

Duration of second stage of labor and associated factors among mothers who give birth in selected health facilities of Dire Dawa administrative city East, Ethiopia, prospective cohort study

Yibekal Manaye*

Department of Epidemiology and Biostatistics, Dire-Dawa University, Dire-Dawa, Ethiopia

Abstract

Background: The second stage of labor is often the most stressful part of the childbearing process for the woman and fetus, and consequently for the provider. Duration of second stage of labor is influenced by many factors. This stage may become prolonged often resulting to maternal and neonatal complications.

Objective: To determine duration of second stage of labor and associated factors among mothers who give birth in selected health facilities of Dire Dawa administrative city, East, Ethiopia, 2018.

Methods: prospective cohort study was conducted among mothers who gave birth in selected health facilities of Dire Dawa administrative city from April to July 2018. A total of 283 mothers who came for delivery care services in a randomly selected health facilities were included in the study. Data were collected using face to face interview, document review, and anthropometric measurement techniques. The data were entered into EPIDATA version 3.1 and exported to STATA version 12 for analysis.

Result: The overall proportion of mothers with prolonged second stage of labor was 21.2 %. The proportion of prolonged second stage of labor was 28.83 % in nulliparous mothers and 15.5 % in multiparous mothers. Physical activity (AHR; 0.4 95%CI: 0.2-0.7), Adequacy of uterine contraction (AHR 2.9, 95%CI: 1.4-6.1), fetal position. (AHR, 0.2, 95%CI: 0.07-0.5), birth weight (AHR: 0.07 95% CI; 0.07-0.6), and adequacy of maternal pelvic (AHR: 0.3, 95%CI: 0.1-0.7) has statistically significant associations with duration of second stage of labor.

Conclusion: The proportion of prolonged second stage of labor was higher in nulliparous mothers than multiparous mothers. Lack of Physical activity during pregnancy, inadequacy of uterine contraction, occipital posterior fetal position, birth weight of >4kg, and inadequate maternal pelvic were predictors of longer duration of second stage of labor.

Keywords: Prolonged second stage of labor, second stage, birth.

*Correspondence Info:

Dr. Yibekal Manaye
Department of Epidemiology and Biostatistics,
Dire-Dawa University, Dire-Dawa, Ethiopia
Tel: + 251918013085

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1. Introduction

Childbirth is defined as the ending of a pregnancy in which one or more babies leaving a woman's uterus by vaginal passage or caesarean section. It is also known as labor or delivery[1]. The most common way of childbirth is a vaginal delivery[2]. In 2015, there were about 135 million births globally. In the developed world, most deliveries occurred in hospital[3,4]. While in the developing world most births took place at home with the support of a traditional birth attendant[5]. According to Ethiopian demographic health survey 2016; there were 11,023 total births in Ethiopia, of which 26.2 deliveries occurred at health

facility. The same data declared that there were 2,072 births in Amhara region, of which 27.1% deliveries took place at health facility[6].

Normal labor is a physiologic process during which the fetus, membranes, umbilical cord, and placenta are expelled from the uterus. Though a continuous process has been divided into three stages for purposes of study[7, 8]. The first stage of labor is the interval between the onsets of labor to full cervical dilation, the second stage of labor is the interval between full cervical dilation to delivery of the neonate and the third stage of labor is the period between the delivery of the neonate and the delivery of the

placenta[9]. Any of the stages of labor could become abnormal. These abnormalities have been mechanically simplified into three categories; abnormalities of the power (uterine contractions and maternal expulsive efforts); abnormalities involving the passenger (fetus) and abnormalities of the passage (the pelvis). These may exist singly or in combination[10]. In 2013 there were an estimated number of 289,000 maternal deaths globally as a result of complications from pregnancy and childbirth. This means, every day, approximately 800 women die from avoidable causes related to pregnancy and childbirth [11]. About 99% of maternal deaths occur in developing countries, while more than half of these deaths occur in sub-Saharan Africa, most could have been preventable. Seven million women have serious long-term problems, and 50 million women have negative health outcomes following delivery. Specific complications include obstructed labor, postpartum bleeding, eclampsia, and postpartum infection[12]. In Ethiopia, According to Ethiopian demographic health survey (EDHS 2016) the national maternal mortality was 412/100,000 live births [13].

Intermittent auscultation with Pindar's stethoscope or sonic aid in combination with the use of the partograph has also produced satisfactory results in many developing countries[14]. The approach to problems occurring during labor and delivery has been substantially changing[15]. The most significant of these changes has been the acknowledgement that vaginal delivery is not the fundamental goal of good obstetric care but good maternal and fetal outcome [16]. Unmonitored labor and admission in the second stage of labor are generally considered to be associated with increased maternal and neonatal complications [17]. Therefore, the aim of this study is to assess determine the proportion of prolonged second stage of labor and identify factors that may affect the duration of second stage of labor among mothers who give birth in health facilities of Dire Dawa administrative city.

Prolonged second stage of labor is an acute condition in obstetrics, which requires prompt attention as it may endanger both mother and fetus. Fetal effects include asphyxia, acidosis, intracranial hemorrhage, neonatal infection and death[18] the management of prolonged second stage of labor is a challenge for both laboring women and caregivers[19]. This is because some studies reported that there is an increased risk of maternal morbidity such as perineal trauma, chorioamnionitis and operative vaginal delivery[20] and others reported good perinatal and maternal outcome in the majority of the women provided that no evidence of fetal heartbeat derangement[21]. Other reports concluded that prolonged second stage is associated with a high rate of vaginal delivery and maternal morbidity (increased risk of operative vaginal delivery, maternal blood loss and perineal tear[22]. As a result, the management of the prolonged second stage

of labor is an unsettled issue, although the common practice is to intervene after a maximum of two-hour stagnation. However, the provision of skilled care and avoidance of complications during the second stage of labor have been relatively neglected[23].

A study from university of California, San Francisco reported that Asian women have the longest first and second stages of labor compared with Caucasian or African American women, and American Indian women had second stages shorter than those of non-Hispanic Caucasian women[24]. Many findings showed that Physical activity may affect the duration of labor via pathways pertaining to stress hormone levels, BMI, and perineal muscle tone[24,25]. Some literatures revealed that different position during birth influence the duration of second stage of labor and progression of labor findings from research conducted in Turk shows that women who adopted squatting position during labor experience a significant reduction in duration of second stage of labor[2].

Duration of second stage of labor is also associated with duration of first stage of labor. findings from a research conducted at Manipal University, India revealed that As the duration of first stage increases the duration of second stage and the incidence of instrumental/caesarean delivery increases[3]. Evidence from some literature shows that sexual intercourse during pregnancy is associated with good prognosis of labor, a research conducted in Cameroon revealed that Female orgasms have been shown to induce uterine contractions. Sexually active women would have significantly shorter duration of active first stage of labor and second stage of labor, normal pattern of labor and higher rate of spontaneous delivery[4]. In a study from Akershus Central Hospital the median duration of labor with spontaneous onset was found to be 8 hours 14 minutes for para 0, 4 hours and 30 minutes for para 1, and 3 hours and 49 minutes for para 2 and above. The second stage of labor accounted for 16, 10 and 8 minutes of these durations, respectively[26]. In a study conducted in Gjsvik Hospital, Norway, the median duration of second stage of labor with spontaneous onset was 31.3 minutes in para 0 mothers, 14.3 minutes in para I mothers and 11.7 minutes in para 2 and above mothers. In this finding induced labors had approximately the same length of second stage as in labors with spontaneous onset. The time distribution showed that the second stage in para 0 mothers had a plateau in the 17.5-37.5 minute range, whereas para 1 and above mothers had a sharper peak at 7.5 minutes[27].

2. Methods and material

2.1 Study design and area

Prospective cohort study was conducted from April to July 2018 in the selected health facilities of Dire Dawa administrative city, East, Ethiopia.

The study was conducted in selected health facilities of Dire Dawa administrative city which provide delivery care services. Dire Dawa city is situated 515 Km away from Addis Ababa with a projected population size of 466,000 in 2020 of which females account for 51.6% and 67.92% of the population are considered urban inhabitants. There are 9 urban and 38 rural kebeles.

The Administration has two public hospitals, fifteen health centers and thirty-four health posts and sixteen private clinic and four-private hospitals [28].

All laboring mothers who gave birth in selected health facilities of Dire Dawa city and Mothers who gave birth in the selected health institutions during the study period were source of population and study population respectively. Laboring mothers with singleton, live fetus, and vaginal delivery were included in the study.

Sample size is calculated using single proportion formula considering proportion of prolonged second stage of labor. From a study conducted in Hawassa university hospital, which was 20.3% [29] sample size was taken as 246 and assuming 15% non-response rate, the final sample size was 283 mothers.

Of all public health institution found in Dire Dawa city that provide delivery service, 1 hospital (Dilechora referral hospital), 3 health centers (Goro health center, Number one Health center and Leg hari health center) were selected randomly using lottery method. All mothers who came for delivery service to the selected health institutions and fulfilled the inclusion criteria were included in the study until the required sample size is reached.

2.2 Measurements

The Dependent variables was time to delivery of fetus from cervical dilatation of 10 cm whereas the independent one Socio-demographic variable: Age, residence, maternal educational status, maternal occupation, husband occupation, religion. Obstetric and gynecological variables: sexual intercourse within the last weeks prior to onset of labor, Modern contraceptive use prior to current pregnancy, contraceptive type, Parity, Gestational age, Birth wt, Birth interval, HX of prior pregnancy, induction in the first stage of labor, birth weight, fetal position, uterine contraction, fetal sex, position of mothers during labor, adequacy of maternal pelvic, fetal membrane status and circumcision. Behavior and Life style variables: Maternal alcohol use, maternal chat use, physical activity during labor, maternal caffeine use. Medical and nutritional factors: maternal HIV status, maternal DM status, nutritional status food intake prior to onset of labor, and fluid intake during labor.

2.3 Data Collection tool and procedure

Interviewer administered questionnaire were used to collect the data. The questionnaire first designed in

English and translated in to Amharic version. Anthropometric measurements were also taken to estimate the mid upper arm circumference and fetal birth weight. Client's chart was also reviewed to retrieve medical information and mother's test results that could not be captured by the interview.

2.4 Data processing and analysis

The data were checked, cleaned, and entered into EPIDATA version 3.1 software, and exported to STATA version 12 statistical software for analysis. Cox-regression analyses were used to identify candidate variables and to determine the presence and strength of association between several independent factors and duration of second stage of labor. The hazard ratio and the 95% CI for the HR were used to show the associations between independent variables and duration of second stage labor. Kaplan Meier survival curves were used to compare duration of second stage of labor among different groups. Variables with p-value of less than 0.2 in the bivariate cox regression analysis were entered for multivariable Cox regression analysis and independent variables with p-value of less than 0.05 were considered as having significant associations with duration of second stage of labor.

2.5 Ethical considerations

Ethical clearance was obtained from ethical review board of school of public health, college of medicine and health sciences, Dire Dawa University and Permission letter was received from the health bureau and respected health institutions in the city. All the study participants were informed about the objective of the study and their verbal consent was obtained.

3. Results

Two hundred eighty-three mothers were included in the study of which 165 were multiparous mothers while, the rest 118 were nulliparous mothers. The minimum and maximum age of the mothers were 18 and 41 years respectively while, the median age of the mothers was 27 years.

Two hundred ten (74.2%) of the mothers were from urban areas and 25.8% were from rural areas. Thirty-five (12.4%) of the participant had no education while 128(45.2%) had primary education and the remaining 120(42.4%) had attended secondary and higher education. From the total number of respondents, 269(95%) were married, 5(1.7%) were unmarried, 7(2.5%) were divorced and the rest 2 (0.7 %) were widowed. With regard to occupation of participants husband, about 93(32.9%) were merchant, 87(32.7%) were government employee, 46(16.3%) were farmers while the rest 6.7%, 5.3% and 3.2% accounts for daily labour, driver and solid respectively. (Table 1)

Table 1: Socio-demographic characteristics of mothers who gave birth in selected health facilities of Dire Dawa city at 2018

Variables		Frequency	Percent
Residence of mother	rural	73	25.8
	urban	210	74.2
Age in years	18 up to 24	66	29.6
	25 up to 31	129	58.8
	above 32 years	28	12.5
Marital status of mothers	married	254	89.8
	unmarried	20	7.1
	divorced	7	2.5
	widowed	2	0.7
Religion of mother	orthodox	202	71.4
	Muslim	40	14.1
	catholic	15	5.3
	protestant	26	9.2
Occupation of mother	house wife	198	70.0
	government employee	41	14.5
	farmer	10	3.5
	merchant	25	8.8
	housemaid	4	1.4
	others	5	1.8
Educational status of mother	illiterate	35	12.4
	primary	128	45.2
	secondary and above	120	42.4
Occupation of husband	government employee	87	30.7
	merchant	93	32.9
	farmer	46	16.3
	solider	9	3.2
	daily labor	19	6.7
	driver	15	5.3
Educational status of husband	illiterate	32	11.3
	primary	89	31.4
	secondary and above	148	52.3

As shown 165(58.3%) of the study participant had given birth before while 118 (41.7%) of the study participant had not given birth before. 81 (48.8%) had birth interval of 34-58 months, 51(30.9) of mothers had birth interval of 59 and above months. More than half 210(74.2%) of the participant have had circumcision while, 73(25.8) of mothers had no circumcision. Forty-eight (17%) of the study participant have had current or past history of diabetes mellitus. about 17(6%) of the mothers had induction in the first stage of labor. More than half 178(62.9%) of mothers had use contraceptive prior to the current pregnancy. from a total of 283 study participants 21(12.5%) had abortion in their prior pregnancy while 24(14.3%) of the study participant had still birth of their prior pregnancy. the mean mid upper arm circumference of the study participant was 22.6 CM. majority 228(80.5%) of the mother had occipitoanterior fetal position while occipito posterior and occipito transverse fetal position

accounts 35(12.3%) and 20(7%) respectively. More than half 152(53.7%) of the mothers had lithotomy position during labor. The mean and median birth weight of the study participants were 3188 and 3100 grams respectively. About (67.1%) of the mothers give female newborn while 32.6% of the mothers give male newborn.

The overall median length of second stage of labor was 40.9 minutes. The median length of second stage of labor was 27.72 minutes in multiparous mothers and 49.5 minutes in nulliparous mothers. Majority of multi parous mothers gave birth at the time interval of 30-40 minutes and Majority of nulliparous mothers gave birth at the time interval of 40-50 minutes. About 68.1% of nulliparous mothers gave birth within the first 100 minutes and about 70.7% nulliparous mothers gave birth within 120 minutes where as in multiparous mothers about 81.4% and 85.03% of the mothers gave birth within 50 and 60 minutes respectively. (Table 2)

Table 2: Life time tables for duration of second stage of labor among mothers who gave birth in selected health facility of Dire Dawa city from April to July 2018

	time interval in minute	Number at risk	No of delivery	No. lost	Cumulative survival	Cumulative delivery	95% CI	
Nulliparous	[20 30]	118	2	0	0.9831	0.0169	0.9339	0.9957
	(30 40]	116	10	0	0.8983	0.1017	0.8279	0.9409
	(40 50]	106	31	0	0.6356	0.3644	0.5419	0.7152
	(50 60]	75	22	0	0.4492	0.5508	0.3580	0.5360
	(60 70]	53	8	0	0.3814	0.6186	0.2942	0.4679
	(70 80]	45	3	0	0.3559	0.6441	0.2707	0.4419
	(80 90]	42	3	0	0.3305	0.6695	0.2475	0.4156
	(90 100]	39	2	0	0.3136	0.6864	0.2322	0.3980
	(100 110]	37	1	0	0.3051	0.6949	0.2246	0.3891
Multiparous	(110 120]	36	2	0	0.2881	0.7119	0.2095	0.3713
	[10 20]	165	23	0	0.8606	0.1394	0.7977	0.9051
	(20 30]	142	61	0	0.4909	0.5091	0.4127	0.5644
	(30 40]	81	41	0	0.2424	0.7576	0.1801	0.3099
	(40 50]	40	8	0	0.1939	0.8061	0.1377	0.2575
	(50 60]	32	6	0	0.1576	0.8424	0.1068	0.2173

The overall proportion of mothers with prolonged second stage of labor was 21.2 % (95%CI; 0.16-0.25). The proportion of mothers with prolonged second stage of labor was relatively higher in nulliparous mothers which were 28.83 % (95%CI; 0.16-0.31) and 15.7 % (95%CI; 0.09-0.19) in multiparous mothers.

Variables significant difference of duration of second stage of labor with in sex of the new born, adequacy of maternal pelvic, fetal positions, adequacy of uterine contraction, physical activity, Fetal position, birth weight and parity. There was no significant difference of duration of second stage of labor in contraceptive users and non-users prior to their current pregnancy (p-value; 0.12), and within contraceptive users of different type (p-value; 0.96), HX of prior pregnancy (p-value: 0.31), birth interval (p-value: 0.23), religion of mothers, residence, maternal education, age of the mothers, occupation of the mothers and husband education.

The Kaplan Meier survival function for duration of second stages of labor, nulliparous mothers survive longer to give birth compared to multiparous mothers indicating that duration of second stage of labor was longer in nulliparous mothers than multiparous mothers.

Mothers who had no physical activity during pregnancy had longer duration of second stage of labor than mothers who had physical activity during pregnancy. Those who had inadequate uterine contraction had longer duration of second stage of labor than those who had adequate uterine contraction. Duration of second stage of labor was also longer in those mothers with birth weight of more than 4000 gram than mothers with birth weight of 2500-4000 gram duration of second stage of labor was longer in those mothers with inadequate maternal pelvic than mothers with adequate maternal pelvic. Similarly, Mothers with occipito posterior fetal position had longer duration of second stage of labor than mothers with occipito anterior fetal position.

Bivariate and multivariate Cox regression analysis of variables

Variable with p-value of less than 0.2 were included in the multivariate Cox regression analysis and variables with p-value of less than 0.05 were considered as having statistically significant associations with duration of second stage of labor.

As presented in table among included variables adequacy of uterine contraction, fetal position, parity, fetal birth weight, adequacy of maternal pelvic and physical activity during pregnancy showed statistically significant association with duration of second stage of labor. In the adjusted Cox regression analysis, it was founded that those with adequate uterine contraction were 2.9 times more likely to give birth with no prolonged second stage of labor (AHR 2.9, 95%CI: 1.4-6.1) compared to mothers with inadequate uterine contraction, indicating that those mothers with inadequate uterine contraction were more likely to have prolonged second stage of labor compared to mothers with adequate uterine contraction. The Cox adjusted analysis also showed that mothers with birth weight of 4000 gram or more were 93%less likely to deliver with no prolonged second stage of labor compared to those with birth weight of less than 2500 gram (AHR: 0.07 95%CI; 0.07-0.6), Indicating that mothers with birth weight of 4000 gram or more were more likely to have a prolonged second stage of labor compared to mothers with birth weight of <2500 gram. Mothers with occipito posterior fetal position were 80% less likely to give birth with no prolonged second stage of labor compared to mothers with occipito anterior fetal position. (AHR, 0.2, 95%CI: 0.07-0.5) This also revealed that mothers with occipitopostiror fetal position tend to have prolonged second stage of labor compared to occipito anterior fetal position. Mothers who had no physical activity during pregnancy were 60%less likely to deliver with no prolonged second stage of labor compared to mothers who had physical activity during pregnancy (AHR; 0.4 95%CI: 0.2-0.7).

The Cox regression analysis also demonstrated that mothers with inadequate pelvic were 70% less likely to give birth with no prolonged second stage of labor compared to mothers with adequate pelvic (AHR: 0.3, 95%CI: 0.1-0.7). Multiparous mothers were 5.5 times more likely to give birth with no prolonged second stage of labor compared to nulliparous mothers (AHR:5.5, 95%CI: 3.8-8.0).

The Cox regression model demonstrate no statistically significant association of duration of second stage of labor with religion of mothers, educational status of mothers ,occupation of husbands, educational status of

husbands, chat use, alcohol drink, cigarette smoking, contraceptive use, gestational age, sexual intercourse within the prior days of onset of labor, food intake prior to onset of labor, fluid intake during labor, sex of the newborn, fetal membrane status, history of prior pregnancy, HIV status, circumcision, nutritional status of mothers, history of Diabetes mellitus and induction of labor.

In those mothers with prolonged second stage of labor 17(32.6%) of mothers had fetal complication of which the majority was birth Aspxia and 14(27.5%) of mothers with prolonged second stage of labor had maternal complication (perineal tear and PPH). (Table 3)

Table 3: Bivariate and multivariate Cox-regression analysis of gynecological and obstetrics characteristics of the cohort studied (n=283 mothers) in selected health facilities of Dire Dawa city at 2018

Variables	Delivery status		CHR (95%CI)	AHR (95%CI)	P-value
	No prolonged 2 nd stage	Prolonged 2 nd stage			
Chat chewing					
Never	190	22	1	1	
Daily	3	5	0.2 (0.06-0.6)	0.4 (0.3-3.9)	0.8
Weekly	7	10	0.22 (0.1-0.4)	0.98 (0.4-2.3)	0.9
Occasionally	23	23	0.3 (0.19-0.4)	0.9 (0.5-1.5)	0.7
Alcohol use					
Never	77	20	1	1	
Daily	25	15	0.54 (0.3-0.8)	0.9 (0.5-1.4)	0.8
Weekly	33	20	0.55 (0.4-0.6)	0.8 (0.5-1.3)	0.4
Occasionally	88	5	1.6 (1.2-2.2)	1.2 (0.8-1.6)	0.2
Coffee use					
Never	30	25	1	1	
Daily	118	19	2.3 (1.5-3.4)	1.0 (0.6-1.6)	0.89
Weekly	40	3	2.7 (1.7-4.4)	1.2 (0.7-2.0)	0.38
Occasionally	35	13	1.7 (1.1-2.8)	1.5 (1.0-2.6)	0.1
Physical activity during pregnancy					
Yes	203	6	1	1	
No	20	54	0.1 (0.06-0.2)	0.4 (0.2-0.7)	0.003
DM currently or by history					
Yes	29	19	1	1	
No	194	40	1.9 (1.3-2.9)	1.4 (0.9-2.1)	0.1
HIV status					
Reactive	3	23	1	1	
non reactive	220	37	7.2 (5.5-16.82)	1.95 (0.5-7.0)	0.3
Prior Contraceptive use					
Yes	137	41	1	1	
No	86	19	1.2 (0.9-1.6)	1.3(0.98-1.7)	0.65
food intake prior to onset of labor					
Yes	147	18	1	1	
No	76	42	0.57 (0.4-0.7)	1.1 (0.8-1.5)	0.44
oral fluid intake during labor					
Yes	154	17	1	1	
No	69	43	0.58 (0.3-0.6)	0.8 (0.6-1.1)	0.24
Induction in 1st stage of labor					
Yes	9	8	1	1	
No	214	52	2.0 (1.0-4.0)	0.5 (0.2-1.0)	0.08
MUAC in centimeter					
< 21 centimeter	15	42	1	1	
>=21 centimeter	208	18	7.2 (4.5-13-2)	1.4 (0.8-2.6)	0.27
Uterine contraction					
Inadequate	16	53	1	1	
Adequate	207	7	9.1 (6.9-13.05)	2.9 (1.4-6.1)	0.006
sexual intercourse within weeks prior to onset of labor					
Yes	137	7	1	1	
No	86	53	0.4 (0.3-0.54)	0.6 (0.5-1.8)	0.057

Adequacy of maternal pelvic					
Adequate	218	31	1	1	
Inadequate	5	29	0.06 (0.02-0.2)	0.3 (0.1-0.7)	0.02
Circumcision					
Yes	28	45		1	
No	195	15	5.5 (3.6-8.4)	1.5(0.9-2.4)	0.06
Fetal Position					
occipito anterior	215	16	1	1	
ocpito posterior	5	34	0.6 (0.02-0.14)	0.2 (0.07-0.5)	0.001
occipito transverse	3	10	0.1 (0.03-0.3)	0.22 (0.06-0.8)	0.02
Fetal Membrane status					
premature rupture of membrane	18	43	1	1	
artificially ruptured	39	6	5.5 (3.1-9.6)	1.4 (0.7-2.7)	0.3
ruptured during labor	166	11	6.5 (4.0-11.0)	1.3 (0.7-2.4)	0.4
Parity					
Nulliparous	84	34	1	1	
Multiparous	139	26	3.1 (2.3-4.2)	5.5 (3.8-8.0)	<0.001
Sex of the New born					
Male	50	55	1	1	
Female	173	5	4.1 (2.9-5.7)	0.67 (0.5-0.9)	0.052
Gestational age in weeks					
<37 weeks	65	13	1	1	
37 up to 40 weeks	133	30	1.1 (0.7-1.3)	0.8(0.4-1.4)	0.4
>=41 weeks	23	14	0.7 (0.4-1.4)	0.85(0.4-1.6)	0.7
Birth weight in gram					
<2500 gram	31	2	1	1	
2500 up to 3900 gram	191	33	0.8 (0.57-1.2)	0.7 (0.4-1.1)	0.16
>=41000 gram	1	25	0.1 (0.02-0.1)	0.07 (0.09-0.6)	0.016

4. Discussion

The finding in this study has demonstrated that the overall median duration of second stage of labor was 40.9 minutes (27.7 minutes in multiparous mothers and 49.5 minutes in nulli parous mothers). This finding was consistence with finding from a study conducted in California which was 47 minutes in nulli parous mothers who did not have an epidural. [30]. In this finding the median duration of second stage of labor was relatively longer than findings from a study conducted in Taiwanese women in which The median length of the second stage of labor in experienced mothers was 45 minutes in people without epidurals [30]. The median duration of second stage of labor in this finding was also relativity longer compared to findings from a study in Akershus Central Hospital in which the median duration of The second stage of labor was 16 minutes for nulliparous and 10 minutes for multiparous mothers [26]. Similarly, the median duration was longer than findings from a study conducted in Gjsvik Hospital, Norway, which was 31.3 minutes in para 0 mothers, and 14.3 minutes in para I with spontaneous onset. This could be due to wider difference in genetic variations and racial difference. The median duration of second stage of labor was shorter in multiparous a mother compared to those nulliparous mothers. this finding is consistent with findings from a study conducted in California in which mothers who had given birth before had shorter second stages of labor than first-time mothers. [30]. In this study The proportion of mothers with prolonged second stage of labor was found to be

21.1%(15.5% in multiparous and 28.8% in nulliparous mothers).Mothers who didn't give birth up to 1 hours for multiparous and up to 2 hours for nulliparous mothers was considered as having prolonged second stage of labor. This finding shows an agreement with findings from a study conducted in Hawassa university hospital, Ethiopia in which the proportion of mothers with prolonged second stage of labor was 20.3% [29]. The proportion of mothers with prolonged second stage of labors in this study is lower than findings from a study conducted in California which was 16.2% in multiparous and 31.1% in nulli parous mothers[5].

Evidence from previous study revealed significant association between Physical activity during pregnancy and prolonged second stage of labor those who had physical activity had shorter duration of second stage of labor[24, 25,29,30]. The possible explanations are three.the first mechanism is that physical activities will strengthen the muscle tone of pelvic floor and perineal muscle which is inturn helpful in rotating the fetal head their by shorting the second stage of labor. In terms of the second mechanism, an active woman may have a lower BMI and gain less weight during pregnancy than an inactive woman. Previous studies have associated increased BMI with dystocia resulting prolonged second stage of labor[6]. In terms of the third mechanism, stress hormones such as epinephrine, norepinephrine, adrenocorticotrophic hormone, cortisol, prolactin and betaendorphins which peak at birth have been shown to facilitate labor. Evidence suggests that regular exercise increases the baseline beta endorphin level

along with other stress hormones [7]. Beta endorphins are opioid agonists released to reduce pain during exercise, but also act as a relaxing agent for muscles thus facilitating labor and potentially leading to a shorter second stage of labor. Consistence with this fact finding from this study revealed stastically significant association between physical activity and duration of second stage of labor. mothers were considered as having physical activities if they involved in house hold/caregiving activites, active living,involved in their occupation,and perform sport activities.those who had no physical activities were more likely to have prolonged second stage of labor.

In this study parity was significantly associated with duration of second stage of labor. mothers were categorised as nulliparous if they did not give birth before the current pregnancy (no delivery of fetus after 28 weeks of gestation) and multiparous if they gave birth before (delivery of fetus after 28 weeks of gestation). Nulliparous mothers were more likely to have a prolonged second stage of labor than multiparous mothers the possible mechanism could be difference in rigidity of perineal muscle and uterine muscle tone. nulliparous mothers tend to have more rigid perineal muscle and less uterine muscle tone than multiparous mothers, tending to have a longer duration of second stage labor. similarly findings from previous study showed that nulliparity was associated with prolonged second stage of labor [7]. In this study maternal pelvic adequacy was assessed through pelvic examination, mothers with subpubic angle of <90 degree and prominent ischial spine were considered as having inadequate pelvic. mothers with inadequate pelvic were found to have longer duration of second stage of labor than mothers with adequate pelvis.

Finding from this study revealed statistically significant associations between Adequacy of uterine contraction and duration of second stage of labor; uterine contraction was taken as adequate if there were 3-5 contraction with in 10 minute each lasting for 40-60 seconds. Mothers with inadequate uterine contraction were more likely to have a prolonged second stage of labor than mothers with adequate uterine contraction. Similarly previous findings from Hawassa university hospital, Ethiopia shows that inadequate uterine contraction was significantly associated with prolonged second stage of labor [29]. Mothers with occipito posterior fetal position were associated with longer duration of second stage of labor. This finding was consistent with previous finding [8]. Birth weight was also associated with duration of second stage of labor. Birth weight of more than 4000 grams were likely to have longer duration of second stage of labor compared to birth weight of less than 2500 gram. Consistently findings from previous study revealed as birth weight was one of the risk factors for a longer pushing phase [7, 8].

Sexual intercourse during pregnancy is associated with good prognosis of labor. The possible evidence behind is that the male seminal fluid contains prostaglandins which in turn can initiate and result sustained uterine contraction they're by facilitating and shortening labor. Evidence in the previous studies from Cameroon revealed that sexually active women had significantly shorter duration of active first stage of labor and second stage of labor, normal pattern of labor and higher rate of spontaneous delivery [9]. But in this study sexual intercourse during pregnancy showed marginally non-significant association with duration of second stage of labor. This could be due to under reporting of sex by the study participants because of sensitivity of the issue and cultural problems in the study area, so this might need further study with larger scale study. In this study age of the mothers didn't show statistically significant associations with duration of second stage of labor. Unlike to this finding Findings from previous study showed that increasing maternal age was associated with a prolonged second [31] Evidences from previous report shows that Sex of the new born is also associated with duration of second stage of labor and this is due to differences in size and shape between male and female fetus. From 20 weeks of gestation on ward males had significantly larger head size than females. More over different variables (parity, maternal height, body mass index, cigarette smoking, and alcohol use) were important determinants of birth weight, length and head circumference [10]. Evidences from previous study revealed that a woman with male fetus had longer duration of labor compared to women with female fetus [11]. In this study finding sex of the new born showed marginal non-significant association with duration of second stage of labor indicating the need to further study with large scale study. The finding from this study has also demonstrated no statistically significant associations between duration of second stage of labor and, food intake in the early onset of labor, chat use, alcohol use, cigarette smoking, gestational age, contraceptive use prior to current pregnancy, nutritional status of mothers, induction, history of diabetes mellitus, HIV status of the mothers, fluid intake during labor, circumcision and position of mothers during labor. unlike to this finding evidence from a study conducted in Turk showed that women who adopted squatting position during labor experience a significant reduction in duration of second stage of labor [2]. This could probably be majority of the mothers assumed lithotomy and lateral position during labor in the study area. In this study majority of mothers with prolonged second stage of labor were tending to have maternal complications (perineal tear majorly and PPH) and fetal complication (birth Aspxia predominantly) compared to those mothers with no prolonged second stage of mothers. Similar with this evidence finding from previous study revealed that mothers with prolonged second stage of labor were more likely to

have third or fourth degree perineal tear and their newborn were at higher risk of low Apgar score[12].

5. Conclusion

The median duration of second stage of labor was relatively longer in both multiparous and nulliparous mothers in the study area. The proportion of prolonged second stage of labor was higher in nulliparous mothers than multiparous mothers. Adequacy of uterine contraction, fetal position, birth weight, maternal pelvic adequacy and physical activity were factors that were associated with duration of second stage of labor.

Pregnant mothers have to be encouraged to be physically active and avoid unnecessary weight gain during their pregnancy time. The association of sexual intercourse during pregnancy with duration of second stage labor has to be examined with larger scale study.

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Ethical approval and consent to participate:

Procedures followed were following the ethical standards of the Ethical Review Board of Dire Dawa University. Following the approval, an Official letter of cooperation was written to Dire Dawa Public Health Institute. From those participants who are agreed to be included in the study verbal consent was taken.

Competing interests:

The authors declare that they have no competing interests.

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