RATE OF CERVICAL DILATATION, DURATION OF ACTIVE LABOR AND RATE OF INTERVENTION AMONG LOW-RISK PREGNANT WOMEN DELIVERING AT DODOMA REGIONAL REFERRAL HOSPITAL

DEUSDEMIT KIMARYO WILLIAM

MASTER OF MEDICINE IN OBSTETRICS AND GYNAECOLOGY
THE UNIVERSITY OF DODOMA
DECEMBER, 2020
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BY
DEUSDEDIT KIMARYO WILLIAM

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THE UNIVERSITY OF DODOMA
DECEMBER, 2020
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I Deusdedit K William, declare that this dissertation was my original work and that it has not been done neither been presented or conducted elsewhere in similar manner either for awards or as a research project.

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CERTIFICATION

The undersigned certifies that has read and hereby recommend for acceptance by the University of Dodoma a dissertation entitled: Rate of Cervical Dilatation, Duration of Active Labor and Rate of Intervention among Low-risk Pregnant Women Delivering at Dodoma Regional Referral Hospital, in partial fulfillments of the requirements for the degree of Master of Medicine in Obstetrics and Gynecology of the University of Dodoma.

DR. MARIA RWEYEMAMU

(Lecturer, Obstetrics and Gynecology, College of Health Science)

Signature: .................. Date: 30/11/2020

(SUPERVISOR)
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DEDICATION
This work is dedicated to my wife Dinna, my children Daniella and Daniel, and the lovely family of MR &MRS William Kimaryo.
ABSTRACT

Background: Cervical dilation at the onset of the active phase of labor determines the rate of cervical dilatation, duration of the active phase of labor and the needs of intervention. Identifying the abnormality toward the natural progress of the active phase of labor is important because timely intervention has been observed to be controversial among developing countries during the current practice among health care providers due to different opinion on the onset of the active phase. Thus, indication like poor progress of labor has been poorly explained in which it has become a common indication for a steady increased rate of primary cesarean section.

Objectives: This study aimed at determining the rate of cervical dilatation, duration of active phase of labor, and rate of intervention among low-risk pregnant women delivered at Dodoma Regional Referral Hospital.

Methods: This is a hospital-based prospective cross-sectional study where systematic sampling method was employed in obtaining sample of 300 pregnant women. Local partograph and a semi-structured questionnaire were used to record the information and findings. Data were analyzed using SPSS version 25. One sample t-test was used to determine the rate and duration of active labor. A Chi-square test was done to find the factors associated with intervention during labor. Furthermore, Binary logistic regression was done to obtain the odds ratio (OR) and 95% confidence intervals (CI). P< 0.05 was considered statistically significant.

Results: The rate of cervical dilatation during active phase for nulliparous was 0.81 cm/hour and 0.88 cm/hour for multiparous. The duration of the active phase of labor was 7.6 hours for nulliparous and 6.8 hours for multiparous. 48(16%) women out of 300 participants had intervention during labor; with higher rate in nulliparous. Oxytocin infusion was the common intervention. Gravidity, gestation age and patient occupation were significantly associated with intervention, other factors were not associated with intervention.

Conclusion: The rate of cervical dilatation was much slower hence the longer duration of active phase than the WHO standards rates. Nulliparous were mostly intervened and oxytocin was a common intervention. Occupation is associated with intervention but further research involving large sample size is recommended.
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DEFINITION OF TERMS

**Action line:** Drawn 4 cm to the right of the alert line drawn from 3 cm and parallel to it, this is the critical line at which a provider must make a specific management decision.

**Active phase of labor:** All with cervical dilatation of 3 cm to 6 cm on admission to labor ward to full cervical dilatation (10cm).

**Decision to delivery interval (DDI):** This is an interval less than 30 minutes from the time of the decision made by an obstetrician to intervein the patient to the time of the baby's delivery.

**Fresh stillbirth:** Is any fetus who at the time of admission had positive fetal heart rate but delivered without sign of life during the second stage with no indication for resuscitation.

**Labor:** When a woman with regular uterine contraction with effacement and dilatation of cervix with or without immediate signs of fetal descent.

**Low risk pregnant woman:** Any woman with single tone fetus, at term with cephalic presentation, gestation Age of 37 completed weeks to 41 weeks, free from medical condition which impairs health during pregnancy like Hypertension in pregnancy, Diabetes in pregnancy etc, but also should have estimated pre-delivery fetal weight of not less than 2.5kg and not greater than 4kg, patient age should not be less than 18 years not greater than 40 years, with no previous history of uterine scar.

**Partograph:** A graph which will be used to monitor women who are in labor until labor is completed to the fourth stage.

**Nulliparous:** A pregnant woman who have never giving birth before.

**Multiparous:** Woman who previously had delivered vaginal at-least one to or three times not more than that.
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<tr>
<th>Abbreviation</th>
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<tr>
<td>ACOG</td>
<td>American College of Obstetrics and Gynecology</td>
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<td>AVD</td>
<td>Assisted Vaginal Delivery</td>
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<tr>
<td>C/S</td>
<td>Cesarean Section</td>
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<tr>
<td>DDI</td>
<td>Decision Delivery Interval</td>
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<tr>
<td>DRRH</td>
<td>Dodoma Referral Regional Hospital</td>
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<tr>
<td>ECS</td>
<td>Emergency Cesarean Section</td>
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<td>FHR</td>
<td>Fetal Heart Rate</td>
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<td>NICU</td>
<td>Neonatal Intensive Care Unit</td>
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<td>PPH</td>
<td>Postpartum Hemorrhage</td>
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<td>SPSS</td>
<td>Statistical Package of Social Science</td>
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<td>SVD</td>
<td>Spontaneous Vaginal Delivery</td>
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<td>TDHS</td>
<td>Tanzania Demographic Health Survey</td>
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<td>WHO</td>
<td>World Health Organization</td>
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CHAPTER ONE
INTRODUCTION

1.1 Background

The presence of regular uterine contraction with cervical changes associated with show to a pregnant woman is called labor (Suite, 2019; Jun Zhang, Troendle, & Mikolajczyk, 2010). It is considered to be normal when occurs at term with well-being of both a mother and baby at the end (Prasantha et al., 2006). This process has four stages including the active phase which is in the first stage which ends at full dilatation of cervix (10 centimeters) before delivery of the baby (Tina Lavender, Hart, Walkinshaw, Campbell, & Alfirevic, 2005).

When a woman in labor reaches active phase, she is should be monitored using the partograph. (Studd, 1973). Friedman proposes initiation of partograph when a woman reaches cervical dilatation of 3 centimeters (Friedman, 1955). But World health organization (WHO) made some modifications and recommends initiation at 4 centimeters cervical dilatation which has resulted into reduction of C/section rate (Tayade, 2016. Ahmed, Jain, & Bharwani, 2017 ); but its coverage is a challenge in resource limited areas. (Mathibe-Neke J.M, Lebeko F.L, 2013).

The Canadian Association of Obstetrics and gynecology in clinical practice guideline defines active phase of labor from 4 to 5 centimeters cervical dilatation depends with gravidity. (L. Lee, Dy, & Azzam, 2016). Initial cervical dilation at the onset of active labor affects the rate of cervical dilatation and duration of active phase of labor with risk of prolonged labor increases when considered before 5 cm.(Suzuki, Horiuchi, & Ohtsu, 2010. J. Zhang & Duan, 2018.). It may also differ depending on race and ethnicity (Hildingsson & Blix, 2015). Labor prolongation may occur with 4 cm but it doesn’t have adverse effect on the outcome (Suzuki et al., 2010).

Rate of cervical dilatation is supposed to be 1.5 centimeters/hour (WHO, 2014); but a study in Italy reported 1 centimeter/hour although unpredictable in most women. (Ferrazzi et al., 2015). Chantry et all conducted a metanalysis study and reported 3 centimeters/hour for multiparous with similar outcome (Béranger & Chantry, 2017). Similarly: in Middle-East, there was a minimal difference in rate of cervical
dilatation depending on gravidity (Sherry, 2013). Obesity was also reported to affect dilatation leading into prolongation of labor (Carlson, Corwin, & Lowe, 2017).

Due to changes in the obstetrical cohort, there was evidence of longer labor duration giving more room for further evaluation (Laughon, Branch, Beaver, & Zhang, 2012). The duration of the active phase range from 3 to 4 hours depending on gravidity (World Health Organization, 2018). However, Suite et al (2019) reports 8 to 12 hours. Albers reported a duration of 5.7 to 7.7 hours depending on gravidity (Albers, Schiff, & Gorwoda, 1996). However, a shorter duration of up to 3 hours in multiparous have been reported (Béranger & Chantry, 2017). This dilemmas in the duration of active phase raises further concern since studies also reported a duration of 3 to 6 hours depending on the initial cervical dilatation (Cohen & Friedman, 2015).

Expectant management of labor increases the risk of labor prolongation and risk of primary caesarean section (Huma Karamat, Afshan Seemab, 2016). When progress of labor is slow it necessitate the need of intervention such as amniotomy and oxytocin infusion to speed it (WHO, 2014). In the Cochrane review series, it was reported that amniotomy alone does not affect the duration of labor (Smyth, Alldred, & Markham, 2013). Therefore, a combination of intervention such as amniotomy and oxytocin infusion is advised (Chen et al., 2018).

Among a cohort of obstetrical practitioners in Australia it was revealed that, intervention was a common practice during labor; yet there was no clear cut on when to intervene and what type of intervention is recommended leading to further dilemma in daily practice (White, Lee, & Beckmann, 2017). Odalapo et al (2018) in sub-Sahara countries reported that, augmentation was minimally required when cervical dilatation reaches 5 centimeters. Similarly, Chukwudi et al reported that need of intervention is minimal at 6 centimeters without affecting the outcome. (Chukwudi, Orhue, & Ande, 2018; Dallo, Archer, & Misra, 2014).

Patients monitored using the Friedman partograph have been subjected to more intervention since it’s easy to diagnose labor dystocia with risk of using oxytocin infusion (Béranger & Chantry, 2017). This was shown from a study in Tanzania which reported that the intervention rate during active labor was 20.6% when labor
was monitored using the local recommended partograph (Chuma, Kihunrwa, Matovelo, & Mahendeka, 2014).

Since the clinical practice in obstetrics as far as labor is concerned in Tanzania, still considering the Friedman’s criteria for active phase from 3cm it is obviously that most women are diagnosed with prolonged labor and hence been subjected into unnecessary intervention including primary caesarean section. This study aimed at determining the rate of cervical dilatation, duration of active labor and rate of intervention during labor and explore factors associated with intervention during labor among low-risk pregnant women at term.

1.2 Problem Statement.
In sub-Saharan countries including Tanzania there is an increased risk of primary c/section due to poor progress of labor resulted from a slower rate of cervical dilatation; noted when Friedman’s partograph is employed to monitor labor; this directly affects the current practice since adopting the modified WHO partograph in resource limited countries has become a challenge (Augustino, 2019).

Currently there is dilemma due to some changes in obstetric practice world-wide on the initial cervical dilatation required to mark the beginning of active phase but WHO recommends 4 cm; as a results local guidelines still consider the active phase of labor from 3cm cervical dilatation making women prone to intervention due to early diagnosis of prolonged or poor progress of labor which may lead into poor obstetrical outcome like neonatal death due to BA (Chuma et al., 2014).

At DRRH there is a steady increase in number of primary c/sections which varies from 20% - 35% of each month total deliveries, with also increased number of preventable perinatal death associated with intrapartum asphyxia where 25% - 40% of all perinatal death each month are fresh still birth which among this are associated to intrapartum asphyxia (Month report reg. 2020).
1.3 Objectives of the study

1.3.1 Broad Objective
To determine the rate of cervical dilatation, duration of the active phase of labor, and intervention rate during the active phase of labor among low-risk pregnant women delivered at Dodoma Regional Referral Hospital.

1.3.2 Specific Objectives
1. To determine the rate of cervical dilatation during the active phase of labor among low-risk pregnant women delivering at Dodoma regional referral hospital.
2. To determine the duration of the active phase of labor among low-risk pregnant women delivering at Dodoma regional referral hospital.
3. To determine the rate of interventions done during the active phase of labor among low-risk pregnant women delivering at Dodoma regional referral hospital.
4. To determine factors associated with intervention during labor among women delivering at Dodoma regional referral hospital.

1.3.3 Research questions
1. What is the rate of cervical dilatation among nulliparous and multiparous women during the active phase of labor?
2. What is the duration of active labor among nulliparous and multiparous women?
3. What is the rate of intervention during labor among nulliparous and multiparous women?
4. During labor is there any factor associated with intervention?

1.4 Significance of the study
In order to reduce this fast-growing rate of c/ section it is important to explore more and understand the rate of dilatation and the overall duration of labor in our society so that avoiding early unnecessary intervention.
This study will also give light on when to perform timely interventions to improve the obstetric outcomes so that reducing or at all eradicating all the perinatal morbidity and mortality related to asphyxia in resource limited settings.

Findings from this study will also help to provide valid and realistic inputs for future researchers and in setting local practice guidelines to ensure reduction of unnecessary intervention but improving the obstetrical outcomes during labor in resource limited settings.
CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

The spontaneous process of childbirth, begins with onset of regular uterine contraction, effacement and dilatation of the cervix and it ends with delivery of fetus and expulsion of the placenta is known as labor (WHO, 2018b). It may be associated with the presence of a show and has four stages (Richa, 2015). Lawrence et al (2012) state that, labor is a normal physiological process for a woman who is at term.

Friedman (1995) defines the active phase of labor, which is in the first stage, as the dilatational division, where there is a rapid rate of cervical dilatation. It has a maximum duration of 12hours in nulliparous, where the rate of cervical dilatation of 1.2cm/hour, and 8hours in multiparous with a rate of 1.5cm/hour (Session & Labour, 2019). There is a descent of the presenting part with a rate of 1cm/hour when cervical dilatation reaches 8cm (Gary et al., 2014). The second stage is the delivery of a fetus, and it is up to 50minutes. However it can be a shorter duration of 20min in multiparous; third stage is the delivery of the placenta, which takes 30 minutes and the fourth stage is the first two hours post-delivery (Opoku & Nguah, 2015)

To have a good outcome, records of labor progress are documented in the partograph, which will reduce the prolongation of labor (T Lavender, Hart, & Rmd, 2012). Friedman discovered the use of partograph during labor, which helps in detecting abnormal progress of labor as early as possible so that to intervein it (Hoh, Cha, Park, Ting Lee, & Park, 2012). Apparently documents has risen alerts on its use due to evidences of variations in the progress of labor (Suzuki et al., 2010). Tina et al (2005) conducted a study to assess the first stage in multiparous; the study revealed difference on the progress of labor when an active phase is considered from 3cm. When the active phase is documented from the cervical dilatation of 6cm, there is no difference between nulliparous and multiparous on the duration of labor though the time taken to move from 4cm to 6cm was longer in prime-parous (Ashwal et al., 2020)

Several studies on intervention and the use of either oxytocin or amniotomy during labor speeds up the rate of dilatation. Studies further observe that, when intervention
is early it reduces the rate of c/section yet shortening of the overall duration of labor (S. Woi. 2009). Amniotomy is a routine practice in active management of labor to shortening the first stage of labor, and there was no enough documented evidence of oxytocin use during augmentation (Berghella, Baxter, & Chauhan, 2008), as an impact of performing this intervention there is improved outcome and reduction of c/section rate in primigravida (Thuillier et al., 2018)

Cochrane reviews show a wide disparity in the current practice on augmentation during labor among countries. Amniotomy is a common intrapartum intervention that does not had impact in low-risk women during labor (ACOG, 2017). Improving the practice of labor augmentation through the provision of evidence-informed guidelines has significant implications on the labor outcomes in both low- and high-income countries (World Health Organization & Jhpiego, 2015)

2.2 Rate of cervical dilatation during active phase of labor among women in labor.

The rate of cervical dilatation is about 1cm/hour when a woman is in active, this is from the established WHO criteria of cervical dilatation of 4cm. However the rate may be higher in multiparous women in which cervical dilatation reaches 6cm (Juhasova, Kretf, Zimmermann, & Kimmich, 2018). There is a significant evidence that multiparous have a higher rate of cervical dilatation when they are in active phase from 5cm cervical dilatation (Ashwal et al., 2020)

A study conducted in Australia on the practice during the first stage of labor-management shows multiparous has a dilatation rate of more > 1cm/hour; although no consensus among care providers on the normal progress of the first stage labor. (White et al., 2017). When other factors associated with labor remain constant, multiparous may still have a faster rate of cervical dilatation than nulliparous (Gunnarsson, Skogvoll, Jónsdóttir, Røislien, & Smáason, 2017). Friedman suggested a rate of cervical dilatation from 1.2cm/hour in nulliparous as a minimum rate of dilatation limit. This was contrary to a study in India that compared the rate of cervical dilatation and revealed a rate of >1.5cm/hour when active labor started from 5cm cervical dilatation (Pitchaimuthu & Bhaskaran, 2018).
A significant problem in obstetrical care is the lack of uniform definitions of the labor stages, especially for the initial landmark of the active phase of the first stage of labor (Hanley GE, et al., 2016). Depending on the definition of when the active phase begins and other maternal factors like BMI, it results in different durations of labor and dilation rates (Gunnarsson et al., 2017). According to ACOG and SMFM, the active phase of the first stage of labor begins at 6 cm cervical dilatation (Neal et al., 2010). A study by Juhasova et al, 2018, reported that, the rate of cervical dilatation during the active phase of labor ranged from 0.29 to 1.57 cm/hour in nulliparous and from 0.32 to 4.47 cm/hour in multiparous; The study further reported that, there was a significant differences in dilation rates noted from 6 cm of cervical dilatation (Juhasova et al., 2018).

Regardless of parity of the woman, the latent phase of the first stage of labor should not exceed 18 hours. However, due to slower progress at the latent phase of the first stage of labor, it cannot define a given time limit for the labor duration before 6 cm of cervical dilatation (N. J. Lee, Neal, Lowe, & Kildea, 2018). However, diagnosing arrested labor should be stated with caution, and application of obstetrical interventions should be made with restraint before 6 cm of dilatation (WHO, 2018b).

Partogram is a well-established tool for assessment of labor progress and diagnosis of labor protraction. Several studies support its use to improve the quality of care with good outcome (N. J. Lee et al., 2018). The widespread use of the World Health Organization (WHO) partogram had some modifications of the labor curves (Carhall S et al., 2015).

Studies assessing the labor graph using a modified WHO partograph that show that the dilatation rate can be higher when labor is from 4cm cervical dilatation, affecting labor duration to become shorter (Bishop et al., 2019). Although in another study by Ferrazzi and et al reported that initial cervical dilatation at the onset of the active phase has little impact on predicting the rate of cervical dilatation due to other factors that affect labor progress (Ferrazzi et al., 2015).
2.3 Duration of the active phase of labor for women in active labor.

Expectations of the duration of the active phase and rates of cervical dilation during the active phase largely stem from research published by Friedman in the 1950s. Friedman reported that labor in nulliparous typically follows a near-identical sigmoid curve varying only in slope with averaged active phase duration of 4.6–4.9 hours; although the average time needed to dilate the cervix from 4 cm to 10 cm was approximated to be 2.6 hours (Friedman, 1955). In contemporary practice, most providers aim to admit women to the labor unit when cervical dilation is expected to become more rapid that is, at the onset of the active phase. Authors of contemporary texts report that the active phase reliably begins at 4 cm, in the presence of regular uterine contractions (F. Gary Cunningham, Kenneth J. Leveno, Steven L. Bloom, Catherine Y. Spong, Jodi S. Dashe, Barbara L. Hoffman, 2014)

The active phase begins with a retrospectively identifiable acceleration of cervical dilation and ends at complete dilatation of the cervix. Duration of active labor is considered to be 4-8hrs, but it can go as short as 4hrs depending on the initiation of cervical dilatation at the onset of active labor. Thus with cervical dilatation below or above 5cm may have an impact on the duration of labor (Abalos et al., 2018). Multiparous have consistency and shorter duration of labor compared to nulliparous; which is a result of a higher rate of cervical dilatation with longer time needed to gain 1cm cervical dilatation. Orji et al (2008) asserts that when active labor begins at 4cm dilatation of the cervix, there is very minimal difference in duration of labor between multiparous and nulliparous (Orji, 2008).

Moderate-certainty evidence from two studies suggests that the median duration of the nulliparous active phase when the starting reference point was 4 cm was 3.7–5.9 hours and 2.2–4.7 hours for multiparous women (Say et al., 2014). When the starting reference point of active phase was 5 cm, the median duration was 3.8–4.3 hours for nulliparous women and 3.1–3.4 hours for multiparous women (Oladapo et al., 2018). Another study reported a median duration of 2.9 hours in nulliparous and 2.2–2.4 hours in multiparous when the starting reference point for active phase was 6 cm (Abalos et al., 2018). One study reported a mean duration of 4.7 hours and statistical limits of 9.9 hours for the active phase with a starting reference point of 3 cm. Sensitivity analysis excluding studies with any intervention (augmentation,
instrumental vaginal birth, and second-stage cesarean section) shows a similar range of mean durations for the active phase starting at 4 cm. This sensitivity analysis did not include any studies reporting median labor duration (Chen et al., 2018).

Nulliparous shows a longer labor duration due to a slower slope than the proposed Friedman slope, as Suzuki et al. reported. (Suzuki et al., 2010). The active phase of labor is longer in induced labors than those with spontaneous onset in nulliparous women (Gunnarsson et al., 2017). Multiparous has shorter labor duration than nulliparous due to the faster rate of cervical dilatation with more consistent cervical changes (Vahratian, Hoffman, Troendle, & Zhang, 2006). It has been documented in previous studies that the duration of labor is influenced by factors such as parity, age, ethnicity, body mass index (BMI), and fetal position (Gordon, Raynes-Greenow, McGeechan, Morris, & Jeffery, 2013).

The duration of the active phase of the first stage of labor was different depending on the initial cervical dilatation where those with higher cervical dilatation at the onset of active labor had shorter duration than others and carries less risk of cesarean section (Sherry, 2013). When the active phase of labor is considered too early is associated with a longer duration of active labor, which may be up to 7 hours compared to when the onset of the active phase of labor is considered late (Pujar, Salian, & Kulkarni, 2015). Zhang et al. found that labor progression from 4 to 6 cm was slower than previously described, and that might define the start of the active phase of labor at 6 cm cervical dilation (Chen et al., 2018). Vahratian et al. showed that elective induced labor in nulliparous women with cervical ripening had slower latent and early active phases (Chen et al., 2018).

Due to the increased rate of cesarean section with the primary indication be poor progress of labor, which is a result of a slower rate of dilatation associated with longer duration of labor American College of Obstetrics and Gynecology released a guideline of labor-management which indicates the active phase of labor should start from 6cm cervical dilatation to reduce the need of augmentation and cesarean section rate(“Doctors Urge Patience , And Longer Labor , To Reduce C- Sections,” 2019) (Tayade & Jadhao, 2012)
Studies have shown that ethnic groups can affect the duration of labor, where it revealed that Asian women had a shorter duration of active labor than Hispanic women and overall shorter compared to what was reported initial by Friedman, but nulliparous still had a longer duration (Albers et al., 1996). Shortening of the active phase of labor can also be done by intervention like amniotomy and oxytocin infusion, especially in nulliparous due to the uncoordinated uterine contractions labor (Chen et al., 2018)

2.4 Intervention during active phase of labor.
The diverse intervention has been observed to fasten and shortening the active phase of labor. Correct and genuine use of partograph may guide the decision to perform intervention where amniotomy and oxytocin use are among the commonly performed intervention during labor in modern-day obstetric practice. (Ness, Goldberg, & Berghella, 2005). Suzuki et al compared Friedman’s curve of labor with the Zang curve and revealed that, due to different changes in the active phase, the need for intervention might decrease as cervical dilatation increase towards full dilatation (Suzuki et al., 2010)

Amniotomy, which is an intentional artificial rupture of the membrane, is one of the common practices done at the onset of labor or before augmentation with oxytocin; It has an effect on shortening the labor duration and has also been linked to good obstetric outcome. (Huma Karamat, Afshan Seemab, 2016). In comparison with other methods of augmentation, there has been a conclusive establishment of the use of amniotomy together with oxytocin at the beginning of labor, and it has been shown that amniotomy and oxytocin use reduces the rate of c/ssection and also reduction of labor duration(S. et al., 2009)

A meta-analysis study of 14 trials assessed the joint use of early amniotomy with oxytocin augmentation for women in spontaneous labor or those with mild delays in labor progress. It was revealed that, a modest decrease in the length of the first stage of labor in addition to a modest decrease in cesarean birth rates in comparison with expectant management (ACOG, 2017b). Conversely, a study in Saudi Arabia found that in low-risk women, amniotomy which was a common intervention in labor was successful in decreasing the rate of cesarean delivery. However, there was no
difference in its rate during the active management of labor for both nulliparous and multiparous (Saadia, 2014).

In 2013, Cochrane reviewed eight studies comprising 1338 low-risk women in the first stage of spontaneous labor at term and found that without treatment or delayed oxytocin neither decreased cesarean delivery nor increased the chances of vaginal deliveries, with an average of 1.3 hours justified a shortened duration of labor (Oláh & Steer, 2015). In other studies, amniotomy has been associated with the development of infection when there is prolonged labor, affecting both maternal and fetal outcomes following delivery (Palareti et al., 2016).

Hoppe et al. reported a similar obstetric outcome that women who had amniotomy with later development of prolonged labor had increased risk of chorioamnionitis and increased cesarean section (Hoppe, Schiff, Benedetti, & Delaney, 2018). A metanalysis study which was done in China to compare the effect of early amniotomy versus late amniotomy of the risk of cesarean delivery found that there were equal chances of cesarean delivery among the two groups and also the obstetric outcome, especially the perinatal outcome, were similar in the two groups (Feng & Chen, 2020)

A study was done in India to compare two different mode of augmentation of labor which revealed the women who had early amniotomy followed with oxytocin infusion had a shorter duration of labor but a higher risk of cesarean section due to meconium-stained liquor, with a similar perinatal outcome (Bala, Bagga, Kalra, & Dutta, 2018). It was shown by Kernberg et al. in Portland-US that oxytocin was mainly used to augment labor during active management of labor and found that the proven effect of its use was shortening the duration of labor rather than reduction of cesarean section (Kernberg & Caughey, 2017). A randomized control trial conducted in India shows that women who had oxytocin augmentation had shorter labor duration than those who did not have augmentation with a similar outcome (Palareti et al., 2016).
2.5 Immediate obstetric outcome among women in the active phase of labor.

During childbirth, interventions are executed promptly and adequately to save the lives of the mother and newborn. However, when extensively used without consideration of precise indications, may disturb the normal physiological progression of childbirth, putting both mother and newborn at significant risk (Çalik, Karabulutlu, & Yavuz, 2018). Rousseau et al., in a randomized control trial, reported that the use of oxytocin during labor is associated with multiple outcomes which were narrated as reduction of labor duration for those who had labor dystocia., It was also found to be associated with uterine hyperactivity and Fetal heart rate abnormality when used in a higher dose (Rousseau & Burguet, 2017).

It is a known fact that the key objective goal of labor is an eventual good maternal-fetal outcome. Following an early and timely intervention, there is a higher rate of successful vaginal delivery with a low rate of cesarean delivery but still no much difference in the neonatal outcome, especially the APGAR score(Huma Karamat, Afshan Seemab, 2016). However, in cervical dystocia, the chances of intervention like oxytocin augmentation increase with the increased chances of cesarean delivery. (Shinde, Bangal, & Singh, 2012).

The rate of cervical dilatation during labor is not a good predictor of severe delivery outcome(Gunnarsson et al., 2017) but can determine the need for oxytocin augmentation. However Patel et al reported poor descent as a risk of cesarean section rather than cervical dilatation (Ghanghoriya & Patel, 2018). Poor progress of labor is termed as abnormal labor and has high risk of birth asphyxia as was concluded in a study which was done to compare the neonatal outcome between normal and abnormal labor(Shinde et al., 2012) although it has been shown that there is no difference on the outcome of labor among the nulliparous women who had intervention during labor (Dencker et al., 2009).

The mode of delivery is less likely to be associated with increased maternal and fetal morbidity, as in a study that compared the complication relating to delivery mode by (Butler et al., 2014). A study by Page et al (2017) on the outcome of labor with a dosage of oxytocin used to augment labor, found that a higher dosage of oxytocin is associated with poor perinatal outcome but also increased risk of uterine rupture as
compared to low oxytocin dosage (Page, McCool, & Guidera, 2017). An online review by Burguet et al (2017) found that there was no difference in neonatal outcome (5th minute APGAR score and Neonatal ICU admission) when comparing the group which was subjected to oxytocin versus those who were not subjected to oxytocin. The study further reported that long term effect in behavioral changes had an association with the use of oxytocin (Burguet & Rousseau, 2017).

Henriksen et al (2015); conducted a study in Denmark to determine the association between labor augmentation and attention-deficit/hyperactive disorder in children after a postulate and if there was an association. Unfortunately the study proved that there was no association between augmentation and ADHD in children (Henriksen, Wu, Secher, Obel, & Juhl, 2015). A meta-analysis study in Greece that involved data from 6 randomized clinical trials to compare the effect of oxytocin augmentation versus other methods not commonly practiced; found that there was no difference in the neonatal outcome since they both have a similar number of NICU admission and APGAR score at 5th minute (Pergialiotis et al., 2016).

2.6 Conceptual framework

It shows the relationship between variables and maternal and fetal outcomes. The independent variables were; Age of the patient, Parity, Gravidity, and Gestation age, while the Intermediate variables were the rate of cervical dilatation, duration of the active phase of labor, and intervention done during labor. Cesarean delivery and non-cesarean delivery during current pregnancy with the maternal duration of hospital stay, fetal Apgar score at 5th minute, birth weight, and neonatal ICU admission are dependent variables.
Nulliparous
- Gestation age
- Age of participant
- Gravidity

Multiparous
- Gestation age
- Age of participant
- Gravidity

WHO STD CRITERIA DURING ACTIVE PHASE OF LABOR
- Rate of cx dilation (nulliparous 1.2cm/hr, multiparous 1.5cm/hr.)
- Duration of active phase of labor 4hrs

Maternal outcomes
- Rate of cx dilation
- Duration of active phase of labor
- Intervention during labor
- Mode of delivery

Fetal outcomes
- Apgar score
- Birth weight
- NICU admission

Figure 1: Conceptual Framework
CHAPTER THREE

METHODOLOGY

3.1 Study Approach

This study was employed quantitative research approach. The duration of the study was three months from March to June 2020. Structured questionnaires were used to collect data from the respondents who met the study inclusion criteria.

Cervical assessment for the participants who met the inclusion criteria was done by the researcher or by the research assistants from an experienced midwife from the obstetric department at DRRH. The assessment also included the initial digital vaginal assessment during time of admission to labor ward.

3.2 Study Design

This was a Comparative Prospective Cross-sectional study design. The researcher opted to use this design because both exposure and outcome can be studied at the same time.

3.3 Study Area

The study was conducted at Dodoma Regional Referral hospital at the department of obstetrics and gynecology. DRRH was selected because it is among the University of Dodoma’s affiliated hospitals. Convenient sampling was used in selecting the hospital. The hospital is located in Dodoma region; the region lies between Latitude 6.00 and 6.30 degrees South and Longitude 35.30 and 36.02 degrees East. The total surface area of the region is 41,311 square kilometers. According to the Tanzania population and Housing census of August 2012 Dodoma region has a total population of 2,328,949 people, where 1,134,496 are males, and 1,194,453 are female. Among this population, women of reproductive age are 526,542 (Tanzania Bureau of Statistics, 2010). The region is divided into seven districts: Dodoma Municipal, Chemba, Kondoa, Bahi, Mpwapwa, Chamwino, and Kongwa. Dodoma shares a border with Manyara region in the North and Iringa region in the South. It borders Singida region on the West, as well as Morogoro region in South-East.

Dodoma Regional Referral Hospital is a teaching hospital where Residents, medical students, clinical officer students, and nursing students attend their clinical rotations.
The hospital has a total bed capacity of 420 (363 available) and 14 departments. Obstetrics and Gynaecology department is among the hospital departments with a total bed capacity of 111. The obstetric unit has a bed capacity of 86 beds, including ten delivery beds. The Labor ward was the main area where study was conducted. It has ten delivery beds, one examination bed at the admission room, a well-functioning and equipped neonatal resuscitation unit, and a nurse station with sufficient privacy and well equipped. There are 16 beds for observation after normal delivery, which are in post-natal ward 21C. Within the department, there are two standard operating theater rooms, one room located near the labor ward, mostly used for cesarean sections.

Furthermore, the department has four obstetricians, residents, interns, and five registrars. There are eight anesthetists and 13 theater nurses and 53 nurses. The total deliveries per year is around 10,800, with an average of 900-1200 deliveries in a month. Where C/S per month ranges from 110 to 140, of which primary C/S is 60-70 in a month. Specifically, it was conducted in the labor ward where the admission room was the initial spot. Participants were recruited and then admitted to the labor side room for continuous support until cervical dilatation reaches 7 centimeters. Thereafter, the researcher transferred them to the delivery room until labor was completed. After normal spontaneous vertex delivery or assisted vacuum delivery, participants were transferred to an observation area which is ward number 21C. From that ward, they were observed for first 2 hours then moved to ward 23C for the remaining time until 24 hours is completed. If no complication the participant was discharged home through RCH clinic. Those who delivered by emergency C/S were transferred to ward number 22A from which an observation was made for the first 8 hours then moved to ward 22C for the next 48-72 hours before being discharged home through RCH clinic if no complications.

The neonatal unit (ward 24), which is located in the same building, has an admission capacity of 340 neonates per month. It includes: premature babies, and it has three general pediatricians, with a minimum of 13 qualified nurses; although their number varies depending on the internal staff rotation. The unit has a Neonatal ICU, Sepsis room, and premature unit.
3.4 Study population
The target population was all low-risk pregnant women at term with single tone fetus with spontaneous onset of labor and in active phase of first stage of labor delivered at Dodoma Regional Referral Hospital.

3.5 Inclusion criteria
All low-risk pregnant women with GA > 37 weeks and < 42 weeks (at term pregnancies), single tone, cephalic presentation attended at DRRH with spontaneous labor in the active phase.

3.6 Exclusion criteria
- Women with labor induction at term.
- Low-risk pregnant women in the late active phase of labor, thus cervical dilatation of > 7 cm.
- Term pregnancy non-vertex presentation in the active phase of labor.
- Referral cases who are at term in the active phase of labor.

3.7 Sampling technique
The researcher used systematic random sampling technique to select participants from those who met the inclusion criteria. Every second person was enrolled in the study after a signed consent.

3.8 Sample size calculation.
The sample size was calculated using Kish and Lesley formula as indicated by Charan et al in the study on sample size estimation for different study designs (Charan & Biswas, 2013). A previous research conducted at Bugando hospital in Mwanza region Tanzania that aimed at assessing the rate of intervention during the first stage of labor, shows that 20.6% of women who were in the active labor were subjected to intervention during the first stage of labor (Chuma et al., 2014)

$$\text{Sample size} = \frac{Z_{1-a/2}^2 \cdot p(1-p)}{d^2}$$

Where
Z – standard normal variate at 5% type 1 error, which is 1.96.
P- Proportion based on previous studies were 20.6%
d- Absolute error or precision which is 5%

The minimum sample size of this research was 251 participants; however, 300 participants were involved, thus at least a quota of months delivery capacity of the unit. Three hundred partographs of low-risk women in the active stage of labor who met the inclusion criteria were followed throughout their progress of labor until delivery at DRRH. This was during the study duration from March 2020 to June 2020.

3.9 Independent variables
Gravidity, Gestation age of pregnancy, age of participant, marital status, employment status and Initial cervical dilatation at admission to labor ward.

3.10 Dependent variables
Rate of cervical dilatation, Duration of active phase of labor, Rate and type of intervention during labor, Mode of delivery, Apgar score, NICU Admission, New born birth weight.

3.11 Study procedure and data collection tools
Clients who met the inclusion criteria of being enrolled in the study were informed on the aim and the need of this study in the society. The researcher further informed the participants on informed on the ethical issues such as: sharing of the information to the authorities and assuring on the safety of the interventions. A signed consent was obtained from those participants who understood and agreed to participate in the study. Study participants were enrolled from the admission room in the labor ward after being assessed by the researcher. The same process of recruiting was repeated until the sample size was achieved. During admission, an initial digital vaginal assessment was done to determine the cervical dilatation. Those who were in the active phase of labor with cervical dilatation from three centimeters were enrolled and partograph was initiated. After 4 hours the researcher or an assistant researcher repeated the vaginal assessment to see the cervical dilatation as per protocol. Information concerning multiparous was in Group B, and for nulliparous was in
Group A. The researcher and assistant researchers continued to fill the structured questionnaire with the information obtained from patient’s partograph concerning the labor progress and outcome. The information included the mode of delivery, newborn APGAR score, and any immediate complication which occurred during labor.

Women who had a cervical dilatation of seven centimeters and above at the time of admission were excluded from the study. This is because they were in a late stage of the active phase of labor.

Two experienced nurse-midwives (RN) were recruited from the labor ward in obstetrics department at DRRH. These Nurses were commissioned to be assistant researchers. They ensured data collection progress even in the absence of a prime researcher. They were informed on the aim and objectives of the study and meaning and the required parameters to identify the low risk women who qualified for enrollment in the study. They were more informed on the importance of the initial digital vaginal assessment, the partograph parameters and their interpretation and the labor outcome. The researcher explained to them on inclusion and exclusion criteria and how to use a check list to retrieve information regarding monitoring indicators from the properly completed filled partograph.

Partograph (Appendix V) was opened for those who was in active phase. This was done after an initial vaginal assessment by the researcher or researcher assistant using a referencing cervical gram chart reported on the Appendix VI and completed after delivery. A well-constructed and structured questionnaire was used to extract information from the client partograph and theatre operating register. The questionnaire contained parts of personnel information (demographic data) followed by the fetal monitoring chart, labor progress chart and the mode of delivery and the information regarding the maternal and neonatal outcome.

Partograph was used as a monitoring tool where documentation was done in a way that all parameters monitored and recorded during labor was easily extracted. Fetal heart rate was recorded using Pinnard fetoscope because it easily available, less expensive and easy to use as compared to doppler scan.
Interventions were grouped into three categories. Augmentation was recommended when there was inadequate uterine contraction or slower cervical dilatation. Likewise, augmentation with oxytocin infusion was recommended by giving dosage of 2.5IU in 500mls of R/Lactate in a rate of 10drops/minute. With increase in rate by ten drops after every 30 minutes with the maximum rate be 60 drops/minute, oxytocin dosage was increased by 2.5IU until the desired contraction was achieved which was determined by presence of 3 or more contraction in 10 minutes and lasted for more than 20seconds (WHO, 2014). Time taken for intervention as per action identified for those detected with abnormal labor was taken. Documentation for deciding time of intervention like C/S and the action time as a timely intervention was also done. ACOG and National institute of clinical excellence (NICE) guideline state that the Decision Delivery Interval (DDI) and emergency C/S should not exceed > 30 minutes. Delay of >75 minutes in the presence of maternal and fetal compromise can results to poor outcome. All this information was filled in the partograph and MTUHA.

Mother’s information was captured from the first part of partograph. Information such as: client’s registration number, age of the patient, gestation age, gravidity, date and time of hospital admission were obtained.

Fetal progress was plotted on the partograph including FHR, status of membrane (if rupture was spontaneous or artificial), state of the liquor, and molding, all this information was filled through partograph. Information regarding labor progress such as: cervical dilatations, descent of the presenting part, uterine contractions, alert and action line, detection of abnormal labor, time of intervention and time of action, duration of active phase of labor were all extracted from the partograph. BP, PR, temperature, urine for protein and acetone from the mother was also assessed.

Mode of delivery together with maternal and fetal outcome was assessed and documented including the complication suffered following delivery, also assessment of Neonatal outcome including the APGAR score was recorded.
3.12 Validity and Reliability

Validity of this study was tested using a pilot questionnaire through the partograph to suggest the association between intervention during active phase of labor and maternal-fetal outcome. Gaps identified were corrected before actual data collection begun. The collection tools (partograph and questionnaire) were tested and retested to assess the findings and they show good reliability.

3.13 Data Analysis

Data were analyzed using statistical software SPSS version 25. Whereby a descriptive analysis for participants’ demographic characteristics and intrapartum information was done. The mean was calculated and simple frequency table was plotted.

Rate of cervical dilatation among participants was calculated to determine the individual dilatation of cervix during active phase of labor. This was from the initial cervical dilatation at the enrollment of active phase to full dilatation divide by the time used to reach full dilatation. One sample independent T-test was determined to compare the mean rate of dilatation for nulliparous and multiparous with the standard WHO minimal rate of cervical dilatation per hour; in which nulliparous were 1.2cm/hour and multiparous were 1.5cm/hour. The rate was determined in two groups in both nulliparous and multiparous. In which the first group included those enrolled with 3-4cm dilatation and the second group included those enrolled with 5-6cm cervical dilatation. This is due to challenges in detecting the exactly difference in dilatation between 3cm and 4cm as applied to 5cm and 6cm.

The same approach was done to determine the individual duration of active phase of labor. One sample T-test was determined after comparing the overall duration of active phase for nulliparous and multiparous with the known standard WHO duration of active phase of labor which is 4 hours. This was extracted from the standard rate of cervical dilatation during active phase of labor as recommended by WHO, where 1.2cm/hr was the minimal rate of cervical dilatation for nulliparous and 1.5cm/hr was the minimum rate of cervical dilatation for multiparous. It was calculated that from 4cm to reach full dilatation of cervix (10cm) which is 6cm therefore the expected duration for nulliparous was 5 hours and multiparous expected to use 4 hours, so the
duration was calculated as the average between duration for nulliparous and duration for multiparous where the duration was 4 hours.

The rate of intervention among the participants was analyzed first by determining the type of intervention. It was testified by using chi-square test between the intervened group and non-intervened group. 95% confidence interval was used to determine the level of significance. Fisher exact T-test was done to measure the strength of association between the factors associated with intervention for those variables which had participants less than 5, where P< 0.005 was considered as statistically significant. Binary logistic regression was done to determine the association since this study has two outcomes of interest (intervened and non-intervened group), where both univariate and multivariate regression was employed to determine the odds of association. Variables with \( p\text{-value} < 0.2 \) in univariate regression were further run into multivariate logistic regression to get the adjusted odds ratio.

### 3.14 Ethical Clearance and consideration

Ethical clearance was granted by the University of Dodoma (UDOM) ethical committee and permission to conduct the study from Dodoma Reginal medical Officer (RMO) and Medical Officer in charge at DRRH. The information obtained from the partograph and health care workers remained confidential.

Taking in consideration that this study dealt on the progress of active labor without determining or hindering any immediate decision or intervention during labor management then there was no any obvious danger neither life threatening intervention which was done to the participant as a part of the study procedure.

### 3.15 Dissemination of Study Findings

Findings from this study will be shared to the research department at the University of Dodoma and drafting of manuscript is not yet done. Reviewed for publication in the peer journals is not yet done. Sharing of the finding to the clinical medicine department and library will be done.

Results will also be submitted to the obstetrics and gynecology department of Dodoma regional referral hospital. This will help improve service provision after having a light about population variation of labor parameters.
CHAPTER FOUR
RESULTS AND DISCUSSION

4.1 Demographic characteristics and intrapartum information of the participants

Three hundred low-risk women who met the inclusion criteria were enrolled in the study after consenting to participate. Of all participants, 137 (46%) were nulliparous and 163 (54%) were multiparous. Table 1 reports the demographic responses of the participants. The mean age for the participants was 25.03 with SD of 5.71, and the mean gestation age was 39 weeks.

Table 1: Socio-Demographic characteristic and intrapartum information of the participants (N=300)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Total N (%)</th>
<th>Nulliparous N (%)</th>
<th>Multiparous N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;20</td>
<td>62 (20.67)</td>
<td>54 (39.42)</td>
<td>8 (4.91)</td>
</tr>
<tr>
<td>20-29</td>
<td>181 (60.33)</td>
<td>71 (51.82)</td>
<td>110 (67.48)</td>
</tr>
<tr>
<td>&gt;30</td>
<td>57 (19.00)</td>
<td>12 (8.76)</td>
<td>45 (27.61)</td>
</tr>
<tr>
<td><strong>Patient Education</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No formal Education</td>
<td>15 (5.00)</td>
<td>5 (3.65)</td>
<td>10 (6.13)</td>
</tr>
<tr>
<td>Formal Education</td>
<td>285 (95.00)</td>
<td>132 (96.35)</td>
<td>153 (93.87)</td>
</tr>
<tr>
<td><strong>Patient Occupation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employed</td>
<td>59 (19.67)</td>
<td>20 (14.71)</td>
<td>38 (23.31)</td>
</tr>
<tr>
<td>Self Employed</td>
<td>129 (43.00)</td>
<td>46 (33.82)</td>
<td>83 (50.92)</td>
</tr>
<tr>
<td>Peasant</td>
<td>112 (37.33)</td>
<td>70 (51.47)</td>
<td>42 (25.77)</td>
</tr>
<tr>
<td><strong>Marital status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>48 (16.00)</td>
<td>27 (19.71)</td>
<td>21 (12.88)</td>
</tr>
<tr>
<td>Married</td>
<td>252 (84.00)</td>
<td>110 (80.29)</td>
<td>142 (87.12)</td>
</tr>
<tr>
<td><strong>Residence</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rural</td>
<td>88 (29.33)</td>
<td>38 (27.74)</td>
<td>50 (30.67)</td>
</tr>
<tr>
<td>Urban</td>
<td>212 (70.67)</td>
<td>99 (72.26)</td>
<td>113 (69.33)</td>
</tr>
<tr>
<td><strong>Gestation Age</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>37-40</td>
<td>258 (86.00)</td>
<td>128 (93.43)</td>
<td>130 (79.76)</td>
</tr>
<tr>
<td>&gt;40</td>
<td>42 (14.00)</td>
<td>9 (6.57)</td>
<td>33 (20.25)</td>
</tr>
</tbody>
</table>
4.2 The Rate of cervical dilatation during active labor among women delivered at DRRH

Using One sample Independent T-test, a comparison of the rate of cervical dilatation during active phase of labor with the recommended WHO standard rate; hence the mean rate of cervical dilatation for nulliparous was 0.81 cm/hour and multiparous had a mean rate of cervical dilatation of 0.88 cm/hour. The mean rates of cervical dilatation of both groups differed significantly with that of WHO with a $p$-value of <0.0001.

Depending on the initial cervical dilatation at admission to labor ward the rate of cervical dilatation was calculated for both nulliparous and multiparous. Nulliparous admitted with cervical dilatation of 3-4 centimeters had a mean rate of 0.70 cm/hour while those admitted with cervical dilatation of 5-6 centimeters had a rate of 0.86 cm/hour.

Similar for multiparous admitted with cervical dilatation of 3-4 centimeters had a mean rate of 0.81cm/hour while those admitted with 5-6 centimeters cervical dilatation had 0.95cm/hour. All mean rates of cervical dilatation were statistically significant with a $p$-value of <0.0001. All described in the Table 2 below.

Table 2: Comparison of the rate of cervical dilatation (cm/hr) to the WHO rate

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>95% CI</th>
<th>WHO rate</th>
<th>t-value</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lower</td>
<td>Upper</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nulliparous</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.8103</td>
<td>0.7622</td>
<td>0.8584</td>
<td>1.2</td>
<td>-13.43</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Multiparous</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.8834</td>
<td>0.8398</td>
<td>0.9270</td>
<td>1.5</td>
<td>-23.38</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Nulliparous</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.7036</td>
<td>0.6530</td>
<td>0.7542</td>
<td>1.2</td>
<td>-16.46</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>0.8679</td>
<td>0.8007</td>
<td>0.9351</td>
<td>1.2</td>
<td>-8.21</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Multiparous</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.8176</td>
<td>0.7693</td>
<td>0.8660</td>
<td>1.5</td>
<td>-23.49</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>0.9500</td>
<td>0.8783</td>
<td>1.0218</td>
<td>1.5</td>
<td>-12.76</td>
<td>&lt;.0001</td>
</tr>
</tbody>
</table>
4.3 Duration of active phase of labor among women delivered at Dodoma regional referral hospital

Results were analyzed into groups depending on parity and initial cervical dilatation during admission to labor ward as shown in Table 3 below. One sample independent t-test comparing the results to the WHO standard average duration of active labor which is 4 hours. The duration of active phase of labor which ranges from 4-5 hours was calculated from the standard rate of cervical dilatation during active phase which ranges from 1.2 cm/hour to 1.5 cm/hour (WHO, 2018a). Nulliparous had a mean duration of active phase of labor of 7.6 hours while multiparous had a mean duration of 6.8 hours with statistical significance and a p-value of <0.0001.

Table 3: Comparison of duration of labor active phase of labor to the WHO standard duration of active labor in hours

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>95% CI Lower</th>
<th>95% CI Upper</th>
<th>WHO duration</th>
<th>t-value</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nulliparous</td>
<td>7.6058</td>
<td>7.2912</td>
<td>7.9205</td>
<td>4</td>
<td>10.2</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Multiparous</td>
<td>6.8589</td>
<td>6.5559</td>
<td>7.1619</td>
<td>4</td>
<td>12.4</td>
<td>&lt;.0001</td>
</tr>
</tbody>
</table>

4.4 Rate of Intervention which was done during labor and obstetric outcome among women who delivered at DRRH

Of all three hundred participants, 16% (48) were intervened during the active phase of labor. The rate of intervention for nulliparous women was 23.31% (31) and for multiparous was 10.18% (17). The study found that, the rate of intervention depends on gravidity was statistically significant higher in nulliparous with p-value of 0.0021. Among the fourth-eight intervened participants; 42% (20) had oxytocin augmentation, 31% (15) had a combination of amniotomy with oxytocin infusion to augment labor while 27% (13) had amniotomy alone as presented in Table 4.1.

Obstetric outcome was also recorded and descriptive analysis was performed, the results are presented in Table 4.2. The results show that of all three hundred participants, 80% (241) had spontaneous vaginal delivery, 18% (56) had emergency cesarean delivery and 1% (3) had assisted vacuum delivery.
92% (276) newborns had a 5th minute APGAR score of above nine while 8% (24) scored less than nine. Likewise, 55% (165) newborns had Birth weight between 2.6-3.5Kg and 10% (31) had birth weight of more than 3.6kg.

**Table 4: Rate of intervention during labor among women delivered at DRRH**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Intervention done</th>
<th>No intervention done</th>
<th>Type of intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gravidity</td>
<td>N (%)</td>
<td>N (%)</td>
<td>Amn+Oxytocin</td>
</tr>
<tr>
<td>Prime-gravida</td>
<td>31(23.31)</td>
<td>102(76.69)</td>
<td>8(61.5)</td>
</tr>
<tr>
<td>Multigravida</td>
<td>17(10.18)</td>
<td>150(89.82)</td>
<td>5(38.5)</td>
</tr>
<tr>
<td>Total</td>
<td>48(16)</td>
<td>252(84)</td>
<td>13(27)</td>
</tr>
</tbody>
</table>

**Table 5: Immediate obstetric outcome**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal outcome</td>
<td>Mode of delivery</td>
<td></td>
</tr>
<tr>
<td></td>
<td>NSVD</td>
<td>241</td>
</tr>
<tr>
<td></td>
<td>Emergency C.S</td>
<td>56</td>
</tr>
<tr>
<td></td>
<td>Assisted vaginal delivery</td>
<td>3</td>
</tr>
</tbody>
</table>

**Duration of active phase of labor**

| < 8hrs | 229 | 76.33 |
| > 8hrs | 71  | 23.66 |

**Newborn outcome**

<table>
<thead>
<tr>
<th>APGAR score</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;9</td>
</tr>
<tr>
<td>9-10</td>
</tr>
</tbody>
</table>

**Birth Weight (Kg)**

<table>
<thead>
<tr>
<th>Birth Weight (Kg)</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤2.5</td>
<td>104</td>
<td>34.67</td>
</tr>
<tr>
<td>2.6-3.5</td>
<td>165</td>
<td>55.00</td>
</tr>
<tr>
<td>3.6+</td>
<td>31</td>
<td>10.33</td>
</tr>
</tbody>
</table>
4.5 Factors associated with intervention during labor

Cross tabulation was done to determine the factors which influenced intervention during labor including the immediate maternal-fetal outcomes among all women participated in the study. Binary logistic regression was done because the study had two outcome of interest, where both univariate and multivariate regression analysis was employed to determine both un adjusted and adjusted odds ratio. The factors which were statistical significance with a $p$-value of $<0.05$ in adjusted odds ratio were the gravidity, patient occupation and gestation age.

Results shows that multiparous were 0.4 times less likely to be intervened compared to nulliparous, also patients admitted with gestation age above 40 weeks were 2.9 times more likely to be intervened compared to those who had gestation age less than that. Furthermore; patients who were self-employed were 0.1 times less likely to be intervened as compared to those who are employed but peasants were 1.4 times more likely to be intervened as compared to the employed patients. Birth weight of the newborn and rate of cervical dilatation had clinical correlation with intervention but there was no statistical significance. There was no significant clinical correlation neither statistically significant association between mode of delivery and intervention, but the was an association between Apgar score and intervention this was due to a significant exact T-test.
Table 6: Factors associated with intervention done during labor (N=300)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Intervention done</th>
<th>Intervention note done</th>
<th>Chisq</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N (%)</td>
<td>N (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gravidity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prime gravida</td>
<td>35 (25.55)</td>
<td>102 (74.45)</td>
<td>17.1013</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Multi gravida</td>
<td>13 (7.98)</td>
<td>150 (92.02)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;20</td>
<td>11 (17.74)</td>
<td>51 (82.26)</td>
<td>0.8671</td>
<td>0.6482</td>
</tr>
<tr>
<td>20-30</td>
<td>31 (16.58)</td>
<td>156 (83.42)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;30</td>
<td>6 (11.76)</td>
<td>45 (88.24)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patient Occupation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employed</td>
<td>12 (20.69)</td>
<td>46 (79.31)</td>
<td>26.3515</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Self Employed</td>
<td>5 (3.88)</td>
<td>124 (96.12)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peasant</td>
<td>31 (27.68)</td>
<td>81 (72.32)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gestation Age (wks)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>37-40</td>
<td>45 (17.44)</td>
<td>213 (82.56)</td>
<td>2.8506</td>
<td>0.0913</td>
</tr>
<tr>
<td>&gt;40</td>
<td>3 (7.14)</td>
<td>39 (92.86)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cervical dilatation on admission (cm)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3-4</td>
<td>29(17.06)</td>
<td>141(82.94)</td>
<td>0.3272</td>
<td>0.5673</td>
</tr>
<tr>
<td>5-6</td>
<td>19(14.62)</td>
<td>111(85.38)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Birth weight (kg)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤2.5</td>
<td>11(10.58)</td>
<td>93(89.42)</td>
<td>4.4612</td>
<td>0.1075</td>
</tr>
<tr>
<td>2.6-3.5</td>
<td>33(20.00)</td>
<td>132(80.00)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;3.5</td>
<td>4(12.90)</td>
<td>27(87.10)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>APGAR score at 5TH min</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abnormal &lt;7</td>
<td>3(75.00)</td>
<td>1(25.00)</td>
<td>0.0138*</td>
<td></td>
</tr>
<tr>
<td>Normal &gt;7</td>
<td>45(15.20)</td>
<td>251(84.80)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mode of delivery</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vaginal delivery</td>
<td>41 (85.4)</td>
<td>203 (80.6)</td>
<td>0.628</td>
<td>0.428</td>
</tr>
<tr>
<td>C/ delivery</td>
<td>7 (14.6)</td>
<td>49 (19.4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duration active phase (hrs)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;8</td>
<td>33 (69)</td>
<td>196 (78)</td>
<td>1.819</td>
<td>0.177</td>
</tr>
<tr>
<td>&gt;8</td>
<td>15 (31)</td>
<td>56 (22)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*More than 25% of the cells had values <5 therefore fishers exact test was used to test for significance
Table 7: Logistic regression on the factors associated with intervention during labor

<table>
<thead>
<tr>
<th>Variable</th>
<th>Un adjusted Logistic regression</th>
<th>Logistic regression</th>
<th>Logistic regression</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR [95% CI]</td>
<td>P-value</td>
<td>AOR [95% CI]</td>
</tr>
<tr>
<td>Gravidity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prime gravid</td>
<td>Reference</td>
<td>&lt;.0001</td>
<td>Reference</td>
</tr>
<tr>
<td>Multi gravid</td>
<td>0.253[0.127, 0.501]</td>
<td>0.406[0.227, 0.727]</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;20</td>
<td>Reference</td>
<td>0.6515</td>
<td></td>
</tr>
<tr>
<td>20-30</td>
<td>0.921[0.432, 1.964]</td>
<td>0.406[0.227, 0.727]</td>
<td></td>
</tr>
<tr>
<td>&gt;30</td>
<td>0.618[0.212, 1.807]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patient Occupation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employed</td>
<td>Reference</td>
<td>&lt;.0001</td>
<td>Reference</td>
</tr>
<tr>
<td>Self Employed</td>
<td>0.155[0.052, 0.463]</td>
<td>0.229[0.109, 0.481]</td>
<td></td>
</tr>
<tr>
<td>Peasant</td>
<td>1.467[0.687, 3.132]</td>
<td>0.802[0.406, 1.587]</td>
<td></td>
</tr>
<tr>
<td>Gestation Age (wks)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>37-40</td>
<td>Reference</td>
<td>0.1039</td>
<td>Reference</td>
</tr>
<tr>
<td>&gt;40</td>
<td>0.364[0.108, 1.230]</td>
<td>2.901[1.367, 6.159]</td>
<td></td>
</tr>
<tr>
<td>Dilatation during admission (cm)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3-4</td>
<td>Reference</td>
<td>0.5676</td>
<td></td>
</tr>
<tr>
<td>5-6</td>
<td>0.832[0.443, 1.562]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Body weight (kg)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤2.5</td>
<td>Reference</td>
<td>0.1142</td>
<td>Reference</td>
</tr>
<tr>
<td>2.6-3.5</td>
<td>2.114[1.016, 4.395]</td>
<td>1.282[0.713, 2.303]</td>
<td></td>
</tr>
<tr>
<td>&gt;3.5</td>
<td>1.253[0.369, 4.251]</td>
<td>1.289[0.472, 3.518]</td>
<td></td>
</tr>
<tr>
<td>Rate of cervical dilation (cm/hr)</td>
<td>0.386[0.123, 1.206]</td>
<td>0.1015</td>
<td></td>
</tr>
<tr>
<td>Mode of delivery(C/S)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not Intervened</td>
<td>Reference</td>
<td>0.356</td>
<td></td>
</tr>
<tr>
<td>Intervened</td>
<td>0.668[0.283, 1.574]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duration of active phase (&gt;8 hours)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not Intervened</td>
<td>Reference</td>
<td>0.326</td>
<td></td>
</tr>
<tr>
<td>Intervened</td>
<td>1.363[0.735, 2.528]</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4.6 Discussion

4.6.1 Rate of cervical dilatation among low-risk pregnant women during active phase of labor

The rate of cervical dilatation during active labor in this study was found to be slower for both nulliparous and multiparous. It is slower than the suggested WHO standards with multiparous showing a higher rate of dilatation than nulliparous. Nulliparous had a rate of 0.81cm/hour and multiparous 0.88cm/hour which is similar to a study done by Juhasova et al, 2018 at the University of Zurich reported that cervical dilation ranged from 0.29-1.57cm/hour in nulliparous and 0.32-4.47cm/hr in multiparous. The study further asserted that, the progress was much faster in multiparous compared to nulliparous. The similarities between this two studies are due to the same state of initial cervical dilatation at the onset of active labor without any obstetrical intervention (Juhasova et al., 2018), but the rates are both slower than the standard WHO rate since it strictly considered active phase from initial cervical dilatation of 4cm while in this study it includes women with 3cm dilatation which may be the source of the slower rate.

Another resemblance in the findings was observed in a prospective cohort study in two sub-Saharan African countries. It is reported that, Multiparous have faster rate of dilatation than nulliparous regardless of the initial state of dilatation using a multistate Markov models because gravidity is associated with faster rate of dilatation (Arulkumaran, Gibb, Lun, Heng, & Ratnam, 1984)

The findings were a little bit different from a study in India that observed the rate of cervical dilatation to be 1.2cm/hour to 1.5cm/hour similarly to the Friedman’s proposal. This can be due to the nature of the study population, in that study only nulliparous were involved. Likewise higher cervical dilatation at the onset of active phase which was considered from 6cm and is associated with steep acceleration of dilatation. (Pitchaimuthu & Bhaskaran, 2018)

Jeremy et al in their publication in a journal of midwife reported different results that women may present with 0.5cm/hour during active labor and still considered to be normal. The same concern was presented in this study where the rate of dilatation was less than 1cm/hour during active labor but higher compared to Jeremy et al
The differences may be associated to study designs in which a study by Jeremy was a database review (Neal et al., 2010).

Different findings were reported in a study conducted in Mexico and found that women do differ in their rate of dilatation. This can be explained by a factor that, each study involves women of different ethnic groups which may affect the practice and monitoring of women during labor (Albers et al., 1996).

4.6.2 Duration of active phase of labor among low-risk pregnant women.
Regarding the duration of active phase of labor, this study revealed that nulliparous and multiparous had significant longer duration of labor as compared to the known duration. The overall mean duration of labor was observed to be 7.6 hours and 6.8 hours in the two groups respectively. The results further indicated that, there was a significant shortening of labor duration with late onset of active phase of labor. It was observed that, nulliparous had a duration of 7.98 hours and eventually reached 8.3 hours when cervical dilatation was less than 5cm. It was further observed that a shorter duration up to 6.6 hours was recorded when active labor begun at 5 cm (or above) dilatation. Similarly, to multiparous where the duration was 7.7 hours if the dilatation was less than 5cm and up to 6 hours when above 5cm.

Similar findings were reported in a study done by Suzuki et all (2010) in Japan. Suzuki observed that to Japanese women the rate of dilatation was much faster. This similarity in the duration of labor and the existing difference in the rate of dilatation may be explained with the different in study design. Suzuki’s study was a retrospective design that reviewed pre-existing information of labor; but also, the study employed a large sample size. Similarly Juhasova et al (2018) reported a longer duration of active phase of labor in nulliparous which was 9.47 hours and multiparous 7.33 hours this duration was almost similar to the higher limit of labor duration in my study (Juhasova et al., 2018).

Similar results were also reported in a study at Delta Medical College, Dhaka, Bangladesh. The study reported that, nulliparous had longer duration of labor with a mean time of 8 hours compared to multiparous who had mean time of 6 hours. This similarity in the findings may be associated with nutritional status which may affect
the overall bone development in young nulliparous which is less likely to affect multiparous (Shuchi, Lovereen, & Mina, 2019).

Comparing the findings from this study, the variation of multiparous curves is smaller than that of nulliparous curve which is because multiparous women may enter the active phase of labor with more organized contractions than nulliparous women. The speed of cervical dilation in active phase is slower in nulliparous than in multiparous. This was reported in a study which done by Zang et al. (2011). The study by Zang further found that the later the onset of labor the shorter the duration will be but also been previously exposed to labor favors the progress in multiparous.

A study by Vahratian et al; 2006 found that, there was a difference between nulliparous and multiparous duration of labor. The study reported that, there is shorter duration in their population compared to the findings from this study. This is because of the initial cervical dilatation at the onset of active phase of labor in this study in which majority were at 3-4cm dilatation; this may hinder the results and affect the duration of labor (Vahratian et al., 2006) but also multiparous have shorter duration due to faster rate of dilatation associated with previous exposure to labor (Helbig, Petersen, Sitter, Daly, & Gross, 2019).

4.6.3 Rate of intervention during labor among low-risk pregnant women
Regarding inefficient uterine contractions as a most common cause of poor progress of labor, interventions such as amniotomy, oxytocin augmentation for both nulliparous and parous women varies widely across studies (World Health Organization, 2018). In this study 48 women were augmented and the rate of intervention was higher in nulliparous. 73% were nulliparous compared to multiparous who were only 27%. Oxytocin infusion was the common intervention followed by amniotomy and the remaining groups had both oxytocin in combination with amniotomy with more success than other. This was in line with a study by Millen et al 2014 at Ohio State University Wexner Medical Center who found that, multiparous require less intervention during labor compared to nulliparous. This was due to the fact that, nulliparous are primarily exposed to labor and has uncoordinated uterine contraction (Millen, Kuo, Zhao & Gecsi, 2014).
Results similarities was observed in a study by Nachum et al (2010) who reported that, interventions of combined oxytocin and amniotomy resulted in a shorter labor duration compared to either amniotomy or oxytocin alone. The study by Nachum also found that nulliparous and multiparous took shorter time with less interventions compared to nulliparous who took more time and needed more intervals of interventions (Nachum et al., 2010). This is because nulliparous need interventions especially the use of oxytocin to augment labor is greatest due to inefficient uterine contraction associated with labor dystocia (Royal College of Obstetricians and Gynaecologists, 2014).

Huma et al; 2016 found that amniotomy was a common intervention which was done to augment labor in Indian. This is different from the findings in this study. The difference is because amniotomy is recommended first during active management of labor to know the color of amniotic fluid before oxytocin infusion to avoid increase in morbidity to the fetus.

4.6.4 Immediate obstetrical outcome among low-risk pregnant women.

Regarding obstetrical outcome, majority of the study participants had vaginal delivery for both nulliparous and multiparous. Few women had caesarean delivery likewise those who had intervention during labor were less likely to deliver by caesarean section. This was similar to a study from Zimbabwe and India in which most nulliparous women had increased risk of caesarean delivery (Majoko, Nystrom, Munjanja, 2014; Jain,Jain & Jain, 2014). The difference between the two groups of those who were intervened to those who were not intervened is because, intervention has shown to reduce the risk of caesarean section by improving contractions during labor.

A study in Bangladesh found that, the initial cervical dilatation at the onset of active labor is associated with the mode of delivery. Women enrolled with higher rate of dilatation >4 cm had higher chance of vaginal delivery yet less risk for caesarean delivery. This is different from this study in which women were not having any difference on the mode of delivery unless they were subjected into intervention. Similarly, this study found that nulliparous were at more risk of intervention than multiparous. This was similar to a study done by Addah and Ikobho (2018) in
Nigeria. In their study, nulliparous were at high risk of being diagnosed with prolonged labor and psychic effect related to fear of giving birth. All this subjected them to early intervention (Addah & Ikobho, 2018).

In this study the outcome was not different among the nulliparous and multiparous. This was similar to findings from Millen et al (2014) that did not report any adverse maternal outcome in their study (Millen, Kuo, & Zhao, 2014). The outcome was different from a study which was conducted by Ganchimeg et al (2013) which found that, birth weight was different but the rate of caesarean section among different ethnic group was the same. This difference is due to the age group which was selected to be enrolled in Ganchimeg’s study. The youngest age was 15 years which is a higher risk pregnancy associated with fetal pelvic disproportional and increase risk of caesarean delivery (Ganchimeg et al., 2013).

With reference to fetal outcome this study did not observe any difference in both birth weight and APGAR score. This is different from the study from Australia which observed that risk of still birth increases with parity and majority in this there was almost equal number of nulliparous and multiparous (Gordon et al., 2013).

4.6.5 Factors associated with intervention during labor.
Caesarean birth is associated with short and long-term risks that can extend for many years; it may affect the health of the woman, the child and future pregnancies (WHO, 2018a). Regarding maternal outcome, mode of delivery was not significantly associated with labor intervention. Since, among the study participants who received interventions and those who did not received intervention, majority delivered vaginally compared to C/Section. This was similar to a study in Iran which reported that, if the interventions were systematic adhered to can lead to the better process of natural childbirth and reduced chances of caesarean section. This is because they are both subjected to close monitoring of both maternal and fetal status during the course of labor (Moradi, Aryankhesal, Heidari, Soroush, & Sadr, 2019).

A systematic review which aimed at determining the interventions for reducing caesarean section and promoting vaginal birth had similar result with this study. In that review it was observed that interventions were associated with reduction of
caesarean birth especially early augmentation with amniotomy and oxytocin. These similarities is due to the fact that both have proved reduction of prolonged labor (Smith, Gallagher, Carroll, Hannon, & Begley, 2019). Likewise, this study found that; multiparous were less likely to be intervened compared to nulliparous which is similar to a study in Norway which reported early interventions among low-risk nulliparous women which was also associated with operative vaginal birth and episiotomy. This is probably because of unnecessary intervention which was done to women with normal progressive labor. (Bernitz, Øian, Rolland, Sandvik, & Blix, 2014).

Oscarson et al found that, women treated with oxytocin had a significantly higher risk of being delivered by emergency C/Section which is contrary to this study (Oscarsson, Amer-Wåhlin, Rydhtstroem, & Källén, 2006). This is because the dosage of oxytocin for augmentation of labor is very subjective to an individual. However, its over-use may lead to hyper-stimulation of uterus which later cause fetal distress hence increased risk of primary caesarean section.

This study observed that; there was a significant association of patient occupation to intervention where peasants were more likely to be intervened this may be probably due to the higher intensity of fear to give birth among them a factor which also makes them more prone to intervention. These findings were similar to a study in Spain which reported that, early sign of infection manifested to women who were intervened because amniotomy increases the risk of ascending infection. Amniotomy is commonly practiced in countries which have already adopted the active management of labor. (Hidalgo-Lopezosa, Hidalgo-Maestre, & Rodríguez-Borrego, 2016).

Other maternal outcomes like duration of labor, rate of cervical dilatation did not show any statistical significance. However, there is some clinical correlation with intervention this is because of study duration and discrepancy of the sample size. The same was also noted on the Apgar score in which there was no significantly association between the intervention given to mothers during the process of labor and those who did not have intervention. This is because most of women who were involved in the study were multiparous leading to a minimal number of women who
were intervened yet delivered babies with low score. This was similar to a study by Bernitz and et al (2014) in that study, no any adverse effects of oxytocin augmentation on the babies’ health was detected. Furthermore the numbers of low Apgar score cases were also too small to find association and making conclusions (Bernitz et al., 2014).
CHAPTER FIVE
CONCLUSION, RECOMMENDATION AND LIMITATIONS

5.1 Conclusion
It was revealed that women involved in this study had a slower rate of cervical dilatation compared to the WHO rates, with normal labor progress.

Further observation from this study is that pregnant women involved had a longer duration of active phase as compared to the calculated standard WHO duration. This in fact indicated that, there is an association between cervical dilatation and the duration of labor.

Nulliparous are more prone to intervention since the rate of intervention during labor was higher than multiparous. Moreover, this study found that oxytocin was common practiced intervention.

Gravidity, employment status and Gestation age may affect the odds of intervention in women who are in labor. Although there was no different in both maternal and neonatal outcome with intervention.

5.2 Recommendation
i. It is important for health service providers to give more time to women in labor by considering the stability of both fetal and maternal parameters. This will help avoid early diagnosis of poor progress of labor due to slower rate of dilatation.

ii. Prolonged labor should not be an absolute indication of caesarean delivery or intervention because women may have longer duration of labor as the result of slow rate of dilatation.

iii. Development of local guideline on management of women who are in labor is important so as to avoid unnecessary intervention and possibly we need to adopt more up to date partograph which consider active labor from a higher cervical dilatation.

iv. More researches should be done enrolling large sample size and longer study duration in order to elicit more on the factors associated with intervention so as to bring stronger conclusion
5.3 Limitations
Time of the study was not adequately enough to recruit as many participants as possible so that to increase the strength of the study findings.
REFFERENCES

Ministry of Health, Community Development, Gender, Elderly and Children (MoHCDGEC), [Tanzania Mainland, Ministry of Health (MoH) [Zanzibar], National Bureau of Statistics (NBS), O. of the C. G. S. (OCGS) and I. (2015). Tanzania 2015-16 Demographic Health Survey and Malaria Indicator Survey. *Tanzania 2015-16 Demographic and Health Survey and Malaria Indicator Survey.*


WHO_CesareanSectionRateRHR_15.02_eng. (2014). https://doi.org/10.1016/j.rhm.2015.07.007


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Sherry, B. (2013). Use 6-cm dilation to judge labor progress. *MDedge/ObbGyn, 1–2.*


WHO. (2018a). *WHO non-clinical recommendations unnecessary to reduce interventions caesarean sections.*


APPENDICES
Appendix I: Questionnaire

Name of interviewer………………
Hospital number…………………..
Questionnaire number……………
Patient name initials………………
Instruction: Circle the correct

I SOCIAL-DEMOGRAPHIC CHARACTERISTICS.

1. AGE………………... (**WRITE AGE HERE**)
   1. 18 -19 years
   2. 20 – 24 years
   3. 25- 29 years
   4. 30 – 25 years

2. Level of education
   1. No formal education
   2. Primary Education
   3. Secondary Education
   4. College / University Education

3. Occupation
   1. Employed
   2. Self employed
   3. Peasant

4. Marital status
   1. Single
   2. Married
   3. Divorced
   4. Separated
   5. Widow

5. Residence
   1. Rural
   2. Urban

6. Address of the client…………………….

II. INDEX PREGNANCY

1. Gestation Age…………… (**WRITE GA IN WKS**)
   1. 37- 38 weeks
   2. 39-40 weeks
   3. 41-42 weeks
2. Gravidity
   1. Primigravida
   2. Multigravida

3. Antenatal visit attendance
   1. None
   2. Once
   3. Two- four
   4. More than four

4. Any risk factor detected during ANC
   1. Yes
   2. No

5. Estimated fetal weight………………..(WT IN KG)
   1. <2.5 kg
   2. 2.5- 4 kg
   3. >4kg

III. PAST OBSTETRIC HISTORY

1. Parity
   1. Nullipara
   2. Multipara

2. Mode of delivery
   1. Vaginal delivery
   2. Caesarean delivery
   3. Assisted vaginal delivery

3. Place of delivery in the previous pregnancy
   1. Home
   2. Health centre/Dispensary
   3. Hospital

4. Obstetric outcome of previous pregnancy
   1. live birth
   2. MSB/FSB
   3. Abortion
   4. Neonatal death

5. Any complication during previous pregnancy
   1. yes
   2. no
6. If yes in question 5, which type of complication
   1. PPH
   2. Preeclampsia/Eclampsia
   3. perineal trauma
   4. prolonged labor/Obstetric trauma

**IV. INTRAPARTUM INFORMATION**

1. Stage of labor on admission to labor ward
   1. First stage active phase
   2. Second stage

2. Designation of the person who admitted
   1. specialist
   2. resident
   3. Nurse midwife

3. Type of Admission
   1. Referral
   2. Non-Referral

4. Time of admission…………
   1. AM
   2. PM

5. Maternal state on admission
   1. Clinical stable
   2. Clinical unstable

6. Cervical state during admission
   1. 3 cm dilated
   2. 4cm dilated
   3. 5cm dilated
   4. 6cm dilated

7. Station of the fetus…………*(WRITE LEVEL HERE EG 3/5)*
   1. -2 or -1
   2. O
   3. +1 or +2
8. Fetal status on admission…………..(WRITE EXACT FHR)
   1. <110b/min
   2. 110-160 b/min
   3. >160bmin

9. Any intervention done during course of labor?
   1. Yes
   2. No

10. If yes to question 9, what type of intervention which was done to augment labor
    1. Ambulation& oral hydration(no intervention)
    2. Amniotomy
    3. Oxytocin augmentation
    4. Amniotomy + oxytocin augmentation

11. Treatment offered at DRRH on admission
    1. Expectant management of labor
    2. Emergency operative delivery

12. Mode of delivery
    1. NSVD
    2. Emergency C/S
    3. Assisted vaginal delivery

13. Indication for Emergency C/section
    1. fetal indication mention …………
    2. Maternal indication mention ………….

14. Duration of active phase of first stage of labor….(WRITE EXACT HOURS HERE)
    1. less than 4 hrs
    2. 5-8 hrs
    3. more than 8 hrs

15. Duration of second stage of labor…………..(WRITE EXACT TIME HERE)
    1. <30 min
    2. 30-60min
    3. >60min

16. State of the mother
    1. Alive
    2. Not alive
17. State of the new bone
   1. Alive
   2. Not alive
18. Hospital stay duration for the mother
   1. 24 hrs
   2. 48 hrs
   3. 72 hrs
   4. above 72 hrs
19. If No to question 16 state the cause of death
   1.
   2.
20. If No to question 17 state the types of death
   1. MSB, Cause …………………
   2. FSB, Cause……………………

V. OBSTERIC OUTCOME

A/Fetal Outcome.

1. APGAR score at 5th minutes………………(WRITE THE RIGHT SCORE)
   1. ≤ 6
   2. 7-8
   3. 9-10
2. Birth weight ………………..(ACTUAL BODY WT)
   1. ≤ 2.5 kg
   2. 2.6 – 3.5 kg
   3. > 3.5 kg
3. Early neonatal death
   1. yes
   2. no
4. If yes in question 3 state the cause of death if yes in question 3
   a. …………………
5. Neonatal ICU admission
   1. yes
   2. no
6. if yes to question 5, cause/Reason for admission
   1. low birth weight
   2. large birth weight
   3. birth asphyxia
   4. neonatal sepsis
   5. Congenital anomaly
7. Duration of Hospital stay
   1. <24hrs
   2. 24-48hrs
   3. ≥ 72hrs

4. MATERNAL OUTCOME
   1. Complication Immediately after delivery
      1. Yes
      2. No
   2. If yes question 1, state nature of complication
      1. PPH
      2. Bladder/ureteric injury
      3. Extensive perineal tear (3$^{rd}$ or 4$^{th}$ degree tear)
      4. Episiotomy
      5. Early puerperal sepsis with presence of fever
   3. Blood transfusion during this delivery
      1. yes
      2. No
   4. If yes to question 3 mention number of units given
      1. one unit
      2. 2-3 units
      3. >3 units
   5. Was the mother satisfied with the service delivered?
      1. yes
      2. no
   6. If no to question number 5, Reason for not being satisfied
      1. Service below standard
      2. Service expensive and unaffordable
      3. Long waiting to deliver the intended service
Appendix II: Data collection method and research instrument:

1. Thorough history taking from the participants with a complete socio-demographic information
2. Recommended standard cervical dilatation tool to relate with digital vaginal assessment findings.
3. Ordinary tape measure, Pinnard fetal-scope, sterile gloves and a pen.
4. Tanzanian recommended partograph for monitoring and documentation of the information during labor.
5. After initial vaginal assessment the information which will be obtained will be plotted on the partograph.
Appendix III: Concert form: English

INTRODUCTION

My name is Deusdedit K William a researcher from University of Dodoma, college of health and allied sciences, Faculty of Medicine in the department of Obstetrics and Gynecology. I am conducting a study on the rate of cervical dilatation, duration of active labor and intervention among low-risk nulliparous and multiparous women at Dodoma regional referral hospital (DRRH) as cohort study.

Selection of participants:

I hereby request your participation in my study, you should be aware that, no one should force you to participate in this study unless you agree to participate in it.

Confidentiality:

Data for this study will be obtained during the cause of labor and intervention and duration of labor. All information will be entered into computer programmed with only the study identification numbers or codes. Name will not appear in the information of which you provided. The information provided will be used in this study only.

Rights to Withdraw and Alternatives:

I hereby inform you that for you to participate in this study is completely based your choice. You can disagree to participate or decide to stop participating in the study at any time you wish. This is applicable even if you have already given your informed written consent. Refusal to participate or withdrawal warrants no penalty neither loss of benefits of treatment that you are supposes to be given.

Who to Contact in case of any problem;

Any question concerning this study especially abuse of your rights please contact the Principal Investigator Dr Deusdedit K William, University of Dodoma, College of health and Allied science. P.O. Box 259. Dodoma. Phone no; 0763425595 or

The Chairperson of Research and Publication committee of the University of Dodoma, P. O. Box 259 Dodoma.

Participant agrees
a) YES  

b) NO

I …… (Initials) have read the contents in this form and understood the explanation given, my questions have been answered, I therefore consent to participate in this study.

Signature of participant ..........................

Signature of Researcher/Research assistant ……

Date of signed consent .............................
Appendix IV: Consent form: Swahili

Utangulizi

Mimi ni Dr. Deusdedit K William mtafiti kutoka chuo kikuu cha Dodoma kitivo cha tiba, ambae ninafanya utafiti juu ya uchungu kwa wamama wajawazito waliokamilisha umri wa mimba na wali katika hatua ya uchungu wakati wa kula zw na kujifungwa nikatazama zaidi kiwango cha muda wa uchungu na njia ya kujifungwa pamoja na mtoto baada ya kuzaliwa.

Kushiriki katika utafiti huu.

Tafadhali ninakuomba uku bali kushiriki katika utafiti hu una ukitambua kuwa unapokubali basi taarifa zako zitatumika katika kupata matokeo ya malengo tarajiwa ya utafiti huu.

Usalama na usiri wa taarifa zako

Nakuhakikishia kuwa taarifa zako unazozitoa kwa ajili ya utafiti huu ni siri na zitatunzwa kwa usalama, lakini la Zaidi ni kuwa ili kulinda siri Zaidi dondoo litakalo tumika katika utafiti huu ili kujaza taarifa zako halitakuwa na jina wala namba yako ya simu.

Haki ya kutokushiriki au kushiriki

Ni hiari kushiriki katika utafiti hu una usiposhiriki haiatazua wewe kupata huduma sahihi na unaruhusiwa kujitoa wakati wowote wa utafiti huu endapo utaona kuna mkanganyiko au uvunjifu wa haki yako kama mteja.

Mawasiliano endapo utakutana na changamoto katika utafiti huu au maswali.

Wasiliana na mtafiti mkuu kwa namba 0763425595 Dr Deusdedit K William wa chuo kikuu cha Dodoma. S.L.P 259 Dodoma, ama unaweza kuwasiliana na Mwenyekiti wa kitengo cha tafiti na uchapishaji Chuo Kikuu cha Dodoma S.L.P 259 dodoma.
Kukubali kushiriki

Ukikubali kushiriki tafadhali yakupasa kusaini form hii hapa chini

Nimesoma ana kuelewa madhumuni ya utafiti huu ia nimepewa maelezo yaliyojitosheleza kuhusiana na utafiti hu una nimekubali kushiriki

Sahihi ya mshiriki herufi ……………

Sahihi ya mtafiti…………

Tarehe ya maridhiano na utafiti…………
Appendix V: Partograph.
Appendix VI: Cervicograph Model
Appendix VII: Ethical clearance Form

THE UNIVERSITY OF DODOMA
OFFICE OF THE DEPUTY VICE CHANCELLOR - ARC
DIRECTORATE OF RESEARCH, PUBLICATIONS AND CONSULTANCY
P.O. BOX 259, DODOMA, TANZANIA TEL: +255 026 2310301 FAX: +255 0262310005 WEBSITE: www.udom.ac.tz

Ref: UDOM/DRP/134/VOL VII/ 10th March 2020

To: Deusdedit K. William
The University of Dodoma

RE: REQUEST FOR ETHICAL CLEARANCE

This is to certify that the proposal titled “Comparing the Rate of Cervical Dilatation, Duration of Labor and Intervention among Low-Risk Nulliparous and Multiparous Women in Dodoma Regional Referral Hospital” has been granted ethical clearance.

However, the Principal Investigator of the study must ensure that the following conditions are fulfilled:

- Progress report is submitted to the University of Dodoma.
- Permission to publish the results is obtained from the University of Dodoma.
- Copies of final publications are made available to the University of Dodoma.
- Sites: Dodoma Regional Referral Hospital.

Approval is valid for a duration provided for under clause five (5) of the Ethical Clearance Form.

Best Regards,

Dr. Alex Shayo
For Chairperson- Institutional Research Review Committee (IRRC)

C: C: Deputy Vice Chancellor-Academic, Research and Consultancy
Appendix VIII: Data collection letter.

THE UNIVERSITY OF DODOMA
OFFICE OF THE VICE CHANCELLOR

Ref: No. UDOM/RP/68/Vol.IV/22
23rd March, 2020

Regional Administrative Secretary
Dodoma Region

RE: REQUEST FOR RESEARCH CLEARANCE

The purpose of this letter is to introduce to you Mr. Dousdedit K. William who is a bonafide student of the University of Dodoma and who is at the moment required to conduct research. Our students undertake research activities as part of his study programmes.

In accordance with government circular letter Ref. No. MPEC/R/10/1 dated 4th July 1980; the Vice-Chancellor of the University is empowered to issue research clearances to staff members and students of the University on behalf of the government and the Tanzania Commission for Science and Technology (COSTECH). I am pleased to inform you that I have granted a research clearance to the student listed above.

I therefore, kindly request you to grant him any help that may enable him to achieve his research objectives. Specifically, we request your permission for him to work at Dodoma Regional Referral Hospital to meet with Patients and Medical Doctors in connection with his research.

The title of his research is "Comparing the Rate of Cervical Dilatation, Duration of Labor and Intervention among Low-Risk Nulliparous and Multiparous Women in Dodoma Regional Referral Hospital".

The period of his research is from April to July, 2020 and it will cover planned Hospitals in Dodoma Region.

Should there be any restrictions, you are kindly requested to advise us accordingly. In case you require further information, please do not hesitate to contact us through the Directorate of Research, Publication and Consultancy. P.O Box 251, Dodoma. Tel. No. + (255) 262310301 Email: research@udoma.ac.tz

Yours Sincerely,

Prof. Faustine K. Bee
VICE CHANCELLOR
Appendix IX: Data Collection Permit

THE UNITED REPUBLIC OF TANZANIA
Ministry of Health, Community Development, Gender, Elderly and Children

Telegram: “Afya” DODOMA
Tel. No.: +255 026 2323267
Email:

In reply please quote:

Ref.No.PB.22/130/02/...55...... Date: 22/09/2020

VICE CHANCELLOR,
UNIVERSITY OF DODOMA,
P. O. Box 389
DODOMA.

REF: DATA COLLECTION PERMIT

Please refer to the above captioned subject matter.

This is to introduce to you, [[NAME OMITTED]], who is a [[STUDENT OMITTED]], has been permitted to collect data for his research titled, "Rate of Cervical Dilatation, Duration of Active Phase of Labor, and Rate of Intervention Among Low-Risk Pregnant Women Delivered at Dodoma Regional Referral Hospital.

Dodoma Region Referral Hospital grants him permission to carry out his research as requested from April 2020 to June 2020.

Yours,

[[SIGNED NAME OMITTED]]
For: MEDICAL OFFICER INCHARGE
DODOMA REGIONAL REFERRAL HOSPITAL