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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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4 1 Pregnancy among Adolescents Girls in Humanitarian settings: A case in
5 2 Refugee Camp of Gambella Regional state, Community Based Cross-
6 3 Sectional Study, Southwest Ethiopia, 2021
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29 14 **ABSTRACT**

30
31 15 Objective: The aim of this study was to assess the prevalence of pregnancy and associated factors among
32
33 16 adolescent girls in the Nguenyiel refugee camp.
34

35
36 17 Methods: A community-based cross-sectional study was done. The Systematic random sampling technique was
37
38 18 used to select respondents. Data were collected using a well-structured and pretested questionnaire. Pregnancy
39
40 19 test was done using HCG test. Bivariate and Multivariate logistic regression analysis was run to identify factors
41
42 20 associated with adolescent pregnancy.
43
44

45 21 Results: The prevalence of pregnancy among adolescent girls in the Nguenyiel refugee camp was 21.7% (95%
46
47 22 C.I: 17.6-25.6). Factors associated with adolescent pregnancy were age (17-19 years) (AOR: 2.79; 95% C.I:
48
49 23 1.55-5.05); Educational status: Primary education (AOR: 7.69; 95% C.I: 3.55-16.68); No formal education
50
51 24 (AOR: 3.42; 95% C.I: 1.59-7.36), and Household living arrangement: Living with none of biological parents
52
53 25 (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).
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56
57 26 **Conclusions and Recommendations:** This study showed that there is a high prevalence of pregnancy among
58
59 27 adolescent girls in the study setting. Age (17-19 years), Educational status, and Household living arrangement
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2
3 28 (Live with none of the biological parents; Live with either of biological parents) were among the factors
4
5 29 significantly associated with adolescent pregnancy. Hence, health workers and other stakeholders in the camps
6
7 30 should focus on strengthening adolescent sexual health education giving especial attention to late adolescents,
8
9 31 uneducated and live without biological family.

11
12 32 **Key words:** [Adolescents](#), [pregnancy](#), [Gambella](#), [Nguenyiel](#), [Refugee](#), [Ethiopia](#).

13 33 **INTRODUCTION**

14
15
16 34 Each year, an estimated 21 million adolescent girls become pregnant every year and approximately 12 million
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18 35 of them give birth worldwide. At least 777,000 births occur to adolescent girls younger than 15 years in
19
20 36 developing countries. Adolescent pregnancy is associated with higher risks of Adverse Birth Outcomes such as
21
22 37 preterm birth, Low Birth Weight (LBW), Intra uterine growth retardation (IUGR), stillbirth, unsafe abortion,
23
24 38 maternal and neonatal mortality and morbidity compared with women in their twenties (1–9). Complications
25
26 39 from pregnancy and childbirth are the leading cause of death among adolescent girls(10,11). Moreover,
27
28 40 adolescent pregnancy is associated with social and economic problems like school drop-out, unemployment, and
29
30 41 limited future opportunities, risk of remaining poor and, and increased cost for health care (2,12).

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34
35 42 Many teenage pregnancies in Ethiopia occur within marriage(13). Similarly, other studies showed that the
36
37 43 prevalence of pregnancy among adolescent girls in humanitarian settings (refugee camps or settlements) is 30%
38
39 44 higher than among their non-displaced counterparts (13, 14). This is due to the fact that adolescents in
40
41 45 humanitarian settings are extremely vulnerable to early sexual practice, violence, and exploitation or abuse
42
43 46 compared with their counterparts in general population (14–16). The experience of forced migration impacts
44
45 47 refugee adolescent girls' decision-making power related to their sexual relationships and reproductive life (9).
46
47 48 Hence, adolescents may lack the autonomy to determine over their affairs including their sexual and reproductive
48
49 49 health and rights (11,17). Adolescents are also the only age group for whom AIDS deaths are on the rise(10).

50
51
52
53 50 According to the Ethiopian Demographic and health survey, the study area, Gambella Regional State of Ethiopia,
54
55 51 has high unmet need for family planning (23%), high polygamy practice (21%)(18) and highest HIV and other
56
57 52 STIs prevalence in the country in general population (13,17,19–21). However, there was no study conducted to
58
59 53 determine the prevalence and factors associated with pregnancy among adolescent refugees in humanitarian

1
2
3 54 settings. This study, therefore, aimed at assessing the prevalence of pregnancy among adolescent girls and
4
5 55 associated factors in the Nguenyiel refugee camp, Gambella region, Southwest Ethiopia.
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9 56 **METHODS AND MATERIALS**

10 11 12 57 **Study Design and Setting**

13
14 58 A community-based cross-sectional study was conducted in the Nguenyiel refugee camp, Gambella region from
15
16 59 May 15 to June 15, 2021. The Gambella region hosted 337,081 refugee population from the bordering country
17
18 60 of South Sudan in 7 refugee camps (as of May 2021). The Nguenyiel refugee camp is the newest and the largest
19
20 61 camp in Ethiopia, opened to accommodate the new refugee influx from South Sudan following the escalation of
21
22 62 conflict in South Sudan in July 2016. It is located in Itang special woreda (district). It is found at about 769 km
23
24 63 away from capital Finfinnee/Addis Ababa and 55 Kms from the region's capital, Gambella town (22) (*See*
25
26
27
28 64 *figure 1*). It has 10,916 households and total populations of 90,506 with Male (43,757) and Female (46,747).
29
30

31 65 Adolescents constitute majority of the women in the Reproductive age in the camp
32

33 66 **Population**

34 35 67 **Source population**

36
37
38 68 The source populations were all adolescent girls (10-19 years) in the Nguenyiel refugee camp. The study
39
40 69 populations were adolescent girls in the selected households who participated on this study.
41

42 43 70 **Eligibility Criteria**

44 45 71 **Inclusion criteria**

46
47 72 All girls in the adolescence age interval (10-19) who were residents in the Nguenyiel refugee camp at least for
48
49 73 the last six months before the data collection were considered eligible.
50

51 74 **Sample size determination**

52
53 75 The sample size was calculated for both objectives. For the first objective, sample size was calculated using a
54
55 76 single population proportion formula with the assumptions of: $Z = 1.96$ at 95% confidence interval, $d =$ Margin
56
57 77 of error assumed to be (0.05), $P =$ prevalence of pregnancy in adolescent from previous studies (2), and 10%
58
59 78 non-response rate; $n = Z\alpha_2p(1-p)/d^2 = 421$
60

79 The sample size for the second objective was calculated by using the double population proportion formula using
 80 Epi info version 3.0 statistical software by considering the following assumptions after reviewing previous
 81 literature: $Z_{\alpha/2}$: 1.96 at 95% confidence level, Z_{β} : power = statistical power of 80%, P1: the probability of
 82 outcome in the unexposed, P2: the probability of outcome in the exposed and r: ratio of unexposed to exposed
 83 (Table 1).

84 Table 1: Sample size calculation based on the significant factors of adolescent pregnancy;
 85 Nguenyiel 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

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

88 Sampling techniques and Procedures

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

1
2
3 94 result, every ninth household with adolescent was chosen. In case a house hold had two or more adolescents,
4
5 95 the lottery technique was employed to choose one adolescent girl.
6
7

8 96 Data collection Tools and Procedures

9
10 97 The data was gathered by eight trained diploma nurses and two supervisors with a BSc in public health. A face-to-
11
12 98 face interviewer administered data collection method was employed using a well-structured questionnaire. The
13
14 99 questionnaire was adapted from different literature and pretested on sites other than the study area before the
15
16 100 commencement of actual data collection (13,21,23). It contained socio-demographic, family, and individual-
17
18 101 level characteristics, including sexual and reproductive health knowledge, modern contraceptive knowledge, and
19
20 102 other pregnancy-related characteristics. Pregnancy among adolescent girls was assessed by conducting a urine
21
22 103 Human Chorionic Gonadotropin (HCG) test at the community level using test kits. Before collecting a urine
23
24 104 sample, each study participant was asked if she had a confirmed pregnancy or if the pregnancy was apparently
25
26 105 visible to the data collectors at the time of data collection (interviews). Then, urine samples were collected from
27
28 106 all study participants except from those whose pregnancies were confirmed.
29
30

31 107 Data Quality control and Analysis

32 108 The questionnaire was first prepared in English and translated into the local language (Nuer); then, it was
33
34 109 translated back into English by a language expert to verify its consistency. Data collectors and supervisors were
35
36 110 provided a two-day training on the importance and objective of the study; data collection tools; sampling
37
38 111 methods; interviewing techniques; and important precautions and procedures to be followed while conducting
39
40 112 the HCG pregnancy test. The questionnaire was pretested on 5% of the sample size in places other than the study
41
42 113 area. The completeness and consistency of the data were checked by supervisors on a daily basis. After that, the
43
44 114 data was entered into Epidata software version 3.1 and exported to SPSS version 22. Frequencies and cross-
45
46 115 tabulations were used to check for missed values.
47
48

49 116 Descriptive analysis was done on socio-demographic, individual-level, and related characteristics and presented
50
51 117 using tables and graphs.
52
53

54 118 Bivariate and multivariate logistic regression analysis was done to identify factors associated with the outcome
55
56 119 variable. Accordingly, variables with a p-value < 0.25 on bi-variable logistic regression were taken as candidates
57
58 120 for multivariate analysis. The goodness of fit for the final regression model was checked by the Hosmer-
59
60

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3 121 Lemeshow goodness of fit test at a p-value of > 0.05. On multivariate logistic regression analysis, variables with
4
5 122 a p-value of less than 0.05 at a 95% confidence level were declared significant. The adjusted odds ratio is used
6
7 123 to measure the strength of the association.
8
9

10 124 Patient and Public Involvement

11 125 No Patient and public involvement
12
13

14 15 126 RESULTS

16 17 127 Socio-Demographic Characteristics of Respondents

18 128 A total of 414 adolescent girls (10–19 years) participated in this study, making the response rate 98.3%. The
19
20 129 mean age of respondents was 16.8 years with ± 1.52 SD. The majority of respondents, 241 (58.2%) were late-
21
22 130 stage adolescents (17-19 years), and more than one-third of respondents, 164 (39.6%), were middle adolescent
23
24 131 girls (14-16 years), while 9 (2.2%) were in the early adolescence stage (10-13 years). Nearly three-fourths of
25
26 132 respondents, 309 (74.6%), were protestants, while 57 (13.8%) and 32 (7.7%) were Seventh-Day Adventist and
27
28 133 Church of God, respectively. More than half, 221 (53.4%) had primary and nearly one-third of respondents, 129
29
30 134 (31.1%), had no formal education. Three-fourths of adolescent girls, 313 (75.6%) were single (not married) and
31
32 135 101 (24.4%) were married or ever-married. The majority of married adolescents, 85 (84.2%), get married while
33
34 136 they are in their middle adolescence age (14-16 years); and one-fifth of marriages, 21 (20.8%), were arranged
35
36 137 marriages (Table 2).
37
38

39 138 **Table 2: Socio-demographic characteristics of respondents (adolescent girls, N=414) in**
40 139 **Nguenyiel refugee camp, Gambella region, Southwest Ethiopia, September 2021.**

42 Variable	43 Category	44 Frequency	45 Percent
46 Age category by adolesc	47 Early adolescence (10-13 years	9	2.20
	48 Middle adolescence (14-16 yea	164	39.6
	49 Late adolescence (17-19 years)	241	58.2
50 Religion	51 Protestant	309	74.6
	52 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 years)	85	84.2
	Late adolescence (17-19 years)	15	14.9
Marriage arranged by	Yes	21	20.8
	No	80	79.2

140

141 **Family related - characteristics of respondents**

142 Only one hundred twenty-six (30.4%) of the study participants had communication with their parents on sexual
 143 and reproductive health (SRH) issues, while more than two thirds of adolescent girls (288, 69.6%) had no
 144 communication with their parents on the issues. Nearly half of adolescents, 194 (46.9%), live with either of their
 145 biological parents (single parent). One-fourth, 104 (25.4%), live with none of their biological parents, and less
 146 than one fifth of adolescents, 75 (18.1%), live with both biological parents. The mean family size in households
 147 of the respondents was 6.32 people, with ± 1.86 SD and a range of 2–13. The majority of adolescent girls, 351
 148 (84.8%), live in households with 5 or more people, three-fourths (75%) of whom live in large families of 7 or
 149 more people (Table 3).

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

Variable	Category	Frequency	Percent
Parent-adolescent communication on 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 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

152

153 **SRH characteristics of respondents**

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

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

162 Table 4: Sexual behaviour (characteristics) of respondents (adolescent girls, N=414) in Nguenyiel refugee
 163 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

164

165 Respondents Knowledge about contraceptive methods among

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

171 Table 5: Knowledge of modern contraceptive methods among adolescent girls (N=414) in Nguenyiel refugee
 172 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

173

174 Prevalence of adolescent pregnancy in Nguenyiel refugee camp, Gambella region

175 The prevalence of pregnancy among adolescent girls in the Nguenyiel refugee camp was 21.7% (95% C.I: 17.6-
176 25-6). More than half of pregnant girls (51.1%) were middle adolescents (14–16 years) and 48.9% were late
177 adolescents (17–19 years old) (*see figure 2*).

178 Factors associated with pregnancy among Adolescent

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

182 The odds of pregnancy among late adolescent girls (17-19 years) was 2.8 times higher compared with adolescents
183 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
184 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 Nguenyiel refugee camp, Gambella region, Southwest Ethiopia, September 2021.

Variable	Categories	Pregnancy (status)		AOR (95% C.I)	P-value
		Yes (HCG positive)	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 (1.6-4.8)	0.001
Educational status	Secondary and above	26 (28.9)	38 (11.7)	1	
	Primary education (1-8)	26 (28.9)	195 (60.2)	7.69 (3.7-16.1)	0.001
	No formal education	38 (42.2)	91 (28.1)	3.42 (1.6-7.4)	0.002
Sexual experience	Sexually active <18 years old	54 (60.0)	142 (47.5)	1	
	Sexually active ≥18 years of age	36 (40.0)	157 (52.5)	1.39 (0.7-2.5)	0.282
Knowledge about contraceptive use	Comprehensive knowledge	37 (41.1)	92 (28.4)	1	
	Good knowledge	20 (22.2)	98 (30.2)	1.29 (0.6-2.5)	0.496
	Poor knowledge	33 (36.7)	134 (41.4)	1.73 (0.9-3.3)	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 (0.2-0.8)	0.096
Parent-adolescent communication on (SRH)	Yes	40 (44.4)	86 (26.5)	1	
	No	50 (55.6)	238 (73.5)	1.37 (0.7-2.5)	0.326
Household living arrangement	Live with both biological parents	29 (32.2)	46 (14.2)	1	
	Live with one biological parent	23 (25.6)	171 (52.8)	3.71 (1.8-7.8)	0.001
	Live with neither biological parent	25 (27.8)	80 (24.7)	2.14 (1.0-4.5)	0.043
	Married and living with husband	13 (14.4)	27 (8.30)	2.04 (0.8-5.0)	0.132

194

DISCUSSIONS

This study showed that the prevalence of pregnancy among adolescent girls (10–19 years) in the Nguenyiel 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.

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3 221 This study showed that pregnancy among refugee adolescents was associated with increasing age; the odds of
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5 222 pregnancy among late adolescent girls (17–19 years) was 2.8 times higher than girls in the early and middle
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7 223 stages of adolescence (10–16 years). This is in line with studies conducted in Eastern Ethiopia, East Africa,
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9 224 Northeast Ethiopia, and Kenya. (31,32,34,35). This could be due to the fact that as age increases, teenagers will
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11 225 have more exposure to sex and their chance of getting married also increase.

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14 226 Adolescent girls with primary education (grade 1-8) were 7.7 times more likely to become pregnant compared
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16 227 with their counterparts who attended secondary and above. Likewise, the odds of pregnancy among adolescents
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18 228 with no formal education was 3.4 times as high compared with girls who attained secondary and above.

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21 229 This is similar with finding of studies conducted in Eastern Ethiopia (36), South East Nigeria(30), a systematic
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23 230 review and Meta-analysis in Africa (27), a multi-level analysis in five East African countries(37).The possible
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25 231 justification could be adolescent girls with lower educational attainment lack appropriate information regarding
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27 232 the consequence of unsafe sexual practice as well as the means to avoid unwanted pregnancy.

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31 233 This study showed that household living arrangements (family structure) were associated with adolescent
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33 234 pregnancy: Adolescent girls living with none of their biological parents were twice more likely to be pregnant
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35 235 compared with adolescents living with both biological parents (i.e., living in nuclear families). The odds of
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37 236 pregnancy among adolescent girls living with either of their biological parents (single parent families) was 3.7
38
39 237 times higher compared with girls living with both of their biological parents. This is similar to the findings of
40
41 238 studies conducted in Southern Ethiopia (28), eastern Ethiopia(31) and north east Ethiopia (34). This could be
42
43 239 because adolescent girls who did not live with one or both of their biological parents lack parental support and
44
45 240 guidance. Adolescent girls might have lost one or both of their biological parents during the conflict. Adolescents
46
47 241 in this situation may feel helpless and hopeless and choose to get married or engage in unsafe sex to secure their
48
49 242 survival.

50 51 52 243 **STRENGTH AND LIMITATION OF THE STUDY**

53 54 244 **Strength**

55 245 Conducting community based study, using primary data including collecting urine samples directly from study
56
57 246 participants in the humanitarian settings is strength.

247 *Limitation of the study*

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

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

253 *CONCLUSIONS*

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

259 *Recommendation*

260 *Health Care Provider*

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

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

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

266 Strengthen health education and schooling for refugee adolescent girls.

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

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

269 *Regional Health Bureaus, Zonal and other Health Offices*

270 Strengthening intervention programs aimed at preventing pregnancy among refugee adolescents.

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

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2
3 273 **Researchers**

4 274 Future researchers should focus on exploring the underlying socio-cultural conditions through a mixed approach
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6
7 275 (qualitative and quantitative study).
8

9 276 Important points that are not addressed in this study, like the level of unmet need for family planning and the
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11 277 prevalence of unwanted pregnancy, are among the issues that seek the attention of future researchers.
12

13 278 *Consent to publish*

14 279 Not applicable.
15

16 280 *Availability of data and materials*

17 281 All the data used or mentioned in this research are available
18

19 282 *Competing interests*

20 283 The authors declare that they have no competing interests.
21

22 284 *Funding*

23 285 The authors declare that no financial support in the research, authorship, and publication of this article was
24
25 286 received
26

27 287 *Author's contribution*

28 288 All authors made a significant contribution to the work reported, whether that is in the conception, study design,
29
30 289 execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising, or
31
32 290 critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to
33
34 291 which the article has been submitted; and agree to be accountable for all aspects of the work
35
36

37 292 *Acknowledgement*

38 293 We would like to acknowledge Mettu University for financial support. We are also grateful to the data collectors
39
40 294 and respondents who took part in this study.
41

42 295 *Abbreviations and Acronyms*

43 296	ASRH	Adolescent Sexual And Reproductive Health
44		
45 297	ARRA	Administration For Refugees And Returnees Affair
46		
47		
48 298	HCG	Human Chorionic Gonadotropins
49		
50 299	IUGR	Intra-Uterine Growth Restriction
51		
52 300	LBW	Low-Birth Weight
53		
54 301	OCP	Oral Contraceptive Pills
55		
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57 302	LMICs	Low And Middle-Income Countries
58		
59 303	SSA	Sub-Sahara Africa
60		

304	SDM	Standard Day Method
305	SRH	Sexual And Reproductive Health;
306	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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13 430 **Figure 1:** Map of Nguenyiel refugee camp, Gambella, Ethiopia.

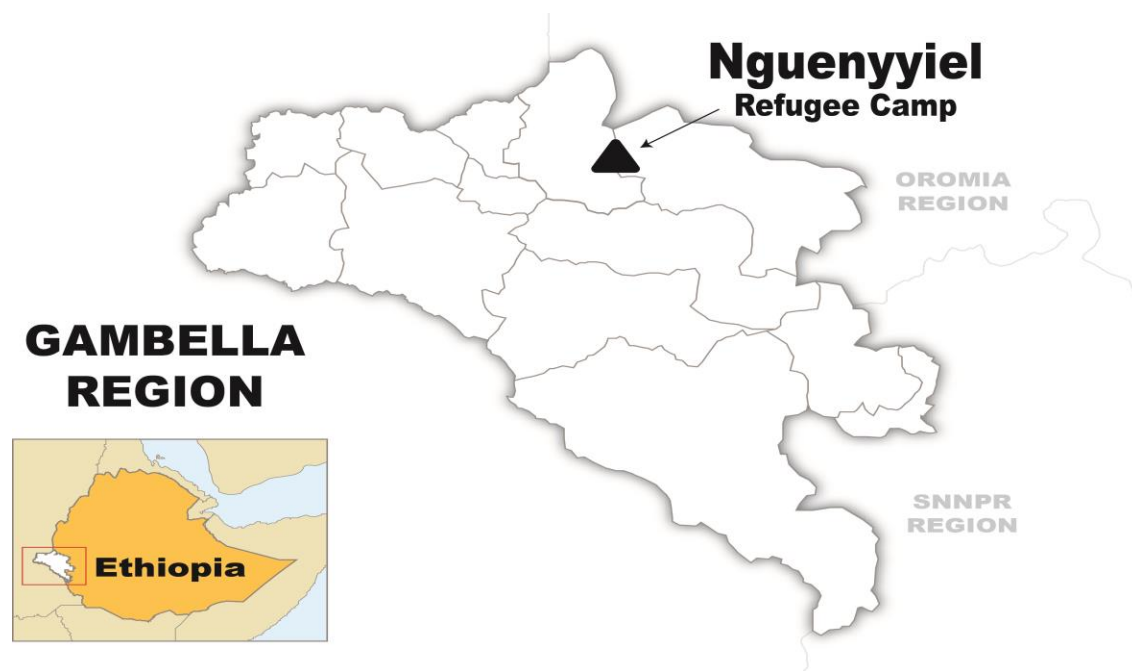
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15 431 Source: [nguenyiel refugee camp map - Bing](#)

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20 433 **Figure 2:** Prevalence of Adolescent pregnancy in humanitarians setting (in Nguenyiel refugee camp)

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

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Pregnancy among Adolescent girls in humanitarian setting

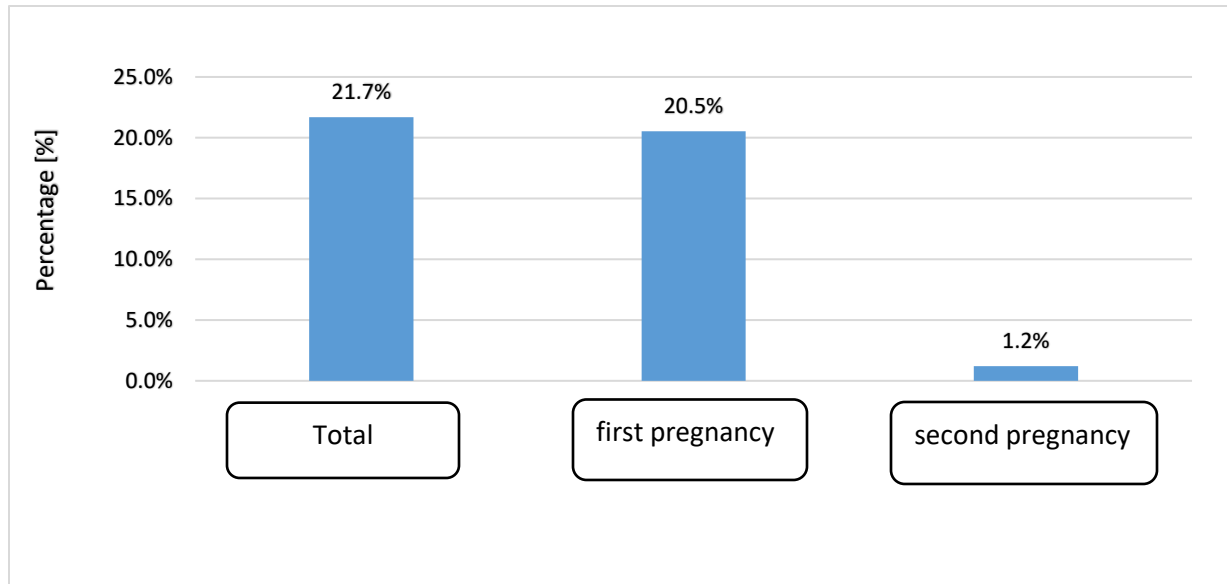


Figure 2: Prevalence of pregnancy among adolescent girls (10-19 years) in Nguenyiel refugee camp, Gambella region, South-west Ethiopia, September 2021.

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.

BMJ Open

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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Primary Subject Heading:	Reproductive medicine
Secondary Subject Heading:	Public health
Keywords:	Reproductive medicine < GYNAECOLOGY, Public health < INFECTIOUS DISEASES, Maternal medicine < OBSTETRICS, SEXUAL MEDICINE

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4 1 Pregnancy among Adolescents Girls in Humanitarian settings: A case in
5 2 Refugee Camp of Gambella Regional state, Community Based Cross-
6 3 Sectional Study, Southwest Ethiopia, 2021
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28

29 14 **ABSTRACT**

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31 15 Objective: The aim of this study was to assess the prevalence of pregnancy and associated factors among
32
33 16 adolescent girls in the Nguenyiel refugee camp.

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36 17 Methods: A community-based cross-sectional study was done among 414 adolescent girls. The Systematic
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38 18 random sampling technique was used to select respondents. Data were collected using a well-structured and
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40 19 pretested questionnaire. Pregnancy test was done using HCG test. Bivariate and Multivariate logistic regression
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42 20 analysis was run to identify factors associated with adolescent pregnancy.

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45 21 Results: The prevalence of pregnancy among adolescent girls in the Nguenyiel refugee camp was 21.7% (95%
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47 22 C.I: 17.6-25.6). Factors associated with adolescent pregnancy were age (17-19 years) (AOR: 2.79; 95% C.I:
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49 23 1.55-5.05); Educational status: Primary education (AOR: 7.69; 95% C.I: 3.55-16.68); No formal education
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51 24 (AOR: 3.42; 95% C.I: 1.59-7.36), and Household living arrangement: Living with none of biological parents
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53 25 (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).

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55
56 26 **Conclusions and Recommendations:** This study showed that there is a high prevalence of pregnancy among
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58 27 adolescent girls in the study setting. Age (17-19 years), Educational status, and Household living arrangement
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(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, Nguenyiel, 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, Low 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

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3 54 refugee adolescent girls' decision-making power related to their sexual relationships and reproductive life (10).
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5 55 Hence, adolescents may lack the autonomy to determine over their affairs including their sexual and reproductive
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7 56 health and rights (12,18). Adolescents are also the only age group for whom AIDS deaths are on the rise(11).
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11 57 According to the Ethiopian Demographic and health survey and many other studies, the study area, Gambella
12
13 58 Regional State of Ethiopia, has high unmet need for family planning (23%)(14), high polygamy practice
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15 59 (21%)(19) and highest HIV/STIs prevalence in the country due to multiple factors such as, low service coverage,
16
17 60 high prevalence of male uncircumcision, early sexual initiation among adolescents related to traditional
18
19 61 malpractice like "*Tifo bet*" (20) and environmental factors like presence Gold Mining Workers(21) and others
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21 62 (14,18,20,22–24). Besides, majority of the refugee community including adolescents are those who lost one or
22
23 63 both of their parents during the conflict. This leaves adolescent girls helpless and enforce them to be engaged
24
25 64 risky sexual behaviours. However, there was no study conducted to determine the prevalence and factors
26
27 65 associated with pregnancy among adolescent refugees in humanitarian settings. This study, therefore, aimed at
28
29 66 assessing the prevalence of pregnancy among adolescent girls and associated factors in the Nguenyiel refugee
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31 67 camp, Gambella region, Southwest Ethiopia.

35 36 68 **METHODS AND MATERIALS**

37 38 69 **Study Design and Setting**

39
40 70 A community-based cross-sectional study was conducted in the Nguenyiel refugee camp, Gambella region,
41
42 71 from May 15 to June 15, 2021. The Gambella region hosted a 337,081 refugee population from the bordering
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44 72 country of South Sudan in 7 refugee camps (as of May 2021). The Nguenyiel refugee camp is the newest and
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46 73 largest camp in Ethiopia. It opened to accommodate the new refugee influx from South Sudan following the
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48 74 escalation of conflict in that country in July 2016. It is located in Itang special woreda (district). It is located
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50 75 about 769 km from the capital, Finfinnee/Addis Ababa, and 55 km from the region's capital, Gambella (25) (*See*
51
52 76 *figure 1*). It has 10,916 households and total populations of 90,506 with Male (43,757) and Female (46,747).
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56
57 77 Adolescents constitute majority of the women in the Reproductive age in the camp
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78 Population

79 Source population

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

82 Eligibility Criteria

83 Inclusion criteria

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

86 Sample size determination

87 The sample size was calculated for both objectives. For the first objective, sample size was
88 calculated using a single population proportion formula with the assumptions of: $Z = 1.96$ at 95%
89 confidence interval, $d =$ Margin of error assumed to be (0.05), $P =$ prevalence of pregnancy in
90 adolescent from previous studies (2), and 10% non-response rate; $n = Z\alpha_2p(1-p)/d^2 = 421$

91 The sample size for the second objective was calculated by using the double population proportion
92 formula using Epi info version 3.0 statistical software by considering the following assumptions
93 after reviewing previous literature: $Z\alpha/2$: 1.96 at 95% confidence level, $Z\beta$: power = statistical
94 power of 80%, $P1$: the probability of outcome in the unexposed, $P2$: the probability of outcome in
95 the exposed and r : ratio of unexposed to exposed (Table 1).

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

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110 Table 1: Sample size calculation based on the significant factors of adolescent pregnancy;
111 Nguenyiel 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

112

113 Sampling techniques and Procedures

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

123 Operational definitions

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

127 **Communication on SRH issues:**

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

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

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

137 Data collection Tools and Procedures

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

148 Data Quality control and Analysis

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

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

160 Bivariate and multivariate logistic regression analysis was done to identify factors
161 associated with the outcome variable. Accordingly, variables with a p-value < 0.25 on bi-variable
162 logistic regression were taken as candidates for multivariate analysis. The goodness of fit for the
163 final regression model was checked by the Hosmer-Lemeshow goodness of fit test at a p-value of
164 > 0.05 . On multivariate logistic regression analysis, variables with a p-value of less than 0.05 at a
165 95% confidence level were declared significant. The adjusted odds ratio is used to measure the
166 strength of the association.

167 Patient and Public Involvement

168 No Patient and public involvement

169 RESULTS

170 Socio-Demographic Characteristics of Respondents

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

174 girls (14-16 years), while 9 (2.2%) were in the early adolescence stage (10-13 years). Nearly three-fourths of
 175 respondents, 309 (74.6%), were protestants, while 57 (13.8%) and 32 (7.7%) were Seventh-Day Adventist and
 176 Church of God, respectively. More than half, 221 (53.4%) had primary and nearly one-third of respondents, 129
 177 (31.1%), had no formal education. Three-fourths of adolescent girls, 313 (75.6%) were single (not married) and
 178 101 (24.4%) were married or ever-married. The majority of married adolescents, 85 (84.2%), get married while
 179 they are in their middle adolescence age (14-16 years); and one-fifth of marriages, 21 (20.8%), were arranged
 180 marriages (Table 2).

181 Table 2: Socio-demographic characteristics of respondents (adolescent girls, N=414) in
 182 Nguenyiel 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

183

184 **Family related - characteristics of respondents**

185 Only one hundred twenty-six (30.4%) of the study participants had communication with their parents on sexual
 186 and reproductive health (SRH) issues, while more than two thirds of adolescent girls (288, 69.6%) had no
 187 communication with their parents on the issues. Nearly half of adolescents, 194 (46.9%), live with either of their
 188 biological parents (single parent). One-fourth, 104 (25.4%), live with none of their biological parents, and less
 189 than one fifth of adolescents, 75 (18.1%), live with both biological parents. The mean family size in households
 190 of the respondents was 6.32 people, with ± 1.86 SD and a range of 2–13. The majority of adolescent girls, 351
 191 (84.8%), live in households with 5 or more people, three-fourths (75%) of whom live in large families of 7 or
 192 more people (Table 3).

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

Variable	Category	Frequency	Percent
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Parent-adolescent 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 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

195

Respondents Knowledge about contraceptive methods among

196

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.

198

199

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).

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

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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

205

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 Nguenyiel 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 year	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 year)	68	17.5
	Early sexual initiation(debut) (N	Yes	338
			86.9
		No	51
			13.1
	Knowledge About	Comprehensive knowledge	129
	contraceptive methods		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

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

219

220 Prevalence of adolescent pregnancy in Nguenyiel refugee camp, Gambella region

221 The prevalence of pregnancy among adolescent girls in the Nguenyiel refugee camp was 21.7% (95% C.I: 17.6-
222 25-6). More than half of pregnant girls (51.1%) were middle adolescents (14–16 years) and 48.9% were late
223 adolescents (17–19 years old).

224 Factors associated with pregnancy among Adolescent

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

228 The odds of pregnancy among late adolescent girls (17-19 years) was 2.8 times higher compared with adolescents
229 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
230 times more likely to become pregnant compared with those with secondary and above (AOR: 7.7; 95% C.I: 3.55–
231 16.7). Similarly, the odds of pregnancy among adolescent girls with no formal education were 3.4 times higher
232 compared with girls who attended secondary school and above (AOR: 3.4; 95% C.I: 1.6-7.4).

233 Odds of pregnancy among adolescent girls living with none of their biological parents were two times
234 more likely to be pregnant compared with adolescents living with both biological parents (AOR: 2.1;
235 95% C.I: 1.02-4.5). Likewise, the odds of pregnancy among adolescent girls living with either of their biological
236 parents was 3.7 times higher compared with girls living with both of their biological parents (AOR: 3.7; 95%
237 C.I: 1.8–7.8) (Table 6).

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

Variable	Pregnancy (status)	AOR (95% C.I)	P-value		
				Yes (HCC)	No(HCGnegative)
Categories	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 (1.55-4.9)	0.001
	Secondary and above	26 (28.9)	38 (11.7)	1	
Educational status	Primary education (grade 1-8)	26 (28.9)	195 (60.2)	7.69 (3.55-16.7)	0.001
	No formal education	38 (42.2)	91 (28.1)	3.42 (1.59-7.4)	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 (SRH)	Yes	40 (44.4)	86 (26.5)	1	
Household living arrangement	No	50 (55.6)	238 (73.5)	1.37 (0.73-2.54)	0.326
	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 together with husband	13 (14.4)	27 (8.30)	2.04 (0.81-5.14)	0.132

241

242 DISCUSSIONS

242

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

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

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2
3 252 The findings of this study are higher than the findings of similar studies among adolescent girls in non-emergency
4
5 253 (non-humanitarian) settings: in Africa (a pooled prevalence of 18.8%)(34). Arba Minch town, Southern Ethiopia
6
7 254 (7.7%),(35), Gambella region of Ethiopia (16.2%) and India (10%) (36).

9 255 The possible reasons for the difference in the prevalence of adolescent pregnancy in humanitarian settings
10
11 256 compared with non-emergency contexts could be due to differences in settings. That is, adolescents in
12
13 257 humanitarian settings are more vulnerable to poor socio-economic status following the disruption of family
14
15 258 structure, loss of father or mother, or both, during conflict or disaster.

17 259 This in turn leads adolescents to hopelessness, being prone to gender-based violence and early marriage. In
18
19 260 addition to that, basic reproductive health care services like family planning, including health information
20
21 261 communication on reproductive issues, are less available in humanitarian settings than in non-humanitarian
22
23 262 settings.

26 263 On the other hand, the finding of this study is lower than that of studies conducted in: Nigeria (45.4%)(37),
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28 264 Eastern Ethiopia, (30.2%)(34), East Africa (pooled prevalence of 54.6%)(38), Uganda (35.8%)(39) and north
29
30 265 east Ethiopia (28.6%)(27). The possible explanation for this discrepancy could be difference in socio-
31
32 266 demographic, socio-economic, larger sample size and inclusion terminated pregnancy in the case of East Africa
33
34 267 pooled prevalence.

36 268 This study showed that pregnancy among refugee adolescents was associated with increasing age; the odds of
37
38 269 pregnancy among late adolescent girls (17–19 years) was higher than girls in the early and middle stages of
39
40 270 adolescence (10–16 years). This is in line with studies conducted in Eastern Ethiopia, East Africa, Northeast
41
42 271 Ethiopia, and Kenya. (27,34,38,40). This could be due to the fact that as age increases, teenagers will have more
43
44 272 exposure to sex and their chance of getting married also increase.

46 273 Adolescent girls with primary education (grade 1-8) were more likely to become pregnant compared with their
47
48 274 counterparts who attended secondary and above. Likewise, the odds of pregnancy among adolescents with no
49
50 275 formal education was high compared with girls who attained secondary and above.

51 276 This is similar with finding of studies conducted in Eastern Ethiopia (41), South East Nigeria(37), a systematic
52
53 277 review and Meta-analysis in Africa(42) (42), a multi-level analysis in five East African countries(43).The

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

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

290 CONCLUSIONS

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

296 Recommendation

297 *Health Care Provider*

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

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2
3 301 **Humanitarian organizations (MS, ARRA, UNHCR, etc.)**

4 302 Strengthen adolescent-youth-friendly services and adolescent girls' empowerment in refugee camps.

6
7 303 Strengthen health education and schooling for refugee adolescent girls.

8
9 304 strengthen comprehensive sexuality education (CSE) programs at schools in refugee camps.

10
11 305 Adolescent girls who have lost their parents should be given special attention.

12
13 306 **Regional Health Bureaus, Zonal and other Health Offices**

14
15 307 Strengthening intervention programs aimed at preventing pregnancy among refugee adolescents.

16
17 308 Prepare programs and strategies (approaches) to support refugee adolescent girls living with none or either of
18
19 309 their biological parents

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21
22
23 310 **Researchers**

24 311 Future researchers should focus on exploring the underlying socio-cultural conditions through a mixed approach
25
26 312 (qualitative and quantitative study).

27
28 313 Important points that are not addressed in this study, like the level of unmet need for family planning and the
29
30 314 prevalence of unwanted pregnancy, are among the issues that seek the attention of future researchers.

31
32 315 *Consent to publish*

33 316 Not applicable.

34 317 *Availability of data and materials*

35 318 All the data used or mentioned in this research are available

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42 324 *Author's contribution*

43 325 **Koang Nyak Bol:** made a significant contribution to the conception, study design, execution,
44
45 326 acquisition of data, analysis, and interpretation and has agreed on the journal to which the article
46
47 327 has been submitted.

48 328 **Ebissa Negera:** took part in study design, execution, drafting, revising and critically reviewing

49 329 the article; gave final approval of the version to be published; agreed on the journal to which the

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51 330 article has been submitted.
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3 331 **Abdi Geda Gedefa:** contributed to planning, acquisition of data, analysis and interpretation,
4
5 332 revising and critically reviewing the article, writing the report, and agreed on the journal to which
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7 333 the article has been submitted.
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12
13 336 and respondents who took part in this study.
14

15 337 *Abbreviations and Acronyms*

16 338	ASRH	Adolescent Sexual And Reproductive Health
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18 339	ARRA	Administration For Refugees And Returnees Affair
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20 340	HCG	Human Chorionic Gonadotropins
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22 341	IUGR	Intra-Uterine Growth Restriction
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24 342	LBW	Low-Birth Weight
25		
26 343	OCP	Oral Contraceptive Pills
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28 344	LMICs	Low And Middle-Income Countries
29		
30 345	SSA	Sub-Sahara Africa
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32 346	SDM	Standard Day Method
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34 347	SRH	Sexual And Reproductive Health;
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36 348	RC	Refugee Camp
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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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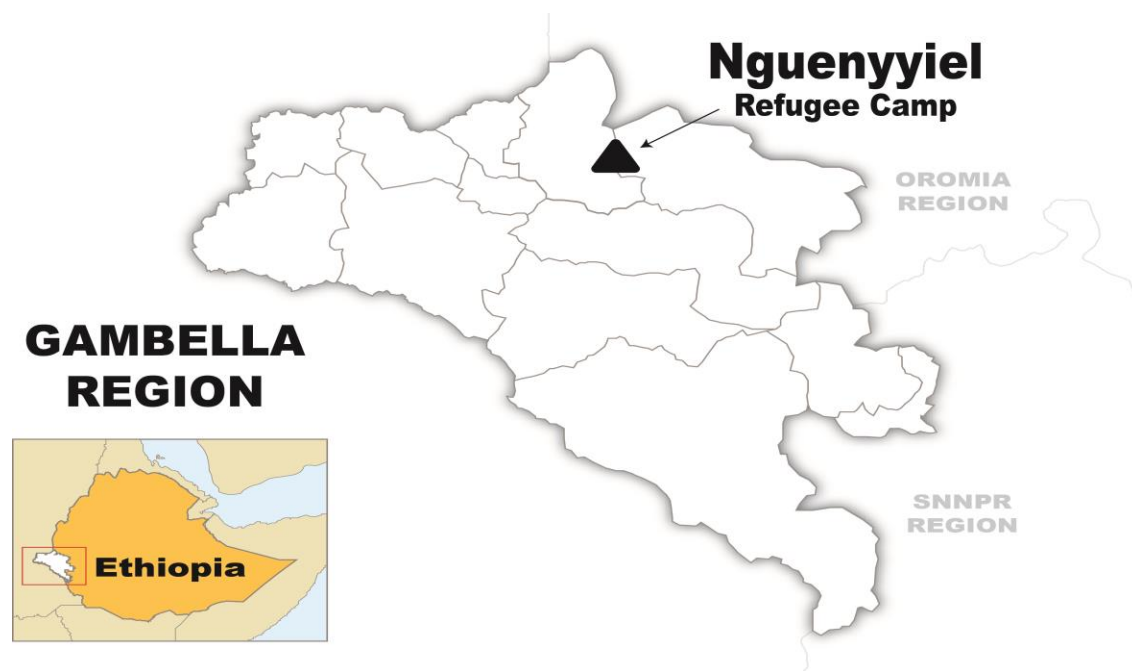
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28 487 **Figure 1:** Map of Nguenyiel refugee camp, Gambella, Ethiopia.
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30 488 Source: [nguenyiel refugee camp map - Bing](#))
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3 Map of Nguenyyiel refugee Camp
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28 Figure 1. Map of Nguenyyiel refugee Camp, Gambella, Ethiopia.

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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.

BMJ Open

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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Primary Subject Heading:	Reproductive medicine
Secondary Subject Heading:	Public health, Sexual health
Keywords:	Reproductive medicine < GYNAECOLOGY, Public health < INFECTIOUS DISEASES, Maternal medicine < OBSTETRICS

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4 1 Pregnancy among Adolescents Girls in Humanitarian settings: A case in
5 2 Refugee Camp of Gambella Regional state, Community Based Cross-
6 3 Sectional Study, Southwest Ethiopia, 2021
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29 14 **ABSTRACT**

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31 15 **Objective:** The aim of this study was to assess the prevalence of pregnancy and associated factors among
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33 16 adolescent girls in Nguenyiel refugee camp.
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36 17 **Design:** cross-sectional study was employed to conduct this study.
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39 18 **Setting:** A community based cross sectional study was done in Nguenyiel refugee camp
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42 19 **Participants:** Four hundred fourteen adolescent girls participated on this study. The Systematic random
43
44 20 sampling technique was used to select respondents. Data were collected using a well-structured and pretested
45
46 21 questionnaire. Pregnancy test was done using HCG test. Bivariate and Multivariate logistic regression analysis
47
48 22 was run to identify factors associated with adolescent pregnancy.
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51 23 **Results:** The prevalence of pregnancy among adolescent girls in the Nguenyiel refugee camp was 21.7%
52
53 24 (95% C.I: 17.6-25.6). Factors associated with adolescent pregnancy were age (17-19 years) (AOR: 2.79; 95%
54
55 25 C.I: 1.55-5.05); Educational status: Primary education (AOR: 7.69; 95% C.I: 3.55-16.68); No formal education
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57 26 (AOR: 3.42; 95% C.I: 1.59-7.36), and Household living arrangement: Living with none of biological parents
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59 27 (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).
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3 28 **Conclusions and Recommendations:** This study showed that there is a high prevalence of pregnancy among
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5 29 adolescent girls in the study setting. Age (17-19 years), Educational status, and Household living arrangement
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7 30 (Live with none of the biological parents; Live with either of biological parents) were among the factors
8
9 31 significantly associated with adolescent pregnancy. Hence, health workers and other stakeholders in the camps
10
11 32 should focus on strengthening adolescent sexual health education giving especial attention to late adolescents,
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13 33 uneducated and live without biological family.

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16 34 **Key words:** Adolescents, pregnancy, Gambella, Nguenyiel, Refugee, Ethiopia.

17 35 **Strength and limitation of this study**

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21 36 • Conducting community-based studies, using primary data including collecting urine samples directly from
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23 37 study participants in humanitarian settings, is strength.
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25 38 • The Human chorionic gonadotropin (HCG) test cannot detect a pregnancy that is less than a week old.
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27 39 • Since adolescent pregnancy is a sensitive issue, respondents may commit social desirability bias.
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29 40 • Therefore, the prevalence of pregnancy among adolescent girls identified by this study among study
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31 41 participants might be higher than the one reported by this study.

32 42 **INTRODUCTION**

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34 43 Each year, an estimated 21 million adolescent girls become pregnant every year and approximately 12 million
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36 44 of them give birth worldwide(1). At least 777,000 births occur to adolescent girls younger than 15 years in
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38 45 developing countries(1). Adolescent pregnancy is associated with higher risks of Adverse Birth Outcomes
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40 46 such as preterm birth, Low Birth Weight (LBW), Intra uterine growth retardation (IUGR), stillbirth, unsafe
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42 47 abortion, maternal and neonatal mortality and morbidity compared with women in their twenties (2–10).
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44 48 Complications from pregnancy and childbirth are the leading cause of death among adolescent girls(11,12).
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46 49 Moreover, adolescent pregnancy is associated with social and economic problems like school drop-out,
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48 50 unemployment, and limited future opportunities, risk of remaining poor and, and increased cost for health care
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50 51 (3,13).

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52 52 Many teenage pregnancies in Ethiopia occur within marriage(14). Similarly, other studies showed that the
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54 53 prevalence of pregnancy among adolescent girls in humanitarian settings (refugee camps or settlements) is
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3 54 30% higher than among their non-displaced counterparts (13, 14). This is due to the fact that adolescents in
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5 55 humanitarian settings are extremely vulnerable to early sexual practice, violence, and exploitation or abuse
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7 56 compared with their counterparts in general population (15–17). The experience of forced migration impacts
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9 57 refugee adolescent girls' decision-making power related to their sexual relationships and reproductive life (10).
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11 58 Hence, adolescents may lack the autonomy to determine over their affairs including their sexual and
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13 59 reproductive health and rights (12,18). Adolescents are also the only age group for whom Acquired Immune
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15 60 deficiency syndrome (AIDS) deaths are on the rise(11).

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19 61 According to the Ethiopian Demographic and health survey and many other studies, the study area, Gambella
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21 62 Regional State of Ethiopia, has high unmet need for family planning (23%)(14), high polygamy practice
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23 63 (21%)(19) and highest Human immune deficiency Virus (HIV)/sexually transmitted infections (STIs)
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25 64 prevalence in the country due to multiple factors such as, low service coverage, high prevalence of male
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27 65 uncircumcision, early sexual initiation among adolescents related to traditional malpractice like “*Tifo bet*” (20)
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29 66 and environmental factors like presence Gold Mining Workers(21) and others (14,18,20,22–24). Besides,
30
31 67 majority of the refugee community including adolescents are those who lost one or both of their parents during
32
33 68 the conflict. This leaves adolescent girls helpless and enforce them to be engaged risky sexual behaviours.
34
35 69 However, there was no study conducted to determine the prevalence and factors associated with pregnancy
36
37 70 among adolescent refugees in humanitarian settings. This study, therefore, aimed at assessing the prevalence of
38
39 71 pregnancy among adolescent girls and associated factors in the Nguenyiel refugee camp, Gambella region,
40
41 72 Southwest Ethiopia.

73 **METHODS AND MATERIALS**

74 **Study Design and Setting**

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

1
2
3 80 about 769 km from the capital Finfinnee/Addis Ababa, and 55 km from the region's capital, Gambella (25)
4
5 81 (*See figure 1*). It has 10,916 households and total populations of 90,506 with Male (43,757) and Female
6
7 82 (46,747). Adolescents constitute majority of the women in the Reproductive age in the camp
8
9

10 83 Population

11 12 84 Source population

13
14 85 The source populations were all adolescent girls (10-19 years) in the Nguenyiel refugee camp. The study
15
16 86 populations were adolescent girls in the selected households who participated on this study.
17

18 19 87 Eligibility Criteria

20 21 88 Inclusion criteria

22
23 89 All girls in the adolescence age interval (10-19) who were residents in the Nguenyiel refugee camp at least for
24
25 90 the last six months before the data collection were considered eligible.
26

27 91 Sample size determination

28
29 92 The sample size was calculated for both objectives. For the first objective, sample size was
30
31 93 calculated using a single population proportion formula with the assumptions of: $Z = 1.96$ at 95%
32
33 94 confidence interval, $d = \text{Margin of error}$ assumed to be (0.05), $P = \text{prevalence of pregnancy in}$
34
35 95 adolescent from previous studies (2), and 10% non-response rate; $n = Z\alpha/2p(1-p)/d^2 = 421$
36

37
38 96 The sample size for the second objective was calculated by using the double population
39
40 97 proportion formula using Epi info version 3.0 statistical software by considering the following
41
42 98 assumptions after reviewing previous literature: $Z\alpha/2$: 1.96 at 95% confidence level, $Z\beta$: power =
43
44 99 statistical power of 80%, $P1$: the probability of outcome in the unexposed, $P2$: the probability of
45
46 100 outcome in the exposed and r : ratio of unexposed to exposed (Table 1).
47

48
49 101 As shown in the above table, since the calculated sample sizes for the second objective are less
50
51 102 than that of the first objective ($n = 421$), finally, the larger sample size ($n = 421$) was taken and
52
53 103 used for this study.
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57 105
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109
110 Table 1: Sample size calculation based on the significant factors of adolescent pregnancy;
111 Nguenyiel 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

112

113 Sampling techniques and Procedures

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

123 Operational definitions

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

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

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

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

137 Data collection Tools and Procedures

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

148 Data Quality control and Analysis

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

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

160 Bivariate and multivariate logistic regression analysis was done to identify factors
161 associated with the outcome variable. Accordingly, variables with a p-value < 0.25 on bi-
162 variable logistic regression were taken as candidates for multivariate analysis. The goodness of fit
163 for the final regression model was checked by the Hosmer-Lemeshow goodness of fit test at a p-
164 value of > 0.05 . On multivariate logistic regression analysis, variables with a p-value of less than
165 0.05 at a 95% confidence level were declared significant. The adjusted odds ratio is used to
166 measure the strength of the association.

167 Patient and Public Involvement

168 No Patient and public involvement

169 RESULTS

170 Socio-Demographic Characteristics of Respondents

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

174 girls (14-16 years), while 9 (2.2%) were in the early adolescence stage (10-13 years). Nearly three-fourths of
 175 respondents, 309 (74.6%), were protestants, while 57 (13.8%) and 32 (7.7%) were Seventh-Day Adventist and
 176 Church of God, respectively. More than half, 221 (53.4%) had primary and nearly one-third of respondents,
 177 129 (31.1%), had no formal education. Three-fourths of adolescent girls, 313 (75.6%) were single (not
 178 married) and 101 (24.4%) were married or ever-married. The majority of married adolescents, 85 (84.2%), get
 179 married while they are in their middle adolescence age (14-16 years); and one-fifth of marriages, 21 (20.8%),
 180 were arranged marriages (Table 2).

181 Table 2: Socio-demographic characteristics of respondents (adolescent girls, N=414) in
 182 Nguennyiel 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

183

184 Family related - characteristics of respondents

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

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

Variable	Category	Frequency	Percent
Parent-adolescent communication on 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 parents	194	46.9
	Live with none of biological parents	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

195

196 Respondents Knowledge about contraceptive methods among

197 More than one-third of adolescent girls, 167 (40.3%), had poor knowledge of modern contraceptive methods;
 198 118 (28.5%) and 129 (31.2%), respectively, had good and comprehensive knowledge of modern
 199 contraceptives. The majority of respondents (326, 78.7%) knew or ever heard of Condom, 305 (73.7%) knew
 200 or ever heard of oral contraceptive pills (OCP), more than half (218, 52.7%) knew or heard about injectables
 201 (Depo-Provera & NET-EN), and 154 (37.2%) heard about implants (Table 4).

202
 203 Table 4: Knowledge of modern contraceptive methods among adolescent girls (N=414) in Nguenyiel refugee
 204 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

206 SRH characteristics (behaviours) of respondents

207 The mean age at menarche (first menstrual bleeding) was 12.5 years with ± 1.99 SD. Menarche in almost all
 208 respondents, 403 (99.5%), occurred between 10 and 14 years of age. The mean age at first sexual intercourse
 209 among respondents was 14.03 years, with ± 3.88 SD. Almost half of the adolescent girls, 193 (49.6%), were
 210 sexually active before 15 years; two-thirds of the respondents, 257 (66.0%), were sexually active in middle
 211 adolescence (14–16 years); and 338 (86.9%) of adolescents had sexual intercourse before 18 years. The
 212 contraceptive prevalence rate (CPR) among adolescent girls was 27 (6.5%). Out of these, 23 (5.6%) of
 213 adolescents had ever used injectables (Depo-Provera and/or NET-EN); 26 (6.3%) used condoms, and 27
 214 (6.5%) of respondents used oral contraceptive pills (OCPs) (Table 5).

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

Variable	Category	Frequency	Percent
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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	Sexually active before 15 ye	193	49.6
(N=389)			
	Sexually active at 15-19 year	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 year	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

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

219

220 Prevalence of adolescent pregnancy in Nguenyiel refugee camp, Gambella region

221 The prevalence of pregnancy among adolescent girls in the Nguenyiel refugee camp was 21.7% (95% C.I:
222 17.6-25.6). More than half of pregnant girls (51.1%) were middle adolescents (14–16 years) and 48.9% were
223 late adolescents (17–19 years old).

224 Factors associated with pregnancy among Adolescent

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

228 The odds of pregnancy among late adolescent girls (17-19 years) was 2.8 times higher compared with
229 adolescents 10-16 years of age (AOR: 2.8; 95% C.I: 1.6-5.1). Adolescent girls with primary education (grade
230 1–8) were 7.7 times more likely to become pregnant compared with those with secondary and above (AOR:
231 7.7; 95% C.I: 3.55–16.7). Similarly, the odds of pregnancy among adolescent girls with no formal education
232 were 3.4 times higher compared with girls who attended secondary school and above (AOR: 3.4; 95% C.I: 1.6-
233 7.4).

234 Odds of pregnancy among adolescent girls living with none of their biological parents were two times
235 more likely to be pregnant compared with adolescents living with both biological parents (AOR: 2.1;
236 95% C.I: 1.02-4.5). Likewise, the odds of pregnancy among adolescent girls living with either of their
237 biological parents was 3.7 times higher compared with girls living with both of their biological parents (AOR:
238 3.7; 95% C.I: 1.8–7.8) (Table 6).

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

241

Variable	Pregnancy (status)	AOR (95% C.I)	P-value		
				Yes (HCG positive) N (%)	No(HCGnegative) 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 (1.55-4.98)	0.001
	Secondary and above	26 (28.9)	38 (11.7)	1	
Educational status	Primary education (grade 1-8)	26 (28.9)	195 (60.2)	7.69 (3.55-16.7)	0.001
	No formal education	38 (42.2)	91 (28.1)	3.42 (1.59-7.4)	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 (0.62-2.65)	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 (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 (1.02-4.45)	0.043
	Married and live together husband	13 (14.4)	27 (8.30)	2.04 (0.81-5.14)	0.132

242

243 DISCUSSIONS

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

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

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

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3 256 The possible reasons for the difference in the prevalence of adolescent pregnancy in humanitarian settings
4
5 257 compared with non-emergency contexts could be due to differences in settings. That is, adolescents in
6
7 258 humanitarian settings are more vulnerable to poor socio-economic status following the disruption of family
8
9 259 structure, loss of father or mother, or both, during conflict or disaster.

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11 260 This in turn leads adolescents to hopelessness, being prone to gender-based violence and early marriage. In
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13 261 addition to that, basic reproductive health care services like family planning, including health information
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15 262 communication on reproductive issues, are less available in humanitarian settings than in non-humanitarian
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17 263 settings.

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21 264 On the other hand, the finding of this study is lower than that of studies conducted in: Nigeria (45.4%)(37),
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23 265 Eastern Ethiopia, (30.2%)(34), East Africa (pooled prevalence of 54.6%)(38), Uganda (35.8%)(39) and north
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25 266 east Ethiopia (28.6%)(27). The possible explanation for this discrepancy could be difference in socio-
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27 267 demographic, socio-economic, larger sample size and inclusion terminated pregnancy in the case of East
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29 268 Africa pooled prevalence.

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32 269 This study showed that pregnancy among refugee adolescents was associated with increasing age; the odds of
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34 270 pregnancy among late adolescent girls (17–19 years) was higher than girls in the early and middle stages of
35
36 271 adolescence (10–16 years). This is in line with studies conducted in Eastern Ethiopia, East Africa, Northeast
37
38 272 Ethiopia, and Kenya. (27,34,38,40). This could be due to the fact that as age increases, teenagers will have
39
40 273 more exposure to sex and their chance of getting married also increase.

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42
43 274 Adolescent girls with primary education (grade 1-8) were more likely to become pregnant compared with their
44
45 275 counterparts who attended secondary and above. Likewise, the odds of pregnancy among adolescents with no
46
47 276 formal education was high compared with girls who attained secondary and above.

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51 277 This is similar with finding of studies conducted in Eastern Ethiopia (41), South East Nigeria(37), a systematic
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53 278 review and Meta-analysis in Africa(42) (42), a multi-level analysis in five East African countries(43).The
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55 279 possible justification could be adolescent girls with lower educational attainment lack appropriate information
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57 280 regarding the consequence of unsafe sexual practice as well as the means to avoid unwanted pregnancy.

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3 281 This study showed that household living arrangements (family structure) were associated with adolescent
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5 282 pregnancy: Adolescent girls living with none of their biological parents were more likely to be pregnant
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7 283 compared with adolescents living with both biological parents (i.e., living in nuclear families). The odds of
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9 284 pregnancy among adolescent girls living with either of their biological parents (single parent families) higher
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11 285 compared with girls living with both of their biological parents. This is similar to the findings of studies
12
13 286 conducted in Southern Ethiopia (35), eastern Ethiopia(34) and north east Ethiopia (27). This could be because
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15 287 adolescent girls who did not live with one or both of their biological parents lack parental support and
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17 288 guidance. Adolescent girls might have lost one or both of their biological parents during the conflict.
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19 289 Adolescents in this situation may feel helpless and hopeless and choose to get married or engage in unsafe sex
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21 290 to secure their survival.

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23
24 291 Finally, even though the authors have tried to maximize the quality of this study, it is important to note that
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26 292 using HCG test to diagnose pregnancy might undermine the true figure of prevalence of adolescent pregnancy
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28 293 as the HCG test cannot detect a pregnancy that is less than a week old.

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30 294 Similar, since sexuality is a sensitive issue, respondents might not disclose their true behaviour. This results in
31
32 295 social desirability bias. Therefore, the authors have forwarded the following recommendations for future
33
34 296 researchers to overcome the limitations committed in this study.

35 36 37 297 **CONCLUSIONS**

38 298 This study showed a high prevalence of pregnancy among refugee adolescent girls (10–19 years) in the
39
40 299 Nguenyiel refugee camp, Gambella region, Ethiopia. The significant factors associated with adolescent
41
42 300 pregnancy were: Age (17–19 years), educational status (no formal education; primary education), and
43
44 301 household living arrangement or family structure: Live with none of the biological parents; live with either of
45
46 302 the biological parents.

47 48 49 303 **Recommendation**

50 51 304 *Health Care Provider*

52 305 Health workers in the camps should work to strengthen targeted adolescent sexual health
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55 306 education and information, giving special attention to the uneducated, those living without
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57
58 307 biological family, and late adolescents.

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3 308 Humanitarian organizations (MS, ARRA, UNHCR, etc.)

4 309 Strengthen adolescent-youth-friendly services and adolescent girls' empowerment in refugee camps.

6
7 310 Strengthen health education and schooling for refugee adolescent girls.

8
9 311 strengthen comprehensive sexuality education (CSE) programs at schools in refugee camps.

10
11 312 Adolescent girls who have lost their parents should be given special attention.

12
13 313 Regional Health Bureaus, Zonal and other Health Offices

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15 314 Strengthening intervention programs aimed at preventing pregnancy among refugee adolescents.

16
17 315 Prepare programs and strategies (approaches) to support refugee adolescent girls living with none or either of
18
19 316 their biological parents

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22
23 317 Researchers

24 318 Future researchers should focus on exploring the underlying socio-cultural conditions through a mixed
25
26 319 approach (qualitative and quantitative study).

27
28 320 Important points that are not addressed in this study, like the level of unmet need for family planning and the
29
30 321 prevalence of unwanted pregnancy, are among the issues that seek the attention of future researchers.

31
32 322 *Consent to publish*

33 323 Not applicable.

34 324 *Availability of data and materials*

35 325 All the data used or mentioned in this research are available

36 326 *Competing interests*

37 327 The authors declare that they have no competing interests.

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40
41 330 received

42 331 *Author's contribution*

43 332 **Koang Nyak Bol:** made a significant contribution to the conception, study design, execution,
44
45 333 acquisition of data, analysis, and interpretation and has agreed on the journal to which the article
46
47 334 has been submitted.

48 335 **Ebissa Negera:** took part in study design, execution, drafting, revising and critically reviewing
49
50 336 the article; gave final approval of the version to be published; agreed on the journal to which the
51
52 337 article has been submitted.

1
2
3 338 **Abdi Geda Gedefa:** contributed to planning, acquisition of data, analysis and interpretation,
4
5 339 revising and critically reviewing the article, writing the report, and agreed on the journal to which
6
7 340 the article has been submitted.
8
9

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12
13 343 collectors and respondents who took part in this study.
14

15 344 *Abbreviations and Acronyms*

16 345	ASRH	Adolescent Sexual And Reproductive Health
17		
18 346	ARRA	Administration For Refugees And Returnees Affair
19		
20 347	HCG	Human Chorionic Gonadotropins
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22 348	IUGR	Intra-Uterine Growth Restriction
23		
24 349	LBW	Low-Birth Weight
25		
26 350	OCP	Oral Contraceptive Pills
27		
28 351	LMICs	Low And Middle-Income Countries
29		
30 352	SSA	Sub-Sahara Africa
31		
32 353	SDM	Standard Day Method
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34 354	SRH	Sexual And Reproductive Health;
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36 355	RC	Refugee Camp
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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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28 494 Figure 1: Map of Nguenyiel refugee camp, Gambella, Ethiopia.

30 495 Source: [nguenyiel refugee camp map - Bing](#))
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Map of Nguenyyiel refugee Camp

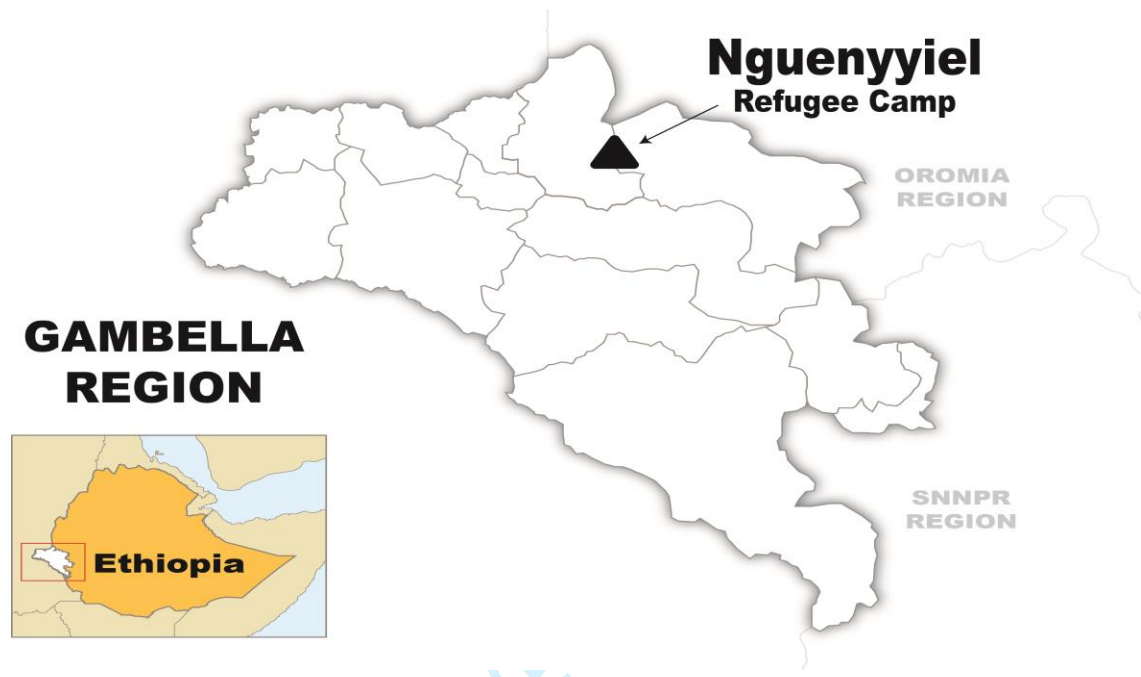


Figure 1. Map of Nguenyyiel refugee Camp, Gambella, Ethiopia.

Source: [nguennyiel 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.