ORIGINAL RESEARCH

Prevalence of Teenage Pregnancy and Associated Factors in Agago District, Uganda: A Community-Based Survey

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Background: Teenage pregnancy remains a common public health and social problem associated with negative health outcomes. We determined the prevalence and factors associated with teenage pregnancy among teenage girls aged 13–17 years in Agago district, Uganda.

Methods: We conducted a community-based, cross-sectional study between October and November 2020 in Lapono Sub-County, Agago district among teenage girls 13–17 years. Multi-stage sampling technique was used. Parishes, villages, and households were randomly selected (computer generated random numbers were used for household selection). In each household, one participant was randomly selected for interview and pregnancy testing. We collected data on socio-demographic factors using a pre-tested semi-structured questionnaire. All eligible participants were tested for urine human chorionic gonadotropin (hCG). Multivariable logistic regression analysis was done to determine independent predictors of teenage pregnancy, with p<0.05 considered statistically significant.

Results: A total of 289 eligible participants, with a mean age of 15.1±1.5 years, were enrolled. Most (n=246, 81.5%) participants had attained primary education, 18 (6.2%) were married, 41 (14.2%) used alcohol, 62 (21.5%) had a history of sexual intercourse and 32 (11.1%) were sexually abused. The prevalence of teenage pregnancy was 2.8% (n=8). Factors significantly associated with teenage pregnancy were alcohol consumption (adjusted odds ratio (aOR): 13.2, 95% Confidence Interval (95% CI): 1.7–100.6, p=0.013) and having secondary/tertiary education (aOR: 10.2, 95% CI: 1.5–71.9, p=0.02).

Conclusion: The study findings suggest that teenage pregnancy is still a public health and social problem in Agago district, Uganda. Interventions discouraging alcohol consumption and promoting education among teenagers are key in addressing the burden of teenage pregnancies in the district.

Keywords: teenage pregnancy, human chorionic gonadotropin, Agago, Uganda

Introduction

Teenage pregnancy, defined as "pregnancy in a teenage girl, usually within the ages of 10–19 years, without having reached legal adulthood,[1] has been recognized as a public health concern that contributes a significant economic, health, and social cost to the mothers and newborn babies, their families, and the wider society.[2] The global pregnancy rate in 2021 was 42.5 births per 1000 women, with Latin America and Sub-Saharan African (SSA) regions having the highest rates of 53.2 and 101 births per 1000 women, respectively.[3] According to the World Health Organisation (WHO), about 21 million teenage pregnancies occurred each year by 2019 with 55% of the unintended teenage pregnancies occurring in low- and middle-income countries.[4] Teenage pregnancy rate is highest in SSA followed by South Asia,[5] and the

relatively high fertility desires in SSA were rooted in traditional pronatalist practices that partly explained the lowest prevalence of contraception in the region.[6]

Several factors such as limited education increased accessibility to social media and pornographic sharing, cross-cultural influences and decreased supervision by adults,[7] early marriage, early initiation of sex, and lack of access to reproductive health information and services[8] perpetuate teenage pregnancies, particularly in developing countries. Teenage is associated with serious obstetric complications (eclampsia, fistula, puerperal infections, and death), mainly due to immaturity and lack of readiness of the reproductive organs to accommodate the physiological changes of pregnancy;[3] contributes significantly to maternal and child mortality, intergenerational cycles of ill-health and poverty;[9] poor maternal growth, undernutrition and morbidity during childbirth;[10] increased risk of antenatal complications, failure to complete schooling, welfare dependence and societal stigma and discrimination, maternal difficulties depression and incompetent parenting.[2] Children born to very young teenage mothers are at an increased risk of morbidity and death;[11] health problems (preterm birth, low birth weight, intrauterine growth retardation, neonatal death), physical injury, behavioral difficulties, cognitive problems, and educational underachievement compared to those born to the adult mothers.[2]

In Uganda, the burden of teenage pregnancy varies across regions ranging from 16% in Kigezi to 31% in Teso region.[11] In Northern Uganda, a prevalence of about 25% has been estimated.[7] Addressing teenage pregnancy in Uganda is key in meeting the United Nation's (UN) Sustainable Development Agenda 2030 targets on ensuring healthy lives and wellbeing at all ages and National Development Plan III, Health Sector Strategic Plans I and II and Vision 2040 for Sustainable Development. Therefore, this study aimed to evaluate the prevalence and factors associated with teenage pregnancy in Agago district, Uganda.

Methods
Study Design and Settings
We conducted a community-based, descriptive, cross-sectional study between October and November 2020 among teenage girls in Lapono Sub-County, Agago district.

Study Population
We recruited teenage girls aged 13–17 years who were residing within Lapono Sub-County for at least one year and provided a written informed assent. Teenage girls aged 13–17 years were considered because they might be aware of their bodies and below the adult age of 18 years as per the Constitution of Uganda. Teenage girls who were severely sick and those with mental impairment were excluded from the study.

Study Procedures
A multi-stage sampling technique was employed in this study. Three parishes and four villages from each parish were randomly selected from Lapono Sub-County, Agago district. Kish Leslie's (1965) formula was utilized to obtain the optimal number of participants. A total of 289 households with teenage girls 13–17 years were randomly enrolled in this study given a standard error of the confidence level (1.96) at 95% confidence interval, the proportion of teenage pregnancy among teenage girls, estimated at 24% for Acholi Sub-region[11] and margin of error assumed at 5%. Lists of all the households in the selected villages were generated with the support of the Local Council one. Using a computer-generated random numbers in the range of 1–300, the required numbers of households in each village were randomly chosen. In each household, one teenage girl was randomly selected for the interview and testing for pregnancy. The household selection was based on probability proportional to size. Data on socio-demographic, individual, familiar and socio-cultural characteristics of the teenage girls and their parents were collected using a pre-tested semi-structured questionnaire consisting of 28 questions (17 for individual, 5 for familial, and 6 for socio-cultural variables) that provide answers on the prevalence of teenage pregnancy and the individual, familiar socio-cultural factors associated with teenage pregnancy.

Assessment of Teenage Pregnancy

Pregnancy was tested using the human chorionic gonadotropin (hCG) hormone assay on urine samples. About 10–15 mls of fresh mid-stream urine samples into sterile universal containers by teenage girls under the supervision of female research assistants (Laboratory Technician or Clinical Officer). Within 1–2 minutes after urine sample collection, the urine containers were placed on a flat surface, hCG strips were inserted vertically for 10–15 seconds into them and removed. Pregnancy test results were read after 15 minutes, positive pregnancy test results were shown by two distinct red lines in control (C) and test (T) regions, and negative pregnancy test results by one red line in the control (C) region only.

Data Analysis

All analyses were done in STATA version 17.0 at 95% confidence and 5% margin of error for univariate, bivariate and multivariate levels. We estimated the prevalence of teenage pregnancy among teenage girls in percentage and reported confidence intervals. The factors associated with teenage pregnancy among teenage girls in Lapono Sub-County, Agago district, Uganda were assessed using logistic regression analysis. In univariate analysis, we summarized continuous variable (age) using mean with its corresponding standard deviation. Categorical variables were summarized by means of frequencies and percentages. In bivariate analysis, the associations of independent variables against teenage pregnancy were assessed and variables with $p < 0.2$ were considered in multivariate analysis. In multivariate analysis, variables were manually removed, starting with the least significant variable. Product terms were formed between variables with $p < 0.05$ and assessed for interaction using a chunk test. Assessment of confounding was done by bringing back the basic variables that were dropped in the model, starting with the variables that were dropped last and checking for percentage change. A percentage change of >10% meant there was confounding. All confounders were retained in the final model. Goodness-of-fit test was done using Hosmer-Lemeshow test. Variables with $p < 0.05$ after multivariate analysis were statistically significant.

Ethical Considerations

Gulu University Research Ethics Committee (GUREC) approved the study protocol, approval number GUREC-073-20 followed by administrative clearance from Agago District Health Officer, Lapono Sub-County Chief Local Council One of the selected villages. Before participation in the study, teenage girls and their parents/caretakers were fully informed on the research purpose, probable benefits, possible risks, pregnancy test procedures and referral arrangements for those who could test positive for pregnancy. Both the teenage girl and her parent/caretaker provided a written an informed assent and consent and participation was on a voluntary basis. Only codes were used to identify study participants. Teenage girls were counselled before collecting urine samples in privacy. Pregnancy test results were released in privacy and all information received was maintained confidentially throughout the study. The study complied with the Declaration of Helsinki involving human subjects.

Results

Sociodemographic Characteristics

A total of 289 participants were enrolled mean age of 15.1±1.5 years. Most of the teenage girls lived in rural areas 155 (53.6%), attained primary education 246 (81.5%) and had both parents alive 240 (83.0%). Only 18 (6.2%) girls were married and a third 88 (30.5%) were living with either only one parent or a relative. Forty-one (14.2%) participants reported alcohol use. Christianity was the dominant religion 265 (91.7%) and majority of their parents had a low socio-economic 273 (94.5%) background, Table 1.

Sexual History

Sixty-two (21.5%) participants had a lifetime history of sexual intercourse. Participants who experienced sexual and physical abuse were 32 (11.1%) and 116 (40.1%), respectively. Sixty-eight (23.5%) participants had sexual education and 148 (51.2%). Close to a third 84 (29.1%) of the participants reported having felt pressure to engage in sexual intercourse. Most teenage girls disagreed that it was not acceptable to have sex 264 (91.4%) and get married 262 (90.7%) before the age of 18 years, Table 2.

Table 1 Baseline Socio-Demographic Characteristics of 289 Participants in Lapono Sub-County

Variable	Category	Frequency N=289	Percentage (%)
Residence			
	Urban	134	46.4
	Rural	155	53.6
Age in years mean (SD)		15.1±1.5	
Still in school			
	No	59	20.4
	Yes	230	79.6
Marital status			
	Not married	271	93.8
	Married	18	6.2
Parents alive			
	Both parents	240	83.0
	Only one/no parent	49	17.0
Living status			
	Both parents	201	69.6
	One parent/relative	88	30.5
Religion			
	Christians	265	91.7
	Non-Christians	24	8.3
Level of education			
	No education	16	5.5
	Primary	246	85.1
	Secondary/tertiary	27	9.3
Socio-economic status			
	Low	273	94.5
	High	16	5.5

Abbreviation: SD, standard deviation.

Table 2 Family, individual and socio-cultural factors of teenage girls in Lapono Sub-County

Variable	Category	Frequency N=289	Percentage (%)
History of sexual intercourse			
	No	227	78.5
	Yes	62	21.5
Family history of teenage pregnancy			
	No	243	84.1
	Yes	46	15.9
History of sexual education			
	No	221	76.5
	Yes	68	23.5
Alcohol consumption			
	No	248	85.8
	Yes	41	14.2
Sexually abused			
	No	257	88.9
	Yes	32	11.1
Physically abused			
	No	173	59.9
	Yes	116	40.1

(*Continued*)

Table 2 (Continued).

Variable	Category	Frequency N=289	Percentage (%)
Living with drunkard			
	No	141	48.8
	Yes	148	51.2
Father's education status			
	No/primary	203	70.2
	Secondary/tertiary	86	29.8
Mother's education status			
	No/primary	246	85.1
	Secondary/tertiary	43	14.9
Parent's occupation status			
	Farmer	257	88.9
	Others	32	11.1
Feel pressure			
	Some pressure	84	29.1
	No pressure	205	70.9
Acceptable for a girl <18 years to have sex			
	Agree	25	8.7
	Disagree	264	91.4
Acceptable for a girl <18 years to get married			
	Agree	27	9.3
	Disagree	262	90.7

Prevalence of Teenage Pregnancy

The prevalence of teenage pregnancy was 2.8% (95% CI 1.385, 5.458). Out of the 62 teenage girls with a history of sexual engagement, 35 (56.5%) had their first sexual intercourse when they were less than 16 years, and 20 (32.3%) had more than one sexual partner. Overall, 20 (6.9%) used contraceptives, 17 (85%) always used contraceptives when having sexual intercourse, Table 3

Table 3 Characteristics of Teenage Girls with a History of Sexual Engagement in Lapono Sub-County

Variable	Category	Frequency N=62	Percentage (%)
Pregnancy status			
	Yes	8	2.8
	No	281	97.2
Age at initial sexual intercourse			
	Age 13–15 years	35	56.5
	Age 16–17 years	27	43.5
Number of sexual intercourses per month			
	Less than 3 times	41	66.1
	Greater than 2 times	21	33.9
More than one sexual partner			
	No	42	67.7
	Yes	20	32.3
Contraceptive use n=20			
	Sometimes	3	15
	Always	17	85

Factors Associated with Teenage Pregnancy Among Study Participants

At bivariate analysis, age (OR 3.032, 95% CI 1.208, 7.613, p=0.018), still in school (OR 0.243, 95% CI 0.059, 1.003, p=0.051), marital status (OR 10.640, 95% CI 2.320, 48.791, p=0.002) and Level of education (OR 10.729, 95% CI 2.561, 44.932, p=0.001) were all associated with teenage pregnancy and considered for multivariate analysis, including residence (OR 6.291, 95% CI 0.764, 51.800, p=0.087), Table 4.

Alcohol consumption (OR 11.343, 95% CI 2.599, 49.504, p<0.001), and sexual abuse (OR 5.214, 95% CI 1.184, 22.951, p=0.029) showed a positive association with teenage pregnancy and were considered for multivariate analysis, Table 5.

At multivariable analysis, alcohol consumption (AOR 13.22, C 1.74, 100.63, p=0.013) and having secondary/ tertiary education (AOR 10.20, 95% CI 1.45, 71.89, p=0.020) were associated with higher odds of teenage pregnancy. Residence (AOR 7.45, 95% CI 0.71, 78.18, p=0.094) was a confounder in the relationship between level of education and teenage pregnancy. Age (AOR 2.00, 95% CI 0.74, 5.45, p=0.174) was a confounder in the relationship between predictors (alcohol consumption and level of education) and teenage pregnancy. Marital status (AOR 3.59, 95% CI 0.36, 36.01, p=0.277) was a confounder in the relationship between alcohol consumption and teenage pregnancy. Sexually abused (AOR 0.45, 95% CI 0.05, 3.92, p=0.469) was a confounder in the relationship between predictors (alcohol consumption and level of education) and teenage pregnancy. Still in school (AOR 0.88, 95% CI: 0.09, 8.54, p=0.915) was a confounder in the relationship between the level of education and teenage pregnancy, Table 6.

Table 4 Bivariate analysis of socio-demographic factors *with teenage pregnancy (N=289)*, Lapono Sub-County

Variable	Category	Teenage pregnancy		OR	95% CI	p-value
		Yes N=8 (%)	No N=281 (%)			
Residence						
	Urban	1 (0.8)	133 (99.2)	Reference		
	Rural	7 (4.5)	148 (95.5)	6.291	0.764, 51.800	0.087
Age (years)				3.032	1.208, 7.613	0.018
Still in school						
	No	4 (6.8)	55 (93.2)	Reference		
	Yes	4 (1.7)	226 (98.3)	0.243	0.059, 1.003	0.051
Marital status						
	Not married	5 (1.9)	266 (98.1)	Reference		
	Married	3 (16.8)	15 (83.2)	10.640	2.320, 48.791	0.002
Parents alive						
	Both parents	7 (2.9)	233 (87.1)	Reference		
	Only one/no parent	1 (2.0)	48 (98.0)	0.693	0.833, 5.767	0.735
Living status						
	Both parents	5 (2.5)	196 (97.5)	Reference		
	One parent/relative	3 (3.4)	85 (96.6)	1.384	0.323, 5.921	0.662
Religion						
	Christians	7 (2.6)	258 (97.4)	Reference		
	Non-Christians	1 (4.2)	23 (95.8)	1.602	0.189, 13.596	0.666
Level of Education						
	No/primary	4 (1.5)	258 (98.5)	Reference		
	Secondary/Tertiary	4 (14.8)	23 (85.2)	10.729	2.561, 44.932	0.001
Socio-economic status						
	Low	7 (2.6)	266 (97.4)	Reference		
	Yes	1 (6.3)	15 (93.7)	2.533	0.292, 21.942	0.399

Abbreviations: OR, odds ratio; CI, Confidence interval.

Table 5 Bivariate Analysis of Family, Individual and Sociocultural Factors of 289 Teenage Girls in Lapono Sub-County

Variable	Category	Teenage Pregnancy		OR	95% CI	p-value
		Yes N=8 (%)	No N=281 (%)			
Family history of teenage pregnancy						
	No	7 (2.9)	236 (97.1)	Reference		
	Yes	1 (2.2)	45 (97.8)	0.749	0.090, 6.238	0.789
History of sexual education						
	No	5 (2.3)	216 (97.7)	Reference		
	Yes	3 (4.4)	65 (95.6)	1.994	0.464, 8.568	0.354
Alcohol consumption						
	No	3 (1.2)	245 (98.8)	Reference		
	Yes	5 (12.2)	36 (87.8)	11.343	2.599, 49.504	0.001
Sexually abused						
	No	5 (2.0)	252 (98.0)	Reference		
	Yes	3 (9.4)	29 (90.6)	5.214	1.184, 22.951	0.029
Physically abused						
	No	3 (1.7)	170 (98.3)	Reference		
	Yes	5 (4.3)	111 (95.7)	2.553	0.598, 10.895	0.206
Living with drunkard						
	No	3 (2.1)	138 (97.9)	Reference		
	Yes	5 (3.4)	143 (96.6)	1.608	0.377, 6.859	0.521
Father's education status						
	No/primary	4 (2.0)	199 (98.0)	Reference		
	Secondary/tertiary	4 (4.6)	82 (95.4)	2.427	0.593, 9.936	0.218
Mother's education status						
	No/primary	7 (2.8)	239 (97.2)	Reference		
	Secondary/tertiary	1 (2.3)	42 (97.7)	0.813	0.097, 6.778	0.848
Parent's occupation status						
	Farmer	7 (2.7)	250 (97.3)	Reference		
	Others	1 (3.1)	31 (96.9)	1.152	0.137, 9.678	0.896
Feel pressure						
	Some pressure	3 (3.6)	81 (96.4)	Reference		
	No pressure	5 (2.4)	200 (97.6)	0.675	0.156, 2.890	0.596

Notes: Others-Business person, Government/NGO employee, Carpenter/welder.
Abbreviations: OR, odds ratio; CI, confidence interval.

Table 6 Multivariate Analysis of Factors Associated with Teenage Pregnancy Among 289 Girls in Lapono Sub-County

Variable	Category	Adjusted Odds Ratio	95% Confidence Interval	p-value
Alcohol consumption				
	No	Reference		
	Yes	13.221	1.737, 100.627	0.013
Level of education				
	No/primary	Reference		
	Secondary/tertiary	10.201	1.447, 71.893	0.020
Residence				
	Urban	Reference		
	Rural	7.451	0.710, 78.182	0.094

(Continued)

Table 6 (Continued).

Variable	Category	Adjusted Odds Ratio	95% Confidence Interval	p-value
Age (years)		2.001	0.735, 5.447	0.174
Marital status				
	Not married	Reference		
	Married	3.594	0.359, 36.005	0.277
Sexually abused				
	No	Reference		
	Yes	0.449	0.052, 3.920	0.469
Still in school				
	No	Reference		
	Yes	0.884	0.091, 8.539	0.915

Discussion

In this study, we sought to determine the prevalence and factors associated with teenage pregnancy in Agago district, Uganda. We found the prevalence to be low estimated at 2.8%. This result is far below the 25% national prevalence of teenage pregnancy reported in the 2016 Uganda Demographic and Health Survey,[11] and the prevalence of 28.6% reported in Northern Ethiopia.[12] The difference in the prevalence of teenage pregnancy could have been due to differences in the measurement of outcome. In this study, teenage pregnancy was determined by rapid hCG test for urine while in the study by Habitu and colleagues, pregnancy status was based on self-report which is unreliable and may over or underestimate the true burden of teenage pregnancies. Agago district about 5 years had the highest prevalence of teenage pregnancy in the country, which raised alarm among different stakeholders (community members, health implementing partners, local leaders, politicians, district officials), attracting concerted efforts, supporting awareness campaigns on the dangers of teenage pregnancy among the teenage girls could have played a role in reducing the prevalence of teenage pregnancy.

The low prevalence of teenage pregnancy could be due toto a missed opportunity to capture deliveries among teenage girls during the time of the study; parents/caretakers of teenage girls might have had the opportunity during COVID-19 lockdowns to closely watch and monitor their teenage girls well, stopping them from engaging in risky sexual practices since the study was conducted during the time of COVID-19 pandemic when people were confined at homes. As found, most of the teenage girls had both of their parents alive (83.0%), which could have offered chances for them to get good sexual advice and guidance related to sexual education, especially from their mothers, empowering them to make an informed sexual decision, thus protecting them from the risk of teenage pregnancy.[7] However, the protective effect of having both parents alive was not significant when included in the multivariable logistic regression model.

The factors associated with teenage pregnancy were level of education, marital status, still in school status and age greater or equal to 15 years. Much as education was found to offer a protective effect against teenage pregnancy, which is consistent with the studies by Poudel and colleagues in Nepal,[5] Mathewos & Mekuria in Southern Ethiopia[13] and Ochen and colleagues in Uganda, where in particular they noted that teenage girls in school might have opportunity for supervision by teachers and parents.[7] However, in multivariate analysis, teenage girls in secondary/tertiary schools had about 10.2-folds higher odds of becoming pregnant than those in primary schools. This may be an indication of negative peer influences by their colleagues in secondary/tertiary schools to get into sexual relationships with their fellows (get boyfriends) and smart phone usage exposing them to surf explicit content motivating early sex, increasing opportunities for sexual activity.[14]

Married teenagers had just over 10-folds higher odds of teenage pregnancy than unmarried. This finding is in keeping with a study in Ethiopia which showed that early marriage exposes a teenage girl to frequent and unprotected sexual activity, often leading to an early and risky first birth.[15] An earlier study in Uganda revealed that keeping teenage girls in school significantly declined child marriage among women 15–19 years and early sexual debut between 2006 and 2016.[16] Apart from early teenage birth, early marriage may result in poor health outcomes and intergenerational cycle of poverty, as it restricts future opportunities for development, studying and employment. However, it contradicts the result

found in Hoima district in Uganda that shows unmarried teenage girls were 9 folds more likely to get pregnant during the COVID-19 pandemic compared to their married counterparts.[17] The different situations created due to the COVID-19 pandemic could have contributed to this finding.

Teenage girls 15 years and above were at high risk of teenage pregnancy. This finding is similar to other studies by Bukenya et al, in rural settings in Eastern Uganda, which indicated up to 38.0% of teenage girls 15–19 years old reported having been involved in sexual intercourse[18] and slightly below the study in Fartaworeda, Northwest, Ethiopia, that show teenage girls 13–14 years were more likely to become pregnant compared to those aged 18–19 years.[19] Teenage girls at this age undergo a growth stage (puberty) in which their bodies experience hormonal changes that make them sexually active. With a huge urge to initiate and experiment adult sexual intercourse at this age, there is a high risk for unintended pregnancy and sexually transmitted infections, and negative social outcomes, such as school dropout and social exclusion for teenage girls.[1] A key requirement for getting pregnant is by having unprotected sexual intercourse and once teenage girls get involved in sexual intercourse, the possibility of them becoming pregnant increases. With an increased demand for sex, teenage girls are eager to engage in risky sexual practices that make them vulnerable to teenage pregnancy.

Individual factors such as alcohol consumption influenced teenage pregnancy. Teenage girls involved in alcohol use had 13-folds higher odds of experiencing teenage pregnancy than those who did not. This result agrees well with the studies by[13] in Southern Ethiopia and Yakubu and Salisu in Nepal,[14] where they found excessive consumption of alcohol and substance abuse increase vulnerability and make teenage girls become targets for sexual exploits. Involvement in alcohol consumption by teenage girls can distort their sexual decision-making ability to resist unprotected sexual intercourse; reduce the opportunity to practice safer sex; compromise their normal sense of judgment of the situation, and increase sexual libido and vulnerability for sexual exploits by strangers. This puts them at greater risk of getting pregnant and contracting sexually transmitted infections.

Limitations and Strengths of the Study

This study has some limitations. There were few positive pregnancy cases (08) identified in the study that could not permit a robust manipulation of the data and resulted in a wider confidence interval which could affect the generalizability of the study findings. However, the strength of our study is in its community-based design, which is likely to reflect the population prevalence of teenage pregnancy. We also used urine-based hCG studies and therefore we got the true reflection of teenage pregnancy.

Conclusions

Overall, we found a prevalence of teenage pregnancy of about 3%, with individuals involved in alcohol consumption and older teenagers in secondary/tertiary education being more likely to get pregnant. These findings inform setting up of interventions targeting alcohol consumption reduction and promoting education may help reduce the prevalence of teenage pregnancy among teenage girls in the district.

Data Sharing Statement

All data generated or analyzed during this study are included in this published article.

Disclosure

The authors declare that they have no competing interests in this work.

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