MAGNITUDE AND RISK FACTORS ASSOCIATED WITH ADOLESCENT PREGNANCY IN ETHIOPIA

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ABSTRACT

Adolescent pregnancy occurs in girls aged between 13-19 years and is a major cause of newborn and maternal mortality in developing countries. This study examined the magnitude and risk factors associated with adolescent pregnancy in Ethiopia. The 2016 Ethiopian national representative survey was employed in the study. The sample of EDHS data was selected using a two-stage cluster sampling strategy. Descriptive statistics were developed using frequencies and percentages. The multilevel logistic regression approaches were then employed to determine the risk factors associated with adolescent pregnancy to factors that were shown to be significant at the 5% level in univariate analysis. The study found that the overall prevalence of adolescent pregnancy in Ethiopia was 10.26%. The finding also show that adolescent girls who were married at the age of less than 15 years (AOR: 3.14, 95% CI: 2.39, 4.14), between the ages of 15 and 17 years (AOR: 2.23, 95% CI: 1.59, 3.13), and who came from lower- or middle-class income households (AOR: 2.33, 95% CI: 1.55, 3.52), didn't use contraception (AOR: 18.46, 95% CI: 6.89, 49.49), and knew when their cycles were most fertile were more likely to become pregnant. In contrast, adolescent girls who achieved primary school and above, and exposed to media (AOR: 0.76, 95% CI: 0.56, 1.02) were associated to a lower risk of adolescent pregnancy. The finding indicated that adolescent pregnancy is a key public health concern in Ethiopia. Hence, the government should implement policies to limit the risks through formal education, and improve access to reproductive health education and contraception, especially among adolescent girls from the poorest households.

KEYWORDS: Adolescent pregnancy, Risk factors, Magnitude, Ethiopia

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INTRODUCTION

The World Health Organization (WHO) explained adolescence as the transition period between childhood and adulthood aged between 10-19 years[1]. According to the UNICEF, 2018 report, adolescent pregnancy occurs in girls between the ages of 13–19 years[2]. Nowadays, adolescent pregnancy remains a major public health concern worldwide and a leading cause of newborn and maternal mortality in developing countries[3]. In many cases, adolescents are not well informed about sexuality and reproductive health risks, making them vulnerable to early unwanted pregnancies, unsafe abortions, unplanned sexual practices, HIV infection, other sexually transmitted diseases (STIs), and, the physical and emotional challenges associated with adolescent pregnancy.

In Africa, the incidence of adolescent pregnancy is 18.8%, with approximately 19.3% in Sub-Saharan Africa[4] and more than 50% globally occurring in seven countries, including Ethiopia[5]. Annually, an estimated twenty one million and about 12 million girls, aged 15-19 years, become pregnant and give birth, respectively, in the least and middle-income countries[6]. Pregnancy-related difficulties and unsafe abortions also expose adolescent girls to a high risk of maternal mortality, morbidity, and neonatal complications[7-8] and also raise the risk of premature delivery, abnormal birth weight, late educational goals, and maternal depression[3].

Despite efforts aimed at reducing adolescent pregnancy and associated factors, it remains among the key sustainable development goals of the Ethiopian government. This goal is set to be achieved through the implementation of a law against early marriage, a national health strategy for adolescent and youth reproductive services; legalization of abortion; a policy on HIV/AIDS, and community mobilization against harmful traditional practices[9]. According to the EDHS-2016 report, the incidence of adolescent pregnancy was about 16% with a higher incidence rate occurring among rural residents[10]. Several studies identified factors associated with adolescent pregnancy such as early sexual intercourse[11,12], early marriage[13], place of residence[14,16], religion[14,15], age[15-18], employment[18,20], educational status[19,21-22], marital status[17-18], socioeconomic status[13-14,21-23], peer influence[21,22], use of contraceptives[11-12, 21], alcohol consumption[25], lack of comprehensive sexuality education[26], rape[27] and media exposure[23,24]. WHO, 2011 reported that adolescents less than 18 years of age have a 60% greater chance of losing their child in the initial years of life[28] and are highly probable to be exposed to marital violence[29]. Previous studies did not address regional and subject-specific variation in adolescent pregnancy between and within regions of Ethiopia using a nationally representative survey.

METHOD AND MATARIALS

Data Source, Study design, and Sampling

This study was performed use of the 2016 Ethiopian Demographic and Health Survey, a recent survey conducted in Ethiopia by the Central Statistical Agency between 1/18/2016 and 6/27/2016. The survey was done in all regions of Ethiopia using a community-based multistage stratified cluster sampling design with two phases covering 645 enumeration areas. Of the areas sampled for the study, 202 were from urban and 443 were from rural areas, considered the primary phase, and 28 households per cluster were made in the second phase. All men and women aged 15-59 were included in the interview. A total of 16,583 women were participated in the EDHS survey, of whom, 3,498 provided the data in this study[10].

Variables in the study

The outcome variable in this study was the status of adolescent pregnancy. It was coded as "1" when the adolescent become pregnant and "0" when they are not pregnant at the time of data collection. The independent variables considered for this study were age at first marriage, place of residence, marital status, early marriage, region, socio-economic status of parents, knowledge of the fertility window, exposure to mass media, employment, religion, use

of contraceptive method, and alcohol consumption.

Operational definitions

Socio-Economic Status (Wealth index): In numerous DHS and other country-level surveys, the wealth index has been used as a measure to highlight disparities in household characteristics, in the utilization of medical and other services, and in clinical outcomes. The resulting wealth index serves as a metric of wealth that is compatible with measures of income and spending. It divides the ranking into five equal portions, starting with quintile 1 (lowest) and ending with quintile 5 (richest or wealthiest). We divided the household wealth quintile into three categories for our study.

Inclusion and exclusion criteria

Adolescent girls aged between 10 to 19 years and who had full information's about pregnancy during the time of data collection were included, and adolescent's girls who lacks information's about pregnancy during the time of data collection were excluded from the investigation.

Methods of data analysis

Descriptive statistics like frequencies and percentages were used to explain the categories of predictors, and a Chi-square test of association was used to examine statistically significant predictors of adolescent pregnancy. Hosmer and Lemeshow's test of goodness of fit was used to measure the goodness of fit (The null hypothesis for the Hosmer and Lemeshow's test is the data fits the model well), while the Chi-square test for contingency was used to test whether there were systemic differences between the groups or regions[30]. Multilevel binary logistic regression models were employed to identify the effect and variations of pregnancy across the regional state of Ethiopia using the Stata statistical software: release 15 (College Station, TX: StataCorp LLC)[34]. In nested structure data like the Ethiopian demographic and health survey, the individual measurements have some degree of correlation within a cluster due to sharing common characteristics. Thus, when ignoring the correlation of the upper level and considering only the individual level characteristics leads to violating the assumption of independence between measurements. This result leads to an underestimation of standard errors, and biased parameter estimates, producing spurious significant results, and incorrect conclusions on effect sizes. In contrast, modeling individual-to-individual variation simultaneously with group-to-group variation analysis has numerous merits. It allows focusing on the importance of both communities' and individuals' effects on individuals' health outcomes[33]. Therefore, in this study, to get a fixed effect for both the individual and community-level factors and a random effect for the between cluster-variation, a two-level mixed-effect logistic regression analysis was used. In this study, a two-level logistic regression model was taken into account with the adolescent considered as level 1 and regions considered as level 2 to know the unexplained variation within groups and between groups. Three multilevel logistic regression models were examined hierarchically in this study, namely: a null model (model without predictors) or no explanatory variable that examined the total variance in the factors of pregnancy among regions; in model 2, only individual-level factors were included. Model 3 measured the combination of the effects of individual and regional-level factors.

The clustered nature of the data and the within and between community variations were taken into account by assuming each community had a different intercept and fixed coefficient. The amount of community variation was conveyed as intra-class correlation (ICC). The AIC, and BIC were used to choose a model that best explains the data, and the three fitted models with the lowest AIC and BIC value were taken.

RESULTS

Descriptive Statistics Results

In this study, 3498 adolescents from nine regional states falling within two administrative cities in Ethiopia were included. 10.26% of adolescents

had experienced pregnancy during the time of data collection. Of the pregnant adolescents, 8.27%, 20.68%, 7.04%, 13.73%, 15.36%, 10.55%, 6.91%, 15.57%, 14.21%, 1.85%, and 7.17% of them lived in Tigray, Afar, Amhara, Oromia, Somali, Benshangul, SNNPR, Gambella, Harari, Addis Ababa, and Dire-Dawa regions, respectively. 4.25% of urban adolescents and 13.59% of rural adolescents were pregnant during the time of data collection. Of the pregnant adolescents, 5.25% were Orthodox; 14.84% were Muslim, and 11.01% were of other religious faiths. 22.46% of pregnant adolescents had no formal education. 9.47% had primary education; 4.64% had secondary education, and 1.94% had higher education. Of pregnant adolescents, 14.13% were below 15 years of age at first marriage; 11.46% were aged 15-17, and 4.87% were aged 18 and above (table 1).

Table 1: Cross-tabulation between pregnancy status among adolescents and indicator variables

Variables	Categories	Not pregnant Count (%)	Pregnant Counts (%)	Chi-square Value	df	P-value
Region	Tigray	388 (91.73)	35 (8.27)			
	Afar	211 (79.2)	55 (20.68)			
	Amhara	330 (92.96)	25 (7.04%)			
	Oromia	358 (86.27)	57 (13.73)			
	Somali	270 (84.64)	49 (15.36)			
	Benishangul	212 (89.45)	25 (10.55)	101.88	10	0.000
	SNNPR	364 (93.09)	27 (6.91)			
	Gambela	179 (84.43)	33 (15.57)			
	Harari	157 (85.79)	26 (14.21)			
	Addis Adaba	424 (98.15)	8 (1.85)			
	Dire Dawa	246 (92.83)	19 (7.17)			
Residence	Urban	1193 (95.75)	53 (4.25)			
	Rural	1946 (86.41)	306 (13.59)	75.89	1	0.000
Age at first marriage	< 15 years	571 (85.87)	94 (14.13)	96.42	2	0.000
	15-17 years	1024 (88.54)	186 (11.46)			
	≥ 18 years	1544 (95.13)	79 (4.87)			
Religion	Orthodox	1335 (94.75)	74 (5.25)	71.499	2	0.000
	Muslim	1222 (95.16)	213 (14.84)			
	Others	582 (88.99)	72 (11.01)			
Educational status	No education	442 (77.54)	128 (22.46)	128.57	3	0.000
	Primary	1835 (90.53)	192 (9.47)			
	Secondary	761 (95.36)	37 (4.64)			
	Higher	101 (98.06)	2 (1.94)			
Socioeconomic status of family	Poor	992 (82.39)	212 (17.61)	128.54	2	0.000
	Middle	413 (87.87)	57 (12.13)			
	Rich	1734 (95.07)	90 (4.93)			
Knowledge of fertile window	During period	132 (89.8)	15 (10.20)	62.20	5	0.000
	After period	537 (81.86)	119 (18.14)			
	Middle time of period	592 (91.36)	56 (8.64)			
	Before period	237 (89.77)	27 (10.23)			
	Every time	707 (90.06)	78 (9.94)			
	Don't know	934 (93.59)	64 (6.41)			
Use of Contraceptives	No	3015 (91.72)	272 (8.28)	233.84	1	0.000
	Yes	124 (58.77)	87 (41.23)			
Employment Status	No	2342 (89.29)	281 (10.71)	2.30	1	0.129
	Yes	797 (91.09)	78 (8.91)			
	Female	1016 (90.31)	109 (9.69)			
Exposure to Mass Media	No	1321 (85.12)	231 (14.88)	64.684	1	0.008
	Yes	1818 (93.42)	128 (6.58)			
Early Marriage	No	2881 (95.9)	123 (4.1)	339.86	1	0.000
	Yes	358 (72.47)	136 (27.53)			
Alcohol consumption	No	3087 (90.32)	331 (9.68)	54.39	1	0.000
	Yes	52 (65)	28 (65)			

17.61% of pregnant adolescents were from poor family backgrounds; 12.13% were from middle socioeconomic and 4.93% were from wealthy family backgrounds. 10.20% perceived that they were fertile during the menstrual period, 18.14% at the end, 8.64% in the middle, 10.23% before, and 9.94% through the entire 30-day cycle, while 6.41% had no idea of when they were fertile. 41.23% of adolescents used contraceptives, while 8.28% did not use contraceptive methods. Moreover, 10.71% pregnant adolescent had non-employed while 8.91% had employed and 14.88% were non-exposed to mass media and 6.58% were exposed to mass media. Of the pregnant adolescent, 27.53% were married at early age while 4.1% were not married at early age; 35% of adolescent drank alcohol, while 9.68% did not drink alcohol.

Logistic Regression model Result

The Hosmer and Lemeshow test revealed that the p-value was greater than 0.05 and failed to reject the null hypothesis, and it indicated that the logistic model was suitable for the data (Table 2).

Table 2: Hosmer and Lemeshow Test

Hosmer and Lemeshow Test			
Step	Chi-square	Df	Sig.
1	7.825	8	0.451

Test of Heterogeneity

Using the Chi-square test ($p \leq 0.001$), we demonstrated significant heterogeneity between adolescent girls from different regional states of Ethiopia (Table 3).

Table 3: Tests of Heterogeneity

Chi-Square Tests			
Statistics	Value	Df	p-value
Pearson Chi-Square	101.880	10	0.000

Intra-correlation coefficients

The ICC in the null model was 0.1016, indicating that 10.16% of the total variation in the prevalence of adolescent pregnancy could be explained by the grouping structure in higher-level units or regions (Table 4).

Table 4: Summary results of model selection criteria and ICC

Class	Null model	Random intercept model	Random slope model
Deviance	72.02(p≤0.001)	409.7528(p≤0.001)	30.0107(p≤0.001)
AIC	2246.424	1864.671	1844.649
BIC	2258.744	1963.231	1974.008
ICC	0.1016461		

Results of Multilevel Binary Logistic Regression Model Associated with pregnancy status

Regional differences were more significantly associated with the level of education and use of contraceptives (Table 5).

Table 5: Confidence interval estimates of Random intercept and Random slope model

Random effects Parameters Region:Unstructured	Estimate	Std. Err.	[95% Conf. Interval]
Variance (Use of contraceptives)	2.046371	1.270492	[.6060591 6.909615]
Variance (Educational level)	0.194058	0.1339266	[.0501748 750546]
Variance (cons)	0.0214262	0.0375757	[.0006889 6663766]

The finding tells that age at first marriage, level of education, religion, socio-economic dynamics, use of contraceptives, knowledge of the fertility window, and media exposure were significantly associated with the risk factors associated with Adolescent pregnancy among adolescent girls in Ethiopia ($p<0.05$) (table 6).

Table 6: Multilevel Binary logistic regression results of predictors associated with Adolescent pregnancy

Variable	Category	Model 2 Odds Ratio (95% CI AOR)	Model 3 Odds Ratio (95% CI of AOR)	P-value
Age at first marriage	≥18 years	1	1	
	15-17 years	2.66(1.88, 3.77)	2.23(1.59, 3.13)	0.000
	< 15 years	3.53(2.62, 4.78)	3.14(2.39, 4.14)	0.000
Education	No education	1	1	
	Primary	0.49(0.36, 0.66)	0.43(0.28, 0.64)	0.000
	Secondary	0.36(0.22, 0.57)	0.26(0.12, 0.53)	0.000
	Higher	0.19(0.04, 0.82)	0.10(0.02, -0.59)	0.0260
Religion	Orthodox	1	1	
	Muslim	3.03(1.98, 4.62)	2.83(1.92, 4.17)	0.000
	Other	2.94(1.83, 4.73)	2.27(1.40, 3.69)	0.000
Socio-economic status of family	Rich	1	1	
	Middle	2.25(1.50, 3.36)	2.33(1.55, 3.52)	0.000
	Poor	2.81(1.99, 3.98)	2.88(2.03, 4.09)	0.000
Use of contraceptives	Yes	1	1	
	No	13.79(9.45,20.13)	18.46(6.89, 49.49)	0.000
Media Exposure	No	1	1	
	Yes	0.740(0.55, .99)	0.76(0.56, 1.02)	0.0490
Knowledge of fertile window	Do not know	1	1	
	During period	2.60(1.34, 5.05)	2.60(1.32, 5.15)	0.006
	After period	4.43(3.09, 6.34)	4.56(3.17, 6.56)	0.000
	Middle time of period	2.68(1.76, 4.08)	2.90(1.89, 4.46)	0.000
	Before period	3.02(1.76, 5.18)	2.98(1.71, 5.20)	0.000
	Every time	2.01(1.38, 2.92)	2.07(1.42, 3.02)	0.000
Constant		0.02(0.011, 0.035)	0.02(0.013, 0.040)	0.000

The finding revealed that adolescents first marriage aged 15-17 and first marriage < 15 were more likely to experience pregnant than those aged ≥18 (AOR: 2.23 (95% CI: 1.59, 3.13)), and (AOR: 3.14 (95% CI: 2.39, 4.14)) and that the odds of an adolescent who had primary, secondary, and higher education were less likely to experience childbirth than no formal education (AOR: 0.43 (95% CI: 0.28, 0.64), AOR: 0.26 (95% CI: 0.12, 0.53), and AOR: 0.10 (95% CI: 0.02, -0.59)) respectively.

The model showed that adolescents of Muslim and Other religions were more likely to experience pregnant than Orthodox followers (AOR: 2.83 (95% CI: 1.92, 4.17), and AOR: 2.27 (95% CI: 1.40, 3.69)) and that adolescent from poor and middle-income backgrounds was more likely to experience pregnancy than those from higher socioeconomic status (OR: 2.88 (95% CI: 2.03, 4.09) and AOR: 2.33 (95% CI: 1.55, 3.52)) respectively.

Similarly, adolescents who did not use contraceptive methods had higher odds of experiencing pregnancy than those from used contraceptives (AOR: 18.46 (95% CI: 6.89, 49.49)). The finding also showed that the log odds of an adolescent being exposed to mass media were less likely to practice pregnancy than those from non-exposed to media (AOR: 0.76 (95% CI: 0.56, 1.02)) holding the other factors constant in the model. The odds of adolescent

who had knowledge of the fertility window during their period, after their period, middle time of their period, before period, and every time were AOR: 2.60 (95% CI: 1.32, 5.15), AOR: 4.56 (95% CI: 3.17, 6.56), AOR: 2.90 (95% CI: (1.89, 4.46), AOR: 2.98 (95% CI: 1.71, 5.20), AOR: 2.07 (95% CI: 1.42, 3.02) times more likely to experience pregnancy than adolescent with no knowledge about fertile time.

DISCUSSION

This study assessed the magnitude and risk factors associated with pregnancy among adolescent girls in Ethiopia. The results were consistent with previous reports from related studies. Adolescent girls who lived in Afar, Gambella, Somali, Harari, and Oromia regions had higher pregnancy rates than those in Benishangul-Gumuz, Tigray, Dire Dawa, Amhara, SNNPR, and Addis Ababa. This is likely a result of regional differences in cultural and religious variations in values towards reproduction, sexuality and marriage.

Using a multilevel binary logistic model, we demonstrated that age at first marriage, education, religion, socio-economic status, the use of contraceptives, knowledge of the fertile window during the menstrual cycle, and media exposure were significantly associated with adolescent pregnancy in Ethiopia. There were no studies at the national level that did address regional and subject-specific variation in adolescent pregnancy. Therefore, this study examines the heterogeneity between pregnancies among adolescent girls from different regional states of Ethiopia and also explored about the magnitude and the risk factors associated with pregnancy. The finding showed that the risk of adolescent pregnancy was higher among early married adolescent, is consistent with reports by Presler-Marshall and Jones (2012) that revealed early marriage increased the likelihood of adolescent pregnancy[13] and also supports with previous reports that revealed early sexual intercourse was a predictor of increasing adolescent pregnancy[11-12]. The possible reason for this might be that early marriage results in repeated births in less than 24 months, multiple unwanted pregnancies, termination of pregnancy, and early sterilization due to absence of access to contraceptives.

The findings of this study also revealed that education had a significant effect on the risk of adolescent pregnancy. This observation is also consistent with reports by Habito et al (2019) and Eyasu (2016) that uneducated adolescent had an increased incidence of adolescent pregnancy[21,31] and with the CSA, 2016 report that increased the level of education was associated with lower chance of exposure to adolescent pregnancy[10]. Reports by Worku et al (2021) showed that the chance of pregnancy was lower among girls who achieved secondary and higher education[22].

The observation that adolescents from poor and middle-income families were more likely to be exposed to adolescent pregnancy is consistent with reports by Mathewos, and Mekuria (2018) that adolescents who lived with poor parents were more likely to experience adolescent pregnancy[15]. Similar observations have been reported elsewhere[11-12] and could be explained to a certain extent due to the fact that adolescents from wealthy families are more likely to get formal education and access to convectional contraceptives where applicable. Like in this study, exposure to media had previously been reported to have an impact on the risk of adolescent pregnancy[23,24].

The odds of adolescents that do not use contraceptive methods have higher odds of experiencing adolescent pregnancy than those using contraceptive methods is in line with the report of Mathewos, and Mekuria (2018) that the non-use of contraceptives increased the likelihood of adolescent pregnancy[15] and is also consistent with a previous report by Morón-Duarte et al (2018) that a low level of contraceptive utilization increased adolescent pregnancy[11].

Surprisingly, the odds of experiencing pregnancy among adolescents who had an idea of when they had been fertile were higher than those with no idea of fertile time. This finding contradicts a previous

report conducted by Mezmur et al (2021) that the risk of adolescent pregnancy was higher among adolescents with no idea of fertile time[32] and the possible reason might be due to they have less desire to use contraceptives and have the desire to have a child on time.

The findings may therefore contribute to preventative programs and strategies by offering current information for program implementation and decision-making at both the individual and community levels to reduce the risk of adolescent pregnancy..

CONCLUSION

This study demonstrated 10.26% prevalence of adolescent pregnancy in Ethiopia and association with cultural practices as well as socioeconomic status of parents. The study also show that adolescent girls who were married at the age of less than 15 years, between the ages of 15 and 17 years, and who came from lower- or middle-class income households, didn't use contraception, and knew when their cycles were most fertile were more likely to become pregnant. Contrary, adolescent girls who achieved primary school and above, and exposed to media was associated to a lower risk of adolescent pregnancy. This study reveals that adolescent pregnancy is one of public health concern in Ethiopia. Hence, the government should implement policies to limit the risk through formal education, improved access to reproductive health education and contraception, especially among adolescent girls from the poorest households.

DECLARATIONS

Abbreviations

UNICEF: United Nations Children Fund; WHO: World Health Organization; OR: Odds Ratio, CSA: Central Statistical Agency; EAs: Enumeration Area; EDHS: Ethiopian Demographic and Health Survey; SSAR: Sub-Saharan African regions; HIV: Human Immune Virus and STI: Sexually Transmitted Diseases.

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Declaration of interests

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Authors' contributions

All authors played a significant role in designing the study, data analysis, interpretation, drafting, revising the article, and accepting all aspects of the work.

Availability of data and materials

The dataset is available through the CSA website: http://www.statsethiopia.gov.et.

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