

Reproductive health education and cohabitation-related behaviours among female undergraduate students: A quasi-experimental study in North-West Nigeria

Pendidikan kesehatan reproduksi dan perilaku terkait hidup bersama di kalangan mahasiswa sarjana: Studi kuasi-eksperimental di Nigeria Barat Laut

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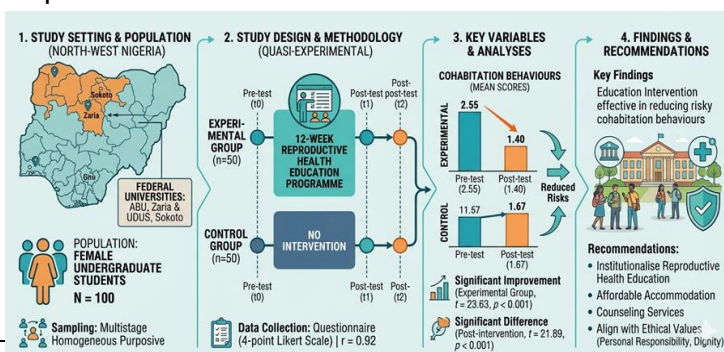
Abstract

Cohabitation among female undergraduates in Nigerian universities poses significant reproductive health risks, yet evidence on structured, sustained educational interventions targeting cohabitation behaviours in North-West Nigerian federal universities remains limited. This study examined the effect of a twelve-week reproductive health education intervention on cohabitation behaviours among female undergraduate students in federal universities in the North-West Zone, Nigeria. A quasi-experimental of pre-test/post-test design with experimental and control groups was used. One hundred (100) female undergraduate students were recruited from two federal universities: Ahmadu Bello University, Zaria (experimental group, $n = 50$) and Usmanu Danfodiyo University, Sokoto (control group, $n = 50$), selected through multistage homogeneous purposive sampling. Data were collected using a researcher-developed questionnaire rated on a four-point Likert scale with excellent internal consistency ($r = 0.92$). The experimental group received a twelve-week reproductive health education programme, while the control group received no intervention. Paired and independent samples t -tests were applied at a 0.05 significance level. Findings indicated a significant improvement in the experimental group's cohabitation behaviours (pre-test mean = 2.55, post-test mean = 1.40; $t(49) = 23.63$, $p < 0.001$, Cohen's $d = 3.34$, 95% CI [2.63, 4.05]), and a significant post-intervention difference between the experimental (mean = 1.40) and control groups (mean = 1.67; $t(98) = 21.89$, $p < 0.001$, Cohen's $d = 4.38$, 95% CI [3.65, 5.11]) after intervention. These findings support institutionalising practice-oriented reproductive health education, counselling, and structural support within universities to strengthen safer behaviours, family health preparedness, responsible decision-making, and culturally appropriate health promotion

Abstrak

Kohabitasi di kalangan mahasiswa di universitas-universitas Nigeria menimbulkan risiko kesehatan reproduksi yang signifikan, namun bukti mengenai intervensi edukasi yang terstruktur dan berkelanjutan untuk menargetkan perilaku kohabitasi di universitas federal di wilayah Barat Laut Nigeria masih terbatas. Penelitian ini bertujuan mengkaji pengaruh intervensi pendidikan kesehatan reproduksi selama dua belas minggu terhadap perilaku kohabitasi pada mahasiswa di universitas federal di Zona Barat Laut, Nigeria. Penelitian menggunakan desain kuasi-eksperimental pre-test/post-test dengan kelompok eksperimen dan kontrol. Sebanyak 100 mahasiswa direkrut dari dua universitas federal, yaitu Ahmadu Bello University, Zaria sebagai kelompok eksperimen ($n = 50$) dan Usmanu Danfodiyo University, Sokoto sebagai kelompok kontrol ($n = 50$), melalui teknik multistage homogeneous purposive sampling. Data dikumpulkan menggunakan kuesioner yang dikembangkan oleh peneliti dengan skala Likert empat poin dan konsistensi internal yang sangat baik ($r = 0,92$). Kelompok eksperimen menerima program pendidikan kesehatan reproduksi selama dua belas minggu, sedangkan kelompok kontrol tidak menerima intervensi. Uji t berpasangan dan uji t sampel independen digunakan pada tingkat signifikansi 0,05. Hasil menunjukkan perbaikan signifikan pada perilaku kohabitasi kelompok eksperimen, dari rerata pre-test 2,55 menjadi 1,40 pada post-test; $t(49) = 23,63$, $p < 0,001$, Cohen's $d = 3,34$, IK 95% [2,63–4,05]. Perbedaan pascaintervensi antara kelompok eksperimen (rerata = 1,40) dan kelompok kontrol (rerata = 1,67) juga signifikan; $t(98) = 21,89$, $p < 0,001$, Cohen's $d = 4,38$, IK 95% [3,65–5,11]. Temuan ini mendukung pelemagaan pendidikan kesehatan reproduksi yang berorientasi praktik, layanan konseling, dan dukungan struktural di universitas untuk memperkuat perilaku yang lebih aman, kesiapan kehidupan berkeluarga, pengambilan keputusan yang bertanggung jawab, serta promosi kesehatan yang sesuai dengan konteks budaya.

Graphical Abstract



Keyword

female; nigeria; reproductive health; students; universities

Artikel History

Submitted : 24 March 2026

In Reviewed : 12 April 2026

Accepted : 27 August 2026

Published : 31 August 2026

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INTRODUCTION

Cohabitation, defined as an unmarried couple living together in a shared domestic arrangement, has become increasingly visible among undergraduate students in Nigerian universities and is associated with important reproductive, psychosocial, and academic consequences (Oladejo & Oseni, 2024). Although cohabitation may provide perceived benefits such as reduced living costs, companionship, and shared domestic responsibilities, female students may experience disproportionate risks, including sexually transmitted infections (STIs), unintended pregnancy, unsafe abortion, emotional distress, relationship instability, and impaired academic performance (Boyer et al., 2022; Wilkins et al., 2022). These concerns have important public health implications because university students represent a population transitioning into adulthood, intimate partnerships, and future family roles. Addressing cohabitation-related reproductive health risks therefore contributes to Sustainable Development Goal (SDG) 3, particularly the promotion of health and well-being and prevention of avoidable reproductive health morbidity, as well as SDG 5, which emphasizes gender equality and women's access to sexual and reproductive health information and services.

The challenge is particularly relevant in Nigeria's North-West Zone, where students' reproductive health behaviours are shaped by intersecting socioeconomic, institutional, and cultural factors. Limited university accommodation, financial constraints, restricted access to youth-friendly reproductive health services, and cultural sensitivities surrounding premarital sexual relationships may increase students' vulnerability while simultaneously restricting open discussion and timely help-seeking (Biu et al., 2025; Eze et al., 2026). Cohabitation has been reported among substantial proportions of students in Nigerian higher institutions, with a recent study in Ondo State documenting a prevalence of 72.86% among 560 students (Fatuyi et al., 2024). Across Nigerian universities, approximately 25%–50% of students have been estimated to engage in cohabiting arrangements, driven by inadequate accommodation, economic pressures, emotional attachment, and perceived opportunities to assess partner compatibility (Yewande, & Mayowa, 2024). These conditions indicate that cohabitation-related reproductive health risks are not solely individual behavioural concerns but also reflect broader institutional and social determinants of health.

Despite awareness of the reproductive health consequences associated with cohabitation, protective behaviours among female undergraduate students remain inconsistent. Evidence from the North-West Zone suggests that students may recognize risks related to STIs, unintended pregnancy, and unstable intimate relationships but still demonstrate inadequate adherence to preventive practices. Reports of unintended pregnancy, abortion, psychosocial distress, and academic disruption among cohabiting students further indicate a persistent gap between reproductive health knowledge and daily behavioural practice (Biu et al., 2025). General health information and one-time awareness campaigns may therefore be insufficient to achieve sustained behavioural change. A more comprehensive response is the implementation of structured reproductive health education that develops knowledge, risk perception, decision-making skills, self-efficacy, and protective practices within university health promotion systems.

Reproductive health education comprises planned learning experiences designed to improve individuals' knowledge, attitudes, competencies, and decision-making regarding sexual and reproductive health, healthy relationships, and responsible behaviour (Balumbi et al., 2025). Such programmes are particularly relevant in university populations, where behaviour may be influenced by peer norms, financial pressures, relationship expectations, and sociocultural beliefs. Targeted educational interventions can provide students with practical competencies to recognize reproductive risks, negotiate safer relationships, access appropriate health services, and make informed decisions concerning sexual and cohabitation practices (Maguena et al., 2025). International and national approaches to reproductive health promotion similarly emphasize that educational programmes should be structured, culturally appropriate, and competency-based if they are to translate knowledge into sustained behavioural practices (Putri et al., 2025).

The importance of reproductive health education extends beyond immediate sexual and reproductive outcomes to broader family health. Cohabitation may precede or substitute for formal family formation and can influence relationship stability, marital preparedness, economic responsibility, reproductive decision-making, and subsequent parenting experiences (Sassler & Lichter, 2020). Behaviours and interpersonal patterns established during premarital co-residence may therefore have implications for the health and stability

of future families. Evidence from sub-Saharan African and comparable university settings indicates that reproductive health education can improve knowledge of STIs and unintended pregnancy and strengthen protective sexual and relationship behaviours (Biu et al., 2025; Uka et al., 2026). Educational interventions addressing sexual risk have also produced improvements in behavioural outcomes, supporting their potential as practical and scalable strategies for university populations (Maguena et al., 2025). These findings provide a strong rationale for evaluating structured reproductive health education among female undergraduates in Nigeria's North-West Zone.

Nevertheless, much of the available Nigerian literature remains descriptive, focusing primarily on the prevalence, determinants, knowledge, attitudes, and self-reported consequences of cohabitation rather than testing interventions designed to change behaviour (Akorede et al., 2022). Studies documenting favourable attitudes toward cohabitation alongside continuing reports of STIs, unintended pregnancy, abortion, psychosocial difficulties, and academic disruption demonstrate that awareness alone does not necessarily translate into safer practices (Katz et al., 2026; Noah et al., 2025; Quaresma et al., 2026). Moreover, evidence remains limited regarding whether a sustained reproductive health education programme can modify cohabitation-related behaviours among female undergraduate students within federal university settings. This limitation is particularly important in the North-West Zone, where sociocultural norms, housing constraints, and limited reproductive health resources may influence both cohabitation and responsiveness to health education.

Accordingly, a critical research gap is the scarcity of quasi-experimental evidence evaluating structured reproductive health education interventions for cohabitation-related behaviours among female undergraduates in federal universities in North-West Nigeria. The present study addresses this gap through a twelve-week reproductive health education intervention using a pre-test/post-test quasi-experimental design with experimental and control groups. One hundred female undergraduate students were recruited from Ahmadu Bello University, Zaria, and Usmanu Danfodiyo University, Sokoto, providing an opportunity to evaluate behavioural changes associated with a sustained educational programme rather than relying solely on cross-sectional observations. The novelty of this study lies in its intervention-focused assessment of whether structured reproductive health education can produce measurable

improvements in cohabitation-related behaviours within a culturally and institutionally specific university context. Therefore, this study aimed to determine the effect of a twelve-week reproductive health education intervention on cohabitation-related behaviours among female undergraduate students in federal universities in the North-West Zone of Nigeria.

METHODS

Study design

This study adopted a quasi-experimental pre-test/post-test design with experimental and control groups. Quasi-experimental designs involve manipulation of an independent variable without random assignment of participants to conditions, making them suitable for evaluating interventions in real-world educational settings where randomisation at the individual level may be impractical. The design was considered appropriate for determining the effect of a reproductive health education intervention on female undergraduate students' cohabitation behaviours in federal universities in the North-West Zone, Nigeria.

Study setting, period, and population

The study was conducted in federal universities in the North-West Zone, Nigeria. The target population comprised female undergraduate students enrolled in Ahmadu Bello University (ABU), Zaria, and Usmanu Danfodiyo University, Sokoto (UDUS) during the 2022/2023 academic sessions. The combined accessible population was 82,163 female students: ABU ($n = 26,978$ and $n = 24,044$ across sessions) and UDUS ($n = 14,352$ and $n = 16,789$ across sessions), as sourced from the respective universities' Management Information Systems. ABU and UDUS were comparable in terms of student composition and faculty structure; however, ABU had a relatively higher student enrolment and broader faculty representation, while UDUS operated within a more regionally homogeneous socio-cultural environment. These differences were noted and considered during analysis to minimise potential confounding effects.

Sample size and sampling technique

A total sample of 100 participants was recruited: 50 female undergraduate students from ABU (experimental group) and 50 from UDUS (control group). The sample size was informed by the need to ensure adequate representation across both institutions and sufficient statistical power to detect meaningful intervention effects. A multistage

homogeneous purposive sampling procedure was adopted in this study. First, faculties without health-related curricula were identified across both institutions to ensure comparability of participants in terms of prior reproductive health knowledge exposure. Second, students from the Department of Public Administration at each institution were purposively selected based on their willingness to participate and relevance to the study criteria. Third, participants were allocated such that ABU served as the experimental site and UDUS served as the control site, with 50 participants recruited from each institution. Eligible participants were female undergraduate students currently enrolled in the specified departments of the selected federal universities, willing to provide informed consent, and available to complete all stages of assessment: pre-test and post-test. Participants were required to be accessible for the entire duration of the study period.

Instrumentation and validity/reliability

Data were collected using a structured, researcher-developed questionnaire comprising two sections: Section A covered socio-demographic information, including age, marital status, and accommodation type; Section B assessed cohabitation behaviours. The modified four-point Likert rating scale of Strongly Agree (SA) = 4 points, Agree (A) = 3 points, Disagree (D) = 2 points and Strongly Disagree (SD) = 1 point was used for positive cohabitation behaviour and rating scale of Strongly Disagree (SD) = 4 points, Disagree (D) = 3 points, Agree (A) = 2 points and Strongly Agree (SA) = 1 point was used for negative cohabitation behaviour. A mean aggregate score of ≥ 2.50 was adopted as the benchmark for negative or risk-prone cohabitation behaviour, while scores below 2.50 indicated positive cohabitation behaviour.

Face, content, and construct validity were established through expert review by specialists in Public Health, Health Education, Sociology, and Nursing Science at Ahmadu Bello University, Zaria. Their feedback was incorporated to refine the final instrument before data collection. A pilot study was conducted at Bayero University, Kano, using 20 female undergraduate students who shared similar characteristics with the target population but were not part of it. The split-half method was employed to assess reliability, and data were analysed using Spearman-Brown's Prophecy Formula, yielding a reliability index of 0.92, indicating excellent reliability. This interpretation is consistent with reliability

guidance that values above 0.75 are regarded as excellent.

Intervention procedure

A structured reproductive health education intervention manual was developed and used to deliver the training programme. The manual covered: the concept and dimensions of reproductive health; risks and consequences of non-marital cohabitation; STI prevention strategies and correct use of protective measures; decision-making skills for healthy intimate relationships; and core reproductive health behaviours, including STI screening, contraception awareness, and boundary-setting in relationships.

Data collection occurred across three stages: pre-intervention (pre-test), intervention and post-intervention (post-test). An introductory letter obtained from the Head of Department, Human Kinetics and Health Education, Ahmadu Bello University, Zaria, was used to facilitate participant consent during data collection. Following institutional permissions, baseline (pre-test) data were obtained from both groups using the questionnaire. The experimental group then received the reproductive health education intervention programme delivered by the researchers over twelve (12) weeks, using projectors, banners, a reproductive health manual, a scheme of work, and lesson plans in a conducive environment with incentives provided for participants (see [Table 1](#)). The control group received no intervention during the same period. Post-test data were collected immediately after the twelve-week programme. Pre-test and post-test data were collated for within-group and between-group comparisons.

Ethical considerations and informed consent

Ethical approval was granted by the Ahmadu Bello University Ethics and Research Committee with Approval Number: ABUCUHSR/2025/203. Participation was voluntary, and written informed consent was obtained before enrolment. Participants were informed about the study objectives, procedures, anticipated benefits and risks, confidentiality protections, and their right to withdraw at any time without penalty. To ensure confidentiality, questionnaires were coded without personal identifiers. Data were stored securely and accessible only to the research team.

Data analysis and presentation

Data were analysed using Statistical Package for Social Sciences (SPSS) version 31. Descriptive

Table 1

Scheme of work for the intervention programme (1 hour, 10:00 am – 11:00 am)

Week	Topic	Title	Objective	Content	Researcher's Activities	Participants' Activities	Learning Outcomes	Resources
One	Introduction to Reproductive Health	Concept of Reproductive Health	To define reproductive health and its components	Meaning of reproductive health; Components (physical, emotional, and social well-being)	Deliver lecture; Introduce programme	Listen actively; Ask questions	Participants will define reproductive health and its components	Projector, slides, handouts
Two	Adolescent Sexual Behaviour	Understanding Sexual Behaviour	To explain sexual behaviours among youths	Types of sexual behaviour; Factors influencing behaviour	Facilitate discussion; Provide examples	Participate in discussion	Participants will identify and explain sexual behaviours	Flip charts, markers
Three	Cohabitation	Meaning and Forms of Cohabitation	To explain cohabitation and its forms	Definition of cohabitation; Types (temporary, transactional, long-term)	Lecture Case studies	Share views; Engage in case analysis	Participants will define and describe forms of cohabitation	Case studies, handouts
Four	Causes of Cohabitation	Factors Influencing Cohabitation	To identify the causes of cohabitation among students	Peer pressure; Financial reasons; Emotional needs	Explain causes Moderate discussion	Contribute ideas	Participants will identify causes of cohabitation	Charts, real-life examples
Five	Risks of Cohabitation	Health and Social Implications	To explain the risks associated with cohabitation	STIs/HIV; Unwanted pregnancy; Academic impact	Deliver lecture; Show illustrations	Listen; Ask questions	Participants will explain the risks of cohabitation	Videos, posters
Six	Sexually Transmitted Infections	Prevention of STIs	To describe STIs and preventive measures	Types of STIs; Transmission; Prevention	Lecture; Demonstration	Participate actively	Participants will identify STIs and prevention methods	Charts, models
Seven	Family Planning	Contraceptive Methods	To explain contraception and its importance	Types of contraceptives; Benefits and misconceptions	Demonstrate methods; Clarify myths	Observe; Ask questions	Participants will describe contraceptive methods	Samples, charts
Eight	Decision Making	Assertiveness and Refusal Skills	To develop decision-making skills	Saying "No"; Negotiation skills	Role-play facilitation	Participate in role-play	Participants will demonstrate refusal skills	Role-play scripts
Nine	Gender and Relationships	Healthy Relationships	To explain the characteristics of healthy relationships	Respect; Communication; Boundaries	Facilitate discussion	Share experiences	Participants will identify healthy relationship traits	Videos, charts
Ten	Socio-cultural Influences	Cultural Beliefs and Cohabitation	To examine cultural influences on cohabitation	Norms and values; Media influence	Lead discussion	Contribute ideas	Participants will analyse cultural influences	Media clips, handouts
Eleven	Personal Development	Self-esteem and Life Goals	To promote self-worth and goal setting	Self-esteem; Academic focus	Guide goal-setting exercise	Write personal goals	Participants will set personal goals and value self-development	Worksheets
Twelve	Review and Behaviour Change	Sustaining Positive Behaviour	To reinforce knowledge and behavioural change	Summary of all topics; Behaviour change strategies	Conduct a revision session; Provide feedback	Participate in revision; Ask questions	Participants will demonstrate improved knowledge and behavioural intentions.	Handouts, summary charts

statistics (frequencies and percentages) summarised participants' demographic characteristics, while means and standard deviations addressed the study's research questions. Inferential analyses were conducted at a 0.05 level of significance. A paired-samples t-test assessed within-group changes in cohabitation behaviours across assessment time points among participants in the experimental group. An independent-samples t-test compared post-test

scores between the experimental and control groups to determine the intervention effect between the two independent groups. Findings were presented in tables using appropriate descriptive and inferential statistics.

RESULTS

A total of 50 respondents were recruited for the experimental group and 50 for the control group, all of whom participated in the intervention programme.

Table 2

Socio-demographic characteristics of the respondents (n = 100)

Variables	Experimental		Control	
	Pre-test (n)	Percentage (%)	Post-test (n)	Percentage (%)
Age				
18-22 Years	25	50	27	54
23-27 Years	20	40	21	42
28 years and above	5	10	2	4
Mean Age	23.48 ±1.6		22.88 ±2.4	
Level of Study				
100 level	5	10	3	6
200 level	12	24	11	22
300 level	20	40	27	54
400 level	13	26	9	18
Marital Status				
Single never married	18	36	43	86
Cohabiting	29	58	5	10
Married	0	0	2	4
Separated/Divorced	3	6	0	0
Ethnic group				
Hausa	16	32	27	54
Yoruba	9	18	17	34
Igbo	3	6	6	12
Nupe	3	6	Nil	Nil
Idoma	3	6	Nil	Nil
Igbira	5	10	Nil	Nil
Kataf/southern Kaduna	11	22	Nil	Nil
Current place of accommodation				
Outside campus (with parents /guardian)	10	20	16	32
Outside campus (rented apartment)	24	48	11	22
Hostel on the campus	2	4	9	18
Outside campus with a boy/girl friend	14	28	14	28
Students' current monthly income				
N10, 000-N20,000	21	42	19	38
N21,000-N30,000	11	22	18	36
N31,000-N40,000	10	20	8	16
N41, 000 and Above	8	16	5	10
Parents' average monthly income				
N1, 000-N10,000	22	44	21	42
N11,000-N 20,000	19	38	13	26
N21,000-N30,000	5	10	4	8
N31,000-N40,000	4	8	12	24
Parent Occupation				
Public/civil servant	29	58	16	32
Business/ trading	13	26	11	22
Farming	8	16	23	46

Table 2 presents the socio-demographic characteristics of participants in the experimental and control groups. In both groups, the largest proportion of students were aged 18–22 years, comprising 25 (50.0%) participants in the experimental group and 27 (54.0%) in the control group, whereas those aged ≥28 years were the least represented, with 5 (10.0%) and 2 (4.0%), respectively. Regarding level of study, 300-level students constituted the largest proportion in both the experimental and control groups, with 20 (40.0%) and 27 (54.0%) participants, respectively, while 100-level students were the least represented, with 5 (10.0%) and 3 (6.0%), respectively. A substantial difference was observed in marital status, as 18 (36.0%) participants in the experimental group were

single and never married compared with 43 (86.0%) in the control group.

Hausa students represented the largest ethnic group in both the experimental and control groups, with 16 (32.0%) and 27 (54.0%) participants, respectively. The experimental group showed greater ethnic diversity, whereas several ethnic groups were not represented in the control group. For accommodation, living in a rented off-campus apartment was most common in the experimental group, reported by 24 (48.0%) participants, whereas living with parents, guardians, or relatives was most common in the control group, reported by 16 (32.0%). Hostel residence was the least common arrangement, involving 2 (4.0%) participants in the experimental group and 9 (18.0%) in the control group. Notably, 14 (28.0%) participants in

Table 3

Effect of reproductive health education on cohabitation behaviours among female undergraduates

S/N	Items	Pre-test		Post-test		Mean Difference
		Mean	Std. Dev.	Mean	Std. Dev.	
1	I cohabit for sexual desire**	2.73	0.7	1.13	0.88	1.6
2	I cohabit for intimacy and regular sex**	2.59	0.62	1.36	0.63	1.23
3	I cohabit for financial help**	2.6	0.7	1.03	0.32	1.57
4	I cohabit for academic purposes**	2.24	0.7	1.38	1.03	0.86
5	I never had pregnancy issue as a cohabiter*	2.23	0.65	2.27	0.79	0.04
6	Cohabiting in the school ends into marriage**	2.53	0.63	1.5	0.73	1.03
7	Breaking up with my cohabiting partner could not result in emotional problems**	2.83	0.8	1.21	0.85	1.62
8	Frequent sexual intercourse among cohabiters often leads to sexually transmitted infections because some are not faithful to each other**	2.54	0.54	1.64	0.69	0.9
9	There is an increase in the number of abortions among cohabiters**	2.59	0.7	1.15	0.87	1.44
10	Cohabiting partners separate for a while and forever after graduating from school**	2.61	0.72	1.32	0.77	1.29
	Aggregate Mean	2.55	0.69	1.4	0.74	1.15

Note: Decision Mean = 2.50; * Positive statement; ** Negative statement

each group reported living off campus with a boyfriend or girlfriend. For personal monthly income, ₦10,000–₦20,000 was the most frequently reported category, involving 21 (42.0%) participants in the experimental group and 19 (38.0%) in the control group. Similarly, parental monthly income was most commonly within the ₦1,000–₦10,000 category, reported by 22 (44.0%) participants in the experimental group and 21 (42.0%) in the control group. Parental occupation also differed between groups: civil service was most common in the experimental group, involving 29 (58.0%) participants, whereas farming was predominant in the control group, involving 23 (46.0%). Overall, the most notable between-group differences were observed in marital status, ethnicity, accommodation, and parental occupation.

Table 3 shows a marked improvement in cohabitation-related behaviours following the reproductive health education intervention. The aggregate mean score decreased from 2.55 at pre-test to 1.40 at post-test, yielding a mean difference of 1.15. Based on the 2.50 decision threshold, this reduction indicates a shift from more risk-prone cohabitation-related beliefs and practices toward safer and more protective behaviours after the intervention.

For interpretation, positively worded items (*) reflect safer behaviours when scores increase, whereas negatively worded items (**) reflect improvement when scores decrease. The overall pattern of change across items therefore supports a

favourable behavioural response to the intervention. The magnitude and statistical significance of these changes are further quantified using Cohen's *d*, 95% confidence intervals, and paired- and independent-samples *t*-tests presented in Tables 3 and Table 4.

Table 4 presents the mean scores of responses comparing the experimental and control groups on cohabitation behaviours among female undergraduate students after the reproductive health education intervention programme. The aggregate mean score for the experimental group (1.40) is lower than that of the control group (1.67), with a mean difference of 0.27. Given that the decision mean is 2.50, all the item mean scores fall below the criterion value, indicating overall disagreement with most of the listed cohabitation behaviours and perceptions in both groups. However, the lower aggregate mean in the experimental group suggests that the intervention programme had a noticeable effect in reducing favourable attitudes toward cohabitation and its associated behaviours. The pattern of responses demonstrates that the reproductive health education intervention programme was effective in reshaping students' perceptions and reducing risky or misleading beliefs about cohabitation behaviours among female undergraduates in the study area.

Table 5 present a clear and statistically significant effect of the reproductive health intervention programme on the cohabitation behaviours of female undergraduate students. The mean score for

Table 4

Post-intervention differences in cohabitation behaviours between experimental and control groups

S/N	Items	Pre-test		Post-test		Mean Difference
		Mean	Std. Dev.	Mean	Std. Dev.	
1	I cohabit for sexual desire**	1.21	0.55	1.13	0.88	0.08
2	I cohabit for intimacy and regular sex**	1.26	0.88	1.36	0.63	0.1
3	I cohabit for financial help**	1.6	0.51	1.03	0.32	0.57
4	I cohabit for academic purposes**	1.09	0.74	1.38	1.03	0.29
5	I never had pregnancy issue as a cohabiter*	1.33	0.92	2.27	0.79	0.94
6	Cohabiting in the school ends into marriage**	2.13	0.63	1.5	0.73	0.63
7	Breaking up with my cohabiting partner could not result in emotional problem**	2.49	0.61	1.21	0.85	1.28
8	Frequent sexual intercourse among cohabiters often leads to sexually transmitted infections because some are not faithful to each other**	2.14	0.68	1.64	0.69	0.5
9	There is an increase in the number of abortions among cohabiters **	1.36	0.71	1.15	0.87	0.21
10	Cohabiting partners separate for a while and forever after graduating from school **	2.06	0.87	1.32	0.77	0.74
	Aggregate Mean	1.67	0.71	1.4	0.74	0.27

Note: Decision Mean = 2.50; * Positive statement; ** Negative statement

cohabitation behaviours decreased markedly from 2.55 at pretest to 1.40 at post-test, resulting in a mean difference of 1.15. This substantial reduction suggests that participants engaged less in cohabitation-related behaviours after the intervention. The paired sample t-test yielded a t-value of 23.63 with 49 degrees of freedom, indicating a very large difference between the pretest and post-test scores. Furthermore, the p-value is reported as less than 0.001, which is far below the conventional significance level of 0.05, confirming that the observed change is not due to chance. Therefore, the null hypothesis of no significant difference is rejected, and it can be concluded that the reproductive health intervention programme was highly effective in positively influencing and reducing cohabitation behaviours among the participants. The magnitude of this change was very large, with a within-group effect size of Cohen's $d_z = 3.34$ (95% CI [2.63, 4.05]), computed from the reported t-value and sample size, indicating that the mean pretest-to-post-test reduction of 1.15 points (95% CI [1.05, 1.25]) represents a substantively, and not merely statistically, important shift in respondents' cohabitation-related behaviours.

Table 6 presents the results of an independent samples t-test comparing the post-intervention cohabitation behaviours of female undergraduate students in the experimental and control groups. The findings show that the control group (N = 50) had a higher mean score of 1.67, while the experimental group (N = 50) recorded a lower mean score of 1.40, resulting in a mean difference of 0.27. This indicates that students in the experimental group exhibited

reduced cohabitation behaviours compared to those in the control group after exposure to the reproductive health education intervention programme. The calculated t-value of 21.89 with 98 degrees of freedom is statistically significant, as the p-value is less than 0.001 and also below the 0.05 level of significance. This implies that the observed difference between the two groups is not due to chance but is attributable to the intervention. Therefore, the reproductive health education programme had a significant effect in reducing cohabitation behaviours among female undergraduate students in the experimental group compared to their counterparts in the control group. The between-group effect size was likewise very large, with Cohen's $d = 4.38$ (95% CI [3.65, 5.11]), computed from the reported t-value and group sizes, and the mean difference of 0.27 points was estimated with a 95% confidence interval of [0.25, 0.29], indicating a precise and practically meaningful post-intervention advantage for the experimental group.

DISCUSSION

The study demonstrated a statistically significant improvement in cohabitation behaviours among female undergraduate students following a twelve-week reproductive health education intervention ($t = 23.63$; $p < 0.001$). This finding is consistent with intervention-based research reporting measurable behavioural gains after structured reproductive health education. For example, Chima-Oduko and Odeyemi (2025), in a quasi-experimental

Table 5
Paired *t*-test of pre- and post-intervention cohabitation behaviours in the experimental group

Cohabitation	N	Mean	Std. Dev.	Mean Difference	df	t-value	p-value
Pretest	50	2.55	0.69	1.15	49	23.63	< 0.001
Post-test	50	1.4	0.74				

Note: *t* (df) = 23.63, *p*-value < 0.05

study involving 600 undergraduate students from two public universities in Lagos, Nigeria, found that a structured digital comprehensive sexuality education intervention incorporating interactive webinars, peer-led discussions, and linkages to youth-friendly reproductive health services significantly increased condom use at the last sexual encounter and improved uptake of sexual and reproductive health services. These findings support the present results by demonstrating that structured, interactive, and practice-oriented reproductive health education can translate knowledge into measurable improvements in protective behaviours among university students, although effects may vary across specific sexual and reproductive health outcomes.

Notably, the magnitude of improvement in the current study contrasts with outcomes from brief or single-session educational programmes. [Kakkar et al. \(2021\)](#) found that a single educational module improved knowledge and attitude but did not significantly improve practice-level outcomes (*P* = 0.15). This divergence highlights the advantage of the present study's twelve-week structure, which likely enabled repeated exposure, guided reflection, and behavioural reinforcement elements that facilitate skills consolidation beyond short-term cognitive gains. In addition, the study's quasi-experimental design with a control group strengthens causal inference relative to purely descriptive studies by directly attributing behavioural change to the intervention rather than to maturation effects or pre-existing group differences ([Zhang & Ning, 2023](#)).

Although many studies document a persistent gap between knowledge acquisition and behaviour change, the present findings suggest that a structured

intervention can bridge this gap when education is sufficiently comprehensive. Cross-sectional research from sub-Saharan Africa illustrates that high reproductive health knowledge does not automatically translate into protective behaviours: [Paschen-Wolff et al. \(2020\)](#) reported that despite the majority of participants demonstrating adequate knowledge, only a minority exhibited corresponding safe practices, while [Munakampe et al. \(2018\)](#) found similarly discordant patterns between favourable knowledge and attitudes on one hand, and poor practice on the other. Rather than contradicting the current results, these studies underscore the need for intervention-based designs and reinforced training. The present intervention likely succeeded because it moved beyond knowledge dissemination toward skill-building, value clarification, and routine behavioural integration, consistent with [Koota et al. \(2024\)](#) conclusion that effective programmes must include both theoretical and practical components.

From a behavioural and systems perspective, the results align with evidence that sustained behaviour change depends on both education and enabling conditions. [Assefa et al. \(2020\)](#) demonstrated that structured training significantly increased safe practices, yet noted that environmental constraints substantially moderated the magnitude of improvement. [Yosef \(2023\)](#) similarly linked positive behavioural outcomes to both access to resources and educational engagement and documented persistent structural challenges in Nigeria, including financial pressures, accommodation shortages, and institutional inattention that hinder protective behaviour adoption among university students. Practically, these findings imply that universities should pair reproductive health

Table 6
Independent *t*-test of post-intervention cohabitation behaviours between experimental and control groups

Cohabitation	N	Mean	Std. Dev.	Mean Difference	df	t-value	p-value
Control	50	1.67	0.71	0.27	98	21.89	< 0.001
Experimental	50	1.4	0.74				

Note: *t* (df) = 21.89, *p*-value < 0.05

education with supportive institutional policies, including affordable on-campus accommodation, financial assistance programmes, and accessible counselling services, to enable and reinforce the behavioural changes stimulated by training. Although the present study did not measure clinical endpoints such as incidence of sexually transmitted infections (STIs) or unintended pregnancies, prior evidence indicates that improved reproductive health behaviours may reduce these outcomes (Mason-Jones et al., 2023), which carries downstream benefits for students' academic continuity, psychological wellbeing, and long-term life outcomes (Balumbi et al., 2025).

The significant post-intervention difference between the experimental and control groups ($t = 21.89$; $p < 0.001$) supports the effectiveness of the reproductive health education programme beyond within-group improvements. This between-group pattern aligns with quasi-experimental evidence demonstrating superior behavioural outcomes among trained participants relative to untrained controls. Farotimi et al. (2018) reported significant practice score differences between experimental and control groups after structured health education ($P = 0.001$), while Shaban et al. (2024) observed marked behavioural improvements following intervention, with no comparable change in the control group. The current results are further consistent with Nigerian evidence that targeted, skills-oriented educational programmes can shift behaviours in high-risk domains when content is relevant and delivered through participatory methods (Shaban et al., 2024). Although some educational interventions show stronger effects on knowledge and attitudes than on practice (Hill et al., 2024), the present study's big between-group difference suggests that the intervention design and delivery conditions were sufficient to translate educational exposure into measurable behavioural outcomes.

The post-intervention gap between groups indicates that practice-oriented reproductive health education can generate improvements that exceed those attributable to routine university exposure alone, thereby supporting institutional investment in structured and sustained health promotion programming. However, evidence also cautions that improvements may be moderated by environmental and structural constraints: Abu-Odah et al. (2022) found that despite substantial knowledge gains, practices remained suboptimal due to institutional limitations, and Obach et al. (2024) reported that individuals frequently encountered situations in which

protective behaviours could not be implemented because of resource and social constraints. Therefore, to sustain the observed group differences, universities should embed reproductive health education within a broader enabling environment that ensures access to safe and affordable accommodation, confidential counselling services, peer support networks, and continuous monitoring of student welfare indicators. Such system strengthening carries potential downstream benefits for reducing STI transmission and unintended pregnancies, limiting the financial and emotional burden borne by families during health crises and academic disruptions (Elendu et al., 2024). Future evaluations should incorporate longitudinal follow-up and, where feasible, cluster-adjusted analytic approaches to account for institutional influences on behaviour.

Integrating ethical and value-based frameworks can provide an additional motivational scaffolding for sustaining protective cohabitation behaviours. The obligation to safeguard one's physical and psychological integrity resonates with widely held moral frameworks, including Islamic ethical principles that emphasise the preservation of life, dignity, and future wellbeing (Fahm et al., 2025). Framing reproductive health behaviours as expressions of personal responsibility, community care, and moral accountability may strengthen intrinsic motivation and reinforce adherence to protective practices, complementing skill-based training models and supporting behavioural maintenance beyond immediate post-intervention gains (Isiaq et al., 2026). This value-based approach does not replace technical and skills-based training; rather, it may enhance commitment and self-efficacy by linking protective behaviours with the student's broader sense of identity, purpose, and social responsibility.

Improved cohabitation behaviours have implications that extend beyond individual students. Reduced exposure to the risks associated with cohabitation, including STIs, unintended pregnancies, emotional distress, and academic disruption, lowers the burden on university health services and contributes to broader family and community wellbeing (Elendu et al., 2024). Additionally, preventing cohabitation-related harms may reduce the financial and emotional costs borne by families who must provide support during health crises, academic setbacks, or early parenthood (Baerecke et al., 2024; Stirling et al., 2024).

The findings may also be interpreted within the Islamic framework of protecting individual dignity,

reproductive health, and family wellbeing. Islamic teachings place strong emphasis on chastity, modesty, responsible relationships, and marriage as the legitimate foundation for intimate partnership and family formation. The Qur'an states in Surah Al-Isra verse 32:

"Do not go near adultery. It is truly a shameful deed and an evil way."

This guidance emphasizes the prevention of behaviours that may expose individuals and families to physical, psychological, and social harm. In the context of the present study, the reduction in risk-prone cohabitation-related behaviours following reproductive health education can be interpreted as consistent with Islamic principles that encourage self-protection, responsible decision-making, and avoidance of circumstances that may compromise personal and family wellbeing.

The Qur'an further describes marriage as a relationship founded on tranquillity, affection, and mercy in Surah Ar-Rum verse 21:

"He created for you spouses from among yourselves so that you may find comfort in them."

From a family health perspective, reproductive health education may therefore contribute not only to reducing sexual and reproductive risks but also to preparing young women for healthier relationships and more stable family formation. In North-West Nigeria, integrating culturally appropriate reproductive health education with Islamic values of modesty, responsibility, dignity, and marital preparedness may strengthen its acceptability among students, families, and university communities. Such an approach positions reproductive health education as complementary to, rather than conflicting with, religious and family values while supporting informed decisions that protect the health and wellbeing of future families.

The study's strengths include the use of a quasi-experimental design with control comparison and a sustained twelve-week intervention that likely promoted behavioural reinforcement. Nonetheless, limitations should be acknowledged. Self-reported Likert-type measures are vulnerable to social desirability bias, potentially inflating the reported prevalence of protective behaviours. University-level group allocation may introduce clustering effects, as shared social norms, peer networks, and institutional cultures within a university could violate independence assumptions and inflate effect estimates. The absence of long-term follow-up limits conclusions about

sustainability, and the study did not directly measure clinical outcomes such as STI incidence or unintended pregnancy rates, which would strengthen causal inference regarding health impacts. Future studies should incorporate longitudinal assessment, cluster-adjusted designs such as cluster randomisation or multilevel modelling and objective health outcome measures to better capture sustained effectiveness and real-world reproductive health benefits.

CONCLUSIONS

This study demonstrated that a twelve-week reproductive health education intervention significantly improved cohabitation-related behaviours among female undergraduate students in federal universities in North-West Nigeria. The marked post-intervention improvement observed in the experimental group indicates that structured, practice-oriented reproductive health education can strengthen safer decision-making and reduce risk-prone cohabitation behaviours in the short term. These findings support the integration of reproductive health education into university health promotion and student support systems, particularly for students who may be more vulnerable to reproductive, psychosocial, and socioeconomic risks.

The findings should, however, be interpreted in light of several limitations. The non-randomized allocation of universities to intervention and control conditions may have introduced contextual differences between institutions, while reliance on self-reported Likert-scale responses may have increased susceptibility to social desirability bias. In addition, the absence of long-term follow-up limits conclusions regarding the sustainability of behavioural changes. Universities should therefore consider institutionalising reproductive health education within general studies, Student Affairs, and Health Services programmes, supported by routine counselling, health promotion, and targeted assistance for financially vulnerable students. Structural drivers should also be addressed through affordable accommodation, financial support, and accessible psychosocial services. Future studies should employ longer follow-up periods, account for institutional clustering, assess intervention cost-effectiveness, and examine downstream outcomes such as STI incidence, unintended pregnancy, service utilisation, and academic performance.

ACKNOWLEDGEMENT

The authors sincerely appreciate the management and relevant authorities of Ahmadu Bello University, Zaria, and Usmanu Danfodiyo

University, Sokoto, for granting the necessary institutional access and support that facilitated the conduct of this study. The authors also appreciate the female undergraduate students who participated in the study for their willingness, cooperation, and commitment throughout the twelve-week intervention and assessment periods. The authors are grateful to the experts who contributed to the validation of the research instrument and to all individuals who provided moral, academic, and administrative support during the course of the study. Their contributions were invaluable to the successful completion of the research.

FUNDING

This research received no external financial support.

AUTHORS' CONTRIBUTIONS

Seun N. Akorede: Conceptualised the study, contributed to the study design and methodology, supervised the research process, reviewed the manuscript critically, and approved the final version. Abdulkabir T. Yusuf: Contributed to the study methodology, instrument development and validation, intervention planning, interpretation of findings, and critical review of the manuscript. Abdulmuhi T. Isiaq: Contributed to the conceptualisation and design of the study, literature review, development and administration of the research instrument, data collection and analysis, interpretation of results, and drafting and revision of the manuscript. Safiya Yakubu: Contributed to the literature review, intervention implementation, data collection, interpretation of findings, and critical review of the manuscript. Okhae K. Relobhegbe: Contributed to the literature review, methodology, interpretation of findings, manuscript review and editing, and approved the final version of the manuscript. All authors read and approved the final manuscript and agreed to be accountable for all aspects of the work, ensuring that questions relating to the accuracy and integrity of the research were appropriately addressed.

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COMPETING INTERESTS

The author(s) declare no potential conflict of interest with respect to the research, authorship, and/or publication of this article.

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