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Pregnancy among Adolescents Girls in Humanitarian settings: A case in Refugee Camp of Gambella Regional state, Community Based Cross-Sectional Study, Southwest Ethiopia, 2021

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ABSTRACT

Objective: The aim of this study was to assess the prevalence of pregnancy and associated factors among adolescent girls in the Nguenyyiel refugee camp.

Methods: A community-based cross-sectional study was done. The Systematic random sampling technique was used to select respondents. Data were collected using a well-structured and pretested questionnaire. Pregnancy test was done using HCG test. Bivariate and Multivariate logistic regression analysis was run to identify factors associated with adolescent pregnancy.

Results: The prevalence of pregnancy among adolescent girls in the Nguenyyiel refugee camp was 21.7% (95% C.I: 17.6-25.6). Factors associated with adolescent pregnancy were age (17-19 years) (AOR: 2.79; 95% C.I: 1.55-5.05); Educational status: Primary education (AOR: 7.69; 95% C.I: 3.55-16.68); No formal education (AOR: 3.42; 95% C.I: 1.59-7.36), and Household living arrangement: Living with none of biological parents (AOR: 2.14; 95% C.I: 1.02-4.49); Living with either of a biological parent (AOR: 3.71; 95% C.I: 1.76-7.81).

Conclusions and Recommendations: This study showed that there is a high prevalence of pregnancy among adolescent girls in the study setting. Age (17-19 years), Educational status, and Household living arrangement

(Live with none of the biological parents; Live with either of biological parents) were among the factors significantly associated with adolescent pregnancy. Hence, health workers and other stakeholders in the camps should focus on strengthening adolescent sexual health education giving especial attention to late adolescents, uneducated and live without biological family.

Key words: Adolescents, pregnancy, Gambella, Nguenyyiel, Refugee, Ethiopia.

INTRODUCTION

Each year, an estimated 21 million adolescent girls become pregnant every year and approximately 12 million of them give birth worldwide. At least 777,000 births occur to adolescent girls younger than 15 years in developing countries. Adolescent pregnancy is associated with higher risks of Adverse Birth Outcomes such as preterm birth, Law Birth Weight (LBW), Intra uterine growth retardation (IUGR), stillbirth, unsafe abortion, maternal and neonatal mortality and morbidity compared with women in their twenties (1–9). Complications from pregnancy and childbirth are the leading cause of death among adolescent girls(10,11). Moreover, adolescent pregnancy is associated with social and economic problems like school drop-out, unemployment, and limited future opportunities, risk of remaining poor and, and increased cost for health care (2,12).

Many teenage pregnancies in Ethiopia occur within marriage(13). Similarly, other studies showed that the prevalence of pregnancy among adolescent girls in humanitarian settings (refugee camps or settlements) is 30% higher than among their non-displaced counterparts (13, 14). This is due to the fact that adolescents in humanitarian settings are extremely vulnerable to early sexual practice, violence, and exploitation or abuse compared with their counterparts in general population (14–16). The experience of forced migration impacts refugee adolescent girls' decision-making power related to their sexual relationships and reproductive life (9). Hence, adolescents may lack the autonomy to determine over their affairs including their sexual and reproductive health and rights (11,17). Adolescents are also the only age group for whom AIDS deaths are on the rise(10).

According to the Ethiopian Demographic and health survey, the study area, Gambella Regional State of Ethiopia, has high unmet need for family planning (23%), high polygamy practice (21%)(18) and highest HIV and other STIs prevalence in the country in general population (13,17,19–21). However, there was no study conducted to determine the prevalence and factors associated with pregnancy among adolescent refugees in humanitarian

settings. This study, therefore, aimed at assessing the prevalence of pregnancy among adolescent girls and associated factors in the Nguenyyiel refugee camp, Gambella region, Southwest Ethiopia.

METHODS AND MATERIALS

Study Design and Setting

A community-based cross-sectional study was conducted in the Nguenyyiel refugee camp, Gambella region from May 15 to June 15, 2021. The Gambella region hosted 337,081 refugee population from the bordering country of South Sudan in 7 refugee camps (as of May 2021). The Nguenyyiel refugee camp is the newest and the largest camp in Ethiopia, opened to accommodate the new refugee influx from South Sudan following the escalation of conflict in South Sudan in July 2016. It is located in Itang special woreda (district). It is found at about 769 km away from capital Finfinnee/Addis Ababa and 55 Kms from the region's capital, Gambella town (22) *(See figure 1)*. It has 10,916 households and total populations of 90,506 with Male (43,757) and Female (46,747). Adolescents constitute majority of the women in the Reproductive age in the camp

Population

Source population

The source populations were all adolescent girls (10-19 years) in the Nguenyyiel refugee camp. The study populations were adolescent girls in the selected households who participated on this study.

Eligibility Criteria

Inclusion criteria

All girls in the adolescence age interval (10-19) who were residents in the Nguenyyiel refugee camp at least for the last six months before the data collection were considered eligible.

Sample size determination

The sample size was calculated for both objectives. For the first objective, sample size was calculated using a single population proportion formula with the assumptions of: Z = 1.96 at 95% confidence interval, d = Margin of error assumed to be (0.05), P = prevalence of pregnancy in adolescent from previous studies (2), and 10% non-response rate; $n = Z\alpha_2 p\ (1\text{-}p)/d2 = 421$

The sample size for the second objective was calculated by using the double population proportion formula using Epi info version 3.0 statistical software by considering the following assumptions after reviewing previous literature: $Z\alpha/_2$: 1.96 at 95% confidence level, Zβ: power = statistical power of 80%, P1: the probability of outcome in the unexposed, P2: the probability of outcome in the exposed and r: ratio of unexposed to exposed (Table 1).

Table 1: Sample size calculation based on the significant factors of adolescent pregnancy; Nguenyyiel refugee camp, Gambella region, southwest Ethiopia, 2021.

S/no.	Significant factors associated with adolescent pregnancy & citations	Power	95% C.I	The proportion of pregnancy among non-exposed adolescent girls (P1)	The proportion of pregnancy among exposed (P2)	Risk Ratio (r)	AOR	n_1	n_{total}
1	Educational status [No formal education Vs. Secondary and above] (21)	80%	1.96	31.0%	7.4%	0.24	3.83	164	181
2	Modern contraceptive use [Users Vs. Non-users] (17)	80%	1.96	64.6%	19.2%	0.29	10.62	131	144
3	Marital status [Married Vs. Single (not-married)] (17)	80%	1.96	3.80%	54.4%	14.3	2.16	33	37

As shown in the above table, since the calculated sample sizes for the second objective are less than that of the first objective (n = 421), finally, the larger sample size (n = 421) was taken and used for this study.

Sampling techniques and Procedures

The 421 respondents in the Nguenyyiel refugee camp were chosen using a systematic random sampling technique. In the Nguenyyiel refugee camp, there were around 4100 adolescent girls (i.e., the source population was 4100). To construct a sampling frame (i.e., to identify families with adolescent girls), a pre-study survey was conducted. The sampling interval was calculated by dividing the number of adolescent girls in the Nguenyyiel refugee camp (N = 4100) by the sample size (n = 421), resulting in K = 4100/421 = 9. As a

result, every ninth household with adolescent was chosen. In case a house hold had two or more adolescents, the lottery technique was employed to choose one adolescent girl.

Data collection Tools and Procedures

The data was gathered by eight trained diploma nurses and two supervisors with a BSc in public health. A face-to-face interviewer administered data collection method was employed using a well-structured questionnaire. The questionnaire was adapted from different literature and pretested on sites other than the study area before the commencement of actual data collection (13,21,23). It contained socio-demographic, family, and individual-level characteristics, including sexual and reproductive health knowledge, modern contraceptive knowledge, and other pregnancy-related characteristics. Pregnancy among adolescent girls was assessed by conducting a urine Human Chorionic Gonadotropin (HCG) test at the community level using test kits. Before collecting a urine sample, each study participant was asked if she had a confirmed pregnancy or if the pregnancy was apparently visible to the data collectors at the time of data collection (interviews). Then, urine samples were collected from all study participants except from those whose pregnancies were confirmed.

Data Quality control and Analysis

The questionnaire was first prepared in English and translated into the local language (Nuer); then, it was translated back into English by a language expert to verify its consistency. Data collectors and supervisors were provided a two-day training on the importance and objective of the study; data collection tools; sampling methods; interviewing techniques; and important precautions and procedures to be followed while conducting the HCG pregnancy test. The questionnaire was pretested on 5% of the sample size in places other than the study area. The completeness and consistency of the data were checked by supervisors on a daily basis. After that, the data was entered into Epidata software version 3.1 and exported to SPSS version 22. Frequencies and cross-tabulations were used to check for missed values.

Descriptive analysis was done on socio-demographic, individual-level, and related characteristics and presented using tables and graphs.

Bivariate and multivariate logistic regression analysis was done to identify factors associated with the outcome variable. Accordingly, variables with a p-value < 0.25 on bi-variable logistic regression were taken as candidates for multivariate analysis. The goodness of fit for the final regression model was checked by the Hosmer-

Lemeshow goodness of fit test at a p-value of > 0.05. On multivariate logistic regression analysis, variables with a p-value of less than 0.05 at a 95% confidence level were declared significant. The adjusted odds ratio is used to measure the strength of the association.

Patient and Public Involvement

No Patient and public involvement

RESULTS

Socio-Demographic Characteristics of Respondents

A total of 414 adolescent girls (10–19 years) participated in this study, making the response rate 98.3%. The mean age of respondents was 16.8 years with ±1.52 SD. The majority of respondents, 241 (58.2%) were late-stage adolescents (17-19 years), and more than one-third of respondents, 164 (39.6%), were middle adolescent girls (14-16 years), while 9 (2.2%) were in the early adolescence stage (10-13 years). Nearly three-fourths of respondents, 309 (74.6%), were protestants, while 57 (13.8%) and 32 (7.7%) were Seventh-Day Adventist and Church of God, respectively. More than half, 221 (53.4%) had primary and nearly one-third of respondents, 129 (31.1%), had no formal education. Three-fourths of adolescent girls, 313 (75.6%) were single (not married) and 101 (24.4%) were married or ever-married. The majority of married adolescents, 85 (84.2%), get married while they are in their middle adolescence age (14-16 years); and one-fifth of marriages, 21 (20.8%), were arranged marriages (Table 2).

Table 2: Socio-demographic characteristics of respondents (adolescent girls, N=414) in Nguenyyiel refugee camp, Gambella region, Southwest Ethiopia, September 2021.

Variable	Category	Frequency	Percent
Age category by adolesc	Early adolescence (10-13 years	9	2.20
	Middle adolescence (14-16 yea	164	39.6
	Late adolescence (17-19 years)	241	58.2
Religion	Protestant	309	74.6
	Seventh-Day Adventist	57	13.8

	Church of God	32	7.70
	Catholic	16	3.90
Ethnicity	Nuer	414	100
Educational status	Secondary and above	64	15.5
	Primary education (grade 1-8)	221	53.4
	No formal education	129	31.1
Marital status	Single (Not married)	313	75.6
	Married and live together	79	19.1
	Married and separated	14	3.40
	Divorced	8	1.90
Age at marriage by age	Married before 15 years	18	17.8
	Married between 15-19 years	83	82.2
Age at marriage by a stage	Early adolescence (10-13 years	1	0.90
	Middle adolescence (14-16 yea	85	84.2
	Late adolescence (17-19 years)	15	14.9
Marriage arranged by p	Yes	21	20.8
	No	80	79.2

Family related - characteristics of respondents

Only one hundred twenty-six (30.4%) of the study participants had communication with their parents on sexual and reproductive health (SRH) issues, while more than two thirds of adolescent girls (288, 69.6%) had no communication with their parents on the issues. Nearly half of adolescents, 194 (46.9%), live with either of their biological parents (single parent). One-fourth, 104 (25.4%), live with none of their biological parents, and less than one fifth of adolescents, 75 (18.1%), live with both biological parents. The mean family size in households of the respondents was 6.32 people, with ±1.86 SD and a range of 2–13. The majority of adolescent girls, 351 (84.8%), live in households with 5 or more people, three-fourths (75%) of whom live in large families of 7 or more people (Table 3).

Table 3: Familial-level characteristics of respondents in Nguenyyiel Refugee Camp Gambella region, Southwest Ethiopia, September 2021.

Variable	Category	Frequency	Percent
Parent-adolescent communication on S	Yes	126	30.4
	No	288	69.6
Household living arrangement	Live with both biological parents	75	18.1
	Live with either of the biological parents	194	46.9
	Live with none of biological parent	104	25.4
	Married (live together with husband)	40	9.60
Family size	Small family (4 persons and below)	63	15.2
	Large family (5 and more persons)	351	84.8

SRH characteristics of respondents

The mean age at menarche (first menstrual bleeding) was 12.5 years with ±1.99 SD. Menarche in almost all respondents, 403 (99.5%), occurred between 10 and 14 years of age. The mean age at first sexual intercourse among respondents was 14.03 years, with ±3.88 SD. Almost half of the adolescent girls, 193 (49.6%), were sexually active before 15 years; two-thirds of the respondents, 257 (66.0%), were sexually active in middle adolescence (14–16 years); and 338 (86.9%) of adolescents had sexual intercourse before 18 years. The contraceptive prevalence rate (CPR) among adolescent girls was 27 (6.5%). Out of these, 23 (5.6%) of

adolescents had ever used injectable (Depo-Provera and/or NET-EN); 26 (6.3%) used condoms, and 27 (6.5%) of respondents used oral contraceptive pills (OCPs) (Table4).

Table 4: Sexual behaviour (characteristics) of respondents (adolescent girls, N=414) in Nguenyyiel refugee camp, Gambella region, Southwest Ethiopia, September 2021.

Variable	Category	Frequency
Adolescent girl had menarche	Yes (Menarche occurred)	405
	No (Menarche not occurred)	9
Sexual practice (N=414)	Yes (Ever had sexual intercourse)	389
	No (Has not ever had sex)	25
Age at sexual practice by age groups (N=389)	Sexually active before 15 years	193
	Sexually active at 15-19 years	196
Age at sexual intercourse stages (N=389)	Early adolescence (10-13 years)	64
	Middle adolescence (14-16 years)	257
	Late adolescence (17-19 years)	68
Early sexual initiation (debut) (N=389)	Yes	338
	No	51
Modern contraceptive use (N=414)	Yes	27
	No	387
Ever used OCP (N=414)	Yes	27
	No	387

Ever used Injectable (N=414)	Yes	23
	No	391
Ever used a condom (N=414)	Yes	26
	No	388
Ever used implant (N=414)	Yes	3
	No	411
Ever used SDM (N=414)	Yes	2
	No	412
Ever used IUCD (N=414)	Yes	5
	No	409
Female sterilization (N=414)	Yes	0
	No	414

Respondents Knowledge about contraceptive methods among

More than one-third of adolescent girls, 167 (40.3%), had poor knowledge of modern contraceptive methods; 118 (28.5%) and 129 (31.2%), respectively, had good and comprehensive knowledge of modern contraceptives. The majority of respondents (326, 78.7%) knew or ever heard of Condom, 305 (73.7%) knew or ever heard of oral contraceptive pills (OCP), more than half (218, 52.7%) knew or heard about injectable (Depo-Provera & NET-EN), and 154 (37.2%) heard about implants (Table5).

Table 5: Knowledge of modern contraceptive methods among adolescent girls (N=414) in Nguenyyiel refugee camp, Gambella region, Southwest Ethiopia, September 2021.

Variable	Category	Frequency (N=414)	Percent
Knew or ever heard of OCP	Yes	305	73.7

	No	109	26.3
Knew or ever heard of injectable	Yes	218	52.7
	No	196	47.3
Knew or ever heard of a condom	Yes	326	78.7
	No	88	21.3
Knew or ever heard of implants	Yes	154	37.2
	No	260	62.8
Knew or ever heard of SDM	Yes	126	30.4
	No	288	69.6
Knew or ever heard of IUCD	Yes	126	30.4
	No	288	69.6
Knew or ever heard of sterilizati	Yes	51	12.3
	No	363	87.7
Knowledge about contraceptive	Comprehensive k	129	31.2
	Good knowledge	118	28.5
	Poor knowledge	167	40.3

Prevalence of adolescent pregnancy in Nguenyyiel refugee camp, Gambella region

The prevalence of pregnancy among adolescent girls in the Nguenyyiel refugee camp was 21.7% (95% C.I: 17.6-25-6). More than half of pregnant girls (51.1%) were middle adolescents (14–16 years) and 48.9% were late adolescents (17–19 years old) *(see figure 2).*

Factors associated with pregnancy among Adolescent

Age (17–19 years), educational status (no formal education, primary education), and family structure (living with either biological parent; living with neither biological parent) were statistically significantly associated with pregnancy among adolescent girls (10–19 years) in Nguenyyiel refugee camp.

The odds of pregnancy among late adolescent girls (17-19 years) was 2.8 times higher compared with adolescents 10-16 years of age (AOR: 2.8; 95% C.I: 1.6-5.1). Adolescent girls with primary education (grade 1–8) were 7.7 times more likely to become pregnant compared with those with secondary and above (AOR: 7.7; 95% C.I: 3.55–

16.7). Similarly, the odds of pregnancy among adolescent girls with no formal education were 3.4 times higher compared with girls who attended secondary school and above (AOR: 3.4; 95% C.I: 1.6-7.4).

Adolescent girls living with none of their biological parents (relative or may not be relative) were twice more likely to be pregnant compared with adolescents living with both biological parents (i.e., nuclear families) (AOR: 2.1; 95% C.I: 1.02-4.5). Likewise, the odds of pregnancy among adolescent girls living with either of their biological parents was 3.7 times higher compared with girls living with both of their biological parents (AOR: 3.7; 95% C.I: 1.8–7.8) (Table 6).

Table 6: Factors associated with pregnancy among adolescent girls (10-19 years) in Nguenyyiel refugee camp, Gambella region, Southwest Ethiopia, September 2021.

Variable	Categories	Pregnancy (status)		AOR (9	P-value
		Yes (HCG	No(HCGnegative)		
		N (%)	N (%)		
Age (stages of adolescence)	10-16 years	46 (51.1)	127 (39.2)	1	
	17-19 years	**44 (48.9)**	**197 (60.8)**	**2.79 (1.**	**0.001**
Educational status	Secondary and ab	26 (28.9)	38 (11.7)	1	
	Primary educat 1-8)	**26 (28.9)**	**195 (60.2)**	**7.69 (3.**	**0.001**
	No formal educa	**38 (42.2)**	**91 (28.1)**	**3.42 (1.**	**0.002**
Sexual experience	Sexually active year-old	54 (60.0)	142 (47.5)	1	
	Sexually active years of age	36 (40.0)	157 (52.5)	1.39 (0.	0.282
Knowledge **about** contraceptive	Comprehensive k	37 (41.1)	92 (28.4)	1	
	Good knowledge	20 (22.2)	98 (30.2)	1.29 (0.	0.496
	Poor knowledge	33 (36.7)	134 (41.4)	1.73 (0.	0.100
Early sexual debut (before 18 y	No	6 (11.8)	84 (24.9)	1	
	Yes	45 (88.2)	254 (75.1)	0.41 (0.	0.096
Parent-adolescent communication **on** (SRH)	Yes	40 (44.4)	86 (26.5)	1	
	No	50 (55.6)	238 (73.5)	1.37 (0.	0.326
Household living arrangement	Live with both parents	29 (32.2)	46 (14.2)	1	
	Live with biological paren	**23 (25.6)**	**171 (52.8)**	**3.71 (1.**	**0.001**
	Live with biological paren	**25 (27.8)**	**80 (24.7)**	**2.14 (1.**	**0.043**
	Married and liv with husband	13 (14.4)	27 (8.30)	2.04 (0.	0.132

DISCUSSIONS

This study showed that the prevalence of pregnancy among adolescent girls (10–19 years) in the Nguenyyiel refugee camp was 21.7%. This finding is consistent with findings of similar studies conducted among South Sudanese refugees (10–19 years) in the Bidibidi refugee settlement, northern Uganda (25%).(3), Eritrean refugees in the northern Tigray region, Ethiopia (28.4%) (24), Somalian refugees in Kobe refugee camp of Somali region, Ethiopia (26.3%) (25), and among refugees in Thailand-Myanmar border settlement, South-east Asia (26).

The observed similarity could be due to similar socio-demographic and socioeconomic characteristics in humanitarian settings as well as similarity in the vulnerability of adolescent girls to SRH problems in humanitarian settings.

The findings of this study are higher than the findings of similar studies among adolescent girls in non-emergency (non-humanitarian) settings: in Africa (a pooled prevalence of 18.8%).(27), Arba Minch town, Southern Ethiopia (7.7%),(28), Gambella region of Ethiopia (16.2%) and India (10%) (29).

The possible reasons for the difference in the prevalence of adolescent pregnancy in humanitarian settings compared with non-emergency contexts could be due to differences in settings. That is, adolescents in humanitarian settings are more vulnerable to poor socio-economic status following the disruption of family structure, loss of father or mother, or both, during conflict or disaster.

This in turn leads adolescents to hopelessness, being prone to gender-based violence and early marriage. In addition to that, basic reproductive health care services like family planning, including health information communication on reproductive issues, are less available in humanitarian settings than in non-humanitarian settings.

On the other hand, the finding of this study is lower than that of studies conducted in: Nigeria (45.4%)(30), Eastern Ethiopia, (30.2%)(31), East Africa (pooled prevalence of 54.6%)(32), Uganda (35.8%)(33) and north east Ethiopia (28.6%)(34). The possible explanation for this discrepancy could be difference in socio-demographic, socio-economic, larger sample size and inclusion terminated pregnancy in the case of East Africa pooled prevalence.

This study showed that pregnancy among refugee adolescents was associated with increasing age; the odds of pregnancy among late adolescent girls (17–19 years) was 2.8 times higher than girls in the early and middle stages of adolescence (10–16 years). This is in line with studies conducted in Eastern Ethiopia, East Africa, Northeast Ethiopia, and Kenya. (31,32,34,35). This could be due to the fact that as age increases, teenagers will have more exposure to sex and their chance of getting married also increase.

Adolescent girls with primary education (grade 1-8) were 7.7 times more likely to become pregnant compared with their counterparts who attended secondary and above. Likewise, the odds of pregnancy among adolescents with no formal education was 3.4 times as high compared with girls who attained secondary and above.

This is similar with finding of studies conducted in Eastern Ethiopia (36), South East Nigeria(30), a systematic review and Meta-analysis in Africa (27), a multi-level analysis in five East African countries(37).The possible justification could be adolescent girls with lower educational attainment lack appropriate information regarding the consequence of unsafe sexual practice as well as the means to avoid unwanted pregnancy.

This study showed that household living arrangements (family structure) were associated with adolescent pregnancy: Adolescent girls living with none of their biological parents were twice more likely to be pregnant compared with adolescents living with both biological parents (i.e., living in nuclear families). The odds of pregnancy among adolescent girls living with either of their biological parents (single parent families) was 3.7 times higher compared with girls living with both of their biological parents. This is similar to the findings of studies conducted in Southern Ethiopia (28), eastern Ethiopia(31) and north east Ethiopia (34). This could be because adolescent girls who did not live with one or both of their biological parents lack parental support and guidance. Adolescent girls might have lost one or both of their biological parents during the conflict. Adolescents in this situation may feel helpless and hopeless and choose to get married or engage in unsafe sex to secure their survival.

STRENGTH AND LIMITATION OF THE STUDY

Strength

Conducting community based study, using primary data including collecting urine samples directly from study participants in the humanitarian settings is strength.

Limitation of the study

This study mainly focused on pregnancy among adolescents and factors associated with it. Underlying causes like level of unmet need for family planning, and unwanted pregnancy are not addressed in this study.

HCG Test cannot detect a pregnancy that is less than a week. Therefore, the prevalence of pregnancy among adolescent girls identified by this study among study participants might be higher than the one reported by this study.

CONCLUSIONS

This study showed a high prevalence of pregnancy among refugee adolescent girls (10–19 years) in the Nguenyyiel refugee camp, Gambella region, Ethiopia. The significant factors associated with adolescent pregnancy were: Age (17–19 years), educational status (no formal education; primary education), and household living arrangement or family structure: Live with none of the biological parents; live with either of the biological parents.

Recommendation

Health Care Provider

Health workers in the camps should work to strengthen targeted adolescent sexual health education and information, giving special attention to the uneducated, those living without biological family, and late adolescents.

Humanitarian organizations (MS, ARRA, UNHCR, etc.)

Strengthen adolescent-youth-friendly services and adolescent girls' empowerment in refugee camps.

Strengthen health education and schooling for refugee adolescent girls.

strengthen comprehensive sexuality education (CSE) programs at schools in refugee camps.

Adolescent girls who have lost their parents should be given special attention.

Regional Health Bureaus, Zonal and other Health Offices

Strengthening intervention programs aimed at preventing pregnancy among refugee adolescents.

Prepare programs and strategies (approaches) to support refugee adolescent girls living with none or either of their biological parents

Researchers

Future researchers should focus on exploring the underlying socio-cultural conditions through a mixed approach (qualitative and quantitative study).

Important points that are not addressed in this study, like the level of unmet need for family planning and the prevalence of unwanted pregnancy, are among the issues that seek the attention of future researchers.

Consent to publish

Not applicable.

Availability of data and materials

All the data used or mentioned in this research are available

Competing interests

The authors declare that they have no competing interests.

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Author's contribution

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising, or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work

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Abbreviations and Acronyms

ASRH	Adolescent Sexual And Reproductive Health
ARRA	Administration For Refugees And Returnees Affair
HCG	Human Chorionic Gonadotropins
IUGR	Intra-Uterine Growth Restriction
LBW	Low-Birth Weight
OCP	Oral Contraceptive Pills
LMICs	Low And Middle-Income Countries
SSA	Sub-Sahara Africa

SDM	Standard Day Method
SRH	Sexual And Reproductive Health;
RC	Refugee Camp

Declarations

Ethics approval and consent to participate

This study was done according to the Declaration of Helsinki.

Research Ethical Committee of Mettu University provided Ethical approval for this study with reference number: RPG/03/2013. The Gambella Regional Health Bureau and ARRA, Gambella Zonal office provided a formal letter of permission. Data collectors were trained on how to handle confidential and private participant information.

Confidentiality was assured by excluding participants' names from the data collection tools. The study purpose, procedure, and duration were clearly explained to study participants. Study participants engaged in the study were informed that they could skip any question they didn't want to respond to and could quit the interview if they felt discomfort. Then consent was obtained from the study participants who were 18 years of age or older. For those who were less than 18 years, assent was taken from the participants but consent was taken from their representatives based on article 25 of the Declaration of Helsinki.

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Figure 1: Map of Nguenyyiel refugee camp, Gambella, Ethiopia.

Source: nguenyyiel refugee camp map - Bing

Figure 2: Prevalence of Adolescent pregnancy in humanitarians setting (in Nguenyyiel refugee camp)

Map of Nguenyyiel refugee Camp

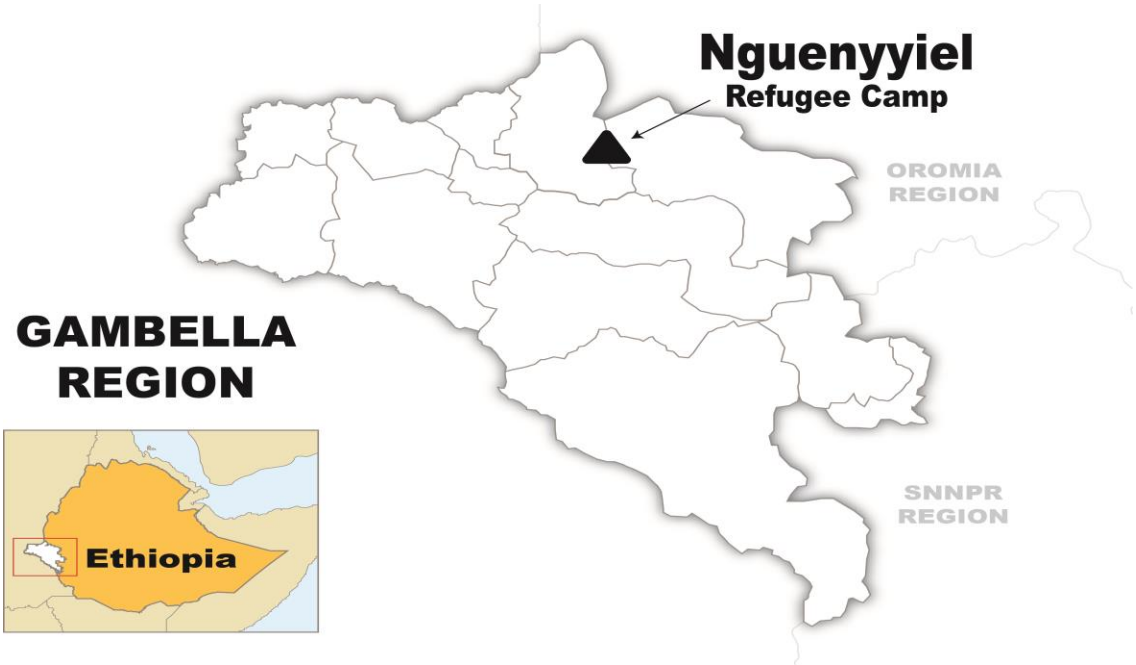

Figure 1. Map of Nguenyyiel refugee Camp, Gambella, Ethiopia.

Source: nguenyyiel refugee camp map - Bing

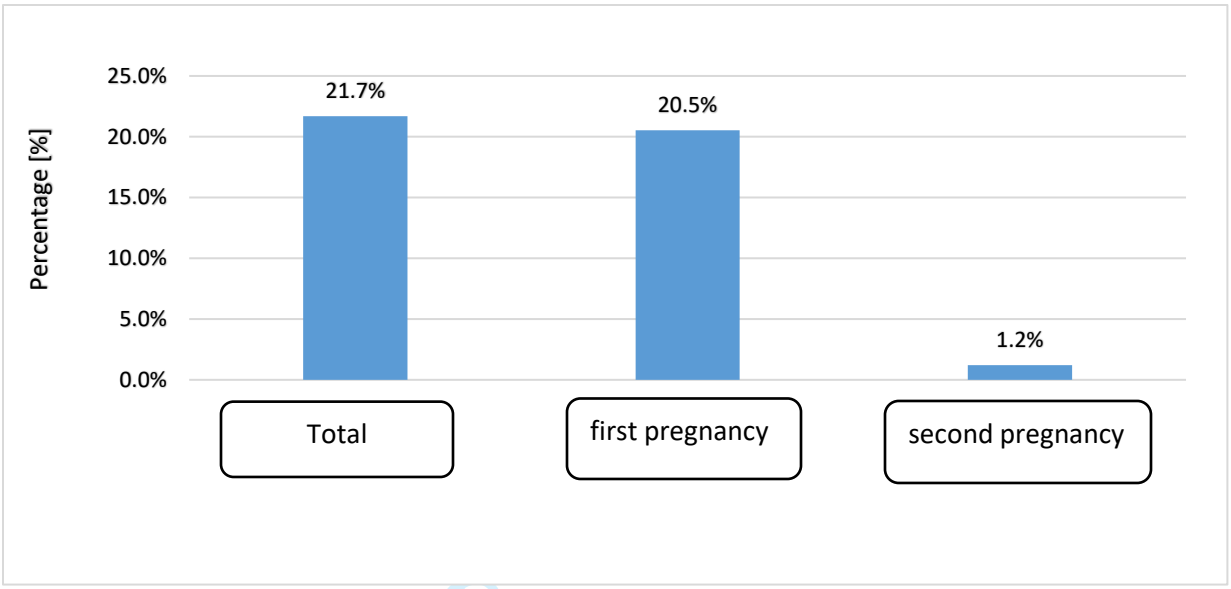

Figure 2: Prevalence of pregnancy among adolescent girls (10-19 years) in Nguenyyiel refugee camp, Gambella region, South-west Ethiopia, September 2021.

STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional studies***

	Item No	Recommendation	Page No
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	1-2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	2-3
Objectives	3	State specific objectives, including any prespecified hypotheses	1
Methods			
Study design	4	Present key elements of study design early in the paper	3
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	3-5
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	4,6
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	*6*
Bias	9	Describe any efforts to address potential sources of bias	6
Study size	10	Explain how the study size was arrived at	4-5
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	6
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	6
		(*b*) Describe any methods used to examine subgroups and interactions	6
		(*c*) Explain how missing data were addressed	6
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	6
		(*e*) Describe any sensitivity analyses	
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	4,6
		(b) Give reasons for non-participation at each stage	NA
		(c) Consider use of a flow diagram	
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	6
		(b) Indicate number of participants with missing data for each variable of interest	4,5,7
Outcome data	15*	Report numbers of outcome events or summary measures	7
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	

		(*b*) Report category boundaries when continuous variables were categorized	NA
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	NA
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	7
Discussion			
Key results	18	Summarise key results with reference to study objectives	12, 13,17
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	16
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	16
Generalisability	21	Discuss the generalisability (external validity) of the study results	16
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	18

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Pregnancy among Adolescents Girls in Humanitarian settings: A case in Refugee Camp of Gambella Regional state, Community Based Cross-Sectional Study, Southwest Ethiopia, 2021

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Pregnancy among Adolescents Girls in Humanitarian settings: A case in Refugee Camp of Gambella Regional state, Community Based Cross-Sectional Study, Southwest Ethiopia, 2021

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ABSTRACT

Objective: The aim of this study was to assess the prevalence of pregnancy and associated factors among adolescent girls in the Nguenyyiel refugee camp.

Methods: A community-based cross-sectional study was done among 414 adolescent girls. The Systematic random sampling technique was used to select respondents. Data were collected using a well-structured and pretested questionnaire. Pregnancy test was done using HCG test. Bivariate and Multivariate logistic regression analysis was run to identify factors associated with adolescent pregnancy.

Results: The prevalence of pregnancy among adolescent girls in the Nguenyyiel refugee camp was 21.7% (95% C.I: 17.6-25.6). Factors associated with adolescent pregnancy were age (17-19 years) (AOR: 2.79; 95% C.I: 1.55-5.05); Educational status: Primary education (AOR: 7.69; 95% C.I: 3.55-16.68); No formal education (AOR: 3.42; 95% C.I: 1.59-7.36), and Household living arrangement: Living with none of biological parents (AOR: 2.14; 95% C.I: 1.02-4.49); Living with either of a biological parent (AOR: 3.71; 95% C.I: 1.76-7.81).

Conclusions and Recommendations: This study showed that there is a high prevalence of pregnancy among adolescent girls in the study setting. Age (17-19 years), Educational status, and Household living arrangement

(Live with none of the biological parents; Live with either of biological parents) were among the factors significantly associated with adolescent pregnancy. Hence, health workers and other stakeholders in the camps should focus on strengthening adolescent sexual health education giving especial attention to late adolescents, uneducated and live without biological family.

Key words: Adolescents, pregnancy, Gambella, Nguenyyiel, Refugee, Ethiopia.

Strength and limitation of this study

- Conducting community-based studies, using primary data including collecting urine samples directly from study participants in humanitarian settings, is strength.
- The HCG test cannot detect a pregnancy that is less than a week old.
- Since adolescent pregnancy is a sensitive issue, respondents may commit social desirability bias.
- Therefore, the prevalence of pregnancy among adolescent girls identified by this study among study participants might be higher than the one reported by this study.

INTRODUCTION

Each year, an estimated 21 million adolescent girls become pregnant every year and approximately 12 million of them give birth worldwide(1). At least 777,000 births occur to adolescent girls younger than 15 years in developing countries(1). Adolescent pregnancy is associated with higher risks of Adverse Birth Outcomes such as preterm birth, Law Birth Weight (LBW), Intra uterine growth retardation (IUGR), stillbirth, unsafe abortion, maternal and neonatal mortality and morbidity compared with women in their twenties (2–10). Complications from pregnancy and childbirth are the leading cause of death among adolescent girls(11,12). Moreover, adolescent pregnancy is associated with social and economic problems like school drop-out, unemployment, and limited future opportunities, risk of remaining poor and, and increased cost for health care (3,13).

Many teenage pregnancies in Ethiopia occur within marriage(14). Similarly, other studies showed that the prevalence of pregnancy among adolescent girls in humanitarian settings (refugee camps or settlements) is 30% higher than among their non-displaced counterparts (13, 14). This is due to the fact that adolescents in humanitarian settings are extremely vulnerable to early sexual practice, violence, and exploitation or abuse compared with their counterparts in general population (15–17). The experience of forced migration impacts

refugee adolescent girls' decision-making power related to their sexual relationships and reproductive life (10). Hence, adolescents may lack the autonomy to determine over their affairs including their sexual and reproductive health and rights (12,18). Adolescents are also the only age group for whom AIDS deaths are on the rise(11).

According to the Ethiopian Demographic and health survey and many other studies, the study area, Gambella Regional State of Ethiopia, has high unmet need for family planning (23%)(14), high polygamy practice (21%)(19) and highest HIV/STIs prevalence in the country due to multiple factors such as, low service coverage, high prevalence of male uncircumcision, early sexual initiation among adolescents related to traditional malpractice like "***Tifo bet"*** (20) and environmental factors like presence Gold Mining Workers(21) and others (14,18,20,22–24). Besides, majority of the refugee community including adolescents are those who lost one or both of their parents during the conflict. This leaves adolescent girls helpless and enforce them to be engaged risky sexual behaviours. However, there was no study conducted to determine the prevalence and factors associated with pregnancy among adolescent refugees in humanitarian settings. This study, therefore, aimed at assessing the prevalence of pregnancy among adolescent girls and associated factors in the Nguenyyiel refugee camp, Gambella region, Southwest Ethiopia.

METHODS AND MATERIALS

Study Design and Setting

A community-based cross-sectional study was conducted in the Nguenyyiel refugee camp, Gambella region, from May 15 to June 15, 2021. The Gambella region hosted a 337,081 refugee population from the bordering country of South Sudan in 7 refugee camps (as of May 2021). The Nguenyyiel refugee camp is the newest and largest camp in Ethiopia. It opened to accommodate the new refugee influx from South Sudan following the escalation of conflict in that country in July 2016. It is located in Itang special woreda (district). It is located about 769 km from the capital, Finfinnee/Addis Ababa, and 55 km from the region's capital, Gambella (25) *(See figure 1)*. It has 10,916 households and total populations of 90,506 with Male (43,757) and Female (46,747).

Adolescents constitute majority of the women in the Reproductive age in the camp

Population

Source population

The source populations were all adolescent girls (10-19 years) in the Nguenyyiel refugee camp. The study populations were adolescent girls in the selected households who participated on this study.

Eligibility Criteria

Inclusion criteria

All girls in the adolescence age interval (10-19) who were residents in the Nguenyyiel refugee camp at least for the last six months before the data collection were considered eligible.

Sample size determination

The sample size was calculated for both objectives. For the first objective, sample size was calculated using a single population proportion formula with the assumptions of: Z = 1.96 at 95% confidence interval, d = Margin of error assumed to be (0.05), P = prevalence of pregnancy in adolescent from previous studies (2), and 10% non-response rate; $n = Z\alpha_2 p\ (1-p)/d2 = 421$

The sample size for the second objective was calculated by using the double population proportion formula using Epi info version 3.0 statistical software by considering the following assumptions after reviewing previous literature: $Z\alpha/_2$: 1.96 at 95% confidence level, Zβ: power = statistical power of 80%, P1: the probability of outcome in the unexposed, P2: the probability of outcome in the exposed and r: ratio of unexposed to exposed (Table 1).

As shown in the above table, since the calculated sample sizes for the second objective are less than that of the first objective (n = 421), finally, the larger sample size (n = 421) was taken and used for this study.

Table 1: Sample size calculation based on the significant factors of adolescent pregnancy; Nguenyyiel refugee camp, Gambella region, southwest Ethiopia, 2021.

S/no.	Significant factors associated with adolescent pregnancy & citations	Power	95% C.I	The proportion of pregnancy among non-exposed adolescent girls (P1)	The proportion of pregnancy among exposed (P2)	Risk Ratio (r)	AOR	n_1	n_{total}
1	Educational status [No formal education Vs. Secondary and above] (26)	80%	1.96	31.0%	7.4%	0.24	3.83	164	181
2	Modern contraceptive use [Users Vs. Non-users] (27)	80%	1.96	64.6%	19.2%	0.29	10.62	131	144
3	Marital status [Married Vs. Single (not-married)] (27)	80%	1.96	3.80%	54.4%	14.3	2.16	33	37

Sampling techniques and Procedures

A pre-study survey was conducted in the Nguenyyiel refugee camp to generate a sampling frame (i.e., to identify families with adolescent girls), Accordingly, around 4100 households with adolescent girls were identified and recorded during the pre-study survey. Then, the 421 respondents in the Nguenyyiel refugee camp were chosen using a systematic random sampling technique. The sampling interval was calculated by dividing the number of households with adolescent girls in the Nguenyyiel refugee camp (N = 4100) by the sample size (n = 421), resulting in K = 4100/421 = 9. As a result, every ninth household with an adolescent was chosen. In cases where a household had two or more adolescents, the lottery technique was employed to choose one adolescent girl that was interviewed.

Operational definitions

Adolescent pregnancy: In this study, adolescent pregnancy is defined as a current conception (pregnancy) occurring in a girl aged 10 to 19 (i.e., before the age of 20), regardless of marital status (28)

Communication on SRH issues:

An adolescent girl was considered to have parent-adolescent communication on SRH issues if she discussed with either of her parents at least one of the SRH issues such as menstrual cycle and fertile period, how one can get pregnant(29).

Knowledge of modern contraceptive methods: Knowledge of modern contraceptive methods among adolescent girls was measured based on the score or correctness of response to the 7 modern contraceptive knowledge-tracing questions.

Adolescent girls who responded "Yes" (scored) five or more, 3 to 4, and two or less were considered to have "**comprehensive knowledge**, **good knowledge**, and **poor knowledge** about contraceptive methods, respectively(29).

Data collection Tools and Procedures

The data was gathered by eight trained diploma nurses and two supervisors with a BSc degree in public health. A well-structured questionnaire was used in a face-to-face interviewer-administered data collection method. The questionnaire was adapted from different literature and pretested on sites other than the study area before the commencement of actual data collection (14,24,30). It contained socio-demographic, family, and individual-level characteristics, including sexual and reproductive health knowledge, modern contraceptive knowledge, and other pregnancy-related characteristics. Pregnancy in adolescent girls was determined using urine Human Chorionic Gonadotropin (HCG) test kits. Each study participant was asked before collecting a urine sample if she was pregnant or if the pregnancy was visible to the data collectors at the time of data collection (interviews). Urine samples were then collected from all study participants except those whose pregnancies had been confirmed.

Data Quality control and Analysis

The questionnaire was first prepared in English and then translated into the local language (Nuer). Then, it was translated back into English by a different language expert to verify its consistency. Data collectors and supervisors were provided a two-day training on the importance and objective of the study.

Data collection tools, sampling methods, interviewing techniques, and important precautions and procedures to be followed while conducting the HCG pregnancy test. The questionnaire was pretested on 5% of the sample size in places other than the study area. The completeness and consistency of the data were checked by supervisors on a daily basis. After that, the data was entered into Epidata software version 3.1 and exported to SPSS version 22. Frequencies and cross-tabulations were used to check for missed values. Descriptive analysis was done on socio-demographic, individual-level, and related characteristics and presented using tables and graphs.

Bivariate and multivariate logistic regression analysis was done to identify factors associated with the outcome variable. Accordingly, variables with a p-value < 0.25 on bi-variable logistic regression were taken as candidates for multivariate analysis. The goodness of fit for the final regression model was checked by the Hosmer-Lemeshow goodness of fit test at a p-value of > 0.05. On multivariate logistic regression analysis, variables with a p-value of less than 0.05 at a 95% confidence level were declared significant. The adjusted odds ratio is used to measure the strength of the association.

Patient and Public Involvement

No Patient and public involvement

RESULTS

Socio-Demographic Characteristics of Respondents

A total of 414 adolescent girls (10–19 years) participated in this study, making the response rate 98.3%. The mean age of respondents was 16.8 years with ±1.52 SD. The majority of respondents, 241 (58.2%) were late-stage adolescents (17-19 years), and more than one-third of respondents, 164 (39.6%), were middle adolescent

girls (14-16 years), while 9 (2.2%) were in the early adolescence stage (10-13 years). Nearly three-fourths of respondents, 309 (74.6%), were protestants, while 57 (13.8%) and 32 (7.7%) were Seventh-Day Adventist and Church of God, respectively. More than half, 221 (53.4%) had primary and nearly one-third of respondents, 129 (31.1%), had no formal education. Three-fourths of adolescent girls, 313 (75.6%) were single (not married) and 101 (24.4%) were married or ever-married. The majority of married adolescents, 85 (84.2%), get married while they are in their middle adolescence age (14-16 years); and one-fifth of marriages, 21 (20.8%), were arranged marriages (Table 2).

Table 2: Socio-demographic characteristics of respondents (adolescent girls, N=414) in Nguenyyiel refugee camp, Gambella region, Southwest Ethiopia, September 2021.

Variable	Category	Frequency	Percent
Age category by adolescence stages	Early adolescence (10-13 years)	9	2.20
	Middle adolescence (14-16 years)	164	39.6
	Late adolescence (17-19 years)	241	58.2
Religion	Protestant	309	74.6
	Seventh-Day Adventist	57	13.8
	Church of God	32	7.70
	Catholic	16	3.90
Ethnicity	Nuer	414	100
Educational status	Secondary and above	64	15.5
	Primary education (grade 1-8)	221	53.4
	No formal education	129	31.1
Marital status	Single (Not married)	313	75.6

	Married and live together	79	19.1
	Married and separated	14	3.40
	Divorced	8	1.90
Age at marriage by age groups	Married before 15 years	18	17.8
	Married between 15-19 years	83	82.2
Age at marriage by adolescence stage	Early adolescence (10-13 years)	1	0.90
	Middle adolescence (14-16 years)	85	84.2
	Late adolescence (17-19 years)	15	14.9
Marriage arranged by parents	Yes	21	20.8
	No	80	79.2

Family related - characteristics of respondents

Only one hundred twenty-six (30.4%) of the study participants had communication with their parents on sexual and reproductive health (SRH) issues, while more than two thirds of adolescent girls (288, 69.6%) had no communication with their parents on the issues. Nearly half of adolescents, 194 (46.9%), live with either of their biological parents (single parent). One-fourth, 104 (25.4%), live with none of their biological parents, and less than one fifth of adolescents, 75 (18.1%), live with both biological parents. The mean family size in households of the respondents was 6.32 people, with ±1.86 SD and a range of 2–13. The majority of adolescent girls, 351 (84.8%), live in households with 5 or more people, three-fourths (75%) of whom live in large families of 7 or more people (Table 3).

Table 3: Familial-level characteristics of respondents in Nguenyyiel Refugee Camp Gambella region, Southwest Ethiopia, September 2021.

Variable	Category	Frequency	Percent

Parent-adolescen communication issues	Yes	126	30.4
	No	288	69.6
Household living arrangement	Live with both biological parents	75	18.1
	Live with either of the biological paren	194	46.9
	Live with none of biological parent	104	25.4
	Married (live together with husband)	40	9.60
Family size	Small family (4 persons and below)	63	15.2
	Large family (5 and more persons)	351	84.8

Respondents Knowledge about contraceptive methods among

More than one-third of adolescent girls, 167 (40.3%), had poor knowledge of modern contraceptive methods; 118 (28.5%) and 129 (31.2%), respectively, had good and comprehensive knowledge of modern contraceptives. The majority of respondents (326, 78.7%) knew or ever heard of Condom, 305 (73.7%) knew or ever heard of oral contraceptive pills (OCP), more than half (218, 52.7%) knew or heard about injectables (Depo-Provera & NET-EN), and 154 (37.2%) heard about implants (Table 4).

Table 4: Knowledge of modern contraceptive methods among adolescent girls (N=414) in Nguenyyiel refugee camp, Gambella region, Southwest Ethiopia, September 2021.

Variable	Category	Frequency (N=414)	Percent
Knew or ever heard of OCP	Yes	305	73.7
Knew or ever heard of injectable	Yes	218	52.7
Knew or ever heard of a condom	Yes	326	78.7
Knew or ever heard of implants	Yes	154	37.2
Knew or ever heard of SDM	Yes	126	30.4
Knew or ever heard of IUCD	Yes	126	30.4
Knew or ever heard of sterilization	Yes	51	12.3
Over all Knowledge about	Comprehensive knowledge	129	31.2

contraceptive methods	Good knowledge	118	28.5
	Poor knowledge	167	40.3

SRH characteristics (behaviours) of respondents

The mean age at menarche (first menstrual bleeding) was 12.5 years with ±1.99 SD. Menarche in almost all respondents, 403 (99.5%), occurred between 10 and 14 years of age. The mean age at first sexual intercourse among respondents was 14.03 years, with ±3.88 SD. Almost half of the adolescent girls, 193 (49.6%), were sexually active before 15 years; two-thirds of the respondents, 257 (66.0%), were sexually active in middle adolescence (14–16 years); and 338 (86.9%) of adolescents had sexual intercourse before 18 years. The contraceptive prevalence rate (CPR) among adolescent girls was 27 (6.5%). Out of these, 23 (5.6%) of adolescents had ever used injectables (Depo-Provera and/or NET-EN); 26 (6.3%) used condoms, and 27 (6.5%) of respondents used oral contraceptive pills (OCPs) (Table 5).

Table 5: Sexual behaviour (characteristics) of respondents (adolescent girls), (N = 414) in Nguenyyiel refugee camp, Gambella region, Southwest Ethiopia, September 2021.

Variable	Category	Frequency	Percent
Adolescent girl had menarche	Yes (Menarche occurred)	405	97.8
	No (Menarche not occurred)	9	2.20
Sexual practice (N=414)	Yes (Ever had sexual interco	389	94.0
	No (Has not ever had sex)	25	6.00
Age at sexual practice by ag (N=389)	Sexually active before 15 ye	193	49.6
	Sexually active at 15-19 yea	196	50.4
Age at sexual intercourse stages	Early adolescence (10-13 ye	64	16.5

	Middle adolescence (14-16 y	257	66.0
	Late adolescence (17-19 yea	68	17.5
Early sexual initiation(debut) (N	Yes	338	86.9
	No	51	13.1
Knowledge About contraceptive methods	Comprehensive knowledge	129	31.2
	Good knowledge	118	28.5
	Poor knowledge	167	40.3
Total contraceptive use		88	21.26
Modern contraceptive use (N=414)		86	20.77
OCP (N=414)		27	6.50
Injectable (N=414)		23	5.60
condom (N=414)		26	6.30
implant (N=414)		3	0.70
SDM (N=414)		2	0.50
IUCD (N=414)		5	1.20

N = Sample size (no of response), OCP = Oral Contraceptive Pills, SDM = Standard Day Method, IUCD = Intra Uterine Contraceptive Device

Prevalence of adolescent pregnancy in Nguenyyiel refugee camp, Gambella region

The prevalence of pregnancy among adolescent girls in the Nguenyyiel refugee camp was 21.7% (95% C.I: 17.6-25-6). More than half of pregnant girls (51.1%) were middle adolescents (14–16 years) and 48.9% were late adolescents (17–19 years old).

Factors associated with pregnancy among Adolescent

Age (17–19 years), educational status (no formal education, primary education), and family structure (living with either biological parent; living with neither biological parent) were statistically significantly associated with pregnancy among adolescent girls (10–19 years) in Nguenyyiel refugee camp.

The odds of pregnancy among late adolescent girls (17-19 years) was 2.8 times higher compared with adolescents 10-16 years of age (AOR: 2.8; 95% C.I: 1.6-5.1). Adolescent girls with primary education (grade 1–8) were 7.7 times more likely to become pregnant compared with those with secondary and above (AOR: 7.7; 95% C.I: 3.55–16.7). Similarly, the odds of pregnancy among adolescent girls with no formal education were 3.4 times higher compared with girls who attended secondary school and above (AOR: 3.4; 95% C.I: 1.6-7.4).

Odds of pregnancy among adolescent girls living with none of their biological parents were two times more likely to be pregnant compared with adolescents living with both biological parents (AOR: 2.1; 95% C.I: 1.02-4.5). Likewise, the odds of pregnancy among adolescent girls living with either of their biological parents was 3.7 times higher compared with girls living with both of their biological parents (AOR: 3.7; 95% C.I: 1.8–7.8) (Table 6).

Table 6: Factors associated with pregnancy among adolescent girls (10-19 years) in Nguenyyiel refugee camp, Gambella region, Southwest Ethiopia, September 2021.

Variable	Categories	Pregnancy (status)		AOR (95%	P-valu
		Yes (HCC	No(HCGnegative)		
		N (%)	N (%)		
Age (stages of adolescence)	10-16 years	46 (51.1)	127 (39.2)	1	
	17-19 years	44 (48.9)	197 (60.8)	2.79 (1.55-4	0.001
Educational status	Secondary and above	26 (28.9)	38 (11.7)	1	
	Primary education (grade 1-8)	26 (28.9)	195 (60.2)	7.69 (3.55-1	0.001
	No formal education	38 (42.2)	91 (28.1)	3.42 (1.59-	0.002

Sexual experience	Sexually active at 15-19 year-old	54 (60.0)	142 (47.5)	1	
	Sexually active before 15 years of age	36 (40.0)	157 (52.5)	1.39 (0.76-2.54	0.282
Knowledge about contraceptive	Comprehensive knowledge	37 (41.1)	92 (28.4)	1	
	Good knowledge	20 (22.2)	98 (30.2)	1.29 (0.62-2.69	0.496
	Poor knowledge	33 (36.7)	134 (41.4)	1.73 (0.90-3.32	0.100
Early sexual debut (before 18 years)	No	6 (11.8)	84 (24.9)	1	
	Yes	45 (88.2)	254 (75.1)	0.41 (0.14-1.17	0.096
Parent-adolescent Communication on (SRH)	Yes	40 (44.4)	86 (26.5)	1	
	No	50 (55.6)	238 (73.5)	1.37 (0.73-2.54	0.326
Household living arrangement	Live with both biological parents	29 (32.2)	46 (14.2)	1	
	Live with either of biological parent	23 (25.6)	171 (52.8)	3.71 (1.76-7.81	0.001
	Live with none of biological parents	25 (27.8)	80 (24.7)	2.14 (1.02-4.49	0.043
	Married and live toge husband	13 (14.4)	27 (8.30)	2.04 (0.81-5.14	0.132

DISCUSSIONS

This study showed that the prevalence of pregnancy among adolescent girls (10–19 years) in the Nguenyyiel refugee camp was high. This finding is consistent with findings of similar studies conducted among South Sudanese refugees (10–19 years) in the Bidibidi refugee settlement, northern Uganda (25%).(4), Eritrean refugees in the northern Tigray region, Ethiopia (28.4%) (31), Somalian refugees in Kobe refugee camp of Somali region, Ethiopia (26.3%) (32), and among refugees in Thailand-Myanmar border settlement, South-east Asia (33).

The observed similarity could be due to similar socio-demographic and socioeconomic characteristics in humanitarian settings as well as similarity in the vulnerability of adolescent girls to SRH problems in humanitarian settings.

The findings of this study are higher than the findings of similar studies among adolescent girls in non-emergency (non-humanitarian) settings: in Africa (a pooled prevalence of 18.8%)(34). Arba Minch town, Southern Ethiopia (7.7%),(35), Gambella region of Ethiopia (16.2%) and India (10%) (36).

The possible reasons for the difference in the prevalence of adolescent pregnancy in humanitarian settings compared with non-emergency contexts could be due to differences in settings. That is, adolescents in humanitarian settings are more vulnerable to poor socio-economic status following the disruption of family structure, loss of father or mother, or both, during conflict or disaster.

This in turn leads adolescents to hopelessness, being prone to gender-based violence and early marriage. In addition to that, basic reproductive health care services like family planning, including health information communication on reproductive issues, are less available in humanitarian settings than in non-humanitarian settings.

On the other hand, the finding of this study is lower than that of studies conducted in: Nigeria (45.4%)(37), Eastern Ethiopia, (30.2%)(34), East Africa (pooled prevalence of 54.6%)(38), Uganda (35.8%)(39) and north east Ethiopia (28.6%)(27). The possible explanation for this discrepancy could be difference in socio-demographic, socio-economic, larger sample size and inclusion terminated pregnancy in the case of East Africa pooled prevalence.

This study showed that pregnancy among refugee adolescents was associated with increasing age; the odds of pregnancy among late adolescent girls (17–19 years) was higher than girls in the early and middle stages of adolescence (10–16 years). This is in line with studies conducted in Eastern Ethiopia, East Africa, Northeast Ethiopia, and Kenya. (27,34,38,40). This could be due to the fact that as age increases, teenagers will have more exposure to sex and their chance of getting married also increase.

Adolescent girls with primary education (grade 1-8) were more likely to become pregnant compared with their counterparts who attended secondary and above. Likewise, the odds of pregnancy among adolescents with no formal education was high compared with girls who attained secondary and above.

This is similar with finding of studies conducted in Eastern Ethiopia (41), South East Nigeria(37), a systematic review and Meta-analysis in Africa(42) (42), a multi-level analysis in five East African countries(43).The

possible justification could be adolescent girls with lower educational attainment lack appropriate information regarding the consequence of unsafe sexual practice as well as the means to avoid unwanted pregnancy.

This study showed that household living arrangements (family structure) were associated with adolescent pregnancy: Adolescent girls living with none of their biological parents were more likely to be pregnant compared with adolescents living with both biological parents (i.e., living in nuclear families). The odds of pregnancy among adolescent girls living with either of their biological parents (single parent families) higher compared with girls living with both of their biological parents. This is similar to the findings of studies conducted in Southern Ethiopia (35), eastern Ethiopia(34) and north east Ethiopia (27). This could be because adolescent girls who did not live with one or both of their biological parents lack parental support and guidance. Adolescent girls might have lost one or both of their biological parents during the conflict. Adolescents in this situation may feel helpless and hopeless and choose to get married or engage in unsafe sex to secure their survival.

CONCLUSIONS

This study showed a high prevalence of pregnancy among refugee adolescent girls (10–19 years) in the Nguenyyiel refugee camp, Gambella region, Ethiopia. The significant factors associated with adolescent pregnancy were: Age (17–19 years), educational status (no formal education; primary education), and household living arrangement or family structure: Live with none of the biological parents; live with either of the biological parents.

Recommendation

Health Care Provider

Health workers in the camps should work to strengthen targeted adolescent sexual health education and information, giving special attention to the uneducated, those living without biological family, and late adolescents.

Humanitarian organizations (MS, ARRA, UNHCR, etc.)

Strengthen adolescent-youth-friendly services and adolescent girls' empowerment in refugee camps.

Strengthen health education and schooling for refugee adolescent girls.

strengthen comprehensive sexuality education (CSE) programs at schools in refugee camps.

Adolescent girls who have lost their parents should be given special attention.

Regional Health Bureaus, Zonal and other Health Offices

Strengthening intervention programs aimed at preventing pregnancy among refugee adolescents.

Prepare programs and strategies (approaches) to support refugee adolescent girls living with none or either of their biological parents

Researchers

Future researchers should focus on exploring the underlying socio-cultural conditions through a mixed approach (qualitative and quantitative study).

Important points that are not addressed in this study, like the level of unmet need for family planning and the prevalence of unwanted pregnancy, are among the issues that seek the attention of future researchers.

Consent to publish

Not applicable.

Availability of data and materials

All the data used or mentioned in this research are available

Competing interests

The authors declare that they have no competing interests.

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Author's contribution

Koang Nyak Bol: made a significant contribution to the conception, study design, execution, acquisition of data, analysis, and interpretation and has agreed on the journal to which the article has been submitted.

Ebissa Negera: took part in study design, execution, drafting, revising and critically reviewing the article; gave final approval of the version to be published; agreed on the journal to which the article has been submitted.

Abdi Geda Gedefa: contributed to planning, acquisition of data, analysis and interpretation, revising and critically reviewing the article, writing the report, and agreed on the journal to which the article has been submitted.

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Abbreviations and Acronyms

ASRH	Adolescent Sexual And Reproductive Health
ARRA	Administration For Refugees And Returnees Affair
HCG	Human Chorionic Gonadotropins
IUGR	Intra-Uterine Growth Restriction
LBW	Low-Birth Weight
OCP	Oral Contraceptive Pills
LMICs	Low And Middle-Income Countries
SSA	Sub-Sahara Africa
SDM	Standard Day Method
SRH	Sexual And Reproductive Health;
RC	Refugee Camp

Declarations

Ethics approval and consent to participate

This study was done according to the Declaration of Helsinki.

Research Ethical Committee of Mettu University provided Ethical approval for this study with reference number: RPG/03/2013. The Gambella Regional Health Bureau and ARRA, Gambella Zonal office provided a formal letter of permission. Data collectors were trained on how to handle confidential and private participant information.

Confidentiality was assured by excluding participants' names from the data collection tools. The study purpose, procedure, and duration were clearly explained to study participants. Study participants engaged in the study were informed that they could skip any question they didn't want to respond to and could quit the interview if they felt discomfort. Then consent was obtained from the study participants who were 18 years of age or older. For those who were less than 18 years, assent was taken from the participants but consent was taken from their representatives based on article 25 of the Declaration of Helsinki.

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Figure 1: Map of Nguenyyiel refugee camp, Gambella, Ethiopia.

Source: nguenyyiel refugee camp map - Bing)

Map of Nguenyyiel refugee Camp

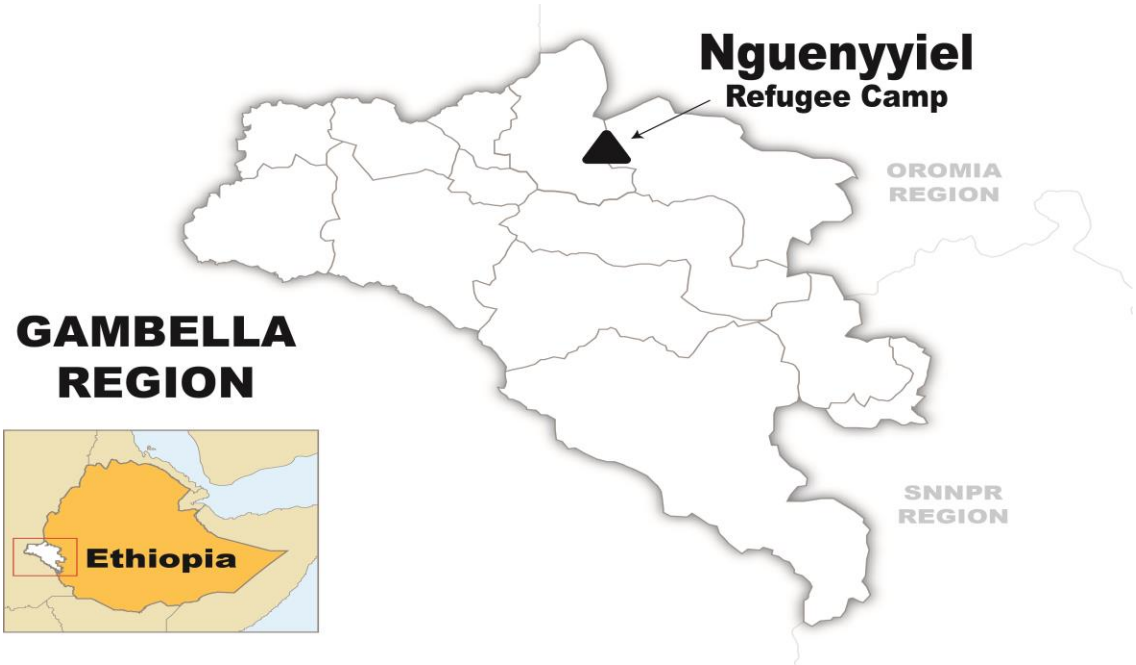

Figure 1. Map of Nguenyyiel refugee Camp, Gambella, Ethiopia.

Source: nguenyyiel refugee camp map - Bing

STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional studies***

	Item No	Recommendation	Page No
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	1-2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	2-3
Objectives	3	State specific objectives, including any prespecified hypotheses	1
Methods			
Study design	4	Present key elements of study design early in the paper	3
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	3-5
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	4,6
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	*6*
Bias	9	Describe any efforts to address potential sources of bias	6
Study size	10	Explain how the study size was arrived at	4-5
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	6
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	6
		(*b*) Describe any methods used to examine subgroups and interactions	6
		(*c*) Explain how missing data were addressed	6
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	6
		(*e*) Describe any sensitivity analyses	
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	4,6
		(b) Give reasons for non-participation at each stage	NA
		(c) Consider use of a flow diagram	
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	6
		(b) Indicate number of participants with missing data for each variable of interest	4,5,7
Outcome data	15*	Report numbers of outcome events or summary measures	7
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	

		(*b*) Report category boundaries when continuous variables were categorized	NA
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	NA
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	7
Discussion			
Key results	18	Summarise key results with reference to study objectives	12, 13,17
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	16
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	16
Generalisability	21	Discuss the generalisability (external validity) of the study results	16
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	18

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Pregnancy among Adolescents Girls in Humanitarian settings: A case in Refugee Camp of Gambella Regional state, Community Based Cross-Sectional Study, Southwest Ethiopia, 2021

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Pregnancy among Adolescents Girls in Humanitarian settings: A case in Refugee Camp of Gambella Regional state, Community Based Cross-Sectional Study, Southwest Ethiopia, 2021

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ABSTRACT

Objective: The aim of this study was to assess the prevalence of pregnancy and associated factors among adolescent girls in Nguenyyiel refugee camp.

Design: cross-sectional study was employed to conduct this study.

Setting: A community based cross sectional study was done in Nguenyyiel refugee camp

Participants: Four hundred fourteen adolescent girls participated on this study. The Systematic random sampling technique was used to select respondents. Data were collected using a well-structured and pretested questionnaire. Pregnancy test was done using HCG test. Bivariate and Multivariate logistic regression analysis was run to identify factors associated with adolescent pregnancy.

Results: The prevalence of pregnancy among adolescent girls in the Nguenyyiel refugee camp was 21.7% (95% C.I: 17.6-25.6). Factors associated with adolescent pregnancy were age (17-19 years) (AOR: 2.79; 95% C.I: 1.55-5.05); Educational status: Primary education (AOR: 7.69; 95% C.I: 3.55-16.68); No formal education (AOR: 3.42; 95% C.I: 1.59-7.36), and Household living arrangement: Living with none of biological parents (AOR: 2.14; 95% C.I: 1.02-4.49); Living with either of a biological parent (AOR: 3.71; 95% C.I: 1.76-7.81).

Conclusions and Recommendations: This study showed that there is a high prevalence of pregnancy among adolescent girls in the study setting. Age (17-19 years), Educational status, and Household living arrangement (Live with none of the biological parents; Live with either of biological parents) were among the factors significantly associated with adolescent pregnancy. Hence, health workers and other stakeholders in the camps should focus on strengthening adolescent sexual health education giving especial attention to late adolescents, uneducated and live without biological family.

Key words: Adolescents, pregnancy, Gambella, Nguenyyiel, Refugee, Ethiopia.

Strength and limitation of this study

- Conducting community-based studies, using primary data including collecting urine samples directly from study participants in humanitarian settings, is strength.
- The Human chorionic gonadotropin (HCG) test cannot detect a pregnancy that is less than a week old.
- Since adolescent pregnancy is a sensitive issue, respondents may commit social desirability bias.
- Therefore, the prevalence of pregnancy among adolescent girls identified by this study among study participants might be higher than the one reported by this study.

INTRODUCTION

Each year, an estimated 21 million adolescent girls become pregnant every year and approximately 12 million of them give birth worldwide(1). At least 777,000 births occur to adolescent girls younger than 15 years in developing countries(1). Adolescent pregnancy is associated with higher risks of Adverse Birth Outcomes such as preterm birth, Law Birth Weight (LBW), Intra uterine growth retardation (IUGR), stillbirth, unsafe abortion, maternal and neonatal mortality and morbidity compared with women in their twenties (2–10). Complications from pregnancy and childbirth are the leading cause of death among adolescent girls(11,12). Moreover, adolescent pregnancy is associated with social and economic problems like school drop-out, unemployment, and limited future opportunities, risk of remaining poor and, and increased cost for health care (3,13).

Many teenage pregnancies in Ethiopia occur within marriage(14). Similarly, other studies showed that the prevalence of pregnancy among adolescent girls in humanitarian settings (refugee camps or settlements) is

30% higher than among their non-displaced counterparts (13, 14). This is due to the fact that adolescents in humanitarian settings are extremely vulnerable to early sexual practice, violence, and exploitation or abuse compared with their counterparts in general population (15–17). The experience of forced migration impacts refugee adolescent girls' decision-making power related to their sexual relationships and reproductive life (10). Hence, adolescents may lack the autonomy to determine over their affairs including their sexual and reproductive health and rights (12,18). Adolescents are also the only age group for whom Acquired Immune deficiency syndrome (AIDS) deaths are on the rise(11).

According to the Ethiopian Demographic and health survey and many other studies, the study area, Gambella Regional State of Ethiopia, has high unmet need for family planning (23%)(14), high polygamy practice (21%)(19) and highest Human immune deficiency Virus (HIV)/sexually transmitted infections (STIs) prevalence in the country due to multiple factors such as, low service coverage, high prevalence of male uncircumcision, early sexual initiation among adolescents related to traditional malpractice like "***Tifo bet"*** (20) and environmental factors like presence Gold Mining Workers(21) and others (14,18,20,22–24). Besides, majority of the refugee community including adolescents are those who lost one or both of their parents during the conflict. This leaves adolescent girls helpless and enforce them to be engaged risky sexual behaviours. However, there was no study conducted to determine the prevalence and factors associated with pregnancy among adolescent refugees in humanitarian settings. This study, therefore, aimed at assessing the prevalence of pregnancy among adolescent girls and associated factors in the Nguenyyiel refugee camp, Gambella region, Southwest Ethiopia.

METHODS AND MATERIALS

Study Design and Setting

A community-based cross-sectional study was conducted in Nguenyyiel refugee camp, Gambella region, from May 15 to June 15, 2021. Gambella region of Ethiopia hosted a 337,081 refugee population from the bordering country of South Sudan in 7 refugee camps (as of May 2021). The Nguenyyiel refugee camp is the newest and largest camp in Ethiopia. It opened to accommodate the new refugee influx from South Sudan following the escalation of conflict in that country in July 2016. It is located in Itang special woreda (district). It is located

about 769 km from the capital Finfinnee/Addis Ababa, and 55 km from the region's capital, Gambella (25) *(See figure 1)*. It has 10,916 households and total populations of 90,506 with Male (43,757) and Female (46,747). Adolescents constitute majority of the women in the Reproductive age in the camp

Population

Source population

The source populations were all adolescent girls (10-19 years) in the Nguenyyiel refugee camp. The study populations were adolescent girls in the selected households who participated on this study.

Eligibility Criteria

Inclusion criteria

All girls in the adolescence age interval (10-19) who were residents in the Nguenyyiel refugee camp at least for the last six months before the data collection were considered eligible.

Sample size determination

The sample size was calculated for both objectives. For the first objective, sample size was calculated using a single population proportion formula with the assumptions of: Z = 1.96 at 95% confidence interval, d = Margin of error assumed to be (0.05), P = prevalence of pregnancy in adolescent from previous studies (2), and 10% non-response rate; $n = Z\alpha_2 p\,(1-p)/d2 = 421$

The sample size for the second objective was calculated by using the double population proportion formula using Epi info version 3.0 statistical software by considering the following assumptions after reviewing previous literature: $Z\alpha/_2$: 1.96 at 95% confidence level, Zβ: power = statistical power of 80%, P1: the probability of outcome in the unexposed, P2: the probability of outcome in the exposed and r: ratio of unexposed to exposed (Table 1).

As shown in the above table, since the calculated sample sizes for the second objective are less than that of the first objective (n = 421), finally, the larger sample size (n = 421) was taken and used for this study.

Table 1: Sample size calculation based on the significant factors of adolescent pregnancy; Nguenyyiel refugee camp, Gambella region, southwest Ethiopia, 2021.

S/no.	Significant factors associated with adolescent pregnancy & citations	Power	95% C.I	The proportion of pregnancy among non-exposed adolescent girls (P1)	The proportion of pregnancy among exposed (P2)	Risk Ratio (r)	AOR	n_1	n_{total}
1	Educational status [No formal education Vs. Secondary and above] (26)	80%	1.96	31.0%	7.4%	0.24	3.83	164	181
2	Modern contraceptive use [Users Vs. Non-users] (27)	80%	1.96	64.6%	19.2%	0.29	10.62	131	144
3	Marital status [Married Vs. Single (not-married)] (27)	80%	1.96	3.80%	54.4%	14.3	2.16	33	37

Sampling techniques and Procedures

A pre-study survey was conducted in the Nguenyyiel refugee camp to generate a sampling frame (i.e., to identify families with adolescent girls), Accordingly, around 4100 households with adolescent girls were identified and recorded during the pre-study survey. Then, the 421 respondents in the Nguenyyiel refugee camp were chosen using a systematic random sampling technique. The sampling interval was calculated by dividing the number of households with adolescent girls in the Nguenyyiel refugee camp (N = 4100) by the sample size (n = 421), resulting in K = 4100/421 = 9. As a result, every ninth household with an adolescent was chosen. In cases where a household had two or more adolescents, the lottery technique was employed to choose one adolescent girl that was interviewed.

Operational definitions

Adolescent pregnancy: In this study, adolescent pregnancy is defined as a current conception (pregnancy) occurring in a girl aged 10 to 19 (i.e., before the age of 20), regardless of marital status (28)

Communication on sexual and reproductive health (SRH) issues: An adolescent girl was considered to have parent-adolescent communication on SRH issues if she discussed with either of her parents at least one of the SRH issues such as menstrual cycle and fertile period, how one can get pregnant(29).

Knowledge of modern contraceptive methods: Knowledge of modern contraceptive methods among adolescent girls was measured based on the score or correctness of response to the 7 modern contraceptive knowledge-tracing questions.

Adolescent girls who responded "Yes" (scored) five or more, 3 to 4, and two or less were considered to have "**comprehensive knowledge**, **good knowledge**, and **poor knowledge** about contraceptive methods, respectively(29).

Data collection Tools and Procedures

The data was gathered by eight trained diploma nurses and two supervisors with a BSc degree in public health. A well-structured questionnaire was used in a face-to-face interviewer-administered data collection method. The questionnaire was adapted from different literature and pretested on sites other than the study area before the commencement of actual data collection (14,24,30). It contained socio-demographic, family, and individual-level characteristics, including sexual and reproductive health knowledge, modern contraceptive knowledge, and other pregnancy-related characteristics. Pregnancy in adolescent girls was determined using urine Human Chorionic Gonadotropin (HCG) test kits. Each study participant was asked before collecting a urine sample if she was pregnant or if the pregnancy was visible to the data collectors at the time of data collection (interviews). Urine samples were then collected from all study participants except those whose pregnancies had been confirmed.

Data Quality control and Analysis

The questionnaire was first prepared in English and then translated into the local language (Nuer). Then, it was translated back into English by a different language expert to verify its consistency. Data collectors and supervisors were provided a two-day training on the importance and objective of the study.

Data collection tools, sampling methods, interviewing techniques, and important precautions and procedures to be followed while conducting the HCG pregnancy test. The questionnaire was pretested on 5% of the sample size in places other than the study area. The completeness and consistency of the data were checked by supervisors on a daily basis. After that, the data was entered into Epidata software version 3.1 and exported to SPSS version 22. Frequencies and cross-tabulations were used to check for missed values. Descriptive analysis was done on socio-demographic, individual-level, and related characteristics and presented using tables and graphs.

Bivariate and multivariate logistic regression analysis was done to identify factors associated with the outcome variable. Accordingly, variables with a p-value < 0.25 on bi-variable logistic regression were taken as candidates for multivariate analysis. The goodness of fit for the final regression model was checked by the Hosmer-Lemeshow goodness of fit test at a p-value of > 0.05. On multivariate logistic regression analysis, variables with a p-value of less than 0.05 at a 95% confidence level were declared significant. The adjusted odds ratio is used to measure the strength of the association.

Patient and Public Involvement

No Patient and public involvement

RESULTS

Socio-Demographic Characteristics of Respondents

A total of 414 adolescent girls (10–19 years) participated in this study, making the response rate 98.3%. The mean age of respondents was 16.8 years with ±1.52 SD. The majority of respondents, 241 (58.2%) were late-stage adolescents (17-19 years), and more than one-third of respondents, 164 (39.6%), were middle adolescent

girls (14-16 years), while 9 (2.2%) were in the early adolescence stage (10-13 years). Nearly three-fourths of respondents, 309 (74.6%), were protestants, while 57 (13.8%) and 32 (7.7%) were Seventh-Day Adventist and Church of God, respectively. More than half, 221 (53.4%) had primary and nearly one-third of respondents, 129 (31.1%), had no formal education. Three-fourths of adolescent girls, 313 (75.6%) were single (not married) and 101 (24.4%) were married or ever-married. The majority of married adolescents, 85 (84.2%), get married while they are in their middle adolescence age (14-16 years); and one-fifth of marriages, 21 (20.8%), were arranged marriages (Table 2).

Table 2: Socio-demographic characteristics of respondents (adolescent girls, N=414) in Nguenyyiel refugee camp, Gambella region, Southwest Ethiopia, September 2021.

Variable	Category	Frequency	Percent
Age category by adolescence stages	Early adolescence (10-13 years)	9	2.20
	Middle adolescence (14-16 years)	164	39.6
	Late adolescence (17-19 years)	241	58.2
Religion	Protestant	309	74.6
	Seventh-Day Adventist	57	13.8
	Church of God	32	7.70
	Catholic	16	3.90
Ethnicity	Nuer	414	100
Educational status	Secondary and above	64	15.5
	Primary education (grade 1-8)	221	53.4
	No formal education	129	31.1
Marital status	Single (Not married)	313	75.6
	Married and live together	79	19.1
	Married and separated	14	3.40
	Divorced	8	1.90
Age at marriage by age groups	Married before 15 years	18	17.8
	Married between 15-19 years	83	82.2

Age at marriage by adolescence stage	Early adolescence (10-13 years)	1	0.90
	Middle adolescence (14-16 years)	85	84.2
	Late adolescence (17-19 years)	15	14.9
Marriage arranged by parents	Yes	21	20.8
	No	80	79.2

Family related - characteristics of respondents

Only one hundred twenty-six (30.4%) of the study participants had communication with their parents on sexual and reproductive health (SRH) issues, while more than two thirds of adolescent girls (288, 69.6%) had no communication with their parents on the issues. Nearly half of adolescents, 194 (46.9%), live with either of their biological parents (single parent). One-fourth, 104 (25.4%), live with none of their biological parents, and less than one fifth of adolescents, 75 (18.1%), live with both biological parents. The mean family size in households of the respondents was 6.32 people, with ±1.86 SD and a range of 2–13. The majority of adolescent girls, 351 (84.8%), live in households with 5 or more people, three-fourths (75%) of whom live in large families of 7 or more people (Table 3).

Table 3: Familial-level characteristics of respondents in Nguenyyiel Refugee Camp Gambella region, Southwest Ethiopia, September 2021.

Variable	Category	Frequency	Percent
Parent-adole communicati SRH issues	Yes	126	30.4
	No	288	69.6
Household living arrangement	Live with both biological parents	75	18.1
	Live with either of the biological parent	194	46.9
	Live with none of biological parent	104	25.4
	Married (live together with husband)	40	9.60
Family size	Small family (4 persons and below)	63	15.2
	Large family (5 and more persons)	351	84.8

Respondents Knowledge about contraceptive methods among

More than one-third of adolescent girls, 167 (40.3%), had poor knowledge of modern contraceptive methods; 118 (28.5%) and 129 (31.2%), respectively, had good and comprehensive knowledge of modern contraceptives. The majority of respondents (326, 78.7%) knew or ever heard of Condom, 305 (73.7%) knew or ever heard of oral contraceptive pills (OCP), more than half (218, 52.7%) knew or heard about injectables (Depo-Provera & NET-EN), and 154 (37.2%) heard about implants (Table 4).

Table 4: Knowledge of modern contraceptive methods among adolescent girls (N=414) in Nguenyyiel refugee camp, Gambella region, Southwest Ethiopia, September 2021.

Variable	Category	Frequency (N=414)	Percent
Knew or ever heard of OCP	Yes	305	73.7
Knew or ever heard of injectable	Yes	218	52.7
Knew or ever heard of a condom	Yes	326	78.7
Knew or ever heard of implants	Yes	154	37.2
Knew or ever heard of SDM	Yes	126	30.4
Knew or ever heard of IUCD	Yes	126	30.4
Knew or ever heard of sterilization	Yes	51	12.3
Over all Knowledge about contraceptive n	Comprehensive knowledge	129	31.2
	Good knowledge	118	28.5
	Poor knowledge	167	40.3

SRH characteristics (behaviours) of respondents

The mean age at menarche (first menstrual bleeding) was 12.5 years with ±1.99 SD. Menarche in almost all respondents, 403 (99.5%), occurred between 10 and 14 years of age. The mean age at first sexual intercourse among respondents was 14.03 years, with ±3.88 SD. Almost half of the adolescent girls, 193 (49.6%), were sexually active before 15 years; two-thirds of the respondents, 257 (66.0%), were sexually active in middle adolescence (14–16 years); and 338 (86.9%) of adolescents had sexual intercourse before 18 years. The contraceptive prevalence rate (CPR) among adolescent girls was 27 (6.5%). Out of these, 23 (5.6%) of adolescents had ever used injectables (Depo-Provera and/or NET-EN); 26 (6.3%) used condoms, and 27 (6.5%) of respondents used oral contraceptive pills (OCPs) (Table 5).

Table 5: Sexual behaviour (characteristics) of respondents (adolescent girls), (N = 414) in Nguenyyiel refugee camp, Gambella region, Southwest Ethiopia, September 2021.

Variable	**Category**	**Frequency**	**Percent**

Adolescent girl had menarche	Yes (Menarche occurred)	405	97.8
	No (Menarche not occurred)	9	2.20
Sexual practice (N=414)	Yes (Ever had sexual interco	389	94.0
	No (Has not ever had sex)	25	6.00
Age at sexual practice by ag (N=389)	Sexually active before 15 yea	193	49.6
	Sexually active at 15-19 yeai	196	50.4
Age at sexual intercourse stages	Early adolescence (10-13 yea	64	16.5
	Middle adolescence (14-16 y	257	66.0
	Late adolescence (17-19 yeai	68	17.5
Early sexual initiation(debut) (N	Yes	338	86.9
	No	51	13.1
Knowledge About contraceptive methods	Comprehensive knowledge	129	31.2
	Good knowledge	118	28.5
	Poor knowledge	167	40.3
Total contraceptive use		88	21.26
Modern contraceptive use (N=414)		86	20.77
OCP (N=414)		27	6.50
Injectable (N=414)		23	5.60
condom (N=414)		26	6.30
implant (N=414)		3	0.70
SDM (N=414)		2	0.50
IUCD (N=414)		5	1.20

N = Sample size (no of response), OCP = Oral Contraceptive Pills, SDM = Standard Day Method, IUCD = Intra Uterine Contraceptive Device

Prevalence of adolescent pregnancy in Nguenyyiel refugee camp, Gambella region

The prevalence of pregnancy among adolescent girls in the Nguenyyiel refugee camp was 21.7% (95% C.I: 17.6-25-6). More than half of pregnant girls (51.1%) were middle adolescents (14–16 years) and 48.9% were late adolescents (17–19 years old).

Factors associated with pregnancy among Adolescent

Age (17–19 years), educational status (no formal education, primary education), and family structure (living with either biological parent; living with neither biological parent) were statistically significantly associated with pregnancy among adolescent girls (10–19 years) in Nguenyyiel refugee camp.

The odds of pregnancy among late adolescent girls (17-19 years) was 2.8 times higher compared with adolescents 10-16 years of age (AOR: 2.8; 95% C.I: 1.6-5.1). Adolescent girls with primary education (grade 1–8) were 7.7 times more likely to become pregnant compared with those with secondary and above (AOR: 7.7; 95% C.I: 3.55–16.7). Similarly, the odds of pregnancy among adolescent girls with no formal education were 3.4 times higher compared with girls who attended secondary school and above (AOR: 3.4; 95% C.I: 1.6-7.4).

Odds of pregnancy among adolescent girls living with none of their biological parents were two times more likely to be pregnant compared with adolescents living with both biological parents (AOR: 2.1; 95% C.I: 1.02-4.5). Likewise, the odds of pregnancy among adolescent girls living with either of their biological parents was 3.7 times higher compared with girls living with both of their biological parents (AOR: 3.7; 95% C.I: 1.8–7.8) (Table 6).

Table 6: Factors associated with pregnancy among adolescent girls (10-19 years) in Nguenyyiel refugee camp, Gambella region, Southwest Ethiopia, September 2021.

Variable	Categories	Pregnancy (status)		AOR (95%	P-valu
		Yes (HCC	No(HCGnegative)		
		N (%)	N (%)		
Age (stages of adolescence)	10-16 years	46 (51.1)	127 (39.2)	1	
	17-19 years	44 (48.9)	197 (60.8)	2.79 (1.55-:	0.001
Educational status	Secondary and above	26 (28.9)	38 (11.7)	1	
	Primary education (grade 1-8)	26 (28.9)	195 (60.2)	7.69 (3.55-:	0.001
	No formal education	38 (42.2)	91 (28.1)	3.42 (1.59-:	0.002

Sexual experience	Sexually active at 15-19 year-old	54 (60.0)	142 (47.5)	1	
	Sexually active before 15 years of age	36 (40.0)	157 (52.5)	1.39 (0.76-2.54	0.282
Knowledge about contraceptive	Comprehensive knowledge	37 (41.1)	92 (28.4)	1	
	Good knowledge	20 (22.2)	98 (30.2)	1.29 (0.62-2.69	0.496
	Poor knowledge	33 (36.7)	134 (41.4)	1.73 (0.90-3.32	0.100
Early sexual debut (before 18 years)	No	6 (11.8)	84 (24.9)	1	
	Yes	45 (88.2)	254 (75.1)	0.41 (0.14-1.17	0.096
Parent-adolescent Communication on (SRH)	Yes	40 (44.4)	86 (26.5)	1	
	No	50 (55.6)	238 (73.5)	1.37 (0.73-2.54	0.326
Household living arrangement	Live with both biological parents	29 (32.2)	46 (14.2)	1	
	Live with either of biological parent	23 (25.6)	171 (52.8)	3.71 (1.76-7.81	0.001
	Live with none of biological parents	25 (27.8)	80 (24.7)	2.14 (1.02-4.49	0.043
	Married and live toge husband	13 (14.4)	27 (8.30)	2.04 (0.81-5.14	0.132

DISCUSSIONS

This study showed that the prevalence of pregnancy among adolescent girls (10–19 years) in the Nguenyyiel refugee camp was high. This finding is consistent with findings of similar studies conducted among South Sudanese refugees (10–19 years) in the Bidibidi refugee settlement, northern Uganda (25%).(4), Eritrean refugees in the northern Tigray region, Ethiopia (28.4%) (31), Somalian refugees in Kobe refugee camp of Somali region, Ethiopia (26.3%) (32), and among refugees in Thailand-Myanmar border settlement, South-east Asia (33).

The observed similarity could be due to similar socio-demographic and socioeconomic characteristics in humanitarian settings as well as similarity in the vulnerability of adolescent girls to SRH problems in humanitarian settings.

The findings of this study are higher than the findings of similar studies among adolescent girls in non-emergency (non-humanitarian) settings: in Africa (a pooled prevalence of 18.8%)(34). Arba Minch town, Southern Ethiopia (7.7%),(35), Gambella region of Ethiopia (16.2%) and India (10%) (36).

The possible reasons for the difference in the prevalence of adolescent pregnancy in humanitarian settings compared with non-emergency contexts could be due to differences in settings. That is, adolescents in humanitarian settings are more vulnerable to poor socio-economic status following the disruption of family structure, loss of father or mother, or both, during conflict or disaster.

This in turn leads adolescents to hopelessness, being prone to gender-based violence and early marriage. In addition to that, basic reproductive health care services like family planning, including health information communication on reproductive issues, are less available in humanitarian settings than in non-humanitarian settings.

On the other hand, the finding of this study is lower than that of studies conducted in: Nigeria (45.4%)(37), Eastern Ethiopia, (30.2%)(34), East Africa (pooled prevalence of 54.6%)(38), Uganda (35.8%)(39) and north east Ethiopia (28.6%)(27). The possible explanation for this discrepancy could be difference in socio-demographic, socio-economic, larger sample size and inclusion terminated pregnancy in the case of East Africa pooled prevalence.

This study showed that pregnancy among refugee adolescents was associated with increasing age; the odds of pregnancy among late adolescent girls (17–19 years) was higher than girls in the early and middle stages of adolescence (10–16 years). This is in line with studies conducted in Eastern Ethiopia, East Africa, Northeast Ethiopia, and Kenya. (27,34,38,40). This could be due to the fact that as age increases, teenagers will have more exposure to sex and their chance of getting married also increase.

Adolescent girls with primary education (grade 1-8) were more likely to become pregnant compared with their counterparts who attended secondary and above. Likewise, the odds of pregnancy among adolescents with no formal education was high compared with girls who attained secondary and above.

This is similar with finding of studies conducted in Eastern Ethiopia (41), South East Nigeria(37), a systematic review and Meta-analysis in Africa(42) (42), a multi-level analysis in five East African countries(43).The possible justification could be adolescent girls with lower educational attainment lack appropriate information regarding the consequence of unsafe sexual practice as well as the means to avoid unwanted pregnancy.

This study showed that household living arrangements (family structure) were associated with adolescent pregnancy: Adolescent girls living with none of their biological parents were more likely to be pregnant compared with adolescents living with both biological parents (i.e., living in nuclear families). The odds of pregnancy among adolescent girls living with either of their biological parents (single parent families) higher compared with girls living with both of their biological parents. This is similar to the findings of studies conducted in Southern Ethiopia (35), eastern Ethiopia(34) and north east Ethiopia (27). This could be because adolescent girls who did not live with one or both of their biological parents lack parental support and guidance. Adolescent girls might have lost one or both of their biological parents during the conflict. Adolescents in this situation may feel helpless and hopeless and choose to get married or engage in unsafe sex to secure their survival.

Finally, even though the authors have tried to maximize the quality of this study, it is important to note that using HCG test to diagnose pregnancy might undermine the true figure of prevalence of adolescent pregnancy as the HCG test cannot detect a pregnancy that is less than a week old.

Similar, since sexuality is a sensitive issue, respondents might not disclose their true behaviour. This results in social desirability bias. Therefore, the authors have forwarded the following recommendations for future researchers to overcome the limitations committed in this study.

CONCLUSIONS

This study showed a high prevalence of pregnancy among refugee adolescent girls (10–19 years) in the Nguenyyiel refugee camp, Gambella region, Ethiopia. The significant factors associated with adolescent pregnancy were: Age (17–19 years), educational status (no formal education; primary education), and household living arrangement or family structure: Live with none of the biological parents; live with either of the biological parents.

Recommendation

Health Care Provider

Health workers in the camps should work to strengthen targeted adolescent sexual health education and information, giving special attention to the uneducated, those living without biological family, and late adolescents.

Humanitarian organizations (MS, ARRA, UNHCR, etc.)

Strengthen adolescent-youth-friendly services and adolescent girls' empowerment in refugee camps.

Strengthen health education and schooling for refugee adolescent girls.

strengthen comprehensive sexuality education (CSE) programs at schools in refugee camps.

Adolescent girls who have lost their parents should be given special attention.

Regional Health Bureaus, Zonal and other Health Offices

Strengthening intervention programs aimed at preventing pregnancy among refugee adolescents.

Prepare programs and strategies (approaches) to support refugee adolescent girls living with none or either of their biological parents

Researchers

Future researchers should focus on exploring the underlying socio-cultural conditions through a mixed approach (qualitative and quantitative study).

Important points that are not addressed in this study, like the level of unmet need for family planning and the prevalence of unwanted pregnancy, are among the issues that seek the attention of future researchers.

Consent to publish

Not applicable.

Availability of data and materials

All the data used or mentioned in this research are available

Competing interests

The authors declare that they have no competing interests.

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Author's contribution

Koang Nyak Bol: made a significant contribution to the conception, study design, execution, acquisition of data, analysis, and interpretation and has agreed on the journal to which the article has been submitted.

Ebissa Negera: took part in study design, execution, drafting, revising and critically reviewing the article; gave final approval of the version to be published; agreed on the journal to which the article has been submitted.

Abdi Geda Gedefa: contributed to planning, acquisition of data, analysis and interpretation, revising and critically reviewing the article, writing the report, and agreed on the journal to which the article has been submitted.

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Abbreviations and Acronyms

ASRH	Adolescent Sexual And Reproductive Health
ARRA	Administration For Refugees And Returnees Affair
HCG	Human Chorionic Gonadotropins
IUGR	Intra-Uterine Growth Restriction
LBW	Low-Birth Weight
OCP	Oral Contraceptive Pills
LMICs	Low And Middle-Income Countries
SSA	Sub-Sahara Africa
SDM	Standard Day Method
SRH	Sexual And Reproductive Health;
RC	Refugee Camp

Declarations

Ethics approval and consent to participate

This study was done according to the Declaration of Helsinki.

Research Ethical Committee of Mettu University provided Ethical approval for this study with reference number: RPG/03/2013. The Gambella Regional Health Bureau and ARRA, Gambella Zonal office provided a formal letter of permission. Data collectors were trained on how to handle confidential and private participant information.

Confidentiality was assured by excluding participants' names from the data collection tools. The study purpose, procedure, and duration were clearly explained to study participants. Study participants engaged in the study were informed that they could skip any question they didn't want to respond to and could quit the interview if they felt discomfort. Then consent was obtained from the study participants who were 18 years of age or older. For those who were less than 18 years, assent was taken from the participants but consent was taken from their representatives based on article 25 of the Declaration of Helsinki.

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Figure 1: Map of Nguenyyiel refugee camp, Gambella, Ethiopia.

Source: nguenyyiel refugee camp map - Bing)

Map of Nguenyyiel refugee Camp

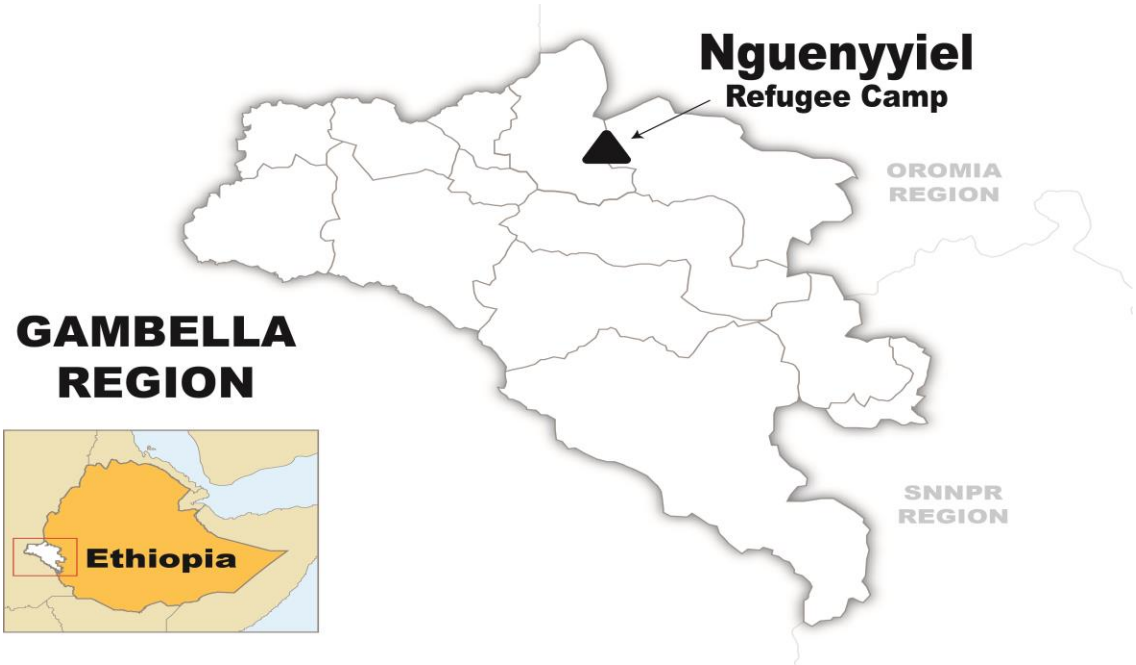

Figure 1. Map of Nguenyyiel refugee Camp, Gambella, Ethiopia.

Source: nguenyyiel refugee camp map - Bing

STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional studies***

	Item No	Recommendation	Page No
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	1-2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	2-3
Objectives	3	State specific objectives, including any prespecified hypotheses	1
Methods			
Study design	4	Present key elements of study design early in the paper	3
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	3-5
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	4,6
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	*6*
Bias	9	Describe any efforts to address potential sources of bias	6
Study size	10	Explain how the study size was arrived at	4-5
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	6
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	6
		(*b*) Describe any methods used to examine subgroups and interactions	6
		(*c*) Explain how missing data were addressed	6
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	6
		(*e*) Describe any sensitivity analyses	
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	4,6
		(b) Give reasons for non-participation at each stage	NA
		(c) Consider use of a flow diagram	
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	6
		(b) Indicate number of participants with missing data for each variable of interest	4,5,7
Outcome data	15*	Report numbers of outcome events or summary measures	7
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	

		(*b*) Report category boundaries when continuous variables were categorized	NA
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	NA
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	7
Discussion			
Key results	18	Summarise key results with reference to study objectives	12, 13,17
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	16
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	16
Generalisability	21	Discuss the generalisability (external validity) of the study results	16
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	18

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.