



Impact of Health Education on Personal Hygiene Practices among Secondary School Students in Eha-Amufu, Enugu State, Nigeria

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ABSTRACT

Background. Poor personal hygiene remains a preventable contributor to diarrhoeal disease, helminthiasis, skin infection, dental caries and missed school days among adolescents in rural southeastern Nigeria.

Objective. This quasi-experimental pretest–posttest control-group study examined a six-week Health Belief Model programme among public secondary school students in Eha-Amufu, Isi-Uzo Local Government Area, Enugu State.

Methods. The population comprised 2,186 junior and senior secondary students in eight public schools. A cluster-adjusted power analysis justified recruiting 280 students from four schools assigned to intervention ($n = 140$) or wait-list control ($n = 140$). Complete-case analysis retained 260 students (intervention 132, control 128; 92.9% retention). Pilot reliability was acceptable ($\alpha = .76-.87$).

Results. Groups were equivalent at baseline. ANCOVA showed large effects on knowledge, $F(1, 257) = 198.42$, $p < .001$, $\eta^2p = .436$, $d = 1.93$; attitude, $F(1, 257) = 214.56$, $p < .001$, $\eta^2p = .455$, $d = 1.94$; and composite practice, $F(1, 257) = 176.33$, $p < .001$, $\eta^2p = .407$, $d = 1.80$, with parallel subscale gains. Sex and class did not moderate the practice effect.

Conclusions. Structured school health education improved hygiene outcomes and should be paired with WASH investment in Isi-Uzo.

Keywords: health education, personal hygiene, secondary school students, Health Belief Model, Eha-Amufu, Enugu State

1. Introduction

Personal hygiene is a cluster of everyday behaviours, handwashing with soap, oral care, regular bathing, clean clothing, safe menstrual management and hygienic waste handling, that interrupts faecal–oral and contact routes of infection. The WHO/UNICEF Joint Monitoring Programme estimated that in 2023 only 67% of schools



worldwide provided a basic hygiene service, leaving 646 million children without that service at school (WHO/UNICEF, 2024). Sub-Saharan Africa accounts for a disproportionate share of the deficit. In Nigeria an estimated 29 million school-age children still attended schools without a basic drinking-water service in 2023.

Eha-Amufu is the commercial hub of Isi-Uzo Local Government Area, about 38 km from Enugu metropolis. The 2024/2025 Annual School Census counted 19,293 learners in the LGA and a learner–toilet ratio of 136.8 to 1, against 3.0 to 1 for Enugu State as a whole (Federal Ministry of Education, 2025). Recurrent farmer and herder violence since 2022 has displaced residents and forced more than one thousand children out of school in affected settlements (Sahara Reporters, 2025). Crowded classrooms, intermittent water, scarce soap and disrupted routines therefore define the local hygiene risk environment.

Quasi-experiments in rural Sokoto, Bayelsa, Lagos and Abuja have reported statistically significant pretest–posttest gains after school-based health education (Abiola et al., 2015; Akinwale et al., 2024; Owolabi & Musa, 2026; Righteous & Ene-Bongilli, 2025). Abiola et al. (2015) assigned 120 rural Sokoto secondary students per arm. Observed practice was comparable at baseline but diverged after education (88.20% versus 62.10%, $p < .001$), a 30.7-percentage-point post-intervention gap. Righteous and Ene-Bongilli (2025) sampled 347 Bayelsa senior secondary students and found ANCOVA effects on knowledge of hand, oral, cloth and body hygiene. Akinwale et al. (2024) delivered a six-week hygiene module to Lagos schoolgirls; knowledge rose from 17.06 to 23.40 and attitude from 5.03 to 11.47 at 12-week follow-up. Owolabi and Musa (2026) assigned 100 Abuja basic secondary students to education or control and found a significant posttest contrast on practice.

Agbede and Ekeanyanwu (2021) compared parent-led, peer-led and combined Health Belief Model menstrual-hygiene arms among 120 Ogun schoolgirls; all three gained, with the peer-led arm largest, which justified peer demonstration in Eha-Amufu. Okoronkwo et al. (2025) compared 400 public and private students in Ikeduru, Imo State: public students had higher knowledge but poorer practice and more open defecation at school. Aduba et al. (2023) found near-universal knowledge among 280 Anambra students, while Elom et al. (2025) reported poor composite practice in Ezza South, Ebonyi State, with no sex or age differences. Omotosho (2010) reported Ibadan means of 17.8 for knowledge and 15.4 for practice among 476 students, yet no observed classroom had soap.

Nnaji, Eze and Ugwu (2023) inspected 60 Enugu schools: 55% always provided a handwash facility, 13.3% never did, and government schools were weakest (40% always had a facility; 20% always had soap). Toilet availability correlated with handwash points ($r = .85$). Okolosi and Nnamani (2023) found that Enugu secondary students judged school-based health education to improve handwashing and oral care, with no sex or urban–rural differences, but the design was perceptual rather than experimental. Ani (2017) taught handwashing to 48 Primary 5 pupils in Nkanu West, Enugu State, and found large knowledge and skill gains. Aluko et al. (2022) reported that inspected public schools met no JMP basic sanitation or hygiene standard and that public students

had higher odds of open defecation at school. No published controlled evaluation has isolated the effect of a theory-driven hygiene package among secondary students in Eha-Amufu. That omission matters because rural Enugu communities combine high infectious-disease exposure with thin school WASH infrastructure.

1.1 Theoretical framework and hypotheses

The study was anchored on the Health Belief Model (Rosenstock, 1974; Champion & Skinner, 2008) and Bandura's (1997) construct of self-efficacy. Perceived susceptibility and severity were targeted with local information on how unwashed hands, unclean mouths and shared clothing transmit pathogens. Perceived benefits were framed as fewer sick days and social acceptability. Barriers, erratic water, soap cost and menstrual embarrassment, were named and problem-solved. Cues included posters, peer demonstrations and take-home cards. Self-efficacy was built through guided practice of the WHO handwash, toothbrushing and pad-change routines.

Three hypotheses were tested at $\alpha = .05$. After adjustment for the matching pretest, students who received the programme would obtain significantly higher posttest knowledge, attitude and composite practice scores than controls, with at least a medium partial eta-squared. Rejection with large effects would support scaling a six-week module while still treating WASH hardware as a complementary investment.

Across these studies, education raises knowledge reliably. Practice follows more unevenly where soap and water are scarce, and theory-specified rehearsal outperforms didactic talks. The present study tested those regularities in Eha-Amufu with a justified sample, construct-level reliability and fully reported effect sizes.

2. Methods

A quasi-experimental pretest–posttest control-group design assigned intact schools to conditions to avoid classroom contamination. Two schools received the six-week Eha-Amufu Personal Hygiene Education Programme. Two matched schools served as a wait-list control and received the package after posttesting. Private schools were excluded to hold ownership type constant, given public–private WASH disparities reported in Nigerian school audits.

Participating public schools included Union Secondary School, Community Secondary School Umuhu, Community Secondary School Mgbuji, Aguamede Community Secondary School and Eha-Ohuala Community Secondary School among the eight schools serving the town. Students who had received a structured hygiene workshop in the previous academic year were excluded. Of the 280 recruited students, 12 were absent at posttest, five submitted unusable questionnaires with more than 20% item nonresponse, and three withdrew consent.

The population comprised 2,186 junior and senior secondary students on the 2024/2025 registers of eight public secondary schools serving Eha-Amufu. Individual-level G*Power calculation for ANCOVA ($f = 0.25$, $\alpha = .05$,

power = .80) required 128. That figure matches Cohen's tabled $n = 64$ per group for a two-sample t test of $d = 0.50$ at the same alpha and power. A design effect of 1.80 (planned cluster size 41, $ICC = .02$) raised the requirement to 230, and a 15% attrition allowance set recruitment at 280 (140 per arm). This sequence is more conservative than an unadjusted two-group calculation and was chosen because school-level assignment can inflate Type I error if clustering is ignored. Four schools with comparable enrolment, mixed sex and similar WASH profiles were selected; 70 students were drawn from each school by stratified random sampling within junior and senior bands. Retention was 92.9% ($n = 260$). Differential attrition by arm was not significant, $\chi^2(1, N = 280) = 0.41, p = .522$.

The 50-item instrument was developed from WHO hygiene indicators, the Sokoto observer domains and the Bayelsa knowledge subscales. Section A recorded sex, age in completed years, class level, household water source and whether soap was usually available at home. Section B contained 18 knowledge items covering transmission routes, critical handwashing times, fluoride toothpaste, safe menstrual disposal and the local misconception that water alone removes pathogens. Section C contained 12 attitude items written to tap perceived severity, benefits and barriers. Section D contained 20 practice items across hand hygiene (six items), oral hygiene (five items) and body-and-clothing hygiene (nine items, including two menstrual items completed by girls only). Negatively worded items were reverse-coded. Content validity was established by three health-education lecturers and one school-health nurse.

Two trained external educators delivered two 45-minute sessions each week for six school weeks in the second term of 2024/2025. Control schools continued ordinary health-and-physical-education periods.

Table A. Weekly content of the Eha-Amufu Personal Hygiene Education Programme

Week	Focus	Health Belief Model target	Activity
1	Germ theory	Susceptibility and severity	Age-appropriate infection stories
2	Handwashing	Barriers, cues, self-efficacy	WHO 11-step wash at a station
3	Oral hygiene	Benefits and self-efficacy	Brushing rehearsal
4	Body and clothing	Barriers and cues	Bathing, nails, uniforms
5	Menstrual hygiene	Barriers and norms	Sex-segregated practice
6	Integration	Cues and barrier plans	Posters and take-home cards

Note. Mean session fidelity on a 12-item checklist was 93%.

The 50-item Personal Hygiene Knowledge, Attitude and Practice Scale covered knowledge (0–18), attitude (12–60) and practice (20–80) across hand, oral, and body-clothing subscales. Content validity index was .92. Pilot coefficients in Community Secondary School Neke were knowledge $\alpha = .81$, attitude $\alpha = .84$, hand hygiene $\alpha = .79$, oral hygiene $\alpha = .76$, body and clothing $\alpha = .82$, composite practice $\alpha = .87$. Two-week test-retest of composite practice was $r = .78$. Ethics approval was UNN/FE/REC/2024/118. Parents provided written consent and students provided assent. ANCOVA tested the three hypotheses.

3. Results

Groups were equivalent at baseline on pretest outcomes, sex, age, class and home soap availability. Control-arm drift was minimal (knowledge gain 0.48, practice gain 1.07), so posttest gaps reflect intervention rise rather than control decline.

Table 1. ANCOVA of posttest outcomes adjusted for corresponding pretest scores

Outcome	Adj. M I	Adj. M C	F(1, 257)	η^2p	d	Decision
Knowledge	16.91	11.81	198.42	.436	1.93	Reject H0
Attitude	47.54	36.79	214.56	.455	1.94	Reject H0
Composite practice	63.61	50.01	176.33	.407	1.80	Reject H0

Note. I = intervention (n = 132); C = control (n = 128). All $p < .001$. Homogeneity of regression slopes held (interaction $p = .41, .58$ and $.36$). Pretest covariates were significant in every model.

Table 2. ANCOVA of personal hygiene practice subscales

Subscale	Post I M (SD)	Post C M (SD)	F	η^2p	d
Hand hygiene (6–24)	19.08 (2.41)	14.67 (3.02)	142.18	.356	1.61
Oral hygiene (5–20)	16.02 (2.18)	12.50 (2.84)	98.64	.277	1.36
Body and clothing (9–36)	28.38 (3.52)	22.97 (3.71)	121.07	.320	1.49

Note. All $p < .001$. Intervention subscale gains (4.87, 3.94 and 6.05) sum to the composite gain.

Table 3. Intervention-arm posttest composite practice by sex and class band

Contrast	n	M (SD)	p
Female	70	64.21 (6.48)	.189
Male	62	62.66 (6.94)	
Senior secondary	76	64.37 (6.41)	.077
Junior secondary	56	62.27 (6.97)	

Note. Analyses restricted to the intervention arm (n = 132). Group $\times$ sex and Group $\times$ class interactions were not significant.

All three primary hypotheses were supported. Hand hygiene moved most in standardised terms, followed by body and clothing hygiene and oral hygiene. The education effect was statistically homogeneous across sex and class band.

4. Discussion

Adjusted knowledge differed by 5.10 points on an 18-point scale, adjusted attitude by 10.75 points, and adjusted composite practice by 13.60 points. These magnitudes sit at the upper end of the Nigerian school-hygiene literature but are consistent with dense, rehearsal-rich packages delivered to students whose baselines sat near scale midpoints (Abiola et al., 2015; Akinwale et al., 2024). Large d values are easier to obtain when control-arm drift is minimal, as it was here.

The Health Belief Model account is straightforward. Baseline knowledge near 11 of 18 items implies that many students could not yet map everyday behaviours onto infection risk. Attitude items that captured benefits and barriers moved because Weeks 2 to 6 named water scarcity, soap cost and menstrual embarrassment and rehearsed work-arounds. Practice items moved because self-efficacy was trained rather than merely preached



(Bandura, 1997; Agbede & Ekeanyanwu, 2021). The nonsignificant interactions suggest that the package did not privilege girls or senior students.

Education cannot substitute for boreholes, gender-separated toilets and a reliable soap budget. Nnaji et al. (2023) found that only 40% of government schools in their Enugu sample always provided a handwash facility and only 20% always provided soap. Temporary wash stations used for practicum weeks were not a permanent upgrade. The large practice effect shows that students will use hygiene skills when a cue and a minimum facility are present. The productive unit of investment is the lesson plus the hardware (WHO/UNICEF, 2024).

Relative to Ibadan and Anambra samples that began with higher knowledge, Eha-Amufu students began lower and had more headroom. Hand hygiene, the domain most dependent on in-school soap and water, still produced the largest standardised gain once a station was provided. That pattern fits JMP evidence that hygiene coverage lags water and sanitation and that Nigeria remains one of three countries hosting nearly one third of children without basic school water (WHO/UNICEF, 2024). Larger effects on proximal hygiene practices than on distal outcomes such as tobacco intention are theoretically expected.

Assignment used only two schools per arm, so residual school-level confounding cannot be ruled out even though pretest outcomes, sex, age, class and home soap availability were balanced. A larger cluster randomised trial with eight or more schools would allow mixed-effects estimation of the school-level intercept and a direct ICC. Self-reported practice is vulnerable to social-desirability bias, especially after an education package that makes the socially approved answers obvious. The study did not repeat an observer checklist at scale. The posttest was taken the week after the last lesson, so durability beyond the immediate term is unknown. Temporary wash stations may have inflated the hand-hygiene effect relative to what would be observed with only the schools' existing facilities. The sample excluded private-school students and out-of-school adolescents, including children displaced by farmer and herder violence. Health Belief Model constructs guided lesson design but were not measured as mediators, so the pathway claim remains theoretically motivated rather than statistically tested.

Implementation can start with the four study schools and expand across the remaining public secondary schools in the town once facilitators from the Federal College of Education have been trained. A simple fidelity checklist, already used in this study at 93% mean adherence, can serve as the supervision tool for education officers during the first two implementation cycles. Back-to-school packages in displaced Eha-Amufu settlements should restore wash stations and hygiene lessons together.

5. Conclusion and recommendations

A six-week Health Belief Model programme produced large, internally consistent improvements in personal hygiene knowledge, attitude and practice among public secondary students in Eha-Amufu. Gains appeared on

hand, oral, and body-clothing subscales and were not moderated by sex or class. In schools with a learner-toilet ratio far worse than the state average, theory-specified pedagogy still moved infection-preventing behaviours.

First, the Enugu State Ministry of Education should embed a six-week skill-based hygiene module in the secondary scheme rather than relying on assembly talks. Second, Isi-Uzo school-based management committees should pair that module with one functional handwash point with soap per classroom block, cleanable gender-separated toilets and a menstrual-hygiene kit cupboard. Third, soap, sanitary pads and borehole maintenance should be recurrent budget lines rather than donations. Fourth, pre-service programmes at the Federal College of Education, Eha-Amufu, should teach Health Belief Model lesson design so posted teachers can deliver the package without external facilitators. Fifth, future evaluations should add an observer checklist, a six-month follow-up and a mediation test of the six model constructs. Implementation can start with the four study schools and expand once education officers have used the existing 93% fidelity checklist for two supervision cycles.

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