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Knowledge about danger signs in pregnancy and its determinants among pregnant teenagers attending antenatal care at public health facilities in Rubirizi District, Southwestern Uganda

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Abstract

Introduction: Pregnancy complications pose significant risks to teenagers and their unborn babies. Despite the high prevalence of these complications, there remains a substantial knowledge gap regarding danger signs in pregnancy among this vulnerable group. This study assessed the level of knowledge about pregnancy danger signs and its determinants among pregnant teenagers attending antenatal care (ANC) in public health facilities of Rubirizi District, Uganda

Methods: A mixed-methods approach was utilized, combining quantitative data from a survey of 237 pregnant teenagers with qualitative insights on facility factors from key informant interviews (KIIs) with 10 healthcare providers. The survey evaluated knowledge about danger signs and determined individual, social, and facility-related factors. Quantitative data were collected using a Kobo-designed questionnaire and analyzed in STATA, while qualitative data were analyzed thematically.

Results: Only 11.0% (26/237) of pregnant teenagers had good knowledge of danger signs in pregnancy. Awareness was highest for vaginal bleeding (23.6%) and excessive vomiting (21.1%), but was low for severe headaches (5.5%) and convulsions (2.5%). Factors significantly associated with good knowledge included having been pregnant more than once (AOR = 3.3, 95% CI: 1.05–10.55), access to a telephone (AOR = 5.4, 95% CI: 1.01–28.72), living in a community where teenage pregnancy was considered taboo (AOR = 3.5, 95% CI: 1.29–9.69), receiving follow-up during the current pregnancy (AOR = 3.8, 95% CI: 1.23–11.69), and being divorced (AOR = 20.5, 95% CI: 2.79–151.13). Participants whose husbands were casual labourers had lower odds of good knowledge compared with those whose husbands were civil servants (AOR = 0.1, 95% CI: 0.01–0.44). Qualitative findings indicated that health workers' attitudes and skills, availability of educational resources, and follow-up by health workers were perceived as important factors related to knowledge of danger signs in pregnancy**.**

Conclusion: The study identified a significant knowledge gap on pregnancy danger signs among pregnant teenagers in Rubirizi District. To enhance knowledge, health workers should adopt a friendly and supportive approach, organize special antenatal care clinics, and engage experienced teenage mothers as peer educators to share knowledge and experience

Background

The World Health Organization (WHO) defines pregnancy danger signs as symptoms that can be easily be recognized by non-health workers but lead to severe complications if not promptly managed (1). These include vaginal bleeding, severe headaches, oedema, convulsions, fever, and generalized weakness, all of which require timely care-seeking from skilled providers. In developing countries, knowledge of obstetric danger signs among pregnant women remains low, yet it is crucial for reducing maternal and neonatal mortality (2).

Globally, teenage pregnancy remains a major public health concern, with approximately 21 million pregnancies occurring annually among adolescents in low- and middle-income countries (3). While high-

income countries such as the United States have experienced declining teenage pregnancy rates and relatively high awareness levels, evidence from low-resource settings shows wide disparities. For example, knowledge of danger signs ranges from 100% in parts of India to between 21.9% and 63.2% across African countries such as the Democratic Republic of Congo, Tanzania, South Africa, and Ethiopia. Sub-Saharan Africa bears a disproportionate burden, with about 24.88% of pregnancies occurring among adolescents, compounded by challenges such as poverty, limited education, stigma, and poor access to healthcare (4, 5).

In Uganda, awareness of pregnancy danger signs among women varies between 52% and 68%, influenced by individual, social, and health system factors including education, parity, marital status, income, access to information, and antenatal care (ANC) utilization (6, 7). Health facility factors such as quality of health education, provider attitudes, and follow-up mechanisms also play a critical role, although gaps in health worker capacity may hinder effective knowledge transfer (6, 7). Rubirizi District, located in southwestern Uganda, has a population of approximately 129,149, with 13.1% being adolescent girls aged 10–19 years (8). Recent DHIS 2 data (2023) indicate that over 5.7% of pregnant teenagers in the district experience complications. The convergence of teenage pregnancy with socioeconomic vulnerabilities, limited healthcare access, and psychosocial stressors creates a unique risk profile in this setting. Despite the importance of ANC services provided through public health facilities, there is limited context-specific evidence on teenagers' knowledge of pregnancy danger signs and associated factors. Therefore, we aimed to assess the level of knowledge about pregnancy danger signs and its determinants among pregnant teenagers attending ANC in public health facilities of Rubirizi District, Uganda.

Materials and Methods

Study Design and Setting

This study employed a facility-based mixed-methods approach from June to December 2024. A convergent parallel design was used for assessing facility-related factors, whereby quantitative and qualitative data were collected simultaneously and analyzed separately to provide a comprehensive understanding of determinants of knowledge on pregnancy danger signs. The study was conducted in Rubirizi District, a predominantly rural district in southwestern Uganda bordering Lake Edward and the Democratic Republic of Congo. The district is characterized by diverse geographical features, including crater lakes and protected areas such as Queen Elizabeth National Park. According to the 2024 National Population and Housing Census, Rubirizi District had a population of 168,211 people (9). Healthcare services are provided through both public and private health facilities, with public health facilities providing antenatal care (ANC) services.

Study population and eligibility criteria

The study population comprised pregnant teenagers aged 13–19 years attending antenatal care (ANC) services at public health facilities in Rubirizi District. This group was selected due to their heightened

vulnerability to social stigma, limited access to resources, and insufficient maternal health knowledge. The study was conducted across 10 public health facilities (9 Health Centre IIIs and 1 Health Centre IV) providing ANC services, which serve as key entry points for maternal healthcare and early identification of pregnancy-related complications. In-charges of Maternal and Child Health (MCH) from these facilities were also included as key informants.

Eligible participants were pregnant teenagers who had attended ANC services within the previous six months. In addition, all available MCH in-charges at the selected facilities during the study period were included for key informant interviews.

Sample size estimation and sampling procedures

A sample size of 241 pregnant teenagers was determined using the formula by Kish and Leslie (7), (95% confidence level, 5% margin of error, and 50% assumed prevalence since there is no previous study done. The initial sample (384) was adjusted for a finite population of 507 pregnant teenagers attending ANC in Rubirizi District and a 10% non-response rate. The sample was proportionally allocated across the 10 public health facilities.

A multistage sampling procedure was used for the quantitative study. All 10 health facilities providing ANC (HC IIIs and IVs) were purposively selected to participate in the study. With the aid of facility in-charges and heads of MCH sections, a sampling frame was generated using ANC registers where the lists of active teenage pregnant mothers who had attended ANC within the previous six (6) months were generated for each participating health facility. These included individual identifiers, appointment dates, addresses and telephone contacts. The sample size was proportionally allocated to each participating health facility based on the number of eligible teenage pregnant mothers registered at the facility. Random sampling was applied to select participants within each health facility after selected participants were contacted by the researcher and interviewed during their appointment dates. Those unavailable during data collection were traced through Village Health Teams and later interviewed face-to-face.

For the qualitative interviews, all 10 heads of MCH in participating health facilities were purposively selected as key informants based on their positions, roles and experiences.

Data Collection

Data were collected using a mixed-methods approach. Quantitative data were obtained through a survey administered to pregnant teenagers to assess knowledge of pregnancy danger signs and associated individual, social, and selected facility-related factors, including ANC follow-ups, health education, and health worker attitudes. The tool was translated to local language spoken in the area (*Runyankole*), to ease the data collection process

Qualitative data were collected through key informant interviews (KIIs) with MCH in-charges from 10 participating health facilities to explore facility-level determinants of knowledge. These participants were

selected due to their roles and experience in ANC service delivery. The KII guide was also translated to the local language.

A structured questionnaire programmed in Kobo Collect was used to capture quantitative data on socio-demographic, reproductive, and social characteristics. A KII guide was used to collect qualitative data on ANC service delivery, health education, and communication of pregnancy danger signs. A team of two research assistants at the level of Bachelor of Public Health-Health Promotion training collected the data.

Measurement of variables

Dependent variable: Knowledge of danger signs in pregnancy was measured using a 9-item index that included vaginal bleeding, convulsions, blurred vision, excessive vomiting, high-grade fever, severe headache, swollen hands and face, loss of fetal movements and severe abdominal pain (10, 11). These were assessed with yes or no response. A teenager recognizing at least three signs (≥33.3%) was classified as having high knowledge, else low (12).

Independent Variables: These included individual factors such as socio-demographic characteristics (age, residence, marital status, level of education of the respondent, occupation of the respondent, level of education of her husband, and employment status of her husband), parity, gravida, ANC attendance, and history of stillbirth; social factors (religion, media exposure, cultural beliefs and practices, source of information) and facility factors (ANC follow-ups, health education, health worker skills and attitude, source of and mode of delivery of information).

Data management and analysis

Quantitative data collected via Kobo Collect were exported to MS Excel for cleaning and analyzed using STATA/SE 15.0. Data were securely stored on a password-protected computer accessible only to the researcher. Descriptive statistics summarized knowledge of pregnancy danger signs using percentages, means, and ranks. Frequency distributions and cross-tabulations examined associations between knowledge and independent variables.

Bivariate logistic regression identified candidate factors ($p \leq 0.25$), followed by multivariable logistic regression to determine significant predictors ($p < 0.05$), adjusting for multicollinearity. Model fit was assessed using goodness-of-fit tests, and adjusted odds ratios (AORs) were reported for significant determinants.

Qualitative data from key informant interviews with MCH in-charges were audio-recorded in English, transcribed verbatim, and reviewed for completeness and accuracy. The researcher repeatedly read the transcripts to achieve familiarization with the data before coding. Meaningful text segments were identified and assigned descriptive codes, which were generated inductively, with initial codes generated directly from the data rather than from a pre-determined coding framework. These codes were subsequently grouped into categories reflecting shared patterns across responses, and broader themes

and subthemes were developed from related categories, reflecting facility-level factors influencing knowledge and awareness of pregnancy danger signs. The coding framework was iteratively reviewed and refined as analysis progressed to ensure consistency and capture emerging concepts. Thematic analysis involved comparing responses across key informants to identify areas of convergence and divergence. This process enabled the identification of commonalities and differences in participants' responses and helped ensure that the themes were grounded in data. Illustrative quotes were selected to support and contextualize the identified themes and to ensure that the findings remained grounded in participants' perspectives and were presented without personally identifying information. To enhance analytical rigour and quality assurance, the coding framework and emerging themes were reviewed and discussed among members of the research team, and any discrepancies were resolved through consensus, ensuring consistency and credibility in the analysis process. The qualitative findings were used to provide contextual explanations for the quantitative findings on knowledge of pregnancy danger signs.

Quality control and quality assurance

To ensure reliable and accurate data, quality control measures included training research assistants on study objectives, ethics, cultural sensitivity, and data collection tools. Data collection instruments were pretested with pregnant teenagers from two randomly selected facilities, and findings were used to refine tools and procedures. Daily field reviews were conducted to check questionnaires for completeness and accuracy.

Quality assurance was maintained through electronic data collection using Kobo Collect, which included built-in checks and prompts to reduce errors and missing data. Detailed instructions were provided to the data collector, and all procedures were supervised to ensure adherence to protocols and high-quality data capture throughout the study.

Results

Demographic characteristics

The average age of the respondents was 17.9 years (± 1.27 SD), with the majority, 72.6% (172/257), falling in the 18-19 year age group. A significant proportion of the teenagers, 74.7% (177/237), commuted distances ranging from 1-5 kilometres to access health facilities for ANC. Among the teenage mothers, 69.2% (164/237) were either married or cohabiting, while 26.2% (62/237) were single, 43.0% (102/237) were housewives, and 40.9% (97/237) did not complete primary school. The majority, 59.5% (141/237), of their husbands were casual labourers. In terms of religion, over 56.5% (134/237) were identified as Catholic, while 11.0% (27/237) were Muslims **(Table 3).**

Table 3: Demographic characteristics of teenage pregnant mothers who attended ANC

Variable	Category	Frequency (n=237)	Percentage
Age group (years)	13-17	65	27.4
	18-19	172	72.6
Residence	Rural	190	80.2
	Semi Urban	45	19.0
	Urban	02	0.8
Marital status	Single	62	26.2
	Married or cohabiting	164	69.2
	Divorced or widowed	11	4.6
Occupation	House wife	102	43.0
	Day/causal labourer	38	16.0
	Clerical work	02	0.8
	Peasant farmer	18	7.6
	Student	13	5.5
	Unemployed	63	27.0
Occupation of the spouse	Civil servant	06	2.5
	Day/causal laborer	141	59.5
	Clerical work	03	1.3
	Peasant farmer	46	19.4
	Student	09	3.8
	Unemployed	32	13.5
Educational level (teenage pregnant woman)	None	02	0.8
	Incomplete primary	97	40.9
	Complete primary	74	31.2
	Incomplete secondary	58	24.5
	Complete secondary	06	2.5
Educational level (spouse)	None	14	5.9

Variable	Category	Frequency (n=237)	Percentage
	Incomplete primary	63	26.6
	Complete primary	49	20.7
	Incomplete secondary	67	28.3
	Complete secondary	30	12.7
	Tertiary	14	5.9
Distance to the nearest facility with ANC (km)	< 1	52	21.9
	1-5	177	74.7
	> 5	08	3.4
Religion	Catholic	134	56.5
	Moslem	26	11.0
	Anglican	45	19.0
	Other religions	32	13.5

Level of knowledge about danger signs in pregnancy

Only 11% (27/237) (95% CI: 7.56, 15.66) of pregnant teenagers had good knowledge about danger signs in pregnancy. Among the nine predefined danger signs, awareness 23.6% (56/237) was highest for vaginal bleeding, followed by excessive vomiting 21.1% (50/237), high-grade fever, 15.6% (37/237), and severe abdominal pain, 14.8% (35/237). Knowledge was notably low for convulsions 2.5% (6/237), with severe headache and loss of fetal movements each reported by only 5.5% (13/237) of respondents **(Table 4).**

Table 4: Level of knowledge about danger signs in pregnancy among pregnant teenagers attending ANC

Danger sign (n=237)	Yes	No	
	Frequency (%), n=237	Frequency (%), n=237	Rank
Vaginal Bleeding	56(23.6)	181(76.4)	1
Convulsions	06 (2.5)	231(97.5)	9
Blurred Vision	29(12.2)	208(87.8)	5
Excessive Vomiting	50(21.1)	187(78.9)	2
High-grade fever	37(15.6)	200(84.4)	3
Severe headache	13(5.5)	224(94.5)	7
Swollen hands and face	28(11.8)	209(88.2)	6
Loss of foetal movements	13(5.5)	224(94.5)	7
Severe abdominal pain	35(14.8)	202(85.2)	4
High knowledge	**11%**		

Determinants of knowledge about danger signs in pregnancy.

More than half, 54.4% (140/257) of teenage mothers had attended ANC more than twice. Among the respondents, many 84.4% (200/237) were gravida one, while only 13.1% (31/237) had given birth to at least one child (parity greater than zero). Additionally, 2.5% (6/237) of the respondents had experienced a stillbirth at some point.

Less than a quarter, 17.3% (41/237) of teenage mothers who had attended ANC in public health facilities reported being taught or guided by their religious leaders about danger signs in pregnancy. Additionally, 24.1% (57/237) acknowledged that their religious beliefs influenced their knowledge about these danger signs. About 32.6% (77/237) of respondents reported that teenage pregnancy was considered a taboo in their families.

Furthermore, more than half, 59.1% (140/237) of the teenage mothers, admitted to relying on traditional healing practices as a way to address pregnancy-related danger signs. Although most teenage mothers 69.2% (164/237) had access to phones, the usage of phone applications like WhatsApp, 14.4% (34/237) and Facebook, 7.2% (17/237) was minimal. Access to television and radio was also limited, with only 28.7% (68/237) and 45.6% (108/237) of the teenage mothers, respectively, using these media sources. About a half, 50.6% (120/237) of teenage pregnant mothers acknowledged receiving health education during ANC. However, 82.3% (195/237) reported no follow-up by health workers. Over 60.3% (143/237) expressed satisfaction with the care received at health facilities **(Table 5).**

Table 5: Elements of factors that influence knowledge about danger signs in pregnancy reported by teenage pregnant mothers who attended ANC

Statement	**Score.**	
Individual Factors	**None N (%)**	**One& above N (%)**
No of stillbirths	231(97.5)	06(2.5)
Parity	206(86.9)	31(13.1)
	One	Greater than one
Gravida	200 (84.4)	37 (15.6)
	First	Second& above
ANC visits for this pregnancy	31(13.1)	206 (86.9)
Social factors	No N (%)	Yes N (%)
Taught or guided by religious leaders or institutions on pregnancy & associated risks.	196 (82.7)	41(17.3)
Religious beliefs affect your knowledge of pregnancy danger signs	180 (75.9)	57(24.1)
Access to radio	129 (54.5)	108(45.6)
Access to TV	169 (71.3)	68(28.7)
Access to =phones	73(30.8)	164(69.2)
Use of WhatsApp	203(85.7)	34(14.4)
Use of Facebook	220(92.8)	17(7.2)
Teenage pregnancy is a taboo in family or community where you live	148(62.5)	89(37.6)
This impact your ability to discuss or seek help for potential danger signs during pregnancy	176(74.3)	61(25.7)
Traditional healing practices used to address pregnancy-related complications.	97(40.9)	140(59.1)
Facility factors		
Followed up by a health worker during ANC in this pregnancy	195(82.3)	42(17.2)
Received health education during ANC	117(49.4)	120(50.6)
Satisfied with the way health workers handled them during ANC	94(39.6)	143(60.3)

Individual, social and facility factors that influence Knowledge about danger signs in Pregnancy

Factors significantly associated with high knowledge of danger signs in pregnancy included marital status, husband's occupation, gravidity, access to a telephone, the cultural belief that teenage pregnancy is taboo, and follow-up by health workers.

After adjustment for other factors in the model, divorced teenage mothers had higher odds of having high knowledge of danger signs in pregnancy compared with those who were single (AOR = 20.5, 95% CI: 2.79–151.13). Teenage mothers with a gravidity greater than one also had higher odds of high knowledge compared with those with a gravidity of one (AOR = 3.3, 95% CI: 1.05–10.55). Similarly, higher odds of high knowledge were observed among teenage mothers who had access to a telephone (AOR = 5.4, 95% CI: 1.01–28.72), those living in communities where teenage pregnancy was considered taboo (AOR = 3.5, 95% CI: 1.29–9.69), and those who reported receiving follow-up from health workers (AOR = 3.8, 95% CI: 1.23–11.69), compared with their respective reference groups. In contrast, teenage mothers whose husbands were casual labourers had lower odds of having high knowledge compared with those whose husbands were civil servants (AOR = 0.1, 95% CI: 0.01–0.44). **(Table 6).**

Table 6: Factors that influenced Knowledge about danger signs in Pregnancy among the teenage mothers who attended ANC

Variable	Knowledge about danger signs in Pregnancy (N=237)		COR (95%CI)	AOR (95%CI)	P-Value
	Poor (N, %)	Good (N, %)			
Marital Status					
Single	59(95.2)	03(4.8)	1.0	1.0	
Married	122(89.7)	14(10.3)	2.3(0.62-8.16)	2.5(0.51-12.15)	0.263
Cohabiting	23(82.1)	05(17.9)	4.3(0.94-19.36)	5.9(0.95-37.12)	0.056
Divorced	06(60.0)	04(40.0)	13.1(2.36-72.96)**	20.5(2.79-151.13)	0.003**
Occupation of the Husband					
Civil servant	03(50.0)	03(50.0)	1.0	1.0	
Clerical Work	02(66.7)	01(33.3)	0.5(0.28-8.95)	0.2(0.01-5.31)	0.342
Casual Labourer	131(92.9)	10(7.1)	0.1(0.01-0.43)**	0.1(0.01-0.44)	0.006**
Peasant Farmer	41(89.1)	05(10.1)	0.1(0.19-0.78)*	0.1(0.02-1.19)	0.072
Student	08(88.9)	01(11.1)	0.1(0.01-1.72)	0.1(0.00-1.66)	0.101
Teaching/guidance by Religious Leaders					
No	178(90.8)	18(9.2)	1.0		
Yes	33(80.5)	08(19.5)	2.4 (0.96-5.97)		
Gravida					
One	182(91.0)	18(9.0)	1.0	1.0	
Greater than one	29(78.4)	08(21.6)	2.8(1.11-7.00)*	3.3(1.05-10.55)	0.041*
Phone access					
No	71(97.3)	02(2.7)	1.0	1.0	
Yes	140(85.4)	24(14.6)	6.1(1.39-26.48)*	5.4(1.01-28.72)	0.049*
Use of WhatsApp					
No	185(91.1)	18(8.9)	1.0		

Variable	Knowledge about danger signs in Pregnancy (N=237)		COR (95%CI)	AOR (95%CI)	P-Value
	Poor (N, %)	Good (N, %)			
Yes	26(74.5)	08(23.5)	3.2(1.25-8.00)*		
Teen Pregnancy considered taboo in community					
No	137(92.6)	11(7.4)	1.0	1.0	
Yes	74(83.2)	15(16.8)	2.5(1.10-5.77)*	3.5(1.29-9.69)	0.014*
Followed up during this Pregnancy					
No	177(90.8)	18(9.2)	1.0	1.0	
Yes	34(80.9)	08(19.1)	2.3(0.93-5.75)	3.8(1.23-11.69)	0.020*
*p<0.05 **p<0.01 ***p<0.001					

Facility factors influencing knowledge of danger signs in pregnancy

Participant characteristics

The participants had a mean age of 36.3 years (SD = 7.9), with the largest age group being 30–34 years 40% (4/10). All respondents were Catholics 100% (10/10). Most, 60% (6/10) held a diploma qualification. The mean working experience in midwifery was 11.8 years (SD = 5.9), with the highest proportions in the 6–10 years, 30% (3/10) and 11–15 years 30% (3/10) categories **(Table 7).**

Table 7: Demographic characteristics of Key informants.

Variable	Attribute	Frequency (n=10)	Percentage (%)
Age (Mean ± SD), 36.3 ± 7.9	25–29	2	20
	30–34	4	40
	35–39	1	10
	45–50	3	30
Religion	Catholics	10	100
Education level	Certificate	4	40
	Diploma	6	60
Working Experience in midwifery years) (Mean ± SD, 11.8 ± 5.9)	0–5	2	20
	6–10	3	30
	11–15	3	30
	16–20	1	10
	21–25	1	10

Facility factors influencing knowledge about danger signs in pregnancy

Four key themes emerged related to facility factors influencing knowledge about danger signs in pregnancy among teenage mothers attending antenatal care (ANC). These themes are: attitudes, skills, logistics and financing, and recommendations.

Table 8: Themes and subthemes from key informants' data

Main themes	Sub-themes
Health workers' attitude	Improved ANC attendance
	Workload
	Wayback culture
Health workers' skills	Capacity building and training
	Work experience
Logistics & financing	Educational materials
	Weakness in policy implementation
Recommendations	Specialized ANC clinics with tailored health education
	Sensitization
	Peer counselling
	Integrated community ANC services
	Mentorships and continuous professional development (CPDs)

Health workers' Attitude

Three subthemes revealed how health workers' attitude was a major underlying factor regarding knowledge about danger signs in pregnancy among teenagers. These were improved ANC attendance, workload, and ancient beliefs- very poor attitude towards pregnant teenagers.

Improved ANC attendance. Almost all participants agreed that there is observed positive attitude in the majority of midwives offering ANC services. Participants reported that currently midwives are welcoming and freely interact with pregnant teenagers. Participants also mentioned that pregnant teenagers were observed looking for specific midwives every time they visited the ANC clinic as well as referring their fellows to the same midwives. And that these same teenagers calmly share their issues without fear of being abused. Additionally, due to good and free interaction between midwives and teenagers, there is an observed reduction of ANC lost follow-ups.

"We now receive many pregnant teenagers at the facility than in previous years due to a good attitude towards them. These teenagers prefer specific health workers they trust and feel comfortable with; they tend to seek out particular health workers, "Musawo" they have befriended, and often share their issues only with those they feel comfortable talking to, indicating their desire for attention and advice".

(KI-10, Experience of 15 years)

Ancient beliefs. Participants acknowledged that though most midwives changed their attitude to a good one, the transition process is not yet at the desired level. They further mentioned that teenagers are observed getting annoyed, others leaving the facility not fully attended to, and possibly missing out on important information they would have otherwise received, which translates to the old art.

"Uuuh…. way back it used to be bad attitude to see a young teenager pregnant" ***(KI7-Experience (5 years))***

*"Those young girls or adolescents have their own way of communication which may irritate the health workers, and also tend to take a lot of time". (****KI-7, Experience of 5 years).***

Theme 2: Health workers' Skills

Capacity building and training efforts have been crucial. All participants reported that Rubirizi District received training on Adolescent and Youth Health, facilitated by Health Child Uganda (HCU). This training targeted health workers from nearly all public health facilities in the area. Participants agreed that they gained essential skills in appropriately handling young people, regardless of the services needed at any point of care entry. These skills align with the standard guidelines and ensure the delivery of a comprehensive care package.

"The HAY program trained health workers to better engage with Adolescents and Young people, recognizing their needs. Previously, a health worker could advise a young girl of 10 to 14 seeking family planning to abstain, but after the training, the focus shifted to providing the health services the adolescent requested." ***(KI-7-Experience of 5 years)***

Work experience. Interview responses indicated that midwives with greater years of experience demonstrated a higher level of receptiveness and patience when caring for young people. These experienced midwives were more likely to provide the relevant information needed by the youth, ensuring a more supportive and informative care experience.

"Health talks for teenagers are now given in small groups of not more than three, as their questions differ from those of older pregnant women and they have many gaps in knowledge. However, some young health workers pretend to be too busy and neglect these teenage mothers" ***(KI-10, Experience of 15years)***

Theme 3: Logistics and Financing

The study revealed a significant lack of Information, Education, and Communication (IEC) materials and other educational tools, such as flip charts on danger signs, across nearly all facilities providing antenatal care (ANC) services. Midwives reported that, due to this shortage, they often rely on their experience and skills to deliver health education to clients. Many midwives noted that health education is not prioritized within their facilities; otherwise, they would have access to training models, audiovisual recordings, and wall charts that clearly communicate danger signs and other essential information to mothers. Such resources would allow mothers to read and understand on their own and seek

clarification when needed. Additionally, midwives pointed out that the few available guidelines are typically kept in the in-charge's office, further limiting access.

"We don't have visual materials like charts showing signs of bleeding, swollen feet, or headaches. I think having these charts would help mothers recognize these symptoms and understand what they might be experiencing". ***(KI5-Experience of 20yrs)***

Weakness in policy guidelines implementation. Participants acknowledged having knowledge about danger signs in pregnancy, which is a crucial starting point in managing complications as outlined in the guidelines. However, it was noted that these danger signs are rarely discussed during the few educational talks conducted during ANC visits, indicating a gap in the implementation of policy guidelines. Most of the health education packages mentioned by participants during the interviews lacked danger signs as a component, and the health education schedules displayed on the walls did not include danger signs as a topic.

*"Our health education covers nutrition, malaria prevention and treatment, when to return to the facility, and birth preparedness planning"****. (KI-8, Experience of 8years)***

Theme 4: Recommendations

Participants provided several key recommendations to improve the quality of care for pregnant teenagers:

Specialized ANC Clinic Days with Tailored Health Education for Teenagers: Participants emphasized the need for dedicated antenatal care (ANC) clinic days specifically for teenagers. They mentioned that these clinics should offer health education sessions tailored to the unique needs and challenges faced by pregnant teenagers. To them, the approach would create a more supportive and considerate environment, thus encouraging teenagers to engage with healthcare services and receive information relevant to their circumstances.

"Giving teenagers a special day each week helps, because they feel more comfortable sharing with peers in their age group. Mixing them with older mothers makes them hesitant to speak up, limiting the information we can provide" ***(KI6-Experience of 7 years)***

"We are requesting for tents to use outdoors, allowing us to provide health education to these teenagers separately" ***(KI-10-Experience of 15years)***

Peer Counselling: The inclusion of peer counselling was highlighted as a valuable approach. Participants suggested that involving peers who have gone through similar experiences can offer emotional support and practical advice to pregnant teenagers. Peer counsellors can relate to the challenges faced by their peers, fostering a sense of understanding and trust, which may lead to better health outcomes.

“I have told you, teenage mothers often refuse advice from older health workers, thinking, what does she know about what we are going through”. ***(KI6-Experience of 7 years)***

Integrated Services, Including ANC Visits in Communities: Participants recommended integrating ANC services into community settings to reduce the workload at health facilities and bring services closer to vulnerable teenagers. By offering ANC visits within the community, healthcare providers can reach teenagers who might otherwise face barriers to accessing care, such as distance, stigma, or lack of transportation.

*“Reach them in villages through outreaches, categorizing/grouping them according to their age, expand source of information by including radio talk shows”****. (KI3-Experience of 5yrs)***

Mentorship and Continuous Professional Development: Participants stressed the importance of mentorship and continuous professional development (CPD) for health workers. These aspects are currently not given sufficient attention, yet they are crucial for equipping healthcare providers with the latest information, skills, and insights. By investing in CPD and mentorship programs, health workers can be better prepared to address the specific needs of pregnant teenagers and provide high-quality care.

"We need refresher training and mentorship as health workers because we forget with time, and also things change." ***(KI4-Experience (8yrs))***

Discussion

This study examined the knowledge of danger signs in pregnancy among teenage mothers attending ANC in public health facilities in Rubirizi district, Uganda and identified influencing factors. It found low levels of knowledge (11%) among teenage pregnant mothers, with greater awareness of signs like vaginal bleeding and excessive vomiting compared to convulsions and severe headache, which were less recognized. Factors significantly associated with high knowledge included maternal divorce, husband’s occupation, higher gravidity, access to telephones, residing in communities where teenage pregnancy is stigmatized, and receiving follow-up care. The low level of knowledge highlights an important public health gap in adolescent maternal health and underscores the need to strengthen targeted ANC health education on pregnancy danger signs, particularly those that are less frequently recognized. Integrating tailored counselling, telephone-based communication, and follow-up support into adolescent-friendly ANC services could improve timely recognition of complications and appropriate care-seeking among teenage mothers.

The findings revealed a concerning lack of knowledge among teenage pregnant mothers regarding danger signs in pregnancy, with 89% (210/237) demonstrating low knowledge levels. This may be attributed to adolescents’ limited exposure to reproductive health information, lower health literacy, and challenges in understanding medical information presented in technical language. These findings differ from those reported in Indonesia, where only 43.34% of women exhibited low knowledge of pregnancy danger signs (13). The high proportion of teenage mothers with inadequate knowledge in Rubirizi District

highlights significant gaps in maternal health education and antenatal care (ANC) information delivery. Poor knowledge of pregnancy danger signs is a serious concern because it increases the likelihood that obstetric complications will go unrecognised, resulting in delays in seeking care and potentially contributing to maternal morbidity and mortality.

Teenage mothers showed greater recognition of visible symptoms such as vaginal bleeding and excessive vomiting, but demonstrated very low awareness of less obvious yet critical danger signs, including convulsions and severe headaches. This pattern suggests that health education efforts may emphasize readily observable symptoms while giving less attention to indirect but equally life-threatening complications. Similar findings of low awareness among pregnant adolescents have been reported in Tanzania (14). However, the level of inadequate knowledge observed in this study was substantially higher than that reported among women in Nigeria, South Africa, and Cameroon, where awareness of obstetric danger signs was generally better (15, 16) (17). Conversely, studies from India and Ethiopia have reported higher levels of knowledge, highlighting the potential contribution of effective health education, supportive cultural norms, and improved access to maternal health services in enhancing awareness of pregnancy danger signs (18, 19).

The markedly lower level of knowledge observed among teenage mothers observed in this study may therefore reflect weaknesses in the delivery of maternal health information through ANC services, as well as the unique vulnerabilities faced by adolescents, including limited health literacy, inadequate access to reproductive health information, and reduced capacity to recognize less obvious danger signs. These findings are consistent with studies conducted in Ethiopia (18, 19) which reported that younger pregnant women and adolescents were significantly less knowledgeable about obstetric danger signs than older women. The authors attributed these differences to lower educational attainment, limited exposure to maternal health information, fewer ANC interactions, and reduced decision-making autonomy among younger mothers. These findings suggest that contextual factors, including the quality of health education, accessibility of maternal health information, and responsiveness of ANC services to the specific needs of adolescents, play an important role in shaping knowledge levels among pregnant women. Strengthening adolescent-responsive health education within health facilities and communities is therefore essential to improve awareness of pregnancy danger signs and promote timely care-seeking behavior among teenage mothers.

This study found that teenage mothers with higher gravida (more than one pregnancy) were significantly more likely to have high knowledge of pregnancy danger signs. This aligns with studies from Ethiopia (20) and the DRC (21) which indicate that prior pregnancies are associated with greater awareness of obstetric complications, because of increased exposure ANC, health education and previous pregnancy-related experiences. However, because this study used a cross-sectional design, this association should not be interpreted as evidence that higher gravidity directly causes greater knowledge. These findings highlight the importance of providing comprehensive and repeated education on pregnancy danger signs, particularly to first-time pregnant adolescents throughout the ANC period.

Pregnant teenagers whose husbands were casual labourers were significantly more likely to have low knowledge of pregnancy danger signs. This may be due to socio-economic circumstances associated with casual labour, including irregular income and potentially limited household resources for accessing health information and supportive services. However, these mechanisms were not directly measured in this study and should therefore be interpreted cautiously. Similar findings from Ethiopia (12) and Tanzania (22) highlight the role of socioeconomic factors in limiting maternal health awareness. Addressing these barriers through targeted education and support interventions is critical for improving maternal health outcomes. Ensuring that adolescent mothers receive accessible and consistent health education through ANC and community-based platforms, regardless of household socioeconomic circumstances, may help address these disparities.

The study identified key social factors influencing teenage mothers' knowledge about danger signs in pregnancy. Divorced teenage mothers were significantly more likely to have high knowledge. This could be attributed to increased autonomy, responsibility, and access to support networks, as well as proactive health information-seeking behaviour. These findings align with a Nigerian study (15), which highlighted how women's autonomy enhances access to maternal health information. Policymakers should prioritize education and empowerment for divorced teenage mothers to improve their awareness of danger signs.

Access to telephones was significantly associated with high knowledge of pregnancy danger signs, emphasizing the potential of mobile technology in health education. This finding highlights the importance of leveraging technology and media to disseminate maternal health information. Telephone access may provide adolescents with additional opportunities to receive health information, communicate with health workers, obtain reminders and seek clarification about pregnancy-related concerns. However, the specific ways in which participants used their telephones were not directly assessed in this study, and therefore the mechanisms underlying this association remains uncertain. Similar studies in Ethiopia (12, 20) underscore the potential of digital platforms to disseminate health information. However, limited access to digital tools (WhatsApp, Facebook) and traditional media in Rubirizi district highlights the need for improved digital literacy and broader access to reliable health education channels.

Cultural beliefs, particularly the stigmatization of teenage pregnancy, were significantly associated with better knowledge of danger signs. Teenage mothers in stigmatizing communities may develop heightened vigilance due to social pressures, or may actively seek health information or have increased exposure to health services or support networks. However, this explanation was not directly assessed in the present study and therefore remains speculative. Importantly, this finding should not be interpreted as suggesting that Stigma is beneficial, as stigma can also discourage timely healthcare-seeking behaviour, reduce social support, create barriers to ANC attendance and disclosure of pregnancy, and increase reliance on traditional healing practices. This finding is therefore best interpreted as an unexpected association that warrants further investigation particularly through Qualitative studies exploring how community attitude influence adolescent access to and use of maternal health information.

Health worker attitudes were a major factor influencing teenage mothers' knowledge of danger signs. Positive interactions with midwives, characterized by welcoming attitudes and respectful communication, encouraged ANC attendance and Continued engagements with health services. Teenage mothers who received follow-up care were significantly more likely to have high knowledge of pregnancy danger signs. This finding suggests that repeated contact with health care providers may provide opportunities to reinforce maternal health information and improve adolescents' understanding of obstetric complications. However, because of the cross sectional nature of the study, the association between follow up care and knowledge should not be interpreted as evidence that follow up directly caused high knowledge.. Similar findings from studies in Uganda (7) and Nigeria (15) suggest that the quality and continuity of interaction between health workers and pregnant women can influence access to and uptake of maternal health information. Addressing persistent negative attitudes and cultural biases (TBAs) among health workers remains critical for improving maternal health education.

Health workers' skills were also identified as pivotal. Qualitative findings indicated that well-trained midwives who had received capacity building in adolescent health were perceived to be better equipped to provide relevant and age-appropriate information to teenage mothers. However, health workers' skills were not directly measured in the quantitative component of this study, and therefore their independent association with knowledge of pregnancy danger signs could not be established. The Quantitative finding that teenage mothers who receive follow-up care were significantly more likely to have high knowledge may indicate that continued interaction with health workers provide additional opportunity to reinforce health information; however, this does not necessarily demonstrate that health workers' skills were responsible for the observed higher knowledge. Similar findings from Uganda (7) suggest that the competence and quality of interaction of health workers can influence the delivery of maternal health information and awareness of obstetric danger signs.. Continuous professional development in adolescent responsive care, effective communication, and pregnancy danger signs counselling is therefore important for strengthening the quality and consistency of maternal health education.

Logistical challenges, such as the lack of Information, Education, and Communication (IEC) materials, were significant barriers to effective health education. Midwives relied heavily on their personal experience due to the absence of tools, limiting the quality of maternal health education. Investing in educational resources and equipping health facilities can improve the dissemination of critical health information.

Participants recommended strategies such as specialized ANC days, peer counseling, integration of pregnancy danger signs education into community based maternal and adolescent health services, and health worker training. Community-based approaches could include health education through Village Health Teams (VHTs), community outreaches, adolescent peer support groups, and referral linkages between communities and health facilities. Enhancing health worker engagement through respectful, adolescent responsive communication individualized counselling, and appropriate follow up could strengthen the delivery and re enforcement of pregnancy danger sign information (6, 20). Providing health workers with adolescent friendly communication skills, adequate IEC materials, and opportunities

for continuous professional development may further improve the quality and consistency of ANC health Education. Addressing logistical barriers is also essential to improving awareness of pregnancy danger signs among teenage mothers in Rubirizi District.

Study strengths and limitations

This study contributes significantly to public health by addressing critical issues related to maternal health, thereby informing targeted interventions for improved outcomes. Conducted in public health facilities, the study's real-world setting enhances its external validity and relevance to similar populations. The use of a mixed-methods approach allowed for a comprehensive understanding of the subject, integrating both quantitative and qualitative data. Furthermore, random sampling techniques ensure rigorous participant inclusion, enhancing the study's methodological robustness.

The findings of this study may have limited generalizability beyond Rubirizi District, in western Uganda as they are context-specific in nature. Additionally, the exclusion of individuals who do not attend ANC services may also restrict the generalizability of results to the broader population. Furthermore, the survey design captures data at a specific moment, which limits the ability to establish causality or observe trends over time, highlighting potential temporal constraints in the interpretation of findings.

Conclusion

This study reveals a significant knowledge gap among pregnant teenagers in Rubirizi District, with only 11% having adequate knowledge about danger signs in pregnancy. Key contributing factors include facility-related aspects, such as health workers' attitudes, skills, follow-ups, and resource availability, as well as individual and social factors, like previous pregnancies, access to telephones, the husband’s occupation (casual laborer), marital status (divorced), and cultural beliefs (stigmatization). These findings emphasize the urgent need for targeted interventions and strategies to bridge this knowledge gap and improve maternal health outcomes for teenage mothers.

Declarations

Ethics approval and consent to participate

The study received ethical approval from the Makerere University School of Public Health Research and Ethics Committee (MakSPH-REC), approval reference SPH500. Administrative permission to conduct the study was obtained from the Chief Administrative Officer (CAO) of Rubirizi District Local Government.

Written informed consent was obtained from study participants before data collection. Participants were informed about the study objectives, procedures, voluntary nature of participation, confidentiality, and their right to withdraw at any time without consequences. Privacy and confidentiality were maintained throughout the study. All research procedures were conducted in accordance with applicable ethical guidelines and regulations, including the principles of the Declaration of Helsinki.

Consent to parental participate

For participants younger than 18 years, written informed consent was obtained from a parent or legal guardian, alongside assent from the adolescent participant. Participants aged 18–19 years provided their own written informed consent. All consent procedures were conducted in accordance with the requirements approved by the Research Ethics Committee (REC).

Consent to publish: Not Applicable

Data Availability Statement

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

Code availability

This does not apply to this study.

Clinical trial number: not applicable.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions:

NR conceptualized the idea, carried out research, analyzed and wrote the manuscript.

TE Supported both data analysis and manuscript writing processes

SA supervised NR, reviewed the proposal, dissertation, and manuscript. JK reviewed the dissertation, and MA and DM reviewed the analysis and manuscript

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Supplementary Files

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