notable deficits in privacy and disposal infrastructure. Observational data confirmed that four of five schools lacked proper sanitary bins in girls’ toilets, and disposal often occurred in general waste bins. Only one school had a sanitary bin in the girls’ toilet cubicles, but the sanitary bin was not a proper sanitary bin.

Table 3. The overall scores for WASH indices across the five schools included in the study.

	Count	Mean	Standard Deviation	Median	Percentile 25	Percentile 75	Maximum	Minimum	95% Lower CL for Mean	95% Upper CL for Mean	Binomial p-value (cut-off = 50)
Water Access Index	129	53.75	13.50	57.14	42.86	57.14	71.43	14.29	51.33	56.17	0.014
Sanitation Access Index	129	56.50	19.53	55.56	44.44	77.78	77.78	11.11	52.74	60.26	0.064
Sanitation Privacy Index	129	53.34	15.58	54.55	45.45	63.64	100.00	18.18	50.43	56.24	0.132
Sanitation Education Index	129	70.25	45.91	100.00	0.00	100.00	100.00	0.00	61.98	78.51	< 0.001
Hygiene Access Index	129	41.90	14.03	36.36	27.27	54.55	72.73	18.18	39.31	44.49	0.001
Hygiene Practice Index	129	56.14	19.12	60.00	40.00	80.00	80.00	20.00	51.97	60.32	0.002
Menstrual Hygiene Index	129	69.89	15.11	72.73	54.55	81.82	90.91	45.45	61.83	77.94	0.004

Table 4. Comparison of WASH index scores between female and male learners.

		Median	25th Percentile	75th Percentile	P value
Female (N = 76)	Water Access Index	57.14	42.86	57.14	0.433
	Sanitation Access Index	66.67	44.44	77.78	0.341
	Sanitation Privacy Index	54.55	45.45	63.64	0.683
	Sanitation Education Index	100.00	0.00	100.00	0.149
	Hygiene Access Index	36.36	27.27	54.55	0.008
	Hygiene Practice Index	60.00	40.00	80.00	0.945
Male (N = 53)	Menstrual Hygiene Index	72.73	54.55	81.82	-
	Water Access Index	57.14	42.86	71.43	
	Sanitation Access Index	55.56	44.44	77.78	
	Sanitation Privacy Index	54.55	36.36	63.64	
	Sanitation Education Index	100.00	100.00	100.00	
	Hygiene Access Index	45.45	36.36	54.55	
	Hygiene Practice Index	60.00	40.00	60.00	

3.9. Staff Interviews and School-Level Observations

Across the five observed schools:

- All had at least one accessible functional water point.
- None provided WASH educational signage.
- None conducted water quality testing.
- Soap was inconsistently available; hygiene materials were rarely restocked.
- Only one school had a sanitary bin in girls' toilets, and it was not purpose-designed.
- Several toilets lacked functional locks or adequate ventilation.

These objective observations aligned with learner-reported deficits in sanitation privacy, hygiene access, and menstrual hygiene facilities.

4. Discussion

This study assessed WASH access, practices, perceptions, and implementation challenges in primary schools in the eThekweni District. The findings reveal a mixed WASH environment: while drinking-water access and sanitation education were relatively strong, substantial gaps persisted in sanitation privacy, hygiene materials, and menstrual hygiene facilities. These deficits were most pronounced among female learners, who consistently reported poorer conditions than their male peers.

4.1. Water Supply, Access, Availability, and Quality

Most learners had access to drinking water at school, and observations confirmed the presence of functional water points in all schools. These results align with national efforts to expand water supply infrastructure in South African schools. However, the wide variation in the number of functional water points suggests inconsistent adequacy relative to school size. The absence of water quality information and monitoring mechanisms may undermine safe water practices.

Access to good water constitutes the basis of sound WASH practice. Access to safe and clean drinking water is a basic human right and an essential component of public health. The WHO argues that almost 2 billion people in the world are still without access to safely managed drinking water services [9]. Research continuously confirms that increased access to sanitation facilities and clean water significantly reduces the incidence of water-borne illnesses. Hygiene habits cannot be sustained in schools without continuous and safe access to water. School water access in South Africa is severely unequal, with enormous differences between rural and urban settings, threatening effective WASH protocols [10]. Globally, only 69% of schools have basic drinking water services, reflecting system weaknesses [30]. Rural Vhembe District, Limpopo, South African schools are devoid of adequate water supply and sanitation facilities, hindering effective WASH routines [11]. Mfolozi Local Municipality in the KwaZulu-Natal relies on diverse water sources, including municipal water, rainwater harvesting, boreholes, and tanker trucks [12]. Rural schools are affected by poorer infrastructure problems, with water supply interruptions occurring frequently due to aspects like load-shedding and seasonal changes [13]. School learners in South Africa have access to poor-quality water and water supply, with significant infrastructure and pollution challenges. Problems associated with infrastructure are the unavailability of water points, lack of treatment facilities, and poor sanitation, reflecting systemic inadequacy in the provision of safe school water [12]. The lack of adequate WASH facilities is a significant public health concern in Southern Africa, where geographical location and the lack of infrastructure are the biggest limitations, particularly in rural areas [10]. The above proofs show that where water infrastructure exists, its quality and adequacy are unequal, especially in rural and peri-urban areas like KwaZulu-Natal and Limpopo. This compromises the strength of schools in maintaining equal hygiene practices. Improvements in WASH services are associated with reduced diarrhoea risks, particularly in low- and middle-income countries where access to safe water is not good [14].

4.2. Waterborne Diseases Linked to Poor WASH Practices

Unsafe WASH practices remain a leading cause of preventable diseases among school-aged children and contribute to approximately 1.4 million global deaths yearly, with sub-Saharan Africa bearing the highest burden [15]. Poor WASH facilities in schools are associated with increased risks of diarrhoea, schistosomiasis, soil-transmitted helminth infections, and malnutrition among school learners [16,17]. Research indicates that WASH remains a significant issue in most developing countries. Schools in low- and middle-income countries lack adequate WASH conditions, affecting over 18,000 schools across 30 countries [18]. In sub-Saharan African schools, inadequate water and sanitation infrastructure and poor hygiene hinder healthy hygiene practices and directly impact learners' health and attendance, with diarrhoeal diseases posing a significant risk to educational continuity [18]. Reproductive Tract Infections (RTI) were found to be significantly associated with using unclean latrines, not washing hands with soap before touching the genital area, having symptoms of RTI, having multiple sexual partners, changing blood-absorbent material only once per day, and washing the genital area only once per day during menstruation [19]. The WHO estimates that about 4.6 billion people do not have access to safely managed sanitation services, leading to exposure to pathogens [20]. Access to clean water sources reduces diarrhoea risk by about 17% and improved sanitation facilities reduce it by 9% [21].

4.3. Gender, Disability, and Access

Inadequate WASH services significantly perpetuate gender inequality, particularly in low- and middle-income countries [22–24]. Most WASH intervention studies focus on health outcomes rather than gender equality and social inclusion (GESI) outcomes, with only 42% measuring transformative GESI outcomes [22]. Disability inclusion in school WASH design remains critically under-addressed, with significant infrastructure barriers preventing full participation of learners with physical impairments [25]. Disability inclusion remains under-addressed in WASH design in Malawi schools. No school fully meets the needs of students with disabilities [26]. People with disabilities face significant challenges in accessing WASH services with dignity and privacy, experiencing greater difficulties compared to those without disabilities [27]. Studies emphasise the need for improved WASH infrastructure in schools to reduce menstrual-related absenteeism and increase attendance rates, especially among female students [28,29]. However, evaluations of WASH interventions often focus on health outcomes, neglecting GESI considerations [22].

4.4. School-based WASH Educational Interventions

School WASH interventions aim to improve health literacy, handwashing, and nutrition in low- and middle-income countries [26,30] found that school absenteeism was higher in schools without improved WASH services compared to schools with services [30]. WASH interventions improve WASH-related knowledge and practices and improve education outcomes, including decreased absenteeism. In one of Kibra's secondary schools in Nairobi, reduced learners' absenteeism was reported due to access to clean drinking water and sanitation and hygiene facilities. In addition to that, WASH interventions were put in place to improve learners' academic performance [31]. Improved school WASH provides a foundation for improving equitable access to education for children. Improved WASH facilities in schools positively impact the health, attendance, and academic achievement of learners, by protecting them against infectious diseases such as schistosomiasis [1,2]. Mulopo et al. testified to the long-standing issue of schistosomiasis in KwaZulu-Natal, South Africa, and the need for multicomponent interventions [12]. School WASH interventions play an important role in reducing diarrheal disease [32], therefore, school-based interventions should focus on promoting handwashing behavior and maintaining cleanliness of WASH facilities to reduce diarrhea and STH infection among children [16]. Mahmud et al. noted that hand-washing and nail-clipping interventions are effective in intestinal parasite infection prevention and in anaemia reduction among learners [33]. The interventions, nonetheless, need correct implementation and

context in order for them to be effective [2]. A study conducted in Nelson Mandela Bay, South Africa, stated that the knowledge of participants on the item 'Washing hands with water and soap is superior to using disinfectant' improved following the intervention. In the case of attitudes, the intervention resulted in small increases in the percentage of positive responses to correct statements. However, most statements, such as 'Caregivers need to lead by example by observing excellent hygiene' and 'Hand washing is important', showed an excellent decrease after intervention [34]. Though results vary, the evidence always supports integrating WASH programs with school health interventions to achieve notable health improvement.

4.5. Challenges That Schools Face Regarding WASH

Schools in South Africa and within the SADC region face deep-seated, interrelated challenges in realizing sustainable WASH services. Systemic barriers result in an inability to maintain infrastructure and deliver services in schools effectively. [10] identified that the key barriers to WASH practices in Southern Africa are geographical inequalities, low investment in WASH infrastructure, and ineffective community engagement [10]. Abrams et al. further discussed how historical inequalities compound these challenges with climate change and are generally limited by economic capacity [33]. Providing resources alone is not sufficient. Sustainable service delivery has to be managed together with resources, information, and accountability mechanisms [35]. Disconnects exist between school textbook knowledge and WASH education interventions, indicating missed opportunities for effective and sustainable behavior change [36]. In addition, WASH committees lack the capacity to manage programs effectively [37]. Moreover, human factors underlying WASH intervention sustainability in schools are complex, with institutional, cultural, and practical domains standing in the way of sustainability [34,35,38]. Additionally, environmental, social, and institutional barriers are undermining WASH access by learners with disabilities in schools [25]. Enhancing monitoring processes and data use for WASH is, therefore, essential for decision-making and accountability. Indicators and data collection may be improved to raise sector coordination and, in turn, data availability, but this process has to be sensitive to the political economy systems [39]. Substantial inconsistencies between reported facilities and actual handwashing practices in low- and middle-income countries [40]. The evidence indicates that these challenges are deeply interconnected; poor infrastructure results in unsafe learning environments, weak monitoring and systems prevent timely interventions, and limited funding exacerbates problems with maintaining schools.

Interventions are essential in promoting public health and disease prevention, particularly in developing countries where access to clean water and improved sanitation facilities is limited. Primary schools are often the first places where WASH interventions are implemented, making them critical in promoting healthy behavioural practices among learners. The implementation of WASH programs in schools will improve the health of school children, their school attendance, and proper menstrual management. WASH in schools promotes hygiene practices and increases the quality of education [41]. Overall, the world is not on track to achieve universal access to basic WASH services by 2030, with current rates of progress needing to double for basic services and multiply for safely managed services [42].

4.6. Implication for School Health Policy

The findings of this study highlight the urgency of sustaining school WASH systems through:

- Reliable provision of hygiene materials (soap and toilet paper)
- Improved maintenance of sanitation facilities
- Gender-responsive infrastructure upgrades
- Dedicated MHM facilities with private changing spaces and functional sanitary bins
- Behavioural reinforcement through structured group handwashing activities; and
- Regular WASH monitoring and accountability mechanisms.

Enhancing WASH in schools is essential for supporting child health, reducing absenteeism, promoting gender equity, and advancing progress toward SDG 6 and national policy commitments.

5. Conclusions

This study demonstrates that while drinking-water access and sanitation education are relatively strong in eThekweni primary schools, significant gaps persist in sanitation privacy, hygiene supplies, and menstrual hygiene management. These limitations disproportionately affect female learners, undermining their health, dignity, and participation in schooling. The significant gender and age disparities observed in the Hygiene Access Index highlight inequitable access to basic hygiene resources.

To improve learner well-being and educational equity, schools require strengthened WASH infrastructure, reliable provision of hygiene materials, regular maintenance systems, and dedicated support for menstrual hygiene management. Ensuring gender-responsive WASH environments is critical for meeting children's basic needs, enabling full participation in school, and advancing broader public health and development goals.

Author Contributions: Conceptualization, A.V.M.; methodology, A.V.M.; validation, A.V.M., C.S.W., and M.K.; formal analysis, A.V.M.; data curation, A.V.M., C.S.W., and M.K.; writing—original draft preparation, A.V.M.; writing—review and editing, A.V.M., C.S.W., and M.K.; visualization, A.V.M., C.S.W., and M.K.; supervision, M.K.; project administration, A.V.M. and M.K.; funding acquisition, A.V.M. All authors have read and agreed to the published version of the manuscript.

Funding: This study was funded by the National Research Foundation of South Africa (NRF), grant number PMDS240807256718.

Institutional Review Board Statement: The research was conducted with the approval of the Institutional Research Ethics Committee of Durban University of Technology (Ref. #: IREWC 226/24) with approval date of 14 May 2025.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data presented in this study are available upon reasonable request from the corresponding author upon reasonable request, subject to institutional and ethical data protection requirements.

Acknowledgments: We would like to acknowledge the KwaZulu-Natal Department of Education for permitting us to collect the data reported in this article. We would also like to express our heartfelt gratitude to the School Principals, Life Orientation teachers, and Grade 7 learners and their parents from all the schools that participated in the study.

Conflicts of Interest: The authors declare no conflicts of interest.

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