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Survival Analysis on Age at Teenage Pregnancies Using Parametric Frailty Models

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors conceived the idea, contributed in the design analyses completed all statistical analyses and interpretation. Both authors read and approved the final manuscript.

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ABSTRACT

Teenage pregnancies are common public health problem in the world. It is one of the main issues concerning reproductive health of teenagers. Although prevention of unwanted teenage pregnancy is our main goal, many females continue to become pregnant at early age. The current article goal is identifying the risk factors affecting survival time of teenage pregnancies. The information of this study was obtained from well-prepared questionnaire and focus group discussion. Female between age intervals 15 to 19 was used for assessing age at teenage pregnancies. Semi parametric model (Cox proportional hazard model) and parametric models (parametric shared frailty) were used to age at teenage pregnancies. The study subjects in this article came from clustered community. Parametric shared frailty models were explored by assuming that women with in the same residence shares similar risk factors. Weibull, Log logistics and Log normal distributions were analyzed for teenagers' data set. All models were compared for their performance based on Akaike information criterion accordingly the log logistic inverse Gaussian shared frailty model was the best model for this data set since it has the minimum Akaike information criterion. This article show that marital status, age at marriage, teenager's education level, Teenager's occupation, mass media, family planning and Religion were significant risk factors for age at teenage pregnancies.

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Keywords: Teenage pregnancies; accelerated failure time; parametric frailty; survival data; heterogeneity.

ABBRIVATIONS

AIC : Akaike Information Criterion
BGRS : Benishangul Gumuz Regional State
PH : Proportional Hazard
WHO : World Health Organization

1. BACKGROUND

Teenage pregnancies is pregnancy in female between age intervals 15 to 19 years, it common public health problem in the world. Globally around 16 million children are born from teen females. Although greatest teenage pregnancies happen in developing countries, also a key concern in developed countries [1,2]. Teenagers' are at great risk of maternal and newborn complications. Early age female delivery, is a major cause of death in teen women and the associated obstetric complications include anemia, hypertensive, preterm birth, urinary tract infection during pregnancies [3].

Females in developing countries are mostly at risk of teenagers' pregnancies. Fertility rate among women aged 15 to 19 years in the developing countries is more than five times greater than that of the developed countries. While teenagers' pregnancies are decrease overall world, high rates in many countries continue. One third of young females in developing countries give birth before 20 birth day [4]. On average 21 million females aged 15-19 years and 2 million females aged below 15 years become pregnant or give birth in developing countries [5]. Premature childbirth can increase risks for infants and teenagers'. In developing countries, children born to teenagers below 20 years of age face complication such as low birth weight, preterm delivery, and severe neonatal conditions [6]. Repeat pregnancy is a concern for teen mothers, which presents risks for mother and child [7].

In our country pregnancies and give birth during adolescent is common. Study conducted eastern Ethiopia showed among women aged 15 to 49 years, the mean age of first pregnancy was 19 years and 41% of those female who had been pregnant at least once had their first pregnancy between the ages of 15-19 years. According to this study about 48.3% of teenage pregnancies were unwanted in this age group and the pregnancy of teen girls was most probably to be unplanned pregnancies [8,9]. Large percentage teenagers are sexually active in Ethiopia. The amount of sexually active teenager was 31.9%, 30.7%, 58% in Koladiba, north Gonder and in Addis Ababa respectively [10].

Teen female pregnancies in our region, BGRS is most influenced by universality of marriage, less age at marriage, low level of literacy, poor standard of living, limited use of family planning and traditional ways of life. On average 156 teenagers' gave birth of total 783 selected teenagers in Assosa general Hospital Beyene, et al. [10].

This article was analyzed using various techniques of survival analysis models, survival mode is statistical tool used to analyze age at teen pregnancies data set. Survival data is describing the data that measure the time to a given event of interest (age at teenagers' pregnancies) in this article. The current article goal is identifying the risk factors affecting survival time of teenage pregnancies in Assosa woreda, BGRS, Ethiopia.

The population of this study divided into clusters community so as to teenagers came same cluster (residence) in this article behave more cohesively than subjects from different residence. The shared frailty models, introduced by Hougaard, [11] and by Wienke, [12] accounts for heterogeneity in baseline. The shared frailty model is an extension of the Cox proportional hazards model which the hazard function depends upon an unobservable random quantity (frailty) that acts multiplicatively on it. The study subjects in this article came from clustered community. Parametric shared frailty models were explored by assuming that women with in the same residence shares similar risk factors. Parametric shared frailty model is a conditional independence model wherever the frailty is common to all individuals in a cluster and also responsible for making dependence among event times [13].

2. METHODOLOGY

2.1 Study Population and Setting

The data of this study were collected from all teen female who had been lived in Assosa woreda during the period of 2018. The information of this study was obtained from well-

prepared questionnaire and focus group discussion with health extension workers selected Assosa woreda. Of total teen female 376 were included in this study and 24 health extension workers were considered for focus group discussion. Of total respondents 47.87 percent had given birth before 20 years. The teenagers' those had no give birth before 20 years were considered for censored.

The following covariates were considered as the major factors for age at teenagers' pregnancies those are; age of teenagers', marital status, age at marriage, teenagers educational level, teenagers parents educational level, residence of teenagers', employment status of teenagers', attending mass media, economic status of teenagers', use of family planning and religion of teenagers.

2.2 Method of Data Analysis

2.2.1 Survival data analysis

Survival analysis is a collection of statistical procedures which analysis data have characteristics of the outcome variable of interest is time until an event occurs. Survival time may be years, months, weeks, or days from the beginning of follow-up of an individual until an event occurs. Event mean death, disease incidence, relapses from remission, recovery or any designated experience of interest that may happen to an individual [14].

2.2.2 Non-parametric survival methods

Nonparametric analyses are widely used in situations where there is doubt about the exact form of distribution. Survival data are conveniently summarized through estimates of the survival function and hazard function.

2.2.3 Log-rank Test

Measure whether or not there is a difference between groups of covariates can only be done, with any degree of confidence, by utilizing statistical tests [15].

$$Q = \frac{[\sum_i^m w_i(d_{1i} - \hat{e}_{1i})]^2}{\sum_i^m w_i^2 \hat{V}_{1i}} \sim \chi^2_{k-1} \quad (1)$$

2.3 Semi-parametric Survival Methods

The non-parametric method does not control for covariates and it requires categorical predictors. When we have several prognostic variables, we must use multivariate approaches which is called semi-parametric survival model [14].

2.4 Hazard Function

The hazard function $h(t)$ the instantaneous potential for failing at time t. In contrast to the survivor function, which focuses on failing, the hazard function focuses on not failing, that is, on the event occurring [14].

$$h(t) = \lim_{\Delta t \to 0} \frac{P(t \le T \le t + \Delta t \mid T \ge t)}{\Delta t} \quad (2)$$

2.5 Cox Proportional Hazard Model

Cox proportional hazard model assesses the relationship between the survival time and covariates upon the information available and taking censoring into account. It is broadly applicable and the most widely used method of survival analysis. The proportional hazards assumptions are vital to use in a fitted proportional hazards model. Variable adds significant information. If the newly added variable is not significant, it can be taken as the assumptions of the proportional hazard assumptions are satisfied [16].

$$\hat{HR} = \frac{h_0(t)\exp(\hat{\beta}' X)}{h_0(t)\exp((\hat{\beta}' X^*)} \quad (3)$$

2.6 Parametric Frailty Models

The idea of frailty offersanappropriate way to introduce random effects in the model in order to account association and unobserved heterogeneity [17]. Shared frailty models are model constructed in terms of group-level frailties since observations within the same group share unmeasured 'risk factors' that prompt them to exit earlier than other subgroups [18]. A random effect describes excess frailty for distinct categories, such as individual or families, over and above any measured covariates. It is recognized that individuals in the in the same group are more similar than individuals in different cluster because thus, frailty or random effect model try to account for correlations within groups [19]. Inverse Gaussian distribution introduced as a frailty distribution alternative to the gamma distribution [11].

2.7 The Gamma Frailty Distribution

The gamma distribution has been widely applied as a mixture distribution. It fits very well as a mixture distribution to failure data from a computational and analytical point of view. Gamma distribution most common reason for using the gamma distribution is its mathematical convenience. Due to the simplicity of the

derivative of the Laplace transform, Gamma distributions most commonly used distribution and also traditional maximum likelihood procedures can be used for parameter estimation [11]. The density of a gamma distribution with parameter θ is given by:

$$f_z(z)= \frac{Z_i \exp\left(-Z_i/\theta\right)}{\theta^{\frac{1}{\theta}}\Gamma(\frac{1}{\theta})}, \theta > 0 \quad (4)$$

2.8 The Inverse Gaussian Frailty Distribution

The inverse Gaussian in verse normal in other name distribution is a frailty distribution alternative to the gamma distribution [20]. The density function of an inverse Gaussian distribution with parameter θ > 0 is given by

$$f(z) = \frac{1}{\sqrt{2\pi}} z^{-3/2} \exp\left(-\left(\frac{1}{2\theta_z}\right)(z-1)^2\right) \quad (5)$$

3. ANALYSIS AND RESULTS

3.1 Descriptive and Non-parametric Analyses

Out of376 teenagers'180 had given birth before 20 years. The median survival time of age at teenagers' pregnancy was 18 years with 95% CI [14.01, 18.34]. Female between age intervals 15 to 19 was used for assessing age at teenage pregnancies. The minimum event time observed was 15 years and the maximum was event time observed 19 years. According to the following Table 1 of total teenagers' respectively 22.07%, 26.33%, 26.60%, 24.47% and 0.57% were single, fiancée, married, divorced and widowed respondents. In the same way education level of teenagers were 11.97% uneducated, 29.79% primary, 43.35% secondary and 10.14% certificate and above.

From teenagers' parents were 30.85% uneducated, 25.53% were primary, 20.21% secondary and 23.40% certificate and above. Also the above table show us 60.11% teenagers' were lived in rural and 39.89% lived in urban. Of total respondent 61.97% were students, 9.84% employed and 28.19% unemployment. In the same way out of total 18.35% of the teenagers' had no any access of mass media and 81.65% of them had habit attending different of mass media. From the total respondents 35.37% and 64.67% of women were poor and middle economic level respectively. Of total 52.13% of the teenagers' had the experience of using family panning while 47.87% of them had no-user. Similarly 36.97% respondents were orthodox, 33.87% protestant, 26.06% Muslim, and 3.19 other religion followers.

In order to compare the survival of age at teenagers' pregnancies curves of two or more groups, log-rank test has been employed. The log-rank test illustrated that, there were significant differences among covariates categories with respect to survival probability (p>0.05) and age at teenagers pregnancies (Table 2).

Uni-variable Cox proportional hazards model analysis is a suitable procedure that is used to screen out hypothetically significant covariates before directly included in the multi-variable model. Variables that included in multivariable Cox proportional hazards model was analyzed with age at teenage pregnancies before multiple Cox model. The following Table 3 show as the predictor's such as marital status, age at marriage, teen education level, teen parents education level, teen occupation, mass media, family planning, religion of teen females are significant for analysis of multivariable Cox proportional hazards model and then Stepwise covariate selection method was used to select the important variables to be included in Cox model (Table 3).

Proportional hazard assumptions were not satisfied in multivariable Cox proportional hazards model for the variables of marital status and teenager's education level, for this reason the parametric shared frailty model was used instead of the Cox model (Table 4).

Uni variable parametric shared frailty models were analyzed in order to examine consequence of the candidate covariates on survival time of age at teenage pregnancies. Variables that were significant in the univariable analysis were included in the analysis of multivariable shared parametric frailty models. The multivariable shared parametric frailty models for this article was done by using the Weibull, Log logistics and Log normal distributions for the base line hazard function. It was done by using the nine significant variables specifically marital status, age at marriage, teen education level, teen occupation, mass media, family planning and religion.

All models were compared for their performance based on Akaike information criterion accordingly the log logistic inverse Gaussian shared frailty model was the best model for this data set since it has the minimum Akaike information criterion (Table 5).

Log-logistic-inverse Gaussian shared frailty model analysis shows that marital status categories married and divorced, age at marriage, teen education level category Certificate and above, occupation category unemployed, mass media exposure, using family planning, religion group Muslim were significant, at 5% level of significance the confidence interval of the acceleration factors the above predictors do not include 1 (Table 6). This specifies that they are the causal factor for the age at teen pregnancies in the study area. Similarly, according to this model teen parent education level, economic status of teen female had no significant effect on age at teenage pregnancies.

Table 1. Descriptive summary of factors associated with teenagers' pregnancy

Variables	Categories	Teenagers pregnancies		Total
		Pregnant (event)	Not pregnant (censored)	
Marital status	Unmarried	4.52%	17.55%	22.07%
	fiancée	4.79%	211.54%	26.33%
	married	15.96%	10.64%	26.60%
	divorced	22.07%	2.39%	24.47%
	widowed	0.53	0.00%	0.53%
Teen Education level	Uneducated	11.17%	0.80%	11.97%
	Primary	19.41%	10.37%	29.79%
	Secondary	12.50%	30.85%	43.35%
	Certificate and above	4.79%	10.11%	10.14%
Teen parents Education level	Uneducated	22.61%	8.24%	30.85%
	Primary	9.31%	16.22%	25.53%
	Secondary	9.38%	10.37%	20.21%
	Certificate and above	6.12%	17.29%	23.40%
Teen residence	Rural	31.65%	28.46%	60.11%
	Urban	16.22%	23.67%	39.89 %
	Student	16.76%	45.21%	61.97%
Occupation	Employed	3.72%	6.12%	9.84%
	Unemployed	27.39%	0.80%	28.19%
mass media	No	14.89%	3.46%	.35%
	Yes	32.98%	48.67%	81.65%
Economic status	Poor	20.48%	17.89%	35.37%
	Middle	27.39%	37.23%	64.63%
Family planning	No	24.20%	27.93%	52.131%
	Yes	23.67%	24.20%	47.87%
Religion	Orthodox	15.96%	21.01%	36.97%
	Protestant	14.36%	19.41%	33.78%
	Muslim	16.76%	9.31%	26.06%
	Others	0.87%	2.39%	3.19%

Table 2. Log-rank tests of covariates

Variables	Chi-square	Df	P-values
Marital status	78.9	4	3.33e-16
Age at marriage	125	7	0.00
Teen Education level	135	3	0.00
Teen parent Education	134	3	0.00
Teenager's Occupation	169	2	0.00
mass media	17.1	1	3.62e-05
Economic status	21.1	1	4.35e-06
family planning	52.4	1	4.57e-13
Religion	30	3	1.37e-06

DF=degree of freedom

Table 3. Multivariate analysis of cox proportional hazards with age at teenage pregnancy

Variables	Categories	$\hat{\beta}$	SE	Wald	Sig.	HR	95% CI for HR
Marital status	fiancée	-0.56	0.37	2.298	0.129571	0.57	[0.276, 1.179]
	married	-2.5	0.77	10.64	0.001107	0.82	[0.018, 0.369]
	divorced	-2.04	0.75	7.46	0.006294	0.13	[0.030, 0.561]
	widowed	-0.55	1.14	0.23	0.631759	0.58	[0.062, 5.427]
Age at marriage		0.17758	0.046	14.81	0.000119	1.19	[1.091, 1.307]
Teen	Primary	-0.23	0.36	0.38	0.540148	0.80	[0.397, 1.623]
Education level	Secondary	-1.36	0.51	7.05	0.007903	0.26	[0.094, 0.700]
	Certificate and above	-1.18	0.53	4.90	0.026914	0.31	[0.108, 0.874]
Teen parents	Primary	-0.11	0.45	0.057	0.811046	0.90	[0.374, 2.158]
Education	Secondary	0.77	0.44	3.10	0.078112	2.16	[0.917, 5.078]
	Certificate and above	0.19	0.52	0.14	0.711791	1.21	[0.434, 3.390]
Teen	Employed	-0.76	0.39	3.72	0.053626	0.47	[0.217, 1.012]
Occupation	Unemployed	1.59	0.36	19.84	8.41e-06	4.89	[2.432, 9.832]
mass media	Yes	0.74	0.266	7.76	0.005355	2.098	[1.245, 3.535]
Economic status	Middle	0.32	0.238	1.84	0.175039	1.38	[0.866, 2.206]
Family planning	Yes	-1.397	0.245	32.12	0.000292	0.247	[0.153, 0.400]
Religion	Protestant	0.142	0.256	0.304	0.580622	1.15	[0.697, 1.904]
	Muslim	0.787	0.260	9.15	0.002475	2.19	[1.320, 3.659]
	Others	-0.163	0.712	0.052	0.818924	0.84	[0.210, 3.431]

SE=Standard Error, DF=Degree of freedom, HR= Hazard Ratio, CI=Confidence Interval

Table 4. Test of proportional hazards assumption

Covariates	rho	Chi-square	p-value
Marital status	0.180	7.627	5.75e-03
Age at marriage	-0.043	0.5122	4.74e-01
Teenager's Education level	0.235	11.568	6.71e-04
Teenager's parent Education level	0.050	0.4815	4.88e-01
Teenager's Occupation	0.003	0.0012	9.73e-01
Assess mass media	-0.012	0.036	8.50e-01
Economic status	-0.038	0.207	6.49e-01
Family planning	-0.104	2.243	1.34e-01
Economic status	-0.015	0.037	8.48e-01
Religion	-0.117	3.054	8.05e-02
Global	-	53.461	6.11e-08

Chisq= chi-squared, DF=degree of freedom

Table 5. AIC for parametric shared frailty models

Model		
Baseline distribution	**Frailty distribution**	**AIC**
Weibull	Gamma	471.2
	Inverse-Gaussian	455.2
Log- logistic	Gamma	431.4
	Inverse-Gaussian	417
Log- normal	Gamma	466
	Inverse-Gaussian	569.8

Source: Assosa woreda, AIC=Akaike's Information Criteria

The acceleration factor for teenagers with marital status categories married and divorced were estimated to be 0.82 and 0.13 respectively this shows married and divorced groups teenagers

had given birth at early age when compared with single category. Likewise the age at marriage was statistically significant to determine age at teen pregnancies, which indicate as age at marriage increase the rate of teenagers pregnancies was increase by a factor of 1.19. The acceleration factor for teenagers' education level category certificate and above is 0.26 which indicates the age at teen pregnancies of teenagers' education level category certificate and above was shorten than category of uneducated. The acceleration factor for teenager's occupation category unemployed is estimated to be 4.89 this indicates unemployed teenagers have prolonged age at pregnancies than that of student teenagers. The estimated acceleration factor for teenagers who attend mass media is 2.098 this indicates attending mass media have prolonged age at pregnancies than that of non-attendant. The estimated acceleration factor for teenagers who use family planning is 0.247 which indicate teenagers using family planning prolong the age at pregnancies than non-users. Finally the acceleration factor for teenager's religion category Muslim is estimated to be 2.19 this indicates Muslim teenagers have prolonged age at pregnancies than that of orthodox teenagers.

3.2 Health Extension Workers Group Discussion Results

List frequency of teenage in the societies

- ✓ Father and mother marry her daughter at early age even at elementary school.
- ✓ Females practice sexual intercourse said that using contraception was appropriate. Nevertheless they stopped from their religious backgrounds.
- ✓ The levels of young females' pregnancies are very high in the community.
- ✓ Rates of teenage pregnancies are higher in societies where it is traditional for girls to marry young and where they are encouraged to bear children as soon as they are able.

Traditional outlook of teen pregnancy

- ✓ Traditional rules and practices has a contribute of increasing in the rate of teen-age pregnancies.
- ✓ Since adolescent pregnancy is not accepted in our culture female face problem such as reproductive health disease.

Do practices and norms of these societies could influence teenage pregnancy?

- ✓ Young female pregnancy is something frowns on our community and
- ✓ Our societies think it is shame for a family to have an adolescent unmarried girl become a mother.
- ✓ Teenage pregnancy is not acceptable in my village; it's a breach of the behavior code in our community.

How does adolescent pregnancy affect the school and society as a whole?

- ✓ The number of female students in a school is become low and societies also loss educated females.
- ✓ Females who become mothers earlier than finishing education may not be able to thrive educationally.
- ✓ Young mothers became unsuccessful by education since they not have supporter to avoid the numerous disruptions to school attending.

Who would care the young mothers to thrive?

- ✓ Husband, family, friends, teachers have obligation to support pregnant teen mothers.
- ✓ Family help by minimizing any disturbance in the lives of the adolescent mothers.
- ✓ Government and health extension workers must provide reproductive advice to teen mothers.

List teen support groups

- ✓ Health extension workers are treat pregnant young females by giving reproductive health advice they role in promoting, advocating teen female infants.
- ✓ Clinicians encourage teenagers mothers to take antenatal and post natal care

4. DISCUSSION

The current article goal is identifying the risk factors affecting survival time of age teenage pregnancies using data collected by well-prepared questionnaire and focus group discussion of health extension workers,. The dataset for this study was obtained from Assosa woreda females between age interval 14 and 20 years. Log rank test was analyzed to measure whether or not there is a difference between groups of covariates and cox PH model was

applied with teenager's pregnancies data set to assesses the relationship between the survival time and covariates upon the information available and taking censoring into account.

From the total of 376 case of events, 180 experienced the event (had given birth before 20 years). The minimum and maximum times of event occurrence of teenagers' were 15 and 19 years respectively. The median age at teenage pregnancies was 18 years.

For the reason of PH assumption was failed for two covariates (marital status and teenager's education level variables is significant) included in multivariable cox model The most frequently parametric shared frailty model such as Weibull, Log normal, and log logistic was applied to analysis age at teenage pregnancies data set. All models were compared for their performance based on Akaike information criterion, model with smaller AIC is the best model from the model compared based on Akaike information criterion [15]. Log logistic inverse Gaussian parametric shared frailty model was the best model to describe the teenagers' pregnancies dataset since it has the minimum Akaike information criterion when compared to the Weibull and Log normal inverse Gaussian & Gamma and log logistic gamma parametric shared frailty models. This article is in similar with the finding Liddy, et al. [21] with regards the Log-normal Inverse-Gaussian model.

Under uni-variable analysis the shared Log logistic inverse Gaussian parametric shared frailty model was shows that marital status, age at marriage, teenager's education level, teenager's occupation, mass media, family planning, religion were significantly associated with age at teenage pregnancies at 5% level of significance. From result of multivariable analysis of log-logistic-inverse Gaussian frailty model the survival age ate teenage pregnancies significantly affected by marital status groups married and divorced, age at marriage, teen education level category certificate and above, occupation group unemployed, attending mass media, using family planning, religion category Muslim.

Table 6. Log-logistic inverse-Gaussian frailty models summary result

Covariates	Category	$\hat{\beta}$	SE	Sig.	ϕ	95% CI for ϕ
Marital status	Fiancée	0.04	0.37	0.129571	0.57	[0.276, 1.179]
	married	0.11	0.77	0.001107	0.82	[0.018, 0.369]
	divorced	0.10	0.75	0.006294	0.13	[0.030, 0.561]
	widowed	0.80	1.14	0.631759	0.58	[0.062, 5.427]
Age at marriage		0.17758	0.046	0.000119	1.19	[1.091, 1.307]
Teen	Primary	-0.23	0.36	0.540148	0.80	[0.397, 1.623]
Education level	Secondary	-0.77	0.44	0.058112	0.92	[0.372, 2.137]
	Certificate and above	-1.36	0.51	0.026914	0.26	[0.094, 0.700]
Teen parent	Primary	-0.11	0.45	0.811046	0.90	[0.374, 2.158]
Education	Secondary	0.77	0.44	0.078112	2.16	[0.917, 5.078]
	Certificate and above	0.19	0.52	0.711791	1.21	[0.434, 3.39]
Occupation	Employed	-0.76	0.39	0.053626	0.47	[0.217, 1.012]
	Unemployed	1.59	0.36	8.41e-06	4.89	[2.432, 9.832]
Mass media	Yes	0.74	0.266	0.005355	2.098	[1.245, 3.535]
Economic status	Middle	0.32	0.238	0.175039	1.38	[0.866, 2.206]
Family planning	Yes	-1.397	0.245	0.000292	0.247	[0.153, 0.400]
Religion	Protestant	0.142	0.256	0.580622	1.15	[0.697, 1.904]
	Muslim	0.787	0.260	0.002475	2.19	[1.320, 3.659]
	Others	-0.163	0.712	0.818924	0.84	[0.210, 3.431]
$\theta = 0.4$		$\tau = 0.075$				
$\lambda = 2.407\text{e-}5$		$\rho = 3.78$				

*Source Assosa woreda, ϕ Indicates Acceleration factor; * significant at 5% level; 95%CI for ϕ: 95% confidence interval for acceleration factor; SE: standard error for estimates;* θ *: Variance of the random effect;* λ *:scale,* τ *:Kendall's tau;* ρ *:shape*

From the result of this study the marital status was significantly associated age at teenage pregnancies. Married and divorced groups' teenagers had given birth at early age than single group. This finding is shows the same results with the studies [22,23]. In addition the result of the study suggested that age at marriage was significant predictive factor for teenage pregnancies. As age at marriage increase the rate of teenager's pregnancies was increase. The current study is consistent with other findings of Gebremedhin [24,25]. The results of this study indicated that teenager's education level was significant predictive factor for age at teenage pregnancies. Education level category certificate and above is has shorter age at teen pregnancies than category uneducated. This study was justified by study by Raj and Boehmer [22,23,26].

Similarly the teenager's occupation also had significant association to teenage pregnancies at 5% of level of significance. This indicates unemployed teenagers have prolonged age at pregnancies than that of student teenagers. This was also indicated by study done by Bangser and Maggie [25,26].

The results of this study indicated that mass media was significant predictive factor for age at teenage pregnancies. Attending mass media have prolonged age at pregnancies than that of non-attendant. This result is the same with finding of Maluli, et al. [27]. Family planning also had significant association to age at teenage pregnancies. Using family planning prolong the age at pregnancies than non-users. This result is the same with finding of Gebremedhin, [24,25,28]. The results of this study indicated that religion was significant predictive factor for age at teenage pregnancies. This result is consistent with [27,29].

In the community were Parents especially mother want to marry her daughter at early age. Health extension workers have a responsible of treating pregnant teenagers' by giving reproductive health advice. Teachers are very supportive of teenagers' at school.

5. CONCLUSION

Although prevention of unwanted teenage pregnancy is our main goal, many females continue to become pregnant at early age. The current article goal is identifying the risk factors affecting survival time of teenage pregnancies. The information of this study was obtained from well-prepared questionnaire and focus group discussion. Female between age intervals 15 to 19 was used for assessing age at teenage pregnancies. Semi parametric model (Cox proportional hazard model) and parametric models (parametric shared frailty) were used to age at teenage pregnancies. The parametric shared Frailty represents the total effect on survival of the covariates not measured when collecting information on group of subjects.

Out of 376 teenagers' 180 had given birth before 20 years. The median survival time of age at teenagers' pregnancy was 18 years. The minimum event time observed was 15 years and the maximum was event time observed 19 years. The covariates such as marital status, age at marriage, teen education level, teen parents' education, teen occupation, mass media, family planning, religion are significant for multivariable analysis then; Stepwise covariate selection method was used to select the important variables to be included in Cox model. Proportional hazard assumptions were violated in multivariable Cox proportional hazards model for the variables of marital status and teenager's education level, for this reason the parametric shared frailty model was used instead of the Cox model.

All models were compared for their performance based on Akaike information criterion accordingly the log logistic inverse Gaussian shared frailty model was the best model for this data set. The results of this study shows marital status categories married and divorced, age at marriage, teen education level category Certificate and above, occupation category unemployed, mass media exposure, using family planning, religion group Muslim were significant factors.

CONSENT

As per international standard or university standard written respondent consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

It is not applicable.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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