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Effects of Short Birth Interval on Birth Outcomes among Term Pregnant Mothers in Labor

Ebba T. KORSA[1]

Fozia I. MOHAMMED[2*]

Kifle W. HAJITO[3]

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ABSTRACT

Short birth interval is a global public health problem that remains challenging in Ethiopia. This study aimed to determine the effects of short birth interval on birth outcomes among term pregnant mothers in labor in Nekemte, Ethiopia.

An institution-based prospective cohort-study with a convenient sampling technique was conducted from February 01 to March 30, 2016. A total of 207 term pregnant mothers were enrolled with the ratio of 1:2 women with short birth intervals and actualbirth intervals. The data collected using a structured questionnaire was analyzed by SPSS version 20.

[1]CEFA Onlus, Addis Ababa, Ethiopia.
[2]Armauer Hansen Research Institute, Addis Ababa, Ethiopia.
[3]Jimma University, Jimma, Ethiopia.
*Corresponding author: F.I. MOHAMMED, foziaibrahim211@gmail.com

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Women with short birth intervals were more likely to have premature rupture of membrane, prolonged labor, preeclampsia, and risk of malposition or malpresentation compared to women with actual birth intervals. Women with short birth intervals also had babies with low birth weight, low APGAR score, respiratory distress, risk of having early age for gestational growth, early neonatal death, and anemicnewborn babies compared to women with actual birth intervals.

Therefore, the findings of this study revealed that short birth intervals had a significant influence on both maternal and neonatal health outcomes.

Keywords: Short Birth Interval, Normal Birth Interval, Birth Outcome, Ethiopia

INTRODUCTION

A birth interval is the period between consecutive pregnancies in pair or live births (Assefa et al., 2010). The optimal birth interval improves the survival of children, and it is a good opportunity for mothers to improve their health status (Begna et al., 2013). According to a demographic health survey analytical study conducted in 20 Sub-Saharan Africa countries, the average median length of an actual birth interval was 2.8 years (33.7 months) (Rafalimanana and Westoff, 2001).

Short birth interval (SBI) is a universal public health problem resulting in adverse maternal and child outcomes (WHO, 2006). The time between previous and index live births has been linked to adverse neonatal outcomes, including child mortality, Low Birth Weight (LBW), preterm birth, stillbirth, Small Age for Gestational growth (SGA), and other medical and obstetric complications. In Ethiopia, about 11% of babies born on average are low birth weights (CSA, 2011).

Pregnant women with SBI revealed a statistically significant association with birth complications such as premature rupture of the membrane (PROM), low hemoglobin level, Vaginal Birth after Cesarean (VBAC), risk of pre-eclampsia, and post-partum hemorrhage, respectively, compared to

women with NBI (Mosha and Philemon, 2010).

SBI also places a great challenge on the population growth and socio-economic health status of the community as NBI protectsthe health of mothers and improves outcomes of subsequent pregnancy (Isiugo-Abanihe and Nwokocha, 2008). Approximately about 4 million out of 130 million infants born worldwide die during the first fourweeks of life (DaVanzo et al., 2007; Exavery et al., 2012). One-half of LBW infants born in developed countries are pre-term (< 37weeks of gestation) (Ramakrishnan, 2004).

In Ethiopia, Maternal Mortality Rate (MMR) is higher than the national average (676/100,000 live births) in 5 out of the 11 regions; the highest being in Afar, followed by the fifth in Oromia regions. In Oromia, (MMR=688/100,000 live births), the predicted MMR is marginally higher than the national average. The neonatal death in Ethiopia is 37/1000 live births, and the prevalence rate of LBW ranges from 10-11% to 9% of which is from rural towns (CSA, 2011).

In 2005, the World Health Organization (WHO) recommended that the interval before attempting the following pregnancy should be at least 24 months (WHO, 2006). Attaining the above birth interval duration was observed as a great challenge to most women in developing countries. In Ethiopia, little is known about maternal and birth outcomes among term pregnant mothers in labors with short birth intervals. Therefore, this study aimed to determine the effects of SBI on birth outcomes among term pregnant mothers in labor in Nekemte, Ethiopia.

METHODOLOGY

Study Area and Setting

The study was conducted in Nekemte town, the capital of East wollega zone located at 321 KM from Addis Ababa to the west. The total population of the town is estimated to be 75,219, of which 38,385 (51%) are females(CSA, 2007). In the town, there were one public hospital and two

health centers.

Study Design and Period

Institution-based prospective cohort study was conducted from February1 to March 30, 2016. The source population for this study was all term pregnant mothers in Nekemte town.

Sample Size and Sampling Technique

The population for this study was all term pregnant women coming to Nekemte town health institutes for delivery utilization and fulfilling the eligibility criteria. Term pregnant mothers with previous birth intervals less than 36 months (SBI) who received delivery service from Nekemte referral hospital and health center were categorized as exposed mothers. While those term pregnant mothers with previous birth intervals between 36-59 months (NBI) who received the service from the same institutions categorized as non-exposed mothers.

The sample size was determined by two population proportion formulas and calculated using Open Epi-info version 3.4.4 statistical software for cohort studies. The assumptions used were: Low APGAR score as an outcome, Alpha=5%, Z=1.96, Power =80%, 1:2 SBI to NBI ratio, 10% outcome in normal birth interval group, 2.56 Risk ratio, and 25.6 %outcome in SBI group (Lilungulu et al., 2015). Hence, the maximum sample size calculated was 189, and the total sample size used for this study was 207 by adding a 10% non-response rate**.**

Eligibility Criteria

All the term pregnant mothers recommended by WHO as SBI and NBI (WHO, 2006), and fulfilling this study's inclusion criteria were conveniently selected from the hospital and health centers until the desired amount sample size was reached. The inclusion criteria werethat all term pregnant mothers coming for delivery services utilization in Nekemte town health institution had at least one live birth previous to this index birth, with no history of abortion, stillbirth, preterm,

obstetric complications, and known chronic medical illness (HIV/AIDS, Hypertension, Diabetes, TB, Malaria, etc.) and having singleton deliveries (Kozuki et al., 2013, Conde-Agudelo and Belizán, 2000, Lilungulu et al., 2015).

Term pregnant mothers who are recruited to exposed against unexposed groups of the appropriate age until the desired number of exposed mothers were reached. For one-term pregnant mothers from the exposed group (out of 69 exposed term pregnant mothers), there would be two controls from the unexposed group (138 unexposed term pregnant mothers).

The term pregnant mothers recruited in this study were then followed up until they gave birth. One week follow-up after delivery was conducted by postnatal visits to the hospital, home, and mobile phone contact.

Data Collection Tools

A structured interviewer-administered questionnaire was used to collect the data. The questionnaire was developed through a review of the available scientific sources (Assefa et al., 2010; Mosha and Philemon, 2010; Lilungulu et al., 2015; Kozuki et al., 2013). The questionnaire consisted of five sections named socio-demographic and economic status, risk factors, biomedical information, measurements taken during delivery (birth weight, APGAR score, and termsmall for gestational age), and post-delivery information.

Data Quality Control

The final version of the questionnaire was translated into the local language, Afan Oromo by language experts. It was translated into English to check the consistency of the translation. Once the questionnaire passed expert evaluation, the questionnaire was pre-tested, and modification was made based on the problems identified. The traininggiven for data collectors on interview techniques and timely supervision of data collectors was done by the investigator during data

collection.

Data Collection Procedure

Six trained midwives were assigned for the data collection process, and the medium of language for data collection was Afan Oromo. Written informed consent was retrieved from the participants before the interview. The data collectors completed the questionnaires, and the filled questionnaires were checked for completeness. The above sections were filled at the beginning of the study and during the follow-up; except for the measurement data questionnaires to be filled during delivery and one-week post-delivery, respectively. Incomplete questionnaires were taken back by the data collectors for completion.

Data Processing and Analysis

Data were entered, cleaned, and analyzed using SPSS version 20. Descriptive statistics like mean, median, proportion, standard deviations were computed. Then, Chi-square was done to test the association between categorical and outcome variables. The identification, as well as control of confounding variables and effect modification between independent and dependent variables, was checked by the stratified analysis method. Also, restriction to control confounding was employed at the design level and during analysis stages.

Relative risk was calculated to test the strength of association between variables. Hence, the adjusted value from the Mantel-Haenszel method of analysis was used for variables interpretation as it was not misleading in epidemiological reasoning, since the two values difference are appreciably less than 10%. Finally, P-Value < 0.05 was used to declare statistical significance andthe finding was presented by using relative risk and its 95% confidence intervals.

Operational Definition

APGAR Score. Itisa sum of the value assigned to an infant at 1 and 5 minutes of life with a score of 7 or more indicating that the baby is in good to excellent condition but a score of less than 7 indicating the baby is in poor to bad outcome condition (Mosha and Philemon, 2010).

Short Birth Interval. It is the birth interval less than 36 months or 3 years between two successive live births. It is measured by the difference between birth date records of the previous live birth and current live birth less than 36 months (Yohannes et al., 2011).

Normal Birth Interval. It is the birth interval greater or equal to 3 and less than 6 years or 36 months to 59 months between two successive live births. Measured by the difference between birth date records of the previous live neonate and current live birth ≥ 36 to 59 months (Yohannes et al., 2011).

Term Pregnancy. The periods from 3 weeks before until 2 weeks after the estimated date of delivery (Lilungulu et al., 2015).

Low Birth Weight. Any infant born weighing less than 2500 gram at birth (Assefa et al., 2010).

Term-Small for Gestational Age. The birth at term and less than the 10^{th} centile or equals from the US national growth curves (Alexander et al., 1996).

Early Neonatal Deaths. The deaths of infants in the first week of a live birth or 0-6 days (Conde-Agudelo et al., 2006).

Birth Outcome. Any good or adverse maternal and neonatal outcomes in SBI and NBI groups of the eligible term pregnant mothers coming for delivery service utilization not resulted in maternal death and stillborn (Lilungulu et al., 2015).

Adverse Maternal Outcomes. Negative outcomes, when the mother developed prolonged labor and other labor complications as well as delivery complications like; PROM, eclampsia, VBAC,

and e.t.c (Lilungulu et al., 2015).

Adverse Neonatal Outcomes. They are any poor outcomes, when the newborn developed birth complication such as respiratory distress, birth asphyxia, low APGAR score, low birth weight, SGA, early neonatal death and e.t.c (Lilungulu et al., 2015).

Ethical Consideration. Ethical approval was obtained with reference number HRPCG/4081/2016 from the institutional review board of the college of public health and Medical Sciences, Jimma University. Informed verbal consent was obtained from every study participant and the information provided by each respondent was kept confidential.

RESULT

Socio-Demographic Characteristics of the Study Population

Sixty-ninewomen with SBI and 138 women with NBI were enrolled in the study. The mean age of women with SBI and NBI were 25.797±3.567 and 27.959±3.327, respectively. Above 91.4% and 33.3% of the women in SBI were married and had completed elementary school, respectively. Meanwhile, 37.7% and 29.7% of women were housewifes among SBI and NBI women respectively (Table 1).

Table 1: Socio-Demographic Characteristics of the Women with SBI and NBI.

Variable	Category	Study group frequency and percentage (%)	
		SBI (n=69)	NBI (n=138)
Age	Mean women age	25.797±3.567	27.959±3.327
Marital status	Married	63 (91.4)	116 (84.1)
	Divorced	3 (4.3)	17 (12.3)
	Widowed	3 (4.3)	5 (3.6)
	Unable to read & write	6 (8.7)	24 (17.4)
	Can read & write	6 (8.7)	18 (13.1)

Educational status	Elementary	23 (33.3)	33 (23.9)
	Secondary school	13 (18.8)	24 (17.4)
	TVET	3 (4.4)	8 (5.8)
	University	8 (11.6)	21 (15.2)
	College diploma	10 (14.5)	10 (7.2)
Religion	Orthodox	12 (17.4)	36 (26.1)
	Protestant	50 (72.5)	88 (63.8)
	Catholic	2 (2.9)	6 (4.3)
	Muslim	5 (7.2)	8 (5.8)
Ethnic Groups	Oromo	62 (89.9)	115 (83.4)
	Amhara	4 (5.8)	10 (7.2)
	Gurage	3 (4.3)	13 (9.4)
Occupation	Housewife	26 (37.7)	41 (29.7)
	Merchant	13 (18.8)	26 (18.8)
	Farmer	7 (10.1)	17 (12.3)
	Employee (GO/NGO)	18 (26.1)	33 (23.9)
	Daily worker	5 (7.3)	21 (15.3)

The Past and Current Biomedical History among Women with SBI and NBI Categories

Thirty-seven to thirty-nine (37-39) gestational weeks were found in 97.1 % and 86.2% of women having SBI and NBI, respectively. Sixty-five (94.2%) women with SBI and 132(95.7%) women with NBI had parity of two to three children. Likewise, about sixty-five (94.2%) of SBI women and 133(96.4%) in NBI women had gravidity of two to three.

Forty-nine (71.0%) and 54(39.1%) of women with SBI and NBI respectively had breastfed their previous infants for less than six months. Planned pregnancy was higher among women with NBI, 125 (90.6%), than SBI 53 (76.8%).

Fifty-eight (84.0%) women with SBI and 126(91.3%) women with NBI had used contraceptives before this index child. Forty-two (60.9%) and 81(58.7%) women with SBI and NBI had 1-3 number of ANCs visits before giving birth. Only 27 (39.1%) women with SBI and 57 (41.3%) women with NBI had used (4 and above, ANCs) service facility utilizations. Among the study participants, 49(71.0%) of women with SBI and 107 (77.6%) with NBI had found to be RH positives (Table2).

Table 2: Past and Current BiomedicalHistory of Women with SBI and NBI

Variable	**Category**	**Study group frequency and percentage (%)**	
		SBI (n=69)	NBI (n=138)
Gestation in weeks	37 - 39	67 (97.1)	119 (86.2)
	>39 and above	2 (2.9)	19 (13.8)
Parity	2-3	65 (94.2)	132 (95.7)
	4 and above	4 (5.8)	6 (4.3)
Gravidity	2-3	65 (94.2)	133 (96.4)

	4 and above	4 (5.8)	5 (3.6)
Breast feeding in months	< 6 months	49 (71.0)	54 (39.1)
	≥6 months	20 (29.0)	84 (60.9)
Is current pregnancy wanted?	Yes	53 (76.8)	125 (90.6)
	no	16 (23.2)	13 (9.4)
Sex of the current baby	Male	36 (52.2)	45 (32.6)
	Female	33 (47.8)	93 (67.4)
Contraceptives utilization	Yes	58 (84.0)	126 (91.3)
	No	11 (16.0)	12 (8.7)
No. of ANCs visits	1-3 visits	42 (60.9)	81 (58.7)
	4 and above visits	27 (39.1)	57 (41.3)

RH types	Positive	49 (71.0)	107 (77.6)
	Negative	10 (14.5)	19 (13.7)
	Unknown	10 (14.5)	12 (8.7)

Maternal Outcomes in Women with SBI and NBI

Seventeen (24.6%) women having SBI were found to have malposition or malpresentation, as compared to 11 (7.9%) of women with NBI. On the other hand, 21 (30.4%) women with SBI had prolonged labor as compared to 15 (10.9%) women with NBI. Meanwhile, 24 (34.8%) women with SBI had preeclampsia as compared to 21 (15.2%) women with NBI. Twenty-seven (39.1%) respondents with SBI had PROM as compared to 25 (18.1%) women with NBI (Table 3).

Table 3: Distribution of Maternal Adverse Outcome among Women SBI and NBI

Variable	**Category**	**Study group frequency and percentage (%)**	
		SBI (n=69)	NBI (n=138)
PROM	Present	27 (39.1)	25 (18.1)
	Absent	42 (60.9)	113 (81.9)
Preeclampsia	Present	24 (34.8)	21 (15.2)
	Absent	45 (65.2)	117 (84.8)
Prolonged labor	Present	21 (30.4)	15 (10.9)
	Absent	48 (69.6)	123 (89.1)
Malposition (malpresentation)	Present	17 (24.6)	11 (7.9)
	Absent	52 (75.4)	127 (92.1)

Neonatal Outcome in Women with SBI and NBI

The frequency of early neonatal death [17(24.6%), 5(3.6%)], low APGAR score [22 (31.8%), 11 (7.9%)], presence of anemia [20 (28.9%), 10 (7.2%)], being low birth weight [20(28.9%), 13 (9.4%)], having respiratory distress [31 (41.9%), 25 (18.1%)] and small for gestational age [36 (52.2%), 19 (13.7%)] were higher in mothers with SBI as compared to mothers with NBI (Table 4).

Table 4: Distribution of Neonatal Adverse Outcome among Women with SBI and NBI

Variable	**Category**	**Study group frequency and percentage (%)**	
		SBI (n=69)	NBI (n=138)
Birth Weight	<2500g	20 (28.9)	13 (9.4)
	>2500g	49 (71.1)	125 (90.6)
Anemia	Present	20 (28.9)	10 (7.2)
	Absent	49 (71.1)	128 (92.8)
Low APGAR Score	Present	22 (31.8)	11 (7.9)
	Absent	47 (68.2)	127 (92.1)
SGA	Present	36 (52.2)	19 (13.7)
	Absent	33 (47.8)	119 (86.3)
Respiratory distress	Present	31 (44.9)	25 (18.1)
	Absent	38 (55.1)	113 (81.9)
Early Neonatal Death	Present	17 (24.6)	5 (3.6)
	Absent	52 (75.4)	133 (96.4)

Factors Associated with Maternal and Neonatal Adverse Outcome in Women with SBI and NBI

Women with SBI have shown 2.16 times higher risk of having PROM as compared to those with NBI, [RR, 2.16; 95% CI 1.688 – 4.702]. Women with SBI were more also likely to have

prolonged labor as compared to women with NBI [RR, 2.80; 95% CI 1.986 – 5.137]. Pre-eclampsia was found more in women with SBI as compared to women with NBI [RR, 2.29; 95% CI 2.264 - 5.954]. The risk of malposition or malpresentation was 3.07 times higher among women with SBI as compared to women with NBI [RR, 3.07; 95% CI 1.525 – 6.184].

On the other side, women with SBI were found to give birth to LBW babies as compared to women with NBI [RR, 3.06; 95% CI 1.622- 5.812]. Low APGAR score was seen more frequently among babies of women with SBI as compared to babies born from women with NBI [RR, 4; 95% CI 2.594 – 6.166]. Newborns of women with SBI had a higher risk of respiratory distress when compared to babies born from women with NBI [RR 2.50; 95% CI 1.751 – 4.255].

Women with SBI have a higher risk of having SGA babies as compared to women with NBI [RR, 3.78; 95% CI 2.356 – 6.092]. Early neonatal death was found to be 6.65 times higher on babies of women with SBI as compared to babies of women with NBI [RR, 6.65; 95% CI 3.046 – 14.514]. Likewise, women with SBI were 3.97 times likely to have anemicnewborn babies as compared to women with NBI [RR, 3.97; 95% CI 2.994 – 5.269] (Table 5).

Table 5: The Relative Risks of Maternal and Neonatal Adverse Outcome among Women with SBI and NBI

Variable	**Relative risk**	**Adjusted 95% CI**	**P-value**
Maternal adverse outcome			
PROM	2.16	1.688 – 4.702	0.009
Pre-eclampsia	2.29	2.264 – 5.954	0.020
Prolonged labor	2.80	1.986 – 5.137	0.000
Malposition (malpresentation)	3.07	1.525 – 6.184	0.004

Neonatal adverse outcome			
Low Birth Weight (LBW)	3.06	1.622 – 5.812	0.001
Low APGAR score	4.00	2.594 – 6.166	0.040
Anemia	3.97	2.994 – 5.269	0.044
SGA	3.78	2.356 – 6.092	0.003
Respiratory distress	2.50	1.751 – 4.255	0.000
Early Neonatal Death (END)	6.65	3.046 – 14.514	0.013

DISCUSSION AND CONCLUSION

This study showed maternal and neonatal adverse outcomes to be more frequent among mothers with SBI as compared to those with NBI. PROM was 39.1% and 18.1% in women with SBI and NBI, respectively, and the difference was statistically significant. This finding was similar to a systemic review by CondeAgunelo et al.(Conde-Agudelo and Belizán, 2000) that revealed that PROM was higher (60%) in short interpregnancy interval (SIPI) women than in actualinterpregnancy interval (NIPI) and observed that women in SIPI might continue to carry the organisms from several weeks to months after the delivery. Thus, unrecognized or recognized preconception maternal infection leading to an increased risk of chorioamnionitis, finally caused PROM on the following pregnancy (Conde-Agudelo and Belizán, 2000). On the other hand, this leads women to an increased risk of post-delivery infections and prolonged hospital stays. Consequently, it incurs more cost to the family and leads to psychological stress.

Pre-eclampsia was 34.8% in women with SBI, and 15.2% in women with NBI and the

difference was statistically significant. The reason for this occurrence of pre-eclampsia was due to short birth space within the duration of one year, which was putting women at risk of having pre-eclampsia and found an increased risk from 10% to 12% for each one year of increased inter-pregnancy or birth since from the first delivery (Conde-Agudelo et al., 2006; DaVanzo et al., 2007; Lilungulu et al., 2015). Thus, appropriate investigations to check for the amount of protein in urine, renal, and liver functions should be done. Moreover, emphasis should be made on regular assessment of neonatal monitoring and when complications arise, they should be controlled by well-experienced obstetric personnel.

The study found that prolonged labor was 30.4% in women withSBI and 10.9% in NBI women and the difference was statistically significant. When birth intervals are spaced too close, women do not have sufficient time to re-build nutritional stores. And hence, this results in additional physiological stress and malnutrition leading to poor labor progress; and a sign of bleeding exposing the mother to PROM and hypertension. On the other hand, poor reproductive readiness and poor nutritional stores due to SBI leads to stress incontinence and contraction of the pelvis, which causes early rupture of the membrane. And this does not allow the fetus to progress to the birth canal, making labor and delivery difficult (Mosha and Philemon, 2010).

Malposition (malpresentation) during delivery was also compared in both groups. In this study, malposition among women with SBI was 24.6% as compared to 7.9% in women with NBI, and the difference was statistically significant. This indicates the need for appropriate Anti Natal Care (ANC) follow-up and a care during labor.

Regarding birth weights of infants, neonates with a birth weight below 2500g were 28.9% in women with SBI and 9.4% in women with NBI, and the difference was statistically significant. This finding is consistent with studies done in Sudan, Bangladesh, and Tanzania (DaVanzo et al.,

2007; Mosha and Philemon, 2010; WHO, 2007). Low birth weight in SBI women may be the result of poor maternal nutritional status due to the very short birth spacing and poor maternal weight gain (Ramakrishnan, 2004). This can be secondary to iron storage capacity and folate depletion in the body which increases women's susceptibility to anemia and compromising their nutritional status. Hence, poor weight gain during pregnancy with a negative effect on birth weight. Therefore, this indicates that the assessment of good care and ANCs visits should be strengthened. And also, appropriate postnatal care observations should be emphasized.

SGA was significantly more frequent (52.2%) in babies born from women with SBI as compared to 13.7% in babies born from women with NBI. According to the study done in Israel Zedek Medical Center (IZMC), there was an increased risk of SGA (8.5% vs. 7.6%) (Grisaru-Granovsky et al., 2009). Another study from Tanzania showed that women with SIPI have a high chance of delivering infants with SGA (23.3%) when compared to (3%) babies born from women with NIPI (Lilungulu et al., 2015). The hypothetical explanation for SGA in SBI pregnant women is due to poor maternal nutritional status and pregnancy folate storage capacity depletion syndrome from the previous pregnancy which is commonly found in pregnant women with SBI (Van Eijsden et al., 2008)

The low APGAR score was 31.8% in babies born from women with SBI and 7.9% in babies born from women with NBI, and this difference was statistically significant. The study done in Tanzania showed that SIPI with less than 18 months is associated with a low APGAR score (Lilungulu et al., 2015). The reason for the low APGAR score in SBI pregnant women is due to the adverse outcome followed by obstetric complications, low birth weight, and prolonged laborthatare commonly found in pregnant women with SBI. SGA and LBW babies are prone to succumb to fetal distress during the labor and hence low APGAR score (Lilungulu et al., 2015).

Infants with respiratory distress were 44.9% in women with SBI and 18.1% in women with NBI, and the difference was statistically significant. This indicates the need for special attention regarding their observation, assessment, care, investigation, and management during the entire period from labor progress to hospital or health center staying. Thus, prolonged stay in hospital might be much costly and cause stress to the mother; and might be a prediction for future healthy impairment in the neonates. Because there is a poor peripheral circulation, and extremities become pale and edematous, when breathing in labor (Conde-Agudelo et al., 2006).

Early neonatal decaths were seen on 24.6% of babies born from women with SBI and 5.0% of women with NBI, which was statistically significant. This finding is similar to other studies which also revealed a preceding birth interval less than 18 months is associated with a two-fold increase of 27% in mortality risk compared to NBI of 36 months or more (Fotso et al., 2013; Williams et al., 2008). One hypothesis of a possible biological mechanism to explain SBI related early neonatal deathsis the poor iron and folic acid storage capacity and pregnancy anemia, that facilitates immune compromise leading to the risk of infection causing chorioamnionitisand finally leading to fetal death (Conde-Agudelo and Belizán, 2000).

Anemia was 28.9% in newborn infants from women with SBI and 7.2% from women with NBI that showeda statistically significant difference. Anemia increases the risk of postnatal complications and can lead to an early neonatal death. A study done in Netherland showed similar results that 28.3% were more likely to have a newborn with anemia during their pregnancy period than women with NBI (Van Eijsden et al., 2008).The study done in Nigeria had also shown similar results (CSA, 2011).

Higher risks of PROM, prolonged labor, pre-eclampsia, and malposition or malpresentation were observed more among women with SBI than those with NBI. Babies born

from women with SBI were also found to have higher SGA, low birth weight babies, babies with low APGAR score, Anemic babies, babies with respiratory distress, and early neonatal death. Therefore, the health care system in Ethiopia should emphasize educating women about the importance of birth spacing and should strengthen family planning as one of the key strategies to improve maternal health.

Ethical Approval: Ethical approval was obtained from institutional review board of the college of public health and Medical Sciences, Jimma University, on February 11, 2016, with reference number HRPCG/4081/2016.

Authors' Contributions: All aurhors contributed in the design of the study, data analysis and interpritation, manuscript preparation and approval for submission. Ebba T.KORSA also supervised the data collection process.

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REFERENCE

Alexander, G., Himes, J., Kaufman, R., Mor, J., Kogan, M. (1996). A united states national reference for fetal growth. Obstet Gynecol, 87,163-168.

Assefa, B. T., Enquoslassie, F., Yusuf, L. (2010). Birth to pregnancy interval and its effect on perinatal outcomes in Addis Ababa, Ethiopia. Ethiopian Journal of Reproductive Health, 4,17-17.

Begna, Z., Assegid, S., Kassahun, W., Gebbaba, M. (2013). Determinants of inter birth interval among married women living in rural pastoral communities of southern Ethiopia: a case control study. BMC pregnancy and childbirth, 13,1-6.

CondeAgudelo, A., Belizan, J. M. (2000). Maternal morbidity and mortality associated with interpregnancy interval: Cross sectional study. BMJ, 321,1255-1259.

CondeAgudelo, A., RosasBermudez, A., Kafury Goeta, A., Cecilia, A. (2006). Birth spacing and risk of adverse perinatal outcomes: A meta-analysis. JAMA, 295,1837-8.

CSA (2007). The 2007 population and housing census of Ethiopia. Addis Ababa: Ethiopia.

CSA (2011). Ethiopia Demographic and Health Survey 2011. Addis Ababa: Ethiopia.

Davanzo, J., Hale, L., Razzaque, A., Rahman, M. (2007). Effects of interpregnancy interval and outcome of the preceding pregnancy on pregnancy outcomes in Matlab, Bangladesh.An International Journal of Obstetrics and Gynaecology, 114,1079-1087.

Exavery, A., Mrema, S., Shamte, A., Bietsch, K., Mosha, D., Mbaruku, G., Masanja, H. (2012). Levels and correlates of non-adherence to WHO recommended inter-birth intervals in Rufiji, Tanzania. BMC Pregnancy and Childbirth, 12,1-8.

Fotso, J. C., Cleland, J., Mberu, B., Mutua, M., Elungata, P. (2013). Birth spacing and child mortality: An analysis of prospective data from the Nairobi urban health and demographic surveillance system. Journal of Biosocial Science, 45,779-798.

Grisaru- Granovsky, S., Gordon, E., Haklai, Z., Samueloff, A., Schimmel, M. (2009). Effect of interpregnancy interval on adverse perinatal outcomes-a national study. Contraception, 80,512-518.

Isiugo- Abanihe, U. C., Nwokocha, E. E. (2008). Prevalence and consequences of ewu-ukwu custom in Mbaise, Imo State, Nigeria.The Nigerian Journal of Sociology and Anthropology, 6,53-70.

Kozuki, N., Lee, A. C., Silveira, M. F., Victora, C. G., Adair, L., Humphrey, J., Ntozini, R., Black, R. E., Katz, J. (2013). The associations of birth intervals with small-for-gestational-age, preterm, and neonatal and infant mortality: A meta-analysis. BMC Public Health, 13,53.

Lilungulu, A., Matovelo, D., Kihunrwa, A., Gumodoka, B. (2015). Spectrum of maternal and perinatal outcomes among parturient women with preceding short inter-pregnancy interval at Bugando Medical Centre, Tanzania. Maternal health, Neonatology and Perinatology, 1,1-7.

WHO (2006). Report of a technical consultation on birth spacing.Switzerland: Geneva.

Mosha, T. C., Philemon, N. (2010). Factors influencing pregnancy outcomes in Morogoro Municipality, Tanzania. Tanzania Journal of Health Research, 12,243-251.

Rafalimanana, H., Westoff, C. F. (2001). Gap between preferred and actual birth intervals in Sub-saharan Africa: Implications for fertility and child health DHS analytical studies (Report Number 2). Calverton: Maryland.

Ramakrishnan, U. (2004). Nutrition and low birth weight: from research to practice. The American Journal of Clinical Nutrition, 79,17-21.

Vaneijsden, M., Smits, L. J., Vanderwal, M. F., Bonsel, G. J. (2008). Association between short interpregnancy intervals and term birth weight: The role of folate depletion. The American Journal of Clinical Nutrition, 88,147-153.

WHO (2007). Report of a technical consultation on birth spacing. Switzerland: Geneva.

Williams, E. K., Hossain, M. B., Sharma, R. K., Kumar, V., Pandey, C. M., Baqui, A. H. (2008). Birth interval and risk of stillbirth or neonatal death: Findings from rural north India. Journal of Tropical Pediatrics, 54,321-327.

Yohannes, S., Wondafrash, M., Abera, M., Girma, E. (2011). Duration and determinants of birth interval among women of childbearing age in Southern Ethiopia. BMC Pregnancy and Childbirth, 11,1-6.