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Research Article

Using a Health and Demographic Surveillance System to Assess Stillbirths Trends and Risk Factors in Siaya County, Kenya between 2008 and 2019

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Introduction: Every year, about 4 million stillbirths occur, most of which are in the developing countries. Although stillbirths are more prevalent in developing countries, they are least studied and hence their rates remain unknown. It is imperative to track trends and identify determinants of stillbirths to inform interventions.
Methods: We used data collected by the Kenya Medical Research Institute's Health and Demographic Surveillance System to analyze trends and risk factors for stillbirths in Siaya County, Kenya in the period between 2008 and 2019. The Health and Demographic Surveillance System's staff collect data on pregnancy status for all women of reproductive age (13 - 49 years) twice a year. Once a pregnancy is registered, its outcome is monitored in the subsequent visits and the outcome type is reported. Using the pregnancy outcome records plus demographic and social attributes of the observed women, we calculated trend and assessed risk factors for stillbirths using logistic regression models at 95% confidence interval.
Results: In total, we analyzed 59,028 records out of which 1,250 (2.1%) were stillbirths. Across the years, the prevalence of stillbirths reduced from 3.69% to 1.77% from 2008 to 2019. The trend was irregular especially in Gem sub-County. Risk factors included mother's age >36 years, having no formal education, living in Rarieda sub-County, low wealth index and year of pregnancy, particularly in 2008 and 2012.
Conclusion: A reducing trend of stillbirths suggests that the existing interventions are effective. However, health care providers should pay attention to the identified risk factors including advanced maternal age, those without formal education, women who have had more than three pregnancies. In addition, more interventions should prioritize Rarieda sub-County over Gem and Karemo.

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Introduction

Every year, about 4 million stillbirths occur, most of which (97%) are in the low-income countries (Cacciatore et al., 2009; Lawn et al., 2009; McClure et al., 2007). Research studies have shown stillbirth rates of more than 30 per 1000 total births especially in sub-Saharan Africa and Southeast Asia (McClure et al., 2007). These numbers are in stark contrast to high income countries such as the United States of America (USA), where the stillbirth rates are low. Although stillbirth is one of the most common adverse pregnancy outcomes, it is least studied due to lack of surveillance data and underreporting perpetuated by emotional distress experienced by the victims (Maaløe et al., 2016; Spector & Daga, 2008). The incomplete data on stillbirth is partly because about half of births take place at home (McClure et al., 2007, 2009). In addition, there are cultural beliefs that require keeping stillbirth events discrete. Also, there are strict accountability requirements at the health facility level that deter open reporting of stillbirths (Maaløe et al., 2016).

The full extent of stillbirth rates is challenging to assess given the small number of studies. For example, a study using generalized mixed models reports a national stillbirth rate for Kenya as 3.9 per 1000 total births (Tesema et al., 2021). The WHO report on perinatal mortality indicates 90 countries worldwide lacked any kind of data on stillbirths (World Health Organization, 2007). In order to reduce the stillbirth rates, the World Health Organization (WHO) set the global target for all countries to achieve a rate of 12 or fewer per 1000 total births by 2030 (WHO, 2014). To be able to meet this target however, detailed surveillance data are required to decide on implementation of the most likely effective interventions to reduce stillbirth rates.

Presently, the main intervention in place is antenatal care (ANC), where health of the mother to be, and the fetus is assessed in order to prevent development of complications during pregnancy. At the ANC clinic, preexisting conditions are also identified and managed. Consequently, women are encouraged to adhere to ANC clinic visit schedule and also make use of skilled birth attendants (Afulani et al., 2019). The WHO recommends eight antenatal care (ANC) clinic visits, which is an increase from the previous four visits (WHO, 2016) because there is evidence that frequent contacts with health providers reduces the likelihood of experiencing a stillbirth.

In the absence of a complete surveillance and vital events registration system, alternatives such as a Health and Demographic Surveillance System (HDSS) can bridge the gap to provide needed health indicators data. A HDSS monitors population changes in a defined area by collecting population-based demographic information, vital events (births and deaths), in and out migrations and, the burden of diseases among other health indicators (Herbst et al., 2021; Ye et al., 2012). Therefore, a HDSS provides an opportunity to estimate stillbirth rates at a community level, which is considered a better alternative to the health facility data with regard to coverage. In this analysis we used this unique resource, the Kenya Medical Research Institute (KEMRI) Center for Global Health Research (CGHR) HDSS in Siaya County, to assess the trend and factors associated with the stillbirth in the communities in light of ANC visits and address this gap of knowledge.

Materials and Methods

Study population

This research study was done in Siaya County, which is one of the 47 counties in Kenya located in the western part. The county lies between latitude 0^0 26' South and 0^0 18' North, and Longitude 33^0 58' and 34^0 33' East. In 2019, the county's population was estimated at 993,183 with a population density of 393 persons per Km^2 (KNBS, 2019). The main economic activities in the area are fishing, subsistence agriculture and trading (Adazu et al., 2005; Odhiambo et al., 2012). The area has a high prevalence of malaria, HIV and Tuberculosis (Calhoun et al., 2014; Desai et al., 2013; Ochieng et al., 2020). The county is sub-divided into six administrative sub-counties known as: Alego-Usonga, Gem, Ugenya, Ugunja, Bondo and Rarieda (County Government of Siaya, 2017). This study was conducted in parts of Alego-Usonga, Gem and Rarieda sub-counties.

Study design

We analyzed pregnancy outcomes using data collected through KEMRI-CGHR HDSS between 2008 and 2019. The HDSS was established in 2001 by the Kenya Medical Research Institute (KEMRI), in collaboration with the Centers for Disease Control and Prevention (CDC) (Adazu et al., 2005). Presently, the HDSS is managed by the KEMRI-CGHR and is monitoring a population of about 262,000. Between 2001 and 2015, the HDSS staff visited households thrice a year to up-date records of registered residents, register new residents (births and in-migrants), report deaths, pregnancies, and collect health related data such as vaccination, antenatal care clinic attendance birth outcomes and socioeconomic indicators including source of water, number of livestock and education level (Odhiambo et al., 2012). After 2015, the number of household visits were reduced to two annually.

For every woman of reproductive age (13-49 years), data on pregnancy are collected. The pregnancy outcomes are captured as: single live birth, multiple live birth, single stillbirth, multiple stillbirth, induced abortion and spontaneous abortion. When the index person is away from home during the visit, a proxy interview is conducted with the next person who can provide information on the pregnancy. For this analysis, we grouped the pregnancy outcomes into two, live births and stillbirths. Abortion and miscarriage records were dropped and all records of single and multiple live births were summed up and referred to as, "live births". On the other hand, single and multiple stillbirths were added and reported as "stillbirths", while cases of live and stillbirths were dropped. Consequently, pregnancy outcome (stillbirth or live birth) was treated as the dependent variable in this analysis.

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Independent variables

We assessed factors that have been reported to influence pregnancy outcome and are being collected by the HDSS platform. Table 1 shows independent variables and how they were categorized for the analysis.

Independent variable	Categories	Reference
Maternal age in years	13 – 18 19 – 24 25 – 30 31 – 35 36 – 48	(Huang et al., 2008; Lawn et al., 2009; Maaløe et al., 2016; McClure et al., 2009; Regan & Rai, 2000)
Education level	None Primary Secondary Tertiary	(Lawn et al., 2009; McClure et al., 2007; Mwilike et al., 2018)
Marital status	Married Not married	(McClure et al., 2009; Mwilike et al., 2018)
Gravida	Primigravida 1 to 3 4 and above	(Altijani et al., 2018)
Sub-county	Rarieda Gem Alego-Usonga	(Gordon et al., 2013)
ANC Visit	< 4 4 ≥	(Saleem et al., 2010)
Wealth Index	Quintile 1 Quintile 2 Quintile 3 Quintile 4 Quintile 5	(Luo et al., 2006)
Year of pregnancy outcome	From 2008 to 2019	(Saleem et al., 2018)

Table 1. Independent variables

Statistical analysis

Descriptive statistics and frequency tables were used to present the distribution of the assessed factors based on the pregnancy outcome, stillbirths and live births. Pearson's chi-square test was used to assess associations between the two outcome groups. The trend of stillbirths was analyzed for the whole dataset and per sub-County. Further, bivariate and multivariate logistic regressions were conducted to assess the odds for stillbirth. All significant predictors in the bivariate model at 95% confidence Interval were used in the multivariate model. We used Stata (Version 14; Stata Corporation, College Station, TX, U.S.A). Stillbirth rate was calculated as the number of stillbirths in a year per 1000 total births and Microsoft Excel spreadsheet was used to make the trend line plots between 2008 and 2019.

Ethical considerations

The HDSS was approved by the Scientific Ethics Review Unit (SERU), number 1801. Compound heads provided written consent for the HDSS data collection activities and household members were allowed to decline the HDSS activities despite the written consent by the compound heads. For this analysis, de-identified data were shared and protection measures such as use of password protected computers and also passwords when sharing files with co-authors were observed.

Results

We retrieved a total of 63, 465 records of women who experienced pregnancy between 2008 and 2019. Out of these, 1752 migrated out of the study area before having a pregnancy outcome and information about 2,561 pregnancies was missed. After excluding miscarriages and abortions, we analyzed 59,028 pregnancy outcome records out of which 1,250 (2.1%) were stillbirths. Some factors had missing values as shown in Table 2.

Factor	Overall	Pregnancy outcome		p-Value
		Stillbirth 1,250 (2.12%)	Live birth 57,778 (97.88%)	
Mother's age (years)				
13 – 18	5,343	89 (1.67%)	5,254 (98.33%)	**<0.001**
19 – 24	21,395	380 (1.78%)	21,015 (98.22%)	
25 – 29	14,268	321 (2.20%)	14,268 (97.80%)	
30 – 35	11,585	289 (2.49%)	11,296 (97.51%)	
36 – 54	6,116	171 (2.80%)	5,945 (97.20%)	
Education level				
None	645	24 (3.72%)	621 (96.28%)	**< 0.001**
Primary	42,723	949 (2.22%)	41,774 (97.78%)	
Secondary	13,104	229 (1.75%)	12,875 (98.25%)	
Tertiary	1,914	20 (1.04%)	1,894 (98.96%)	
Missing values	642	28	614	
Marital status				
Married	42,690	990 (2.32%)	41,700 (97.68%)	**< 0.001**
Not married	9,069	181 (2.00%)	8,888 (98.00%)	
Missing values	7,269	79	7,190	
Gravida				
Primigravida	20,351	398 (1.96%)	19,953 (98.04%)	**<0.001**
2 - 3	27,892	553 (1.98%)	27,339 (98.02%)	
4 and above	10,785	299 (2.77%)	10,486 (97.23%)	
Sub-county				
Rarieda	16,431	395 (2.40%)	16,036 (97.60%)	**0.011**
Gem	21,491	435 (2.02%)	21,056 (97.98%)	
Alego-Usonga	21,106	420 (1.99%)	20,686 (98.01%)	
No. of ANC visits				
<4	14,648	26 (0.18%)	14,622 (99.82%)	**< 0.001**
4 and above	19,245	21 (0.11%)	19,224 (99.89%)	
Missing values	25,135	1,203	23,932	
Wealth index				
Quintile 1	9,364	210 (2.24%)	9,154 (97.76)	0.118
Quintile 2	11,073	224 (2.02%)	10,849 (97.98%)	
Quintile 3	11,289	257 (2.28%)	11,032 (97.72%)	
Quintile 4	10,534	225 (2.14%)	10,309 (97.86)	
Quintile 5	9,564	170 (1.78%)	9,394 (98.22%)	
Missing values	7,204	1,250	57,778	
Year of pregnancy outcome				
2008	4,856	179 (3.69%)	4,677 (96.31%)	**<0.001**
2009	4,971	147 (2.96%)	4,824 (97.04%)	
2010	4,348	111 (2.55%)	4,237 (97.45%)	
2011	3,102	69 (2.22%)	3,033 (97.78%)	
2012	2,205	65 (2.95%)	2,140 (97.05%)	
2013	4,783	99 (2.07%)	4,684 (97.93%)	
2014	6,023	126 (2.09%)	5,897 (97.91%)	
2015	5,267	62 (1.18%)	5,205 (98.82%)	
2016	5,748	100 (1.74%)	5,648 (98.26%)	
2017	5,689	80 (1.41%)	5,609 (98.59%)	
2018	6,154	108 (1.75%)	6,046 (98.25%)	
2019	5,882	104 (1.77%)	5,778 (98.23%)	

Table 2. Descriptive Statistics

Trends of stillbirths

In general, the analysis showed a decreasing trend of stillbirths from a high of 36 in 2008 to 17 per 1000 total births in 2019. The stillbirths' trends in Alego-Usonga and Rarieda sub-Counties are similar despite Rarieda displaying slightly higher rates. On the other hand, the stillbirth trend in Gem is unstable, see Figure 1.

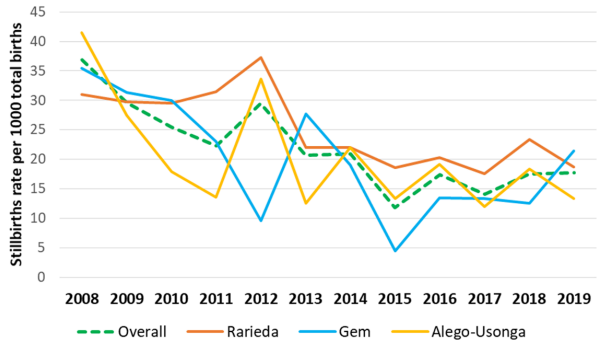

Figure 1. Trends of stillbirths between 2008 and 2019

Determinants of stillbirths

Factors that showed an increased chance for a stillbirth outcome are age (>36), education status (limited or none), having had four and above pregnancies, living in Rarieda sub-County and experiencing a pregnancy outcome in 2008 and 2012. Combining all the factors assessed, except ANC clinic visits, the significant determinants for stillbirth are mother's education level, number of pregnancies, sub-County of residence and year of pregnancy outcome. The number of ANC clinic visit was excluded from the multivariate model because of many missing values (25,135). The HDSS started collecting information about ANC clinic visits in 2013, therefore, on a separate analysis we included the number of ANC clinic visits in the multivariate model and restricted the year between 2013 and 2019. Results indicated that the number of ANC clinic visits of four and above has a statistically significant protective effect (adjusted OR = 0.51, 95% CI: 0.27, 0.96). Table 3 presents the bivariate and multivariate models for stillbirth in Siaya County.

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Factor	*OR	**95% CI	p- value	***aOR	**95% CI	p- value
Mother's age in years						
13 – 18	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
19 – 24	1.06	0.84, 1.34	0.583	0.94	0.70, 1.27	0.731
25 – 29	1.32	1.04, 1.68	0.019	1.03	0.76, 1.40	0.820
30 – 35	1.51	1.18, 1.91	0.001	1.19	0.87, 1.62	0.265
36 – 54	1.69	1.31, 2.19	<0.001	1.32	0.95, 1.83	0.093
Education level						
None	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Primary	0.58	0.38, 0.88	0.012	0.58	0.37, 0.90	0.016
Secondary	0.46	0.29, 0.70	<0.001	0.60	0.38, 0.95	0.030
Tertiary	0.27	0.14, 0.49	<0.001	0.38	0.20, 0.75	0.005
Marital status						
Married	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Not married	0.85	0.73, 1.00	0.060	0.91	0.76, 1.09	0.324
Gravida						
Primigravida	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
2 – 3	1.01	0.89, 1.15	0.083	0.90	0.77, 1.05	0.193
4 and above	1.42	1.22, 1.66	<0.001	1.14	0.95, 1.37	0.131
Sub-county						
Rarieda	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Gem	0.83	0.73, 0.96	0.012	0.81	0.69, 0.95	0.012
Alego-Usonga	0.82	0.71, 0.94	0.006	0.78	0.67, 0.92	0.004
No. of ANC visit						
Less than 4 visits	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
4 and above	0.61	0.34, 1.09	0.097	-	-	-
Wealth Index						
Quintile 1	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Quintile 2	0.90	0.74, 1.08	0.278	0.87	0.71, 1.06	0.185
Quintile 3	1.01	0.84, 1.22	0.870	1.02	0.84, 1.23	0.807
Quintile 4	0.95	0.78, 1.15	0.607	0.92	0.75, 1.12	0.434
Quintile 5	0.78	0.64, 0.96	0.023	0.72	0.57, 0.89	0.003
Year of pregnancy outcome						
2008	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
2009	0.79	0.63, 0.99	0.044	0.73	0.57, 0.94	0.015
2010	0.68	0.53, 0.87	0.002	0.69	0.53, 0.90	0.007
2011	0.59	0.44, 0.78	<0.001	0.57	0.42, 0.78	0.001
2012	0.79	0.59, 1.05	0.116	0.74	0.53, 1.02	0.073
2013	0.55	0.43, 0.70	<0.001	0.54	0.40, 0.71	<0.001
2014	0.55	0.44, 0.70	<0.001	0.61	0.47, 0.78	<0.001
2015	0.31	0.23, 0.41	<0.001	0.33	0.24, 0.46	<0.001
2016	0.46	0.36, 0.59	<0.001	0.48	0.36, 0.63	<0.001
2017	0.37	0.28, 0.48	<0.001	0.37	0.27, 0.51	<0.001
2018	0.46	0.36, 0.59	<0.001	0.48	0.36, 0.64	<0.001
2019	0.47	0.36, 0.60	<0.001	0.51	0.38, 0.68	<0.001

Table 3. Determinants for stillbirths in Siaya County between 2008 and 2019

**OR = Un adjusted Odds Ratio; **CI = 95% Confidence Interval ***aOR = Adjusted Odds Ratio*

Discussion

We quantified stillbirths, analyzed trend and assessed risk factors in an area served by the Health and Demographic Surveillance System (HDSS). Our findings indicate that the cumulative rate of stillbirths in Siaya County between 2008 and 2019 is 21

per 1000 total births, which is lower than the health facility based estimates observed in Migori, Kenya between 2016 and 2018 (Waiswa et al., 2020). There was a reducing trend from the high of 36 per 1000 total births in 2008 to 17 in 2019. The stillbirth rates in Rarieda sub-County were slightly higher than those in Gem and Karemo sub-Counties. The trend in Gem sub-County was unstable and the pattern did not resemble those of the other two sub-Counties. Although developing countries generally experience higher rates of stillbirth (Saleem et al., 2018), the possible explanation for the surge of stillbirths in 2008 is the effect of post-election violence. Violence erupted all over Kenya following the hotly contested presidential election in December 2007. Many services including health were disrupted and people were internally displaced. Siaya County received many internally displaced people (IDPs) from various parts of the country. Conflicts cause stresses that affect pregnancy outcome adversely and babies exposed to violence in utero have been observed to have an increased chance of low birth weight and being very small at birth (Guantai & Kijima, 2020). Another possibility for the spiked stillbirth rates is health workers' industrial action. Between 2010 and 2019, Kenyan health workers engaged in more than 40 regional and national strikes (Ong'ayo et al., 2019). Health workers strike exposes patients to serious risks of harm including death (Russo et al., 2019; Waithaka et al., 2020), especially where there are no provisions for partial or emergency services.

The study findings show unstable stillbirth rates in Gem sub-County, for instance, where Rarieda and Karemo experienced a spike in 2012 data shows a decline in Gem. The rise in 2012 is consistent with the data reported by Saleem et al. (2018) despite the fact that they were reporting data from two countries, Kenya and Zambia. In their report, the rate of stillbirths jumped from 19.0 in 2011 to 24.6 per 1000 births in 2012, which could be due to the health workers' nationwide industrial action. In Gem, the HDSS experienced logistical challenges due to underfunding that affected data collection as evidenced by the reduced number of observations in Gem, 23% (521). In 2012, Gem site did not have field staff and relied on those from the other two sub-Counties to up-date the basic vital event records. Therefore, the field staff from Rarieda and Alego-Usonga spared a month during the period of each data collection round to up-date vital event records in Gem sub-County. The rapid data collection approach condensed within a period of one month could have reduced the effectiveness of pregnancy outcomes observations. Also, the entire HDSS reduced the three rounds of data collection in a year to two in 2015. Despite the challenges, presently, the HDSS is the only existing surveillance system with a wider coverage and frequent observation visits in Siaya County. Therefore, the reducing trend indicates that the health workers' efforts to reduce stillbirths among other adverse pregnancy outcomes is slowly producing positive results.

In addition to the stillbirths' trend, we assessed risk factors and observed that mother's age, education level, number of pregnancies, sub-County of residence, wealth index and year of pregnancy outcome were important individual predictors of stillbirth. The combined effect of the factors showed that the education level, number of pregnancies, sub-County of residence, socio-economic status and year of the pregnancy outcome are the significant predictors. The number of ANC clinic visits was excluded from the final model because it had few observations. The HDSS incorporated ANC clinic records from 2013, therefore, there were no records between 2008 and 2012. Despite the challenge with the ANC data in our study, research studies have reported that ANC clinic services help reduce adverse pregnancy outcomes. For example, Saleem et al. (2018) conducted a study in Pakistan, Guatemala, Asia and Africa, and observed that ANC is a determinant of a successful pregnancy outcome. That women who did not attend ANC clinic were at a higher risk of experiencing stillbirth with a range of 1.5 in Pakistan to 4.5 in India. In general, medical care during pregnancy should be encouraged by providing access to quality antenatal care services so as to achieve the global target of reducing stillbirths to less than 10 per 1000 total births. The different risk levels observed in the three sub-Counties could be due to varying distances to the referral Hospital. In Siaya County, there is one referral Hospital, Siaya County Referral Hospital (SCRH), which is located in Alego-Usonga sub-County. Complicated medical cases from the three sub-Counties are referred to the SCRH. Gem sub-County is neighboring and closer to Alego-Usonga, than Rarieda sub-County, which means residents of Rarieda incur more costs to access the SCRH.

Our findings show that maternal age is an important risk factor to consider when monitoring pregnancy health. In our study, and advanced maternal age increases the likelihood of experiencing stillbirth. This is inconsistent with the findings from a study conducted in Kenya and Zambia, which reported maternal age as a significant risk factor for stillbirth (Saleem et al., 2018) but with the risk higher among women of less than 20 years old. Although the findings are inconsistent, it is known that the effect of maternal age on pregnancy outcome is experienced on both extreme ends. A study in Ghana reported women aged between 40 and 49 years had elevated odds of experiencing stillbirths compared to those between 25 and 29 years (Afulani, 2016). Regarding women from 35 years, Gordon et al. (2013) observed a high risk for stillbirth and concluded that in their first pregnancy, these women should be counselled about stillbirth risk at the end of pregnancy to help them make informed decision on delivery. Due to high risk of stillbirth among women aged 40 years and above, induction of labour by 40 weeks gestation is recommended, especially for those in their first pregnancy (Avagliano et al., 2020).

Women with formal education are able to read, learn and understand health messages better than those who lack formal education. Our findings indicate that women with at least primary education level have a reduced chance of experiencing stillbirths. The stillbirth chance is further diminishing with each advanced education level. The effect of education in reducing stillbirth suggests that efforts to educate pregnant women at the health facility on safe pregnancies should be strengthened in terms of quality and coverage. Therefore, we recommend scaling up efforts to educate women on pregnancy health. This can be achieved through the Community Health Volunteers (CHVs), where they are trained as trainers to reach more pregnant women at their homes. Hopefully, educating pregnant women on safe pregnancy will bridge the gap observed between the women with higher levels of education and those with lower levels or without. Further, education can be an indicator of a person's socio-economic status, where those with higher education levels experience better socio-economic statuses than those with lower or no formal education. Our findings show that those in the fifth quintile of the wealth index have a significantly reduced chance of experiencing stillbirth compared to those in the first quintile, which is consistent with the findings of the studies conducted in Denmark and Canada (Luo et al., 2006; Olsen & Madsen, 1999).

Strength and limitations

This research study benefited from longitudinal data with a large sample size collected through the HDSS over a period of 12 years. Also, the HDSS staff register pregnancies at home, according to reports provided by the women being observed or other household members. This approach enhances coverage but with a risk of reporting false pregnancies too. For an effective categorization of pregnancy outcome, measures such as quality interviews that promote open reporting, accurate estimation of gestation age and measurement of fetus weight are necessary. Attaining such levels requires trained staff in discussing sensitive issues around failed pregnancy and an organized process that enables collection of timely information at the community level. Obtaining reliable information that describes perinatal mortality in less developed countries can be challenging due to high rates of home births as well as variation in terminology and data collection systems (Spector & Daga, 2008). Information collected at home after an event had occurred in the past is subjected to recall bias as most cases lack clinical records. Presently, HDSS allows for proxy interviews. In order to obtain quality pregnancy outcome data, Regan & Rai (2000) recommend pregnancies are registered first and then they are monitored up to the time of birth, in which case, the data collector should be in close touch with the participant being observed.

Conclusions

We have demonstrated the potential of using a HDSS to estimate trend and to assess risk factors for stillbirth. Also, we have pointed out areas that need strengthening to improve quality of pregnancy outcome data collected through the HDSS platform. We believe that discussions around pregnancy, especially where adverse outcome was experienced, are sensitive and as such require a trained staff that can address related emotional challenges. Interviews about pregnancy outcome should be done with the index persons, not proxy, and pregnancies should be first registered and then monitored closely for timely reporting of the outcome. Our findings show a reducing trend of stillbirths suggesting that the existing interventions are effective. The wavy nature of the trend calls for enhanced and consistent efforts in stillbirth prevention. We propose working with the CHVs to improve coverage in sensitizing women on safe pregnancy and encouraging deliveries by the help of trained birth attendants. We recommend surveillance systems and research studies that target women of reproductive age directly and incorporate measures to address emotional disturbance following a failed pregnancy.

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Conflict of interest

Authors declare no conflict of interest.

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