ORIGINAL RESEARCH ARTICLE

Birth interval and its predictors among married women in Dabat District, Northwest Ethiopia: A retrospective follow up study

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Abstract

Birth intervals (time between two successive live births) if short are associated with diverse complications. We assessed birth interval and its predictors among 613 married women who gave birth from January 1 to December 30, 2008. Data were collected in April 2012. Life table and Kaplan-Meier curve were used to estimate cumulative probabilities and median birth interval, respectively. Log rank test was employed to compare survival between categories of explanatory variables. Cox-proportional hazards model was fitted to compute hazard ratios with their 95% confidence intervals. Median birth interval was 32.6 months (95%CI: 31.2-34.1). The cumulative probabilities of survival at 12, 24, and 36 months were 0.97, 0.82 and 0.56 respectively. Death of the index child (AHR=3.12), contraceptive non use (AHR=4.29) and husband's education (AHR=2.20) were significant predictors. Birth interval was short. Contraceptive use and paternal education should be given greater attention in addition to prevention of infant and child mortality. (*Afr J Reprod Health 2013; 17[2]: 39-45).*

Résumé

Si les intervalles entre les naissances (période entre deux naissances vivantes successives) sont courts, ils sont associés à des complications diverses. Nous avons évalué l'intervalle entre les naissances et ses indices chez les 613 femmes mariées qui ont donné naissance à partir du janvier 1 au 30 décembre 2008. Les données ont été recueillies en avril 2012. Des tables de mortalité et de Kaplan-Meier ont été utilisées pour estimer les probabilités cumulées et l'intervalle médian à la naissance, respectivement. Le Test du log rank a été utilisé pour comparer la survie entre les catégories de variables explicatives. Le modèle Cox- à risques proportionnels a été équipé pour calculer les ratios de risque et leurs intervalles de confiance à 95%. L'intervalle médian était de 32,6 mois (95% CI: 31.2 à 34.1). Les probabilités cumulées de survie à 12, 24, et 36 mois étaient de 0,97, 0,82 et 0,56 respectivement. La mort de l'enfant indice (AHR = 3,12), de la non utilisation de la contraception (AHR = 4,29) et de l'éducation du mari (AHR = 2,20) étaient des indices significatifs. L'intervalle entre les naissances était court. L'utilisation du contraceptif et l'éducation paternelle devraient être accordées une plus grande attention, y compris la prévention de la mortalité infantile et juvénile. (*Afr J Reprod Health 2013; 17[2]: 39-45).*

Keywords : Birth interval, Married women, Retrospective follow up, Ethiopia

Introduction

Birth interval is the length of time between two successive live births[1]. It is composed of three major components namely, postpartum ammenorrhea (PPA), waiting time to conception and gestation. In one sense, the gestation is a constant duration while PPA is in fact a physiological process which varies in a complex fashion[2, 3]. The second component, waiting time to conception, (the time interval between the resumption of menses after delivery until the beginning of the next pregnancy), is highly influenced by socio-economic, demographic, cultural, and behavioral factors[4]. Differentials in fertility levels are attributed to the length of the reproductive life of women and the interval between births[5]. Longer periods between births allow the next pregnancy and birth to occur more likely at full gestation and growth[1].

A birth interval of at least 36 months before couples deliver the next child is recommended for mothers and their children[6]. A study from Latin America revealed that short birth intervals increase

risk of poor perinatal outcomes[7]. An Indian National Family Health Survey showed a 67% increase in child mortality if birth interval is less than 24 months[8]. Similarly, a longitudinal analysis in Bangladesh reported an improved child survival with longer birth intervals[9].

Demographic and Health Surveys (DHS) data from 18 developing countries in Asia, Latin America, Africa and the Middle East showed that a birth interval of three-years improve the survival status of under five children[10]. Another similar survey from 52 developing countries revealed that too short birth intervals are associated with adverse pregnancy outcomes, increased morbidity in pregnancy, and increased infant and child mortality[11].

Birth interval beyond 2 years improves maternal health by decreasing maternal morbidities (such as toxaemia, anaemia and third trimester bleeding) and mortality[7]. In sub-Saharan Africa, about 60% of women deliver the next child before the index child celebrates his/her third birth day and almost a quarter before the second birth day[12].

Ethiopia is the second most populous country in Africa with a total population of 87.1 million and a total fertility rate of 4.8[1,13]. Information on duration of birth intervals provide insight to birth spacing patterns which is the heart of reproductive health in general and family planning in particular. Therefore, this study assessed the duration and predictors of birth interval among married women in Dabat district, Northwest Ethiopia.

Methods

A community based retrospective follow up study was conducted at Dabat Research Center (DRC). The DRC is hosted by the University of Gondar located in Dabat district, Northwest Ethiopia. The district has an estimated population of 145,458 people in 27 rural and 3 urban *kebeles* (kebele-smallest administrative unit in Ethiopia) from which the DRC includes ten of these *kebeles* representing the district. The local communities largely depend on subsistent agricultural economy. There are two health centers and twenty nine health posts in the district. The population for this study was married women aged 15-49 years who gave birth from January 01 to December 30, 2008. Every child born during this period was termed an *index child*.

A sample size of 600 was calculated using a single population proportion formula; assuming 50% proportion, 95% level of confidence and 4% margin of error. However the total number of women who delivered during the stated period were 617 and hence all were included. List of these women was obtained from the DRC database. Ten women having history of abortion or still birth after the index child were excluded.

Birth interval was defined as the duration of months between the birth of the index child and the subsequent live birth. In this study, *event* was defined as the occurrence of a live birth after the index child whereas women who did not give birth until the end of the follow up period were considered as *censored*.

Data were collected using a structured questionnaire by face to face interview in April 2012. Ten female data collectors supervised by two supervisors from the DRC (after shortly trained for this purpose) collected data by face-to-face interview at the participant's home. Pre-test was done on 30 women in a nearby *kebele* after which the questionnaire was modified. Data were cleaned and entered in to a computer using EPI info version 3.5.3 statistical software and exported to SPSS version 20 for analysis. As this study considered time-to-event data, survival analysis technique was carried out and Cox proportional hazards model was fitted. Life table was used to estimate cumulative probabilities. Kaplan-Meier curve (an intuitive graphical presentation which describes survivorship of the study population) was used to estimate the median duration of birth interval. Log rank test was used to compare survival curves between different categories of explanatory variables. Bivariate and multivariate Cox proportional hazard model were used to identify predictors of birth interval. Hazard Ratios (HR) with 95% confidence intervals were computed and statistical significance was accepted at the 5% level ($p<0.05$).Ethical clearance was obtained from the institutional review board of the Institute of Public Health at the University of Gondar. Formal letter of cooperation was written for the district and the research centre. Informed

verbal consent was obtained from study participants and anonymity was maintained to ensure confidentiality.

Results

Baseline Socio-Demographic Characteristics

Out of 617 married women, 613 were included in the final analysis (response rate = 99.5%). The mean age of women was 27.9 ± 8.5SD years. Majority (85.0%) were aged 20 to 40 years. Five hundred and fifteen (84%) of the husbands had no formal education and majority (92.8%) of them were farmers in occupation (Table 1).

Maternal related factors

About three quarters of women (76.2%) breastfed their index child for more than 2 years. Nearly two third (65.1%) had more than 4 live births. Two hundred and forty (39.2%) of the women were using one of the modern contraceptive methods, of which 89.7% were using injectable contraceptives. Nearly all (97.6%) preferred more than 36 months between two successive live births (Table 2).

Birth after the index child

During the follow up period, 276 (45%) women had births after the index child. The median birth interval was 32.6 months (95%CI: 31.2-34.1). Total person-time of follow up was 1953.72 person-years. The probability of birth after the index child was 14 births per 100 women years during the follow up period.

There were 19 (6.8%), 108 (39.1%) and 255 (92.4%) births within the first twelve, twenty four and thirty six months after the birth of the index child, respectively. The rest 337 (55%) married women had not given birth until the end of the study period. The cumulative probability of not having birth at 12, 24, 36 and 48 month was 97%, 82%, 56%, and 37% respectively.

Kaplan-Meier survival curve depicted that none of the mothers gave birth during the first year of follow up, however the curve started to drop just

Table 1: Baseline Socio-demographic characteristics of participants in Dabat District, Northwest Ethiopia, 2012 (n=613)

Variables	Number	%
Residence		
Urban	83	13.5
Rural	530	86.5
Age group		
15-19	51	8.3
20-29	261	42.6
30-39	260	42.4
40-49	41	6.7
Age at first marriage (years)		
< 15	291	47.5
15-17	230	37.5
18 +	92	15.0
Religion		
Orthodox Christian	600	97.9
Muslim	13	2.1
Ethnicity		
Amhara	608	99.2
Tigrie	5	0.8
Educational status of women		
No Formal Education	530	86.5
Primary Education	43	7.0
Secondary and above	40	6.5
Occupation of women		
Employee	17	2.8
House wife	569	92.8
Merchant	10	1.6
Others*	17	2.8
Educational status of husband		
No formal Education	515	84.0
Primary Education	58	9.5
Secondary and above	40	6.5
Occupation of husband		
Employee	40	6.5
Merchant	14	2.3
Farmer	538	87.8
Others*	21	3.4
Sex of the index child		
Male	307	50.1
Female	306	49.9
Status of the index child		
Alive	575	93.8
Dead	38	6.2

*Others include students and daily laborers

Table 2: Maternal related characteristics of study participants in Dabat Research center, Dabat District, Northwest Ethiopia, 2012 (n=613)

Variables	Number	%
Parity		
1	34	5.5
2	89	14.5
3	91	14.8
4+	399	65.1
Duration of breast feeding(in months)		
0-6	20	3.3
7-12	33	5.4
13-23	93	15.2
24+	467	76.2
Contraceptive use		
Yes	240	39.2
No	373	60.8
Preferred birth interval		
Less than 24 month	2	0.3
24-35 month	13	2.1
36 month	598	97.6

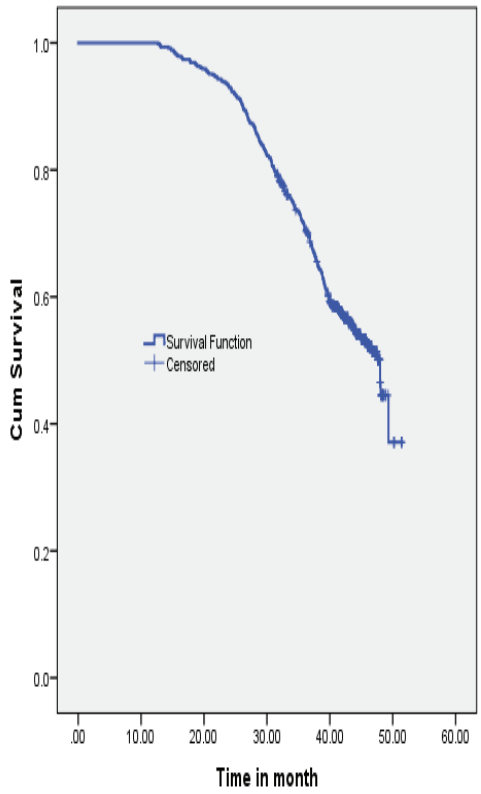

Figure 1: Kaplan Meir survival function showing probability of birth after index child among married women in Dabat District, 2012.

after the first year. Moreover, about 40% of mothers still remain at risk after 50 months of follow up period (Figure 1).

Predictors of birth interval

Status of the index child, maternal age at birth of the index child, contraceptive use and duration of breast feeding, education and occupation of the husband were significant predictors of birth interval in the multivariate analysis. However, maternal variables such as residence, education status, occupation and age at first marriage were not statistically significant predictors.

Women whose index child died were 3 times more likely to have subsequent birth compared with women whose index child is alive (AHR = 3.12, 95% CI: 1.88, 5.15).

Age of women at birth of the index child was significant predictor of birth interval. Women aged 20-29 years were 50% less likely to have a subsequent birth compared to those aged 15-19 years (AHR = 0.50, 95% CI: 0.35, 0.71). Likewise, women aged 30-39 and 40-49 years were 71% (AHR = 0.29, 95% CI: 0.20, 0.43) and 94% (AHR=0.06, 95% CI: 0.02, 0.20) less likely to have a subsequent birth respectively.

With regard to contraceptive use, women who did not use any of the contraceptive methods were about four times more likely to have subsequent birth after the index child compared to contraceptive users (AHR = 4.29, 95 CI%: 3.00, 6.13). Women who breastfed for 7-12 months were 6 times more likely to have subsequent birth compared to those who breastfed for less than 6 months (AHR= 6.12, 95 CI%: 2.79, 13.38).

Women whose husband's had no formal education were about 2 times more likely to have subsequent birth after the index child compared to those with at least secondary education (AHR= 2.11, 95 CI%: 1.38, 3.22). In addition, if the husband is a farmer, there is a 2.3 (AHR= 2.34, 95 CI%: 1.38, 3.22) times more risk having subsequent birth after the index child compared the employed husband (Table 3).

Discussion

Birth intervals of short duration are associated with adverse pregnancy outcomes, increased

morbidity during pregnancy, and increased infant and child mortality[11]. This study aimed to assess the duration and predictors of birth interval among married women in Dabat district, Northwest Ethiopia.

In this study, it was found that the median birth interval was 32.6 months (95%CI: 31.2-34.1). This finding was similar with recent studies from southern Ethiopia (33 month)[14], the 2011 Ethiopian Demographic and Health Survey report (34 months)[1] and a study from India (34 month)[15]. However, it was lower than the recommendation (36 months) for birth interval by the WHO[6]. A total of 276 (45%) women had birth after the index child in the 51.5 months follow up period. Majority (92.4%) occurred in the first three years after the index child.

If the index child died there was a 3 times higher risk of having subsequent birth than when the child survived. This finding is consistent with

Table 3: The Cox-Regression analysis of predictors of birth interval among married women living in Dabat District, Northwest Ethiopia, 2012

Variables	Birth status		HR(95% CI) Crude HR (95% CI)	Adjusted HR (95% CI)
	Birth	Censored		
Residence				
Urban	23	60	0.51(0.33,0.78)	0.70(0.36,1.36)
Rural	253	277	1	1
Status of index child				
Alive	247	328	1	**1***
Dead	29	9	3.33 (2.26, 4.89)	**3.12(1.88,5.15)**
Educational status of women				
No Formal Education	246	284	1.67(0.96,2.92)	1.08(0.43,2.65)
Primary	17	26	1.38(0.67,2.85)	1.20(0.49,2.94)
Secondary and above	13	27	1	1
Husband Educational status				
No Formal Education	235	280	1.88(1.03,3.44)	**2.11(1.38,3.22)***
Primary	30	28	2.25(1.13,4.95)	1.22(0.53,2.81)
Secondary and above	11	29	1	**1**
Occupation of Husband				
Gov't employee	13	27	1	**1***
Merchant	6	8	1.02(0.33,3.12)	1.13(0.36,3.57)
Farmer	257	281	1.75(1.00,1.22)	**2.34(1.07,5.07)**
Others**	8	13	0.28(0.06,1.22)	0.51(0.11,2.40)
Contraceptive use				
Yes	42	198	1	1*
No	234	139	5.09(3.66,7.08)	**4.22(2.96,6.02)**
Age at birth of the index child				
15-19	5	6	1	**1***
20-29	138	123	0.27(0.19, 0.38)	**0.50(0.35,0.71)**
30-39	90	170	0.14(0.10,0.21)	**0.29(0.20,0.43)**
40-49	13	28	0.03(0.01,0.08)	**0.06(0.02,0.20)**
Age at Marriage				
Less than 15	141	150	1	1
15-18years	104	126	0.93(0.72,1.19)	1.05(0.80,1.36)
18years+	31	61	**0.62 (0.42,0.92)**	0.88(0.57,1.35)
Duration of Breast feeding(months)				
0-6	14	6	1	**1***
7-12	26	7	2.49(1.32,4.70)	**6.12(2.79,13.38)**
13-23	81	12	1.37(0.77,2.43)	1.95(0.95,4.01)
24+	150	317	0.19(0.11,0.34)	0.53(0.25,1.09)

* Significant from the multivariate Cox regression **others (n=student, daily laborers)

studies done in southern Ethiopia, Tanzania and India[14-16]. This could happen due to the desire of parents' to replace the dead child sooner. In addition, if the child dies, the woman is less likely to be protected from lactational amenorrhea.

A number of studies identified contraceptive use as a significant determinant of birth interval length[17, 18]. This study also confirmed that contraceptive use was a significant predictor of birth interval. Women who were not on any contraceptive method were about 4 times more likely to have a subsequent birth as compared to contraceptive users. This could be due to the effect of contraceptives to postpone the time until the next conception.

In this study birth interval showed a significant difference with age of women at birth of the index child. As women get older and older there is a consistent decrement in the probability of having subsequent births. This could be explained in two ways. Firstly, as the woman's age increases, fecundity decreases. Secondly, older women are likely to have achieved the desired number of children. Studies done in southern Ethiopia and northern Iran support this finding[14, 19]. It was also shown by the DHS analysis from 50 countries[12].

Women who breast fed their child for 7-12 months were 6 times more likely to give subsequent birth after the index child. Studies done at the southern region of Ethiopia[14] and Mozambique[20] showed similar findings. Possibly, women may believe that breast feeding prevents pregnancy for long and may not use contraceptives which later pose them to be pregnant.

Women whose husband's had no formal education were about 2 times at higher risk of having subsequent birth after the index child compared to those with at least secondary education. This might be due to the reason that couples who had better education were more likely to access contraceptive methods to space birth than those who had no education. They may also put fewer constraints on their wives' decision-making, thus facilitating care-seeking. In addition, women whose husbands were farmers had about 2.3 times more likely to have subsequent birth after the index child as compared to employees. This could be due to the lower awareness and limited access for contraceptive methods among rural people (in this case, farmers) compared to employees.

In conclusion, the median birth interval at the end of the follow up period was short. Death of the index child, non use of contraceptive methods, older age at birth of the index child, breast feeding, husband's occupation and education predict birth interval. Use of contraceptive methods and husband education should be given greater attention in addition to prevention of infant and child mortality to prolong birth intervals.

Acknowledgements

We are very grateful to the University of Gondar for technical and financial support of this study. We thanks Dabat research center for providing the list of eligible women.

Contribution of Authors

Gizachew A Tessema wrote the proposal, participated in data collection, analyzed the data and drafted the paper. Berihun M Zeleke and Tadesse A Ayele approved the proposal with some revisions, participated in data analysis and revised subsequent drafts of the paper. All authors read and approved the final manuscript.

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