

ORIGINAL RESEARCH ARTICLE

Knowledge, attitudes, and practices of contraceptive use amongst female student nurses in South Africa

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Abstract

Despite widespread access to contraceptives, unplanned pregnancies continue to occur among female student nurses, often hindering academic progress. A quantitative descriptive cross-sectional study using a census approach was conducted, with 170 of the 243 eligible students participating (70% response rate). The study investigated their knowledge, attitudes, and practices (KAP) regarding contraceptive use. Data were collected through a self-administered questionnaire and analyzed using SPSS version 28.0. The findings revealed that 99.4% of participants had received education about contraception, with 67% citing healthcare professionals as their primary information source. Approximately 90% of participants demonstrated positive attitudes toward contraceptive use, while about 10% viewed it as sinful or were unsure. Furthermore, 71.2% reported current contraceptive use; among these, condoms (24.8%), injectables (20.7%), and oral pills (18.2%) were the most commonly used methods. Although overall knowledge and attitudes were positive, a minority showed gaps and disinterest, indicating the need for targeted educational support. These findings highlight the importance of integrating focused contraceptive education into nursing curricula. (*Afr J Reprod Health* 2026; 30 [9]:65-75).

Keywords: Assessing, Attitude, Contraceptives, Knowledge, Nursing Education Institution

Résumé

Malgré un accès généralisé aux contraceptifs, les grossesses non désirées persistent chez les étudiantes infirmières, compromettant souvent leur réussite scolaire. Une étude descriptive transversale quantitative, menée selon une approche de recensement, a été réalisée auprès de 170 des 243 étudiantes admissibles (taux de réponse de 70 %). L'étude a examiné leurs connaissances, attitudes et pratiques (CAP) concernant l'utilisation de la contraception. Les données ont été recueillies au moyen d'un questionnaire auto-administré et analysées avec le logiciel SPSS version 28.0. Les résultats ont révélé que 99,4 % des participantes avaient reçu une formation sur la contraception, et que 67 % d'entre elles citaient les professionnels de santé comme principale source d'information. Environ 90 % des participantes ont manifesté une attitude positive envers l'utilisation de la contraception, tandis qu'environ 10 % la considéraient comme un péché ou étaient indécises. Par ailleurs, 71,2 % ont déclaré utiliser actuellement une méthode contraceptive; parmi celles-ci, les préservatifs (24,8 %), les contraceptifs injectables (20,7 %) et les pilules (18,2 %) étaient les méthodes les plus fréquemment utilisées. Bien que les connaissances et les attitudes générales soient positives, une minorité a montré des lacunes et un désintérêt, indiquant la nécessité d'un soutien éducatif ciblé. Ces résultats soulignent l'importance d'intégrer une formation ciblée sur la contraception dans les programmes de formation en soins infirmiers (*Afr J Reprod Health* 2026; 30 [9]:65-75).

Mots-clés: Évaluation, attitude, contraceptifs, connaissances, établissement de formation en soins infirmiers

Introduction

Unintended pregnancies among undergraduate students have become an increasingly pressing concern in Higher Education Institutions (HEIs), despite the widespread availability of various contraceptive methods.¹ This concerning trend is attributed to several interrelated factors, including limited access to reproductive health services, inadequate knowledge of contraceptive use, and

low perception of pregnancy risk.³ Akwara et al.⁴ note that reproductive health challenges are shaped by complex social, cultural, and infrastructural dynamics that vary significantly between and within countries.

In many developed countries, university students generally show higher contraceptive uptake, supported by comprehensive sexual education, accessible reproductive health services, and favourable policies.⁵ However, even in these

well-resourced contexts, students still face challenges that can hinder consistent use.⁶ In contrast, African HEIs, including those in South Africa, continue to grapple with more pronounced barriers such as stigma, cultural and religious resistance, fear of side effects, and limited availability of youth-friendly or on-campus reproductive health services.^{7–9} These factors collectively undermine consistent contraceptive use, leading to vulnerability among sexually active students. Additionally, misconceptions and negative social attitudes toward contraception discourage open discussion and utilization of family planning services.

The consequences of inconsistent or non-use of contraceptives among students in South African HEIs are far-reaching. Research shows that poor contraceptive practices are closely linked to increasing rates of unintended pregnancies, particularly among unmarried female students.^{2,10} These pregnancies often interrupt academic progress, create emotional and financial strain, and in some cases lead to academic exclusion. For nursing and other health sciences students, unplanned pregnancies can be especially disruptive, contributing to delayed graduation, reduced clinical exposure, and a loss of confidence in their future career paths. Moreover, recent data show that for girls aged 15–19 years the birth rate increased from 49.6 to 55.6 births per 1 000 girls between 2017 and 2021, reflecting ongoing adolescent childbearing despite available services.¹¹ These consequences emphasize the need for effective contraceptive education and supportive institutional policies that promote reproductive autonomy and health-seeking behaviors among students.

Nurses and midwives are at the forefront of providing reproductive health services, including family planning counselling and contraceptive provision. However, the knowledge, attitudes and practices (KAP) of contraception use among nursing students and trainee nurses in South Africa have not been well studied. Understanding this group is important as future healthcare providers, their own contraceptive KAP will influence community education and youth-friendly services. Given the high unmet need and persistent myths observed among youth, it is critical to examine student nurses' perspectives on contraception. Therefore, this study addresses the following research question: What is the knowledge, attitudes,

and practices of contraceptive use among female student nurses in South Africa?

Purpose of the study

This study assessed the level of knowledge, attitudes, and practices related to contraceptive use amongst female student nurses. The rest of the paper is organised as follows: Section 2 comprises the theoretical framework, Section 3 presents the literature review, Section 4 presents the research methodology, outlining the process and steps undertaken to collect and analyse the data. Sections 5 and 6 are dedicated to the presentation of the results as well as discussion of the findings. Lastly, Section 7 provides the conclusion of the study, summarising the key insights and implications drawn from the research.

Theoretical framework

The Knowledge, Attitudes, and Practices (KAP) theory provided a structured framework for understanding and influencing female student nurses' behaviour regarding contraceptive usage. The KAP model, a health behaviour change framework, was introduced by Everett M. Rogers in the late 1950s and early 1960s and later became widely recognised through its extensive use in family planning research across different countries.¹² Over time, the model has been adopted across numerous fields including medical care, public health, and nursing education because of its proven value in guiding behavioural change and enhancing health outcomes.^{13–15} The theory is built around three interconnected components: knowledge, attitudes, and practices. These elements collectively form a foundation for understanding and influencing human behaviour. The model assumes that behavioural change follows a sequential process beginning with the acquisition of knowledge, progressing to the development of attitudes, and culminating in behavioural practice.

In the context of contraceptive use among student nurses in HEIs, the KAP framework helps to unpack how students understand, feel about, and ultimately use contraceptives. According to the model, accurate and comprehensive knowledge of contraceptive methods including their effectiveness, benefits, and possible side effects forms the basis for developing positive attitudes. These attitudes then support the adoption and

consistent use of appropriate contraceptive practices.¹⁴

This framework is especially valuable for student nurses, who are not only beneficiaries of contraceptive education but will also be responsible for offering reproductive health guidance to patients in their future roles. Strengthening their knowledge and shaping informed, responsible attitudes equips them to make sound personal decisions while also enhancing their professional competence in family planning and reproductive health. By ensuring that student nurses possess solid knowledge and favourable attitudes toward contraception, the KAP model ultimately contributes to their ability to deliver accurate, evidence-based counselling and improve reproductive health outcomes..

Methods

Research approach and design

A quantitative, descriptive cross-sectional research design was employed to assess and describe the levels of knowledge, attitudes, and practices regarding contraceptive use among female student nurses enrolled at a nursing education institution in Limpopo Province. This approach was selected to capture a snapshot of participants' perspectives and behaviors at a specific point in time, enabling a comprehensive analysis of prevailing trends and associations within the study population.¹⁵

Study setting

The study was conducted in South Africa, Limpopo at University of Limpopo, Turfloop campus that is situated in Polokwane, Capricorn district at Mankweng along R71 Tzaneen

Population and sampling

The target population comprised all female undergraduate student nurses registered for the 2024 academic year at a selected Higher Education Institution in Limpopo Province. Given the manageable size and accessibility of this population, a census approach was used, meaning all eligible students were invited to participate rather than selecting only a portion of them. This strategy allowed for broader coverage and helped reduce potential sampling bias. Of the 243

registered female student nurses, 170 chose to complete the questionnaire, yielding a response rate of about 70%.

Data collection

Data were collected using a structured, self-administered questionnaire designed to capture information from a diverse group of female student nurses at a single point in time. The instrument was adapted from a validated questionnaire developed by¹⁶ and modified to align with the context of student nurses. The questionnaire was presented in English, the official medium of instruction at the selected Higher Education Institution (HEI). It comprised 20 items organized into four key sections: Demographic Information, Knowledge, Attitudes, and Practices related to contraceptive use. To enhance clarity and facilitate accurate responses, the questionnaire employed a mix of response formats, including multiple-choice, yes/no, and Likert-scale items. Data was collected from September 2024 to October 2024 collection was conducted electronically via Google Forms to ensure accessibility and convenience for participants.

Data analysis

Data analysis was conducted using the Statistical Package for the Social Sciences (SPSS) version 28.0, with guidance from a biostatistician to ensure accuracy and validity. Descriptive statistical techniques were applied to summarize categorical variables, and results were expressed as frequencies and percentages. Prior to analysis, all data were screened for completeness and consistency. Cases with substantial missing responses defined as having more than 20% of items unanswered were excluded from the final analysis, while smaller gaps were handled using pairwise deletion to retain as much useful information as possible. This approach helped strengthen the reliability of the findings and reduce potential bias linked to incomplete data. Once cleaned, the dataset was carefully organised and presented using tables, bar graphs, and pie charts to support clear interpretation and highlight key trends in participants' knowledge, attitudes, and practices regarding contraceptive use. Rigorous data validation and cross-checking procedures were undertaken to maintain data integrity and analytical dependability.¹⁶

Validity and reliability of the study

To ensure the validity and reliability of the study, several measures were undertaken during the research process. A comprehensive literature review of recent and relevant sources was undertaken to guide the development and contextual appropriateness of the study instrument. The structured questionnaire, originally developed by¹⁷, was adapted to reflect the specific experiences and needs of student nurses in a South African Higher Education Institution. This adapted version was administered consistently to all participants to ensure reliability through uniform measurement. Face and content validity were strengthened by assessing whether the questionnaire appeared to measure the intended concepts, particularly through input from individuals knowledgeable about the topic.

To this end, the questionnaire was reviewed by academic supervisors with expertise in reproductive health and nursing education, who confirmed that the questions were appropriate, relevant, and clearly worded, while content validity was achieved by cross-checking the content against the literature and further validated by both the supervisors and a biostatistician, who confirmed that the instrument sufficiently captured the scope of the study.¹⁸

Ethical considerations

Ethical clearance for the study was granted by the Turfloop Research Ethics Committee (TREC/1452/2024:UG), with further permission obtained from the Director of the School of Health Care Sciences and the Head of the Department of Nursing Sciences at the University of Limpopo. Core ethical principles, including beneficence, respect for human dignity, justice, informed consent, anonymity, and confidentiality, were observed.¹⁸ Participants were fully informed about the study's purpose and voluntary nature, with their right to withdraw emphasized. Informed consent was obtained, and anonymity was preserved by assigning codes instead of names. Confidentiality was ensured by limiting data access to the research team. To reduce harm and uphold ethical integrity, the questionnaire was adapted and avoided sensitive questions and was piloted to address

potential issues such as response fatigue and bias. The study design prioritized participant well-being, and support services were made available through the University Student Support Services if needed..

Results

Demographics

Table 1 summarises the demographics' results. A total of 170 female undergraduate student nurses participated in the study by completing the questionnaire. The majority of the respondents (97.6%) were between the ages of 17 and 24, while only 2.4% were aged between 25 and 30. Most participants (98.8%) identified as African, with the remaining 1.2% being from other racial backgrounds, excluding Indian and White. In terms of religious affiliation, 94.7% of the students were Christian and 5.3% belonged to other religions. Regarding academic level, the highest participation was recorded among Level 1 students (34.7%), followed by Level 4 (27.6%), while Level 2 and Level 3 students had equal representation (18.8%) each. The majority of the respondents (98.8%) were single. A small proportion of students reported being married (0.6%) or divorced (0.6%).

Table 1: Demographic results summary (N170)

Variable	Category	Frequency (n)	Percentage (%)
Agggroup	17–24 years	166	97.6
	25–30 years	4	2.4
		170	100%
Race	African	168	98.8
	Other	2	1.2
		170	100%
Religion	Christian	161	94.7
	Other	9	5.3
		170	100%
Year of Study	Level 1	59	34.7
	Level 2	32	18.8
	Level 3	32	18.8
	Level 4	47	27.6
		170	100%
Marital Status	Single	168	98.8
	Married	1	0.6
	Divorced	1	0.6
		170	100%

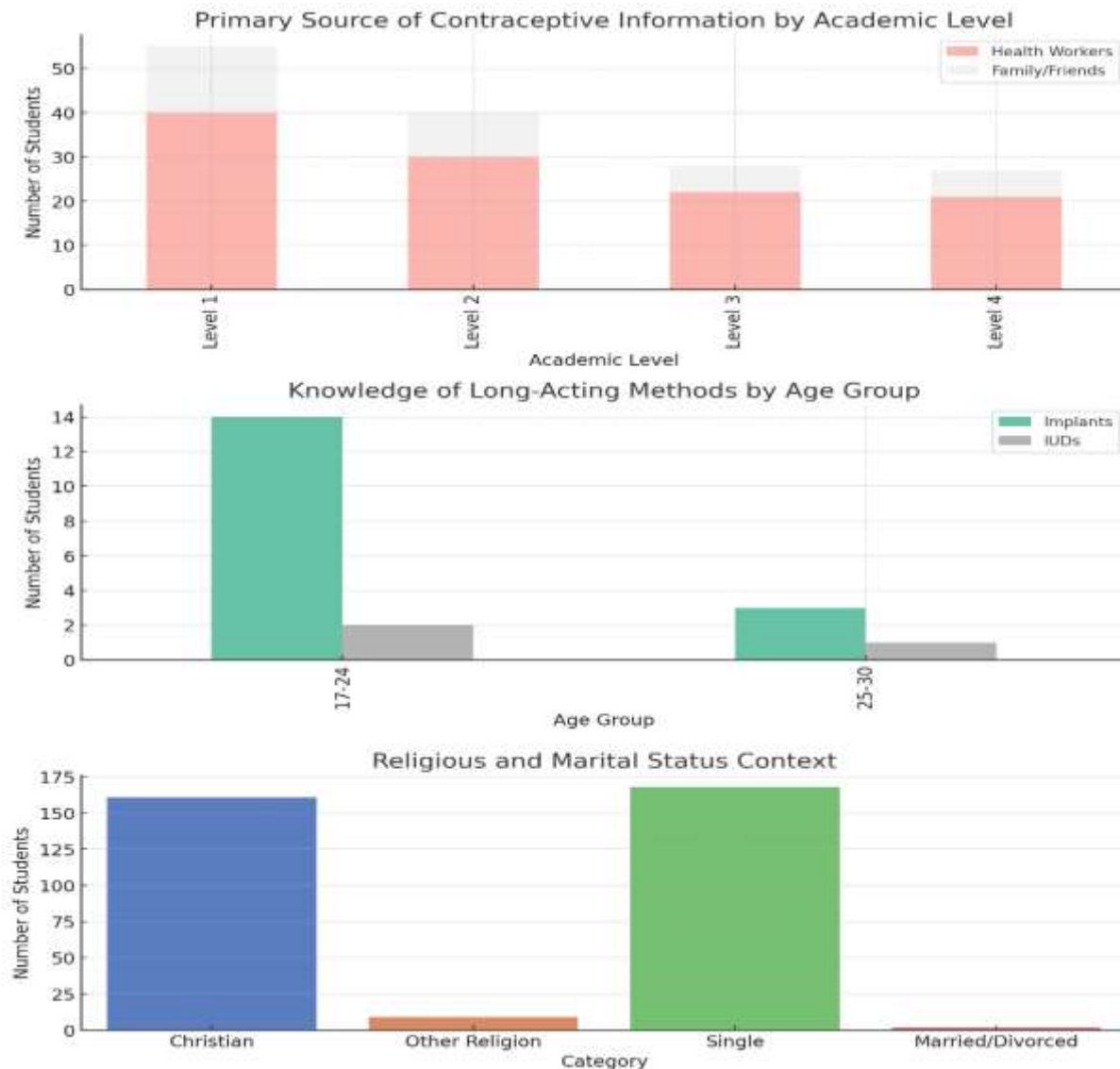


Figure 1: Association between knowledge and key demographic variables (N=170)

Table 2: Summarising the contraceptive attitudes and their associations (N170).

Statement	Agree (n) (n) (%)		Disagree (n) (%)		Neutral/Unsure (n) (%)		Key Associations
Discussing contraceptives with a partner is very important	13	78,2%	26	15,3%	11	6,5%	Higher agreement among students aged 17–24 and those in Level 1 and 2
Interest in learning about contraceptives	15	88,8%	13	7,7%	6	3,5%	Consistent across all groups; slightly higher in Level 1 and single students
Interest in using contraceptives	12	70,6%	29	17%	21	%	Higher among Level 3 & 4 students and those aged 25–30, likely due to maturity
Willingness to recommend contraceptives to a partner	13	79,4%	20	11,8%	15	8,8%	Most prominent among Christian and single students, showing positive attitude
Belief that using contraceptives is a sin	17	10%	135	79,4%	18	10,6%	Agreement/uncertainty more common in senior levels or among diverse religious groups

Table 3: Summary of practices regarding contraceptives use (N170)

Practice Aspect	Category/Response	Frequency (n)	Percentage (%)
Contraceptive use	Currently using	121	71.2
	Not using	49	28.8
Reasons for non-use ¹	Religion/tradition	24	48.0
	Fear of side effects	20	40.0
	Partner/family objection or access issues	5	12.0
Common methods used ²	Condoms	30	24.8
	Injectables	25	20.7
	Pills	22	18.2
	Implants	18	14.9
	Other (patch, IUD, injection)	26	21.4
Side effects ³	None reported	76	62.4
	Experienced side effects	45	37.6

¹Predominantly reported by Level 1 students.

²Older students (25–30 years; Levels 3–4) favored long-acting methods.

³ Commonly reported symptoms: irregular bleeding, headaches, nausea.

Knowledge of contraceptives

Out of 170 female undergraduate student nurses who participated in the study, a vast majority (99.4%) reported that they had heard about contraceptives, whereas only a small proportion (0.6%) indicated they had not. Among those who had heard about contraceptives, the primary source of information was health workers (67.1%), followed by family and friends (24.6%). Other sources included television (7.1%) and radio majority (78.2%) agreed that discussing contraceptives with a partner is very important, (15.3%) disagreed, while (6.5%) were neutral. Agreement was particularly high among students aged 17–24 and those in Level 1 and 2. The participants (88.8%) showed a strong interest in learning about contraceptives, while (7.7%) disagree, and (3.5%) were unsure.

This strong interest was consistent across all academic levels and age groups, with slightly higher interest among Level 1 students and single students. Regarding interest in using contraceptives (70.6%) agreed, (17%) disagree and (12.4%) were unsure. Level 3 and 4 students and those aged 25–30 showed more interest in actual use, possibly due to maturity and greater personal relevance. In terms of willingness to recommend contraceptives to a partner (79.4%) agreed, (11.8%) disagreed and (8.8%) were neutral. This was most prominent among Christian and single students, reinforcing positive attitudes despite potential cultural or religious norms.

(1.2%). In terms of knowledge about different types of contraceptives, condoms were the most commonly known method (32.4%), followed by injectables (27.7%) and pills (26.5%). Fewer participants were aware of implants (10%), intrauterine devices (IUDs) (1.8%), patch (1.2%) and sterilization (0.6%).

Attitudes towards contraceptive use

Table 2 presents the distribution of responses regarding attitudes towards contraceptives use. The

The majority (79.4%) disagreed that using contraceptives is a sin, while (10%) agreed and (10.6%) were not sure. Although the majority disagreed with this belief, the minority agreeing or unsure were more likely to be from senior academic levels or different religious affiliations, suggesting a complex interplay of cultural and moral beliefs.

Practices regarding contraceptives use

The participants (28.8%) reported not using any contraceptives currently. Among those not currently using contraceptives, the primary reasons included religion or tradition/culture (48%), followed by fear of side effects (40%), prohibition by the partner (4.8%), lack of accessibility (2.4%), lack of information about contraceptives (2.4%) and prohibition by parents/family (2.4%). Among those using contraceptives (71.2%), the most commonly used method was condoms (24.8%), injectables (20.7%), pills (18.2%) and implants (14.9%). Fewer participants were using the patch

(8.2%), IUD (6.6%) or injection (6.6%). Younger participants aged 17 to 24 and Level 1 to 2 students predominantly used short-term methods such as condoms and pills. Older students 25 to 30 years, Levels 3 and 4 were more likely to use long-acting methods like implants and injectables. Among non-users (78.2%) indicated they would use contraceptives in the future, while (21.8%) stated they would not. In terms of side effects, (62.4%) of the participants indicated that they did not experience any side effects while using contraceptives, while (37.6%) reported experiencing side effects. Side effects were more commonly reported among Level 3 and 4 students, possibly due to longer duration of use or use of long-acting methods. Fear of side effects was more commonly cited by Level 1 students. Among those experiencing side effects (49%) experienced. However, persistent barriers such as cultural and religious stigma, fear of side effects, and limited awareness of long-acting reversible contraceptives (LARCs) continue to hinder optimal contraceptive practices.

The demographic profile showed that most participants were between 17 and 24 years of age, reflecting the typical age structure of nursing students entering tertiary education directly after secondary school, as reported in previous South African and Nigerian studies.^{19 20} This youthful demographic highlights the importance of sustained reproductive health support and continuous reinforcement of positive reproductive health behaviors during formative professional years.

The study's finding of exceptionally high contraceptive awareness aligns with research across several African countries, including Zimbabwe, Uganda, and Ghana, which collectively indicate that university students generally possess good foundational knowledge of contraception.^{8 21 22} Within the KAP theoretical framework, knowledge represents the first cognitive domain influencing health behavior yet it is only effective when translated into positive attitudes and consistent practices.²² In this study, while knowledge levels were remarkably high, the existence of misconceptions and inconsistent use among some participants illustrates a partial disconnection within the KAP sequence. This finding reinforces the theory's assertion that information alone is insufficient to change behavior; attitudinal

irregular bleeding, (15%) reported headaches, (11%) reported nausea or vomiting, another (11%) experienced heavy and prolonged menstrual bleeding, (7%) had abdominal pain and (7%) reported breast tenderness. The practices results are summarised in Table 3.

Discussion

This study investigated contraceptive knowledge, attitudes, and practices (KAP) among female undergraduate student nurses in Limpopo Province, revealing patterns consistent with broader regional and international trends. Findings indicated that participants demonstrated high levels of contraceptive knowledge (99.4%), predominantly positive attitudes, and relatively high contraceptive use (71.2%).

readiness and environmental enablers are equally critical to sustaining contraceptive practices.

Healthcare professionals emerged as the primary source of contraceptive information, reaffirming their pivotal role in shaping reproductive awareness among young adults.^{24 25} However, the relatively low utilization of mass media and digital platforms as information sources suggests missed opportunities to influence attitudes and practices beyond the classroom or clinic. According to the KAP model, repetitive, credible, and socially relevant messaging across multiple platforms strengthens both attitude formation and behavior adoption. Therefore, enhancing outreach through social media, campus campaigns, and youth-friendly services could help bridge the gap between knowledge acquisition and behavioral consistency. Condoms were the most commonly used contraceptive method, followed by injectables and pills, consistent with studies in South Africa and Nigeria emphasizing their accessibility and dual protection benefits.^{27 28} The limited awareness and uptake of LARCs, however, reflect the "practice gap" often described in the KAP model, where favorable attitudes toward contraception coexist with limited behavioral application due to structural, informational, or psychological barriers.²⁹ These findings suggest that while students intellectually support contraceptive use, perceived risks and insufficient confidence in managing side effects inhibit full behavioral translation.

Although most participants did not view contraceptive use as sinful (79.4%), a minority expressed moral or religious reservations, echoing findings from other African contexts where socio-religious norms shape reproductive attitudes.^{19 30} Within the KAP framework, such beliefs influence the attitudinal stage, acting as internalized barriers that limit progression toward consistent practice. Thus, culturally sensitive and value-based approaches to contraceptive counselling are essential to modify attitudes while respecting students' belief systems.

Encouragingly, nearly nine out of ten participants expressed interest in expanding their contraceptive knowledge, particularly in partner communication and decision-making. This motivation reflects the attitude-to-practice transition emphasized in KAP theory, where increased awareness and positive perceptions enhance behavioral intention and confidence.^{20 21 31} Educators can leverage this openness by embedding reproductive health modules that actively link theoretical knowledge with clinical application, reinforcing positive attitudes through experiential learning and mentorship.

Nevertheless, barriers such as myths, fear of side effects, and confidentiality concerns remain major deterrents to consistent contraceptive use. Several African studies confirm that such psychosocial factors disrupt the progression from knowledge to practice, leading to partial or inconsistent adoption of contraceptives.^{31 35-37} Frequently reported side effects including irregular bleeding, headaches, and nausea further reinforce avoidance behaviors.^{38 39} Addressing these barriers within nursing education through evidence-based counselling and side-effect management training would enhance both self-efficacy and professional competence, aligning with the KAP principle that behavioral reinforcement requires continuous knowledge updating and attitude strengthening.

The reliance on short-term methods such as condoms and injectables also indicates limited understanding or accessibility of LARCs, consistent with trends reported in other Sub-Saharan African universities.⁴⁰ From a KAP perspective, this pattern reflects an incomplete behavioral adoption phase where knowledge and attitudes are present but constrained by limited skills, confidence, or access to preferred methods. Strengthening curricular components on

contraceptive technology, LARC counselling, and patient-centered reproductive care could therefore empower nursing students to make informed choices and promote the same among their future patients.

In conclusion, the KAP theory provides a useful interpretive lens for understanding these findings. While nursing students demonstrated strong contraceptive knowledge and generally positive attitudes, residual stigma, misconceptions, and fear of side effects continue to hinder full behavioral translation. Nursing curricula should therefore integrate comprehensive reproductive health education that bridges the gap between knowledge and practice by emphasizing LARC counselling, side-effect management, and culturally sensitive communication. By fostering both cognitive understanding and attitudinal competence, nursing education can produce graduates who are not only informed users of contraception but also effective advocates for reproductive health in diverse communities.

Conclusion

This study found that female nursing students generally possess strong knowledge and positive attitudes toward contraceptive use, with most engaging in active practices. However, lingering misconceptions highlight the need for targeted, context-specific educational interventions. Strengthening evidence-based contraceptive education within nursing curricula will enhance students' competence to provide accurate reproductive health guidance, thereby reducing unintended pregnancies and improving public health outcomes. Future qualitative and longitudinal studies should explore evolving knowledge, attitudes, and practices across training years to inform sustainable, evidence-driven educational reforms.

Strengths and limitations of the study

Strengths

This study provides significant insights into the contraceptive knowledge, attitudes, and behaviors of female nursing students, a population essential for future health education and service provision. This study specifically targets nursing students at a higher education institution, who will become

future healthcare practitioners influencing community reproductive health outcomes. The implementation of a structured, self-administered questionnaire grounded in a robust theoretical framework (KAP) improved the reliability and validity of the gathered results. The comparatively elevated response rate also enhances the generalizability of the findings within the study context.

Limitations

Despite its strengths, the employment of a non-probability purposive sampling method may restrict the sample's representativeness, limiting the generalization of the findings to the entire population of nursing students in South Africa. Secondly, the cross-sectional approach merely offers a temporal snapshot, inhibiting any causal inferences regarding the links among knowledge, attitudes, and contraceptive utilization. Moreover, dependence on self-reported data may engender social desirability bias, especially for sensitive topics such as contraceptive habits and religious convictions.

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Author contributions

The study's conceptualization was created collaboratively by PN, MM, and TA. The same authors developed the methodological framework and study design. While PN, MM, and TA worked together to clean the data, do statistical analysis, and interpret the findings, PN was in charge of organising for data collection and preliminary fieldwork. PN prepared the first draft of the manuscript. The intellectual material was improved and subjected to technical editing and critical evaluation by MM and TA. All three authors gave their final approval to the paper. The final manuscript has been read and approved by all authors, who also take full responsibility for every part of the work.

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Data availability

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare no competing interest.

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