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High burden of teenage pregnancy and low modern contraceptive methods uptake in refugee settlements of Northern Uganda in the post COVID-19 era Between 2020 and 2023

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Keywords: Teenage pregnancy., Modern contraceptives., Refugee Settlements., Adolescent Pregnancy,. Uganda.

Abstract

Background: Following the COVID-19 pandemic, there was an increase in teenage pregnancies nationally, however, limited data exists regarding the same among girls living in refugee settlements.

Objectives: We evaluated the prevalence of teenage pregnancy and associated factors in Palorinya and Bidi Bidi refugee settlements in Obongi and Yumbe districts of Northern Uganda, in the post COVID-19 era.

Design: We conducted a cross sectional descriptive study.

Setting: Refugee settlements in northern Uganda.

Participants: We included 385 teenage girls aged 15 to 19 years

Methods: We used cluster sampling techniques between March and May, 2023. Prevalence of teenage pregnancy was assessed by self-reported pregnancies between January 2020 to May 2023 among participants. We performed modified Poisson regression analysis on variables with P<0.2 to assess associations. Level of significance was set at $P < 0.05$.

Primary and Secondary Outcome Measures: The primary outcome measure was the prevalence of teenage pregnancy, assessed through self-reported pregnancies among participants. Secondary outcome measures included factors associated with teenage pregnancy, such as living with a husband, lack of formal education, peer pressure, and history of sexual abuse. These factors were identified through modified Poisson regression analysis.

Results: Overall, the mean age of 17 (IQR: 15-18), sexual debut at 16 (IQR: 15-17) years. Lifetime modern contraceptive use was 13.8% (n= 53/385) and current use was 7.5% (n=29/385). Teenage pregnancy period prevalence was 34.0% (CI: 29.4% to 38.9%). Factors independently associated with teenage pregnancy were; living with a husband (aPR: 3.8, 95% CI: 2.51 to 5.84, P <0.001), lack of formal education (aPR: 2.3, 95% CI: 1.26 to 4.35, P = 0.007), peer pressure (aPR: 2.1, 95% CI: 1.54 to 2.86, P <0.001) and history of sexual abuse (aPR: 1.5, 95% CI: 1.07 to 1.99, P = 0.018).

Conclusion: Teenage pregnancy in Ugandan refugee settlements surpasses global and national rates, highlighting unmet contraceptive needs. Improving access to modern contraceptives, education, and targeted interventions against child marriage and abuse is essential.

Article Summary

Strengths and limitations of the Study

- The study's inclusion of only two refugee settlements may limit generalizability to all refugee settlements in Uganda, affecting external validity.
- Randomly selecting settlements and using a substantial sample size within each strengthens the statistical reliability of our conclusions.
- Conducting a cross-sectional analysis without pre-pandemic data prevents establishing causal relationships between variables.
- Future research could adopt longitudinal approaches to track changes over time and incorporate historical data for a comprehensive assessment of causal associations.

Background

Teenage pregnancy is defined as a pregnancy in girls 13–19 years of age [1]. Teenage pregnancies can have negative consequences for the mother's health such as unsafe abortion attempts leading to mortality, as well as economic and social outcomes, exacerbated by stigmatization, school dropout and isolation from family [2]. Complications from teenage pregnancy and childbirth are the leading cause of death of girls aged 15 to 19 years worldwide [3].

The incidence of teenage pregnancy is increasing and has become of a worldwide concern. It is estimated that about 16 million girls 15–19 years old give birth each year, contributing nearly 11% of all births worldwide [1]. Globally in 2022, an estimated 13 per cent of adolescent girls and young women give birth before age 18 [4]. In South Asia, one in ten (11%) teenage girls give birth before the age of 19 [5].

In Africa, more than 20% of women aged 15 to 19 have given birth to at least one child [1]. Sub-Saharan Africa is home to more than one million teenage girls with pregnancy [5]. Sub-Saharan Africa additionally experiences some of the highest rates of gender inequality in the world, resulting in unequal access to education and high rates of violence against girls, early pregnancy, and child marriage [6]. It is estimated that 608,000 girls are thought to be at risk of child marriage, and 542,000 additional girls at risk of early pregnancy [7].

The regional teenage birth rate in SSA is more than double the global average, with 101 births per 1,000 girls aged 15 to 19 – ranging from 39 births per 1,000 girls aged 15 to 19 in Rwanda to 184 births per 1,000 girls aged 15 to 19 in Nigeria [4]. Child marriage is

widespread in West and Central Africa, where 42% of women are married as children, and in East and Southern Africa, where child marriage a-ects 37% of girls [8].

Despite Uganda's commitment to ending child, early and forced marriages and teenage pregnancy by year 2030 through co-sponsoring the 2013 and 2014 UN General Assembly and 2013 Human Rights Council resolutions on early and forced marriages [9], one in four (24%) teenage girls in Uganda report having given birth for the first time by the age of 18 [10]. According to UNICEF (2021) estimates, a total of 354,736 teenage pregnancies were registered in 2020, and 196,499 in the first six months of 2021 amidst the COVID-19 pandemic [11].

The COVID-19 pandemic wreaked unprecedented havoc on children, families, and communities around the globe, disrupting vital services like girl child education, and putting millions of lives at risk. The United Nations estimated that nearly 11 million primary and secondary school learners worldwide – 5.2 million of whom are girls – did not return to education following school closures amidst COVID-19 due to teenage pregnancy and related outcomes [12].

For the most vulnerable children, especially girls living in refugee settlements, accessing education and staying in school is hard enough. The pandemic caused additional, unanticipated disruption, compounding their vulnerability to teenage pregnancies by many folds [7]. Moreover, teenage girls living in refugee settlements face challenges accessing sexual and reproductive health services, including sex education and modern contraceptive methods [13]. Data on teenage pregnancies and associated factors among the teenage girls in refugee settlements is deficient. Additionally, statistics on modern contraceptive methods

uptake among this population is unknown. We therefore aimed to estimate the prevalence and associated factors of teenage pregnancies in the post covid-19 era in Palorinya and Bidi Bidi refugee settlements of west Nile region, Northern Uganda.

Methods

Study Design and Rationale

We conducted a community-based, cross-sectional, observational study, adopting quantitative techniques between March and May, 2023. We followed the Strengthening The Reporting of Observational Studies in Epidemiology (STROBE) guidelines to design this manuscript in order to ensure attention to detail [14].

Study Setting and Rationale

We conducted this study in Palorinya and Bidi Bidi refugee settlements of west Nile region, Northern Uganda. According to data from the Office of the Prime Minister (OPM) and United Nations Higher Commissioner for Refugees (UNHCR), Uganda is now home to 1,622,738 refugees living in 13 refugee settlements across the country, and almost half (6) of these are in the west Nile region [15].This setting was chosen because it hosts the biggest number of refugee settlements, proposed to provide a big pool of potential respondents for sampling.

Study Population, Inclusion and Exclusion criteria.

Our study targeted teenage girls living in the refugee settlements of Northern Uganda. We included only respondents between 15 to 19 years old, who provided written informed consent or had ascent obtained, and were living in the refugee settlements before the beginning of COVID-19.Those who did not provide informed consent or ascent were not included.

Sample size determination.

We used the Kish and Lisle (1965) formula for calculation of sample size for an unknown population. At 95% confidence interval, we used an error of 5%, alpha risk expressed in z score of 1.96 and a conservative assumption of a 50% population proportion was made to ensure robustness. We obtained a sample size of 385. These choices were guided by standard practices, aiming to balance precision and practicability.

Sampling method.

We used cluster sampling to randomly select Bidi Bidi and Palorinya refugee settlements that participated in the study. The refugee settlements in west Nile region, northern Uganda were listed down on small pieces of paper, with each settlement representing one cluster. Two pieces of paper were randomly picked (two clusters), from which the study was conducted. We used convenience sampling in each of the clusters to select study participants.

Research Instruments

We developed a semi structured questionnaire including both open and closed ended questions. The data collection tool was developed in English and translated into three languages: *Acholi, Kuku, and Arabic*. We pretested the tool among respondents of similar

characteristics outside the study area, after which we refined and fine-tuned the tool for reliability and validity. The tool was then exported into Kobotoolbox installed in mobile phone devices which was used for data collection. We asked about demographics, house hold characteristics, pregnancy history between January 2020 and May 2023 and intentions, marriage status, modern contraceptive use between January 2020 and May 2023, sex education, sexual and physical abuse among others.

Data Collection Procedures

We recruited research assistants, who were given a one-day training for acquaintance with the tool and were taken through research ethics and good clinical practice. The research assistants carried out the collection of data. They explained the purpose of the study to each of the respondents identified, and obtained informed consent, followed by administration of the questionnaire using an electronic form stored in Kobotoolbox mobile application, which is a free open-source tool for mobile data collection.

Data management.

The phone devices that were used to collect the data were fully charged at every moment the research team set off to collect data, and the data captured in the phone was regularly saved to avoid loss of data. We safely kept the devices under key and lock before and after data collection, and limited access. We exported the data into STATA version 15, where analysis was done from.

Data analysis.

Prevalence of teenage pregnancy was assessed by self-reported pregnancies from January 2020 to May 2023. We performed Pearson's chi square and Fisher's exact tests at bivariate analysis. Level of significance was set at $P < 0.05$. We then performed modified Poisson regression analysis on variables with $P<0.2$ to assess associations. Level of significance was set at $P < 0.05$. We considered variables with $P<0.2$ since their power of association is > or = 80%.

The data was then computed in form of percentages and frequencies and finally presented on figures (pie chart, bar graph) and tables.

Results

Participant Characteristics

Table 1 summarizes the general characteristics of 385 teenage girls living in refugee settlements of west Nile region, northern Uganda. The mean age was 17 (IQR: 15 to 18), years, and 99.5% were Christians, 316 (82.1%) had attained primary education as the highest level, 85.6% were not working, median monthly income was 0 (IQR: 0 to 1,000), Uganda shillings, 56.1% did not live with both parents, 54.8% of household heads were female, and 22.1% of house hold leads were husband /spouse.

Overall, 178 (46.2%) were sexually active, and mean age of sex debut was 15.8 (SD: 1.44), years, sexual abuse was reported by 5.2% of respondents, of whom 75% were sexually abused by strangers, meanwhile physical abuse was reported by 21.6% of respondents, 37.1%

of teenage girls experienced peer pressure and alcohol consumption was reported by 8.8% of respondents.

Figure 2 summarizes modern contraceptive methods used by teenage girls living in refugee settlements of west Nile region, northern Uganda. Some of the teenage girls; 13.8% had ever used modern contraceptives in their lifetime, meanwhile only 7.5% were currently using modern contraceptives, of whom only 13.2% reported to have ever used long term contraceptive methods, and 30.2% reported to have ever used multiple methods (including long term and short-term methods). Overall, 17.9% received contraceptive use counselling from home, and 36.1% received home sex education, meanwhile 55.1% had received sex education from school, 40.5% had received contraceptives use counselling from school, and 64.7% had ever been health educated on the dangers of teenage pregnancy.

Some respondents, 5.7% had the intention of getting pregnant in the next 12 months, whereas 52.0% had friends who are pregnant,24.9% were married, of whom 38.5% were forced / arranged. Up to 9.8% of the respondents had ever had an abortion, and 22.0% had had a caesarean section.

Fig 1: Prevalence of teenage pregnancy among 385 girls aged 15 to 19 living in Palorinya and Bidi Bidi refugee settlements of west Nile region, Northern Uganda.

Fig 2: The different contraceptive methods used by teenage girls living in Palorinya and Bidi Bidi refugee settlements of west Nile region, Northern Uganda (N=385; n=53)

Table 1: Individual characteristics of 385 teenage girls living in Palorinya and Bidi Bidi refugee settlements of west Nile region, northern Uganda

Variable	Frequency	Percentage
Age, median (Interquartile range), years	17	15-18
Occupation		
Working	56	14.6
Not working	329	85.6
Average monthly income, median (Interquartile range), Ugx	0	0 – 1,000
Education		
No formal education	5	1.3
Primary	316	82.1
Secondary and beyond	64	16.6
Media Exposure		
Listens to Radio	60	15.6
Owns a mobile phone	71	18.4
Reads newspaper	11	2.9
Watch Television	3	0.8
Uses more than one Medium	65	16.9
None of the above	175	45.6
Relationship to household head		

Parent	251	65.2
Relative	49	12.7
Husband/Spouse	85	22.1
Intention to get pregnant in 12 months		
Yes	22	5.7
No	363	94.3
Have friends who are pregnant		
Yes	200	52.0
No	185	48.0
Ever gotten pregnant		
Yes	131	34.0
No	254	66.0
Number of pregnancies, median (min, max), times	1	1, 3
Pregnancy Outcome		
Live births	110	90.2
Abortions	7	5.7
Both	5	4.1
Peer pressure		
Yes	143	37.1
No	242	62.9
Married		
Yes	96	24.9
No	289	75.1
Mode of Marriage		
Arranged / Forced	37	38.5
Willingly	59	61.5
History of Contraceptive Use		
Yes	53	13.8
No	332	86.2
Current contraceptive use		
Yes	29	7.5
No	356	93.5
Living with both Parents		
Yes	169	43.9
No	216	56.1
Home sex education		
Yes	139	36.1
No	246	63.9
Home contraceptive use counselling		
Yes	69	17.9
No	316	82.1
Received school sex education		

Yes	212	55.1
No	173	44.9
School contraceptive use counselling		
Yes	156	40.5
No	229	59.5
Health education on dangers of teenage pregnancy		
Yes	249	64.7
No	136	35.3
Sexual abuse		
Yes	20	5.2
No	365	94.8
Perpetrator (n=20)		
Relative	5	25.0
Stranger	15	75.0
Physical abuse		
Yes	83	21.6
No	302	78.4
Alcohol Consumption		
Yes	34	8.8
No	351	91.2

Period prevalence of teenage pregnancy among 385 teenage girls living in Palorinya and Bidi Bidi refugee settlements of west Nile region, northern Uganda

Figure 1 shows the prevalence of teenage pregnancy among 385 teenage girls living in refugee settlements of west Nile region, northern Uganda. We found out that up to 34.0% of respondents reported to have ever gotten pregnant between 2020 to 2023 (CI: 29.4% to 38.9%), the median number of pregnancies was 1, with a minimum of 1 and maximum of 3.

Predictors of teenage pregnancy among 385 teenage girls living in Palorinya and Bidi Bidi refugee settlements of west Nile region, northern Uganda

Table 2 summarizes the factors associated with teenage pregnancy among 385 teenage girls living in refugee settlements of west Nile region, northern Uganda. At bivariate level, factors such as; lack of formal education (PR: 3.1, 95% CI: 2.64-3.64, p<0.001), male house hold head (PR: 2.3, 95% CI: 1.72 – 3.13, p<0.001), living with a husband / spouse (PR: 5.4, 95% CI: 4.11-7.17, P<0.001), intention to get pregnant (PR: 1.1, 95% CI: 1.03 – 1.15, p= 0.003), peer pressure (PR: 3.7, 95% CI: 2.73-5.05, P<0.001), being married (PR: 6.6, 95% CI: 4.95 – 8.82, P<0.001), history of contraceptive use (PR: 3.2, 95% CI: 2.55 – 3.94, P<0.001), lack of home sex education (PR: 1.6, 95%CI: 1.16 – 2.24, P = 0.005), health education on dangers of teenage pregnancy (PR: 1.8, 95% CI: 1.25 – 2.49, P = 0.001), sexual abuse (PR: 2.7, 95% CI: 2.14 – 3.46, P<0.001), physical abuse (PR: 2.3, 95% CI: 1.80 – 2.99, P<0.001) and alcohol consumption (PR: 2.3, 95% CI: 1.77 – 3.03, P<0.001), were positively associated to teenage pregnancy.

We then performed modified Poisson regression on all variables that had a P value < 0.2, while controlling for occupation, media exposure and living with both parents. Teenage girls with no formal education were 2.3 times more likely to be pregnant (aPR: 2.3, 95% CI: 1.26-4.35, P = 0.007) as compared with those who had formal education; those who were living with a husband / spouse were 3.8 times more likely to be pregnant (aPR: 3.8, 95% CI: 2.51-5.84, P<0.001) as compared with those who lived with their parents; teenage girls who experienced peer pressure were 2.1 times more likely to be pregnant (aPR: 2.1, 95% CI: 1.54-2.86, P<0.001) as compared to those who didn't; those who had a history of contraceptive use were 1.8 times more likely to be pregnant (aPR: 1.8, 95% CI: 1.31-2.33, P<0.001) as compared to those who did not have; and teenage girls who experienced sexual abuse were

1.5 times more likely to be pregnant (aPR: 1.5, 95% CI: 1.07-1.99, P = 0.018) as compared to those who didn't.

Table 2: Factors independently associated with teenage pregnancy among 385 teenage girls living in Palorinya and Bidi Bidi refugee settlements of west Nile region, Northern Uganda

Variable	All (N=385) Freq (%)	Teenage Pregnancy		Crude PR (95% CI)	P value	Adjusted PR (95% CI)	P value
		Yes (n=131) Freq (%)	No (n=254) Freq (%)				
Occupation							
Working	56 (14.6)	29 (22.1)	27 (10.6)	1.7(1.24 – 2.56)	0.001	1.1(0.86-1.54)	0.346
Not working	329 (85.6)	102 (77.86)	227 (89.4)	Reference		Reference	
Education							
No education	5 (1.3)	5 (3.8)	0 (0.0)	3.1(2.64-3.64)	<0.001	2.3(1.26-4.35)	0.007
Primary	316 (82.1)	102 (77.9)	214 (84.3)	Reference		Reference	
Secondary and beyond	64 (16.6)	24 (18.3)	40 (15.8)	1.2(9.81-1.66)	0.407	1.1(0.84-1.51)	0.439
Media Exposure							
Listens to Radio	60 (15.6)	5 (3.8)	55 (21.6)	1 (1.00 – 1.00)	1.000	N/A	
Owns a mobile phone	71 (18.4)	50 (38.2)	21 (8.3)	0.9 (0.80 – 0.98)	0.015	0.9 (0.80 – 1.00)	0.052
Reads newspaper	11 (2.9)	1 (0.8)	10 (3.9)	1 (1.00 – 1.00)	1.000		
Watch Television	3 (0.8)	1 (0.8)	2 (0.8)	1 (1.00 – 1.00)	1.000		
Uses more than one Medium	65 (16.9)	39 (29.8)	26 (10.2)	0.9 (0.84 – 1.01)	0.085		
None of the above	175 (45.6)	35 (26.7)	140 (55.1)	Reference			
Relationship to household head							
Parent	251 (65.2)	43 (32.8)	208 (81.9)	Reference		Reference	
Relative	49 (12.73)	9 (6.9)	40 (15.8)	1.1(0.56-2.06)	0.834	0.9(0.47-1.64)	0.687
Husband/Spouse	85 (22.1)	79 (60.3)	6 (2.4)	5.4(4.11-7.17)	<0.001	3.8(2.51-	<0.001

						5.84)	
Intention to get pregnant in 12 months							
Yes	22 (5.7)	19 (14.5)	3 (1.2)	1.1 (1.03 – 1.15)	0.003	1.0 (0.97 – 1.1)	0.246
No	363 (94.3)	112 (85.5)	251 (98.8)	Reference		Reference	
Have friends who are pregnant							
Yes	200 (52.0)	116 (88.6)	84 (33.1)	1.1 (0.89 – 1.36)	0.421	N/A	
No	185 (48.0)	15 (11.4)	170 (66.9)	Reference			
Peer pressure							
Yes	143 (37.1)	90 (68.7)	53 (20.9)	3.7 (2.73-5.05)	<0.001	2.1(1.54-2.86)	<0.001
No	242 (62.9)	41(31.3)	201 (79.1)	Reference		Reference	
Married							
Yes	96 (24.9)	90 (68.7)	6 (2.4)	6.6 (4.95 – 8.82)	<0.001	1.1 (0.88 – 1.46)	0.337
No	289 (75.1)	41 (31.3)	248 (97.6)	Reference		Reference	
Mode of Marriage							
Arranged / Forced	37 (38.5)	33 (36.7)	4 (66.7)	Reference		N/A	
Willingly	59 (61.5)	57 (63.3)	2 (33.3)	1.0 (0.95 – 1.16)	0.347		
History of Contraceptive Use							
Yes	53 (13.8)	44 (33.6)	9 (3.5)	3.2(2.55 – 3.94)	<0.001	1.8(1.31-2.33)	<0.001
No	332 (86.2)	87 (66.4)	245 (96.5)	Reference		Reference	
Living with both Parents							
Yes	169 (43.9)	65 (49.6)	104 (40.9)	1.3(0.95 – 1.66)	0.104	1.1(0.88-1.40)	0.392
No	216 (56.1)	66 (50.4)	150 (59.1)	Reference		Reference	
Home sex education							
Yes	139 (36.1)	34 (26.0)	105 (41.3)	Reference		Reference	
No	246 (63.9)	97 (74.0)	149 (58.7)	1.6(1.16 – 2.24)	0.005	1.2(0.94-1.63)	0.127
Home contraceptive use counselling							
Yes	69 (17.9)	26 (19.8)	43 (16.9)	1.13(0.81 – 1.60)	0.471	N/A	
No	316 (82.1)	105 (80.2)	211 (83.1)	Reference			
Received school sex education							
Yes	212 (55.1)	67 (52.3)	145 (57.1)	1.0 (0.96 – 1.17)	0.265	N/A	
No	173 (44.9)	61 (47.7)	109 (42.9)	Reference			
School contraceptive use counselling							
Yes	156 (40.5)	56 (43.8)	100 (39.4)	1.0 (0.93 – 1.13)	0.573	N/A	
No	229 (59.5)	75 (56.2)	154 (60.6)	Reference			
Health education on dangers of teenage pregnancy							
Yes	249 (64.7)	100 (76.3)	149 (58.7)	1.8(1.25 – 2.49)	0.001	1.2(0.92-1.66)	0.167
No	136 (35.3)	31 (23.7)	105 (41.3)	Reference		Reference	

Sexual abuse							
Yes	20 (5.2)	17 (13.0)	3 (1.2)	2.7(2.14 – 3.46)	<0.001	1.5(1.07-1.99)	0.018
No	365 (94.8)	114 (87.0)	251 (98.8)	Reference		Reference	
Physical abuse							
Yes	83 (21.6)	51 (38.9)	32 (12.6)	2.3(1.80 – 2.99)	<0.001	1.1(0.82-1.36)	0.658
No	302 (78.4)	80 (61.1)	222 (87.4)	Reference		Reference	
Alcohol Consumption							
Yes	34 (8.8)	24 (18.3)	10 (3.9)	2.3(1.77 – 3.03)	<0.001	0.9(0.64-1.20)	0.414
No	351 (91.2)	107 (81.7)	244 (96.1)	Reference		Reference	

Discussion

There is a high prevalence of teenage pregnancies (34.0%) among teenage girls living in refugee settlements of northern Uganda. It is notable that there is a gap in literature on sexual and reproductive health issues in refugee settings in general, and teenage pregnancy statistics in similar settings is not widely studied. The prevalence of teenage pregnancies in the current study surpasses national (24%) and global (11%) averages [1,5]. This could be because our study only considered teenage girls between 15 to 19 years old, meanwhile the other studies considered 13 to 19. Considering the close relationship between sexual abuse and teenage pregnancy, which was similarly observed in Malawi [16], relevant refugee authorities and government stakeholders need to develop strategies aimed at addressing this challenge among teenage girls living in refugee settings, to contribute towards addressing the bigger problem of maternal morbidity and mortality related to teenage pregnancy. There is also need to explore legal opportunities against the perpetrators of sexual abuse among teenage girls in

refugee settings. Our study found out that up to 25% of the perpetrators of sexual abuse among the teenage girls are relatives. This makes it particularly hard to seek support from community and cultural leaders, necessitating the involvement of higher authorities. The ministry of health in conjunction with the office of the prime minister need to put in place favourable measures to deal with the perpetrators of sexual violence against teenage girls in the refugee context.

Several factors were independently associated to teenage pregnancies in our study. Importantly, living with a spouse / husband presented four-fold likelihood of teenage pregnancy compared to those who lived with their parents. Other studies agree to our findings [17]. Moreover, we also found out that most of the child marriages in the refugee context were forced (38.5%). Therefore, targeted measures are urgently needed to deal with the challenge of forced child marriages in the refugee situation. These measures could include, forming child and adolescent support groups, encouraging girl child education, involving relevant authorities in protecting the rights of the girl child living in refugee settlements, and creating awareness among the teenage girls in these settings on the legal opportunities available to deal with the perpetrators of sexual violence.

It is high time the government and civil society organizations come up with targeted measures to make the refugee settlements safer for the teenage girl. This will not only deal with the problem of sexual violence, but also the challenges brought about by teenage pregnancy such as maternal morbidity and mortality. Our study also found out that 9.8% of the respondents had ever had an abortion. The limitation is that our study did not explore whether this was induced or spontaneous. Furthermore, we do not know whether this abortion

was in the watch of a qualified health service provider. This poses a greater risk of severe morbidity and mortality among the teenage mothers in these settings.

Additionally, teenage girls without a formal education stood at a 2.3 times higher risk of teenage pregnancy compared to those with at least a primary education. Similarly, another study conducted in Malawi noted an inequality in teenage pregnancy which worsened to the disadvantage of the less educated [18]. Strengthening education access and acceptability among the teenage girls living in refugee settlements will go a long way in reducing the burden of teenage pregnancy in this vulnerable population. Moreover, keeping the girl child in school will also have a secondary benefit especially in the fight against HIV.

Another important predictor of teenage pregnancy in our study was peer pressure. This is related with another study carried out in Kibuku district, Uganda, that pointed out that bad peer groups were an outstanding cause of teenage pregnancy among the respondents [19]. Addressing the challenge of peer pressure requires a multi-sectoral collaboration. Thoughtfully, fostering education among the teenage girls could be one way of dealing with this issue. Relevant stake holders need to come up with inclusive solutions to encourage girl child education and lower the challenge of peer pressure and consequently teenage pregnancy.

Paradoxically, our study found out that teenage girls who had a history of using modern contraceptives stood at 1.8 risk of teenage pregnancies as compared to those who did not. These findings were unlike those observed in Malawi [16], who otherwise found out that history of contraceptive use was a protective factor. Unfortunately, our study did not distinguish between the use of long term and short-term contraceptives, in relation to

pregnancy. Furthermore, much as we saw that 13.8% of teenage girls living in refugee settlements reported to have ever used a modern contraceptive method in their lifetime, and considering the relatively low age of sex debut (15.8) years, only 7.5% were currently using modern contraceptives, of whom only 13.2% reported to have ever used long term contraceptive methods. Noting the inconsistencies in the use of modern contraceptives among the study participants makes it possible that these inconsistencies contribute to the high prevalence of teenage pregnancy in this setting. Additionally, the proportion of respondents who had ever used long term methods is relatively low, leaving a wider window for teenage pregnancies in this setting. Strengthening the uptake of long-term contraceptive methods among the refugee teenage girls would go a long way in reducing the prevalence of teenage pregnancy in this setting.

Conclusions

Our study found out that about 1 in 3 adolescent girls in refugee settlement of Northern Uganda experienced pregnancy during the COVID-19 pandemic. This burden exceeds the global and national averages, revealing gaps in meeting contraceptive needs. However, only 1 in 13 of the adolescents was currently using modern methods of contraception. Therefore, enhancing accessibility and promoting modern contraceptive methods are crucial. Urgent action is required to address disparities in access to quality education, and implement targeted interventions against child marriages, peer pressure and sexual abuse, to mitigate challenges associated with teenage pregnancy in the refugee context.

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Declarations

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Consent for Publication

Not applicable

Conflicts of interest

We declare no conflict of interest in this research work.

Data Availability Statement

All relevant data are within the manuscript and its supporting information files. Data are available upon reasonable request from the first author.

Ethical Considerations

We obtained an ethical approval and clearance letter from Gulu University Research and Ethics Committee (GUREC), (approval number: GUREC-2022-291) which was presented to the district health offices (DHO) of the selected districts, to seek administrative clearance. We presented the introductory letter from the DHO to the refugee welfare council 2 (RWC2) of selected refugee settlements to seek entry into the community and commence data collection. A private and comfortable room was acquired and used during the process of data collection to ensure privacy and confidentiality. Written informed consent was obtained from respondents who were 18 or 19 years. For respondents below 18, a written informed ascent was obtained from a parent / guardian who also consented to allow their daughter participate in the study, and participation was free and voluntary. Participants were assured of their freedom to withdraw from the study at any time with no penalty. Confidentiality of the information collected was observed by using numbers and not names.

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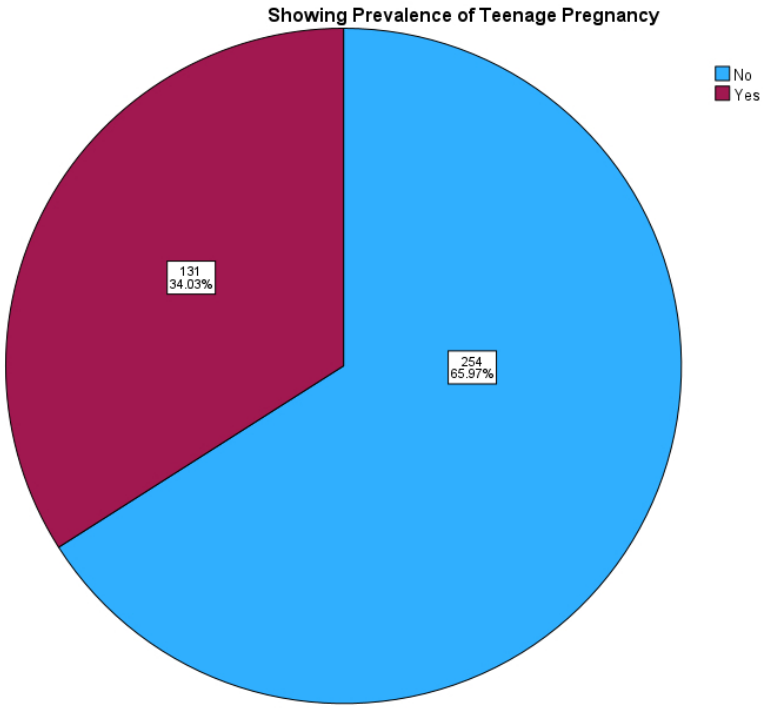

Fig 1: Prevalence of teenage pregnancy among 385 girls aged 15 to 19 living in Palorinya and Bidi Bidi refugee settlements of west Nile region, Northern Uganda.

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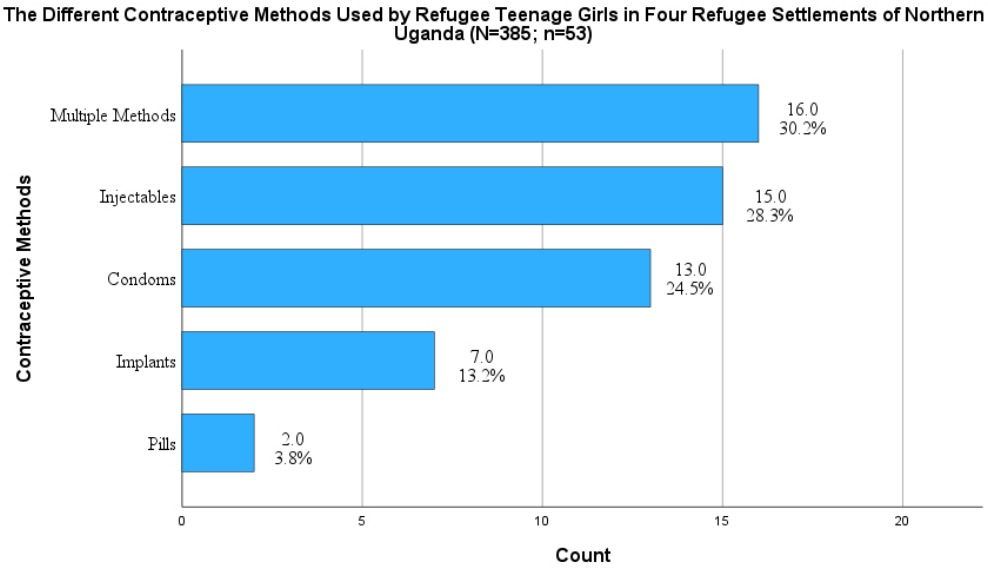

Fig 2: The different contraceptive methods used by teenage girls living in Palorinya and Bidi Bidi refugee settlements of west Nile region, Northern Uganda (N=385; n=53)

299x176mm (72 x 72 DPI)

Factors Contributing to High Prevalence of Teenage Pregnancies in the Post COVID-19 Era in Refugee Settlements of West Nile Region, North Western Uganda

A research proposal submitted to Gulu University Research Ethics Committee (GUREC) for approval to carry out study

Investigators (Research Team):

Name	Title	Role on research team	Affiliation
Otika Donald	Mr.	Principal Investigator	Gulu University
Odongo George	Mr.	Co-Principal Investigator	Medical Teams International
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Lamwaka Beatrice Oweka	Ms.	Co-Principal Investigator	Gulu University

Version: 3.0, January 30, 2023

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Declaration

We hereby declare that this is our original research work and has never been submitted for publication.

Otika Donald Signature:  Date: **October 18, 2022**

(Principal Investigator)

Odongo George Signature:  Date: **October 18, 2022**

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Muzaki Ruth Mary Signature:  Date: **October 18, 2022**

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Lamwaka Beatrice Oweka Signature:  Date: **October 18, 2022**

(Co-Principal Investigator)

Definition of Key Terms

In order to avoid ambiguity, the following terms were operationally defined:

Maternal mortality: Refers to deaths due to complications from pregnancy or childbirth.

Miscarriage: The spontaneous or unplanned expulsion of a foetus from the womb before it is able to survive independently.

Teenage pregnancy: A teenage girl, usually within the ages of 13-19, becoming pregnant.

Teenager: A person aged between 13 and 19 years.

List of Acronyms

COVID-19: Corona Virus Disease - 2019

HMIS: Health Management Information Systems

MoH: Ministry of Health

SPSS: Statistical Package for Social Sciences

UBOS: Uganda Bureau of Statistics

UDHS: Uganda Demographic and Health Survey

WHO: World Health Organization

Table of Contents

Table of Contents

Project Abstract

Background: Complications from teenage pregnancy and childbirth are the leading cause of death of girls aged 15 to 19 years worldwide.

Globally, prior to the COVID-19 crisis, 258 million children and youth of primary and secondary school age were already failing to access education.

One in four (25%) women aged 20 to 24 in Uganda report having given birth for the first time by the age of 18. West Nile region of Uganda has observed a peak of teenage pregnancies in the post – COVID-19 era.

Specific Aims: To find out the socio-economic factors contributing to high prevalence of teenage pregnancy in the post COVID-19 era in refugee settlements in West Nile region, North western Uganda.

To establish the individual factors contributing to high prevalence of teenage pregnancy in the post COVID-19 era in refugee settlements in West Nile region, North western Uganda.

Research design/Methodology: A cross-sectional descriptive study design will be used. The study will also adopt quantitative data collection techniques.

Setting: The study will be conducted in all the refugee settlements of West Nile region of Uganda.

Participants: The study will target all pregnant teenagers in the refugee settlements of West Nile region of Uganda.

Data collection measures: The researcher will obtain an introductory letter from Gulu University Research and Ethics Committee (GUREC). The letter will then be presented to the

refugee welfare council 2 (RWC2) of selected refugee settlements, and the purpose of the study will be explained to each of the respondents prior to data collection.

Chapter One: Introduction

The proposed study will assess the factors Contributing to high prevalence of teenage pregnancies in the post COVID-19 era in refugee settlements of West Nile region, north western Uganda, and will be presented in three chapters. The first chapter (introduction) will have the background of the study, the problem statement, purpose of the study and specific objectives. It will also cover research questions, significance and justification for the study.

1.1 Background of the Study

Teenage pregnancy is defined as a pregnancy in girls 13–19 years of age (WHO, 2014). Teenage pregnancies can have negative consequences for the mother's health as well as economic and social outcomes. Complications from teenage pregnancy and childbirth are the leading cause of death of girls aged 15 to 19 years worldwide (WHO, 2020). Teenagers often face a higher risk of maternal mortality and miscarriage due to limited access to pre- and postnatal care (Irinoye et al., 2014). Teenage mothers are also more likely to drop out of school, leading to poorer economic outcomes and social isolation (Save the Children, 2020). The risks to young mothers of poor maternal/child health, may be exacerbated by stigmatization, isolation from family and unsafe abortion attempts (Neema, Musisi & Kibombo, 2014).

The COVID-19 pandemic has wreaked unprecedented havoc on children, families and communities around the globe, disrupting vital services and putting millions of lives at risk. Since march, attempts to avert the global health crisis have seen nationwide school closures in 194 countries, affecting nearly 1.6 billion learners – over 90 per cent of the world's school-going population (UNESCO, 2020a).

For the most vulnerable children, especially refugee girls, accessing education and staying in school is hard enough. The pandemic has caused additional, unanticipated disruption, and the likelihood of vulnerable children being able to continue their education has dropped. According to Save the Children's Global Girlhood Report, 2020 risks being a year of irreversible setbacks for an entire generation of girls (Save the Children, 2020).

Globally, prior to the COVID-19 crisis, 258 million children and youth of primary and secondary school age were already failing to access education. Teenage pregnancies, among other risk factors, are adding to the

number of girls who are not in school. Even before Covid-19, there were 98 million teenage girls in Africa who were not in school and research suggests the pandemic could add an additional 20 million (GLOW, 2021).

On top of that, the United Nations now estimates that nearly 11 million primary and secondary school learners worldwide – 5.2 million of whom are girls – are at risk of not returning to education following school closures due to COVID-19 due to teenage pregnancy and related outcomes (UNESCO, 2020b). In 2018, the estimated global teenage birth rate was 42 births per 1,000 girls aged 15 to 19 (World Bank, 2020).

The incidence of teenage pregnancy is increasing and has become of a worldwide concern. It is estimated that about 16 million girls 15–19 years old give birth each year, contributing nearly 11% of all births worldwide (WHO, 2014). Among the developed countries, the United States of America (USA) has approximately 850,000 teenagers who become pregnant each year (Realini, 2014). In 2010, the UK had the highest rate of teenages' pregnancies. About 38,690 girls under the age of 18 became pregnant and 44.8% of those pregnancies resulted in legal abortions; 7,617 of those conceptions were under 16 years, and 54.5% of conceptions ended in legal abortions (Linda, 2013).

In Africa, more than 20% of women aged 15 to 19 have given birth to at least one child (WHO, 2014). Sub-Saharan Africa is home to more out-of-school children than any other region in the world, with nearly 97 million (38%), of these children, teenagers and youth (UNESCO, 2020c). World Vision estimates that as many as one million girls across sub-Saharan Africa may be blocked from returning to school due to pregnancy during COVID-19 school closures (UNICEF, 2019). Sub-Saharan Africa experiences some of the highest rates of gender inequality in the world, resulting in unequal access to education and high rates of violence against girls, early pregnancy, and child marriage (UNDP, 2020). It is estimated that 608,000 girls are thought to be at risk of child marriage, and 542,000 additional girls at risk of early pregnancy (Save the children, 2020).

The regional teenage birth rate in SSA is more than double the global average, with 101 births per 1,000 girls aged 15 to 19 – ranging from 39 births per 1,000 girls aged 15 to 19 in Rwanda to 184 births per 1,000 girls

aged 15 to 19 in Nigeria (World Bank, 2020). In countries such as Nigeria, Mauritania and Sudan, more than 15% of the girls have given birth before age 15 (NCCDPH, 2019).

One in four (25%) women aged 20 to 24 in Uganda report having given birth for the first time by the age of 18, compared to one in ten (11%) in South Asia (UNICEF, 2019). The teenage pregnancy rate of 25% in Uganda is worrying, and according to UNICEF (2021) estimates, A total of 354,736 teenage pregnancies were registered in 2020, and 196,499 in the first six months of 2021. The high rates of teenage pregnancy can be attributed to disruption to programs that support access to sexual reproductive health information and services to schoolgirls (Wamajji, 2021).

1.2 Problem Statement

Uganda is committed to ending child, early and forced marriages and teenage pregnancy by year 2030 through: co-sponsoring the 2013 and 2014 UN General Assembly and 2013 Human Rights Council resolutions on early and forced marriages (UN, 2019). According to WHO (2013), several interventions must be combined and integrated for effectiveness (WHO/UNFPA, 2013). Uganda also set the age of marriage at 18, and in 2015, the same country launched the African Union Campaign to end child marriage and pregnancy (UN, 2019). Policies, strategies, campaigns and sensitization by the Ministry of Gender, Labor and Social Development in conjunction with organizations under the "Girls Not Brides" partnership and UN agencies all aim at ending early marriages and child bearing (UN, 2019).

However, refugee settlements in the West Nile region of Uganda have observed a peak of teenage pregnancies in the post – COVID-19 era. Trends of first Antenatal Care visits show a spike in teenage pregnancies in the region. Data on contraceptive uptake is deficient, suggesting limited access and unmet needs. Socio-economic and individual-level influences provide an important contribution in this gap, emanating to teenage pregnancies. This study will therefore help to determine the same.

1.3 Purpose of the Study

The purpose of the study is to assess the Factors Contributing to High Prevalence of Teenage Pregnancy in the Post COVID-19 Era in Refugee Settlements of West Nile Region, North Western Uganda, with a view of reducing the morbidity and mortality related to teenage pregnancies.

1.4 Specific Objectives

1. To find out the Socio-economic Factors Contributing to High Prevalence of Teenage Pregnancies in the Post COVID-19 Era in Refugee Settlements of West Nile Region, North Western Uganda.
2. To establish the individual-level Factors Contributing to High Prevalence of Teenage Pregnancies in the Post COVID-19 Era in Refugee Settlements of West Nile Region, North Western Uganda.

1.5 Research Questions

1. What are the Socio-economic Factors Contributing to High Prevalence of Teenage Pregnancies in the Post COVID-19 Era in Refugee Settlements of West Nile Region, North Western Uganda?
2. What are the individual-level Factors Contributing to High Prevalence of Teenage Pregnancies in the Post COVID-19 Era in Refugee Settlements of West Nile Region, North Western Uganda?

1.6 Justification for the Study

World Vision estimates that as many as one million girls across sub-Saharan Africa may be blocked from returning to school due to pregnancy during COVID-19 school closures (UNICEF, 2019). With school closures related to COVID-19 threatening to lead to an increase in teenage pregnancy, Sub-saharan Africa is self-assured for a further crisis in girls' education unless governments and partners act now.

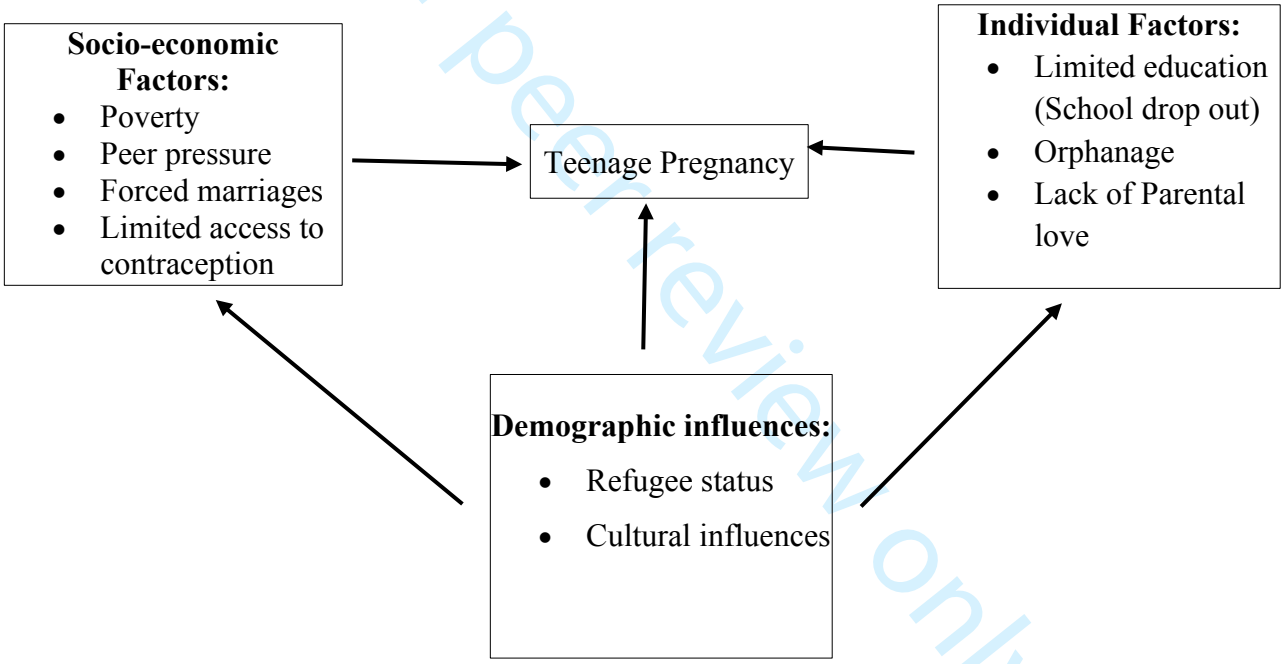
School closures during crises can lead to increases in teenage pregnancy by as much as 65 per cent, as closures result in girls spending more time with men and boys than they would were they to be in school, leading to greater likelihood of engagement in risky sexual behavior and increased risk of sexual violence and exploitation. This generally endangers the life of the teenage girl and necessitates developing strategies to reduce the high incidence rate.

Increasing access and uptake of contraceptive methods are solely adequate to reducing teenage pregnancies. Unmet family planning / contraceptive use provides a favorable gap for teenage pregnancies in the refugee settlements.

With increases in teenage pregnancies looming and policies and practices that ban pregnant girls and young mothers from school, an estimated one million girls in sub-Saharan Africa may be blocked from returning to school once they reopen after closures due to COVID-19.

A lost education is catastrophic to young mothers, their children, and their communities. If countries across sub-Saharan Africa fail to ensure the continued education of teenage mothers, the region could see its economy suffer from a further US$10 billion loss in GDP above and beyond the immediate, crippling effects of COVID-19.

1.7 Conceptual Framework



The study highlighted two key players to teenage pregnancy. Socio-economic factors like poverty, peer pressure, forced marriages and limited access to contraception were projected to directly influence teenage pregnancy. Individual factors that were proposed to play a determinant role in teenage pregnancy included limited education (school drop out), orphanage, and lack of parental love. These factors force teenage girls to engage in risky sexual behaviors, hence unwanted pregnancies.

Demographic influences were postulated to affect teenage pregnancies in a wider perspective. Factors such as refugee status and cultural influences were thought to affect teenage pregnancies directly, or indirectly by affecting Socio-economic and individual-level factors.

Socio-economically, refugee status alone impacts greatly on the level of income. Cultural influences have been widely seen to affect girl child education, proposing school drop out, as well as forced marriages among some communities. All these independently lead to teenage pregnancies.

An interplay of these factors, coupled with the challenges set by the COVID-19 situation therefore puts a huge burden on the refugee teenage girl, fueling school drop out, peer pressure, engagement in risky sexual behaviors, and ultimately teenage pregnancy.

Chapter Two: Literature Review

2.0 Introduction

This chapter reviews literature available on the same topic, studied by other researchers. Various studies were conducted and have been reviewed in this chapter from Google scholar, pub med, Wikipedia and Hinari, following the chronology of the study objectives.

2.1 Socio-economic Factors Contributing to High Prevalence of Teenage Pregnancy in The Face of COVID-19

School closures and higher poverty rates caused by the COVID-19 pandemic are predicted to increase rates of child marriage and teenage pregnancies around the world. One particular vulnerability that is known to be exacerbated by school closures in times of crisis and risks the continued education of vulnerable children is teenage pregnancy. Additionally, poverty has led to some parents to marry off their daughters in order to make money to survive. This was highlighted by a study conducted to understand the factors that contribute to teenage pregnancy during covid-19 in Bugiri municipal council, Bugiri district, Uganda. The study used a cross sectional research design with both qualitative and quantitative research methods. The sample size of the study was 66 and six members who participated in a key informant interview were selected using purposive sampling method. The study findings highlighted that the outbreak of the corona virus pandemic is largely responsible for the dramatic increase in the numbers of teenage pregnancy in Bugiri town. This is coupled with the harsh economic stress, anxiety as well as lack of access to family planning services including idleness (Namukasa, 2021).

Similarly, a study by UBOS (2016) pointed out socio-economic factors contributing to increased teenage pregnancies in Uganda as being high fertility rates, risky sexual behaviors, peer pressure into early sex, child marriages, lack of education, lack of family support, low socio-economic status, low education levels and low use of contraceptives. School closures during crises is independently suggested to result in girls spending more time with men and boys than they would were they to be in school, leading to greater likelihood of engagement in risky sexual behaviour and increased risk of sexual violence and exploitation. In support, Gwido and Fekadu (2015) conducted a study to explore the factors contributing to, and effecting, pregnancy among teenagers in Juba. This descriptive cross-sectional study was conducted in Juba Teaching Hospital

among 50 randomly sampled pregnant teenagers in 2015. Socio-economic factors contributing to teenage pregnancy included: lack of school fees, lack of parental care, communication and supervision, poverty, peer pressure, non-use of contraceptives, desire for a child, forced marriage, low educational level and need for dowries (Gwido & Fekadu, 2015).

Another study that explored sociocultural factors associated with unplanned teenage pregnancy was carried out in Zomba district of Malawi and the results were closely comparable. Data were obtained from 505 participants under the age of 20 years using a questionnaire administered through face-to-face interviews held at five antenatal clinics. Over 76% of the teenage respondents in the study had experienced unplanned pregnancy. Among the prominent factors that stood out in the analysis for this high rate of teenage pregnancy were early sex and marriage (46%), low contraceptive use (53%), low educational levels (41%), low socio-economic status (76%), lack of knowledge of reproductive and sexual health (72%), gender inequity (50%), and physical/sexual violence (33%) (Nanzen & Ezekiel, 2016).

In Ghana, teenage pregnancy is linked to lack of sexual and reproductive health education and services, child marriage, health and well-being risks, and increased poverty and insecurity. A cross-sectional survey involving 820 teenage girls aged 15–19 years was carried out in Accra, Ghana. The main focus of this study was to examine how social capital, economic capital, cultural capital and symbolic capital contributed to the development of competencies of teenages to deal with the threat of teenage pregnancy and childbirth. Out of 820 teenages interviewed, 128 (16 %) were pregnant or mothers. teenages in both groups (62 % never pregnant girls and 68 % pregnant / young mothers) had access to social support, especially from their parents. Parents were taking the place of aunts and grandmothers in providing sexual education to their teenage girls due to changing social structures where extended families no longer resided together in most cases. More (79 %) pregnant girls and young mothers compared to never pregnant girls (38 %) had access to economic support (P = <0.001). This study determined that access to social, economic and cultural capitals were associated with high competence to either prevent or deal with pregnancy among teenage girls (Collins, Constanze & Brigit, 2015).

2.2 Individual-level Factors Contributing to High Prevalence of Teenage Pregnancy in The Face of COVID-19

In as much as the COVID-19 situation is hugely blamed for fueling teenage pregnancies in most parts of the globe, a number of individual characteristics make girls particularly vulnerable to the effects of school closure during the pandemic, for which teenage pregnancy is viewed as the most detrimental to the girl child. The contributions of individual factors in aggravating teenage pregnancies during the COVID-19 state of affairs has been demonstrated by several schools of thought. A study that used data from the 2016 Ethiopian Demographic and Health Survey (EDHS) involving a total of 3381 teenagers aged 15– 19 years obtained using a two-stage stratified cluster approach. Multilevel mixed effect logistic regression was used to identify factors affecting teenage pregnancy. Being 17, 18 and 19 years old, uneducated, primary educated, being married were predictors of teenage pregnancy. This study concluded that age, educational status, and marital status formed individual-level factors predicting teenage pregnancy (Bereket et al., 2020).

Correspondingly, in a related literature, Chirwa et al. (2019) conducted another study using the 2014 and 2015–16 series of nationally representative Malawi Demographic Health Survey covering 12,719 women. The teenage pregnancy and childbearing rate averaged 29% ($p<0.01$) between 2014 and 2015–16. Trends showed a "u-shape" in teenage pregnancy and childbearing rates, albeit a small one (34.1%; $p<0.01$) in 2014: (25.6%; $p<0.01$) in 2015, and (29%; $p<0.01$) in 2016. The calculated concentration indices indicated that inequality in teenage pregnancy and childbearing worsened to the disadvantage of the less educated in the country. Additionally, the decomposition exercise suggested that the primary drivers to inequality in teenage pregnancy and child bearing were, early sexual debut (15.5%), being married (50%), and education status (13.8%) (Chirwa et al., 2019).

In Uganda, the contribution of individual factors in teenage pregnancy is not any different. A research was set out to determine the factors associated with teenage pregnancy and its effects in Kibuku Town Council, Kibuku District. The research used a cross sectional study that employed both quantitative and qualitative methods. Researcher administered questionnaires were given to 180 teenagers in three randomly selected secondary schools in Kibuku Town Council while oral interviews were conducted to 40 pregnant teenagers and teenage mothers attending antenatal clinic at Kibuku Health Centre IV. There was a big knowledge gap

about reproductive health as 75% of school going teenagers believed the minimum age of conception was above 14 years. Bad peer groups were an outstanding cause of teenage pregnancy while school dropout at 48%, was recorded as its major effects (Manzi et al., 2018).

In another study, it was noted that women exposed to abuse, domestic violence and family strife in child hood were more likely to become pregnant as teenages and the risk of becoming pregnant as an teenage increased with the number of adverse child hood experiences (Jacks, 2014). Studies have also found that girls whose father left the family early in their lives had the highest rates on early sexual activity and teenage pregnant girls whose fathers left at a later age had a lower chance of early sexual activity and the lowest rates are found in girls fathers were present through their child hood (Allen, 2013).

Chapter Three: Methodology

3.0 Introduction

This chapter deals with the description of the methodology that the researcher will use in data collection. It will involve the description of study, study setting and rationale, study population, sample size determination, sampling procedure, inclusion criteria, definition of variables, research instruments, data collection procedure, data management, ethical considerations, limitations of the study and how results will be disseminated.

3.1 Study Design and Rationale

A cross-sectional descriptive study design will be used since data will be collected at one point in time, and that the findings will also be presented as they were observed from the field. The study will also adopt quantitative data collection techniques. This technique will be preferred as findings will be presented in numbers and percentages. These designs will be suitable for the study since they will be cost effective and feasible for the researcher.

3.2 Study Setting and Rationale

The study will be conducted in the West Nile region, Northwestern Uganda. According to World Vision (2016), this region is now home to more than 500,000 refugees from South Sudan, living in 48 refugee settlements in 5 districts; Adjumani, Arua, Koboko, Obongi and Yumbe districts. Adjumani and Arua districts both have 17 refugee settlements each, Koboko has 8 while Yumbe has 6. The part of the country hosts the biggest number of refugee settlements, proposed to provide a big pool of potential respondents for sampling.

3.3 Study Population

The study will target pregnant refugee teenage girls of the refugee settlements of West Nile region of Uganda.

3.3.1 Sample size determination.

Using Kish and Lisle (1965),

$$n = \frac{Z^2 \times P\,(1-P)}{d^2}$$

At a confidence interval of 95%, a sample size of 385 will be used. This sample size is projected to give accurate and generalizable results.

3.3.2 Sampling method.

Multi-stage sampling will be used to randomly select two districts within the West Nile region, where the study will be conducted. The five districts; Adjumani, Arua, Koboko, Obongi and Yumbe will be listed in small pieces of paper, put together, mixed, and two will be randomly picked out.

Cluster sampling will be used to randomly identify refugee settlements within the sampled districts that will participate in the study. The refugee settlements will be listed down on small pieces of paper, with each settlement representing one cluster. Two pieces of paper will be randomly picked, which will represent two clusters from which the study will be conducted.

Snow balling Sampling will be used in particular refugee settlements to recruit potential participants. Respondents will be sampled one after another from the refugee settlement. After identifying one respondent, she will be requested to direct the data collectors to any other potential respondent that she may be knowing since they are peers and are most likely expected to be knowing each other.

3.3.3 Inclusion criteria.

- Only respondents between 15 to 19 years old will be included in the study.
- Only those who will consent to study will be included in the study.

3.3.4 Exclusion criteria.

- Respondents who will not consent to the study will not be included.

3.4 Research Instruments

The researcher will develop a semi structured questionnaire including both open and closed ended questions. The tool will be pretested among respondents of similar characteristics outside the study area. The tool will then be refined and fine-tuned by the Principal Investigator (PI) for reliability and validity. The tool ~~and~~ will then be ~~exported~~ converted into Kobotoolbox which is technological application that will be installed in mobile phone devices and used for data collection. The application is effective in data collection as it minimizes errors during data collection, and enjoy faster turnaround time for data cleaning. This is

technological application that has been used before in similar and bigger studies with great success. Wayan et al (2020) stated that with KoboCollect/toolbox, researchers quickly find out the results of the research. Similarly, Poloju et al (2022) also noted in their study that Kobo toolbox has better advantages compared to different data collection tools.

3.5 Data Collection Procedures

The Principal Investigator will obtain an ethical approval and clearance letter from Gulu University Research and Ethics Committee (GUREC). The letter will be presented to the district health offices (DHO) of the selected districts, to seek administrative clearance.

The PI will then proceed to recruit research assistants, who will be given a one day training for acquaintance with the tool, and will be taken through research ethics and good clinical practice.

The PI together with the team of trained data collectors will present the introductory letter from the DHO to the refugee welfare council 2 (RWC2) of selected refugee settlements to seek entry into the community, and commence data collection.

A private and comfortable room will be acquired and used during the process of data collection in order to ensure privacy and confidentiality.

The research assistants (data collectors) will carry out the collection of data. They will explain the purpose of the study to each of the respondents identified, and informed Consent will then be obtained, followed by administration of the questionnaire using an electronic form stored in Kobotoolbox mobile application.

3.5.1 Data management.

The phone devices that will be used to collect the data will be fully charged at every moment the research team set off to collect data, and the data captured in the phone will be regularly saved to avoid loss of data. The devices will be safely kept under key and lock before and after data collection, and only accessible by the PI. Data captured in the Kobotoolbox application installed in the phone devices will be protected using a password only known by the principal investigator. Data will then be exported into Statistical Package of Social Sciences (SPSS) version 23.0, where they will be analyzed. The data will then be computed in form

of percentages and frequencies and finally presented on figures (pie charts, bar graphs and tables) and narratives.

3.6 Ethical Considerations

Ethical approval will be obtained from Gulu University Research EthicsCommittee (GUREC).

Administrative clearance will be sought from the office of the District Health Officer (DHO) of the selected districts. Informed consent will be obtained from all respondents and participation will be free and voluntary. Participants will be free to withdraw from the study at any time with no penalty.Privacy will be observed by interviewing the study participants in a private andcomfortable room.

Access to data will be limited to the study team. Electronic data will be password protected.

Confidentiality of the information collectedwill be observed by using numbers and not names. Participants shall not be traced backto their study variables.

3.7 Anticipated Limitations of the Study

Since this study will include only two refugee settlements of West Nile region, findings may not be very representative of all the many refugee settlements in Uganda, therefore may have a limitation in external validity of the results obtained. However, the strength is the relatively large sample size we shall recruit.

Secondly, this study is a cross-sectional investigation and will not compare the results with those before the COVID-19 pandemic. Therefore, we do not know whether the associations will be causal.

3.8 Dissemination plan

Preliminary findings will be communicated to the study participants.

Final research projectreport will be presented to Faculty of Medicine of Gulu University and at different community meetings.

Copy of the report will be given to the District Health Officers and the refugee administration. Copies of the final report will also be given to the Library of Gulu University and Department of Public Health. Presentation will be made at the Gulu university annual dissemination conference and other scientific conferences.

We intend to have this research project published in a peer-reviewed journal.

Findings will also be disseminated to the local refugee authorities and stake holders.

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High burden of teenage pregnancy and low modern contraceptive methods uptake in refugee settlements of Northern Uganda in the post COVID-19 era Between 2020 and 2023

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Abstract

Background: Following the COVID-19 pandemic, there was an increase in teenage pregnancies nationally, however, limited data exists regarding the same among girls living in refugee settlements.

Objectives: We evaluated the prevalence of teenage pregnancy and associated factors in Palorinya and Bidi Bidi refugee settlements in Obongi and Yumbe districts of Northern Uganda, in the post COVID-19 era.

Design: We conducted a cross sectional descriptive study.

Setting: Refugee settlements in northern Uganda.

Participants: We included 385 teenage girls aged 15 to 19 years

Methods: We used cluster sampling techniques between March and May, 2023. Prevalence of teenage pregnancy was assessed by self-reported pregnancies between January 2020 to May 2023 among participants. We performed modified Poisson regression analysis on variables with P<0.2 to assess associations. Level of significance was set at $P < 0.05$.

Primary and Secondary Outcome Measures: The primary outcome measure was the prevalence of teenage pregnancy, assessed through self-reported pregnancies among participants. Secondary outcome measures included factors associated with teenage pregnancy, such as living with a husband, lack of formal education, peer pressure, and history of sexual abuse. These factors were identified through modified Poisson regression analysis.

Results: Overall, the mean age of 17 (IQR: 15-18), sexual debut at 16 (IQR: 15-17) years. Lifetime modern contraceptive use was 13.8% (n= 53/385) and current use was 7.5% (n=29/385). Teenage pregnancy period prevalence was 34.0% (CI: 29.4% to 38.9%). Factors independently associated with teenage pregnancy were; living with a husband (aPR: 3.8, 95% CI: 2.51 to 5.84, P <0.001), lack of formal education (aPR: 2.3, 95% CI: 1.26 to 4.35, P = 0.007), peer pressure (aPR: 2.1, 95% CI: 1.54 to 2.86, P <0.001) and history of sexual abuse (aPR: 1.5, 95% CI: 1.07 to 1.99, P = 0.018).

Conclusion: Teenage pregnancy in Ugandan refugee settlements surpasses global and national rates, highlighting unmet contraceptive needs. Improving access to modern contraceptives, education, and targeted interventions against child marriage and abuse is essential.

Article Summary

Strengths and limitations of the Study

- The study's inclusion of only two refugee settlements may limit generalizability to all refugee settlements in Uganda, affecting external validity.
- Randomly selecting settlements and using a substantial sample size within each strengthens the statistical reliability of our conclusions.
- Conducting a cross-sectional analysis without pre-pandemic data prevents establishing causal relationships between variables.
- Future research could adopt longitudinal approaches to track changes over time and incorporate historical data for a comprehensive assessment of causal associations.

Background

Teenage pregnancy is defined as a pregnancy in girls 13–19 years of age [1]. Teenage pregnancies can have negative consequences for the mother's health such as unsafe abortion attempts leading to mortality, as well as economic and social outcomes, exacerbated by stigmatization, school dropout and isolation from family [2]. Complications from teenage pregnancy and childbirth are the leading cause of death of girls aged 15 to 19 years worldwide [3].

The incidence of teenage pregnancy is increasing and has become of a worldwide concern. It is estimated that about 16 million girls 15–19 years old give birth each year, contributing nearly 11% of all births worldwide [1]. Globally in 2022, an estimated 13 per cent of adolescent girls and young women give birth before age 18 [4]. In South Asia, one in ten (11%) teenage girls give birth before the age of 19 [5].

In Africa, more than 20% of women aged 15 to 19 have given birth to at least one child [1]. Sub-Saharan Africa is home to more than one million teenage girls with pregnancy [5]. Sub-Saharan Africa additionally experiences some of the highest rates of gender inequality in the world, resulting in unequal access to education and high rates of violence against girls, early pregnancy, and child marriage [6]. It is estimated that 608,000 girls are thought to be at risk of child marriage, and 542,000 additional girls at risk of early pregnancy [7].

The regional teenage birth rate in SSA is more than double the global average, with 101 births per 1,000 girls aged 15 to 19 – ranging from 39 births per 1,000 girls aged 15 to 19 in Rwanda to 184 births per 1,000 girls aged 15 to 19 in Nigeria [4]. Child marriage is

widespread in West and Central Africa, where 42% of women are married as children, and in East and Southern Africa, where child marriage affects 37% of girls [8].

Despite Uganda's commitment to ending child, early and forced marriages and teenage pregnancy by year 2030 through co-sponsoring the 2013 and 2014 UN General Assembly and 2013 Human Rights Council resolutions on early and forced marriages [9], one in four (24%) teenage girls in Uganda report having given birth for the first time by the age of 18 [10]. According to UNICEF (2021) estimates, a total of 354,736 teenage pregnancies were registered in 2020, and 196,499 in the first six months of 2021 amidst the COVID-19 pandemic [11].

The COVID-19 pandemic wreaked unprecedented havoc on children, families, and communities around the globe, disrupting vital services like girl child education, and putting millions of lives at risk. The United Nations estimated that nearly 11 million primary and secondary school learners worldwide – 5.2 million of whom are girls – did not return to education following school closures amidst COVID-19 due to teenage pregnancy and related outcomes [12].

For the most vulnerable children, especially girls living in refugee settlements, accessing education and staying in school is hard enough. The pandemic caused additional, unanticipated disruption, compounding their vulnerability to teenage pregnancies by many folds [7]. Moreover, teenage girls living in refugee settlements face challenges accessing sexual and reproductive health services, including sex education and modern contraceptive methods [13]. Data on teenage pregnancies and associated factors among the teenage girls in refugee settlements is deficient. Additionally, statistics on modern contraceptive methods

uptake among this population is unknown. We therefore aimed to estimate the prevalence and associated factors of teenage pregnancies in the post covid-19 era in Palorinya and Bidi Bidi refugee settlements of west Nile region, Northern Uganda.

Methods

Study Design and Rationale

We conducted a community-based, cross-sectional, observational study, adopting quantitative techniques between March and May, 2023. We followed the Strengthening The Reporting of Observational Studies in Epidemiology (STROBE) guidelines to design this manuscript in order to ensure attention to detail [14].

Study Setting and Rationale

We conducted this study in Palorinya and Bidi Bidi refugee settlements of west Nile region, Northern Uganda. According to data from the Office of the Prime Minister (OPM) and United Nations Higher Commissioner for Refugees (UNHCR), Uganda is now home to 1,622,738 refugees living in 13 refugee settlements across the country, and almost half (6) of these are in the west Nile region [15]. This setting was chosen because it hosts the biggest number of refugee settlements, proposed to provide a big pool of potential respondents for sampling.

Study Population, Inclusion and Exclusion criteria.

Our study targeted teenage girls living in the refugee settlements of Northern Uganda. We included only respondents between 15 to 19 years old, who provided written informed consent or had ascent obtained, and were living in the refugee settlements before the beginning of COVID-19. Those who did not provide informed consent or ascent were not included.

Sample size determination.

We used the Kish and Lisle (1965) formula for calculation of sample size for an unknown population. At 95% confidence interval, we used an error of 5%, alpha risk expressed in z score of 1.96 and a conservative assumption of a 50% population proportion was made to ensure robustness. We obtained a sample size of 385. These choices were guided by standard practices, aiming to balance precision and practicability.

Sampling method.

We used cluster sampling to randomly select Bidi Bidi and Palorinya refugee settlements that participated in the study. The refugee settlements in west Nile region, northern Uganda were listed down on small pieces of paper, with each settlement representing one cluster. Two pieces of paper were randomly picked (two clusters), from which the study was conducted. We used convenience sampling in each of the clusters to select study participants.

Research Instruments

We developed a semi structured questionnaire including both open and closed ended questions. The data collection tool was developed in English and translated into three languages: *Acholi, Kuku, and Arabic*. We pretested the tool among respondents of similar

characteristics outside the study area, after which we refined and fine-tuned the tool for reliability and validity. The tool was then exported into Kobotoolbox installed in mobile phone devices which was used for data collection. We asked about demographics, house hold characteristics, pregnancy history between January 2020 and May 2023 and intentions, marriage status, modern contraceptive use between January 2020 and May 2023, sex education, sexual and physical abuse among others.

Data Collection Procedures

We recruited research assistants, who were given a one-day training for acquaintance with the tool and were taken through research ethics and good clinical practice. The research assistants carried out the collection of data. They explained the purpose of the study to each of the respondents identified, and obtained informed consent, followed by administration of the questionnaire using an electronic form stored in Kobotoolbox mobile application, which is a free open-source tool for mobile data collection.

Data management.

The phone devices that were used to collect the data were fully charged at every moment the research team set off to collect data, and the data captured in the phone was regularly saved to avoid loss of data. We safely kept the devices under key and lock before and after data collection, and limited access. We exported the data into STATA version 15, where analysis was done from.

Data analysis.

Prevalence of teenage pregnancy was assessed by self-reported pregnancies from January 2020 to May 2023. We performed Pearson's chi square and Fisher's exact tests at bivariate analysis. Level of significance was set at $P < 0.05$. We then performed modified Poisson regression analysis on variables with $P<0.2$ to assess associations. Level of significance was set at $P < 0.05$. We considered variables with $P<0.2$ since their power of association is > or = 80%.

The data was then computed in form of percentages and frequencies and finally presented on figures (pie chart, bar graph) and tables.

Patient and Public Involvement

Dissemination of findings was made to the key stakeholders.

Results

Participant Characteristics

Table 1 summarizes the general characteristics of 385 teenage girls living in refugee settlements of west Nile region, northern Uganda. The mean age was 17 (IQR: 15 to 18), years, and 99.5% were Christians, 316 (82.1%) had attained primary education as the highest level, 85.6% were not working, median monthly income was 0 (IQR: 0 to 1,000), Uganda shillings, 56.1% did not live with both parents, 54.8% of household heads were female, and 22.1% of house hold leads were husband /spouse.

Overall, 178 (46.2%) were sexually active, and mean age of sex debut was 15.8 (SD: 1.44), years, sexual abuse was reported by 5.2% of respondents, of whom 75% were sexually abused by strangers, meanwhile physical abuse was reported by 21.6% of respondents, 37.1% of teenage girls experienced peer pressure and alcohol consumption was reported by 8.8% of respondents.

Figure 2 summarizes modern contraceptive methods used by teenage girls living in refugee settlements of west Nile region, northern Uganda. Some of the teenage girls; 13.8% had ever used modern contraceptives in their lifetime, meanwhile only 7.5% were currently using modern contraceptives, of whom only 13.2% reported to have ever used long term contraceptive methods, and 30.2% reported to have ever used multiple methods (including long term and short-term methods). Overall, 17.9% received contraceptive use counselling from home, and 36.1% received home sex education, meanwhile 55.1% had received sex education from school, 40.5% had received contraceptives use counselling from school, and 64.7% had ever been health educated on the dangers of teenage pregnancy.

Some respondents, 5.7% had the intention of getting pregnant in the next 12 months, whereas 52.0% had friends who are pregnant,24.9% were married, of whom 38.5% were forced / arranged. Up to 9.8% of the respondents had ever had an abortion, and 22.0% had had a caesarean section.

Fig 1: Prevalence of teenage pregnancy among 385 girls aged 15 to 19 living in Palorinya and Bidi Bidi refugee settlements of west Nile region, Northern Uganda.

Fig 2: The different contraceptive methods used by teenage girls living in Palorinya and Bidi Bidi refugee settlements of west Nile region, Northern Uganda (N=385; n=53)

Table 1: Individual characteristics of 385 teenage girls living in Palorinya and Bidi Bidi refugee settlements of west Nile region, northern Uganda

Variable	Frequency	Percentage
Age, median (Interquartile range), years	17	15-18
Occupation		
Working	56	14.6
Not working	329	85.6
Average monthly income, median (Interquartile range), Ugx	0	0 – 1,000
Education		
No formal education	5	1.3
Primary	316	82.1
Secondary and beyond	64	16.6
Media Exposure		
Listens to Radio	60	15.6

Owns a mobile phone	71	18.4
Reads newspaper	11	2.9
Watch Television	3	0.8
Uses more than one Medium	65	16.9
None of the above	175	45.6
Relationship to household head		
Parent	251	65.2
Relative	49	12.7
Husband/Spouse	85	22.1
Intention to get pregnant in 12 months		
Yes	22	5.7
No	363	94.3
Have friends who are pregnant		
Yes	200	52.0
No	185	48.0
Ever gotten pregnant		
Yes	131	34.0
No	254	66.0
Number of pregnancies, median (min, max), times	1	1, 3
Pregnancy Outcome		
Live births	110	90.2
Abortions	7	5.7
Both	5	4.1
Peer pressure		
Yes	143	37.1
No	242	62.9
Married		
Yes	96	24.9
No	289	75.1
Mode of Marriage		
Arranged / Forced	37	38.5
Willingly	59	61.5
History of Contraceptive Use		
Yes	53	13.8
No	332	86.2
Current contraceptive use		
Yes	29	7.5
No	356	93.5
Living with both Parents		
Yes	169	43.9
No	216	56.1
Home sex education		

Yes	139	36.1
No	246	63.9
Home contraceptive use counselling		
Yes	69	17.9
No	316	82.1
Received school sex education		
Yes	212	55.1
No	173	44.9
School contraceptive use counselling		
Yes	156	40.5
No	229	59.5
Health education on dangers of teenage pregnancy		
Yes	249	64.7
No	136	35.3
Sexual abuse		
Yes	20	5.2
No	365	94.8
Perpetrator (n=20)		
Relative	5	25.0
Stranger	15	75.0
Physical abuse		
Yes	83	21.6
No	302	78.4
Alcohol Consumption		
Yes	34	8.8
No	351	91.2

Period prevalence of teenage pregnancy among 385 teenage girls living in Palorinya and Bidi Bidi refugee settlements of west Nile region, northern Uganda

Figure 1 shows the prevalence of teenage pregnancy among 385 teenage girls living in refugee settlements of west Nile region, northern Uganda. We found out that up to 34.0% of respondents reported to have ever gotten pregnant between 2020 to 2023 (CI: 29.4% to 38.9%), the median number of pregnancies was 1, with a minimum of 1 and maximum of 3.

Predictors of teenage pregnancy among 385 teenage girls living in Palorinya and Bidi Bidi refugee settlements of west Nile region, northern Uganda

Table 2 summarizes the factors associated with teenage pregnancy among 385 teenage girls living in refugee settlements of west Nile region, northern Uganda. At bivariate level, factors such as; lack of formal education (PR: 3.1, 95% CI: 2.64-3.64, p<0.001), male house hold head (PR: 2.3, 95% CI: 1.72 – 3.13, p<0.001), living with a husband / spouse (PR: 5.4, 95% CI: 4.11-7.17, P<0.001), intention to get pregnant (PR: 1.1, 95% CI: 1.03 – 1.15, p= 0.003), peer pressure (PR: 3.7, 95% CI: 2.73-5.05, P<0.001), being married (PR: 6.6, 95% CI: 4.95 – 8.82, P<0.001), history of contraceptive use (PR: 3.2, 95% CI: 2.55 – 3.94, P<0.001), lack of home sex education (PR: 1.6, 95%CI: 1.16 – 2.24, P = 0.005), health education on dangers of teenage pregnancy (PR: 1.8, 95% CI: 1.25 – 2.49, P = 0.001), sexual abuse (PR: 2.7, 95% CI: 2.14 – 3.46, P<0.001), physical abuse (PR: 2.3, 95% CI: 1.80 – 2.99, P<0.001) and alcohol consumption (PR: 2.3, 95% CI: 1.77 – 3.03, P<0.001), were positively associated to teenage pregnancy.

We then performed modified Poisson regression on all variables that had a P value < 0.2, while controlling for occupation, media exposure and living with both parents. Teenage girls with no formal education were 2.3 times more likely to be pregnant (aPR: 2.3, 95% CI: 1.26-4.35, P = 0.007) as compared with those who had formal education; those who were living with a husband / spouse were 3.8 times more likely to be pregnant (aPR: 3.8, 95% CI: 2.51-5.84, P<0.001) as compared with those who lived with their parents; teenage girls who experienced peer pressure were 2.1 times more likely to be pregnant (aPR: 2.1, 95% CI: 1.54-

2.86, P<0.001) as compared to those who didn't; those who had a history of contraceptive use were 1.8 times more likely to be pregnant (aPR: 1.8, 95% CI: 1.31-2.33, P<0.001) as compared to those who did not have; and teenage girls who experienced sexual abuse were 1.5 times more likely to be pregnant (aPR: 1.5, 95% CI: 1.07-1.99, P = 0.018) as compared to those who didn't.

Table 2: Factors independently associated with teenage pregnancy among 385 teenage girls living in Palorinya and Bidi Bidi refugee settlements of west Nile region, Northern Uganda

Variable	All (N=385) Freq (%)	Teenage Pregnancy		Crude PR (95% CI)	P value	Adjusted PR (95% CI)	P value
		Yes (n=131) Freq (%)	No (n=254) Freq (%)				
Occupation							
Working	56 (14.6)	29 (22.1)	27 (10.6)	1.7(1.24 – 2.56)	0.001	1.1(0.86-1.54)	0.346
Not working	329 (85.6)	102 (77.86)	227 (89.4)	Reference		Reference	
Education							
No education	5 (1.3)	5 (3.8)	0 (0.0)	3.1(2.64-3.64)	<0.001	2.3(1.26-4.35)	0.007
Primary	316 (82.1)	102 (77.9)	214 (84.3)	Reference			
Secondary and beyond	64 (16.6)	24 (18.3)	40 (15.8)	1.2(9.81-1.66)	0.407	Reference 1.1(0.84-1.51)	0.439
Media Exposure							
Listens to Radio	60 (15.6)	5 (3.8)	55 (21.6)	1 (1.00 – 1.00)	1.000	N/A	
Owns a mobile phone	71 (18.4)	50 (38.2)	21 (8.3)	0.9 (0.80 – 0.98)	0.015	0.9 (0.80 – 1.00)	0.052
Reads newspaper	11 (2.9)	1 (0.8)	10 (3.9)	1 (1.00 – 1.00)	1.000		
Watch Television	3 (0.8)	1 (0.8)	2 (0.8)	1 (1.00 – 1.00)	1.000		
Uses more than one Medium	65 (16.9)	39 (29.8)	26 (10.2)	0.9 (0.84 – 1.01)	0.085		
None of the above	175 (45.6)	35 (26.7)	140 (55.1)	Reference			
Relationship to household head							

Parent	251 (65.2)	43 (32.8)	208 (81.9)	Reference		Reference	
Relative	49 (12.73)	9 (6.9)	40 (15.8)	1.1(0.56-2.06)	0.834	0.9(0.47-1.64)	0.687
Husband/Spouse	85 (22.1)	79 (60.3)	6 (2.4)	5.4(4.11-7.17)	<0.001	3.8(2.51-5.84)	<0.001
Intention to get pregnant in 12 months							
Yes	22 (5.7)	19 (14.5)	3 (1.2)	1.1 (1.03 – 1.15)	0.003	1.0 (0.97 – 1.1)	0.246
No	363 (94.3)	112 (85.5)	251 (98.8)	Reference		Reference	
Have friends who are pregnant							
Yes	200 (52.0)	116 (88.6)	84 (33.1)	1.1 (0.89 – 1.36)	0.421	N/A	
No	185 (48.0)	15 (11.4)	170 (66.9)	Reference			
Peer pressure							
Yes	143 (37.1)	90 (68.7)	53 (20.9)	3.7 (2.73-5.05)	<0.001	2.1(1.54-2.86)	<0.001
No	242 (62.9)	41(31.3)	201 (79.1)	Reference		Reference	
Married							
Yes	96 (24.9)	90 (68.7)	6 (2.4)	6.6 (4.95 – 8.82)	<0.001	1.1 (0.88 – 1.46)	0.337
No	289 (75.1)	41 (31.3)	248 (97.6)	Reference		Reference	
Mode of Marriage							
Arranged / Forced	37 (38.5)	33 (36.7)	4 (66.7)	Reference		N/A	
Willingly	59 (61.5)	57 (63.3)	2 (33.3)	1.0 (0.95 – 1.16)	0.347		
History of Contraceptive Use							
Yes	53 (13.8)	44 (33.6)	9 (3.5)	3.2(2.55 – 3.94)	<0.001	1.8(1.31-2.33)	<0.001
No	332 (86.2)	87 (66.4)	245 (96.5)	Reference		Reference	
Living with both Parents							
Yes	169 (43.9)	65 (49.6)	104 (40.9)	1.3(0.95 – 1.66)	0.104	1.1(0.88-1.40)	0.392
No	216 (56.1)	66 (50.4)	150 (59.1)	Reference		Reference	
Home sex education							
Yes	139 (36.1)	34 (26.0)	105 (41.3)	Reference		Reference	
No	246 (63.9)	97 (74.0)	149 (58.7)	1.6(1.16 – 2.24)	0.005	1.2(0.94-1.63)	0.127
Home contraceptive use counselling							
Yes	69 (17.9)	26 (19.8)	43 (16.9)	1.13(0.81 – 1.60)	0.471	N/A	
No	316 (82.1)	105 (80.2)	211 (83.1)	Reference			
Received school sex education							
Yes	212 (55.1)	67 (52.3)	145 (57.1)	1.0 (0.96 – 1.17)	0.265	N/A	
No	173 (44.9)	61 (47.7)	109 (42.9)	Reference			
School contraceptive use counselling							
Yes	156 (40.5)	56 (43.8)	100 (39.4)	1.0 (0.93 – 1.13)	0.573	N/A	
No	229 (59.5)	75 (56.2)	154 (60.6)	Reference			

Health education on dangers of teenage pregnancy							
Yes	249 (64.7)	100 (76.3)	149 (58.7)	1.8(1.25 – 2.49)	0.001	1.2(0.92-1.66)	0.167
No	136 (35.3)	31 (23.7)	105 (41.3)	Reference		Reference	
Sexual abuse							
Yes	20 (5.2)	17 (13.0)	3 (1.2)	2.7(2.14 – 3.46)	<0.001	1.5(1.07-1.99)	0.018
No	365 (94.8)	114 (87.0)	251 (98.8)	Reference		Reference	
Physical abuse							
Yes	83 (21.6)	51 (38.9)	32 (12.6)	2.3(1.80 – 2.99)	<0.001	1.1(0.82-1.36)	0.658
No	302 (78.4)	80 (61.1)	222 (87.4)	Reference		Reference	
Alcohol Consumption							
Yes	34 (8.8)	24 (18.3)	10 (3.9)	2.3(1.77 – 3.03)	<0.001	0.9(0.64-1.20)	0.414
No	351 (91.2)	107 (81.7)	244 (96.1)	Reference		Reference	

Discussion

There is a high prevalence of teenage pregnancies (34.0%) among teenage girls living in refugee settlements of northern Uganda. It is notable that there is a gap in literature on sexual and reproductive health issues in refugee settings in general, and teenage pregnancy statistics in similar settings is not widely studied. The prevalence of teenage pregnancies in the current study surpasses national (24%) and global (11%) averages [1,5]. This could be because our study only considered teenage girls between 15 to 19 years old, meanwhile the other studies considered 13 to 19. Considering the close relationship between sexual abuse and teenage pregnancy, which was similarly observed in Malawi [16], relevant refugee authorities and government stakeholders need to develop strategies aimed at addressing this challenge among teenage girls living in refugee settings, to contribute towards addressing the bigger problem

of maternal morbidity and mortality related to teenage pregnancy. There is also need to explore legal opportunities against the perpetrators of sexual abuse among teenage girls in refugee settings. Our study found out that up to 25% of the perpetrators of sexual abuse among the teenage girls are relatives. This makes it particularly hard to seek support from community and cultural leaders, necessitating the involvement of higher authorities. The ministry of health in conjunction with the office of the prime minister need to put in place favourable measures to deal with the perpetrators of sexual violence against teenage girls in the refugee context.

Several factors were independently associated to teenage pregnancies in our study. Importantly, living with a spouse / husband presented four-fold likelihood of teenage pregnancy compared to those who lived with their parents. Other studies agree to our findings [17]. Moreover, we also found out that most of the child marriages in the refugee context were forced (38.5%). Therefore, targeted measures are urgently needed to deal with the challenge of forced child marriages in the refugee situation. These measures could include, forming child and adolescent support groups, encouraging girl child education, involving relevant authorities in protecting the rights of the girl child living in refugee settlements, and creating awareness among the teenage girls in these settings on the legal opportunities available to deal with the perpetrators of sexual violence.

It is high time the government and civil society organizations come up with targeted measures to make the refugee settlements safer for the teenage girl. This will not only deal with the problem of sexual violence, but also the challenges brought about by teenage pregnancy such as maternal morbidity and mortality. Our study also found out that 9.8% of the respondents had ever had an abortion. The limitation is that our study did not explore

whether this was induced or spontaneous. Furthermore, we do not know whether this abortion was in the watch of a qualified health service provider. This poses a greater risk of severe morbidity and mortality among the teenage mothers in these settings.

Additionally, teenage girls without a formal education stood at a 2.3 times higher risk of teenage pregnancy compared to those with at least a primary education. Similarly, another study conducted in Malawi noted an inequality in teenage pregnancy which worsened to the disadvantage of the less educated [18]. Strengthening education access and acceptability among the teenage girls living in refugee settlements will go a long way in reducing the burden of teenage pregnancy in this vulnerable population. Moreover, keeping the girl child in school will also have a secondary benefit especially in the fight against HIV.

Another important predictor of teenage pregnancy in our study was peer pressure. This is related with another study carried out in Kibuku district, Uganda, that pointed out that bad peer groups were an outstanding cause of teenage pregnancy among the respondents [19]. Addressing the challenge of peer pressure requires a multi-sectoral collaboration. Thoughtfully, fostering education among the teenage girls could be one way of dealing with this issue. Relevant stake holders need to come up with inclusive solutions to encourage girl child education and lower the challenge of peer pressure and consequently teenage pregnancy.

Paradoxically, our study found out that teenage girls who had a history of using modern contraceptives stood at 1.8 risk of teenage pregnancies as compared to those who did not. These findings were unlike those observed in Malawi [16], who otherwise found out that history of contraceptive use was a protective factor. Unfortunately, our study did not

distinguish between the use of long term and short-term contraceptives, in relation to pregnancy. Furthermore, much as we saw that 13.8% of teenage girls living in refugee settlements reported to have ever used a modern contraceptive method in their lifetime, and considering the relatively low age of sex debut (15.8) years, only 7.5% were currently using modern contraceptives, of whom only 13.2% reported to have ever used long term contraceptive methods. Noting the inconsistencies in the use of modern contraceptives among the study participants makes it possible that these inconsistencies contribute to the high prevalence of teenage pregnancy in this setting. Additionally, the proportion of respondents who had ever used long term methods is relatively low, leaving a wider window for teenage pregnancies in this setting. Strengthening the uptake of long-term contraceptive methods among the refugee teenage girls would go a long way in reducing the prevalence of teenage pregnancy in this setting.

Conclusions

Our study found out that about 1 in 3 adolescent girls in refugee settlement of Northern Uganda experienced pregnancy during the COVID-19 pandemic. This burden exceeds the global and national averages, revealing gaps in meeting contraceptive needs. However, only 1 in 13 of the adolescents was currently using modern methods of contraception. Therefore, enhancing accessibility and promoting modern contraceptive methods are crucial. Urgent action is required to address disparities in access to quality education, and implement targeted interventions against child marriages, peer pressure and sexual abuse, to mitigate challenges associated with teenage pregnancy in the refugee context.

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Declarations

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Donald Otika is the guarantor

Consent for Publication

Not applicable

Conflicts of interest

We declare no conflict of interest in this research work.

Data Availability Statement

All relevant data are within the manuscript and its supporting information files. Data are available upon reasonable request from the first author.

Ethical Considerations

We obtained an ethical approval and clearance letter from Gulu University Research and Ethics Committee (GUREC), (approval number: GUREC-2022-291) which was presented to the district health offices (DHO) of the selected districts, to seek administrative clearance. We presented the introductory letter from the DHO to the refugee welfare council 2 (RWC2) of selected refugee settlements to seek entry into the community and commence data collection. A private and comfortable room was acquired and used during the process of data collection to ensure privacy and confidentiality. Written informed consent was obtained from respondents who were 18 or 19 years. For respondents below 18, a written informed ascent was obtained from a parent / guardian who also consented to allow their daughter participate in the study, and participation was free and voluntary. Participants were assured of their freedom to withdraw from the study at any time with no penalty. Confidentiality of the information collected was observed by using numbers and not names.

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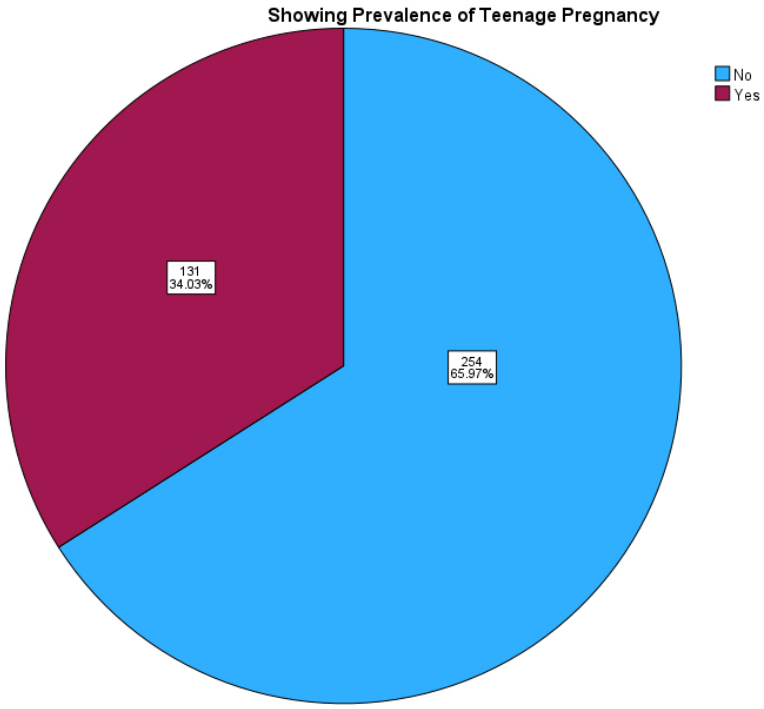

Fig 1: Prevalence of teenage pregnancy among 385 girls aged 15 to 19 living in Palorinya and Bidi Bidi refugee settlements of west Nile region, Northern Uganda.

299x218mm (72 x 72 DPI)

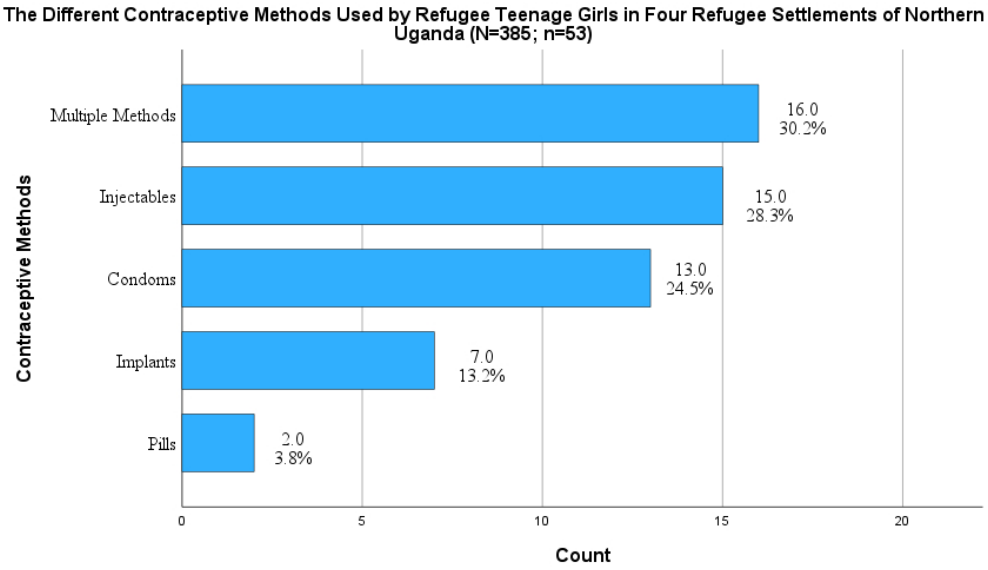

Fig 2: The different contraceptive methods used by teenage girls living in Palorinya and Bidi Bidi refugee settlements of west Nile region, Northern Uganda (N=385; n=53)

299x176mm (72 x 72 DPI)

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High burden of teenage pregnancy and low modern contraceptive methods uptake in refugee settlements of Northern Uganda in the post COVID-19 era Between 2020 and 2023

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Prevalence and factors associated with teenage pregnancy in refugee settlements of northern Uganda post-COVID-19 (2020-2023): A cross-sectional study

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Abstract

Background: Following the COVID-19 pandemic, there was an increase in teenage pregnancies nationally, however, limited data exists regarding the same among girls living in refugee settlements.

Objectives: We evaluated the prevalence of teenage pregnancy and associated factors in Palorinya and Bidi Bidi refugee settlements in Obongi and Yumbe districts of Northern Uganda, in the post-COVID-19 era.

Design: We conducted a cross-sectional study.

Setting: Refugee settlements in northern Uganda.

Participants: We included 385 teenage girls aged 15 to 19 years

Methods: We used convenience sampling techniques between March and May 2023. Prevalence of teenage pregnancy was assessed by self-reported pregnancies between January 2020 and May 2023 among participants. We conducted Pearson's chi-square and Fisher's exact tests for bivariate analysis. All variables with a P-value <0.2 at bivariate analysis were included in multivariable regression. We applied a modified Poisson regression model at multivariable level to evaluate independent associations. The level of statistical significance was set at $P < 0.05$.

Primary and Secondary Outcome Measures: The primary outcome measure was the prevalence of teenage pregnancy, assessed through self-reported pregnancies among participants. Secondary outcome measures included factors associated with teenage

pregnancy, such as living with a husband, lack of formal education, peer pressure, and history of sexual abuse.

Results: Overall, the mean age of 17 (IQR: 15-18), and sexual debut at 16 (IQR: 15-17) years. Lifetime modern contraceptive use was 13.8% (n= 53/385) and current use was 7.5% (n=29/385). Teenage pregnancy period prevalence was 34.0% (CI: 29.4% to 38.9%). Factors independently associated with teenage pregnancy were; living with a husband (aPR: 3.8, 95% CI: 2.51 to 5.84, P <0.001), lack of formal education (aPR: 2.3, 95% CI: 1.26 to 4.35, P = 0.007), peer pressure (aPR: 2.1, 95% CI: 1.54 to 2.86, P <0.001) and history of sexual abuse (aPR: 1.5, 95% CI: 1.07 to 1.99, P = 0.018).

Conclusion: Our study revealed that around 1 in 3 adolescent girls in Northern Uganda's refugee settlements experienced pregnancy during the COVID-19 pandemic, with only 1 in 13 currently using modern contraceptives. To address this, targeted strategies by relevant authorities are crucial, including legal actions against sexual abuse, promoting girl child education, and enhancing access to long-term contraception, to reduce teenage pregnancy and associated health risks in these settings.

Article Summary

Strengths and Limitations of the Study

- The study's inclusion of only two refugee settlements may limit generalizability to all refugee settlements in Uganda, affecting external validity.
- Randomly selecting settlements and using a substantial sample size within each strengthens the statistical reliability of our conclusions.

- Conducting a cross-sectional analysis without pre-pandemic data prevents establishing causal relationships between variables.
- Future research could adopt longitudinal approaches to track changes over time and incorporate historical data for a comprehensive assessment of causal associations.

Background

Teenage pregnancy is defined as a pregnancy in girls 13–19 years of age [1]. Teenage pregnancies can have negative consequences for the mother's health such as unsafe abortion attempts leading to mortality, as well as economic and social outcomes, exacerbated by stigmatization, school dropout and isolation from family [2]. Complications from teenage pregnancy and childbirth are the leading cause of death in girls aged 15 to 19 years worldwide [3].

The incidence of teenage pregnancy is increasing and has become a worldwide concern. It is estimated that about 16 million girls 15–19 years old give birth each year, contributing nearly 11% of all births worldwide [1]. Globally in 2022, an estimated 13 per cent of adolescent girls and young women give birth before the age of 18 [4, 5]

In Africa, more than 20% of women aged 15 to 19 have given birth to at least one child [1]. Sub-Saharan Africa is home to more than one million teenage girls with pregnancy [5]. Sub-Saharan Africa additionally experiences some of the highest rates of gender inequality in the world, resulting in unequal access to education and high rates of violence against girls, early pregnancy, and child marriage [6]. It is estimated that 608,000 girls are thought to be at risk of child marriage, and 542,000 additional girls are at risk of early pregnancy [7].

The regional teenage birth rate in SSA is more than double the global average, with 101 births per 1,000 girls aged 15 to 19 – ranging from 39 births per 1,000 girls aged 15 to 19 in Rwanda to 184 births per 1,000 girls aged 15 to 19 in Nigeria [4]. Child marriage is widespread in West and Central Africa, where 42% of women are married as children, and in East and Southern Africa, where child marriage affects 37% of girls [8].

Despite Uganda's commitment to ending child, early and forced marriages and teenage pregnancy by the year 2030 through co-sponsoring the 2013 and 2014 UN General Assembly and 2013 Human Rights Council resolutions on early and forced marriages [9], one in four (24%) teenage girls in Uganda report having given birth for the first time by the age of 18 [10]. According to UNICEF (2021) estimates, a total of 354,736 teenage pregnancies were registered in 2020, and 196,499 in the first six months of 2021 amidst the COVID-19 pandemic [11].

The COVID-19 pandemic wreaked unprecedented havoc on children, families, and communities around the globe, disrupting vital services like girl-child education, and putting millions of lives at risk. The United Nations estimated that nearly 11 million primary and secondary school learners worldwide – 5.2 million of whom are girls – did not return to education following school closures amidst COVID-19 due to teenage pregnancy and related outcomes [12].

For the most vulnerable children, especially girls living in refugee settlements, accessing education and staying in school is hard enough. The pandemic caused additional, unanticipated disruption, compounding their vulnerability to teenage pregnancies by many folds [7]. Moreover, teenage girls living in refugee settlements face challenges accessing

sexual and reproductive health services, including sex education and modern contraceptive methods [13]. These girls are at a significantly higher risk of early pregnancy, a situation that worsened due to the COVID-19 pandemic. According to a recent study by the Forum for African Women Educationalists (Uganda Chapter), the rate of teenage pregnancy among girls in refugee settlements rose from 3.3% to 4.1% during the pandemic. In one Palabek settlement, the proportion of refugee girls who reported being pregnant during the COVID-19 period reached 4.8%, compared to the national average of 1.8% [14]. Additionally, statistics on modern contraceptive methods uptake among this population are unknown.

Teen pregnancies in refugee and humanitarian settings are influenced by several factors including poverty, lack of education, cultural norms, etc., further driven by limited access to health care, lack of social support and increased risk of sexual violence [15–17]. Addressing these issues requires targeted interventions that consider the unique challenges faced by teenage girls in these settings.

We therefore aimed to estimate the prevalence and associated factors of teenage pregnancies in the post-COVID-19 era in Palorinya and Bidi Bidi refugee settlements of the west Nile region, Northern Uganda.

Methods

Study Design and Rationale

We conducted a community-based, cross-sectional study between March and May, 2023. We followed the Strengthening The Reporting of Observational Studies in Epidemiology (STROBE) guidelines to design this manuscript in order to ensure attention to detail [18].

Study Setting and Rationale

We conducted this study in Palorinya and Bidi Bidi refugee settlements of the west Nile region, Northern Uganda. According to data from the Office of the Prime Minister (OPM) and United Nations Higher Commissioner for Refugees (UNHCR), Uganda is now home to 1,622,738 refugees living in 13 refugee settlements across the country, and almost half (6) of these are in the west Nile region [19]. Women and girls constitute over 80% of this population, and the settlements are arranged in blocks and zones. Palorinya refugee settlement has 4 zones, and 9 level 3 health centers, meanwhile Bidi Bidi has 6 zones and 16 level 3 health centers. None of the refugee settlements has a higher-level health center, however, there are several referral sites e.g., Yumbe Health Center IV, Midigo Health Center IV and Yumbe Regional Referral Hospital. All these facilities provide family planning services to adolescents. This setting was chosen because it hosts the biggest number of refugee settlements, proposed to provide a big pool of potential respondents for sampling.

Study Population, Inclusion and Exclusion Criteria.

Our study targeted teenage girls living in the refugee settlements of Northern Uganda. We included only respondents between 15 to 19 years old, who provided written informed consent or had ascent obtained, and were living in the refugee settlements before the beginning of COVID-19. Those who did not provide informed consent or assent were not included.

Sample size determination.

We used the Kish Lisle (1965) formula for the calculation of sample size for an unknown population. At 95% confidence interval, we used an error of 5%, alpha risk expressed in z score of 1.96 and a conservative assumption of a 50% population proportion was made to ensure robustness. We obtained a sample size of 385. These choices were guided by standard practices, aiming to balance precision and practicability.

Sampling method.

We used convenience sampling to select study participants from Bidi Bidi and Palorinya refugee settlements. Convenience sampling in our study involved selecting participants who were readily available and willing to participate in the study. We approached individuals in many community spaces, targeting various times and days to ensure diversity. The participation acceptance rate was 100%, with no declines. This method allowed us to gather data from a broad participant base.

Research Instruments

We developed a semi-structured questionnaire including both open and closed-ended questions. The data collection tool was developed in English and translated into three languages: *Acholi, Kuku, and Arabic*. We pretested the tool among respondents of similar characteristics outside the study area, after which we refined and fine-tuned the tool for reliability and validity. The tool was then exported into Kobotoolbox installed on mobile phone devices which was used for data collection. We asked about demographics, household characteristics, pregnancy history between January 2020 and May 2023 and intentions,

marriage status, modern contraceptive use between January 2020 and May 2023, sex education, and sexual and physical abuse among others. Abuse was measured by asking 'Have you ever experienced physical abuse?' and 'Have you ever experienced sexual abuse?' with timeframes specified as 'in the past 12 months' and 'in your lifetime,' respectively. Contraception use was assessed by asking 'Have you ever used any form of contraception?'. Those who had ever used were further asked to specify the method of contraception used. Peer pressure was measured by asking 'Have you ever experienced any form of peer pressure to get pregnant?' Alcohol consumption was assessed by asking 'Do you take alcohol?'. These responses were recorded as binary outcomes (yes/no). The tool was developed de novo, adhering to established guidelines and drawing from relevant literature. This tool had not been previously used in this setting, and it was tailored specifically for this study.**Data Collection Procedures**A private and comfortable room was acquired and used during the process of data collection to ensure a private and confidential environment for respondents. We recruited research assistants, who were given a one-day training for acquaintance with the tool and were taken through research ethics and good clinical practice. The research assistants carried out the collection of data. Although gender matching between participants and data collectors was not implemented, all research assistants underwent comprehensive training on ethical principles. This training highlighted the importance of maintaining privacy and confidentiality, especially when handling sensitive information related to abuse. They explained the purpose of the study to each of the respondents identified, and obtained informed consent, followed by administration of the questionnaire using an electronic form stored in the Kobo toolbox mobile application, which is a free open-source tool for mobile data collection.

Data management.

The phone devices that were used to collect the data were fully charged at every moment the research team set off to collect data, and the data captured in the phone was regularly saved to avoid loss of data. We safely kept the devices under key and lock before and after data collection, and limited access. We exported the data into STATA version 15, where analysis was done from.

Data analysis.

The prevalence of teenage pregnancy was assessed by self-reported pregnancies from January 2020 to May 2023. We conducted Pearson's chi-square and Fisher's exact tests for bivariate analysis. The level of statistical significance was set at $P < 0.05$. Variables with a P-value < 0.2 from these tests were included in the multivariable analysis. We applied a modified Poisson regression model at the multivariable level to evaluate independent associations. The level of statistical significance was set at $P < 0.05$. Modified Poisson regression was chosen over logistic regression because the outcome was common (i.e., the prevalence rate was high), because in such cases, the odds ratio from logistic regression can significantly overestimate the relative risk. We considered variables with $P<0.2$ from bivariate analysis to be included in the multivariable regression since their power of association is > or = 80%.

The research questions tested in statistical analysis were, 'what is the prevalence of teenage pregnancies in the study population?' and 'what are the associated factors of teenage pregnancies in the study population?'

The data was then computed in percentages and frequencies and finally presented in figures (pie chart, bar graph) and tables.

Patient and Public Involvement

The public was involved in this study. Dissemination of findings was done to key stakeholders.

Results

Participant Characteristics

Table 1 summarizes the general characteristics of 385 teenage girls living in refugee settlements of the West Nile region, in northern Uganda. The mean age was 17 (IQR: 15 to 18), years, and 99.5% were Christians, 316 (82.1%) had attained primary education as the highest level, 85.6% were not working, median monthly income was 0 (IQR: 0 to 1,000), Uganda shillings, 56.1% did not live with both parents, 54.8% of household heads were female, and 22.1% of household leads were husband /spouse.

Overall, 178 (46.2%) were sexually active, and the mean age of sex debut was 15.8 (SD: 1.44), years, sexual abuse was reported by 5.2% of respondents, of whom 75% were sexually abused by strangers, meanwhile physical abuse was reported by 21.6% of respondents, 37.1% of teenage girls experienced peer pressure and alcohol consumption was reported by 8.8% of respondents.

Figure 2 summarizes modern contraceptive methods used by teenage girls living in refugee settlements of the west Nile region, in northern Uganda. Some of the teenage girls; 13.8% had ever used modern contraceptives in their lifetime, meanwhile only 7.5% were currently using modern contraceptives, of whom only 13.2% reported to have ever used long term contraceptive methods, and 30.2% reported to have ever used multiple methods (including long term and short-term methods). Overall, 17.9% received contraceptive use counselling from home, and 36.1% received home sex education, meanwhile 55.1% had received sex education from school, 40.5% had received contraceptives use counselling from school, and 64.7% had ever been health educated on the dangers of teenage pregnancy.

Some respondents, 5.7% had the intention of getting pregnant in the next 12 months, whereas 52.0% had friends who are pregnant,24.9% were married, of whom 38.5% were forced / arranged. Up to 9.8% of the respondents had ever had an abortion, and 22.0% had had a caesarean section.

Fig 1: Prevalence of teenage pregnancy among 385 girls aged 15 to 19 living in Palorinya and Bidi Bidi refugee settlements of west Nile region, Northern Uganda.

Fig 2: The different contraceptive methods used by teenage girls living in Palorinya and Bidi Bidi refugee settlements of west Nile region, Northern Uganda (N=385; n=53)

Table 1: Individual characteristics of 385 teenage girls living in Palorinya and Bidi Bidi refugee settlements of west Nile region, northern Uganda

Variable	Frequency	Percentage
Age, median (Interquartile range), years	17	15-18
Occupation		
Working	56	14.6
Not working	329	85.6
Average monthly income, median (Interquartile range), Ugx	0	0 – 1,000
Education		
No formal education	5	1.3
Primary	316	82.1
Secondary and beyond	64	16.6
Media Exposure		
Listens to Radio	60	15.6
Owns a mobile phone	71	18.4
Reads newspaper	11	2.9
Watch Television	3	0.8
Uses more than one Medium	65	16.9
None of the above	175	45.6
Relationship to household head		
Parent	251	65.2
Relative	49	12.7
Husband/Spouse	85	22.1
Intention to get pregnant in 12 months		

Yes	22	5.7
No	363	94.3
Have friends who are pregnant		
Yes	200	52.0
No	185	48.0
Ever gotten pregnant		
Yes	131	34.0
No	254	66.0
Number of pregnancies, median (min, max), times	1	1, 3
Pregnancy Outcome		
Live births	110	90.2
Abortions	7	5.7
Both	5	4.1
Peer pressure		
Yes	143	37.1
No	242	62.9
Married		
Yes	96	24.9
No	289	75.1
Mode of Marriage		
Arranged / Forced	37	38.5
Willingly	59	61.5
History of Contraceptive Use		
Yes	53	13.8
No	332	86.2
Current contraceptive use		
Yes	29	7.5
No	356	93.5
Living with both Parents		
Yes	169	43.9
No	216	56.1
Home sex education		
Yes	139	36.1
No	246	63.9
Home contraceptive use counselling		
Yes	69	17.9
No	316	82.1
Received school sex education		
Yes	212	55.1
No	173	44.9
School contraceptive use counselling		

Yes	156	40.5
No	229	59.5
Health education on dangers of teenage pregnancy		
Yes	249	64.7
No	136	35.3
Sexual abuse		
Yes	20	5.2
No	365	94.8
Perpetrator (n=20)		
Relative	5	25.0
Stranger	15	75.0
Physical abuse		
Yes	83	21.6
No	302	78.4
Alcohol Consumption		
Yes	34	8.8
No	351	91.2

Period prevalence of teenage pregnancy among 385 teenage girls living in Palorinya and Bidi Bidi refugee settlements of west Nile region, northern Uganda

Figure 1 shows the prevalence of teenage pregnancy among 385 teenage girls living in refugee settlements of west Nile region, northern Uganda. We found out that up to 34.0% of respondents reported to have ever gotten pregnant between 2020 to 2023 (CI: 29.4% to 38.9%), the median number of pregnancies was 1, with a minimum of 1 and maximum of 3.

Predictors of teenage pregnancy among 385 teenage girls living in Palorinya and Bidi Bidi refugee settlements of west Nile region, northern Uganda

Table 2 summarizes the factors associated with teenage pregnancy among 385 teenage girls living in refugee settlements of west Nile region, northern Uganda. At bivariate level, factors such as; lack of formal education (PR: 3.1, 95% CI: 2.64-3.64, p<0.001), male house hold head (PR: 2.3, 95% CI: 1.72 – 3.13, p<0.001), living with a husband / spouse (PR: 5.4, 95% CI: 4.11-7.17, P<0.001), intention to get pregnant (PR: 1.1, 95% CI: 1.03 – 1.15, p= 0.003), peer pressure (PR: 3.7, 95% CI: 2.73-5.05, P<0.001), being married (PR: 6.6, 95% CI: 4.95 – 8.82, P<0.001), history of contraceptive use (PR: 3.2, 95% CI: 2.55 – 3.94, P<0.001), lack of home sex education (PR: 1.6, 95%CI: 1.16 – 2.24, P = 0.005), health education on dangers of teenage pregnancy (PR: 1.8, 95% CI: 1.25 – 2.49, P = 0.001), sexual abuse (PR: 2.7, 95% CI: 2.14 – 3.46, P<0.001), physical abuse (PR: 2.3, 95% CI: 1.80 – 2.99, P<0.001) and alcohol consumption (PR: 2.3, 95% CI: 1.77 – 3.03, P<0.001), were positively associated to teenage pregnancy.

We then performed modified Poisson regression on all variables that had a P value < 0.2, while controlling for occupation, media exposure and living with both parents. Teenage girls with no formal education were 2.3 times more likely to be pregnant (aPR: 2.3, 95% CI: 1.26-4.35, P = 0.007) as compared with those who had formal education; those who were living with a husband / spouse were 3.8 times more likely to be pregnant (aPR: 3.8, 95% CI: 2.51-5.84, P<0.001) as compared with those who lived with their parents; teenage girls who experienced peer pressure were 2.1 times more likely to be pregnant (aPR: 2.1, 95% CI: 1.54-2.86, P<0.001) as compared to those who didn't; those who had a history of contraceptive use were 1.8 times more likely to be pregnant (aPR: 1.8, 95% CI: 1.31-2.33, P<0.001) as compared to those who did not have; and teenage girls who experienced sexual abuse were

1.5 times more likely to be pregnant (aPR: 1.5, 95% CI: 1.07-1.99, P = 0.018) as compared to those who didn't.

Table 2: Factors independently associated with teenage pregnancy among 385 teenage girls living in Palorinya and Bidi Bidi refugee settlements of west Nile region, Northern Uganda

Variable	All (N=385) Freq (%)	Teenage Pregnancy		Crude PR (95% CI)	P value	Adjusted PR (95% CI)	P value
		Yes (n=131) Freq (%)	No (n=254) Freq (%)				
Occupation							
Working	56 (14.6)	29 (22.1)	27 (10.6)	1.7(1.24 – 2.56)	0.001	1.1(0.86-1.54)	0.346
Not working	329 (85.6)	102 (77.86)	227 (89.4)	Reference		Reference	
Education							
No education	5 (1.3)	5 (3.8)	0 (0.0)	3.1(2.64-3.64)	<0.001	2.3(1.26-4.35)	0.007
Primary	316 (82.1)	102 (77.9)	214 (84.3)	Reference		Reference	
Secondary and beyond	64 (16.6)	24 (18.3)	40 (15.8)	1.2(9.81-1.66)	0.407	1.1(0.84-1.51)	0.439
Media Exposure							
Listens to Radio	60 (15.6)	5 (3.8)	55 (21.6)	1 (1.00 – 1.00)	1.000	N/A	
Owns a mobile phone	71 (18.4)	50 (38.2)	21 (8.3)	0.9 (0.80 – 0.98)	0.015	0.9 (0.80 – 1.00)	0.052
Reads newspaper	11 (2.9)	1 (0.8)	10 (3.9)	1 (1.00 – 1.00)	1.000		
Watch Television	3 (0.8)	1 (0.8)	2 (0.8)	1 (1.00 – 1.00)	1.000		
Uses more than one Medium	65 (16.9)	39 (29.8)	26 (10.2)	0.9 (0.84 – 1.01)	0.085		
None of the above	175 (45.6)	35 (26.7)	140 (55.1)	Reference			
Relationship to household head							
Parent	251 (65.2)	43 (32.8)	208 (81.9)	Reference		Reference	
Relative	49 (12.73)	9 (6.9)	40 (15.8)	1.1(0.56-2.06)	0.834	0.9(0.47-1.64)	0.687
Husband/Spouse	85 (22.1)	79 (60.3)	6 (2.4)	5.4(4.11-7.17)	<0.001	3.8(2.51-	<0.001

						5.84)	
Intention to get pregnant in 12 months							
Yes	22 (5.7)	19 (14.5)	3 (1.2)	1.1 (1.03 – 1.15)	0.003	1.0 (0.97 – 1.1)	0.246
No	363 (94.3)	112 (85.5)	251 (98.8)	Reference		Reference	
Have friends who are pregnant							
Yes	200 (52.0)	116 (88.6)	84 (33.1)	1.1 (0.89 – 1.36)	0.421	N/A	
No	185 (48.0)	15 (11.4)	170 (66.9)	Reference			
Peer pressure							
Yes	143 (37.1)	90 (68.7)	53 (20.9)	3.7 (2.73-5.05)	<0.001	2.1(1.54-2.86)	<0.001
No	242 (62.9)	41(31.3)	201 (79.1)	Reference		Reference	
Married							
Yes	96 (24.9)	90 (68.7)	6 (2.4)	6.6 (4.95 – 8.82)	<0.001	1.1 (0.88 – 1.46)	0.337
No	289 (75.1)	41 (31.3)	248 (97.6)	Reference		Reference	
Mode of Marriage							
Arranged / Forced Willingly	37 (38.5)	33 (36.7)	4 (66.7)	Reference		N/A	
	59 (61.5)	57 (63.3)	2 (33.3)	1.0 (0.95 – 1.16)	0.347		
History of Contraceptive Use							
Yes	53 (13.8)	44 (33.6)	9 (3.5)	3.2(2.55 – 3.94)	<0.001	1.8(1.31-2.33)	<0.001
No	332 (86.2)	87 (66.4)	245 (96.5)	Reference		Reference	
Living with both Parents							
Yes	169 (43.9)	65 (49.6)	104 (40.9)	1.3(0.95 – 1.66)	0.104	1.1(0.88-1.40)	0.392
No	216 (56.1)	66 (50.4)	150 (59.1)	Reference		Reference	
Home sex education							
Yes	139 (36.1)	34 (26.0)	105 (41.3)	Reference		Reference	
No	246 (63.9)	97 (74.0)	149 (58.7)	1.6(1.16 – 2.24)	0.005	1.2(0.94-1.63)	0.127
Home contraceptive use counselling							
Yes	69 (17.9)	26 (19.8)	43 (16.9)	1.13(0.81 – 1.60)	0.471	N/A	
No	316 (82.1)	105 (80.2)	211 (83.1)	Reference			
Received school sex education							
Yes	212 (55.1)	67 (52.3)	145 (57.1)	1.0 (0.96 – 1.17)	0.265	N/A	
No	173 (44.9)	61 (47.7)	109 (42.9)	Reference			
School contraceptive use counselling							
Yes	156 (40.5)	56 (43.8)	100 (39.4)	1.0 (0.93 – 1.13)	0.573	N/A	
No	229 (59.5)	75 (56.2)	154 (60.6)	Reference			
Health education on dangers of teenage pregnancy							
Yes	249 (64.7)	100 (76.3)	149 (58.7)	1.8(1.25 – 2.49)	0.001	1.2(0.92-1.66)	0.167
No	136 (35.3)	31 (23.7)	105 (41.3)	Reference		Reference	

Sexual abuse							
Yes	20 (5.2)	17 (13.0)	3 (1.2)	2.7(2.14 – 3.46)	<0.001	1.5(1.07-1.99)	0.018
No	365 (94.8)	114 (87.0)	251 (98.8)	Reference		Reference	
Physical abuse							
Yes	83 (21.6)	51 (38.9)	32 (12.6)	2.3(1.80 – 2.99)	<0.001	1.1(0.82-1.36)	0.658
No	302 (78.4)	80 (61.1)	222 (87.4)	Reference		Reference	
Alcohol Consumption							
Yes	34 (8.8)	24 (18.3)	10 (3.9)	2.3(1.77 – 3.03)	<0.001	0.9(0.64-1.20)	0.414
No	351 (91.2)	107 (81.7)	244 (96.1)	Reference		Reference	

Discussion

This study reveals a high prevalence of teenage pregnancies (34.0%) among teenage girls living in refugee settlements in northern Uganda. Several factors were independently associated with teenage pregnancies in this context, including living with a spouse or husband, lack of formal education, peer pressure, and inconsistent use of modern contraceptives. Additionally, 9.8% of the respondents had experienced an abortion, highlighting the potential risks of maternal morbidity and mortality in this vulnerable population. Furthermore, the study identified concerning levels of sexual abuse, with 25% of the perpetrators being relatives, emphasizing the challenges faced by these girls in seeking support and justice.

Notably, there is a gap in the literature on sexual and reproductive health issues in humanitarian settings in general, and teenage pregnancy statistics in similar settings are not

widely studied. Our study reveals a comparatively higher prevalence of teenage pregnancy in the refugee settings of northern Uganda, way higher than that in other studies. The high prevalence of teenage pregnancy in our study could be because our study only considered teenage girls between 15 to 19 years old, meanwhile the other studies considered 13 to 19. We found a close relationship between sexual abuse and teenage pregnancy, which was similarly observed in Malawi [20]. Our study found that up to 25% of the perpetrators of sexual abuse among teenage girls are relatives. This makes it particularly hard to seek support from community and cultural leaders, necessitating the involvement of higher authorities. Several factors were independently associated with teenage pregnancies in our study. Importantly, living with a spouse/husband presented four-fold likelihood of teenage pregnancy compared to those who lived with their parents. Other studies agree with our findings [21]. Moreover, we also found out that most of the child marriages in the refugee context were forced (38.5%), similarly observed in different studies [21]. Forced and early/child marriage in Bidi Bidi refugee settlement and among Ugandan refugees is a complex issue driven by various factors such as poverty and economic hardship, gender norms and cultural practices, stigma and social pressure [22]. Providing education and vocational training for girls, engaging community leaders and members in dialogue and strengthening and enforcing laws against child marriage can provide a legal deterrent, meanwhile offering comprehensive sexual and reproductive health services and support for survivors of child and / or forced marriages can mitigate some of the adverse effects [22].

Our study also found that 9.8% of the respondents had ever had an abortion. The limitation is that our study did not explore whether this was induced or spontaneous. Furthermore, we do not know whether this abortion was in the watch of a qualified health service provider. This

poses a greater risk of severe morbidity and mortality among teenage mothers in these settings.

Additionally, teenage girls without a formal education stood at a 2.3 times higher risk of teenage pregnancy compared to those with at least a primary education. Similarly, another study conducted in Malawi noted an inequality in teenage pregnancy which worsened to the disadvantage of the less educated [23]. Another important predictor of teenage pregnancy in our study was peer pressure. This is related to another study carried out in Kibuku district, Uganda, that pointed out that bad peer groups were an outstanding cause of teenage pregnancy among the respondents [24]. Addressing the challenge of peer pressure requires a multi-sectoral collaboration, involving the Ministry of Health, and education among other ministries.

Paradoxically, our study found out that teenage girls who had a history of using modern contraceptives stood at 1.8 risk of teenage pregnancies as compared to those who did not. These findings were unlike those observed in Malawi [17], which otherwise found that history of contraceptive use was a protective factor. Unfortunately, our study did not distinguish between the use of long-term and short-term contraceptives, in relation to pregnancy. We observed that 13.8% of teenage girls living in refugee settlements reported having ever used a modern contraceptive method in their lifetime. Despite this, given the relatively low average age of sexual debut (15.8 years), only 7.5% were currently using modern contraceptives, with just 13.2% having ever used long-term contraceptive methods. Noting the inconsistencies in the use of modern contraceptives among the study participants makes it possible that these inconsistencies contribute to the high prevalence of teenage pregnancy in this setting. Additionally, the proportion of respondents who had ever used

long-term methods is relatively low, leaving a wider window for teenage pregnancies in this setting.

Conclusions and Recommendations

Our study found out that about 1 in 3 adolescent girls in refugee settlement of Northern Uganda experienced pregnancy during the COVID-19 pandemic. Only 1 in 13 of the adolescents was currently using modern methods of contraception.

Relevant refugee authorities and government stakeholders must develop targeted strategies to address teenage pregnancy in refugee settings, which contributes to the broader issue of maternal morbidity and mortality. This includes exploring legal actions against perpetrators of sexual abuse and implementing measures to combat forced child marriages, such as forming support groups, promoting girl child education, and protecting the rights of girls in refugee settlements.

The Ministry of Health, in collaboration with the Office of the Prime Minister, should implement measures to combat sexual violence against teenage girls in refugee contexts. This could include enhancing education access for girls, which not only reduces teenage pregnancy but also helps in the fight against HIV. Encouraging the uptake of long-term contraceptive methods and fostering inclusive education solutions will help lower the incidence of teenage pregnancy and address associated challenges.

In as much as this study provides important insights into the SRH challenges faced by adolescent girls in the Bidi Bidi refugee settlement, the findings must be interpreted within the context of the study's limitations. Future research should aim to include a larger, more

diverse sample to further validate these findings and explore the broader applicability of the results.

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Declarations

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Author Statement

Donald Otika *(Corresponding Author) is the guarantor.*

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Consent for Publication

Not applicable

Conflicts of interest

We declare no conflict of interest in this research work.

Data Availability Statement

All relevant data are within the manuscript and its supporting information files. Data are available upon reasonable request from the first author.

Ethical Considerations

We obtained an ethical approval and clearance letter from Gulu University Research and Ethics Committee (GUREC) (approval number: GUREC-2022-291), which was presented to the district health offices (DHO) of the selected districts, to seek administrative clearance. We presented the introductory letter from the DHO to the refugee welfare council 2 (RWC2) of selected refugee settlements to seek entry into the community and commence data collection. A private and comfortable room was acquired and used during the process of data collection to ensure privacy and confidentiality. Written informed consent was obtained from respondents who were 18 or 19 years. For respondents below 18, a written informed assent was obtained from a parent/guardian who also consented to allow their daughter to participate in the study, and participation was free and voluntary. Participants were assured of their freedom to withdraw from the study at any time with no penalty. Confidentiality of the information collected was observed by using numbers and not names.

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Supplementary file 1: Data collection tool

Supplementary file 2: STROBE checklist

Supplementary file 3: Supplemental Material for Editors only

Supplementary file 4: Response to Reviewer Comments

Word count: 3503

Figure legends

Fig 1: Prevalence of teenage pregnancy among 385 girls aged 15 to 19 living in Palorinya and Bidi Bidi refugee settlements of west Nile region, Northern Uganda.

Fig 2: The different contraceptive methods used by teenage girls living in Palorinya and Bidi Bidi refugee settlements of west Nile region, Northern Uganda (N=385; n=53)

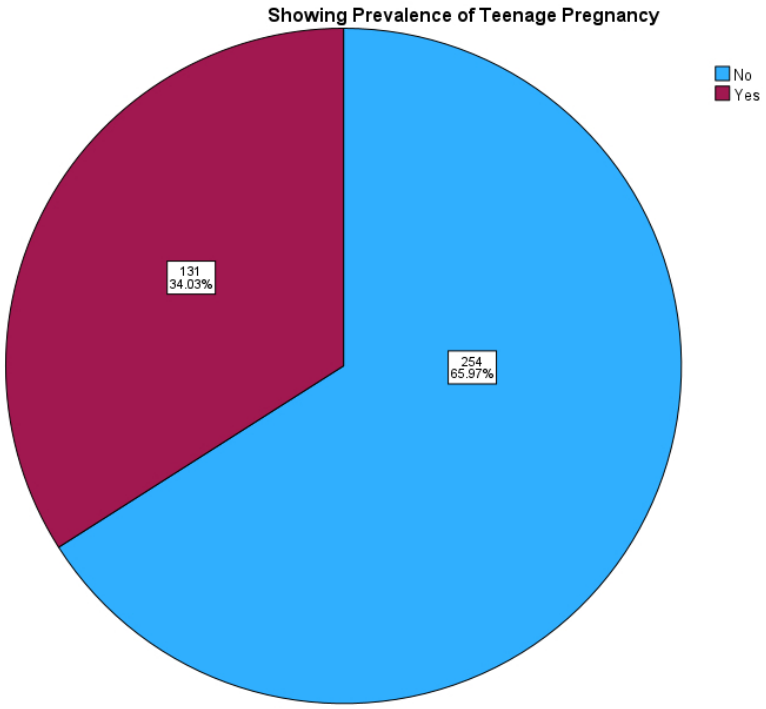

Fig 1: Prevalence of teenage pregnancy among 385 girls aged 15 to 19 living in Palorinya and Bidi Bidi refugee settlements of west Nile region, Northern Uganda.

299x218mm (72 x 72 DPI)

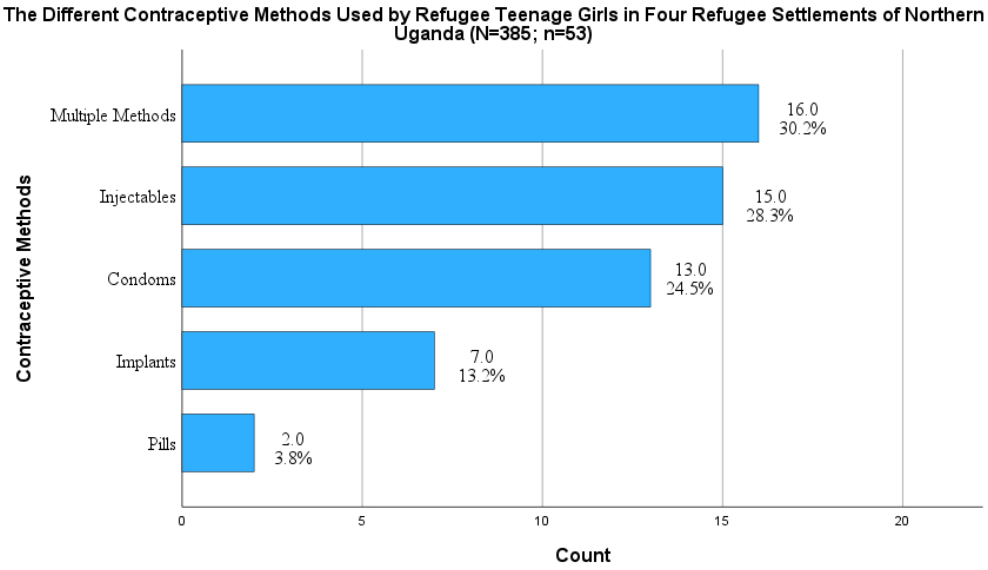

Fig 2: The different contraceptive methods used by teenage girls living in Palorinya and Bidi Bidi refugee settlements of west Nile region, Northern Uganda (N=385; n=53)

299x176mm (72 x 72 DPI)

Appendix VIII: Questionnaire - English

Version: 2.0, October 18, 2022

Instructions: Tick in the box provided on the left only answers of the respondent's choice that apply and not more than one option can be chosen. Additional answers may be added in the spaces provided.

Section A: Socio Demographic Data

1. Age_____[Years]

2. Which religion are you?

   a) Christian

   b) Muslim

3. What is your country of Origin?

……

4. What is your tribe?

……..

5. What is your education level?

   a) No education

   b) Primary

   c) Secondary and beyond

6. What is your occupation?

   a) Not working

   b) Working

7. What is your average monthly income? _____[UGX/Month]

8. Do you have any media exposure? (tick all that apply)

a) Reads newspaper.

b) Listens to radio.

c) Watch television.

d) Owns a mobile phone.

e) None of the above

9. What is the sex of household lead?

a) Male

b) Female

10. What is your relation to household lead?

a) Husband / Spouse

b) Parent

c) Relative

11. Have you ever had sex?

a) Yes

b) No

12. If yes, what was your age at first sex debut _____ [Age in years]

Section B: Pregnancy

13. Do you have the Intention-to-get pregnant in the next 12 months.

a) Yes

b) No

14. Do you have friends within the same age bracket who are pregnant?

a) Yes

b) No

15. Have you ever got peer pressure to get pregnant?

a) Yes

b) No

16. Have you ever gotten pregnant?

a) Yes

b) No

17. If yes, How many times? _____ [Number of pregnancies]

18. What was the outcome of pregnancy (tick all that apply)

a) Live births [ ]

b) Abortions [ ]

c) Still birth [ ]

d) Ectopic [ ]

19. If births, what was the mode of delivery? (tick all that apply)

a) SVD

b) C/S

20. If live births, did your baby get any neonatal complications?

a) Yes

b) No

21. If Yes, _____ [specify]

Section C: Marriage

22. Do you have friends within the same age bracket who are married?

    c) Yes

    d) No

23. Have you ever got peer pressure to get married?

    a) Yes

    b) No

24. What is your marital status?

    a) Married

    b) Unmarried

25. If married, what was your mode of marriage?

    a) Forced / Arranged.

    b) Willingly

Section D: Contraception

26. Have you ever used modern contraceptive methods

    a) Yes

    b) No

27. If Yes, which one (select all that applies)

    a) Pills

        i. Emergency pills

        ii. Combined oral contraceptive pills

    b) Condoms

c) Implants

d) Injectables

e) IUDs

f) Others _____ [specify]

28. Are you currently using modern contraceptive methods (within the last 3 months)

a) Yes

b) No

29. If yes, which one (select all that applies)

a) Pills

i. Emergency pills

ii. Combined oral contraceptive pills

b) Condoms

c) Implants

d) Injectables

e) IUDs

f) Others _____ [specify]

Section D: Other factors

30. Do you have both parents?

a) Yes

b) No

31. Have you ever received sex education from home (parents)?

a) Yes

b) No

32. Have you ever received contraceptives use training from home (parents)?

a) Yes

b) No

33. Have you ever received sex education from school (teachers)?

a) Yes

b) No

34. Have you ever received contraceptives use training from school (teachers)?

a) Yes

b) No

35. Have you ever been health educated about the dangers of teenage pregnancies?

a) Yes

b) No

36. Have you ever been sexually abused?

a) Yes

b) No

37. If Yes, who was the perpetrator?

a) Parents

b) Relatives

c) Strangers

38. Have you ever been physically abused?

a) Yes

b) No

39. Do you take alcohol?

a) Yes

b) No

Depression Screening

PHQ-9 modified for Adolescents (age 12-17)

Over the last 2 weeks, how often have you been bothered by any of the following:

	Not at all	Several days	More than half the days	Nearly every day
1. Little interest or pleasure in doing things?	0	1	2	3
2. Feeling down, depressed, irritable or hopeless?	0	1	2	3
3. Trouble falling asleep, staying asleep, or sleeping too much?	0	1	2	3
4. Feeling tired or having little energy?	0	1	2	3
5. Poor appetite, weight loss or overeating?	0	1	2	3
6. Feeling bad about yourself—or feeling that you are a failure, or that you have let yourself or your family down?	0	1	2	3
7. Trouble concentrating on things like school work, reading or watching TV?	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed? Or the opposite—being so fidgety or restless that you were moving around a lot more than usual?	0	1	2	3
9. Thoughts that you would be better off dead or of hurting yourself in some way?	0	1	2	3
If response to question 9 is in shaded squares, answer question 10 below. If response to question 9 is 0 → **STOP**.				

10. Have you had thoughts of actually hurting yourself?	YES	NO
Staff: Add score for 9 questions. Enter all information in PHQ-9 doc flowsheet. If question 10 response if YES, a **P4 ASSESSMENT IS NEEDED**.		
Additional Questions		
In the past year have you felt sad or depressed most days, even if you felt okay sometimes	YES	NO
If you are experiencing any of the problems listed on this form, how **difficult** have these problems made it for you to do your work, take care of things at home or get along with other people?	Not difficult at all / Somewhat difficult	Very difficult / Extremely difficult
Has there been a time in the past month when you had serious thoughts about ending your life?	YES	NO
Have you **EVER** in your WHOLE LIFE, tried to kill yourself or made a suicide attempt?	YES	NO

Thank you for participating

BMJ Open

High burden of teenage pregnancy and low modern contraceptive methods uptake in refugee settlements of Northern Uganda in the post COVID-19 era Between 2020 and 2023

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Keywords:	Adolescents < Adolescent, Pregnancy, Cross-Sectional Studies

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Prevalence and factors associated with teenage pregnancy in refugee settlements of northern Uganda post-COVID-19 (2020-2023): A cross-sectional study

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Keywords: Teenage pregnancy., Modern contraceptives., Refugee Settlements., Adolescent Pregnancy,. Uganda.

Abstract

Background: Following the COVID-19 pandemic, there was an increase in teenage pregnancies nationally, however, limited data exists regarding the same among girls living in refugee settlements.

Objectives: We evaluated the prevalence of teenage pregnancy and associated factors in Palorinya and Bidi Bidi refugee settlements in Obongi and Yumbe districts of Northern Uganda, in the post-COVID-19 era.

Design: We conducted a cross-sectional study.

Setting: Refugee settlements in northern Uganda.

Participants: We included 385 teenage girls aged 15 to 19 years

Methods: We used convenience sampling techniques between March and May 2023. Prevalence of teenage pregnancy was assessed by self-reported pregnancies between January 2020 and May 2023 among participants. We conducted Pearson's chi-square and Fisher's exact tests for bivariate analysis. All variables with a P-value <0.2 at bivariate analysis were included in multivariable regression. We applied a modified Poisson regression model at multivariable level to evaluate independent associations. The level of statistical significance was set at $P < 0.05$.

Primary and Secondary Outcome Measures: The primary outcome measure was the prevalence of teenage pregnancy, assessed through self-reported pregnancies among participants. Secondary outcome measures included factors associated with teenage

pregnancy, such as living with a husband, lack of formal education, peer pressure, and history of sexual abuse.

Results: Overall, the mean age of 17 (IQR: 15-18), and sexual debut at 16 (IQR: 15-17) years. Lifetime modern contraceptive use was 13.8% (n= 53/385) and current use was 7.5% (n=29/385). Teenage pregnancy period prevalence was 34.0% (CI: 29.4% to 38.9%). Factors independently associated with teenage pregnancy were; living with a husband (aPR: 3.8, 95% CI: 2.51 to 5.84, P <0.001), lack of formal education (aPR: 2.3, 95% CI: 1.26 to 4.35, P = 0.007), peer pressure (aPR: 2.1, 95% CI: 1.54 to 2.86, P <0.001) and history of sexual abuse (aPR: 1.5, 95% CI: 1.07 to 1.99, P = 0.018).

Conclusion: Our study revealed that around 1 in 3 adolescent girls in Northern Uganda's refugee settlements experienced pregnancy during the COVID-19 pandemic, with only 1 in 13 currently using modern contraceptives. To address this, targeted strategies by relevant authorities are crucial, including legal actions against sexual abuse, promoting girl child education, and enhancing access to long-term contraception, to reduce teenage pregnancy and associated health risks in these settings.

Article Summary

Strengths and Limitations of the Study

- The study's inclusion of only two refugee settlements may limit generalizability to all refugee settlements in Uganda, affecting external validity.
- Randomly selecting settlements and using a substantial sample size within each strengthens the statistical reliability of our conclusions.

- Conducting a cross-sectional analysis without pre-pandemic data prevents establishing causal relationships between variables.
- Future research could adopt longitudinal approaches to track changes over time and incorporate historical data for a comprehensive assessment of causal associations.

Background

Teenage pregnancy is defined as a pregnancy in girls 13–19 years of age [1]. Teenage pregnancies can have negative consequences for the mother's health such as unsafe abortion attempts leading to mortality, as well as economic and social outcomes, exacerbated by stigmatization, school dropout and isolation from family [2]. Complications from teenage pregnancy and childbirth are the leading cause of death in girls aged 15 to 19 years worldwide [3].

The incidence of teenage pregnancy is increasing and has become a worldwide concern. It is estimated that about 16 million girls 15–19 years old give birth each year, contributing nearly 11% of all births worldwide [1]. Globally in 2022, an estimated 13 per cent of adolescent girls and young women give birth before the age of 18 [4, 5]

In Africa, more than 20% of women aged 15 to 19 have given birth to at least one child [1]. Sub-Saharan Africa is home to more than one million teenage girls with pregnancy [5]. Sub-Saharan Africa additionally experiences some of the highest rates of gender inequality in the world, resulting in unequal access to education and high rates of violence against girls, early pregnancy, and child marriage [6]. It is estimated that 608,000 girls are thought to be at risk of child marriage, and 542,000 additional girls are at risk of early pregnancy [7].

The regional teenage birth rate in SSA is more than double the global average, with 101 births per 1,000 girls aged 15 to 19 – ranging from 39 births per 1,000 girls aged 15 to 19 in Rwanda to 184 births per 1,000 girls aged 15 to 19 in Nigeria [4]. Child marriage is widespread in West and Central Africa, where 42% of women are married as children, and in East and Southern Africa, where child marriage affects 37% of girls [8].

Despite Uganda's commitment to ending child, early and forced marriages and teenage pregnancy by the year 2030 through co-sponsoring the 2013 and 2014 UN General Assembly and 2013 Human Rights Council resolutions on early and forced marriages [9], one in four (24%) teenage girls in Uganda report having given birth for the first time by the age of 18 [10]. According to UNICEF (2021) estimates, a total of 354,736 teenage pregnancies were registered in 2020, and 196,499 in the first six months of 2021 amidst the COVID-19 pandemic [11].

The COVID-19 pandemic wreaked unprecedented havoc on children, families, and communities around the globe, disrupting vital services like girl-child education, and putting millions of lives at risk. The United Nations estimated that nearly 11 million primary and secondary school learners worldwide – 5.2 million of whom are girls – did not return to education following school closures amidst COVID-19 due to teenage pregnancy and related outcomes [12].

For the most vulnerable children, especially girls living in refugee settlements, accessing education and staying in school is hard enough. The pandemic caused additional, unanticipated disruption, compounding their vulnerability to teenage pregnancies by many folds [7]. Moreover, teenage girls living in refugee settlements face challenges accessing

sexual and reproductive health services, including sex education and modern contraceptive methods [13]. These girls are at a significantly higher risk of early pregnancy, a situation that worsened due to the COVID-19 pandemic. According to a recent study by the Forum for African Women Educationalists (Uganda Chapter), the rate of teenage pregnancy among girls in refugee settlements rose from 3.3% to 4.1% during the pandemic. In one Palabek settlement, the proportion of refugee girls who reported being pregnant during the COVID-19 period reached 4.8%, compared to the national average of 1.8% [14]. Additionally, statistics on modern contraceptive methods uptake among this population are unknown.

Teen pregnancies in refugee and humanitarian settings are influenced by several factors including poverty, lack of education, cultural norms, etc., further driven by limited access to health care, lack of social support and increased risk of sexual violence [15–17]. Addressing these issues requires targeted interventions that consider the unique challenges faced by teenage girls in these settings.

We therefore aimed to estimate the prevalence and associated factors of teenage pregnancies in the post-COVID-19 era in Palorinya and Bidi Bidi refugee settlements of the west Nile region, Northern Uganda.

Methods

Study Design and Rationale

We conducted a community-based, cross-sectional study between March and May, 2023. We followed the Strengthening The Reporting of Observational Studies in Epidemiology (STROBE) guidelines to design this manuscript in order to ensure attention to detail [18].

Study Setting and Rationale

We conducted this study in Palorinya and Bidi Bidi refugee settlements of the west Nile region, Northern Uganda. According to data from the Office of the Prime Minister (OPM) and United Nations Higher Commissioner for Refugees (UNHCR), Uganda is now home to 1,622,738 refugees living in 13 refugee settlements across the country, and almost half (6) of these are in the west Nile region [19]. Women and girls constitute over 80% of this population, and the settlements are arranged in blocks and zones. Palorinya refugee settlement has 4 zones, and 9 level 3 health centers, meanwhile Bidi Bidi has 6 zones and 16 level 3 health centers. None of the refugee settlements has a higher-level health center, however, there are several referral sites e.g., Yumbe Health Center IV, Midigo Health Center IV and Yumbe Regional Referral Hospital. All these facilities provide family planning services to adolescents. This setting was chosen because it hosts the biggest number of refugee settlements, proposed to provide a big pool of potential respondents for sampling.

Study Population, Inclusion and Exclusion Criteria.

Our study targeted teenage girls living in the refugee settlements of Northern Uganda. We included only respondents between 15 to 19 years old, who provided written informed consent or assent with a consent from parent / guardian, and were living in the refugee settlements before the beginning of COVID-19. Those who did not provide informed consent or assent were not included.

Sample size determination.

We used the Kish Lisle (1965) formula for the calculation of sample size for an unknown population. At 95% confidence interval, we used an error of 5%, alpha risk expressed in z score of 1.96 and a conservative assumption of a 50% population proportion was made to ensure robustness. We obtained a sample size of 385. These choices were guided by standard practices, aiming to balance precision and practicability.

Sampling method.

We used convenience sampling to select study participants from Bidi Bidi and Palorinya refugee settlements. Convenience sampling in our study involved selecting participants who were readily available and willing to participate in the study. We approached individuals in many community spaces, targeting various times and days to ensure diversity. The participation acceptance rate was 100%, with no declines. This method allowed us to gather data from a broad participant base.

Research Instruments

We developed a semi-structured questionnaire including both open and closed-ended questions. The data collection tool was developed in English and translated into three languages: *Acholi, Kuku, and Arabic*. We pretested the tool among respondents of similar characteristics outside the study area, after which we refined and fine-tuned the tool for reliability and validity. The tool was then exported into Kobotoolbox installed on mobile phone devices which was used for data collection. We asked about demographics, household characteristics, pregnancy history between January 2020 and May 2023 and intentions,

marriage status, modern contraceptive use between January 2020 and May 2023, sex education, and sexual and physical abuse among others. Abuse was measured by asking 'Have you ever experienced physical abuse?' and 'Have you ever experienced sexual abuse?' with timeframes specified as 'in the past 12 months' and 'in your lifetime,' respectively. Contraception use was assessed by asking 'Have you ever used any form of contraception?'. Those who had ever used were further asked to specify the method of contraception used. Peer pressure was measured by asking 'Have you ever experienced any form of peer pressure to get pregnant?' Alcohol consumption was assessed by asking 'Do you take alcohol?'. These responses were recorded as binary outcomes (yes/no). The tool was developed de novo, adhering to established guidelines and drawing from relevant literature. This tool had not been previously used in this setting, and it was tailored specifically for this study.

Data Collection Procedures

A private and comfortable room was acquired and used during the process of data collection to ensure a private and confidential environment for respondents. We recruited research assistants, who were given a one-day training for acquaintance with the tool and were taken through research ethics and good clinical practice. The research assistants carried out the collection of data. Although gender matching between participants and data collectors was not implemented, all research assistants underwent comprehensive training on ethical principles. This training highlighted the importance of maintaining privacy and confidentiality, especially when handling sensitive information related to abuse. They explained the purpose of the study to each of the respondents identified, and obtained informed consent, followed by administration of the questionnaire using an electronic form

stored in the Kobo toolbox mobile application, which is a free open-source tool for mobile data collection.

Data management.

The phone devices that were used to collect the data were fully charged at every moment the research team set off to collect data, and the data captured in the phone was regularly saved to avoid loss of data. We safely kept the devices under key and lock before and after data collection, and limited access. We exported the data into STATA version 15, where analysis was done from.

Data analysis.

The prevalence of teenage pregnancy was assessed by self-reported pregnancies from January 2020 to May 2023. We conducted Pearson's chi-square and Fisher's exact tests for bivariate analysis. The level of statistical significance was set at $P < 0.05$. Variables with a P-value < 0.2 from these tests were included in the multivariable analysis. We applied a modified Poisson regression model at the multivariable level to evaluate independent associations. The level of statistical significance was set at $P < 0.05$. Modified Poisson regression was chosen over logistic regression because the outcome was common (i.e., the prevalence rate was high), because in such cases, the odds ratio from logistic regression can significantly overestimate the relative risk. We considered variables with $P<0.2$ from bivariate analysis to be included in the multivariable regression since their power of association is > or = 80%.

The research questions tested in statistical analysis were, 'what is the prevalence of teenage pregnancies in the study population?' and 'what are the associated factors of teenage pregnancies in the study population?'

The data was then computed in percentages and frequencies and finally presented in figures (pie chart, bar graph) and tables.

Patient and Public Involvement

The public was involved in this study. Dissemination of findings was done to key stakeholders.

Results

Participant Characteristics

Table 1 summarizes the general characteristics of 385 teenage girls living in refugee settlements of the West Nile region, in northern Uganda. The mean age was 17 (IQR: 15 to 18), years, and 99.5% were Christians, 316 (82.1%) had attained primary education as the highest level, 85.6% were not working, median monthly income was 0 (IQR: 0 to 1,000), Uganda shillings, 56.1% did not live with both parents, 54.8% of household heads were female, and 22.1% of household leads were husband /spouse.

Overall, 178 (46.2%) were sexually active, and the mean age of sex debut was 15.8 (SD: 1.44), years, sexual abuse was reported by 5.2% of respondents, of whom 75% were sexually abused by strangers, meanwhile physical abuse was reported by 21.6% of respondents, 37.1%

of teenage girls experienced peer pressure and alcohol consumption was reported by 8.8% of respondents.

Figure 2 summarizes modern contraceptive methods used by teenage girls living in refugee settlements of the west Nile region, in northern Uganda. Some of the teenage girls; 13.8% had ever used modern contraceptives in their lifetime, meanwhile only 7.5% were currently using modern contraceptives, of whom only 13.2% reported to have ever used long term contraceptive methods, and 30.2% reported to have ever used multiple methods (including long term and short-term methods). Overall, 17.9% received contraceptive use counselling from home, and 36.1% received home sex education, meanwhile 55.1% had received sex education from school, 40.5% had received contraceptives use counselling from school, and 64.7% had ever been health educated on the dangers of teenage pregnancy.

Some respondents, 5.7% had the intention of getting pregnant in the next 12 months, whereas 52.0% had friends who are pregnant,24.9% were married, of whom 38.5% were forced / arranged. Up to 9.8% of the respondents had ever had an abortion, and 22.0% had had a caesarean section.

Fig 1: Prevalence of teenage pregnancy among 385 girls aged 15 to 19 living in Palorinya and Bidi Bidi refugee settlements of west Nile region, Northern Uganda.

Fig 2: The different contraceptive methods used by teenage girls living in Palorinya and Bidi Bidi refugee settlements of west Nile region, Northern Uganda (N=385; n=53)

Table 1: Individual characteristics of 385 teenage girls living in Palorinya and Bidi Bidi refugee settlements of west Nile region, northern Uganda

Variable	Frequency	Percentage
Age, median (Interquartile range), years	17	15-18
Occupation		
Working	56	14.6
Not working	329	85.6
Average monthly income, median (Interquartile range), Ugx	0	0 – 1,000
Education		
No formal education	5	1.3
Primary	316	82.1
Secondary and beyond	64	16.6
Media Exposure		
Listens to Radio	60	15.6
Owns a mobile phone	71	18.4
Reads newspaper	11	2.9
Watch Television	3	0.8
Uses more than one Medium	65	16.9
None of the above	175	45.6
Relationship to household head		

Parent	251	65.2
Relative	49	12.7
Husband/Spouse	85	22.1
Intention to get pregnant in 12 months		
Yes	22	5.7
No	363	94.3
Have friends who are pregnant		
Yes	200	52.0
No	185	48.0
Ever gotten pregnant		
Yes	131	34.0
No	254	66.0
Number of pregnancies, median (min, max), times	1	1, 3
Pregnancy Outcome		
Live births	110	90.2
Abortions	7	5.7
Both	5	4.1
Peer pressure		
Yes	143	37.1
No	242	62.9
Married		
Yes	96	24.9
No	289	75.1
Mode of Marriage		
Arranged / Forced	37	38.5
Willingly	59	61.5
History of Contraceptive Use		
Yes	53	13.8
No	332	86.2
Current contraceptive use		
Yes	29	7.5
No	356	93.5
Living with both Parents		
Yes	169	43.9
No	216	56.1
Home sex education		
Yes	139	36.1
No	246	63.9
Home contraceptive use counselling		
Yes	69	17.9
No	316	82.1
Received school sex education		

Yes	212	55.1
No	173	44.9
School contraceptive use counselling		
Yes	156	40.5
No	229	59.5
Health education on dangers of teenage pregnancy		
Yes	249	64.7
No	136	35.3
Sexual abuse		
Yes	20	5.2
No	365	94.8
Perpetrator (n=20)		
Relative	5	25.0
Stranger	15	75.0
Physical abuse		
Yes	83	21.6
No	302	78.4
Alcohol Consumption		
Yes	34	8.8
No	351	91.2

Period prevalence of teenage pregnancy among 385 teenage girls living in Palorinya and Bidi Bidi refugee settlements of west Nile region, northern Uganda

Figure 1 shows the prevalence of teenage pregnancy among 385 teenage girls living in refugee settlements of west Nile region, northern Uganda. We found out that up to 34.0% of respondents reported to have ever gotten pregnant between 2020 to 2023 (CI: 29.4% to 38.9%), the median number of pregnancies was 1, with a minimum of 1 and maximum of 3.

Predictors of teenage pregnancy among 385 teenage girls living in Palorinya and Bidi Bidi refugee settlements of west Nile region, northern Uganda

Table 2 summarizes the factors associated with teenage pregnancy among 385 teenage girls living in refugee settlements of west Nile region, northern Uganda. At bivariate level, factors such as; lack of formal education (PR: 3.1, 95% CI: 2.64-3.64, p<0.001), male house hold head (PR: 2.3, 95% CI: 1.72 – 3.13, p<0.001), living with a husband / spouse (PR: 5.4, 95% CI: 4.11-7.17, P<0.001), intention to get pregnant (PR: 1.1, 95% CI: 1.03 – 1.15, p= 0.003), peer pressure (PR: 3.7, 95% CI: 2.73-5.05, P<0.001), being married (PR: 6.6, 95% CI: 4.95 – 8.82, P<0.001), history of contraceptive use (PR: 3.2, 95% CI: 2.55 – 3.94, P<0.001), lack of home sex education (PR: 1.6, 95%CI: 1.16 – 2.24, P = 0.005), health education on dangers of teenage pregnancy (PR: 1.8, 95% CI: 1.25 – 2.49, P = 0.001), sexual abuse (PR: 2.7, 95% CI: 2.14 – 3.46, P<0.001), physical abuse (PR: 2.3, 95% CI: 1.80 – 2.99, P<0.001) and alcohol consumption (PR: 2.3, 95% CI: 1.77 – 3.03, P<0.001), were positively associated to teenage pregnancy.

We then performed modified Poisson regression on all variables that had a P value < 0.2, while controlling for occupation, media exposure and living with both parents. Teenage girls with no formal education were 2.3 times more likely to be pregnant (aPR: 2.3, 95% CI: 1.26-4.35, P = 0.007) as compared with those who had formal education; those who were living with a husband / spouse were 3.8 times more likely to be pregnant (aPR: 3.8, 95% CI: 2.51-5.84, P<0.001) as compared with those who lived with their parents; teenage girls who experienced peer pressure were 2.1 times more likely to be pregnant (aPR: 2.1, 95% CI: 1.54-2.86, P<0.001) as compared to those who didn't; those who had a history of contraceptive use were 1.8 times more likely to be pregnant (aPR: 1.8, 95% CI: 1.31-2.33, P<0.001) as compared to those who did not have; and teenage girls who experienced sexual abuse were

1.5 times more likely to be pregnant (aPR: 1.5, 95% CI: 1.07-1.99, P = 0.018) as compared to those who didn't.

Table 2: Factors independently associated with teenage pregnancy among 385 teenage girls living in Palorinya and Bidi Bidi refugee settlements of west Nile region, Northern Uganda

Variable	All (N=385) Freq (%)	Teenage Pregnancy		Crude PR (95% CI)	P value	Adjusted PR (95% CI)	P value
		Yes (n=131) Freq (%)	No (n=254) Freq (%)				
Occupation							
Working	56 (14.6)	29 (22.1)	27 (10.6)	1.7(1.24 – 2.56)	0.001	1.1(0.86-1.54)	0.346
Not working	329 (85.6)	102 (77.86)	227 (89.4)	Reference		Reference	
Education							
No education	5 (1.3)	5 (3.8)	0 (0.0)	3.1(2.64-3.64)	<0.001	2.3(1.26-4.35)	0.007
Primary	316 (82.1)	102 (77.9)	214 (84.3)	Reference		Reference	
Secondary and beyond	64 (16.6)	24 (18.3)	40 (15.8)	1.2(9.81-1.66)	0.407	1.1(0.84-1.51)	0.439
Media Exposure							
Listens to Radio	60 (15.6)	5 (3.8)	55 (21.6)	1 (1.00 – 1.00)	1.000	N/A	
Owns a mobile phone	71 (18.4)	50 (38.2)	21 (8.3)	0.9 (0.80 – 0.98)	0.015	0.9 (0.80 – 1.00)	0.052
Reads newspaper	11 (2.9)	1 (0.8)	10 (3.9)	1 (1.00 – 1.00)	1.000		
Watch Television	3 (0.8)	1 (0.8)	2 (0.8)	1 (1.00 – 1.00)	1.000		
Uses more than one Medium	65 (16.9)	39 (29.8)	26 (10.2)	0.9 (0.84 – 1.01)	0.085		
None of the above	175 (45.6)	35 (26.7)	140 (55.1)	Reference			
Relationship to household head							
Parent	251 (65.2)	43 (32.8)	208 (81.9)	Reference		Reference	
Relative	49 (12.73)	9 (6.9)	40 (15.8)	1.1(0.56-2.06)	0.834	0.9(0.47-1.64)	0.687
Husband/Spouse	85 (22.1)	79 (60.3)	6 (2.4)	5.4(4.11-7.17)	<0.001	3.8(2.51-	<0.001

						5.84)	
Intention to get pregnant in 12 months							
Yes	22 (5.7)	19 (14.5)	3 (1.2)	1.1 (1.03 – 1.15)	0.003	1.0 (0.97 – 1.1)	0.246
No	363 (94.3)	112 (85.5)	251 (98.8)	Reference		Reference	
Have friends who are pregnant							
Yes	200 (52.0)	116 (88.6)	84 (33.1)	1.1 (0.89 – 1.36)	0.421	N/A	
No	185 (48.0)	15 (11.4)	170 (66.9)	Reference			
Peer pressure							
Yes	143 (37.1)	90 (68.7)	53 (20.9)	3.7 (2.73-5.05)	<0.001	2.1(1.54-2.86)	<0.001
No	242 (62.9)	41(31.3)	201 (79.1)	Reference		Reference	
Married							
Yes	96 (24.9)	90 (68.7)	6 (2.4)	6.6 (4.95 – 8.82)	<0.001	1.1 (0.88 – 1.46)	0.337
No	289 (75.1)	41 (31.3)	248 (97.6)	Reference		Reference	
Mode of Marriage							
Arranged / Forced Willingly	37 (38.5)	33 (36.7)	4 (66.7)	Reference		N/A	
	59 (61.5)	57 (63.3)	2 (33.3)	1.0 (0.95 – 1.16)	0.347		
History of Contraceptive Use							
Yes	53 (13.8)	44 (33.6)	9 (3.5)	3.2(2.55 – 3.94)	<0.001	1.8(1.31-2.33)	<0.001
No	332 (86.2)	87 (66.4)	245 (96.5)	Reference		Reference	
Living with both Parents							
Yes	169 (43.9)	65 (49.6)	104 (40.9)	1.3(0.95 – 1.66)	0.104	1.1(0.88-1.40)	0.392
No	216 (56.1)	66 (50.4)	150 (59.1)	Reference		Reference	
Home sex education							
Yes	139 (36.1)	34 (26.0)	105 (41.3)	Reference		Reference	
No	246 (63.9)	97 (74.0)	149 (58.7)	1.6(1.16 – 2.24)	0.005	1.2(0.94-1.63)	0.127
Home contraceptive use counselling							
Yes	69 (17.9)	26 (19.8)	43 (16.9)	1.13(0.81 – 1.60)	0.471	N/A	
No	316 (82.1)	105 (80.2)	211 (83.1)	Reference			
Received school sex education							
Yes	212 (55.1)	67 (52.3)	145 (57.1)	1.0 (0.96 – 1.17)	0.265	N/A	
No	173 (44.9)	61 (47.7)	109 (42.9)	Reference			
School contraceptive use counselling							
Yes	156 (40.5)	56 (43.8)	100 (39.4)	1.0 (0.93 – 1.13)	0.573	N/A	
No	229 (59.5)	75 (56.2)	154 (60.6)	Reference			
Health education on dangers of teenage pregnancy							
Yes	249 (64.7)	100 (76.3)	149 (58.7)	1.8(1.25 – 2.49)	0.001	1.2(0.92-1.66)	0.167
No	136 (35.3)	31 (23.7)	105 (41.3)	Reference		Reference	

Sexual abuse							
Yes	20 (5.2)	17 (13.0)	3 (1.2)	2.7(2.14 – 3.46)	<0.001	1.5(1.07-1.99)	0.018
No	365 (94.8)	114 (87.0)	251 (98.8)	Reference		Reference	
Physical abuse							
Yes	83 (21.6)	51 (38.9)	32 (12.6)	2.3(1.80 – 2.99)	<0.001	1.1(0.82-1.36)	0.658
No	302 (78.4)	80 (61.1)	222 (87.4)	Reference		Reference	
Alcohol Consumption							
Yes	34 (8.8)	24 (18.3)	10 (3.9)	2.3(1.77 – 3.03)	<0.001	0.9(0.64-1.20)	0.414
No	351 (91.2)	107 (81.7)	244 (96.1)	Reference		Reference	

Discussion

This study reveals a high prevalence of teenage pregnancies (34.0%) among teenage girls living in refugee settlements in northern Uganda. Several factors were independently associated with teenage pregnancies in this context, including living with a spouse or husband, lack of formal education, peer pressure, and inconsistent use of modern contraceptives. Additionally, 9.8% of the respondents had experienced an abortion, highlighting the potential risks of maternal morbidity and mortality in this vulnerable population. Furthermore, the study identified concerning levels of sexual abuse, with 25% of the perpetrators being relatives, emphasizing the challenges faced by these girls in seeking support and justice.

Notably, there is a gap in the literature on sexual and reproductive health issues in humanitarian settings in general, and teenage pregnancy statistics in similar settings are not

widely studied. Our study reveals a comparatively higher prevalence of teenage pregnancy in the refugee settings of northern Uganda, way higher than that in other studies. The high prevalence of teenage pregnancy in our study could be because our study only considered teenage girls between 15 to 19 years old, meanwhile the other studies considered 13 to 19. We found a close relationship between sexual abuse and teenage pregnancy, which was similarly observed in Malawi [20]. Our study found that up to 25% of the perpetrators of sexual abuse among teenage girls are relatives. This makes it particularly hard to seek support from community and cultural leaders, necessitating the involvement of higher authorities. Several factors were independently associated with teenage pregnancies in our study. Importantly, living with a spouse/husband presented four-fold likelihood of teenage pregnancy compared to those who lived with their parents. Other studies agree with our findings [21]. Moreover, we also found out that most of the child marriages in the refugee context were forced (38.5%), similarly observed in different studies [21]. Forced and early/child marriage in Bidi Bidi refugee settlement and among Ugandan refugees is a complex issue driven by various factors such as poverty and economic hardship, gender norms and cultural practices, stigma and social pressure [22]. Providing education and vocational training for girls, engaging community leaders and members in dialogue and strengthening and enforcing laws against child marriage can provide a legal deterrent, meanwhile offering comprehensive sexual and reproductive health services and support for survivors of child and / or forced marriages can mitigate some of the adverse effects [22].

Our study also found that 9.8% of the respondents had ever had an abortion. The limitation is that our study did not explore whether this was induced or spontaneous. Furthermore, we do not know whether this abortion was in the watch of a qualified health service provider. This

poses a greater risk of severe morbidity and mortality among teenage mothers in these settings.

Additionally, teenage girls without a formal education stood at a 2.3 times higher risk of teenage pregnancy compared to those with at least a primary education. Similarly, another study conducted in Malawi noted an inequality in teenage pregnancy which worsened to the disadvantage of the less educated [23]. Another important predictor of teenage pregnancy in our study was peer pressure. This is related to another study carried out in Kibuku district, Uganda, that pointed out that bad peer groups were an outstanding cause of teenage pregnancy among the respondents [24]. Addressing the challenge of peer pressure requires a multi-sectoral collaboration, involving the Ministry of Health, and education among other ministries.

Paradoxically, our study found out that teenage girls who had a history of using modern contraceptives stood at 1.8 risk of teenage pregnancies as compared to those who did not. These findings were unlike those observed in Malawi [17], which otherwise found that history of contraceptive use was a protective factor. Unfortunately, our study did not distinguish between the use of long-term and short-term contraceptives, in relation to pregnancy. We observed that 13.8% of teenage girls living in refugee settlements reported having ever used a modern contraceptive method in their lifetime. Despite this, given the relatively low average age of sexual debut (15.8 years), only 7.5% were currently using modern contraceptives, with just 13.2% having ever used long-term contraceptive methods. Noting the inconsistencies in the use of modern contraceptives among the study participants makes it possible that these inconsistencies contribute to the high prevalence of teenage pregnancy in this setting. Additionally, the proportion of respondents who had ever used

long-term methods is relatively low, leaving a wider window for teenage pregnancies in this setting.

Conclusions and Recommendations

Our study found out that about 1 in 3 adolescent girls in refugee settlement of Northern Uganda experienced pregnancy during the COVID-19 pandemic. Only 1 in 13 of the adolescents was currently using modern methods of contraception.

Relevant refugee authorities and government stakeholders must develop targeted strategies to address teenage pregnancy in refugee settings, which contributes to the broader issue of maternal morbidity and mortality. This includes exploring legal actions against perpetrators of sexual abuse and implementing measures to combat forced child marriages, such as forming support groups, promoting girl child education, and protecting the rights of girls in refugee settlements.

The Ministry of Health, in collaboration with the Office of the Prime Minister, should implement measures to combat sexual violence against teenage girls in refugee contexts. This could include enhancing education access for girls, which not only reduces teenage pregnancy but also helps in the fight against HIV. Encouraging the uptake of long-term contraceptive methods and fostering inclusive education solutions will help lower the incidence of teenage pregnancy and address associated challenges.

In as much as this study provides important insights into the SRH challenges faced by adolescent girls in the Bidi Bidi refugee settlement, the findings must be interpreted within the context of the study's limitations. Future research should aim to include a larger, more

diverse sample to further validate these findings and explore the broader applicability of the results.

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Declarations

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Author Statement

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Consent for Publication

Not applicable

Conflicts of interest

We declare no conflict of interest in this research work.

Data Availability Statement

All relevant data are within the manuscript and its supporting information files. Data are available upon reasonable request from the first author.

Ethical Considerations

We obtained an ethical approval and clearance letter from Gulu University Research and Ethics Committee (GUREC) (approval number: GUREC-2022-291), which was presented to the district health offices (DHO) of the selected districts, to seek administrative clearance. We presented the introductory letter from the DHO to the refugee welfare council 2 (RWC2) of selected refugee settlements to seek entry into the community and commence data collection. A private and comfortable room was acquired and used during the process of data collection to ensure privacy and confidentiality. Written informed consent was obtained from respondents who were 18 or 19 years. For respondents below 18, a written informed assent was obtained, and their parent/guardian also provided written informed consent to allow their daughter to participate in the study, and participation was free and voluntary. Participants were assured of their freedom to withdraw from the study at any time with no penalty. Confidentiality of the information collected was observed by using numbers and not names.

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Supplementary file 1: Data collection tool

Supplementary file 2: STROBE checklist

Supplementary file 3: Supplemental Material for Editors only

Supplementary file 4: Response to Reviewer Comments

Word count: 3503

Figure legends

Fig 1: Prevalence of teenage pregnancy among 385 girls aged 15 to 19 living in Palorinya and Bidi Bidi refugee settlements of west Nile region, Northern Uganda.

Fig 2: The different contraceptive methods used by teenage girls living in Palorinya and Bidi Bidi refugee settlements of west Nile region, Northern Uganda (N=385; n=53)

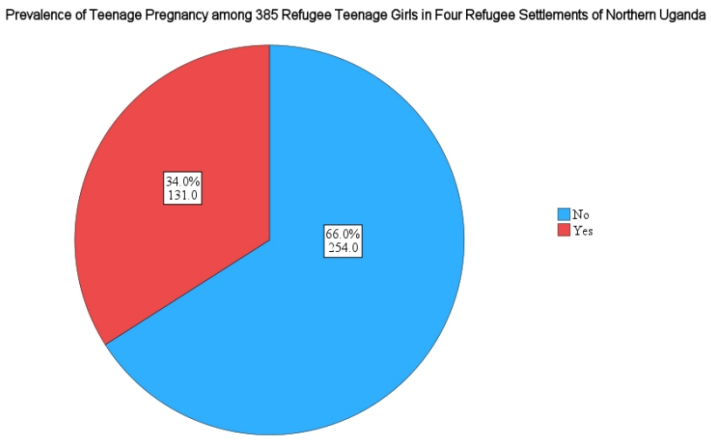

Fig 1: Prevalence of teenage pregnancy among 385 teenage girls living in Palorinya and Bidi Bidi refugee settlements of west Nile region, Northern Uganda

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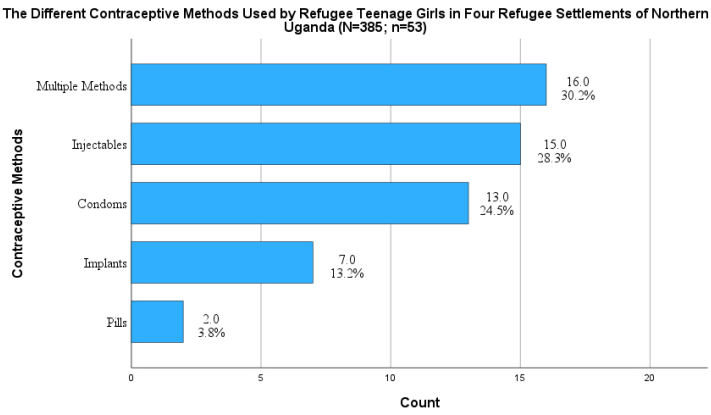

Fig 2: The different contraceptive methods used by teenage girls living in Palorinya and Bidi Bidi refugee settlements of west Nile region, Northern Uganda (N=385; n=53)

99x99mm (300 x 300 DPI)

Appendix VIII: Questionnaire - English

Version: 2.0, October 18, 2022

Instructions: Tick in the box provided on the left only answers of the respondent's choice that apply and not more than one option can be chosen. Additional answers may be added in the spaces provided.

Section A: Socio Demographic Data

1. Age_____[Years]

2. Which religion are you?

   a) Christian

   b) Muslim

3. What is your country of Origin?

……

4. What is your tribe?

……..

5. What is your education level?

   a) No education

   b) Primary

   c) Secondary and beyond

6. What is your occupation?

   a) Not working

   b) Working

7. What is your average monthly income? _____[UGX/Month]

8. Do you have any media exposure? (tick all that apply)

a) Reads newspaper.

b) Listens to radio.

c) Watch television.

d) Owns a mobile phone.

e) None of the above

9. What is the sex of household lead?

a) Male

b) Female

10. What is your relation to household lead?

a) Husband / Spouse

b) Parent

c) Relative

11. Have you ever had sex?

a) Yes

b) No

12. If yes, what was your age at first sex debut _____ [Age in years]

Section B: Pregnancy

13. Do you have the Intention-to-get pregnant in the next 12 months.

a) Yes

b) No

14. Do you have friends within the same age bracket who are pregnant?

a) Yes

b) No

15. Have you ever got peer pressure to get pregnant?

a) Yes

b) No

16. Have you ever gotten pregnant?

a) Yes

b) No

17. If yes, How many times? _____ [Number of pregnancies]

18. What was the outcome of pregnancy (tick all that apply)

a) Live births [ ]

b) Abortions [ ]

c) Still birth [ ]

d) Ectopic [ ]

19. If births, what was the mode of delivery? (tick all that apply)

a) SVD

b) C/S

20. If live births, did your baby get any neonatal complications?

a) Yes

b) No

21. If Yes, _____ [specify]

Section C: Marriage

22. Do you have friends within the same age bracket who are married?

    c) Yes

    d) No

23. Have you ever got peer pressure to get married?

    a) Yes

    b) No

24. What is your marital status?

    a) Married

    b) Unmarried

25. If married, what was your mode of marriage?

    a) Forced / Arranged.

    b) Willingly

Section D: Contraception

26. Have you ever used modern contraceptive methods

    a) Yes

    b) No

27. If Yes, which one (select all that applies)

    a) Pills

        i. Emergency pills

        ii. Combined oral contraceptive pills

    b) Condoms

c) Implants

d) Injectables

e) IUDs

f) Others _____ [specify]

28. Are you currently using modern contraceptive methods (within the last 3 months)

a) Yes

b) No

29. If yes, which one (select all that applies)

a) Pills

i. Emergency pills

ii. Combined oral contraceptive pills

b) Condoms

c) Implants

d) Injectables

e) IUDs

f) Others _____ [specify]

Section D: Other factors

30. Do you have both parents?

a) Yes

b) No

31. Have you ever received sex education from home (parents)?

a) Yes

b) No

32. Have you ever received contraceptives use training from home (parents)?

a) Yes

b) No

33. Have you ever received sex education from school (teachers)?

a) Yes

b) No

34. Have you ever received contraceptives use training from school (teachers)?

a) Yes

b) No

35. Have you ever been health educated about the dangers of teenage pregnancies?

a) Yes

b) No

36. Have you ever been sexually abused?

a) Yes

b) No

37. If Yes, who was the perpetrator?

a) Parents

b) Relatives

c) Strangers

38. Have you ever been physically abused?

a) Yes

b) No

39. Do you take alcohol?

a) Yes

b) No

Depression Screening

PHQ-9 modified for Adolescents (age 12-17)

Over the last 2 weeks, how often have you been bothered by any of the following:

	Not at all	Several days	More than half the days	Nearly every day
1. Little interest or pleasure in doing things?	0	1	2	3
2. Feeling down, depressed, irritable or hopeless?	0	1	2	3
3. Trouble falling asleep, staying asleep, or sleeping too much?	0	1	2	3
4. Feeling tired or having little energy?	0	1	2	3
5. Poor appetite, weight loss or overeating?	0	1	2	3
6. Feeling bad about yourself—or feeling that you are a failure, or that you have let yourself or your family down?	0	1	2	3
7. Trouble concentrating on things like school work, reading or watching TV?	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed? Or the opposite—being so fidgety or restless that you were moving around a lot more than usual?	0	1	2	3
9. Thoughts that you would be better off dead or of hurting yourself in some way?	0	1	2	3
If response to question 9 is in shaded squares, answer question 10 below. If response to question 9 is 0 → **STOP**.				

10. Have you had thoughts of actually hurting yourself?	YES	NO
Staff: Add score for 9 questions. Enter all information in PHQ-9 doc flowsheet. If question 10 response if YES, a **P4 ASSESSMENT IS NEEDED**.		
Additional Questions		
In the past year have you felt sad or depressed most days, even if you felt okay sometimes	YES	NO
If you are experiencing any of the problems listed on this form, how **difficult** have these problems made it for you to do your work, take care of things at home or get along with other people?	Not difficult at all / Somewhat difficult	Very difficult / Extremely difficult
Has there been a time in the past month when you had serious thoughts about ending your life?	YES	NO
Have you **EVER** in your WHOLE LIFE, tried to kill yourself or made a suicide attempt?	YES	NO

Thank you for participating