Original Research

Open Access

Predictors of Adolescent Pregnancy among 13-19 Years Old Girls in Karongi District: unmatched case-control study, 2021

Jean Paul Niyomugabo[1,*], Christian Nsanzabaganwa[1], Sonia Muhawenimana[1], Noella Benemaliya[2], Judith Mukamurigo[2]

[1]*Rwanda Biomedical Centre, Kigali, Rwanda*
[2]*University of Rwanda, Kigali, Rwanda*

***Corresponding author:**
Dr. Jean Paul Niyomugabo
Rwanda Biomedical Centre (RBC), Kigali, Rwanda
Email: niyopaul55@gmail.com

Received: September 29, 2023
Accepted: May 28, 2024
Published: June 31, 2024

Cite this article as: Niyomugabo et al. Predictors of Adolescent Pregnancy among Girls Aged 13-19 Years in Karongi District: unmatched case-control study, 2021.. *Rw. Public Health Bul. 2024. 5 (2): 30-43.* https://dx.doi.org/10.4314/rphb.v5i2.3

ABASTRACT

INTRODUCTION: Adolescent pregnancy is a global public health challenge, and in Rwanda, though the percentage of adolescent girls experiencing pregnancy has decreased slightly, it remains a concern, particularly in Karongi District, with high incidences. This study aims to identify the risk factors associated with adolescent pregnancy in Karongi district.

METHODS: A case-control study design with a 1:2 ratio of adolescent girls aged 13-19 years was carried out in Karongi District, Western Province, Rwanda. The data were collected using a structured questionnaire and face-to-face interviews. Multivariate logistic regression analysis was performed to identify factors independently associated with adolescent pregnancy. The findings were presented as adjusted odds ratios (aORs) with 95% confidence intervals (CIs).

RESULTS: A total of 522 adolescent girls participated in the study. In bivariate analysis, the majority of variables were significantly associated with adolescent pregnancy. In multivariable analyses, significant factors independently associated with adolescent pregnancy were low socioeconomic status [Ubudehe category 1 (aOR = 4.6, CI = 1.47-14.28), and Ubudehe category 2 (aOR = 5.6, CI = 2.06-14.61)], lack of sexual education from parents/guardians [aOR = 4.5, CI = 1.71-11.82], peer pressure to engage in sexual intercourse (aOR = 3, CI = 1.23-7.32), first sexual intercourse at ≥ 16 years old (aOR = 32, CI = 5.98-88.52).

CONCLUSION: Low socioeconomic status, lack of sexual education from parents/guardians, peer pressure, and first-sex intercourse at ≥ 16 years old were found to be positively associated with adolescent pregnancy. Interventions focusing on increasing parental involvement in sexual health education, supporting low-income families, and addressing peer influence may play a vital role in preventing adolescent pregnancy.

INTRODUCTION

Adolescent pregnancy is an important public health challenge. An estimated 16 million girls aged 15 to 19 years and two million girls under the age of 15 give birth every year, and this makes up 11% of all births worldwide. The low- and middle-income countries have the highest proportion, nearly 95% of adolescent pregnancies [1,2]. An estimated 21 million girls aged 15 to 19 years in

Potential Conflicts of Interest: No potential conflicts of interest disclosed by all authors. **Academic Integrity:** All authors confirm their substantial academic contributions to development of this manuscript as defined by the International Committee of Medical Journal Editors. **Originality:** All authors confirm this manuscript as an original piece of work, and confirm that has not been published elsewhere. **Review:** All authors allow this manuscript to be peer-reviewed by independent reviewers in a double-blind review process. © **Copyright:** The Author(s). This is an Open Access article distributed under the terms of the Creative Commons Attribution License (CC BY-NC-ND), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited. **Publisher:** Rwanda Health Communication Centre, KG 302st., Kigali-Rwanda. Print ISSN: 2663 - 4651; Online ISSN: 2663 - 4653. **Website:** https://rbc.gov.rw/publichealthbulletin/

developing regions become pregnant every year, and among them, 12 million give birth. Estimates also demonstrate that 2.5 million girls aged under 16 years give birth every year [3,4].

Various factors, including behavior, culture, and religion, influence adolescent pregnancy. Risk factors include multiple sexual partners, lack of contraception, peer pressure, early marriage, sexual abuse, and community violence [5,6]. Family dynamics, economic status, education, and knowledge gaps also contribute to adolescent pregnancy [7]. Restrictive laws, limited access, and gender inequality further compound the issue [8].

In Sub-Saharan Africa, an estimated 45% of pregnancies among young women aged 15-19 are unwanted pregnancies, leading to unwanted births and unsafe abortions [3]. The rate of adolescent pregnancy in the eastern African region is high, varying from 18% of adolescents in Kenya to 29% in both Malawi and Zambia [9]. In addition, children who are born to adolescent mothers have a higher risk of dying and are more vulnerable to other life-threatening conditions [10]. Complications of pregnancy among adolescents during delivery are the most important contributors to mortality among 15-19-year-old adolescents and young women [2]. Adolescent girls are still experiencing the disproportionately high burden of sexual and reproductive ill health, mostly in sub-Saharan Africa, with the prevalence of adolescent pregnancy of 19.3% [11,12].

According to the World Health Organization (WHO), the majority of pregnancies and childbirth are not planned and wanted [13]. Adolescent pregnancy is associated with high maternal and child morbidity and mortality, and it affects the socioeconomic development of a country. It is related to an increased risk of adverse pregnancy and childbirth outcomes compared to older women [14,15].

Although the Government of Rwanda (GoR) has put efforts into most aspects of health and the fight against Gender-Based Violence (GBV) among its priorities, in the last 5 years, there was a reduction of only 1% in adolescent pregnancy. From 6% in 2014/2015 to 5% in 2019/2020 [16,17]. The Rwanda Demographic and Health Survey (RDHS) 2019-2020 report, 5% of adolescent women aged 15-19 have begun childbearing, 4% have given birth, and 1% are pregnant with their first child. There is a slight decline in adolescent pregnancy of 2% since 2014-2015. The percentage of female adolescents who have begun childbearing is highest in the East and South, at 6% each, and in the West and the city of Kigali, it is 4% [16]. However, Karongi district has a higher proportion of adolescent pregnancy (9.3%) [18], highlighting the need to explore further this public health issue. Therefore, this study assessed the predictors of adolescent pregnancy in Karongi district, Rwanda. Understanding these predictors will inform policies and strategies to effectively combat adolescent pregnancy, ultimately improving the health and socioeconomic outcomes for adolescents and their communities.

METHODS

Study design: An unmatched case-control study with a 1:2 ratio (case/control) was conducted from January 1 to December 31, 2021, in Karongi district, Western Province, Rwanda.

Study population: The study targeted adolescent girls (cases and controls) between the ages of 13 and 19 years who are residents of Karongi District and who gave birth in healthcare facilities. In Karongi District, 87% of adolescent pregnant girls gave birth at the hospital level, and 13% gave birth at health centers. A case was defined as any female adolescent girl aged 13-19 years, who was pregnant or had given birth to at least one child, who resided and attended any of the catchment areas of three hospitals (Kirinda, Mugonero, and Kibuye hospitals) in Karongi district. Controls were defined as adolescent girls who had never been pregnant and resided in the closest neighboring households of cases.

Households where parents/guardians or adolescent girls refused to participate were disqualified, and alternative households were selected randomly. The study excluded the ones who did not consent to participate.

Sample size and sampling technique: Considering a 95% confidence, power of 80%, and 9.3% prevalence of adolescent pregnancy in Karongi district [18] as exposure, the minimum case sample was 158. After adding 10% to compensate for dropout and non-responses, we recruited 174 cases and a subsequent 348 controls. The list of cases (adolescent girls) with names, age, residential sector, cell, village and phone numbers

were retrieved from medical records of the health facilities and were used to find respondents. The controls (adolescent girls who have never been pregnant) were identified and selected from the closest neighboring households using a simple random sampling technique.

Data collection tools and methods: We used a questionnaire adapted from similar previous studies conducted on adolescent pregnant girls [4,6,9-15]. The questionnaire consisted of participants' socio-demographics such as age, residence, mother and father's educational status, and adolescent education level. Other items, such as behavior and familial factors related to pregnancy within respondents, were assessed, and they answered with a binary response (e.g., Yes or No). The respondents were interviewed to get information about demographic factors, and familial factors such as having living parents, divorced parents, and siblings with a history of adolescent pregnancy. Socioeconomic status was identified using Ubudehe categorization, which is the categorization of all households based on economic status into one of 4 categories (from 1: the poorest to 4: the richest). Behavior factors, such as age at first sex, multiple sex partners, alcohol use, and contraceptive knowledge, and societal factors such as peer influence to engage in sexual intercourse, were also identified through interviews.

Data collectors were trained for three days on data collection tools, interview techniques, and recruitment of study participants. The questionnaire was designed in English and later translated into Kinyarwanda which is the first language of respondents. Data collectors visited eligible participants at home, and they explained the purpose of the study and got consent before starting data collection.

Data analysis: Data was collected using Epi-info software, cleaned in Excel, and entered into STATA version 14.0 for analysis. Descriptive characteristics of participants were presented as frequencies and percentages. Bivariate analysis using a chi-square test of independence was initially performed between the dependent variable (pregnancy status) and each of the independent variables (demographic, behavioral, familial, and socioeconomic factors) to identify the independent variables that show statistically significant associations with the dependent variable. Statistically significant associations of variables at $p < 0.05$ with chi-square analysis allowed the selection of variables that were further moved to a multiple regression model to assess the odds of the factors associated with adolescent pregnancy, and adjust the effect of possible confounders. Results were expressed in terms of the Adjusted Odds Ratio (AOR) and their corresponding 95% confidence intervals (CI).

Ethics approval to conduct this study was obtained from the College of Medicine and Health Sciences (CMHS), University of Rwanda (UR) Institutional Review Board (IRB) (Ref: CMHS/IRB/124/2023). Before starting data collection, participants were briefed, and informed consent was obtained. The data were kept secret, were only accessible by investigators, and were used solely for the purpose of this study. Parents/guardians signed a consent form to authorize the participation of under 18 years old participants (minors), and the minor participants gave their assent. Participation was voluntary, and participants had the right to withdraw from the study whenever they felt uncomfortable. Autonomy, respect, and confidentiality were maintained at all stages of the data collection process by not mentioning any personal identifiers, such as names from the questionnaire.

RESULTS

Socio-demographic characteristics of the study participants: Overall, 174 cases and 384 controls were included. The mean age of the cases and controls was 17.4 years and 16.3 years, respectively. Over 78% were between the ages of 16 and 19, and there were cases (94.8%). Most participants attended primary and secondary school, with the higher proportion of cases attending primary (51.7%), while among controls, the proportion was higher in secondary school (59.2%). Most of the parents were alive (62.3%) and were farmers (39.7% and 51.3% for fathers and mothers, respectively). Ubudehe category 3 had the highest proportion (44%) (Table 1).

Familial characteristics of participants: Among study participants, the proportion of parental separation was 38.9%, and 16.1% of participants had siblings with a history of adolescent pregnancy.

Table 1: *Socio-demographic characteristics of the study participants*

Variables	Cases (n=174) Frequency (%)	Control (n=348) Frequency (%)	Total (n=522) Frequency (%)
Age group (years)			
13-15	9 (5.2)	101 (29.0)	110 (21.1)
16-19	165 (94.8)	247 (71.0)	412 (78.9)
Residence			
Kibuye catchment area	80 (46.0)	160 (46.0)	240 (46.0)
Kirinda catchment area	51 (29.3)	102 (29.3)	153 (29.3)
Mugonero catchment area	43 (24.7)	86 (24.7)	129 (24.7)
Adolescent's education			
No formal education	6 (3.5)	3 (0.9)	9 (1.7)
Primary	90 (51.7)	139 (39.9)	229 (43.9)
Secondary	78 (44.8)	206 (59.2)	284 (54.4)
Parents alive			
Both are alive	64 (36.8)	261 (75.0)	325 (62.3)
None is alive	37 (21.3)	15 (4.3)	52 (9.9)
Only father is alive	23 (13.2)	14 (4.0)	37 (7.1)
Only mother is alive	50 (28.7)	58 (16.7)	108 (20.7)
Father's education			
No formal education	62 (35.6)	59 (17.0)	121 (22.8)
Primary	100 (57.5)	180 (51.7)	280 (53.6)
Secondary and post-secondary	12 (6.9)	109 (31.3)	121 (23.2)
Mother's education			
No formal education	43 (24.7)	76 (21.8)	119 (22.8)
Primary	121 (69.5)	173 (49.7)	294 (56.3)
Secondary and post-secondary	10 (5.8)	99 (28.5)	109 (20.9)
Father's occupation			
Farmer	74 (42.5)	133 (38.2)	207 (39.7)
Business	11 (6.3)	84 (24.1)	95 (18.2)
Government/non-government organization	5 (2.9)	51 (14.7)	56 (10.7)
Unemployed	84 (48.3)	80 (23.0)	164 (31.4)
Mother's occupation			
Farmer	97 (55.7)	171 (49.2)	268 (51.3)
Business	8 (4.6)	87 (25.0)	95 (18.2)
Government/non-government organization	8 (4.6)	44 (12.6)	52 (10.0)
Unemployed	61 (35.1)	46 (13.2)	107 (20.5)
Socioeconomic status (Ubudehe category)			
Category 1	85 (48.9)	52 (15.0)	137 (26.2)
Category 2	62 (35.6)	94 (27.0)	156 (29.9)
Category 3	27 (15.5)	202 (58.0)	229 (43.9)

Around 51% of participants received sexual health education from parents, and the proportion of alcohol abuse in the family was 36.8% (Table 2).

Behavior and societal characteristics of participants: Among study participants, around 57% received condom education, while 29.5%

Table 2: *Familial characteristics of participants*

Variables	Cases (n=174) Frequency (%)	Control (n=348) Frequency (%)	Total (n=522) Frequency (%)
Parental separation/divorce			
No	64 (36.8)	225 (73.3)	319 (61.1)
Yes	110 (63.2)	93 (26.7)	203 (38.9)
Sibling with a history of adolescent pregnancy			
No	135 (77.6)	303 (87.1)	438 (83.9)
Yes	39 (22.4)	45 (12.9)	84 (16.1)
Received sexual education from parents			
Yes	51 (29.3)	221 (63.5)	272 (52.1)
No	123 (70.7)	127 (36.5)	250 (47.9)
Alcohol abuse in the family			
No	107 (61.5)	223 (64.1)	330 (63.2)
Yes	67 (38.5)	125 (35.9)	192 (36.8)

Table 3: *Behavior and societal characteristics of participants*

Variables	Cases (n=174) Frequency (%)	Control (n=348) Frequency (%)	Total (n=522) Frequency (%)
Received education on condom use			
Yes	104 (59.8)	193 (55.5)	297 (56.9)
No	70 (40.2)	155 (44.5)	225 (43.1)
Involved in alcohol consumption			
No	113 (64.9)	255 (73.3)	368 (70.5)
Yes	61 (35.1)	93 (26.7)	154 (29.5)
Peer pressure to engage in sexual intercourse			
No	49 (28.2)	261 (75.0)	310 (59.4)
Yes	125 (71.8)	87 (25.0)	212 (40.6)
Lived in Kigali			
No	52 (29.9)	280 (80.5)	332 (63.6)
Yes	122 (70.1)	68 (19.5)	190 (36.4)
Age at first sexual intercourse (n=222)			
≥ 16 years	121 (72.9)	12 (21.4)	133 (60.0)
13-15 years	39 (23.5)	29 (51.8)	68 (30.6)
≤ 12 years	6 (3.6)	15 (26.8)	21 (9.4)
Multiple sex partners (n=222)			
No	112 (67.5)	20 (35.7)	132 (59.5)
Yes	54 (32.5)	36 (64.3)	90 (40.5)
Condoms use (n=222)			
Often use	49 (29.5)	28 (50.0)	77 (34.7)
Never	117 (70.5)	28 (50.0)	145 (65.3)

were involved in alcohol consumption. About 60% of participants had peer influence to engage in sexual intercourse, and of 222 participants who had sexual intercourse, 60% had their first sex

Table 4: *Bivariate analysis of socio-demographic and economic factors associated with adolescent pregnancy*

Variables	Cases (n=174) Frequency (%)	Control (n=348) Frequency (%)	OR (95% CI)	P-value
Age group (years)				
13-15	9 (8.2)	101 (91.8)	reference	
16-19	165 (40.0)	247 (60.0)	7.5 (3.68-15.24)	< 0.001
Adolescent's education				
Secondary	71 (26.5)	197 (73.5)	reference	
Primary	86 (38.0)	140 (62.0)	1.7 (1.16-2.49)	0.006
No formal education	17 (60.7)	11 (39.3)	4.3 (1.91-9.59)	< 0.001
Parents alive				
Both are alive	66 (20.2)	261 (79.8)	reference	
None is alive	36 (70.6)	15 (29.4)	9.5 (4.90-18.36)	< 0.001
Only father is alive	23 (62.2)	14 (37.8)	6.5 (3.17-13.31)	< 0.001
Only mother is alive	49 (45.8)	58 (54.2)	3.3 (2.09-5.32)	< 0.001
Father's education				
secondary and post-secondary	12 (10.0)	109 (90.0)	reference	
Primary	100 (35.7)	180 (64.3)	5 (2.65-9.61)	< 0.001
No formal education	62 (51.2)	59 (48.8)	9.5 (4.76-19.12)	< 0.001
Mother's education				
Secondary and post-secondary	10 (9.2)	99 (90.8)	reference	
Primary	121 (41.2)	173 (58.8)	7.0 (3.47-13.81)	< 0.001
No formal education	43 (36.1)	76 (63.9)	5.6 (2.64-11.86)	< 0.001
Father's occupation				
Business	11 (11.6)	84 (88.4)	reference	
Farmer	85 (36.3)	149 (63.7)	4.3 (2.2-8.6)	< 0.001
Government/non-government organization	5 (8.9)	51 (91.1)	0.7 (0.25-2.28)	0.610
Unemployed	73 (53.3)	64 (46.7)	8.7 (4.27-17.76)	< 0.001
Mother's occupation				
Business	8 (8.4)	87 (91.6)	reference	
Farmer	106 (37.3)	178 (62.3)	6.5 (3.02-13.89)	< 0.001
Government/non-government organization	8 (15.4)	44 (84.6)	1.9 (0.69-5.62)	0.201
Unemployed	52 (57.1)	39 (42.9)	14.5 (6.29-33.40)	< 0.001
Socioeconomic status (Ubudehe category)				
Category 3	27 (11.8)	202 (88.2)	reference	
Category 2	62 (39.7)	94 (60.3)	2.14 (1.39-3.30)	< 0.001
Category 1	85 (62.0)	52 (38.0)	12.2 (7.2-20.76)	< 0.001

CI: Confidence internal, AOR: Adjusted Odd ratio, p<0.05: Statistically significant

intercourse at 16 years old and above, 59.5% had sexual intercourse with more than one partner, and 34.7% often used condoms (Table 3).

Bivariate analysis of socio-demographic and economic factors associated with adolescent pregnancy: The bivariate analysis showed that adolescent pregnancy was significantly associated

Table 5: *Bivariate analysis of familial, behavior, and societal factors associated with adolescent pregnancy*

Variables	Cases (n=174) Frequency (%)	Control (n=348) Frequency (%)	OR (95% CI)	P-value
Parental separation/divorce				
No	64 (20.0)	255 (80.0)	reference	
Yes	110 (54.2)	93 (45.8)	4.7 (3.19-6.95)	< 0.001
Sibling with a history of adolescent pregnancy				
No	135 (30.8)	303 (69.2)	reference	
Yes	39 (46.4)	45 (53.6)	1.9 (1.21-3.12)	0.006
Received sexual education from parents				
Yes	51 (18.7)	221 (81.3)	reference	
No	123 (49.2)	127 (50.8)	4.2 (2.83-6.21)	< 0.001
Alcohol abuse in the family				
No	107 (32.4)	223 (67.6)	reference	
Yes	67 (34.9)	125 (65.1)	1.12 (0.77-1.63)	0.564
Received education on the use of condoms				
Yes	104 (35.0)	193 (65.0)	reference	
No	70 (31.1)	155 (68.9)	0.8 (0.58-1.21)	0.349
Involved in alcohol consumption				
No	113 (30.7)	255 (69.3)	reference	
Yes	61 (39.6)	93 (60.4)	1.5 (1.00-2.19	0.050
Peer pressure to engage in sexual intercourse				
No	49 (15.8)	261 (84.2)	reference	
Yes	125 (59.0)	87 (41.0)	7.6 (5.08-11.53)	< 0.001
Lived in Kigali				
No	52 (15.7)	280 (84.3)	reference	
Yes	122 (64.2)	68 (35.8)	9.7 (6.35-14.69)	< 0.001
Age at first sexual intercourse (n =222)				
≤ 12 years	6 (28.6)	15 (71.4)	reference	
13-15 years	39 (57.4)	29 (42.6)	3.4 (1.16-9.72)	0.025
≥ 16 years	121 (91.0)	12 (9.0)	25.2 (8.25-77.05)	< 0.001
Multiple sex partners (n=222)				
No	112 (84.8)	20 (15.2)	reference	
Yes	54 (60.0)	36 (40.0)	0.3 (0.14-0.50)	< 0.001
Condoms use (n=222)				
Never	117 (80.7)	28 (19.3)	reference	
Often use	49 (63.6)	28 (36.4)	0.4 (0.22-0.78)	0.006

CI: Confidence internal, AOR: Adjusted Odd ratio, p<0.05: Statistically significant

with age (P<0.001), lack of formal education (P<0.001) and having only primary education (P=0.006), losing parents (P<0.001), lack of formal education and primary education of parents (P<0.001), employment of the parents (P<0.001), and Ubudehe category (P<0.001) (Table 4).

Bivariate analysis of familial, behavior, and societal factors associated with adolescent pregnancy: The analysis has shown adolescent pregnancy was significantly associated with parent's separation (P<0.001), having a sibling with a history of adolescent pregnancy (P=0.006), not receiving sexual education from parents

Table 6: *Multivariate analysis of the risk factors associated with adolescent pregnancy*

Risk factor	aOR	95% CI		P-value
		Lower	Upper	
Age group (Years)				
13-15	reference			
16-19	3.1	0.53	18.6	0.206
Adolescent's education				
Secondary	reference			
Primary	1.3	0.46	3.9	0.586
No formal education	1.8	0.14	24.1	0.638
Parents alive				
Both are alive	reference			
None is alive	1	0.23	3.7	0.911
Only father is alive	3.8	0.67	21.97	0.128
Only mother is alive	1.7	0.55	5.47	0.352
Father's education				
secondary and post-secondary	reference			
Primary	0.8	0.13	4.64	0.794
No formal education	1.15	0.16	8.40	0.888
Mother's education				
Secondary and post-secondary	reference			
Primary	0.4	0.14	5.28	0.864
No formal education	0.8	0.05	3.32	0.406
Father's occupation				
Business	reference			
Farmer	0.9	0.21	4.32	0.958
Government/non-government organization	0.3	0.02	3.13	0.291
Unemployed	4.6	0.38	56.03	0.225
Mother's occupation				
Business	reference			
Farmer	0.9	0.16	5.13	0.918
Government/non-government organization	1.3	0.08	19.75	0.855
Unemployed	6.1	0.43	86.80	0.181
Socioeconomic status (Ubudehe category)				

Continued on the next page....

Category 3	reference			
Category 2	5.6	2.06	14.61	0.001
Category 1	4.6	1.47	14.28	0.008
Parental separation/divorce				
No	reference			
Yes	1.9	0.48	7.64	0.359
Sibling with a history of adolescent pregnancy				
No	reference			
Yes	0.4	0.12	1.35	0.145
Received sexual education from parents				
Yes	reference			
No	4.5	1.71	11.82	0.002
Peer pressure to engage in sexual intercourse				
No	reference			
Yes	3	1.23	7.32	0.016
Lived in Kigali				
No	reference			
Yes	2.2	0.90	5.56	0.082
Age at first sexual intercourse (n =222)				
≤ 12 years	reference			
13-15 years	2.5	0.69	9.02	0.163
≥ 16 years	23	5.98	88.52	< 0.001
Multiple sex partners (n=222)				
Yes	reference			
No	0.4	0.12	1.43	0.166
Condoms use (n=222)				
Never	reference			
Often use	0.4	0.13	1.05	0.062

CI: Confidence internal, AOR: Adjusted Odd ratio, p<0.05: Statistically significant

(P<0.001), peer pressure to engage in sexual intercourse and live in Kigali (P<0.001), age at first sexual intercourse and multiple sex partners (P<0.001), and never using condoms (P=0.006) (Table 5)

Multivariable analysis of the risk factors associated with adolescent pregnancy: Multivariable analysis showed that these factors were independently and significantly associated with adolescent pregnancy: Ubudehe category 1 (Adjusted Odds Ratio [aOR] = 4.6, 95% confidence interval [CI] = 1.47-14.28, P=0.008), Ubudehe category 2 (aOR = 5.6, 95%CI = 2.06-14.61, P<0.001); Not receiving sexual education from parents (aOR = 4.5, 95%CI = 1.71-11.82, P = 0.002), peer pressure to engage in sexual intercourse (aOR = 3, 95%CI = 1.23-7.32, P=0.016); age at first sexual intercourse (aOR = 23, 95%CI = 5.98-88.52, P<0.001) (Table 6).

DISCUSSION

This study aimed to identify predictors of adolescent pregnancy in the Karongi District of Western Province, Rwanda. Key findings indicated

that low socioeconomic status, inadequate sexual health education, peer influence, age at first sexual intercourse, and parental marital status were significantly associated with adolescent pregnancy. These findings resonate with previous studies and provide a comprehensive understanding of the factors influencing adolescent pregnancy in Karongi District and in Rwanda in general and would inform policies and strategies to solve this persisting, though decreasing, public health issue with devasting consequences on Rwandan youth [19].

This study found that adolescents from financially unstable families (Ubudehe categories 1 and 2) were significantly more likely to experience pregnancy compared to those from financially stable families (Ubudehe category 3). This finding aligns with a previous study that reported that low socioeconomic status was a significant predictor of adolescent pregnancy across African countries [20,21]. Similarly, studies in Ghana reported that adolescents from low-income families were at higher risk of being pregnant due to socioeconomic pressures [22,23]. These findings suggest that financial instability may expose adolescents to exploitation and risky behaviors due to the need to meet their basic needs. This might be attributed to the fact that adults with ill behaviors are more likely to take advantage of adolescents from families with poor financial status, and girls get into risks trying to satisfy their needs. Moreover, girls from low-income families are at high risk of substance and alcohol abuse, which increases their likelihood of unwanted pregnancy [24,25]. Thus, interventions aimed at improving the socioeconomic status of families in low-income communities are necessary to reduce the incidence of adolescent pregnancy.

Inadequate sexual health education was another significant predictor of adolescent pregnancy in this study. Adolescents who did not receive sexual health education were at a higher risk of becoming pregnant, a finding consistent with a study in Nigeria that emphasized the importance of sex education in preventing unwanted pregnancies [26]. Conversely, a study in the United States found that abstinence-only education was associated with higher rates of teen pregnancy, highlighting the importance of comprehensive sex education over restrictive educational approaches [27]. These findings underscore the critical role of sexual health education in equipping adolescents with the knowledge to make informed decisions about their sexual health. It was found that comprehensive sexual health education, including information on contraception and safe sex practices, can significantly reduce the rates of adolescent pregnancy compared to abstinence-only education [28,29].

Peer pressure to engage in sexual intercourse was also identified as a significant risk factor for adolescent pregnancy. This finding is supported by another study that highlighted the influential role of peers in adolescent behavior, including engagement in risky sexual activities [30]. If an adolescent's friends are sexually active, they are prone to engage in unprotected sexual activity themselves and subsequently become pregnant [31]. A study on barriers to adolescent girls' access to sexual and reproductive health services further indicated that peer acceptance often leads adolescents to engage in risky behaviors, such as unprotected sex and substance abuse [30]. The consistency across these studies points to the need for interventions that address peer dynamics and promote healthy peer relationships. Targeted programs that address peer pressure and promote positive peer influences would decrease risky sexual behaviors and subsequent adolescent pregnancies.

This study also found that engaging in sexual intercourse at an older age (16 years and above) was associated with a higher risk of pregnancy. This may be due to societal pressures and peer mockery faced by older adolescents who have not yet had sexual experiences, leading them to engage in sexual activities without adequate knowledge or preparation [22,31]. This contrasts with findings from other studies where early sexual initiation was more commonly linked to higher pregnancy rates [32,33]. For instance, studies in Ethiopia reported that girls who initiated sexual activity at a younger age were more likely to experience pregnancy [32,34]. This discrepancy suggests that cultural and social contexts may play a crucial role in how age at first sexual intercourse influences pregnancy risk among adolescents. Age-specific and tailored sexual health interventions that address the specific needs and pressures faced by adolescents based on their age categories would reduce the incidence of pregnancy. This is supported by a systematic review showing that tailored interventions lead to fewer adolescent pregnancy incidences than untailored interventions [35].

Adolescents from separated or divorced parents

were found to be more likely to become pregnant compared to those from intact families. This finding is in line with studies from Ethiopia [36], Malaysia [37], and South Africa [38], which reported similar associations between parental marital status and adolescent pregnancy. It was found that adolescents from single-parent families are more likely to be insecurely attached and are more likely to get pregnant [39]. The stability provided by married parents may offer a protective effect by ensuring better supervision and communication about sexual health matters between adolescents and parents, reducing the risks of pregnancy. This highlights the importance of family dynamics in shaping adolescent behaviors and outcomes. Additionally, adolescents raised by single mothers were more likely to become pregnant than those raised by single fathers. This may be due to the perception that male parents are generally stricter with their daughters than female parents. Furthermore, in accordance with the cultural perspective in Rwanda, a household with a male presence might instill more fear and discipline compared to a household with only female figures. This cultural perspective might lead to single mothers imposing more unhealthy restrictive controls on their girls, which further exposes them to risky behaviors. A study done on single mother parenting and adolescent psychopathology indicated single mothers can exhibit more controlling behaviors, negatively affecting the development of a healthy sense of autonomy in their children, whereas a mother who engages in a less negative controlling behavior, allows their children to achieve developmentally appropriate levels of independence [40]. Moreover, single mothers and their families are at higher risk of financial instability, stress, and other mental health disorders than single fathers, which further exposes adolescent girls in those families to higher risks of pregnancy [39,41]. Moreover, girls with single mothers are more likely to drop out of school, increasing the risk of pregnancy [42]. These findings indicate that support programs for families undergoing separation or divorce are essential and would mitigate the increased risk of adolescent pregnancy.

This study provides a baseline knowledge of risk factors associated with pregnancy among adolescents in Karongi District. It could also inform policies to set preventive measures aimed at reducing adolescent pregnancies through evidence-based prevention programs in Karongi District. However, this study has some limitations for consideration. The case-control design was unmatched and prone to recall and selection bias. Furthermore, the generalizability of the results to other districts is limited since it was conducted in one district. Therefore, we recommend an extensive longitudinal study that includes the whole country with larger samples.

CONCLUSION

The research reveals that adolescent pregnancy is positively influenced by factors, such as low socioeconomic status, lack of sexual education from parents/guardians, peer pressure, and first sex intercourse at ≥ 16 years old. To prevent adolescent pregnancy, support for low-income families can help reduce the likelihood of adolescent pregnancy. Comprehensive sexual education that includes information on contraception, and safe sex practices can be prioritized. Poverty reduction programs are also essential to empower families, especially families of single mothers. Parents can play a crucial role by providing sexual health education and discussing risks with their children and should be engaged and educated to step up and educate their children. Peer pressure can also be reduced through mentoring programs and after-school activities. By addressing these risk factors, the number of adolescents who become pregnant can be reduced, promoting a healthy life.

REFERENCES

[1] "WHO. Preventing early pregnancy and poor reproductive outcomes among adolescents in developing countries. Geneva: WHO; 2011.". https://www.who.int/publications/i/item/9789241502214

[2] "UNFPA. (2013). Motherhood in childhood: facing the challenge of adolescent pregnancy. Paris: UNFPA." https://www.unfpa.org/press/state-world-population-2013-motherhood-childhood

[3] J. E. Darroch, V. Woog, and A. Bankole, "Adding it up : Costs and Benefits of Meeting the Contraceptive Needs of Adolescents," New York: Guttmacher Institute, no. May, pp. 1–16, 2016.

[4] S. Neal, Z. Matthews, M. Frost, H. Fogstad, A. V Camacho, and L. Laski, "Childbearing in adolescents aged 12-15 years in low resource countries: a neglected issue. New estimates

from demographic and household surveys in 42 countries.," Acta obstetricia et gynecologica Scandinavica, vol. 91, no. 9, pp. 1114–1118, Sep. 2012, doi: 10.1111/j.1600-0412.2012.01467.x.
[5] S. F. Wallington, "Akella, Devi and Jordan, Melissa (2014) 'Impact of Social and Cultural Factors on Adolescent Pregnancy,' Journal of Health Disparities Research and Practice: Vol. 8 : Iss. 1 , Article 3.," The Routledge Handbook of Language and Health Communication, vol. 8, no. 1, 2015, doi: 10.4324/9781315856971.ch11.
[6] O. V Panova, A. M. Kulikov, A. Berchtold, and J. C. Suris, "Factors Associated with Unwanted Pregnancy among Adolescents in Russia.," Journal of pediatric and adolescent gynecology, vol. 29, no. 5, pp. 501–505, Oct. 2016, doi: 10.1016/j.jpag.2016.04.004.
[7] H. Mezmur, N. Assefa, and T. Alemayehu, "Adolescent pregnancy and its associated factors in eastern ethiopia: A community-based study," International Journal of Women's Health, vol. 13, pp. 267–278, 2021, doi: 10.2147/IJWH.S287715.
[8] S. Caffe et al., "Looking back and moving forward: Can we accelerate progress on adolescent pregnancy in the Americas?," Reproductive Health, vol. 14, no. 1, pp. 1–8, 2017, doi: 10.1186/s12978-017-0345-y.
[9] Y. D. Wado, E. A. Sully, and J. N. Mumah, "Pregnancy and early motherhood among adolescents in five East African countries: A multi-level analysis of risk and protective factors," BMC Pregnancy and Childbirth, vol. 19, no. 1, pp. 1–11, 2019, doi: 10.1186/s12884-019-2204-z.
[10] T. Ganchimeg et al., "Maternal and perinatal outcomes among nulliparous adolescents in low- and middle-income countries: A multi-country study," BJOG: An International Journal of Obstetrics and Gynaecology, vol. 120, no. 13, pp. 1622–1630, 2013, doi: 10.1111/1471-0528.12391.
[11] S. J. Phillips and M. T. Mbizvo, "Empowering adolescent girls in Sub-Saharan Africa to prevent unintended pregnancy and HIV: A critical research gap.," International journal of gynaecology and obstetrics: the official organ of the International Federation of Gynaecology and Obstetrics, vol. 132, no. 1, pp. 1–3, Jan. 2016, doi: 10.1016/j.ijgo.2015.10.005.
[12] G. M. Kassa, A. O. Arowojolu, A. A. Odukogbe, and A. W. Yalew, "Prevalence and determinants of adolescent pregnancy in Africa: A systematic review and Meta-analysis 11 Medical and Health Sciences 1117 Public Health and Health Services," Reproductive Health, vol. 15, no. 1, pp. 1–18, 2018, doi: 10.1186/s12978-018-0640-2.
[13] M. Najafian, K. B. Karami, M. Cheraghi, and R. Mohammad Jafari, "Prevalence of and Some Factors Relating with Unwanted Pregnancy, in Ahwaz City, Iran, 2010," ISRN Obstetrics and Gynecology, vol. 2011, pp. 1–4, 2011, doi: 10.5402/2011/523430.
[14] World Health Organization (WHO), "WHO Recommendations on Adolescent Health: Guidelines Approved by the WHO Guidelines Review Committee," World Health Organization, no. August, pp. 1–30, 2017.
[15] A. Kirbas, H. C. Gulerman, and K. Daglar, "Pregnancy in Adolescence: Is It an Obstetrical Risk?," Journal of Pediatric and Adolescent Gynecology, vol. 29, no. 4, pp. 367–371, 2016, doi: https://doi.org/10.1016/j.jpag.2015.12.010.
[16] National Institute of Statistics of Rwanda and Rwanda Ministry of Health, Rwanda Demographic Health Survey, 2019-20. 2021.
[17] NISR, Ministry of Health (MOH) [Rwanda], and ICF International, Rwanda Demographic and Health Survey 2014-2015. 2015.
[18] D. SE. Theogene M, David HO, Vedaste N, "Theogene M, David HO, Vedaste N, Dieudonné SE. Prevalence and associated factors to adolescent pregnancies in Mugonero hospital catchment area.," vol. 1473, no. March, pp. 8–10, 2019.
[19] D. Uwizeye, R. Muhayiteto, E. Kantarama, S. Wiehler, and Y. Murangwa, "Prevalence of adolescent pregnancy and the associated contextual correlates in Rwanda," Heliyon, vol. 6, no. 10, p. e05037, Oct. 2020, doi: 10.1016/j.heliyon.2020.e05037.
[20] I. Yakubu and W. J. Salisu, "Determinants of adolescent pregnancy in sub-Saharan Africa: a systematic review," Reprod Health, vol. 15, no. 1, p. 15, Dec. 2018, doi: 10.1186/s12978-018-0460-4.
[21] C. Odimegwu and S. Mkwananzi, "Factors Associated with Teen Pregnancy in sub-Saharan Africa: A Multi-Country Cross-Sectional Study," Afr J Reprod Health, vol. 20, no. 3, pp. 94–107, Sep. 2016, doi: 10.29063/ajrh2016/v20i3.14.
[22] M. Amoadu et al., "Socio-cultural factors influencing adolescent pregnancy in Ghana: a scoping review," BMC Pregnancy Childbirth, vol. 22, no. 1, p. 834, Nov. 2022, doi: 10.1186/s12884-022-05172-2.
[23] B. Y. A. Asare, D. Baafi, B. Dwumfour-Asare, and A.-R. Adam, "Factors associated with

adolescent pregnancy in the Sunyani Municipality of Ghana," International Journal of Africa Nursing Sciences, vol. 10, pp. 87–91, 2019, doi: 10.1016/j.ijans.2019.02.001.
[24] H. S. Connery, B. B. Albright, and J. M. Rodolico, "Adolescent substance use and unplanned pregnancy: strategies for risk reduction," Obstet Gynecol Clin North Am, vol. 41, no. 2, pp. 191–203, Jun. 2014, doi: 10.1016/j.ogc.2014.02.011.
[25] M. Namukisa, O. Kamacooko, J. F. Lunkuse, E. Ruzagira, M. A. Price, and Y. Mayanja, "Incidence of unintended pregnancy and associated factors among adolescent girls and young women at risk of HIV infection in Kampala, Uganda," Front Reprod Health, vol. 5, p. 1089104, 2023, doi: 10.3389/frph.2023.1089104.
[26] U. E. Osadolor, E. O. Amoo, D. E. Azuh, I. Mfonido-Abasi, C. P. Washington, and O. Ugbenu, "Exposure to Sex Education and Its Effects on Adolescent Sexual Behavior in Nigeria," Journal of Environmental and Public Health, vol. 2022, pp. 1–10, Jun. 2022, doi: 10.1155/2022/3962011.
[27] K. F. Stanger-Hall and D. W. Hall, "Abstinence-Only Education and Teen Pregnancy Rates: Why We Need Comprehensive Sex Education in the U.S," PLoS ONE, vol. 6, no. 10, p. e24658, Oct. 2011, doi: 10.1371/journal.pone.0024658.
[28] A. Cheedalla, C. Moreau, and A. E. Burke, "Sex education and contraceptive use of adolescent and young adult females in the United States: an analysis of the National Survey of Family Growth 2011-2017," Contracept X, vol. 2, p. 100048, 2020, doi: 10.1016/j.conx.2020.100048.
[29] M. T. Mbizvo et al., "Comprehensive sexuality education linked to sexual and reproductive health services reduces early and unintended pregnancies among in-school adolescent girls in Zambia," BMC Public Health, vol. 23, no. 1, p. 348, Feb. 2023, doi: 10.1186/s12889-023-15023-0.
[30] M. Janighorban, Z. Boroumandfar, R. Pourkazemi, and F. Mostafavi, "Barriers to vulnerable adolescent girls' access to sexual and reproductive health," BMC Public Health, vol. 22, no. 1, p. 2212, Nov. 2022, doi: 10.1186/s12889-022-14687-4.
[31] L. Widman, S. Choukas-Bradley, S. W. Helms, and M. J. Prinstein, "Adolescent Susceptibility to Peer Influence in Sexual Situations," J Adolesc Health, vol. 58, no. 3, pp. 323–329, Mar. 2016, doi: 10.1016/j.jadohealth.2015.10.253.
[32] S. D. Kebede et al., "Spatial distribution and determinants of Early sexual initiation in Ethiopia," BMC Public Health, vol. 24, no. 1, p. 1536, Jun. 2024, doi: 10.1186/s12889-024-19057-w.
[33] M. Arefaynie, M. Yalew, Y. Damtie, and B. Kefale, "Determinants of early sexual initiation among female youth in Ethiopia: a multilevel analysis of 2016 Ethiopian Demographic and Health Survey," BMC Womens Health, vol. 20, no. 1, p. 205, Sep. 2020, doi: 10.1186/s12905-020-01069-4.
[34] B. E. Birhanu, D. L. Kebede, A. B. Kahsay, and A. B. Belachew, "Predictors of adolescent pregnancy in Ethiopia: a multilevel analysis," BMC Public Health, vol. 19, no. 1, p. 601, Dec. 2019, doi: 10.1186/s12889-019-6845-7.
[35] E. Brown et al., "Improving the Sexual Health of Young People (under 25) in High-Risk Populations: A Systematic Review of Behavioural and Psychosocial Interventions," Int J Environ Res Public Health, vol. 18, no. 17, p. 9063, Aug. 2021, doi: 10.3390/ijerph18179063.
[36] Y. Ayanaw Habitu, A. Yalew, and T. Azale Bisetegn, "Prevalence and Factors Associated with Adolescent Pregnancy, Northeast Ethiopia, 2017: A Cross-Sectional Study," Journal of Pregnancy, vol. 2018, pp. 1–7, Nov. 2018, doi: 10.1155/2018/1714527.
[37] S. Abdullah, S. Abd. Ghani, S. S. S. M. S. Akil, and N. M. Faudzi, "Relationship of Parent and Peer Attachment with Coping Strategy among Adolescentrs Pregnancy," Procedia - Social and Behavioral Sciences, vol. 114, pp. 334–338, Feb. 2014, doi: 10.1016/j.sbspro.2013.12.707.
[38] C. Odimegwu and S. Mkwananzi, "Family structure and community connectedness: Their association with adolescent pregnancy in South Africa," Journal of Psychology in Africa, vol. 28, no. 6, pp. 479–484, Nov. 2018, doi: 10.1080/14330237.2018.1544390.
[39] K. Chavda and V. Nisarga, "Single Parenting: Impact on Child's Development," Journal of Indian Association for Child and Adolescent Mental Health, vol. 19, no. 1, pp. 14–20, Jan. 2023, doi: 10.1177/09731342231179017.
[40] I. Daryanani, J. L. Hamilton, L. Y. Abramson, and L. B. Alloy, "Single Mother Parenting and Adolescent Psychopathology," J Abnorm Child Psychol, vol. 44, no. 7, pp. 1411–1423, Oct. 2016, doi: 10.1007/s10802-016-0128-x.
[41] R. J. Stack and A. Meredith, "The Impact of Financial Hardship on Single Parents: An Exploration of the Journey From Social Distress

to Seeking Help," J Fam Econ Iss, vol. 39, no. 2, pp. 233–242, Jun. 2018, doi: 10.1007/s10834-017-9551-6.
[42] J. L. Sobngwi-Tambekou, M. Tsague-Agnoux, L. K. Fezeu, and F. Ndonko, "Adolescent childbearing and school dropout in a sample of 18,791 single mothers in Cameroon," Reprod Health, vol. 19, no. 1, p. 10, Dec. 2022, doi: 10.1186/s12978-021-01323-4.