Original Article

State of Knowledge and Awareness of Preconception Preparedness among Premarital Couples in Rwanda: A Quantitative Cross-Sectional Survey

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Abstract

Background
Preconception preparedness (PP) is important for improving maternal and neonatal health outcomes by promoting health optimization before conception. However, awareness remains limited in sub-Saharan Africa. Furthermore, evidence on premarital couples as a distinct population is scarce.

Aim
To assess the status, including level of knowledge and awareness (KA), of PP and identify associated factors among premarital couples in Rwanda.

Methods
A cross-sectional survey was conducted between May and July 2024 among 600 couples (n = 1,200) recruited from civil and religious marriage registration offices in 15 districts of Rwanda. Data were collected using a structured questionnaire and analyzed using IBM SPSS Statistics for Windows version 29 (IBM Corp, Armonk, NY, USA). Descriptive statistics, independent t-tests, and multiple logistic regression were used to examine KA levels and associated factors.

Results
The mean participant age was 29.5 years (SD, 5.5), 91.2% of participants demonstrated low PP KA, while only 8.8% had fair KA. At the couple level, 95.3% of them had both partners in the low KA category. Females were more likely than males to demonstrate fair KA (12.0% vs. 2.8%). Other factors associated with fair KA included female sex (AOR = 2.1; p = 0.007), secondary or higher education (AOR = 6.3; p = 0.004), and urban residence (AOR = 1.7; p = 0.009). Prior exposure to PP information was uncommon (3.3%) but was associated with higher odds of fair KA (AOR = 3.3; p = 0.002)

Conclusion
Knowledge and awareness of PP are low among the majority of premarital couples in Rwanda. Strengthening community-based educational interventions, integrating PP into premarital counseling, and expanding information dissemination are needed to improve preconception health literacy among couples preparing for parenthood.

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Keywords: preconception preparedness, knowledge, awareness, preconception care, premarital couples, Rwanda

Background

Maternal and neonatal mortality, along with morbidity, continues to pose a critical global health challenge.[1,2] Evidence indicates that nearly 800 women die every day from preventable causes related to pregnancy and childbirth.[3] A staggering 95% of these deaths occur in low- and middle-income countries (LMICs), with Africa accounting for more than half of the global maternal mortality burden, while 70% of deaths occur in the sub-Saharan Africa region.[4] Besides the burden of maternal mortality and morbidity in LMICs, an estimated 1.4 million foetuses die in the womb as stillbirths,[5] and 3.6 million babies die in the first four weeks of life each year.[6]

Though it continues to be a burden, the literature shows that about 80% of pregnancy-related maternal and neonatal deaths and morbidities are preventable.[1] Evidence shows that approximately 75% of maternal mortalities and morbidities are linked to pre-pregnancy modifiable risk factors, including health conditions such as non-communicable diseases, mental distress, negative health attitudes, behaviours, or lifestyles of both partners involved in pregnancy,[7–10] and environmental toxin exposure.[11,12]

To help address this issue of preventable maternal and child mortality and morbidity, and to achieve the Sustainable Development Goal (SDG) target of reducing the global maternal mortality ratio to less than 70 per 100,000 live births and newborn mortality to at least 12 per 1,000 live births by 2030,[2] the literature highlights that antenatal and peri-pregnancy care alone cannot reach this target.[13] Instead, it recommends complementary strategies, including the promotion of preconception care and preconception preparedness (PP) awareness among the childbearing-aged population.[14–17] Throughout this manuscript, 'preconception preparedness (PP)' refers to the knowledge, awareness, and readiness of an individual or couple to plan and optimize health before pregnancy, encompassing behavioural, nutritional, and medical dimensions. 'Preconception care' refers to the formal health services and clinical interventions provided within this period. While the two concepts overlap, 'preconception preparedness' is used when discussing knowledge and awareness, and 'preconception care' when referring to specific health services. Furthermore, a study in Rwanda revealed that over 61% of women seek their first antenatal care (ANC) visit at 16 weeks of gestation or later, after the embryonic period has ended, making it impossible to avoid preventable pre-embryonic risk factors through antenatal pathways alone; the promotion of preconception care awareness was therefore recommended.[18] Also in Rwanda, some evidence showed that pregnancy intention and exposure to intimate partner violence are significant predictors of ANC standard visits adherence.[19,20]

Preconception preparedness awareness has been found to be a valuable opportunity that may help both women and men adopt healthy behaviours and lifestyles that can lead to improved maternal and foetal outcomes. Beyond its role in reducing mortality, preconception preparedness plays a vital role in preventing unintended pregnancies and their associated risks. Unintended pregnancies are common globally and are associated with delayed initiation of antenatal care, increased exposure to teratogenic substances before pregnancy recognition, higher rates of adverse perinatal outcomes, and greater maternal psychosocial stress.[8,21,22] Addressing PP knowledge before marriage is therefore relevant not only to optimizing planned pregnancies but also to mitigating the consequences of unintended ones.

Evidence shows that promoting awareness of preconception care can lead to several beneficial effects, such as a 39% increase in seeking antenatal care and a 17% reduction in neonatal mortality.[14] Moreover, predictions show that adequate PP knowledge and awareness could efficiently avert 71% of neonatal deaths, 33% of

stillbirths, and 54% of maternal deaths per year by 2025 through addressing pre-pregnancy health problems, changing or mitigating preconception risky behaviours, risky attitudes, and unhealthy social and environmental lifestyles.[13,23,24] Furthermore, multiple studies have demonstrated that having knowledge and awareness of PP can reduce adverse obstetrical, foetal, and neonatal outcomes, including miscarriage, preterm birth, anaemia, intrauterine foetal death, neural tube defects and other birth defects, low birth weight, and postpartum haemorrhage. [17,25,26] Conversely, other literature shows that lacking knowledge and awareness of preconception health, risky lifestyles, and behaviours can lead to harmful short-term and long-term maternal and child health effects, including maternal deaths, pre-eclampsia, abortion, gestational diabetes, congenital abnormalities, neonatal and child deaths, low birth weight, preterm birth, placental abruption, and different offspring metabolic disorders.[10,22,27,28] Thus, fostering awareness about preconception health can result in substantial benefits for both parents and their future children.

Preconception preparedness encompasses two interrelated domains that reflect the breadth of health behaviours relevant before pregnancy. The first is the medical domain, which includes knowledge of the importance and timing of pre-pregnancy health screening, recommended blood tests and check-ups, screening and management of chronic medical conditions, the impact of family health history and genetic conditions on pregnancy, and prophylactic interventions including folic acid supplementation, recommended vaccines, and preventive medications.[14,16,17,26] The second is the behavioural, attitudinal, and lifestyle domain, encompassing knowledge of fertility awareness; family planning and reproductive life planning; safe medication use and avoidance of teratogenic substances; weight regulation and nutrition; avoidance of smoking, alcohol, and illicit drugs; physical activity; stress management; protection from environmental and occupational toxin exposure; and the consequences of gender-based violence on reproductive health.[7,10,25] Adequate awareness of both domains is necessary for comprehensive preconception health optimization.

To develop effective preconception care education policies, design PP awareness strategies and interventions, and allocate resources to significantly enhance PP awareness in the population, the literature recommends first conducting a baseline survey of knowledge and awareness.[29,30] Such a survey provides critical insight into the current level of understanding among the population regarding key risk factors and health behaviours necessary for optimal conception outcomes. In addition, by assessing knowledge gaps and specific knowledge needs, healthcare providers can tailor educational programs and resources to address these deficiencies. [31] Furthermore, identifying baseline awareness allows measurement of progress over time and evaluation of the effectiveness of interventions designed to enhance PP awareness. This foundational data supports the design of targeted public health campaigns aimed at raising awareness about the importance of PP.[32]

Despite the benefits of assessing knowledge and awareness of PP, limited studies have been conducted among engaged couples, and especially those on the verge of marriage. Different studies conducted in the area of PP awareness have focused mainly on women of reproductive age, with very few focusing on soon-to-be-married couples. [29–34] This evidence gap extends beyond Rwanda to sub-Saharan Africa more broadly, where studies specifically characterizing PP knowledge and awareness among engaged couples as a distinct population with immediate reproductive intentions remain scarce. As couples on the verge of marriage are often in a transitional phase where they are contemplating starting a family and having offspring soon, assessing premarital couples' knowledge and awareness toward PP can help identify gaps

in understanding preconception health risks and behaviours, enabling targeted education, risk modification, and interventions to optimize maternal, foetal, and child outcomes before pregnancy begins, as recommended by different studies.[33,34]

Therefore, this study aimed to assess knowledge and awareness toward preconception preparedness among engaged couples preparing for marriage in Rwanda. The findings from this study can inform policymakers, other reproductive and maternal and child health stakeholders, and researchers to establish and innovate preconception care education programs by targeting the childbearing-aged population, particularly engaged couples.

Methods

Study design

A quantitative cross-sectional survey was conducted to assess the level and predictors of knowledge and awareness of preconception preparedness (PP) among engaged couples preparing for marriage in Rwanda, carried out from May to July 2024.

Study setting

In Rwanda, couples are required to attend premarital education sessions before receiving an official marriage license. These sessions are typically held at least once a month over a period of three to six months. The education is delivered at designated venues, mainly sector offices and churches. Therefore, participants for this study were recruited from premarital counselling sites across the country.

A total of 15 sites were selected from Rwanda's four provinces and Kigali City, covering both urban and rural settings to ensure broad geographic representation. These included Mushonyi, Gisenyi, and Kanama in the Western Province; Huye, Nyarusange (Muhanga District), and Kamonyi in the Southern Province; Muhoza (Musanze District), Ruli (Gakenke District), and Shyorongi (Rulindo District) in the Northern Province; Rwamagana, Kayonza, and Muhura (Gatsibo District) in the Eastern Province; and Kinyinya (Gasabo District), Nyamirambo (Nyarugenge District), and Masaka (Kicukiro District) in Kigali City. Each province contributed three sites, with Kigali City contributing three sites as well, ensuring balanced inclusion of both urban and rural populations.

Study population and eligibility criteria

The target population comprised engaged couples registered for civil or religious marriage during the study period. The legal age for official marriage in Rwanda is 21 years.[35] Inclusion criteria required both partners to be aged 21 years or older, resident in Rwanda, registered for civil or religious marriage within six months of the data collection date, and willing to provide written informed consent. Couples were also required to self-identify as intending to have children after marriage.

Exclusion criteria comprised: couples where either partner had previously been married; couples where the female partner was aged over 50 years; and couples where either or both partners were unwilling to participate. Couples where either partner had previously been married were excluded because the study aimed to characterize baseline PP knowledge among individuals entering a first formal union, a population for whom the preconception period represents a genuinely novel reproductive transition, and among whom prior exposure to antenatal or postnatal health education from a previous pregnancy could confound the baseline knowledge estimate. Couples where either partner was unable to communicate in Kinyarwanda or English were also excluded.

Sample size and sampling

The minimum sample size was calculated using the Cochran formula [36] for estimation of population proportions: $n = Z^2 \cdot p \cdot q / d^2$, where Z = 1.96 (95% confidence level), p = 0.50 (conservative prevalence estimate used in the absence of local PP data), q = 1 − p = 0.50, and d = 0.05 (5% margin of error), yielding a minimum of 384 couples.

The calculated sample was inflated to 670 couples to account for potential non-response and data incompleteness, and a final analyzed sample of 600 couples was retained after screening and exclusions (see Figure 1).

A three-stage multistage cluster sampling technique was employed to recruit participants. In Stage 1, fifteen districts were purposively selected across the four provinces and Kigali City (three districts per province/city) to ensure geographic representation of both urban and rural populations across Rwanda. In Stage 2, all sectors within each selected district were enumerated, and two sectors per district were randomly selected by blind draw. In Stage 3, 21 couples per selected sector were purposively selected from the premarital counselling attendance lists.

If a selected couple was ineligible or declined to participate, the next available couple was approached. Both partners from each selected couple were interviewed independently. Figure 1 presents the participant recruitment and selection flowchart. Of 1,543 couples registered for civil and religious marriage during the study period, 670 were screened for eligibility. Thirty-eight couples (5.7%) did not meet inclusion criteria and were excluded. Among the 632 eligible couples, nine (1.3%) withdrew voluntarily and 23 (3.4%) were excluded due to incomplete data. The final sample comprised 600 couples (90% of eligible couples), providing complete and analyzable data.

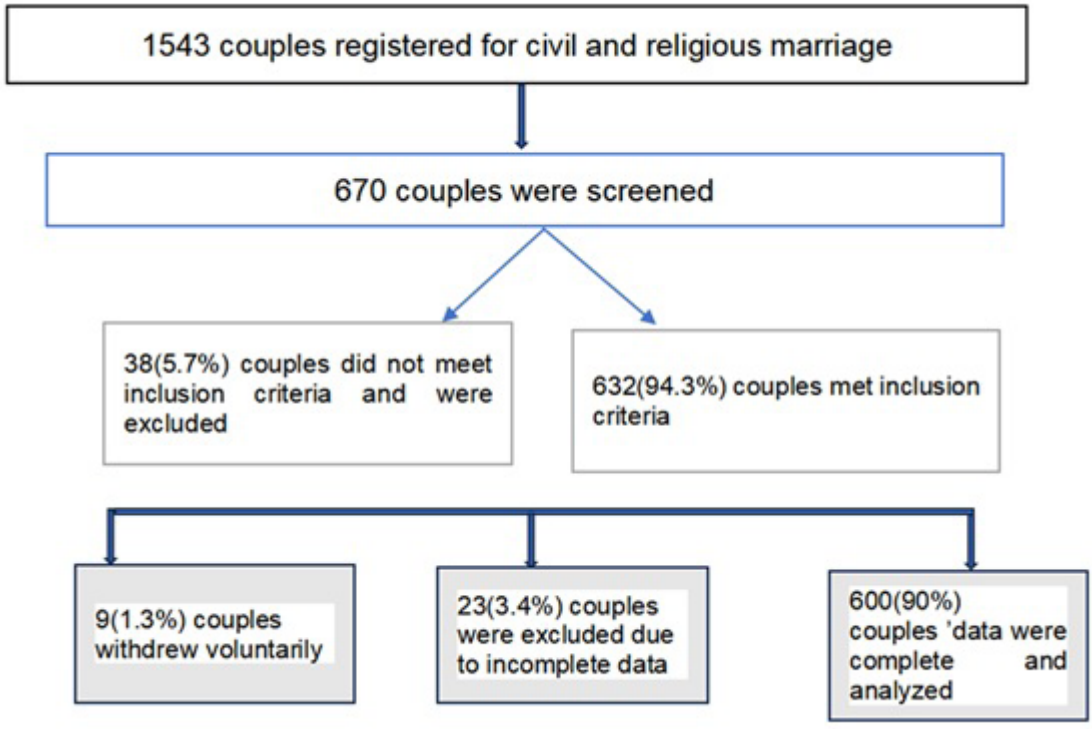

Figure 1. Participants' recruitment and selection flowchart

Data collection tool

A structured questionnaire was developed by the research team, informed by existing PP knowledge and awareness tools published in the literature,[25,26,29–31] the International Federation of Gynaecology and Obstetrics (FIGO) Preconception Care Checklist,[32] and consultations with public health experts and specialists in reproductive, maternal, neonatal, and child health. The tool was customized to the local context and study objectives.

The questionnaire comprised two parts. Part 1 contained three sections:

(i) socio-demographic characteristics; (ii) couple relationship and bond characteristics; and (iii) open short-answer questions assessing knowledge and awareness of preconception medical prophylaxis, health checks, and screenings, as well as preconception risky lifestyles, attitudes, and behaviours. Each response was scored using an embedded marking scheme, classifying answers as 'correctly answered,' 'not correctly answered,' or 'do not know.' Part 2 consisted of closed-ended Yes/No questions covering 15 key PP areas: general PP knowledge; routine preconception laboratory tests; chronic medical condition screening and stabilization; recommended vaccines for pregnancy planning; guidance on medicines, herbs, and supplements to avoid; weight management; smoking, alcohol, and drug avoidance; recommended physical exercises; dietary habits; prophylactic vitamin and folic acid intake; stress, rest, and relaxation; fertility awareness; environmental toxin and chemical exposure; family planning and reproductive life planning; and gender-based violence awareness.

A total of 19 items assessed knowledge and awareness across both parts. Each item was scored individually; the maximum possible score was 19 points (one point per correctly answered item). Individual scores were then expressed as percentages of the maximum possible score. Participants scoring ≥50% (≥10/19 correct items) were classified as having 'fair' knowledge and awareness (KA), while those scoring <50% (<10/19) were classified as having 'low' KA. This ≥50% threshold was selected in line with precedent in the preconception health literacy literature.[18,19] A sensitivity analysis using a ≥60% threshold yielded qualitatively identical conclusions, with 96.4% classified as low KA, confirming the robustness of findings to the choice of cut-off. To ensure linguistic and cultural validity, the questionnaire was initially developed in English and then subjected to forward translation into Kinyarwanda by qualifiedtranslators fluent in both languages, with careful attention to cultural nuances. A back-translation was subsequently performed by an independent third-party team to identify any discrepancies introduced during initial translation. The Kinyarwanda version was pilot-tested among 30 couples not included in the main study to evaluate clarity, cultural appropriateness, and data capture effectiveness, and the tool was revised accordingly.

Data collection procedure

The questionnaire was administered by ten trained research assistants (nurses and midwives) using a structured interview format, in which each item was read aloud to participants and responses recorded on tablets or smartphones using the KoBoToolbox digital data collection application. This interviewer-administered approach was adopted to accommodate participants with varying literacy levels, consistent with the predominantly rural and low-education study population.

Prior to commencing fieldwork, all ten research assistants and two supervising public health specialists completed a two-day standardized training program covering: the study's purpose and objectives; structured interview and questionnaire administration procedures; ethical conduct during data collection; participant rights and confidentiality; and practical use of the KoBoToolbox application on smartphones, tablets, and computers. Written informed consent was obtained from each participant before the interview. Interviews were conducted privately, with each partner interviewed separately by a dedicated research assistant (one assigned to male participants, one to female participants), using the same couple identification code supplemented by 'M' or 'F' to enable dyadic linkage during analysis. KoBoToolbox automatically computed participants' scores before they left, and data were securely transmitted to the collection server in real time. Supervisors conducted daily checks for data completeness and consistency; incomplete records were flagged and excluded.

Data management and analysis

Prior to analysis, an initial data inspection assessed consistency, completeness, and missing values. Data were coded and entered into Microsoft Excel before export to IBM SPSS Statistics version 29 for cleaning and analysis. Descriptive statistics (frequencies, percentages, means, and standard deviations) characterized the sample and summarized KA levels. Before inferential analysis, normality of continuous variables was assessed using the Shapiro-Wilk, Kolmogorov-Smirnov, and Anderson-Darling tests to obtain a more robust assessment of the distribution of variables. Independent samples t-tests compared mean KA scores between groups. Dyadic analysis was conducted at the couple level to determine the proportion of couples in which both partners demonstrated correct knowledge. Multiple binary logistic regression identified independent predictors of fair versus low KA, with results expressed as adjusted odds ratios (AOR) with 95% confidence intervals (CI). Statistical significance was set at $p < 0.05$.

Ethical considerations

This study received ethical approval from the Institutional Review Board (IRB) of the College of Medicine and Health Sciences at the University of Rwanda (Approval No. 337/CMHS-IRB/2024). Additional permissions were obtained from local authorities and church leaders at district and sector levels. All procedures were conducted in accordance with the Declaration of Helsinki. Written informed consent was secured from all participants after explaining the study's purpose, procedures, voluntary nature, and benefits. Participants were assured of their right to withdraw at any time without consequences. Confidentiality was maintained through coded anonymity; all interviews were conducted in a private environment, and raw data were accessible only to the principal investigator.

Results

Socio-demographic and relationship characteristics

Table 1. Socio-demographic characteristics of participants (N=1200)

Characteristic	Category	n	%
Sex	Female / Male	600 / 600	50.0 / 50.0
Age (years)	21–30	776	64.7
	31–40	346	28.8
	≥41	78	6.5
	Mean = 29.5 yrs (SD, 5.5); range 21–45		
Education level	Non-literate	53	4.4
	Primary	550	45.8
	Secondary & TVET	494	41.2
	University	103	8.6
Occupation	Cultivator/Farmer & Self-employed	712	59.4
	Private sector	174	14.5
	Public sector	71	5.9
	Unemployed/Student	199	16.6
Religion	Christian	968	80.7
	Non-Christian	180	15.0
	No religious affiliation	52	4.3
Residence	Rural	978	81.5
	Urban	222	18.5
Monthly income	≤200,000 RWF	726	60.5
	>200,000 RWF	474	39.5

Note: TVET = Technical and Vocational Education and Training. Christian includes Catholic, Protestant, and Adventist. PP = Preconception Preparedness. Socio-demographic percentages based on N=1,200; relationship profile percentages based on n=600 couples.

Table 1 presents the socio-demographic and relationship characteristics of the 1,200 study participants (600 couples). The majority of participants were aged 21–30 years (64.7%), with a mean age of 29.5 years (SD, 5.5; range 21–45 years). Nearly half of the respondents had attained primary education (45.8%), followed by secondary or TVET education (41.2%), while only 8.6% had university-level education. Most participants were farmers or self-employed. The majority were Christians, lived in rural areas, and reported a monthly income of ≤200,000 RWF. Detailed sociodemographic characteristics are presented in Table 1.

Relationship characteristics/profile of participants

Figure 2 presents the relationship characteristics of the 600 premarital couples and their prior exposure to preconception care (PCC) information.

Most couples (65.3%, n=392) had been in a relationship for 24 months or less, while 34.7% (n=208) had been together for more than 24 months. The majority were scheduled to marry within three months (89.3%, n=536) and intended to have their first child within one year after marriage (89.3%, n=536). Only 21.8% (n=131) had undergone HIV testing together, whereas 78.2% (n=469) had not. More than half of the couples (56.3%, n=338) were not living in the same residential zone.

Prior exposure to PCC information was notably low. Overall, only 3.3% of participants (n=40) reported previous exposure to PCC information, while 96.7% (n=1,160) had never received such information. Exposure was higher among female partners (5.5%, n=33/600) than male partners (1.2%, n=7/600). At the couple level, only 20 couples (3.3%) reported prior PCC information exposure.

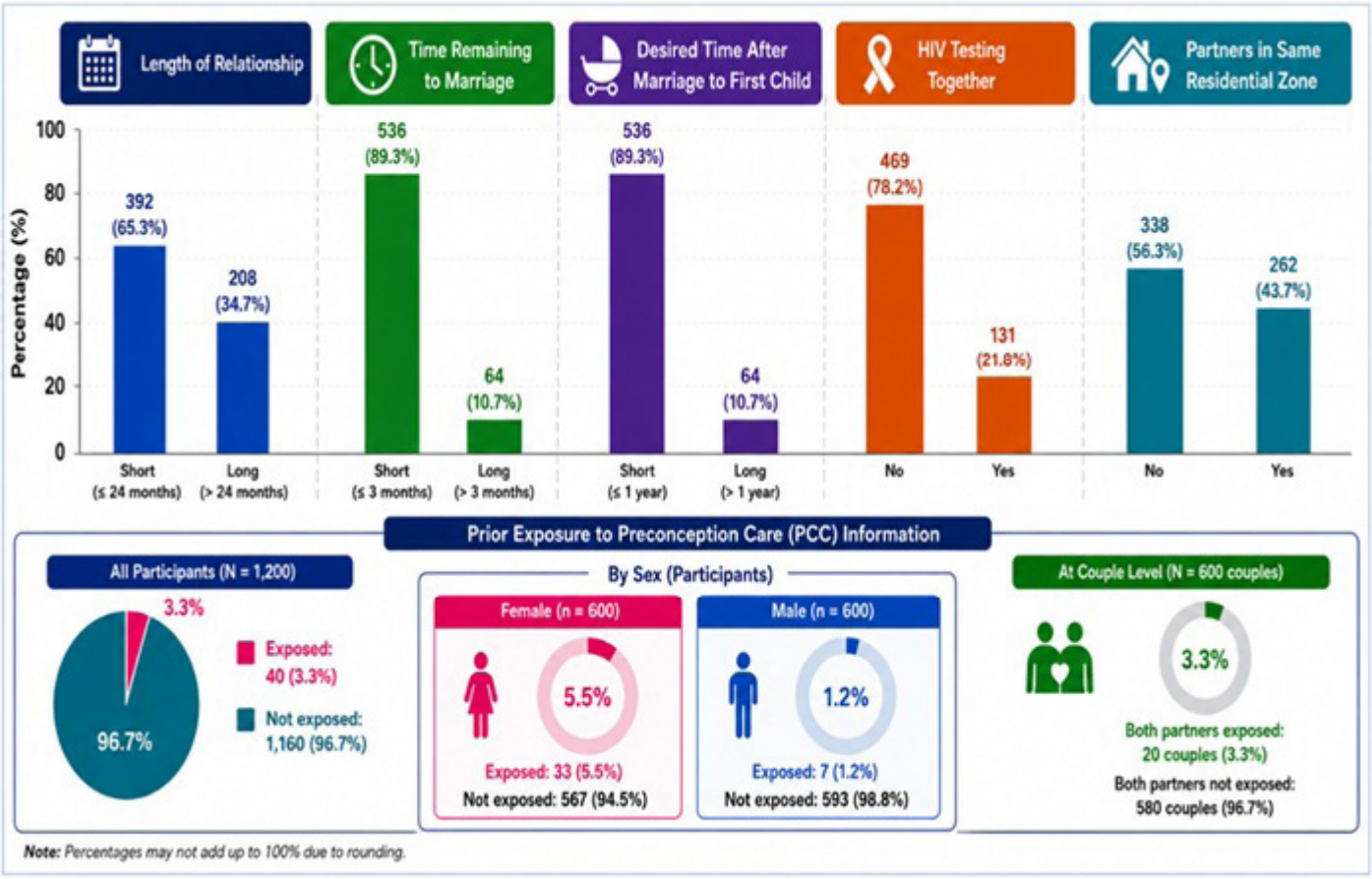

Figure 2. Relationship characteristics and prior exposure to preconception care information among premarital couples (N = 600 couples; 1,200 participants).

Distribution of knowledge and awareness of preconception preparedness among participants

Table 2 presents the distribution of knowledge and awareness across different domains. Knowledge of preconception screening and examinations was very low, with no item correctly answered by more than 25.5% of participants. Male participants generally scored lower than female participants. At the dyadic level, fewer than 14% of couples had correct knowledge on any single item. In the attitude, behaviour, and lifestyle domain, awareness of gender-based violence was an exception, with 80.2% of participants answering correctly and 52.0% of couples showing correct responses. All other items in this domain had correct response rates below 25%.

Table 2. Knowledge and awareness of preconception preparedness among participants

KA Item	Male n (%)	Female n (%)	Total n (%)	Dyadic n (%)
Preconception screening & examinations				
Importance of pre-pregnancy screening	121 (20.2)	185 (30.8)	306 (25.5)	82 (13.7)
Where to seek pre-pregnancy care	138 (23.0)	147 (24.5)	285 (23.7)	72 (12.0)
When to start preconception preparedness	4 (0.7)	31 (5.2)	36 (3.0)	2 (0.3)
Effect of pre-pregnancy health status	96 (16.0)	109 (18.2)	205 (17.1)	51 (8.5)
Family health history impact	84 (14.0)	123 (20.5)	207 (17.2)	68 (11.3)
Preconception genetic conditions	52 (8.7)	64 (10.7)	116 (9.8)	24 (4.0)
Blood tests and check-ups	107 (17.8)	132 (22.0)	239 (19.9)	47 (7.8)
Chronic medical conditions screening	113 (18.8)	128 (21.3)	241 (20.1)	56 (9.3)
Prophylactic regimens and vaccines	16 (2.7)	31 (5.2)	47 (3.9)	17 (2.8)
Attitude, behaviour & lifestyle				
Regular fertility check-up visit	7 (1.2)	40 (6.7)	47 (3.9)	5 (0.8)
Family planning and reproductive life plan	124 (20.7)	147 (24.5)	271 (22.6)	59 (9.8)
Gender-based violence and consequences	402 (67.0)	560 (93.3)	962 (80.2)	312 (52.0)
Medicines, herbs, and supplements to avoid	8 (1.3)	26 (4.3)	34 (2.8)	5 (0.8)
Weight regulation and management	69 (11.5)	103 (17.2)	172 (14.3)	57 (9.5)
Eating habits and behaviours	67 (11.2)	92 (15.3)	159 (13.5)	63 (10.5)
Smoking, alcohol, and drug use	113 (18.8)	80 (13.3)	193 (16.1)	74 (12.3)
Stress, rest, and relaxation precautions	125 (20.8)	164 (27.3)	289 (24.1)	112 (18.7)
Physical exercises and activities	148 (24.7)	128 (21.3)	276 (23.0)	120 (20.0)
Environmental exposure self-protection	9 (1.5)	6 (1.0)	15 (1.3)	4 (0.7)

Note: n = number who answered correctly; Total % = percentage of all 1,200 participants; Male/Female % = percentage of 600 individuals per sex group; Dyadic % = percentage of 600 matched couples where both partners answered correctly.

Overall, knowledge and awareness level towards preconception preparedness

The overwhelming majority (91.2%) of participants were classified as having low KA, with only 8.8% demonstrating fair KA. At the dyadic level, 95.3% of couples had both partners in the low KA category; only 4.7% of couples demonstrated shared fair awareness. A notable gender disparity was observed: 12.0% of females demonstrated fair KA compared to 2.8% of males (Figure 3).

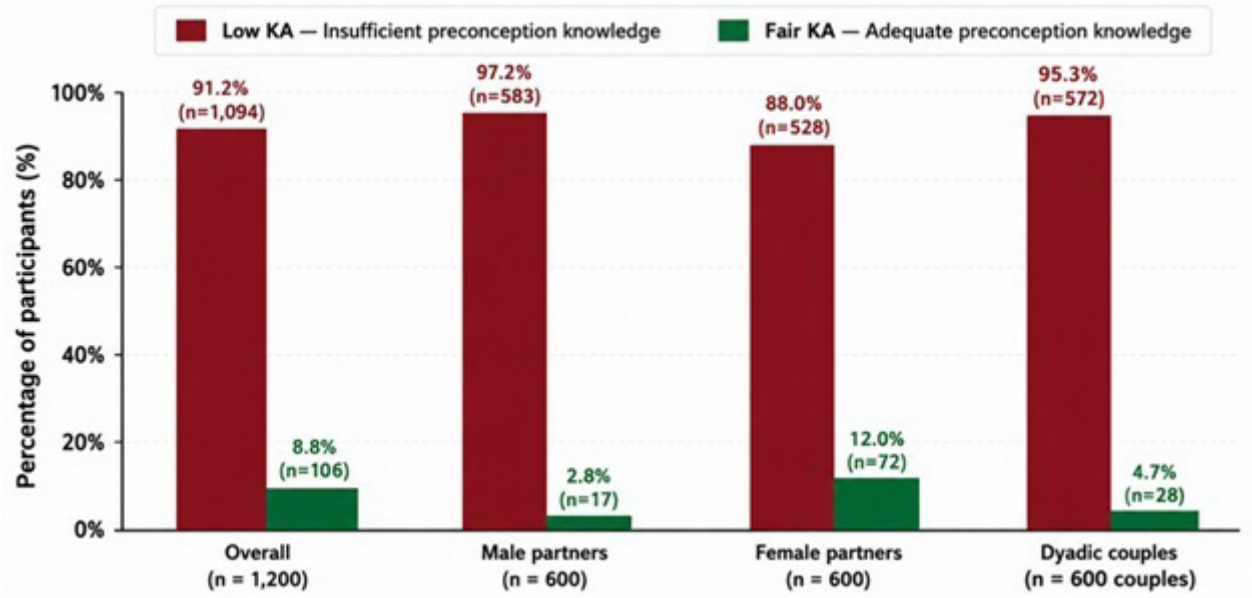

Figure 3. Overall knowledge and awareness (KA) level towards preconception preparedness by participant group - overall, male partners, female partners, and dyadic couples (n = 1,200)

Source: Study data. KA = Knowledge and Awareness. Dyadic n = 600 couples. Percentages rounded to 1 d.p.

Factors and predictors of KA of preconception preparedness

Table 3 presents factors and predictors of KA. Significant factors associated with KA included sex (t=3.52; p<0.001), education level (t=−13.37; p<0.001), and residence (t=3.64; p=0.042). Age category, religion, and occupation showed no significant associations (all p>0.05).

Multiple logistic regression identified sex, education level, residency, and prior PP information exposure as independent significant predictors.

Females were twice as likely as males to have fair KA (AOR=2.1; 95% CI: 1.22–3.62; p=0.007).Education was the strongest predictor (AOR=6.3; 95% CI: 2.88–13.82; p=0.004). Urban residents had 70% higher odds of fair KA (AOR=1.7; 95% CI: 1.07–2.70; p=0.009). Prior PP information exposure was associated with 3.25-fold higher odds of fair KA (AOR=3.25; 95% CI: (1.42–7.43); p=0.002). All relationship variables were non-significant (all p>0.05).

Table 3. Factors and predictors of knowledge and awareness of preconception preparedness

Variable	Category	n (%)	Mean KA ± SD	t	P	AOR (95% CI)	p
Socio-demographic characteristics (n = 1,200)							
Sex	Male (ref)	600 (50.0)	32.4 ± 5.2	—	**<0.001***	1.0 (ref)	**0.007***
	Female	600 (50.0)	34.3 ± 7.4	3.52		2.10 (1.23–3.52)	
Education	Low (ref)	603 (50.2)	32.4 ± 5.4	—	**<0.001***	1.0 (ref)	**0.004***
	High	597 (49.8)	43.4 ± 7.8	−13.37		6.27 (2.91–13.51)	
Residency	Rural (ref)	978 (81.5)	31.0 ± 4.8	—	**0.042***	1.0 (ref)	**0.009***
	Urban	222 (18.5)	33.8 ± 6.6	3.64		1.69 (1.15–2.49)	

Table 3. Continued

Variable	Category	n (%)	Mean KA ± SD	t	P	AOR (95% CI)	p
Socio-demographic characteristics (n = 1,200)							
Age category	Young (21–35) (ref)	1,122 (93.5)	33.2 ± 6.3	1.82	0.173	1.10 (0.99–1.24)	0.052
	Advanced (>35)	78 (6.5)	34.8 ± 7.8				
Religion	Christian (ref)	1,148 (95.7)	33.2 ± 6.6	1.25	0.712	1.12 (0.96–1.31)	0.167
Occupation	Employed (ref)	458 (38.2)	33.4 ± 6.0	1.00	0.322	1.09 (0.93–1.28)	0.284
Relationship characteristics (n = 600 couples)							
HIV testing together	No (ref)	469 (78.2)	32.9 ± 6.1	1.05	0.281	1.0 (ref)	0.691
	Yes	131 (21.8)	33.5 ± 6.0			1.10 (0.60–2.03)	
Partners from same zone	No (ref)	338 (56.3)	32.9 ± 6.1	0.98	0.315	1.0 (ref)	0.115
	Yes	262 (43.7)	33.6 ± 6.0			1.48 (0.91–2.42)	
Length of relationship	Short (ref)	392 (65.3)	33.1 ± 6.2	1.02	0.310	1.0 (ref)	0.952
	Long	208 (34.7)	32.9 ± 6.1			1.02 (0.63–1.66)	
Time to marriage	Short (ref)	536 (89.3)	33.0 ± 6.1	0.90	0.354	1.0 (ref)	0.311
	Long	64 (10.7)	33.8 ± 6.3			2.29 (0.56–9.46)	
Desired child timing	≤1 year (ref)	536 (89.3)	33.1 ± 6.1	0.92	0.349	1.0 (ref)	0.490
	Yes >1 year	64 (10.7)	33.8 ± 6.2			1.21 (0.71–2.08)	
Prior PP exposure	No (ref)	580 (96.7)	33.0 ± 6.1	—	**<0.001***	1.0 (ref)	**0.002***
	Yes	20 (3.3)	44.1 ± 6.3	7.86		3.25 (1.42–7.43)	

Note:

- *p < 0.05. AOR = Adjusted Odds Ratio; CI = 95% Confidence Interval; ref = Reference category; KA = Knowledge and Awareness; PP = Preconception Preparedness.
- AORs were obtained from a multivariable logistic regression model for fair Knowledge and Awareness (KA), adjusted simultaneously for all variables listed in this table (sex, education, residency, age category, religion, occupation, HIV testing together, partners from same zone, length of relationship, time to marriage, desired child timing, and prior PP exposure).
- Low Education level = non-literate and primary education; High Education level = secondary, TVET, and university education.
- Short length of relationship ≤ 24 months; Long length of relationship ≥ 24 months.
- Short time remaining to marriage ≤ 3 months; Long time remaining to marriage ≥ 3 months.
- Short desired time to first child after marriage ≤ 1 year; Long desired time to first child after marriage ≥ 1 year.
- Because the 'Prior PP exposure' reference group is small (n = 20), the AOR and 95% CI for this variable were estimated using Firth's penalized-likelihood logistic regression with profile-likelihood confidence intervals, rather than standard Wald-based maximum-likelihood estimation, to obtain a stable and statistically appropriate confidence interval.

Discussion

This study assessed preconception preparedness (PP) knowledge and awareness among 600 engaged couples preparing for marriage at different sites including churches and sectors in Rwanda. Four key findings emerged: knowledge and awareness of PP were generally low across all study participants; women demonstrated higher knowledge than men; education level and urban residence were associated with better knowledge; and previous exposure to PP information was associated with higher knowledge and awareness.

Overall low PP knowledge and awareness across participants

Overall, knowledge and awareness levels towards PP were low, with 91.2% of participants and 95.3% of couples classified in the low category. These findings suggest that preconception health information has not been widely disseminated among this population. Similar findings have been reported in several low- and middle-income countries.

Studies from Ethiopia, Sudan, and Nigeria reported low levels of preconception care knowledge and awareness among reproductive aged population [30,39,41,42] demonstrating that limited awareness of preconception health remains a common challenge across many African settings. These similarities may reflect the limited integration of preconception care into routine reproductive health services in many countries within the region.[14]

Knowledge gaps were observed across nearly all assessed domains. Awareness of the appropriate timing of preconception preparation, recommended screening and examinations, preventive interventions, and vaccination was particularly low. Comparable deficiencies have been reported in studies from Ethiopia and Sri Lanka, where participants demonstrated limited knowledge of folic acid supplementation, pre-pregnancy screening, and other evidence-based preconception interventions.[43,44] Such findings suggest that awareness of specific preconception health practices remains inadequate even among individuals who may have some general understanding of reproductive health.

The low levels of PP knowledge observed in this study are lower than those reported in some other settings. For example, a study in Malawi found that approximately 54% of participants had heard of preconception care,[45,46] while research from Cameroon reported substantially higher levels of preconception knowledge, with 88% of respondents demonstrating good knowledge among those who had heard of the concept. [47] However, these comparisons should be interpreted cautiously because of differences in study populations, measurement tools, and recruitment approaches.The Cameroonian study recruited participants through social media platforms, which may have resulted in a more educated and urban sample than the predominantly rural population included in the present study. Similarly, awareness of preconception care does not necessarily equate to comprehensive knowledge and awareness as measured in this study. The findings also contrast with evidence from high-income countries, where awareness of preconception health is generally higher. Studies conducted in the United Kingdom and Australia have reported greater knowledge of key preconception health recommendations among reproductive-aged adults.[48,49] These differences may reflect the longer history of integrating preconception care into primary healthcare services, stronger health promotion systems, and broader public health campaigns in those settings. [23] Although direct comparisons are limited by contextual differences, the contrast highlights the influence that health system structures and public health investment may have on population awareness.

Gender disparity in PP knowledge and awareness

A gender difference in PP knowledge and awareness was observed, with female participants demonstrating higher knowledge levels than male participants. This finding is consistent with studies from Jordan and Indonesia, which similarly reported higher reproductive health knowledge among women.[50,51] Women are generally more likely to encounter reproductive health information through maternal health services, family planning programs, and community health initiatives. [52] In Rwanda, where reproductive health services have traditionally focused on women, greater female exposure to reproductive health information may partly explain this difference. Similar demographic disparities in reproductive health knowledge, including by race, ethnicity, and age, have been documented elsewhere.[53]

However, the gender disparity observed in this study differs from findings reported in some higher-income settings. Craig et al. [54] found that men demonstrated equal or higher knowledge in selected preconception domains across several countries, while Shawe et al. [48] reported relatively high levels of preconception knowledge among men in England.

These contrasting findings suggest that gender differences in preconception knowledge may be influenced by how reproductive health information is delivered within different health systems and cultural contexts. Importantly, despite women having relatively higher knowledge than men in the present study, knowledge levels remained low among both groups.

Education level and rural residency as predictors of PP knowledge and awareness

Educational attainment emerged as one of the strongest factors associated with knowledge and awareness. Participants with secondary or higher education were more likely to demonstrate better PP knowledge than those with primary education or less. This finding is consistent with studies from Ethiopia, Uganda, and Nigeria, which reported positive associations between education and preconception health knowledge. [44,55,56] Higher education may improve access to health information, strengthen health literacy, and enhance the ability to understand and apply health-related messages.[57]

Urban residence was also associated with higher PP knowledge and awareness. Similar urban-rural disparities have been documented in studies from Ethiopia, Uganda, and the United States.[56,58–60] Individuals living in urban areas often have greater access to healthcare facilities, health information sources, and educational opportunities than those residing in rural communities. Limited access to health information channels, such as public libraries, in rural settings may further compound these disparities.[61] Given that most participants in this study lived in rural areas, the overall low knowledge levels observed may partly reflect broader inequalities in access to health information and services.

Prior PP information exposure and its association with higher knowledge and awareness

Participants who reported prior exposure to PP information were more likely to demonstrate higher knowledge and awareness. Although this finding should be interpreted cautiously because of the small number of participants with prior exposure, it is consistent with previous studies showing a positive relationship between exposure to health information, health literacy, and reproductive health knowledge, including preconception preparedness. [14,23,57,62,63] The finding that only a small proportion of participants had ever received PP information further suggests that preconception health education is not routinely reaching couples before pregnancy.

Strengths and limitations

This study has several strengths. It is among the first studies to assess preconception preparedness (PP) knowledge and awareness among engaged couples in Rwanda and one of the few in sub-Saharan Africa to use a dyadic design by including both partners in each couple. The large sample of 1,200 participants recruited from 15 districts across Rwanda enhances the representativeness of the findings. In addition, the use of both open-ended and closed-ended questions provided a comprehensive assessment of knowledge and awareness across 19 PP domains.

As limitations, the following should be considered. The cross-sectional design does not allow causal inferences regarding factors associated with PP knowledge and awareness. The interviewer-administered questionnaire may have introduced social desirability bias, potentially leading participants to over-report their knowledge. The study included only couples preparing for formal civil or religious marriage and may not represent couples in informal unions. The association between prior PP information exposure and knowledge should be interpreted cautiously because only a small proportion of participants reported previous exposure, resulting in an imprecise estimate. Finally, the quantitative design did not explore cultural beliefs, perceptions, and other contextual factors that may influence PP knowledge and awareness.

Conclusion

Overall, the findings show low levels of preconception preparedness knowledge and awareness among engaged couples in Rwanda. The limited prior exposure to PP information among most participants suggests that preconception health education is not routinely reaching the community. Given that most couples intended to have children soon after marriage, the premarital period may provide an important opportunity for delivering PP information and supporting informed reproductive health decision-making. These findings highlight the need for targeted, evidence-based PP education interventions for engaged couples. Integrating structured PP content into existing premarital education and counselling programs, complemented by community-based outreach, health worker training, and mass media campaigns, may help improve awareness and promote informed preparation for pregnancy. Further research should explore the sources and accessibility of preconception information among premarital couples, investigate sociocultural and health-system factors influencing PP knowledge and awareness in Rwanda.

Authors' contributions

RN: Conceptualization, data collection, formal analysis, writing original draft, review and editing. TCU: Conceptualization, methodology, formal analysis, review and editing. DG: Conceptualization, methodology, formal analysis, review and editing. OB: Review and editing, critical revision. IMC: Supervision, writing original draft, review and editing. HL: Writing original draft, review and editing. JRL: Writing original draft, review and editing.

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Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this article.

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Generative AI use

The authors used generative AI tools (primarily ChatGPT and Grok) solely for grammar correction, typo fixing, language polishing, and improving sentence clarity and flow in the manuscript. All AI-assisted edits were reviewed, verified, and finalized by the authors. No AI tool was used to generate original content, analyze data, interpret results, or draft any scientific sections. The authors take full responsibility for the accuracy, integrity, and originality of the final manuscript.

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