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Improving Prostate Cancer Screening Knowledge, Attitudes, and Uptake among Male College Students through a Structured, Theory-Driven Disease Education Intervention

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ABSTRACT

Background: Prostate cancer is the leading male cancer in Nigeria, responsible for an estimated 5,098 deaths annually, yet screening uptake remains critically low, particularly among young men. Structured disease education is a promising but underexplored strategy to close this gap in sub-Saharan Africa.

Purpose of the Study: This study evaluated the effects of a theory-grounded, eight-week disease education intervention on prostate cancer screening knowledge, attitudes, and uptake among male College of Education students in Oyo State, Nigeria.

Methods: A quasi-experimental, pretest–posttest control group design with a 2×2×2 factorial matrix was employed. Two hundred male students were recruited from government-owned Colleges of Education using a multi-stage sampling technique. Participants were randomly assigned to an experimental group (prostate cancer education, eight weekly 2-hour sessions) or a control group (personal hygiene education). Instruments included the self-developed Knowledge of Prostate Cancer Screening Questionnaire (KPCSQ; $\alpha = 0.78$), Attitude Towards Prostate Cancer Screening Questionnaire (APCSQ; $\alpha = 0.81$), Uptake of Prostate Cancer Screening Questionnaire (UPCSQ; $\alpha = 0.77$), and the standardised Multidimensional Health Locus of Control scale. Data were analysed using Multivariate Analysis of Covariance (MANCOVA) at the 0.05 significance level.

Results: The prostate cancer education programme significantly improved participants' knowledge, attitudes, and uptake of prostate cancer screening compared with the control group, with large effect sizes (partial η^2 ranging from 0.30 to 0.65). Religion had no significant main effect on any outcome. Locus of control showed a significant main effect on uptake only, with participants of external locus of control demonstrating higher uptake. None of the interaction effects were statistically significant.

Keywords
Prostate Cancer; Disease Education; Screening Uptake; Locus of Control; Nigeria; Health Belief Model

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Introduction

Each year, prostate cancer (PCa) claims an estimated 5,098 lives in Nigeria alone, yet many cases are diagnosed only when the disease has reached an advanced, often incurable, stage (World Health Organization, 2005). Globally, PCa ranks as the second most diagnosed male cancer and the fifth most lethal cancer overall (Ferlay et al., 2011). Among men of African descent, the burden is disproportionately severe: Nigeria leads nine African countries in PCa incidence, recording approximately 6,236 new cases annually (World Health Organization, 2005). Nigerian men are reported to be ten times more likely to develop PCa and 3.5 times more likely to die from it than their African American counterparts (Abdulkareem, 2009). This excess mortality is not inevitable; it is substantially attributable to late-stage presentation driven by limited knowledge, a weak screening culture, and inadequate health infrastructure (Ajape et al., 2010).

Despite a growing global evidence base, knowledge of PCa and its principal screening modalities prostate-specific antigen (PSA) testing and digital rectal examination (DRE) remains alarmingly low in Nigeria. Fewer than 40% of Nigerian men can correctly identify PCa symptoms, and only a small fraction has ever undergone PSA testing (Oladimeji et al., 2010; Nnodimele, 2010). This knowledge deficit is especially consequential among younger men: health behaviours established in early adulthood tend to persist across the life course (Kalesanwo, 2004), making young men a strategically critical, yet chronically under-served, target group for preventive intervention.

Prostate cancer screening behaviour is shaped by a constellation of psychosocial factors. The Health Belief Model (HBM) (Champion & Skinner, 2008) the primary theoretical framework of this study posits that perceived susceptibility, severity, benefits, barriers, cues to action, and self-efficacy jointly determine whether an individual engages in a recommended preventive behaviour. Disease education functions as a potent external cue to action: it raises perceived susceptibility and benefits while dismantling perceived barriers. Complementing the HBM, Bloom's Taxonomy (Bloom et al., 1956) provided the pedagogical architecture for the intervention, sequencing content from cognitive knowledge acquisition through attitudinal (affective) change to behavioural uptake (psychomotor domain). Bandura's Social Cognitive Theory (Bandura, 1977) further informed programme design: peer discussion and modelling by trained research assistants created opportunities for vicarious learning that strengthen self-efficacy a necessary precondition for translating knowledge into action. Two contextual moderators were also examined. Locus of control (LOC), operationalised using the Multidimensional Health Locus of Control (MHLC) scale (Wallston et al., 1978), distinguishes individuals who attribute health outcomes to personal agency (internal LOC) from those who attribute them to external forces; the latter may be especially responsive to institutional health education. Religion a well-documented moderator of cancer screening behaviour across sub-Saharan Africa (Holt et al., 2003) was examined because faith-based beliefs can both facilitate and impede health-seeking in the Nigerian context.

College of Education students constitute a strategically important target population. As future educators, they are custodians of community knowledge and are positioned to disseminate health information to broader populations. Yet, research specifically targeting this group on PCa in Nigeria is scarce. Existing interventions have largely focused on older men, female secondary school students, or undergraduates in faith-based institutions (Balogun et al., 2025; Ajape et al., 2010).

Against this backdrop, the present study examined the effects of a structured, eight-week, theory-driven disease education intervention on PCa screening knowledge, attitudes, and uptake among male College of Education students in Oyo State, Nigeria, and tested whether religion and locus of control moderated those effects.

Theoretical Framework

The Health Belief Model

The Health Belief Model (HBM), originally developed by Rosenstock (1966) and subsequently elaborated by Becker (1974) and Champion and Skinner (2008), constitutes the primary theoretical anchor of this study. The HBM posits that an individual's likelihood of engaging in a preventive health behaviour is determined by six interacting constructs: (1) perceived susceptibility-the subjective assessment of personal risk of contracting a disease; (2) perceived severity-beliefs about the seriousness of the disease and its consequences; (3) perceived benefits-beliefs about the efficacy of the recommended action in reducing the threat; (4) perceived barriers-the anticipated costs, inconveniences, or negative consequences of taking the action; (5) cues to action-internal (e.g., symptoms) or external (e.g., educational messages, media) stimuli that trigger health-protective behaviour; and (6) self-efficacy-the individual's confidence in their ability to perform the recommended behaviour successfully.

In the context of prostate cancer screening, young Nigerian men present a profile characterised by low perceived susceptibility, high perceived barriers (fear, stigma, cost, lack of access), and negligible cues to action due to limited exposure to prostate cancer health education. Disease education directly targets these HBM constructs: by providing accurate epidemiological information, the intervention raises perceived susceptibility; by detailing consequences of late-stage disease, it amplifies perceived severity; by teaching evidence-based screening protocols (PSA, DRE), it enhances perceived benefits; and by directly addressing barriers and misperceptions, it reduces perceived barriers. As an institutional programme facilitated by trained health educators, the intervention itself constitutes a potent external cue to action.

Social Cognitive Theory and Self-Efficacy

Bandura's Social Cognitive Theory (SCT) (Bandura, 1977) complements the HBM by foregrounding the role of self-efficacy and observational learning in health behaviour change. SCT argues that behaviour change results from a dynamic, reciprocal interaction between personal cognitive factors, behaviour, and environmental influences-termed reciprocal determinism. The structured PCE programme drew on SCT by incorporating group discussions, question-and-answer sessions, and facilitated modelling by trained research assistants, creating opportunities for vicarious learning and mastery experiences that strengthen participants' self-efficacy regarding screening. The social norm dimension of SCT further suggests that peers expressed intentions to undergo screening serve as social modelling that reinforces individual behavioural intentions, a mechanism particularly potent in the collectivist cultural context of Nigerian universities.

Bloom's Taxonomy of Educational Objectives

Bloom's Taxonomy (Bloom et al., 1956), specifically its three domains: cognitive, affective, and psychomotor provided the pedagogical architecture for the intervention. The cognitive domain corresponds to knowledge of prostate cancer screening modalities, risk factors, and protocols (measured by KPCSQ). The affective domain corresponds to participants' attitudes toward PCa screening (APCSQ). The psychomotor domain, operationalised in a health education context as behavioural intention and actual uptake of a health action, corresponds to screening uptake (UPCSQ). Bloom's Taxonomy predicts a hierarchical learning progression: cognitive change precedes and facilitates affective change, which in turn is a precondition for behavioural change.

Multidimensional Health Locus of Control and the Role of Religion

Wallston, Wallston, and DeVellis's (1978) Multidimensional Health Locus of Control (MHLC) framework extends Rotter's (1966) general locus of control construct into the domain of health behaviour. The MHLC distinguishes three belief orientations: internal LOC (health

outcomes are determined by one's own actions), powerful others LOC (health outcomes are controlled by significant others, including healthcare providers), and chance LOC (health outcomes are a matter of fate, luck, or divine will). This tripartite structure is theoretically important because Nigerian cultural and religious contexts may predispose many participants toward a chance or powerful-others orientation. Religion operates as a contextual moderator within both the HBM and MHLC frameworks: faith-based health beliefs may intersect with perceived susceptibility and perceived barriers, while religiously affiliated institutions can also serve as powerful platforms for health-promoting cues to action (Holt et al., 2003).

Method

Study Design

A quasi-experimental, pretest–posttest control group design with a 2 (treatment vs. control) × 2 (Christianity vs. Islam) × 2 (internal vs. external locus of control) factorial matrix was employed. The design allowed attribution of post-intervention differences to the educational intervention while controlling for pre-existing differences between groups. The study was conducted in government-owned Colleges of Education in Oyo State, Nigeria, during the 2020–2021 academic year. The stages of intervention from recruitment to post-test data collection are illustrated in Figure 1.

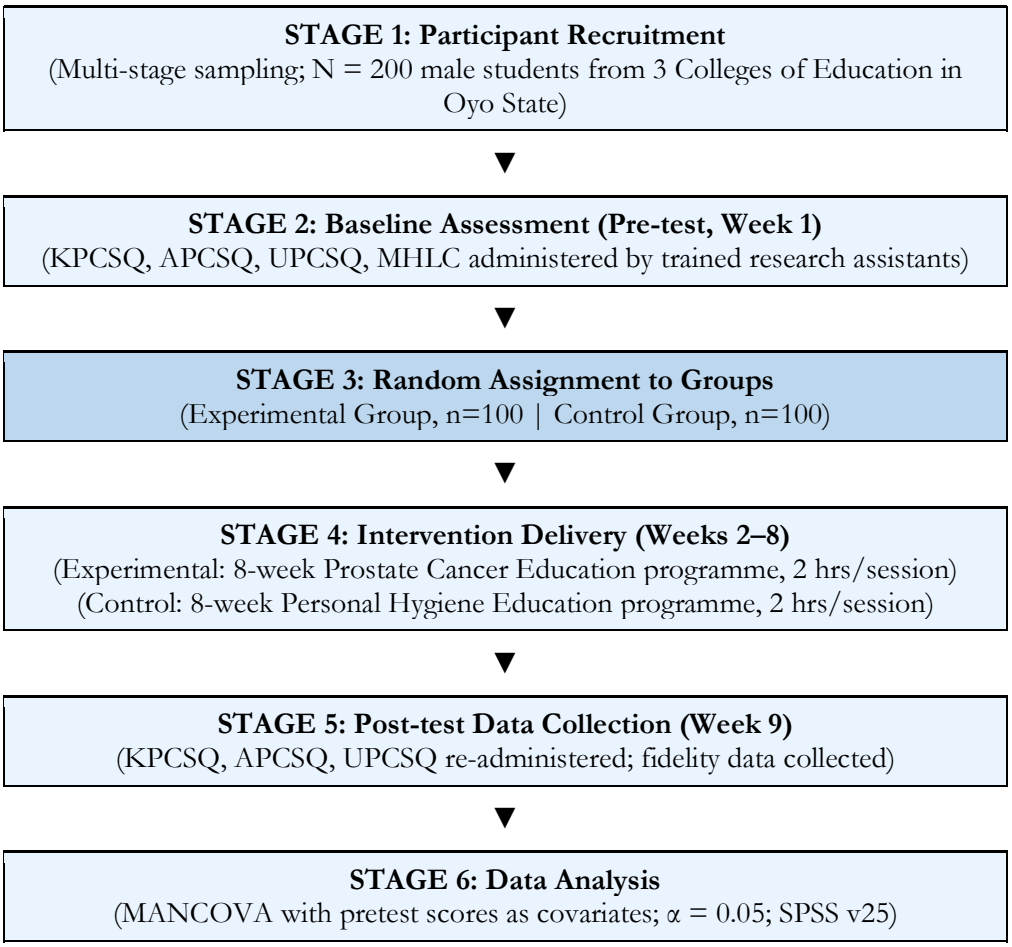

Figure 1. Method Flowchart: Stages of Intervention from Participant Recruitment to Post-test Data Collection. Note: COVID-19 disruptions were managed through schedule flexibility and make-up sessions where required. Participants who missed sessions were tracked.

Sample and Sampling

A total of 200 male students were recruited using a multi-stage sampling procedure. In Stage 1, purposive sampling was used to select three government-owned Colleges of Education: Federal College of Education (Special), Oyo; Oyo State College of Education, Lanlate; and Emmanuel Alayande College of Education, Oyo Town. In Stage 2, simple random sampling (fishbowl without replacement) was used to select one state-owned institution. In Stage 3, the selected institutions were randomly assigned to experimental or control conditions. In Stage 4, purposive sampling identified four schools (Science, Education, Arts and Social Sciences, Languages) within each institution. In Stage 5, 25 male volunteers per school were recruited, yielding 100 participants per arm. Inclusion criteria required full-time enrolment and signed informed consent; part-time and external students were excluded.

Intervention

The experimental group received the Prostate Cancer Education (PCE) programme a structured nine-session (eight teaching plus one post-test) intervention delivered once weekly over nine weeks at two hours per session. The programme was grounded in the HBM and covered: an overview of cancer types and causes; prostate anatomy and physiology; epidemiology and aetiology of PCa; risk factors (age, genetics, hormones, diet, environment); signs and symptoms; screening modalities (DRE, PSA, biopsy, imaging); barriers to screening; and the importance of early detection. Sessions combined conventional didactic teaching, group discussion, charts, and posters. Five trained research assistants facilitated the sessions.

The control group received an eight-session Personal Hygiene Education programme of equivalent duration, covering general hygiene practices, hygiene barriers, pathogen contact and disease, and hand-washing procedures. This placebo-equivalent control was used to mitigate attention and contact effects.

Instruments

Four instruments were used:

- Knowledge of Prostate Cancer Screening Questionnaire (KPCSQ): Six items assessing knowledge of PSA testing, DRE, and screening protocols (Yes/No/Don't know; Cronbach's $\alpha = 0.78$).
- Attitude Towards Prostate Cancer Screening Questionnaire (APCSQ): Ten items on a 4-point Likert scale (SA–SD; $\alpha = 0.81$).
- Uptake of Prostate Cancer Screening Questionnaire (UPCSQ): Seven items assessing willingness to be screened (SA–SD; $\alpha = 0.77$).
- Multidimensional Health Locus of Control (MHLC) Scale: An 18-item standardised instrument (Wallston et al., 1978) with three subscales-internality, powerful others, and chance used to classify participants as internal or external LOC ($\alpha = 0.74$).

Content validity was established through expert review by health educators, an oncologist, and a psychometrician. Exploratory factor analysis yielded a Kaiser–Meyer–Olkin value of 0.73, with all retained items loading at ≥ 0.60. The instrument was piloted on 20 students from Kwara State College of Education, Ilorin (not part of the study sample).

Data Collection Procedure

Following institutional ethical clearance and written informed consent from all participants, the researcher administered the pretest instruments in Week 1 (Session 1). The intervention was delivered across Weeks 2–8. Post-test instruments were administered in Week 9 (Session 9). Data collection occurred within participants' campus settings. All instruments were administered and collected by trained research assistants.

Ethical Considerations

The study adhered to the Declaration of Helsinki. Participation was voluntary; participants were free to withdraw at any point without penalty. Confidentiality was maintained throughout. Approval was obtained from the relevant institutional authority.

Statistical Analysis

Demographic data and research questions were analysed using descriptive statistics (frequency counts, percentages). All seven hypotheses (each with three sub-variables: knowledge, attitudes, uptake) were tested using Multivariate Analysis of Covariance (MANCOVA), with pretest scores as covariates, at the $\alpha = 0.05$ significance level. Adjusted marginal means were computed to indicate the direction of significant differences. Statistical analyses were performed using SPSS version 25.

Result

Sociodemographic Characteristics

Of the 200 male participants, most were in their second year of study (200 level: 59.0%). The majority (81.0%) were aged 21–25 years. Most participants (67.0%) identified as Christians, while 33.0% identified as Muslims. Table 1 presents the full sociodemographic profile.

Table 1: Sociodemographic Characteristics of Participants (N = 200)

Variable	Frequency (n)	Percentage (%)
Level of Study		
100 Level	32	16.0
200 Level	118	59.0
300 Level	50	25.0
Age Group (years)		
15–20	30	15.0
21–25	162	81.0
26–30	8	4.0
Religion		
Christianity	134	67.0
Islam	66	33.0

Baseline Knowledge and Attitudes

At baseline, participant knowledge of PCa screening was very low. Only 2.5% agreed that PSA is a key screening test; 1.0% correctly identified both DRE and PSA as screening methods. A weighted mean score of 1.61 (criterion value: 2.0) confirmed low pre-intervention knowledge. Baseline attitudes were predominantly negative. Over 80% strongly agreed that there was no value in attending PCa screening, and nearly 70% agreed that PCa was a punishment for sin, making screening unnecessary. The weighted mean attitude score of 1.40 (criterion value: 2.50) reflected a pervasively negative pre-intervention disposition.

Assistance Process Data

Implementation fidelity data were collected across all eight intervention sessions. Overall session attendance for the experimental group was high, with an average attendance rate of approximately 93% per session. Of the 100 participants assigned to the experimental group, 87 completed all eight sessions (87% completion rate). The 13 participants who missed one or more sessions were predominantly affected by academic examination schedules and COVID-19-related institutional disruptions, which resulted in two sessions being rescheduled during the intervention period. All rescheduled sessions were conducted within the same academic week to minimise content gaps. Facilitator adherence to the session protocol was monitored by the lead researcher using a session checklist; all five trained research assistants adhered to the standardised session outlines across all eight modules. No participants formally withdrew from the study, and all 200 participants (experimental and control groups) provided post-test data.

Hypothesis Testing

Hypothesis 1: Effect of Disease Education on Knowledge, Attitudes, and Uptake

MANCOVA revealed a significant main effect of the disease education intervention across all three outcomes: knowledge ($F(1,192) = 83.52$, $p < 0.001$, $\eta^2 = 0.30$), attitudes ($F(1,192) = 359.12$, $p < 0.001$, $\eta^2 = 0.65$), and uptake ($F(1,192) = 139.20$, $p < 0.001$, $\eta^2 = 0.42$). Hypothesis 1 was rejected for all three sub-variables. Adjusted mean scores confirmed that participants in the experimental group substantially outperformed those in the control group across all outcomes (Table 2). The intervention achieved its primary objective: the experimental group demonstrated a 64% higher knowledge score (M = 15.70 vs. M = 9.58), a 101% higher attitude score (M = 35.03 vs. M = 17.41), and an 85% higher uptake score (M = 22.18 vs. M = 12.00) compared to the control group.

Table 2: Adjusted Marginal Means by Treatment Group for All Outcomes

Outcome	Experimental Group (M)	Control Group (M)	F (1,192)
Knowledge	15.70	9.58	83.52***
Attitudes	35.03	17.41	359.12***
Uptake	22.18	12.00	139.20***

*Note: ***$p < 0.001$. η^2 values: knowledge = 0.30; attitudes = 0.65; uptake = 0.42.*

Hypothesis 2: Effect of Religion on Knowledge, Attitudes, and Uptake

No significant main effect of religion was found for knowledge ($F(1,192) = 0.11$, $p = 0.985$, $\eta^2 < 0.01$), attitudes ($F(1,192) = 0.36$, $p = 0.547$, $\eta^2 = 0.002$), or uptake ($F(1,192) = 0.03$, $p = 0.855$, $\eta^2 = 0.003$). Hypothesis 2 was accepted for all three sub-variables. Adjusted means showed marginal differences: Christian participants scored slightly higher on knowledge (M = 12.65 vs. 12.64) and uptake (M = 17.01 vs. 17.17), while Muslim participants scored slightly higher on attitudes (M = 26.50 vs. 25.94). These differences were not statistically meaningful.

Hypothesis 3: Effect of Locus of Control on Knowledge, Attitudes, and Uptake

Locus of control did not significantly affect knowledge ($F(1,192) = 0.46$, $p = 0.497$, $\eta^2 = 0.002$) or attitudes ($F(1,192) = 0.19$, $p = 0.667$, $\eta^2 = 0.001$). However, a significant main effect of locus of

control was found for uptake ($F(1,192) = 3.62$, $p = 0.048$, $\eta^2 = 0.019$), with participants with external LOC demonstrating higher uptake ($M = 17.91$) than those with internal LOC ($M = 16.27$). Hypotheses 3a and 3b were accepted; Hypothesis 3c was rejected.

Hypotheses 4–7: Interaction Effects

None of the two-way interaction effects (treatment × religion, treatment × locus of control, religion × locus of control) nor the three-way interaction (treatment × religion × locus of control) were statistically significant for any of the three outcome variables (all $p > 0.05$). These hypotheses were therefore accepted. Adjusted marginal mean comparisons indicated that within the experimental group, participants with external LOC consistently achieved the highest mean scores on knowledge and uptake, while Muslim participants with internal LOC achieved the highest mean scores on attitudes.

Discussion

This study provides robust evidence that a structured, theory-driven disease education intervention can produce large, significant improvements in prostate cancer screening knowledge, attitudes, and uptake among young Nigerian men. The intervention achieved its objective of improving prostate cancer screening outcomes: the experimental group demonstrated a 64% higher knowledge score, a 101% higher attitude score, and an 85% higher uptake score compared to the control group. The intervention accounted for 30%, 65%, and 42% of variance in knowledge, attitudes, and uptake, respectively effect sizes that are substantial by any standard. These findings confirm that structured, theory-driven education functions as a powerful cue to action within the Health Belief Model framework, simultaneously raising perceived susceptibility and severity, enhancing perceived benefits, and reducing perceived barriers. Viewed through the lens of Bloom's Taxonomy, the pattern of effect sizes is theoretically coherent: the largest gain occurred in the affective domain (attitudes: $\eta^2 = 0.65$), followed by the psychomotor domain (uptake: $\eta^2 = 0.42$), and then the cognitive domain (knowledge: $\eta^2 = 0.30$), precisely the hierarchical progression Bloom's framework predicts.

These findings align with a growing body of research demonstrating the effectiveness of educational interventions in improving cancer screening behaviours. Wilkinson (2003) demonstrated that a single educational seminar improved PCa awareness among African American men; the present eight-week structured programme extended this effect across multiple outcomes. Prior work by Mohamed, Lamadah, and Hafez (2015) in Egypt, and Interis et al. (2016) in Jamaica similarly documented significant attitudinal improvements following comparable educational approaches, corroborating the cross-cultural relevance of this strategy. The particularly large effect on attitudes ($\eta^2 = 0.65$) suggests that sustained, contextually tailored education is especially powerful in shifting deeply embedded negative dispositions toward cancer screening in Nigerian populations.

The absence of a significant main effect of religion on any outcome is partially contrary to prior literature. Studies by Holt et al. (2003) and Blocker et al. (2006) reported that religious involvement was associated with cancer screening behaviours among African American men. However, the present findings are consistent with those of Iweriebor (2015) and Omuemu et al. (2013), who found that religion did not significantly influence screening-related outcomes among Nigerian students. A plausible explanation is that the intervention itself served as a sufficiently powerful equalising force, overriding pre-existing faith-based differences in health beliefs.

The significant main effect of locus of control on uptake alone but not on knowledge or attitudes is theoretically consistent with the conceptualisation of uptake as a psychomotor-domain

behaviour, more directly governed by perceived control. The finding that external LOC predicted higher uptake contrasts with the general expectation that internal LOC promotes health-promoting behaviour (Wallston et al., 1978). This pattern may reflect greater responsiveness to institutional cues among externally oriented participants, consistent with Grady's (1981) observation that individuals valuing powerful others are more likely to participate in health education programmes. Future studies should disaggregate MHLC subscales to test whether the powerful others versus chance subscales differentially predict uptake in Nigerian samples. The absence of significant interaction effects suggests that the programme was equally effective across religious affiliations and LOC orientations-strengthening its broad public health utility.

Researcher-Designed Nature of the Intervention and Community Participation

An important contextual consideration is that this intervention was conceived, designed, and implemented entirely by the researcher without systematic community or participant involvement in the planning process. While the programme's content was grounded in established theoretical frameworks and validated through expert review, community members including students, religious leaders, or local health workers were not engaged as co-designers of the curriculum, delivery modality, or evaluation approach. This is a recognised limitation of researcher-initiated health education programmes, which may not fully capture community-defined priorities, culturally nuanced barrier structures, or locally preferred modes of engagement. The journal's emphasis on community service and participatory approaches (pengabdian) underscores the importance of this issue.

Future community-based interventions in this area could meaningfully incorporate participatory elements, such as community advisory panels, participatory action research approaches, or co-design workshops with student representatives, community health workers, and religious leaders. Engaging beneficiary communities in identifying health priorities, adapting intervention content to local cultural contexts, and selecting delivery formats would not only strengthen ecological validity but also enhance community ownership and long-term sustainability of the programme. Such participatory approaches would align more closely with the (pengabdian) philosophy of community-centred service, in which knowledge and health-promoting practices are developed in genuine partnership with the communities they are intended to serve.

Limitations

Several limitations warrant acknowledgement. First, attrition due to academic demands and COVID-19 disruptions may have introduced selection bias; however, the researcher implemented measures to maximise retention, including schedule flexibility and make-up sessions. Second, this was a researcher-designed intervention without community participation in the planning phase; all content, delivery modality, and evaluation procedures were determined by the researcher, which may limit the ecological validity and cultural responsiveness of the programme. Third, the quasi-experimental design does not allow complete elimination of confounders, and the residential campus design may have limited control over extraneous variables such as internet access and media exposure related to prostate cancer. Fourth, the short follow-up period precludes conclusions about the durability of behavioural change post-intervention. Fifth, the study was confined to male college students in Oyo State, limiting generalisability to other Nigerian populations or age groups.

Conclusion

This quasi-experimental study demonstrates that a structured, eight-week, HBM-grounded disease education programme produces large and significant improvements in prostate cancer screening knowledge, attitudes, and uptake among male College of Education students in Oyo State, Nigeria. The programme was equally effective across religious affiliations and locus of control orientations, supporting its broad applicability. Locus of control independently predicted screening uptake, an important nuance for future intervention design in collectivist, institutionally embedded contexts. The researcher-designed nature of this intervention, while yielding a rigorous and theoretically coherent programme, also highlights the opportunity for future work to incorporate participatory design principles that engage community members as active partners in health education planning and delivery.

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Conflicts of Interest

The author asserts that no financial or business connections are apparent that could be perceived as a potential conflict of interest.

Ethical Approval and Consent

The study was conducted in accordance with the Declaration of Helsinki. Informed written consent was obtained from all participants prior to enrolment. Participation was voluntary

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