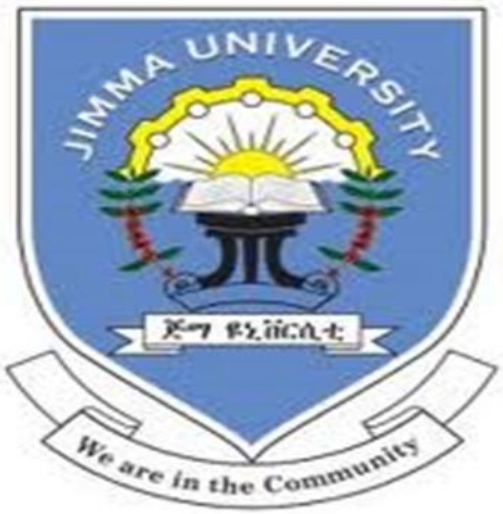

The prevalence of certainty of gestational age (certain and uncertain) and its associated factors among mothers admitted for delivery at Jimma Medical Center, South West Ethiopia, 2019

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A thesis report to be submitted to department of Obstetrics and Gynecology, Institute of Health, Jimma University in Partial Fulfillment of the Requirements of Specialization in Obstetrics and Gynecology

August, 2019

Jimma, Ethiopia

The prevalence of certainty of gestational age (certain and uncertain) and its associated factors among mothers admitted for delivery at Jimma Medical Center, South West Ethiopia, 2019; A comparative cross-sectional study.

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ABSTRACT

Background: The proper management of every pregnancy is largely dependent on accurate estimation of gestational age (GA) which every clinician face in their daily practice. In developing countries where ultrasound is not widely available, the establishment of GA mainly depends on the calculation of LNMP though many studies have proven its unreliability. This study aimed at comparing the magnitude of certainty of GA and its association with pregnancy outcome among pregnant mothers admitted to Jimma Medical Center (JMC) for delivery from March 1/2019 to May 31/2019.

Methods: Hospital based cross sectional comparative study was conducted among pregnant mothers admitted to JMC for delivery. Using a systematic random sampling technique a totals of 418 samples were selected. Data was collected using a structured questionnaire and entered into Epidata version 4.31 and finally exported to SPSS version 20 for further analysis. Cross tabs and logistic regression was applied to determine the association of variables with outcome variable with specific AOR, 95% CI and p-value less than 0.05 statistically significant. The result of the study was presented by using tables, charts and narration.

Results: The general mean age was 25.67±5.01 that ranges from 14-40 years and there was no mean difference of age between groups. About 218 (52.2%) of the study subjects were living in urban area while the rest 200 (47.8%) were from rural. The proportion of uncertain gestation was 64.1% while the remaining 35.9% belongs to certain GA. Unknown LNMP was a major contributory factor (86.9%). The other responsible factor for uncertain GA was contraceptive use (34.7%), irregular cycle (19%), prolonged cycle (2.2%), lactational amenorrhea (2.2%) and early pregnancy bleeding (2.2%). The factors associated with uncertain GA were educational status (no formal education), time of U/S scanning (not done) and mode of delivery (emergency C/S) with specific AOR, 95% CI of 3.24 (0.96-10.73) p-value 0.04; 5.86 (1.05-34.43) p-value 0.04; and 2.65 (1.41-4.95) p-values 0.00 respectively.

Conclusion and recommendation: uncertain gestation has a strong association with adverse pregnancy outcome. Thus, health education is recommended by different means of communication about the significance of this problem and its solution.

Keywords: Certainty of Gestation, Pregnant mothers, Associated factors, Jimma, Ethiopia

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ACKNOWLEDGMENT

I would like to thank my advisors Dr. Dejene Asefa and Mr. Wondu Reta for their assistance and valuable comment throughout the preparation of this paper. In addition, I would like to pass my deepest gratitude for the research office of Jimma University and Department of Obstetrics and Gynecology for giving me the opportunity to conduct this research.

ACRONYMS AND ABBREVIATION

ANC: Antenatal care

BPD: Biparietal diameter

CRL: Crown-rump length

EDD: Estimated date of delivery

GA: Gestational age

HSTP Health sector transformation plan

IUGR: Intrauterine growth restriction

JMC: Jimma Medical Center

LNMP: Last normal menstrual period

L.B.W: Low birth weight

SES: Socioeconomic status

S.V.D: Spontaneous vaginal delivery

U S: Ultrasound scan

WHO: World Health Organization

Chapter one: Introduction

1.1 Back ground

Uncertain gestation is a pregnancy in which the G.A calculation is uncertain by the traditional clinical methods. The clinical estimate of gestational age typically relies on clinical history (menstrual cycle length, regularity, and recall of the first day of the last menstrual period), followed by confirmation by physical examination or other signs and symptoms (1).

Uncertain gestational age is one of the most common problems facing the clinician every day in practice. By reviewing the literature there were few studies in which the incidence of uncertain gestation was mentioned. The incidence is not less than 22% in patients attending antenatal clinics (2). Surveying the British births in 1970, the G.A. was uncertain in 17% of cases (3). In the next year (1971) they obtained an incidence of uncertain gestation in 22% of patients (4). The incidence of unreliable menstrual history was 24.9% – 44.7% (5,6). The proportion of uncertain gestation was 42.9% (7). A study done by the Swiss Precision Diagnostics revealed that 56% of women were able to recall their LNMP and 50% of women cannot recall their LNMP (8). 10 to 40% of pregnant women have no knowledge, have irregular history of menstrual cycle or have been on oral contraception which distorts menstrual cycle (9).

Perinatal mortality and morbidity is strongly linked with prematurity and intrauterine growth retardation (I.U.G.R). The accurate estimation of the G.A. is of paramount importance for proper management of these conditions. Uncertain gestation is significantly associated with adverse pregnancy outcome. A high incidence of low birth weight (L.B.W) babies (10%) found with uncertain gestation (10). There was a positive correlation between uncertain gestation and unfavorable pregnancy outcome, such as increased perinatal mortality, L.B.W. and spontaneous preterm delivery which is not dependent on the adverse maternal characteristics (11,12). There was also high rates of operative deliveries in uncertain gestation as well as increased neonatal mortality ($P < 0.005$) (12). The uncertain gestation is associated with adverse fetal and maternal outcome such as L.B.W., prematurity and increase rate of emergency caesarean section (7).

1.2 Statement of the problem

The accurate dating of pregnancy is critically important for pregnancy management from the first trimester to delivery, and is particularly necessary for determining viability in premature labor and in post-dates deliveries (13).

Abnormal fetal growth patterns such as growth restriction or macrosomia may be missed or diagnosed incorrectly if GA is unknown or incorrect. Reliable GA estimation is also important at a population level to calculate rates of preterm delivery and small- for- gestational- age neonates at delivery. The lack of accurate GA estimation, particularly in geographical regions at greatest risk of these conditions, means that preterm delivery and small- for- gestational- age rates are mere approximations in many parts of the world (14,15).

Globally, LNMP date is uncertain or unknown in 20% of pregnant women (16). There is wide variation in prevalence of uncertain date in most study from different part of the world. Surveying the British births in 1970, the G.A. was uncertain in 17% of cases (3). Another study in UK found the incidence of uncertain gestation in 22% of patients (4). In the USA 7.5% of the white pregnant women but 15.5% of the black did not know their LMP (17). Another study in Amsterdam found the overall incidence was 22.7% in all foreign patients while it was only 9.5% amongst the indigenous Dutch people (18). Also in other European country like Denmark found that unreliable LNMP in 18.6% of cases and there was an increased risk of adverse outcomes, especially fetal death which was doubled compared to those with reliable LNMP and also the risks of preterm birth, LBW, and LBW for gestation were also significantly increased (19).

LNMP has been used over several decades in determining the GA and this has given some significantly reliable clinical estimation of actual GA. Although the establishment of GA via the LNMP is usable, many studies have proven its unreliability, especially, in the least developed countries largely due to high illiteracy among obstetric patients (20). In 2013 in India found that about 10 to 40% of pregnant women have no knowledge, have irregular history of menstrual cycle or have been on oral contraception which distorts menstrual cycle (9). The use of LNMP is not easily reliable which may be due to poor recollection, irregular menstrual cycles of varying duration, lactational amenorrhea, bleeding in early pregnancy, or hormonal contraceptive use prior to conception (13) .

In Africa, there are few studies which investigate the level of unknown gestation and its consequence. In a study done in Sudan shows the proportion of uncertain gestation was 42.9% where unknown last menstrual period (LMP) was the major contributory factor. And also found that the rates of emergency caesarean section, preterm labor and low birth weight (LBW) were high among women with uncertain dates (7) . In a study carried out in Zimbabwe, the incidence reported was 21.4% of patients and there was also a high rates of operative deliveries in uncertain gestation as well as increased neonatal mortality ($P < 0.005$) (12) .

In developing countries like Ethiopia we expect to find a higher incidence despite there are lack of studies. A study done on induction of labor prevalence at Wolliso St. Luke, Catholic Hospital found the proportion of unknown LMP 55% from the study (21) . As highlighted in the 2015-16 Health Sector Transformation Plan (HSTP), maternal and newborn health is a priority for the Government of Ethiopia. Maternal health is closely linked with the survival of the newborn. It was estimated that approximately 2.7 million newborn babies died in 2015, and an additional 2.6 million are stillborn, also mainly in low-resource settings (22). Perinatal mortality and morbidity is strongly linked with prematurity and I.U.G.R. The accurate estimation of the G.A. is of paramount importance for proper management of these conditions (16).

In many high-resource countries, a first-trimester US scan and a second scan between 18 and 22 weeks are essential parts of obstetric practice because they establish GA and screen for fetal anomalies (23,24). It is generally confirmed from studies that US dating is the most reliable standard of establishing GA (25,26). However, Ultrasound (US) dating is not available or accessible especially in low resourced countries. World Health Organization (WHO) estimated that up to 75% of the world's population has no access to diagnostic imaging (27). And where available, the equipment is expensive to use, often of poor quality, and operated by undertrained technicians. In addition, women often seek prenatal care late in pregnancy, which further limits the use of ultrasound to assess GA (23,28). Alternate methods of assessing GA are therefore necessary in such settings like using the LNMP.

This has become imperative to evaluate the pregnancy outcome of women with uncertain dates.

It is of a great value to study uncertain gestation because in research studies using the GA as a variable, the women with uncertain gestation were excluded from the study population and this

would introduce bias. The exclusion of women with uncertain gestation who are more likely to have a small for dates baby may lead to lower incidence of growth retardation in a study sample (29).

Jimma Medical Center (JMC) which is referral and teaching hospital was found to be an appropriate site to assess the pregnancy outcome of women with uncertain dates admitted to labor ward, taking into consideration socio-demographic characteristics, and the knowledge gained from this study can be used to improve pregnancy outcome in health facilities in general and in the selected hospitals in particular.

Chapter Two: Literature review

The revolution in obstetrics began in 1960s coinciding with the time when obstetrical researches were focused on the fetus and considered him as a patient generating impulses and stimuli to the mother who in turn responds passively.

The growth of the fetus starts at the time of fertilization and from then onwards there are considerable anatomical and physiological changes of the fetus which are strongly correlated with the duration of pregnancy, and any subsequent management of this particular pregnancy will depend mostly on the accurate dating. In the period from fertilization to the 8th week of pregnancy the human conceptus is termed an embryo, and from the eighth week until delivery it is called a fetus.

Commonly the epidemiologists calculate the G.A. (length of gestation) as the interval between the first day of the L.M.P. and the date of birth, assuming an invariant 28 day cycle with ovulation occurring at the mid-cycle. This estimation is based on the calculation of the expected date of delivery (E.D.D) by applying Naegle's rule (by adding 7 days to the date of the first day of the last normal spontaneous menstruation and subtracting 3 months). The LMP is the most used technique in estimating GA in epidemiological research and clinical care (30).

This interval is approximately 10 Lunar months or 280 days. Most patients will deliver within 2 weeks of the E.D.D. By analyzing 7504 pregnancies, It was found the mean duration of pregnancy to be 282 days (31). In Japan they found the mean duration of pregnancy to be 279±17 days (±2 standard deviations) (32). One is expected to deliver a baby 280 days after the LMP (33). Gestational age is termed the menstrual age in contrast to the ovulation age (post-conception age or fertilization age) which is used by the embryologists and it is 2 weeks shorter than the G.A. This assertion is per the assumption of a woman with menstrual cycle of 28 days with ovulation happening on the 14th day after a new menstrual cycle. INTERGROWTH-21st Project—the Fetal Growth Longitudinal Study (FGLS)—the last menstrual period was used to calculate gestational age provided that the date was certain; the woman had a regular 24–32 day menstrual cycle; she had not been using hormonal contraception or breastfeeding in the preceding 2 months (34).

As the months of the Ethiopian calendar have 13 days each with the 13th month (pagume) being 5 days and 6 days every leap year, one can calculate the EDD by adding 9 months either 10 days if the EDD does not jump to another year and 5 or 4 days if it passes a year depending on whether the 13th month at the middle has 5 or 6 days.

The G.A. is expressed in complete weeks. Certain G.A. cannot be determined precisely unless pregnancy resulted from an isolated intercourse, or there is an accurate temperature record over a period of conception or in cases of induced ovulation (35).

2.1 Assessment of the gestational age:

To ascertain the dates accurately multiple parameters must be used together to reach a final evaluation. Obstetricians concentrate mainly on the prenatal assessment for proper management of pregnancy so as to reach an optimal fetal and maternal outcome, while the postnatal assessment of the G.A. is of a great importance to the pediatricians for the proper management of the neonate.

2.2 Prenatal assessment of the gestational age:

One of the major goals of the initial Antenatal Care (ANC) is to determine the G.A. of the fetus. To achieve this goal, detailed gynecological and obstetrical history is necessary, in addition to the performance of investigations which can accurately determine the duration of pregnancy.

2.3 Gynecological and obstetrical history:

In the history the very important point is the detailed history of menstruation. The first day of the LMP must be dated correctly; is it a normal spontaneous period or not?, regularity of the cycle and is it shorter or prolonged cycle?. When the menstrual cycle length is prolonged, the proportion of post term (> 42 weeks) and postdate (> 40 weeks) births increased because ovulation occurs constantly at 14 days premenstrual i.e. the post ovulation phase of the menstrual cycle is a constant 14 days long (36). In female humans, one characteristic that connotes one to be fertile is menstruation. Menstruation simply refers to a woman's monthly bleeding. On the average, menstrual periods are supposed to last for three to five days. The cycles of menstruation re-occurring is called the menstrual cycle. On the average, a menstrual cycle lasts for 28 days (37).

Reliance on LMP alone has shown a tendency to overestimate GA at the extremes of gestation due to recall bias, thereby overestimating the proportion of post-date pregnancies and underestimating preterm deliveries (38).

The clinician must enquire about the precedence of the pregnancy by lactational amenorrhea because in this situation it is very difficult to calculate the G.A. clinically without the help of specific investigations. The mechanisms producing lactational amenorrhea are complex and not completely understood. The main consequent to suckling is a change in the hypothalamic sensitivity to the feedback effects of ovarian hormones (39).

Nature offers breast feeding as a form of contraception, particularly in developing countries where women breast feed their babies for an average of 2 years, so lactational amenorrhea may play a role in the high incidence of uncertain gestation. One – 10% of women will get pregnant during lactational amenorrhea (40).

History of oral contraceptive pills is important. Usually the pills cause regularity of the menstrual cycles, but in a small number of women may affect the assessment of G.A. by causing disturbances of menstrual cycle such as break through bleeding specially in early cycles following the treatment. Also mid-cycle spotting may occur commonly in association with the lower fixed dose pills. In 1960s amenorrhea was common when high dose pills were used and if it occurs with low dose pills pregnancy should be excluded. Post pill anovulation can result for a while (41).

Amenorrhea is relatively common in women taking the pills who have previous history of irregular cycles or those who lost a considerable weight during the treatment and those who exercise heavily while they are on the pills.

Injectable long-acting contraceptive like medroxy-progesterone acetate (Depo-provera) can cause irregular menstruation in early cycles as well as amenorrhea. Anovulation may occur up to 18 months after discontinuing the treatment so it is not used widely throughout the world.

In the developed countries women are less likely to breast feed their babies and they depend mainly on artificial contraception usually in form of pills and this may contribute to a minor degree to uncertainty of gestation. In the history questions must be asked about bleeding in the

first half of pregnancy. Some women may have unexplained cyclical bleeding throughout pregnancy. Implantation can cause spotting about 6 days after fertilization until 29-35 days after the LMP in many women.

The introduction of U/S into the medical practice in late 1950s was pioneered by the gynecologist Ian Donald. Nowadays, nobody can imagine obstetrics and gynecology without U/S. Ultrasonography was used for dating pregnancy since 1960s. In obstetrics the commonest indication for U/S scanning was estimation of G.A. or bleeding. It constituted about 90% of scanning (42). Ultrasonography will improve the accuracy of G.A. estimate. The most common used parameters for assessing the G.A. is Crown-rump length (CRL) in the first trimester and the biparietal diameter (BPD) in the second trimester. Other parameters such as femur length may be used. If there is a discrepancy of a week or more in the G.A. between that obtained from the menstrual history and that from the U/S, the age estimated by U/S should be used for the patient's management and a second confirmatory scan is advised to be done early in the second half of the pregnancy. One of the disadvantages of later U/S in dating if done at 18-19 weeks may lead to serious misjudgments in cases of early growth retardation (43). To estimate the G.A. very correctly the use of multiple parameters offers a significant advantage over any single parameter used alone (44).

2.4 Postnatal assessment of the gestational age:

The postnatal assessment of the G.A. is mainly considered by the pediatricians. For proper management of the newborn the accurate G.A. must be estimated immediately after delivery by observing the physical characteristics and the neurological behavior of the baby which change with age. Many authors have used the combinations of these criteria. A rapid yet rather accurate estimate of G.A. of the newborn is done immediately after delivery by examining some of the physical signs of the baby. These include sole creases, breast nodule, scalp hair, ear lobe and the external genitalia. Accordingly the baby is categorized into premature (< 37 weeks), mature (37-42) and the signs of post maturity should be looked for such as desquamation of the epidermis and absence of vernix caseosa. This is a simple method for assessment and can be done in the labor room by any doctor who is attending the delivery.

A more definite estimate can be made a few days later by carrying out a detailed neurological examination in addition to the physical examination. Two methods are used to reach a definite estimate of the G.A. The most accurate but a complicated assessment was done by using combination of physical and neurological signs. These scores are relatively accurate in preterm babies but at term the accuracy is only to within 2 weeks (45).

The simplified assessment is the one complied by Ballard (46). The physical characteristics are more reliable (95% confidence limit of 18 days), because it may often be inconvenient to do a neurological assessment immediately after birth. Postnatal assessment using Ballard method may give biased overestimates of the LMP interval in certain ethnic groups e.g. blacks have an average greater level of maturity as measured by Ballard method (47).

The more recent one is the New Ballard Score (NBS) to improve assessment of infants as preterm as 20 weeks. Correlation was similar when the examination was performed up to 96 hours of age in infants of at least 26 weeks gestation, but is best if done prior to 12 hours in infants less than 26 weeks (48).

2.5 The importance of certain gestation:

Fetal biophysical tests should be interpreted in relation to G.A. as suggested by Herrmann (49). The non-stress test and fetal breathing movements were likely to be abnormal at 26 to 33 weeks gestation in comparison with 34 to 41 weeks. The non-stress test, fetal breathing movements, fetal tone and amniotic fluid volume were more likely to be abnormal at 42 to 44 weeks gestation compared with 37 to 41 weeks (50). Chemical tests either maternal or fetal are correlated significantly with the G.A. Levels of maternal alpha fetoproteins should be interpreted to accurate estimation of G.A. in relation to fetal neural tube defects. Uncertain gestation may indicate apparently high levels of alpha-fetoproteins.

Certain G.A. is important for performing chorionic villous sampling and early amniocentesis as early as 10-12 weeks (51). Certain G.A. is the most important variable in timing the obstetrical intervention. When caesarean section is decided for fetal interest, its timing is mainly governed by the fetal maturity and the fetal condition. In current practice the obstetricians date any pregnancy by U/S particularly when the indications for caesarean section are clear in early pregnancy. Induction of labor is decided according to the G.A. and other confounding factors. In

order to minimize the fetal distress occurrence which contributed to a higher rate of caesarean sections in primipara, the proper time for delivery would be before 41 full weeks of amenorrhea (52).

2.6 Pregnancy outcome in relation to the gestational age:

The accurate estimation of G.A. is an important part of pregnancy management, since uncertain gestation carries an increased risk of perinatal mortality and morbidity.

WHO defines the perinatal mortality as stillbirth and first week mortality at a specified week of gestation divided by all births at the same gestational week. This calculation does not predict the risk of future perinatal mortality of living fetus still in utero. In order to calculate the future prospective risk of perinatal mortality by dividing all future perinatal deaths from a certain week of gestation by all fetuses, those undelivered. There is a decrease in risk from 16 to 39 gestational weeks and a rise from 39 weeks onwards (53).

The common causes of perinatal mortality and morbidity are prematurity and I.U.G.R. whose management depends mainly on the accurate estimation of the G.A. Unexplained stillbirth is an important cause of perinatal mortality (25%), and its rate is highest among preterm deliveries, minimal at 39-40 weeks gestation and rises again at 41-42 weeks. The risk of unexplained stillbirth was measured as the number of impending stillbirths divided by the total number of undelivered fetuses, and the risk was least in preterm pregnancies rising 4 folds after 39 weeks to a maximum at 41 weeks (54).

The mortality rate decreases with increasing G.A. The mortality rate was 84% at 23 weeks, 57% at 24 weeks, 45% at 25 weeks, 37% at 26 weeks, 23% at 27 weeks and 13% at 28 weeks G.A. It decreases with increasing birth weight for each G.A. Female babies had shown a lower incidence of mortality rate than males (odds ratio 1.9; confidence interval: 1.4 to 2.5). Twins had poor prognosis than singletons. The neonatal services were minimized significantly with increasing G.A. from 25 weeks onwards (55).

By analyzing the preterm deliveries, the neonatal mortality decreased as the length of gestation advanced, and heavier infants have less mortality for a specific G.A. Females < 29 weeks survived better than males, and singletons < 29 weeks have good prognosis than twins, for term

black infants is higher. The largest improvement in survival occurred between 25 and 26 weeks. At 30 weeks survival was > 90% and improved < 1% every week thereafter (56). There was a significant association between post term pregnancy and potential fetal complications such as fetal heart rate decelerations and meconium staining (57). Post term pregnancy was correlated with a significant increase in the incidence of macrosomia and dysmaturity. So post-term increases the perinatal mortality and maternal mortality and morbidity by causing dystocia, prolonged labor, fetopelvic disproportion and high rate of operative deliveries (58). In order to achieve good pregnancy outcome the G.A. must be ascertained accurately by making use of clinical information offered by the patient, conducting proper obstetrical examination as early in pregnancy as possible and U/S scanning early in pregnancy if possible.

2.7 Conceptual frame work

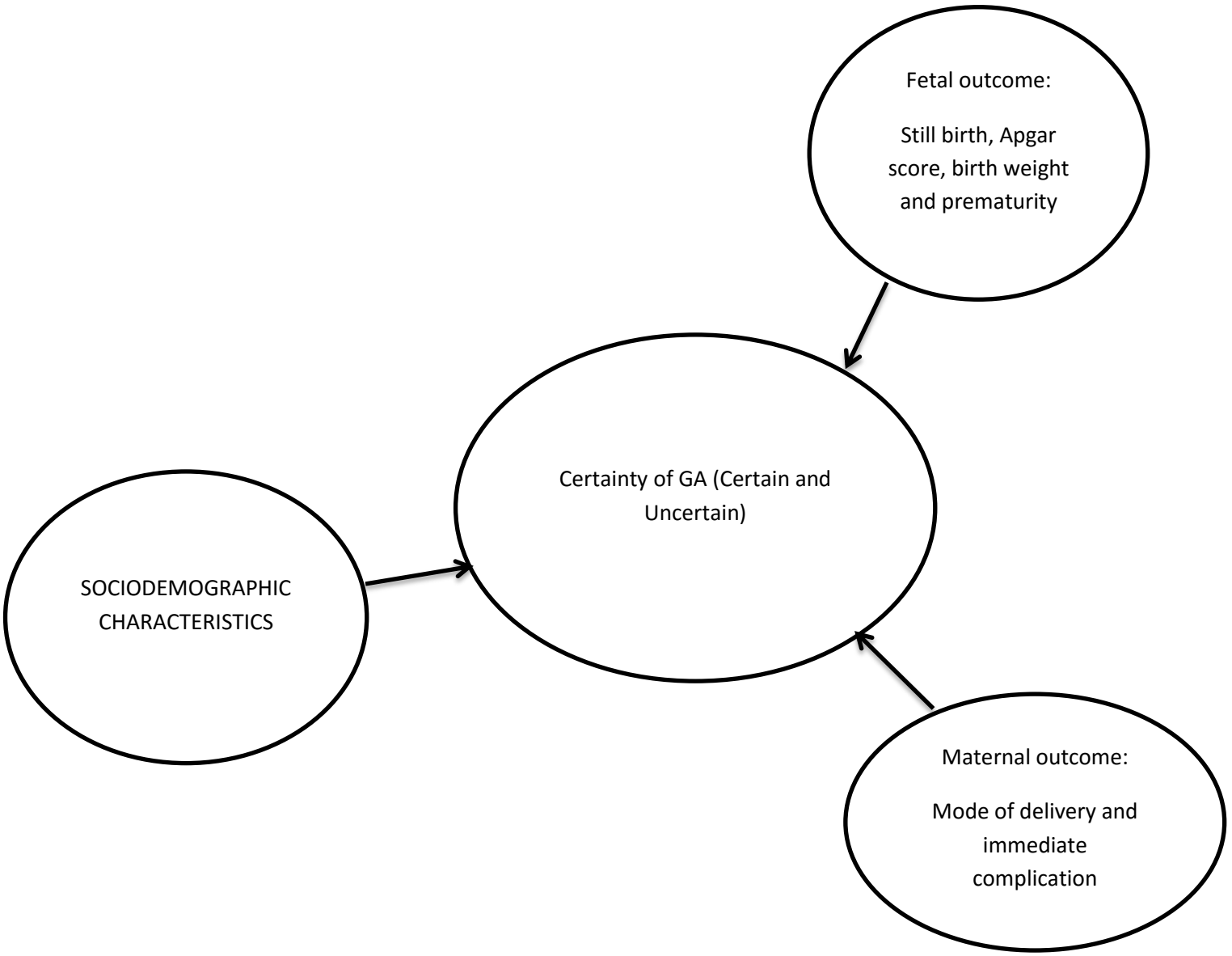

Figure 1: Developed conceptual frame work after reviewing literatures

2.8 Significance of the study

As there are very few studies done in regards to the present objective so far in Ethiopia and study setting, it investigates the level of unknown gestation and its contributing factors and consequences. The knowledge gained from this study will help the hospital and government policy makers to construct plausible solutions to improve the obstetric care and pregnancy outcome. By constructing possible solution to this problem, it will help to avoid the unnecessary hospitalization, testing and interventions in the study setting. And also it will be used as a baseline data for further studies conducted on similar themes and to reduce bias in other studies.

Chapter Three: Objectives

3.1 General objectives

- To assess the prevalence of certainty of GA (certain and uncertain) and determine factors affecting them among pregnant mothers admitted to JMC for delivery, 2019

3.2 Specific objectives

- To assess the prevalence of uncertain of GA among pregnant mothers admitted to JMC for delivery, 2019
- To compare mothers with uncertain and certain GA with respect to pregnancy outcome and socio-demographic characteristics among pregnant mothers admitted to JMC for delivery, 2019
- To find out factors responsible for the generation of uncertain GA among pregnant mothers admitted to JMC for delivery, 2019

Chapter Four: Methodology

4.1 Study area and Study period

The study was conducted at JMC. The center is one of the oldest public hospitals in the country located in Jimma town of Oromia Regional State, Ethiopia. Geographically, it is located in Jimma city 352 km southwest of Addis Ababa and there are two public hospitals found in the town which are called JMC and Shenen gibe hospital. JMC is the only specialized teaching and referral hospital in the South Western part of country and providing services for approximately 15,000 inpatient, 160,000 outpatient attendants, 11,000 emergency cases and 5000 deliveries in a year coming to the hospital from the catchment population of about 15 million people. The average number of hospital deliveries per month is approximately 500. Labor and delivery ward have 11 first stage beds and five second stage delivery couches. The patients are referred from ANC clinics, institutional health settings, private clinics or those who are brought by the midwives or who come to the hospital on their own. The hospital is well equipped and staffed. The service is rendered by senior gynecologist and obstetrician, residents, medical interns, midwives and nurses. On average two senior gynecologists and obstetrician, six residents of gynecology and obstetrics, six interns and five midwives and nurses are available in the labor and delivery ward for services. Cases are discharged after 6 hours post-delivery unless there are complications or delivery by caesarean section. This study was conducted from March 1/2019 to May 31/2019 G.C.

4.2 Study design

A comparative cross-sectional study was employed for pregnant women who admitted for delivery during the study period

4.3 Population

4.3.1 Source population

All pregnant women admitted to JMC for delivery during the study period

4.3.2 Study population

All available and selected pregnant women during the study period.

4.4 Inclusion criteria and Exclusion criteria

4.4.1 Inclusion criteria

- ❖ All pregnant women admitted for hospital delivery to the labor room during study period

4.4.2 Exclusion criteria

- ❖ Women with multiple pregnancy

4.5 Techniques of sampling

4.5.1 Sample size determination

The sample size was calculated by sample size determination formula for a single population proportion:

$$n = \frac{(Z\ 1-\alpha/2)^2\ p\ (1-p)}{d^2}$$

Sample size was calculated with the following assumption:

- n = minimum sample size,
- Z 1-α/2= significance level at α =0.05
- d= margin of error (5%)
- P= prevalence of uncertain GA (55%) was used to calculate sample size which was taken from research done at Wolliso St. Luke, Catholic Hospital.
- 10% non-response rate

The total sample size was 418 by adding also 10% non-response rate.

4.5.2 Sampling procedure

Systematic random sampling technique was used after taking average of 1200 mothers who expected to deliver within three month and by taking constant K of 3 computed from total 1200/418. Then the first case was selected by lottery method and accordingly all mothers were selected every K's from all mothers who gave birth at institution by creating study frame in order of their card number.

4.6 Study variables

4.6.1 Dependent variables

- Certainty of gestational age

4.6.2 Independent variables

- Socio-economic and demographic characteristics: age, education level, occupation, marital status, place of residence, family income, religion and ethnicity.
- Parity , frequency of ANC visits, time of first ANC visit, planned or unplanned pregnancy, time of U/S scanning
- Mode of delivery, immediate complications, status of baby at birth, Apgar score, birth weight and GA at birth

4.7 Data collection tool and technique

The questionnaire was initially prepared in English then translated to the local language, Amharic and Afaan Oromo, by professional and it was retranslated back to English in order to check consistence. A Pre-test was conducted in another facility at shenen gibe hospital on 5% (21) pregnant mothers prior to month of data collection. Based on the result of pre-test, an appropriate modification was made to have the final version.

The data was collected by an interviewer - administered questionnaire for each lady who fulfilled the study criteria, who was admitted to the labor room at the time of delivery. The data included the socio-demographic characteristics, identification of certainty of gestation and then the ANC history was reviewed. According to INTERGROWTH-21st Project dating criteria, certain LNMP was considered if she: had a regular 24–32 day menstrual cycle; not been using hormonal contraception or breastfeeding in the preceding 2 months; had no bleeding in early pregnancy and was sure of it. The subjects were followed up until they deliver and the mode of delivery was noted together with any complications arising. All patients were followed up for two hours except those who sustained complications. The baby examined immediately after delivery with respect to Apgar score, weight in grams and assessment of G.A. by examining the baby physically, and accordingly categorizing babies into the obstetrically broad categories premature (< 37 weeks), mature (37-42) and post mature (> 42 weeks) of gestation.

The principal investigator and supervisor made a day to day on site supervision during the whole period of data collection and checked each questionnaire daily for its completeness and consistency.

Data was collected by three BSc nurses under supervision of principal investigator.

4.8 Data quality control

To assure the data quality, one day training was given for three data collectors. The data collection was supervised by the principal investigator. The quality of data was assured by properly designed and pretested of the questionnaire among 5% of the total sample size to assess its clarity, length, completeness and consistency. The questionnaire pre-tested among women admitted for hospital delivery at Shenen Gibe hospital prior to month of data collection. Every day the computed questionnaires were reviewed and checked for completeness and relevance by principal investigator and the necessary feedback was offered to data collectors in the next morning before the actual procedure.

4.9 Data Processing and Analysis

Data was transcribed from the questionnaire form to a data sheet with coding and was double checked for consistency. Data was entered into EPI data version 4.31 and exported to SPSS (Version 20.0) for statistical analysis. Cross tabs and logistic regression was applied to determine the association of variables with outcome variable with specific AOR, 95% CI and p-value less than 0.05 statistically significant. The result of the study was presented by using tables, charts and narration.

4.10 Ethical clearance

The study was reviewed and approved by the Institutional Review Board (IRB) of Institute of Health, Jimma University. Written consent was obtained from mothers. Confidentiality of information collected from each study participant was maintained.

4.11 Utilization and dissemination of results

The result of the study will be presented to department of Obstetrics and gynecology, Health institute, Jimma University and respective bodies (regional health bureau and zonal health departments) and finally effort will be made to disseminate through publication on peer reviewed international and nation journals.

4.12 Operational definition

- LMP- is the woman's first day of the last menstrual period.
- Gestational age- is referred to as the age of the unborn "baby" or as the number of days from the LMP or a period between the first day of the LMP of a pregnant woman to the day on which an assessment of gestation period is being made and is usually defined in weeks
- A case of uncertain gestation - defined if the patient possessed any one of the following criteria at the index pregnancy: unknown LMP or she was not sure about it, irregular or prolonged cycle, lactational amenorrhea, history of recent contraceptive use or bleeding in early pregnancy.
- A case of certain gestation at the index pregnancy - defined as any client who is sure of her LMP and it is normal, has no lactational amenorrhea and she did not experience bleeding early in pregnancy
- Index Pregnancy outcome - Results of conception and ensuing pregnancy, such as sex ratio, birth weight, spontaneous abortion, congenital malformations, lower birth weight, live birth (full term or preterm birth) or stillbirth.
- Monthly income: It was measured on daily income of workers based on 2013 millennium development report which was used to classify workers in developing country as extremely poor, moderately poor, near poor, developing middle class and developed middle class based on their daily income of (<$1.25, ≥$1.25and $2, ≥2 $ and $4, ≥$4 and <$13and >$13) dollars respectively. By changing the dollar to current currency that is one USA dollar is equal to 27.7 Ethiopian birr at the time of data collection.
- Live birth - The term used to record a birth whenever the newborn at or sometime after birth breathes spontaneously or shows any other sign of life such as a heartbeat or definite spontaneous movement of voluntary muscles
- Stillbirth – a baby born with no signs of life at ≥28 weeks

- Birth weight. The weight of a neonate determined immediately after delivery or as soon thereafter as feasible and expressed to the nearest gram
- Low birth weight - A newborn whose weight is <2500 g
- Excessive perineal tear – tear that involves the anal sphincter or rectal mucosa
- postpartum hemorrhage - cumulative blood loss ≥1000 mL and/or bleeding associated with signs/symptoms of hypovolemia within 24 hours of the birth process regardless of delivery route

Chapter Five: RESULT

5.1 Socio-demographic characteristics of study participants

418 deliveries were attended at JMC which included during the study period. The mean age was 25.67±5.01 that ranges from 14-40 years. About 218 (52.2%) of the study subjects were living in urban area while the rest 200 (47.8%) were from rural. Majority of them were married 414(99.0%), Muslim 295(70.6%) and Oromo 323(77.3%). With regard to educational status, 145(34.7%) and 128(30.6%) were in their secondary and primary school level of education respectively followed by no formal education 110(26.3%). Majority of the study participants were from low SES 341(81.6%) depending on family income (table 1).

Table 1: Socio- demographic characteristics of mothers admitted for delivery at Jimma Medical Center, South West Ethiopia, 2019

Variables	Categories	Frequency	Percentage (%)
Residence	Urban	218	52.2
	Rural	200	47.8
	Total	**418**	**100.0**
Age in years	<15	1	0.2
	15-19	37	8.9
	20-24	129	30.9
	25-29	157	37.6
	30-34	59	14.1
	≥35	35	8.4
	Total	**418**	**100.0**
Educational status	No formal education	110	26.3
	Primary school	145	34.7
	Secondary school	128	30.6
	College or university	35	8.4
	Total	**418**	**100.0**
Religious status	Muslim	295	70.6
	Orthodox	86	20.6

	Protestant	37	8.9
	Total	**418**	**100.0**
Ethnicity	Oromo	323	77.3
	Amhara	57	13.6
	Guraghe	20	4.8
	Dawuro	7	1.7
	Keffa	9	2.2
	Others	2	0.5
	Total	**418**	**100.0**
Occupation	Unemployed	12	2.9
	Merchant	98	23.4
	Daily laborer	32	7.7
	Government employee	136	32.5
	Farmer	107	25.6
	Others	33	7.9
	Total	**418**	**100.0**
Marital status	Married	414	99.0
	Unmarried	3	0.7
	Divorced	1	0.2
	Total	**418**	**100.0**
Family income	Extremely poor	88	21.1
	Moderately poor	82	19.6
	Near poor	171	40.9
	Low middle class	77	18.4
	Total	**418**	**100.0**

5.2 Obstetric characteristics of study participant

The obstetric profile of the pregnant women showed majority of mothers were multipara in 228(54.5%) followed by primipara 173(41.4%). About 361(86.4%) and 180(43.1%) of the participants respectively started their first ANC visit and time of U/S scanning during 2nd trimester of pregnancy. More than half of the subjects had four and more visit. Regarding the mode of delivery, SVD is the most common which account 294(70.3%) followed by C/S 105(25.2%) and 67(16.0%) were induced labor. In only 19(4.5%) of the mothers were found to have immediate maternal complication from the study participants. Regarding the status of baby at birth, majority of them were Alive 403(96.4%), with Apgar score of 7-9(97.3%), birth weight in between 2500-3499 gm. (74.2%) and gestational age at birth in week 37-42(93.8%). (Table 2)

Table 2: Obstetric characteristics of mothers admitted for delivery at Jimma Medical Center, South West Ethiopia, 2019

Variables	Categories	Frequency	Percentage (%)
Parity	primipara	173	41.4
	Multipara	228	54.5
	Grand multipara	16	3.8
	Great grand-multipara	1	0.2
	Total	**418**	**100.0**
Date of quickening	Known	1	0.2
	Unknown	417	99.8
	Total	**418**	**100.0**
Time of first ANC visit	1st trimester	28	6.7
	2nd trimester	361	86.4
	3rd trimester	6	1.4
	No visit	23	5.5
	Total	**418**	**100.0**
Number of ANC visit	No visit	23	5.5
	1 times	2	0.5
	2-3 times	120	28.7

	≥4 times	273	65.3
	Total	**418**	**100.0**
Time U/S scanning	1st trimester	**17**	**4.1**
	2nd trimester	**180**	**43.1**
	3rd trimester	**27**	**6.5**
	Not done	**194**	**46.4**
	Total	**418**	**100.0**
Pregnancy status	Planned	**353**	**84.4**
	Unplanned	**65**	**15.6**
	Total	**418**	**100.0**
Mode of delivery	SVD	**294**	**70.3**
	Assisted breech delivery	**1**	**0.2**
	Ventose	**5**	**1.2**
	Forceps	**9**	**2.2**
	Emergency C/S	**101**	**24.2**
	Elective C/S	**4**	**1.0**
	Destructive delivery	**1**	**0.2**
	Laparotomy	**3**	**0.7**
	Total	**418**	**100.0**
Need for induction of labor	Yes	**67**	**16.0**
	No	**351**	**84.0**
	Total	**418**	**100.0**
Immediate maternal complication	Yes	**19**	**4.5**
	No	**399**	**95.5**
	Total	**418**	**100.0**
Status of baby at birth	Alive	**403**	**96.4**
	Fresh still birth	**13**	**3.1**
	Macerated still birth	**2**	**0.5**
	Total	**418**	**100.0**

Apgar score	<7	**4**	**1.0**
	7-9	**392**	**97.3**
	10	**7**	**1.7**
	Total	**403**	**100.0**
Birth weight in gram	<2500	**36**	**8.6**
	2500-3499	**310**	**74.2**
	3500-3999	**64**	**15.3**
	≥4000	**8**	**1.9**
	Total	**418**	**100.0**
GA age at birth in weeks	<37	**21**	**5.2**
	37-42	**378**	**93.8**
	≥42	**4**	**1.0**
	Total	**403**	**100.0**

5.3 Certainty of gestational age

From a total number of 418 women studied, 268(64.1%) were found to be of uncertain gestation and the remaining 150(35.9%) were certain gestation. (Figure 1)

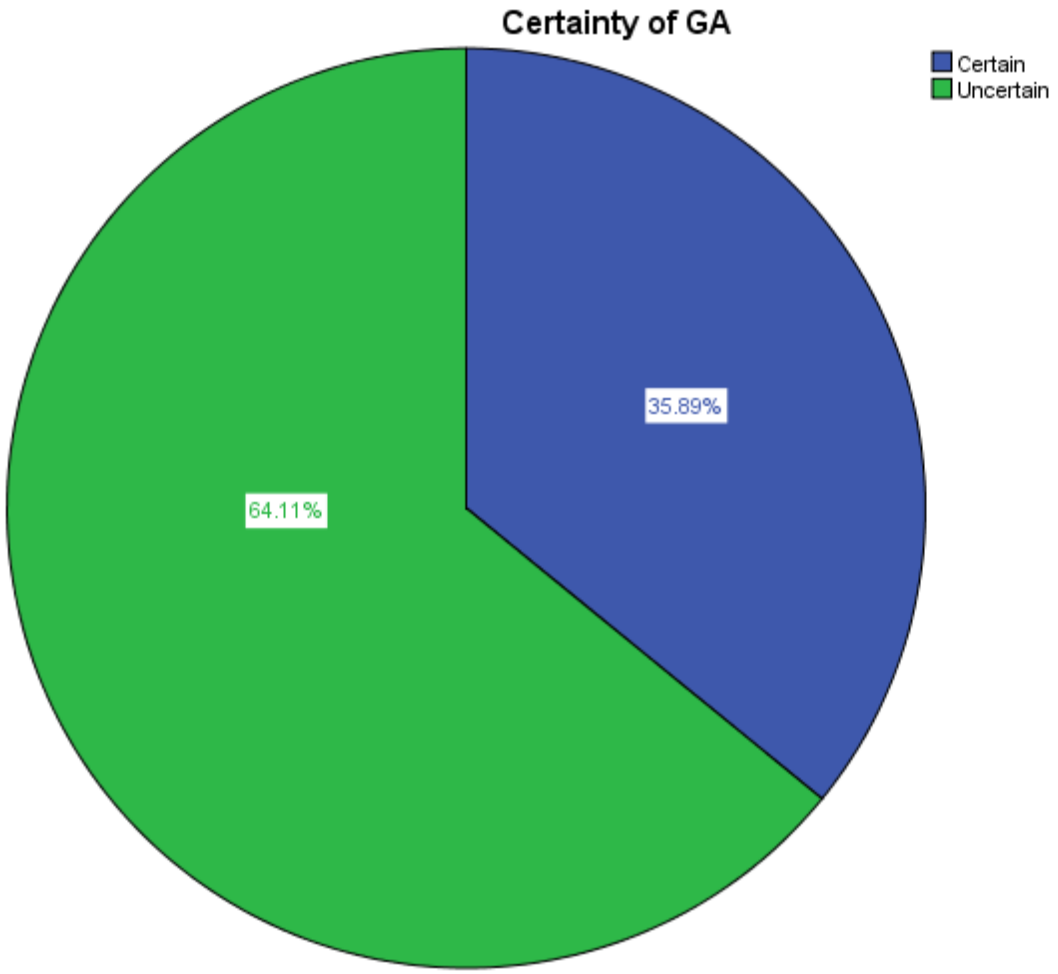

Figure 2: Certainty of GA among mothers admitted for delivery at Jimma Medical Center, South West Ethiopia, 2019

5.4 Criteria of selecting subjects with uncertain and certain gestation

Table 3 shows the distribution of criteria used for selecting subjects with uncertain and certain gestation. Unknown LMP was the major factor (86.9%) responsible for uncertain gestational age. (Figure 2)

Table 3: Criteria used for selection of certainty GA among mothers admitted for delivery at Jimma Medical Center, South West Ethiopia, 2019

Variables	Categories	Certain GA		Uncertain GA		Total	
		Frequency	%	Frequency	%	Frequency	%
LMP	Known	150	35.9	35	8.4	185	44.3
	Unknown	0	0.0	233	55.7	233	55.7
	Total	**150**	**35.9**	**268**	**64.1**	**418**	**100.0**
Menstrual cycle	Regular	150	35.9	211	50.5	361	86.4
	Irregular	0	0.0	51	12.2	51	12.2
	Prolonged	0	0.0	6	1.4	6	1.4
	Total	**150**	**35.9**	**268**	**64.1**	**418**	**100.0**
Lactational amenorrhea	Yes	0	0.0	6	1.4	6	1.4
	No	150	35.9	262	62.7	412	98.6
	Total	**150**	**35.9**	**268**	**64.1**	**418**	**100.0**
Contraceptive use	Yes	27	6.5	93	22.2	120	28.7
	No	123	29.4	175	41.9	298	71.3
	Total	**150**	**35.9**	**268**	**64.1**	**418**	**100.0**
Early pregnancy bleeding	Yes	0	0.0	6	1.4	6	1.4
	No	150	35.9	262	62.7	412	98.6
	Total	**150**	**35.9**	**268**	**64.1**	**418**	**100.0**

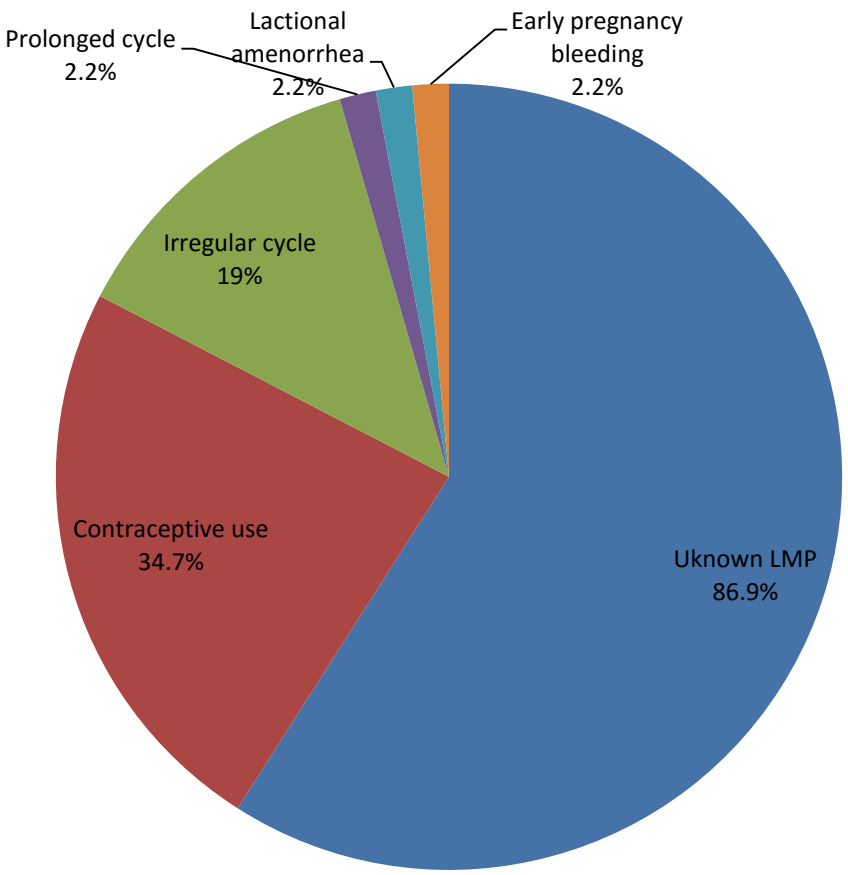

Figure 3: Factors responsible for Uncertain GA among mothers admitted for delivery at Jimma Medical Center, South West Ethiopia, 2019

5.5 Factors associated with certainty of GA

To identify factors associated with certainty of gestational age, logistic analysis was applied. In the bivariate analysis, the candidate variables having p-value < 0.25 were selected for the final model. Accordingly, about fourteen variables (residence, age, educational status, religion, occupation, family income, pregnancy status, time of first ANC visit, ANC visit, time of U/S scanning, mode of delivery, status of baby at birth, birth weight, and gestational age at birth) were identified as the expected factors associated with certainty of gestational age with their specific COR with 95% CI and p-values as explained in **table 4** in details.

Table 4: Association of certainty of GA and other variables by bivariate logistic regression analysis among mothers admitted for delivery at Jimma Medical Center, South West Ethiopia, 2019

Variables	Categories	certainty of GA			COR(95 % CI)	P- value
		Certain, No (%)	Uncertain, No (%)	Total, No (%)		
Residence	Urban	107(25.6)	111(26.6)	218(52.2)	1	0.00*
	Rural	43(10.3)	157(37.6)	200(47.8)	3.5(2.2-5.4)	
	Total	**150(35.9)**	**268(64.1)**	**418(100.00)**		
Age in years	<20	9(2.2)	29(6.9)	38(9.1)	1.1(0.4-3.2)	0.84
	20-34	132(31.6)	213(51.0)	345(82.5)	0.5(0.2-1.2)	0.14*
	≥35	9(2.2)	26(6.2)	35(8.4)	1	
	Total	**150(35.9)**	**268(64.1)**	**418(100.00)**		
Educational status	No formal education	22(5.3)	88(21.1)	110(26.3)	8.7(3.7-20.4)	0.00*
	Primary school	44(10.5)	101(24.2)	145(34.7)	5.0(2.2-11.1)	0.00*
	Secondary school	60(14.4)	68(16.3)	128(30.6)	2.4(1.1-5.4)	0.02*
	College/university	24(5.7)	11(2.6)	35(8.4)	1	
	Total	**150(35.9)**	**268(64.1)**	**418(100.00)**		
Religious status	Muslim	88(21.1)	207(49.5)	295(70.6)	2.2(1.1-4.4)	0.02*
	Orthodox	44(10.5)	42(10.0)	86(20.6)	0.9(0.4-1.9)	0.79
	Protestant	18(4.3)	19(4.5)	37(8.9)	1	0.89

	Total	**150(35.9)**	**268(64.1)**	**418(100.00)**		
Ethnicity	Oromo	101(24.2)	222(53.1)	323(77.3)	2.2(0.1-35.4)	0.57
	Amhara	30(7.2)	27(6.5)	57(13.6)	0.9(0.05-15.1)	0.94
	Guraghe	11(2.6)	9(2.2)	20(4.8)	0.8(0.04-14.9)	0.89
	Dawuro	3(0.7)	4(1.0)	7(1.7)	0.3(0.05-31.1)	0.85
	Keffa	4(1.0)	5(1.2)	9(2.2)	1.2(0.05-26.8)	0.88
	Other	1(0.2)	1(0.2)	2(0.5)	1	
	Total	**150(35.9)**	**268(64.1)**	**418(100.00)**		
Occupation	Unemployed	4(1.0)	8(1.9)	12(2.9)	1.4(0.3-5.8)	0.58
	Merchant	36(8.6)	62(14.8)	98(23.4)	1.3(0.5-2.8)	0.56
	Daily laborer	7(1.7)	25(6.0)	32(7.7)	2.6(0.8-7.7)	0.08*
	Government employee	73(17.5)	63 (15.1)	136(32.5)	0.6(0.3-1.4)	0.24*
	Farmers	16(3.8)	91(21.8)	107(25.6)	4.2(1.7-10.0)	0.00*
	Others	14(3.3)	19(4.5)	33(7.9)	1	
	Total	**150(35.9)**	**268(64.1)**	**418(100.00)**		
Marital status	Married	149(35.6)	265(63.4)	414(99.0)	1	
	Others	1(0.2)	3(0.7)	4(1.0)	1.7(0.17-16.3)	0.65
	Total	**150(35.9)**	**268(64.1)**	**418(100.00)**		
Family Income	Extremely	15(3.6)	73(17.5)	88(21.1)	6.8(3.3-	0.00*

	poor				14.0)	
	Moderately poor	20(4.8)	62(14.8)	82(19.6)	4.3(2.2-8.5)	0.00*
	Near poor	70(16.7)	101(24.2)	171(40.9)	2.0(1.1-3.5)	0.01*
	Low middle class	45(10.8)	32(7.7)	77(18.4)	1	
	Total	**150(35.9)**	**268(64.1)**	**418(100.00)**		
Pregnancy status	Planned	137(32.8)	216(51.7)	353(84.4)	1	
	Unplanned	13(3.1)	52(12.4)	65(15.6)	2.5(1.3-4.8)	0.00*
	Total	**150(35.9)**	**268(64.1)**	**418(100.0)**		
Parity	Primipara	70(16.7)	103(24.6)	173(41.4)	1	
	Multipara	75(17.9)	153(36.6)	228(54.5)	0.6(0.2-1.8)	0.37
	Others	5(1.2)	12(2.9)	17(4.1)	0.8(0.3-2.5)	0.76
	Total	**150(35.9)**	**268(64.1)**	**418(100.00)**		
Time of first ANC visit	1st trimester	15(3.8)	13(3.3)	28(7.1)	1	
	2nd trimester	131(33.2)	230(58.2)	361(91.4)	2.0(0.9-4.3)	0.07*
	3rd trimester	1(0.3)	5(1.3)	6(1.5)	5.7(0.5-55.9)	0.13*
	Total	**147(37.2)**	**248(62.8)**	**395(100.00)**		
ANC visit	Yes	147(35.2)	248(59.3)	395(94.5)	1	
	No	3(0.7)	20(4.8)	23(5.5)	3.9(1.1-13.5)	0.02*
	Total	**150(35.9)**	**268(64.1)**	**418(100.00)**		
Immediate complication	Yes	6(1.4)	13(3.1)	19(4.5)	1.2(0.4-3.2)	0.68

	No	144(34.4)	255(61.0)	399(95.5)	1	
	Total	**150(35.9)**	**268(64.1)**	**418(100.00)**		
Time of U/S scanning	1st trimester	11(2.6)	6(1.4)	17(4.1)	1	
	2nd trimester	92(22.0)	88(21.1)	180(43.1)	1.7(0.6-4.9)	0.28
	3rd trimester	10(2.4)	17(4.1)	27(6.5)	3.1(0.8-11.0)	0.07*
	Not done	37(8.9)	157(37.6)	194(46.4)	7.7(2.7-22.4)	0.00*
	Total	**150(35.9)**	**268(64.1)**	**418(100.00)**		
Mode of delivery	SVD	117(28.3)	177(42.9)	294(71.2)	1	
	Ventose	2(0.5)	3(0.7)	5(1.2)	0.9(0.1-6.0)	0.9
	Forceps	4(1.0)	5(1.2)	9(2.2)	0.8(0.2-3.1)	0.7
	Emergency C/S	24(5.8)	77(18.6)	101(24.5)	2.1(1.2-3.5)	0.00*
	Elective C/S	3(0.7)	1(0.2)	4(1.0)	0.2(0.02-2.1)	0.19*
	Total	**150(36.3)**	**263(63.7)**	**413(100.0)**		
Need for induction of labor	Yes	20(4.8)	47(11.2)	67(16.0)	1.38(0.7-2.4)	0.26
	No	130(31.1)	221(52.9)	351(84.0)	1	
	Total	**150(35.9)**	**268(64.1)**	**418(100.00)**		
Status of baby at birth	Alive	149(35.6)	254(60.8)	403(96.4)	1	
	Still birth	1(0.2)	14(3.3)	15(3.6)	8.2(1.1-63.1)	0.04*
	Total	**150(35.9)**	**268(64.1)**	**418(100.00)**		
Apgar score	<7	1(0.2)	3(0.7)	4(1.0)	1.2(0.07-19.6)	0.9

	7-9	146(36.2)	246(61.0)	392(97.3)	0.7(0.1-3.5)	0.6
	10	2(0.5)	5(1.2)	7(1.7)	1	
	Total	**149(37.0)**	**254(63.0)**	**403(100.0)**		
Birth weight in gram	≤2499	12(2.9)	24(5.7)	36(8.6)	1	
	2500-3499	102(24.4)	208(49.8)	310(74.2)	1.02(0.5-2.1)	0.96
	3500-3999	32(7.7)	32(7.7)	64(15.3)	0.5(0.2-1.2)	0.10*
	≥4000	4(1.0)	4(1.0)	8(1.9)	0.5(0.1-2.3)	0.38
	Total	**150(35.9)**	**268(64.1)**	**418(100.00)**		
GA at birth in weeks	<37	5(1.2)	16(4.0)	21(5.2)	1	
	37-42	143(35.5)	235(58.3)	378(93.8)	0.5(0.2-1.4)	0.20*
	≥42	1(0.2)	3(0.7)	4(1.0)	0.9(0.1-11.1)	0.9
	Total	**149(37.0)**	**254(63.0)**	**403(100.0)**		

Further, multivariate analysis (binary logistic regression with enter methods) was used to identify the main predictor variables. Finally three variables, educational status (no formal education), time of ultrasound scanning (not done) and mode of delivery (emergency C/S) were identified as the factors associated with certainty of gestation age among mothers with p-value less than 0.05 and specific AOR (95% CI). Mothers who had no formal education were 3.2 times more likely to have uncertain gestation than those who had formal and higher education [AOR=3.246 (95% CI=0.962-10.736)] and mothers for whom U/S not done 5.8 times more likely to have uncertain gestational age as compared to mothers who had U/S scanning[AOR=5.867 (95% CI=1.056-34.439)]. In addition, emergency C/S 2.6 times more common in those with uncertain gestation compared to those with certain gestation [AOR=2.652 (95% CI=1.418-4.958)].

Table 5: Association of certainty of gestation and other variables by multivariate logistic regression analysis among mothers admitted for delivery at Jimma Medical Center, South West Ethiopia, 2019

Variables candidate for multivariate logistic regression	Sig.	Exp(B) AOR	95% C.I.for AOR	
			Lower	Upper
Residence(Rural)	0.239	1.483	0.770	2.856
Age (20-34 years)	0.807	1.139	0.401	3.236
Educational status (No formal education)	**0.049**	**3.246**	**0.962**	**10.736**
Educational status (Primary school)	0.06	2.762	0.974	7.830
Educational status (Secondary school)	0.204	1.895	0.706	5.083
Religion (Muslim)	0.895	1.064	0.427	2.652
Occupation (Daily laborer)	0.201	2.481	0.617	9.979
Occupation (Government employee)	0.827	0.892	0.320	2.489
Occupation (Farmer)	0.724	1.252	0.360	4.353
Monthly income (Extremely poor)	0.554	1.445	0.427	4.885
Monthly income (Moderately poor)	0.815	1.123	0.425	2.969
Monthly income (Near poor)	0.409	1.334	0.673	2.644
Pregnancy status (Unplanned)	0.356	1.524	0.623	3.729
Time of first ANC visit (2^{nd} trimester)	0.608	0.716	0.200	2.566
Time of first ANC visit (3^{rd} trimester)	0.990	1.020	0.055	18.911
Time of U/S scanning (3^{rd} trimester)	0.212	3.353	.501	22.456
Time of U/S scanning (Not done)	**0.049**	**5.867**	**1.056**	**34.439**
Mode of delivery (Emergency C/S)	**0.002**	**2.652**	**1.418**	**4.958**
Mode of delivery (Elective C/S)	0.598	0.507	0.041	6.337
Birth_weight_in gram (3500-3999)	0.638	1.367	0.373	5.011
GA at birth in weeks (37-42)	0.435	0.519	0.100	2.690

Chapter Six: DISCUSSION

A total number of 418 delivery were studied with response rate of 100%. The general mean age was 25.67±5.01 that ranges from 14-40 years while the mean age among mothers with certain GA and uncertain GA was 25.6±4.3 that ranges from 17-40 years and 25.7±5.3 that ranges from 14-40 years respectively. Thus, relatively there was no mean difference of age between groups. This present finding was also supported by other studies (7,11). About 218 (52.2%) of the study subjects were living in urban area while the rest 200 (47.8%) were from rural. Among rural dwellers the groups of mothers with uncertain GA were dominant (37.6%) compared to certain group (10.3%) which reflects residence in rural area has inadequate services, less education and poor health education as it agrees with other studies Abdella and Chimbira (7).

The objective of the present study was to discriminate the proportion of certainty of GA and determine the associated factors. Certainty of GA was identified by the following criteria: unknown LMP, irregular or prolonged cycle, lactational amenorrhea, history of recent contraceptive use and bleeding in early pregnancy.

In the present study conducted among a total of 418 pregnant mothers, the proportion of uncertain gestation was 64.1% while the remaining 35.9% belongs to certain GA. This finding was also in harmony with study of Abdella (7). But, this was relatively higher if compared to other studies (3–5,59) of figures, like in U.K. the frequency was found to be 22% and 17%, 24.9% and 7.1%. In Zimbabwe and Sudan the percentage was 21.4% and 42.9% respectively (7,12). It could be due to ignorance resulting from a high prevalence of illiteracy, or to a communication failure to convert the date of the LMP from the lunar or Arabic calendar used by most Muslim women to the Gregorian or Ethiopian calendar.

As regards to the factors involved in the genesis of uncertain gestation, the study showed that unknown LMP was a major contributory factor (86.9%).This also higher than the study done at Wolliso St. Luke, Catholic Hospital where the proportion of unknown LMP was 55% from the study of Abdulkadir et al (21) and at University of Khartoum was 73.2% (7). And also in developed countries like in U.K it was 12.3% (59). This can be explained by lack of awareness of mothers about the importance of proper knowledge of their menstrual history which in turn resulted from illiteracy or poor health education. The other responsible factor for uncertain GA

was contraceptive use (34.7%), irregular cycle (19%), prolonged cycle (2.2%), lactational amenorrhea (2.2%) and early pregnancy bleeding (2.2%).

Among maternal factors assessed among mothers delivered at the setting, the following variables (unplanned pregnancy, ANC visit and time of first visit, time of U/S scanning and mode of delivery) were highly correlated with certainty of GA, being more prevalent among uncertain GA by specific COR in bivariate logistic regression analysis as stated in Table 4 in detail.

Despite, the prevalence of immediate maternal complication difference was observed among groups (1.4% in certain GA and 3.1% in uncertain GA), there was no statistical significance which was also in harmony with the study by Abdella (7) which is due to lack of difference in frequency of babies born with birth weight $\geq$ 4000gm.

Among fetal factors (status of baby at birth, birth weight and GA at birth) were showed significant difference statistically among certain and uncertain GA. The still birth rate is higher (3.3%) among the uncertain GA in compared to the certain GA group (0.2%) and this finding was also in line with study Chimbira and Nguyen et al (13,19). The frequency of LBW and prematurity was also higher in the uncertain group (5.7% and 4%) in compared to certain group (2.9% and 1.2%) respectively. This was also supported with studies of Abdella, Chimbira, and Hall et al (7,12,59). Buekens et al (60) also revealed the proportion of LBW of 9% and 6.5% among uncertain and certain GA respectively. The possible justification can be explained by incorrect timing of intervention and also low family income.

The factors associated with uncertain GA were identified by employing multivariate logistic regression with specific AOR, 95%CI and P-value. Accordingly, educational status (no formal education), time of U/S scanning (not done) and mode of delivery (emergency C/S) affect the likelihood of being uncertain GA by 3.24 (0.96-10.73) p-value 0.04; 5.86 (1.05-34.43) p-value 0.04; and 2.65 (1.41-4.95) p-values 0.00 respectively.

The possible interpretation for the present study was, having no formal education in comparison to other educational status increases the probability of uncertain GA by 3.2 times. This finding was also supported by other studies (7,12,59). Pregnant mothers who do not undergo U/S scanning had 5.8 times likely to be in the uncertain GA group in relative to those who had U/S scanning and this finding is in line with studies of Abdella (7) for possible justification of high

illiteracy ratio, no ANC follow-up, low family income and less utilization of technology. But, this finding was against the study of Hall et al (59) who reported the high proportion of U/S scanning among uncertain GA due population difference of Jimma and UK.

In comparison to mothers with certain GA, mothers with uncertain GA were 2.6 times more likely to deliver by emergency C/S which was also in harmony with other studies (7,12,59).This could be explained by the fact that in women with certain gestation the time of caesarean section is known beforehand, but in uncertain gestation, the physicians try to avoid delivering a preterm baby, may defer the time of the operation until the patient goes into labor, thus performing the operation under unfavorable circumstances with the consequent maternal and fetal hazards.

7. Limitations of the study

- In this study the criteria for certainty of GA with consideration of hormonal contraceptive used by referring to the INTERGROWTH-21st which is a multicenter, multiethnic and population-based project, but it is found that in other study they used different criteria's by consideration of oral contraceptive use only

8. CONCLUSION AND RECOMMENDATIONS

8.1 Conclusion

The present study revealed higher prevalence of uncertain GA (64%) as determined by unknown LNMP, hormonal contraceptive use, irregular/ prolonged menses, lactational amenorrhea and early pregnancy bleeding which was also strongly correlated with socio-demographic characteristics, maternal factors and fetal factors. Finally, three variables (educational status (no formal education), time of ultrasound scanning (not done) and mode of delivery (emergency C/S) were identified as the factors associated with certainty of GA.

8.2 Recommendation

- Promoting formal education should be encouraged for females as it affects the certainty of GA.

- Increasing community awareness about the importance of keeping record of menstrual history, early initiation of ANC and early U/S scanning through training health extension workers and/or integrating based training should be ensured to enhance the fate of certain GA that further reduces associated maternal and fetal complications.

- The hospital should set a means of communication with the health facilities within the catchment areas for monitoring and continued trainings

References

1. Andersen HF, Johnson Jr TR, Flora Jr JD, Barclay ML. Gestational age assessment: II. Prediction from combined clinical observations. Am J Obstet Gynecol. 1981; 140(7):770–774.

2. Edmonds DK, Dewhurst J Sir, Edmonds DK, Dewhurst CJ. Dewhurst's textbook of obstetrics and gynaecology for postgraduates [Internet]. 6th ed. Malden, Mass. : Blackwell Science; 1999

3. Chamberlain R; Chamberlain G; Howlett B; Claireaux A. British births 1970. A survey under the joint auspices of the National Birthday Trust Fund and London, William Heinemann Medical Books, 1975.

4. Beazley JM, Underhill RA. Confinement date unknown. Nurs Times. 1971;67(45):1414–1417.

5. Grennert L, Persson P-H akan, Gennser G, Kullander S. Benefits of ultrasonic screening of a pregnant population. Acta Obstet Gynecol Scand. 1978; 57(sup78):5–14.

6. Campbell S, Warsof SL, Little D, Cooper DJ. Routine ultrasound screening for the prediction of gestational age. Obstet Gynecol. 1985; 65(5):613–620.

7. Khadiga Abdalla Abdelmula. 7. Abdalla, K. (2015). Uncertain Gestation and Pregnancy Outcome at Omdurman Maternity Hospital 1996. University of Khartoum.

8. Ohuma EO, Papageorghiou AT, Villar J, Altman DG. Estimation of gestational age in early pregnancy from crown-rump length when gestational age range is truncated: the case study of the INTERGROWTH-21 st Project. BMC Med Res Methodol. 2013; 13(1):151.

9. Babuta S, Chauhan S, Garg R, Bagarhatta M. Assessment of fetal gestational age in different trimesters from ultrasonographic measurements of various fetal biometric parameters. J Anat Soc India. 2013; 62(1):40–46.

10. Thomson AM, Billewicz WZ, Hytten FE. The assessment of fetal growth. BJOG Int J Obstet Gynaecol. 1968; 75(9):903–916.

11. Hall MH, Carr- Hill RA. The significance of uncertain gestation for obstetric outcome. BJOG Int J Obstet Gynaecol 1985; 92(5):452–60.

12. Chimbira TH. Uncertain gestation and pregnancy outcome. Cent Afr J Med. 1989 Feb;35(2):329–33.

13. Kalish RB, Chervenak FA. Sonographic determination of gestational age. Ultrasound Rev Obstet Gynecol. 2005;5(4):254–258.

14. de Onis M, Blössner M, Villar J. Levels and patterns of intrauterine growth retardation in developing countries. Eur J Clin Nutr. 1998 Jan; 52 Suppl 1:S5-15.

15. Blencowe H, Cousens S, Oestergaard MZ, Chou D, Moller A-B, Narwal R, et al. National, regional, and worldwide estimates of preterm birth rates in the year 2010 with time trends since 1990 for selected countries: a systematic analysis and implications. Lancet Lond Engl. 2012 Jun 9; 379(9832):2162–72.

16. Lamont RF. Advances in the Prevention of Infection-Related Preterm Birth. Front Immunol [Internet]. 2015 Nov 16 [cited 2019 Sep 1]; 6.

17. Vital and Health Statistics; Series 21, No. 37 (4/80). : 45.

18. Bleker O, Buimer M, Van der Post J, Veen F. Ted (G.J.) Kloosterman: On Intrauterine Growth. The Significance of Prenatal Care. Studies on Birth Weight, Placental Weight and Placental Index. Placenta. 2006 Nov 1; 27:1052–4.

19. Nguyen TH, Larsen T, Engholm G, Møller H. Increased adverse pregnancy outcomes with unreliable last menstruation. Obstet Gynecol. 2000 Jun;95(6 Pt 1):867–73.

20. Brakohiapa EK, Coleman J, Ofori EK, Ndanu TA, Antwi WK. Pregnancy dating and its confirmation in Ghana: last menstrual period versus ultrasonographic dating. J Med Appl Biosci. 2012; 4:74–86.

21. Abdulkadir Y, Dejene A, Geremew MA, Dechasa B. Induction of Labor Prevalence and Associated Factors for Its Outcome at Wolliso St. Luke. Cathol Hosp South West Shewa Oromia Intern Med. 2017; 7(255):2.

22. Blencowe H, Cousens S, Jassir FB, Say L, Chou D, Mathers C, et al. National, regional, and worldwide estimates of stillbirth rates in 2015, with trends from 2000: a systematic analysis. Lancet Glob Health. 2016; 4(2):e98–e108.

23. Kalish RB, Chervenak FA. Sonographic determination of gestational age. Ultrasound Rev Obstet Gynecol. 2005 Jan 1;5(4):254–8.

24. Chervenak FA, McCullough LB. Should all pregnant women have an ultrasound examination? Croat Med J. 1998 Jun;39(2):102–6.

25. Ugwu EO, Odoh GU, Dim CC, Obi SN, Ezugwu EC, Okafor II. Women's perception of accuracy of ultrasound dating in late pregnancy: a challenge to prevention of prolonged pregnancy in a resource-poor Nigerian setting. Int J Womens Health. 2014; 6:195.

26. Jehan I, Zaidi S, Rizvi S, Mobeen N, McClure EM, Munoz B, et al. Dating gestational age by last menstrual period, symphysis-fundal height, and ultrasound in urban Pakistan. Int J Gynecol Obstet. 2010; 110(3):231–234.

27. Tsung J. History of ultrasound and technological advances. In: World Congress Ultrasound in Medical Education (www wcume org). 2015.

28. Neufeld LM, Haas JD, Grajéda R, Martorell R. Last menstrual period provides the best estimate of gestation length for women in rural Guatemala. Paediatr Perinat Epidemiol. 2006 Jul; 20(4):290–8.

29. ROSENBERG K, GRANT JM, TWEEDIE I, AITCHISON T, GALLAGHER F. Measurement of fundal height as a screening test for fetal growth retardation. BJOG Int J Obstet Gynaecol. 1982; 89(6):447–450.

30. Hoffman CS, Messer LC, Mendola P, Savitz DA, Herring AH, Hartmann KE. Comparison of gestational age at birth based on last menstrual period and ultrasound during the first trimester. Paediatr Perinat Epidemiol. 2008; 22(6):587–596.

31. Kortenoever ME. Pathology of pregnancy: Pregnancy of long duration and postmature infant. Obstet Gynecol Surv. 1950;5(6):812–813.

32. Nakano R. Post-term pregnancy: a five-year review from Osaka National Hospital. Acta Obstet Gynecol Scand. 1972; 51(3):217–222.

33. Practice C on O, Medicine AI of U in, Medicine S for M-F. Committee Opinion No 700: Methods for Estimating the Due Date. Obstet Gynecol. 2017; 129(5):e150.

34. Papageorghiou AT, Kemp B, Stones W, Ohuma EO, Kennedy SH, Purwar M, et al. Ultrasound-based gestational-age estimation in late pregnancy. Ultrasound Obstet Gynecol. 2016; 48(6):719–726.

35. Fisher B, Rose NC, Carey JC. Principles and practice of teratology for the obstetrician. Clin Obstet Gynecol. 2008; 51(1):106–118.

36. Berg AT. Menstrual cycle length and the calculation... -. Am J Epidemiol [Internet]. 1991 [cited 2019 Aug 14]; 133(6):585–9.

37. U.S Department of Health and Human Services. Menstrual Cycle | womenshealth.gov [Internet]. 2017

38. WINGATE MS, ALEXANDER GR AND BUEKENS P. Comparison of Gestational Age Classifications: Date ofLast Menstrual Period vs. Clinical Estimate. Ann Epidemiol 17 [Internet]. [Cited 2019 Aug 14]; 17:425–430.

39. BAIRD DT, McNEILLY AS, SAWERS RS, SHARPE RM. Failure of estrogen-induced discharge of luteinizing hormone in lactating women. J Clin Endocrinol Metab. 1979; 49(4):500–506.

40. McCann MF, Liskin LS, Piotrow PT, Rinehart W, Fox G. Breast-feeding fertility and family planning. Popul Rep J. 1981 ;(24):1–51.

41. Shearman R. Amenorrhoea after treatment with oral contraceptives. Lancet. 1966; 1110–1111.

42. Wilson RD, Kendrick V, Wittmann BK, McGillivray B. Spontaneous abortion and pregnancy outcome after normal first-trimester ultrasound examination. Obstet Gynecol. 1986; 67(3):352–355.

43. Bergh J. Should ultrasound examination be performed earlier in pregnancy? Tidsskr Den nor Laegeforening Tidsskr Prakt Med NY Raekke. 1992; 112(27):3450–3451.

44. Hadlock FP, Harrist RB, Shah YP, King DE, Park SK, Sharman RS. Estimating fetal age using multiple parameters: a prospective evaluation in a racially mixed population. Am J Obstet Gynecol. 1987; 156(4):955–957.

45. Dubowitz LM, Dubowitz V, Goldberg C. Clinical assessment of gestational age in the newborn infant. J Pediatr. 1970;77(1):1–10.

46. Ballard JL, Kazmaier K, Driver M, Light IJ. A simplified assessment of gestational age. Pediatr Res. 1977;11(4):374.

47. Alexander GR, de Caunest F, Hulsey TC, Tompkins ME, Allen M. Ethnic variation in postnatal assessments of gestational age: a reappraisal. Paediatr Perinat Epidemiol. 1992; 6(4):423–433.

48. Ballard JL, Khoury JC, Wedig KL, Wang L, Eilers-Walsman BL, Lipp R. New Ballard Score expanded to include extremely premature infants. J Pediatr. 1991; 119(3):417–423.

49. Herrmann Jr U, Dürig P, Amato M, Sidiropoulos D, Schneider H. Outcome of fetuses with abnormal biophysical profile. Gynecol Obstet Invest. 1989; 27(3):122–125.

50. Baskett TF. Gestational age and fetal biophysical assessment. Am J Obstet Gynecol. 1988; 158(2):332–334.

51. Hanson FW, Tennant F, Hune S, Brookhyser K. Early amniocentesis: Outcome, risks, and technical problems at≤ 12.8 weeks. Am J Obstet Gynecol. 1992; 166(6):1707–1711.

52. Marpeau L, Calmar N. [The ideal time for delivery]. Rev Fr Gynecol Obstet. 1990 Mar; 85(3):149–51.

53. Lim ML, Elferink-Stinkens PM, Wallenburg HC, van Hemel OJ. Estimate of perinatal mortality risk. Eur J Obstet Gynecol Reprod Biol. 1993 Oct; 51(2):97–101.

54. Yudkin PL, Wood L, Redman CWG. Risk of unexplained stillbirth at different gestational ages. The Lancet. 1987; 329(8543):1192–1194.

55. Synnes AR, Ling EW, Whitfield MF, Mackinnon M, Lopes L, Wong G, et al. Perinatal outcomes of a large cohort of extremely low gestational age infants (twenty-three to twenty-eight completed weeks of gestation). J Pediatr. 1994;125(6):952–960.

56. Copper RL, Goldenberg RL, Creasy RK, DuBard MB, Davis RO, Entman SS, et al. A multicenter study of preterm birth weight and gestational age—specific neonatal mortality. Am J Obstet Gynecol. 1993; 168(1):78–84.

57. Divon MY, Marks AD, Henderson CE. Longitudinal measurement of amniotic fluid index in postterm pregnancies and its association with fetal outcome. Am J Obstet Gynecol. 1995 Jan; 172(1 Pt 1):142–6.

58. Angeles CW, Sentíes LC, García AA, Chávez JA. Fetal Growth in prolonged pregnancy. Ginecol Obstet Mex. 1989; 57:16–22.

59. HALL MH, CARR-HILL RA, FRASER C, CAMPBELL D, SAMPHIER ML. The extent and antecedents of uncertain gestation. BJOG Int J Obstet Gynaecol. 1985;92(5):445–451.

60. Buekens P, Delvoye P, Wollast E, Robyn C. Epidemiology of pregnancies with unknown last menstrual period. J Epidemiol Community Health. 1984 Mar; 38(1):79–80.

Annex 1

English questionnaire

Information sheet and mothers Consent form (English)

Information sheet

Good morning? / Good afternoon/Good evening? My name is Dr. Mikiyas Tadesse. I am a final year obstetrics and gynecology resident at Jimma University. I am conducting a study on the prevalence of certainty of GA (certain and uncertain) and determine factors affecting them among pregnant mothers admitted to JMC for delivery, for my partial fulfillment of the requirements for the master degree in Obstetrics and Gynecology. You are chosen to participate in the study. We need to collect data about socio-demography; obstetrics and gynecology reproductive history and your chart will be reviewed to get data about your obstetric characteristics and pregnancy outcome. I want to assure you that all of your answers will be kept strictly secret. I will not keep a record of your name or address. You have the right to stop the interview at any time, or to skip any questions that you don't want to answer. Your participation is completely voluntary but your experiences could be very helpful to improve maternal and perinatal outcome in the region.

If you agree to participate in the study, interview will take about 30 minutes to complete. Do you have any questions?

Consent form

Do you agree to be interviewed?

Yes ☐ No ☐

May I begin the interview now?

To be signed by interviewer: I certify that I have read the above consent procedure to the participant.

Signed: _____

QUESTIONS

Card No……

1) Age in complete years: ……..
2) Marital status a) married b) unmarried c) divorced d) widowed
3) Residence: a) Rural b) Urban
4) Ethnicity: a)Oromo b)Amhara c)Guraghe d)Dowaro e)Kaffa f) other(specify)
5) Religion: a) Muslim b) Orthodox c) Protestant d) Others (specify)……..
6) Education: 1. No formal education 2. Primary school 3. Secondary school 4. College/University
7) Husband's occupation: 1. Non-employed 2. Merchant 3. Daily Laborer 4. Government employee 5. Farmer 6. Other (specify) ……..
8) Family income ……
9) Is the pregnancy planned? 1-Planned 2-Unplanned
10) Parity:

    1- Primipara 2- Multipara 3- Grandmultipra 4-Greatgrand multipara
11) LMP:

    1- Known 2- Unknown
12) Menstrual cycle:

    1- Regular 2- Irregular 3- Prolonged

13) Lactational amenorrhea: 1-Yes 2- No
14) Did you use any hormonal Contraceptive recently : 1-Yes 2- No

    If yes to Q.14, Answer Q no 15 to 16
15) Which type 1-Pills 2-Injectables 3-Implants 4-IUD
16) When did you discontinue?
17) Bleeding throughout pregnancy: 1-Yes 2- No
18) Date of quickening: 1- Known 2-Unknown
19) Gestational age: 1-Certain 2-Uncertain
20) Do you have antenatal visit? 1-Yes 2-NO

    If yes to Q.20 answer Q no 21 to 23

21) How many visits do you have?

22) When did you start your First antenatal visit:

1- First trimester 2- Second trimester 3- Third trimester

23) U/S scanning: 1- First trimester 3- Third trimester

2- Second trimester 4- Not done

24) Is there a need for induction of labor? 1- yes 2- No

25) Mode of delivery: 1-S.V.D 2-ABD 3-Ventose 4-

Forceps 5- EM C/S 6- EL C/S 7-Destructive 8-Laparatomy

26) Immediate complications to the mother:

1- Hemorrhage 2- Collapse 3- Tears

4- Others (specify) 5- None

27) Condition of the baby at birth:

1- Alive 2- Fresh stillbirth 3- Macerated stillbirth

28) Apgar score at 5 minutes:

1- < 7 2- 7 - 9 3- 10

29) Birth weight in grams:

1- < 2500 2- 2500 - 3499

3- 3500 - 3999 4- $\geq$ 4000

30) Gestational age at birth in weeks:

1- < 37 2- 37 - 42 3- $\geq$ 42

THANK YOU, FOR YOUR COOPERATION!

ASSURANCE OF PRINCIPAL INVESTIGATOR

The undersigned agrees to accept responsibility for the scientific ethical and technical conduct of the research project and for provision of required progress reports as per terms and conditions of the Health Science Institute in effect at the time of grant is forwarded as the result of this application.

Name of the resident: _____

Date._____ Signature _____

APPROVAL OF ADVISORS

Name of the first advisor:_____

Date._____ Signature _____

Name of the second advisor: _____

Date _____ Signature_____