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The hazard of pregnancy loss and stillbirth among women in Kersa, East Ethiopia: A follow up study

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ABSTRACT

Background: Although pregnancy loss causes considerable challenge to women's health, population-based studies in rural areas are not widely available in low-income countries. This study aims to determine the hazard of pregnancy loss and related factors in the rural communities of Ethiopia.
Methodology: A prospective community-based study was conducted over a period of 1 year. Pregnancy was identified as early as possible by a pregnancy urine test. All pregnant women identified during the screening were followed up at their home until termination of pregnancy or delivery of the neonate. The total follow-up time was 7802 'pregnant person months'. A Cox regression analysis was done to estimate the hazard of pregnancy loss.
Result: Out of a total of 1438 terminated pregnancies, 143 (9.9%) did not end in live birth, 116 ended due to bleeding and 27 were stillbirths. Whilst the hazard of pregnancy loss was low among women with pregnancy interval of two or more years [AHR 0.3 (95% CI: 0.15, 0.43)], it was high among women having unplanned pregnancy [AHR 2.2 (95% CI: 1.56, 3.11)], among those who complained STI like symptoms during the index pregnancy [AHR 4.5 (95% CI: 2.79, 7.38)] and among those never received antenatal care [AHR 1.8 (95% CI: 1.13, 2.73)].
Conclusion: Pregnancy loss was higher amongst women experienced unplanned pregnancy, complained STI like symptoms and women who had not attended antenatal care services.
Recommendation: To reduce pregnancy loss in rural Ethiopia expanding and promoting the use of family planning, antenatal services and other reproductive health care is necessary.

Introduction

Pregnancy loss is a collective term used to describe pregnancies that failed to produce a live birth [1]. The losses can occur any time during the course of pregnancy. According to the International Classification of Diseases, version 10 (ICD-10), stillbirth is a late pregnancy loss and is defined as a loss of a fetus after 22 weeks of gestation [2]. In low-income countries a very high proportion of pregnancies are lost at different stages of the 40 weeks of gestational period [1,3,4].

The majority of pregnancies fail within the first month, some very early between the time of fertilization and first detection of Human Chorionic Gonadotrophin (HCG) in urine, and the remaining in the consecutive 3 weeks. Thus, a large proportion of pregnancies fail without being noticed by the woman [1,4–6]. However, these early pregnancy losses have little effect on the reproductive health of a woman.

After 1 month of conception, fetal losses usually happen in the form of abortion or stillbirth. Such losses may have profound effect on the woman [3,7]. In such conditions, infection, hemorrhage and tissue damage are the commonest health problems. In addition, the normal psychological reaction to the loss can sometimes be pronounced and result in grief, guilt, depression and anxiety that can affect the normal life of the entire family [8].

The loss of pregnancies due to abortion constitutes approximately 10–25% of all detectable pregnancies. Of these losses, the majority occurs during 7–12 weeks of gestational period and induced abortion is the main cause [9–14]. Although reliable information is hard to come by; available evidence suggests that the prevalence of induced abortion is in the range of 12–21% of all recognized pregnancies in many low-income countries [7,14–17], and 18–25% in developed countries [18–20].

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In Ethiopia, in 2005, even though some amendments were made to the provision of abortion, it remained illegal and imposes serious punishments [21]. In Ethiopia, estimates based on data from health institutions providing abortion and post abortion care under limited conditions such as rape, incest, debilitated mental and physical health conditions, indicated that the annual abortion rate was 23 per 1000 women aged 15–44, and the abortion ratio was 13 per 100 live births. For Oromia region, where this study was carried out, the figure was 23.3% and 11.0%, respectively [22]. The case fatality rate of women who seek post abortion care in Ethiopia was 628 per 100,000 [23].

Late pregnancy loss (stillbirth) is another important health event in many low-income countries. The annual global burden of stillbirths amounts to 3.2 million, 98% of which occur in Low and Middle Income Countries (LMICs). Of these, 1.02 million (32%) were intra partum. The main causes of stillbirth in these countries include child birth complications (obstructed or prolonged labor), maternal infections (malaria, syphilis and gram-negative infections), maternal disorders (hypertension and diabetes), maternal under nutrition, fetal growth restriction and congenital anomalies [24,25].

Several studies indicated that induced abortion is common among women whose age is less than 29 years compared to women whose age is 40–49 years. It is also common among women who had technical skill training or secondary high school education compared to women who did not have technical skill training or had primary school or no education, respectively [7,17,19,20,26–28].

The risk of pregnancy loss is generally higher during the first trimester, among women with low parity (parity < 4), women who reported previous abortion, women with shorter (<6 months) or longer (>37 months) pregnancy intervals and those with non-use or inconsistent use of contraception [7,17,27,28]. Use of oral contraceptives appears to decrease the subsequent risk of abortion [17,18,29]. Non-use or inconsistent use of contraception is found to increase the risk of abortion by twofold [28].

Late pregnancy loss (stillbirth) is highly associated with low birth weight, older maternal age, rural residence and failure to attend antenatal care [29,30].

Many countries in sub-Saharan Africa, including Ethiopia, have intensified their efforts to achieve the Millennium Development Goal (MDG) on maternal and child health. In these countries, to inform and guide policy and program decisions, community-based data is insufficient. Countries and International Organizations often depend on estimates derived from hospital based studies. Such sources of information are often biased because of differential use of health services in low-income countries, especially in rural areas [31].

Therefore, it is crucial to gather community-based information to provide evidence necessary for appropriate actions that enhance the chances of achieving maternal and child health MDG goals. In this study we focus on the women residing the rural areas of Ethiopia. The aim of this research was to determine the hazard of pregnancy loss and related factors in rural communities of Ethiopia.

Methodology

This research was based on 'the pregnancy surveillance program' instituted in Kersa Demographic Surveillance and Research Center (KDS-HRC) in Kersa district, Oromia region, Ethiopia during December 2009 to November 2010 [32]. The study site has 12 Kebeles (smallest administrative unit in Ethiopia with a population of approximately 5000). Ten of the Kebeles are rural and two are small towns, called Kersa and Weter.

The district has six health centers that provide basic health services including a range of maternal health services such as family planning, antenatal care and delivery care. On average each health center has one or two health officers and eight nurses. In the district, there are also two midwives assigned to work at two of the six health centers. There are no medical doctors in the district. In each of the 12 Kebeles there are 1–2 health extension workers. These health workers received one-year training on 16 health packages. The 16 health packages are organized in four major themes; sanitation and hygiene, disease prevention and control, family health and health communication-education. The primary duty of the health extension workers is health promotion and disease prevention through awareness creation on proper sanitation, safe water supply, excreta disposal, solid and liquid waste management, prevention and control of tuberculosis, malaria and HIV/AIDS. They are also expected to provide basic health services like family planning, antenatal care, safe uncomplicated delivery and immunization [33–36].

The study was cleared by the National Ethical Clearance Board of Ethiopia and informed written consent was obtained from all study participants. The majority of the study subjects were illiterate, thus informed consent was obtained after it was read and clarification was given by data collectors. They were also informed about the right to decline if they were not interested in participating or to withdraw from the study at any time after enrollment. Once they agree to participate, they were asked to sign on a consent form.

All married women, and women heading a household, who were in the reproductive age group and living in the field research site, were eligible for pregnancy screening. Pregnant women were identified through a house to house survey using a two-step screening procedure. First, to rule out pregnancy, women were interviewed using a standardized questionnaire previously used in Kenya, [37]. Second, for those women where pregnancy was not ruled out, a urine test was done to ascertain pregnancy. This procedure was conducted every 3 months on all eligible women during the study period. After confirming their pregnancy status, women were followed up at their residence on a monthly basis until the index pregnancy was terminated either due miscarriage/abortion or delivery. Identifying pregnant women, the method of follow-up and other details are discussed in detail in other papers [32,38]. Pregnancies terminated due to bleeding were confirmed with a second urine test. For those with a positive test, follow up was continued on a monthly basis. All other relevant data was collected through face-to-face interviews with the pregnant women using an orally administered a uniform questionnaire. The field work was done by 12 high school completed data collectors and two diploma nurse supervisors. The data collectors and supervisors were trained on the questionnaire and conducting pregnancy tests.

Variables considered in the analysis were socio demographic/economic status characteristics including age, residence and economic status, reproductive health history including parity, previous abortion/still birth, and pregnancy interval and conditions related to the index pregnancy for example pregnancy intention, health complaints, and violence.

Some of the health complaints reported during pregnancy were labeled as Sexually Transmitted Infections (STI) like and complaint of other illnesses. "STI like health problem" was constructed using three symptoms; burning sensation during urination (dysuria), vaginal bleeding and spotting during the index pregnancy. "Complaint of other illness" was constructed using three symptoms; convulsion, swelling of the hands and swelling of the face (edema).

Experience of violence during the index pregnancy was assessed by asking the women if she had encountered any physical abuse or sexual advances by her partner without her consent [39,40]. To assess the experience of such incident questions adapted from World Health Organization violence study were used [41]. Reports of either of being slapped, shoved, dragged,

threatened with gun or knife was recorded as Physical violence. And manners of unconsented sex or sexual advances were recorded as sexual violence.

The economic status of participants was categorized into rich, middle and poor using wealth index. The wealth index of participants was assessed applying the principal components analysis on 33 household asset items and other variables [42–44]. In this research, pregnancy was regarded as "lost" and coded 1 if the pregnancy was ended due to bleeding or stillbirth and considered "not lost" and coded 0 if it was ended in a live birth [6].

After checking completeness, the data were entered into computer using Epi data and later transferred to STATA software for analysis [45,46]. In order to identify factors associated with pregnancy loss in the study population, first, the crude hazard ratios were calculated. Then, to control the effects of confounding Cox regression was used taking into account the follow-up time. Before applying Cox regression, tests of proportionality of the hazard among the different categories were checked using graph plotting, and variables retained in the final model were tested favorably for concordance [47].

Results

During the study period a total of 1438 women terminated their pregnancy, 143 (9.9%) ended due to bleeding, i.e., miscarriage/abortion/still birth and the remaining 1295 (90.1%) were live births. The majority of the women were 20–39 years of age, illiterate, rural residents, and in the middle or poor wealth category in their community. Regarding their reproductive history, 164 women (11.4%) reported a previous adverse pregnancy outcome (either abortion or still birth), 449 (31.2%) had five or more children, and 305 (21.2%) reported the time gap between the occurrence of this pregnancy and the previous birth to be less than 2 years. Unplanned pregnancy was reported by 31.8% of the study subjects and only 28.7% had at least one antenatal visit during the index pregnancy. Physical and sexual violence during the pregnancy was reported by 19.1% of the study participants (Table 1).

Fifty-one (3.6%) study subjects reported to experience Sexually Transmitted Infection (STI) like symptoms during their pregnancy.

The crude hazard ratio of pregnancy loss was higher among women residing in rural areas, women having a shorter pregnancy interval (less than 2 years), those reported the index pregnancy was unplanned, those never attended antenatal care, those reported physical violence, and those reported STI-like symptoms during the index pregnancy. All showed a statistically significant association with pregnancy loss at the $p < 0.05$ level (Table 1).

Three separate Cox regression models were fitted before deciding on the variables to be included in the final model. The three models were: socio-demographic and economic variables (model 1), maternal, reproductive and nutrition factors (model 2), and factors related to the index pregnancy, such as pregnancy intention, complaining STI like symptoms, Antenatal Care (ANC), and pregnancy interval (model 3).

Table 1
Pregnancy loss by background characteristics, crude hazard ratios and 95% confidence intervals: Kersa, Ethiopia, 2010.

Characteristics		Total (n = 1438)	Lost (n = 143)	Live birth (n = 1295)	Crude HR	95% CI		p = value
Age	40+ years	36	8.3	91.7	1.0			
	30–39 years	685	12.1	87.9	1.1	0.68	1.91	0.629
	20–29 years	618	7.3	92.7	0.7	0.40	1.19	0.182
	<20 years	99	12.1	87.9	1.1	0.54	2.34	0.756
Mother's education level	Literate	201	7.9	92.1	1.0			
	Illiterate	1237	10.3	89.7	1.4	0.83	2.36	0.201
Maternal residence	Rural town	115	2.6	97.4	1.0			
	Rural	1323	10.6	89.4	3.7	1.19	11.75	0.024
Household wealth status	Rich	420	8.8	91.2	1.0			
	Middle	477	8.8	91.2	1.0	0.61	1.48	0.815
	Poor	541	11.8	88.2	1.4	0.93	2.10	0.105
Previous abortion/stillbirth	No	1274	9.2	90.2	1.0			
	Yes	164	11.0	89.0	1.0	0.62	1.67	0.946
Parity	Never gave birth	170	11.2	88.8	1.0			
	1–4 births	819	7.8	92.2	0.9	0.53	1.47	0.621
	5–6 births	247	10.9	89.1	1.2	0.64	2.08	0.629
	7 plus births	202	16.3	83.7	1.9	1.10	3.39	0.022
Pregnancy interval	Never Pregnant	283	14.1	85.9	1.0			
	<2 years	305	21.0	79.0	1.5	1.03	2.27	0.035
	2+ years	850	4.6	95.4	0.3	0.21	0.50	0.000
Mid-upper arm circumference	23+ cm	784	10.2	89.8	1.0			
	<23 cm	654	9.6	90.4	0.8	0.57	1.11	0.178
Pregnancy intention	Planned	980	6.7	93.3	1.0			
	Unplanned	458	16.8	83.2	3.0	2.15	4.15	0.000
Antenatal care	Attended 1+ times	415	6.3	93.7	1.0			
	Not attended	1023	11.4	88.6	1.9	1.25	2.93	0.003
Violence during	No violence	1163	9.5	90.5	1.0			
Index pregnancy	Any physical violence	217	13.8	86.2	1.6	1.09	2.45	0.017
	Sexual violence only	58	5.2	94.8	0.5	0.17	1.64	0.267
STI like symptoms	No	1387	8.7	91.3	1.0			
	Yes	51	43.1	56.9	6.5	4.12	10.27	0.000
Complaints of other illnesses	No	1352	10.1	89.9	1.0			
	Yes	86	6.9	93.1	0.6	0.28	1.41	0.275

Hazard ratios/HR was calculated using Cox regression. Pregnancy loss is coded as =1.
p values were based on results from hazard regression.

In model 1, only rural residence was significantly associated with an increased hazard of pregnancy loss. In model 2 among maternal factors, parity of 7 or more and longer pregnancy interval (2+ years) were significantly associated with pregnancy loss compared to their respective reference groups. Relative to their reference categories, the hazard of pregnancy loss was increased by twofold among women who had 7 or more parity. In the same model, relative to the reference category, the hazard of pregnancy loss was significantly decreased for women who had a pregnancy interval of two or more years (Table 2).

In model 3 relative to the reference groups, the hazard of pregnancy loss was increased by twofold among women who reported that the index pregnancy was unplanned, by sixfold for those who reported STI-like symptoms during the index pregnancy, and by nearly twofold for those women who had never received antenatal care during the index pregnancy (Table 2).

In the final model all three block factors were considered simultaneously, accordingly, the hazard of pregnancy loss was significantly associated with the length of the pregnancy interval, pregnancy intention, STI like symptoms and ANC.

While the hazard of pregnancy loss was 70% lower among women who reported a pregnancy interval of two or more years, it was increased twofold among women who reported STI like symptoms and among women who had not attended ANC during the index pregnancy (Table 2).

Discussion

The overall prevalence of pregnancy loss was almost 10% during the study period. The hazard of pregnancy loss was higher, for index pregnancies reported to be unplanned, among women reporting STI like symptoms and among women who had not received ANC during the index pregnancy. The risk of pregnancy loss was significantly lower among women who reported a pregnancy interval of two or more years.

This study's distinguishing feature, as compared to others conducted in rural areas of low-income countries, is its confirmation of pregnancy as early as possible with urine tests and following pregnant women at home throughout the course of their pregnancy. Through systematic home-based surveillance, the possibility of missing the event of interest was considerably reduced.

A study limitation is the inability to differentiate between stillbirth, miscarriage and elective abortion as separate pregnancy

Table 2
Multivariate Cox proportional hazards regression of pregnancy loss on socio-demographic, reproductive and pregnancy-related factors: Kersa, 2010.

Characteristics		Model -I			Model –II			Model-III			Final Model		
		AHR	95% CI		AHR	95% CI		AHR	95% CI		AHR	95% CI	
Age	40+ years	1.0									1.0		
	30–39 years	1.2	0.69	1.97							1.2	0.71	2.16
	20–29 years	0.8	0.44	1.31							0.9	0.52	1.72
	<20 years	1.3	0.63	2.78							1.4	0.62	3.04
Mother's educational level	Literate	1.0									1.0		
	Illiterate	1.2	0.70	2.06							1.3	0.71	2.18
Maternal residence	Rural town	1.0									1.0		
	Rural	3.2*	1.01	10.31							2.0	0.62	6.70
Household wealth status	Rich	1.0									1.0		
	Middle	0.9	0.57	1.38							0.9	0.56	1.40
	Poor	1.2	0.83	1.87							0.8	0.54	1.28
Previous abortion/stillbirth	No				1.0						1.0		
	Yes				0.8	0.45	1.25				0.6	0.34	0.99
Parity	Never give birth				1.0						1.0		
	1–4 birth				1.1	0.59	2.07				0.9	0.45	1.68
	5–6 birth				1.6	0.81	3.27				1.0	0.48	2.13
	7+ birth				2.3*	1.21	4.44				1.3	0.61	2.68
Pregnancy interval	Never pregnant				1.0						1.0		
	<2 years				1.3	0.80	2.08				1.0	0.63	1.74
	2+ years				0.3***	0.16	0.44				0.3***	0.15	0.43
Mid upper arm circumference	23+ cm				1.0								
	<23 cm				1.0	0.74	1.45						
Pregnancy intention	Planned							1.0			1.0		
	Unplanned							2.4***	1.73	3.34	2.2***	1.56	3.11
STI like symptoms	No							1.0			1.0		
	Yes							6.0***	3.80	9.53	4.5***	2.79	7.38
Complaint of other illness	No							1.0			1.0		
	Yes							0.6	0.27	1.37	0.7	0.30	1.58
Antenatal care	Attended 1+ times							1.0			1.0		
	Not attended							2.0**	1.28	3.00	1.8*	1.13	2.73
Violence during index pregnancy	No violence							1.0			1.0		
	Any physical							1.4	0.90	2.03	1.5	0.95	2.21
	Sexual only							0.5	0.16	1.54	0.8	0.23	2.39
LR chi2		18.04			80.57			85.80			158.80		
Prob > chi2		0.0118			0.0000			0.0000			0.0000		
Log likelihood		−1014.3261			-939.23646			−936.62401			−900.12358		

* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

outcomes. Other published studies have examined stillbirth or abortion as individual outcomes, where this study must consider these together as pregnancy loss [22–24]. The only pregnancy losses diffentiated were 27 confirmed stillbirths and four elective aboritons. The main reason for inablity to differentaite between abortion and stillbirth was the difficulty of estimating the gestational weeks as the women were unable to recall their Last Menstrual Period (LMP). The other reason for failure to differentiate between spontaneous and induced abortion was the sensitivity of the issue associated with culture and legal matters. As a result majority of the women whose pregnancy was terminated due to bleeding was reporting pregnancy termination on its own. As a result, handling these small numbers in a separate category was not suitable for statstical analysis. Therefore, it was necessary to put them together as 'pregnancy loss'.

The pregnancy loss estimate in this study is somewhat lower than studies reporting on abortion alone [7,14–16]. It is also slightly lower than the abortion rate and ratio for Oromia region in Ethiopia, which is 23.3 and 11, respectively [22]. This may be due to the difference in the study populations. In most published literature, the study populations were drawn from urban areas where induced abortion are common [9,14]. Reported induced abortion in this study was very low, with only 2.8% of women with a pregnancy loss reporting elective abortion. In Ethiopia, induced abortion is largely illegal except in certain conditions. Even then, such services are not widely avalable in rural areas. In addition, in the study area, like other similar places, children are considered as an asset [26,48], and therefore, terminating a pregnancy is considered to be killing a baby. As a result women are not interested in talking about it.

In this study, a longer birth interval was found to be protective against pregnancy loss. In other studies, a shorter birth interval was found to be a risk factor for abortion and stillbirth, whereas, a longer birth interval lowers the risk of the same [17,18,29]. A short pregnancy interval does not provide sufficient time to stabilize the internal womb for next pregnancy. In many communities, women are expected to be involved in heavy work including farming. These duties are additions to the regular domestic responsibilities. Malnutrition also disproportionately affects women. Shorter birth interval compounded by these factors affects pregnancy retention to term[49].

The findings regarding the association of unplanned pregnancy with a higher hazard for pregnancy loss may reflect women's underreporting of elective terminations. This finding is consistent with the study findings that suggest women with unmet contraceptive need are at increased risk of obtaining an abortion. Women with unplanned pregnancies tended to underutilize ANC and their adverse pregnancy conditions were more likely to go undetected [17,28].

In addition, in a rural setting, most unplanned pregnancies tended to occur among women who are at higher parity [50]. Repeated pregnancy exposure places heavy physiological demands on a woman's health and reduces the likelihood that she can carry the next fetus safely to term [18–20]. In this study, pregnancy termination due to bleeding was the most frequently reported type of pregnancy loss. Even though a statistically significant association was not detected between higher parity and pregnancy loss, 7 and more parity was found to increase the hazard of pregnancy loss by 30%.

Given the higher risk of pregnancy loss associated among unplanned pregnancies and to the extent loss reported as bleeding represents underreported abortions, the study findings suggest a role for expanded access to family planning services in the rural setting where the Contraceptive Prevalence Rate (CPR) is low and unmet need is high [51]. Enabling women to receive family planning services can reduce pregnancy loss experience. Family planning is also well known to mitigate many maternal health problems [6,10,52].

In this study, pregnant women with STI-like complaints had an increased hazard of pregnancy loss. This is consistent with the findings from other studies, indicating STI-related inflammation of the uterus can cause premature termination of pregnancies [18,30]. Other studies in Sub Sahara Africa showed that syphilis is not uncommon among pregnant women. It was also demonstrated that pregnancy loss among those suffering from syphilis was higher [53–55].

Although ANC should help identify complications in pegnant women, and facilitate supplementations of essentail nutrients, the health service is not widely utilized in rural areas [10,27]. In this study setting, even though the health extension workers visit every household regularly, in most instances they were overburdened by different duties and had minimum time to work on ANC [21,56].

Conclusion and recommendation

This study showed that pregnancy loss is associated with pregnancy interval, unplanned pregnancy, symptoms similar to Sexually Transmitted Infections and non-use of ANC. This situation can be resolved by using the existing maternal health service in Ethiopia.

ANC can prevent the hazard of pregnancy loss by identifying women having risk factors. If a pregnant woman attends for a minimum of four ANC visits, besides identifying the risk factors for pregnancy loss, she will receive health education on pertinent subjects. Health education during ANC focuses among others on proper nutrition, personal hygiene during pregnancy, the need for immunization. ANC also helps to prepare the mother for birth and identify complications during pregnancy and childbirth. These activities are supportive to helpful in mitigating pregnancy loss, and make pregnancy and childbirth safer. Therefore, ANC should be stressed and its usability should be strengthened though the existing health care delivery system. The health system and service providers need to intensify their efforts in expanding family planning to rural communities that comprise over 80% of the country's population.

Screening for syphilis during early pregnancy and providing appropriate treatment can reduce pregnancy loss especially against stillbirth by up to 50% [24], Thus making sure that all pregnant women are screened for syphilis during pregnancy can save many lives. Provision of family planning services to increase the pregnancy interval can also be achieved by expanding the services through Community Based Reproductive Health Agents (CBRHA) [57]. Promotion of condom use in the rural setting through public, private and community (CBRHA) outlets would help in reducing the transmission of STI.

Making abortion legal and availing safe abortion services in Ethiopia would benefit the rural population in tackling the consequences once unplanned pregnancy occurs. If these services were made available in the rural health centers, the poor women in rural setting would have access to them. Manual Vacum Aspiration (MVA) with basic training for the midwives and nurses in the rural health centers can simplify the introduction of such services.

Author's contribution

N.A., Y.B., A.W. and A.T. participated in all steps of the study from its inception to writing. They have reviewed and approved the submission of the manuscript.

Competing interest

This research does not have any competing interest with any party or organization.

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