Incidence and outcome of macrosomia in Jimma University Specialized Hospital, South West Ethiopia

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Abstract

Introduction: Macrosomia is defined as birth weight of 4,000 g and above irrespective of gestational age and affects 3-15% of all pregnancies. Multiple factors and maternal, fetal and neonatal complication are related with fetal macrosomia [1].

Objective: The aim of this study to determine incidence of macrocosmic deliveries, maternal, fetal and neonatal complication of macrosomia in Jimma specialized Hospital from April to December, 2015

Methods: AHospital based Cohort control study design was conducted. A total of 122macrocosmic neonates whose weight was >=4000 gm. were selected for Cases and 244 normal birth weight(Normosomia), neonates whose weight was between 2,500–3,999 gm. were selected for the controls using simple random sampling technique. Data were collected from the patients directly, charts and from managing team when the information missed or unclear. The collected data were cleared, coded and entered into SPSS version 20 for analysis.. Bivariateand multivariate regression was used to identify the factors associated with macrosomia, Chi square and t-independent test used to see maternal, fetal and neonatal complication .RR calculated by using openEpi epidemiologic statistics. The results of the study were presented by text,tables and figures based on the types of data.

Results:The incidence of macrosomia was 3.3% among 3658 total deliveries in study period. Male sex of the infant six times increases the risk of macrosomia (RR=5.9, 95%CI: 1.68-20.7) Obstructed labor ,postpartum hemorrhage, anemia ,high rate of cesarean delivery were higher in mothers of macrosomic neonate and birth trauma was eight to nine times in macrosomic fetus and perinatal asphyxia seven times,hypoglycemia ten times and neonatal sepsis three times higher in macrosomic fetus and Macrosomia was an independent factor for poor maternal outcome.

Conclusion: Male infant was an independent risk factor for macrosomia, and macrosomia was an independent risk factor for poor maternal and neonataloutcome.

Key words: macrosomia, maternal outcome, fetal outcome, neonatal outcome

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ACRNOMY AND ABBREVATIONS

ADA: American Diabetic Association

APGAR: Appreance, Pulse rate, Grimace, Activity and Respiratory rate

ACOG: American college of Obstetrics and Gynecology

ANC: Antenatal care

APH: Antepartum hemorrhage

ARR: Adjusted Relative Risk

C/D: Cesarean delivery

C/I: 95% confidence interval

CeMoc: Comprehensive Emergency Obstetric and Newborn Care

CPD: Cephalo pelvic disproportion

DM: Diabetic mellitus

EONS: Early Onset Neonatal Sepsis

FAVD: Forceps Assisted Vaginal Delivery

FBS: Fasting blood sugar

GDM: Gestational Diabetic Mellitus

g :gram

Hct: Hematocrit

HCG: Human chorionic gonadotropin

IGF: Insulin like growth factor

IUGR: Intrauterine growth restriction

JUSH: Jimma University Specialized Hospital

KG: Kilogram

Lb: pound

LGA: Large for Gestational Age

LNMP: Last Normal Menstrual Period

MAS: Meconium Aspiration Syndrome

MCH: Maternal and Child Hospital

NICU: Neonatal Intensive Care Unit

NBW: Normal Birth Weight

NRFHRP: Non Reassuring Fetal Heart Rate Pattern

OZ----- ounce(0.0283495231 kilogram)

OGTT---- Oral Glucose Tolerance test

OL------ Obstructed labor

RR------ Relative Risk

PNA: Perinatal Asphyxia

PPH: Post-partum hemorrhage

RBS: Random Blood Sugar

U/S: Ultrasound

VAVD: Vacuum Assisted Vaginal Delivery

WHO: World Health Orginazation

1. Introduction

1.1 Background

Human fetal growth is characterized by sequential patterns of tissue and organ growth, differentiation, and maturation [19]. Fetal growth is regulated at multiple levels and requires successful development of the placental interface between maternal and fetal compartments [18].

The term macrosomiais used rather imprecisely to describe a very large fetus or neonate. Although there is general agreement among obstetricians that newborns weighing < 4000 g are not excessively large, a similar consensus has not been reached for the definition of macrosomia.[19] The first report of fetal macrosomia in the literature was made by the doctor monk Francois Rabelais in the sixteenth century[19]

Because there are no widely accepted and precise definitions of pathological fetal overgrowth, several terms are currently used clinically. The most common of these macrosomia is defined by birth weights that exceed certain percentiles for a given population. Newborn weight exceeding 4000 g—8 lb 13 oz—is also a frequently used threshold to define macrosomia. Others use 4250 g or even 4500 g—10 lb [19].The risk of morbidity is greater for infants born weighing between 4000 and 4500 g compared to the average population. However, the risk of infant morbidity is substantially increased at birth weights greater than 4500 g(20).

Newborn weight rarely exceeds 11 pounds (5000 g), and excessively large infants are a curiosity. The largest newborn cited in the Guinness Book of World Records was a 23-lb 12-oz (10,800 g) infant boy born to a Canadian woman, Anna Bates, in 1879[19] .

In most part of the world and in this study macrosomia is defined as one with a birth weight greater than the 90th centile for that population, a definition that includes all infants born with a birth weight greater than or equal to 4000 gm.

There are classifications of macrosomia as follows

- 4000-4499 gram as grade I,
- 4500gram-4999 gram as grade II and
- $\geq$ 5000 gram as grade III

1.2 **Statement of the problem**

Despite major progress in obstetrics over the last 100 years, the delivery of large fetuses remains a source of anxiety among caregivers because these pregnancies are at increased risk of several perinatal complications, including :

Maternal risks:

- Protracted or arrested labor
- Operative vaginal delivery
- Cesarean delivery
- Genital tract lacerations
- Postpartum hemorrhage
- Uterine rupture
- Obstructed labor

Fetal and neonatal risks:

- Shoulder dystocia leading to birth trauma (brachial plexus injury, fracture) or asphyxia
- Neonatal hypoglycemia
- Polycythemia
- Electrolyte abnormality ,mainly hypocalcaemia
- Hyperbilirubinemia

Long-term risks in offspring:

- Development of impaired glucose tolerance and obesity
- Development of metabolic syndrome
- Increase in aorta intima-media thickness, left ventricular mass, and abnormal lipid profile

A diagnosis of fetal macrosomia can be made only by measuring birth weight after delivery; therefore, the condition is confirmed only after delivery of the neonate. Fetal macrosomia is encountered in up to 10% of deliveries [3**].**

To be sure, the incidence of excessively large infants increased during the 20th century. According to Williams (1903), at the beginning of the 20th century, the incidence of birth weight > 5000 g was 1 to 2 per10,000 births. This compares with 16 per 10,000 at Parkland Hospital from 1988 through 2008 and 11 per 10,000 in the United States in 2010.[19]

Maternal diabetes, whether gestational, chemical, or insulin dependent, is the condition classically associated with fetal macrosomia. The "Pedersen hypothesis" was long assumed to account for fetal macrosomia, that is, the condition was the result of inadequate management of diabetes during pregnancy.([20], [21],[22]).

Maternal obesity is associated with a 3- to 4-fold increased likelihood of fetal macrosomia. The increased risk of macrosomia associated with maternal obesity appears to be independent of comorbidities such as gestational or presentational diabetes.([20],[21])

Prolonged pregnancy is more likely to result in a macro-somic fetus, presumably because of continued delivery of nutrients and oxygen to the fetus.[20].

Several genetic and congenital syndromes are associated with an increased incidence of macrosomia.Beckwith-Wiedemann syndrome is frequently associated with fetal macrosomia, usually because of pancreatic islet cell hyperplasia.

Fetuses that are suspected of being LGA may simply be large secondary to constitutional factors [20].

Large maternal stature should be considered as contributing to macrosomia because birth weight tends to correlate more closely with maternal height than maternal weight.

Male fetuses are more likely to be considered LGA because male fetuses are an average of 150 g heavier than appropriately matched female fetuses at each gestational week during late pregnancy **[20].**

Excessive maternal weight gain in pregnancy is associated with macrosomia. A weight gain of more than 40 lb significantly increased the incidence of macrosomia by an odds ratio of 3.3[20].

When controlled for gestational age and fetal gender, the average birth weight with successive pregnancies increases by 80–120 g up to the fifth pregnancy.[20]

Any woman who delivers an LGA baby should be informed that the risk of her having another LGA baby is increased by 2.5- to 4-fold[20].

The rate of shoulder dystocia has been reported to be as high as 17 percent for neonates with birth weights of at least 4500 g, and 23 percent for neonates with birth weights of at least 5000 g[19].

Approximately 10–15% of infants with shoulder dystocia experience brachial plexus injury; facial nerve injury and fractures of the humerus or clavicle also may be seen([20], [23],[24], [26]).

Perinatal trauma is more likely with a macrosomic pregnancy and is related to an increased Incidence of shoulder dystocia and operative vaginal delivery. Vaginal delivery of a macrosomic infant increases by 5-fold the risk of third- or fourth-degree laceration.[20],[9]

Neonatal risks associated with macrosomia include hypoglycemia (50%), hematological disturbances (i.e., polycythemia) and electrolyte disturbances (up to 50%)[5].

Due to the under nutrition of women in this region macrosomia baby is very dangerous as their pelvis is not capacious complicating as obstructed labor, uterine rupture, vesico-vagina/recto-vaginal fistula and perinatal asphyxia.

The prevalence of obesity across the world increases significantly and maternal obesity has direct association with macrosomia and this implies the prevalence of macrosomia increases significantly [10].

Macrosomia causes obstructed labor, cephalopelvic disproportion, uterine rupture, increases incidence of cesarean delivery, third and fourth degree perianal tear, and labor abnormality in maternal and shoulder dystocia, birth trauma, hypoglycemia, polycythemia in fetus and neonates. Macrosomia may be a greater obstetric hazard for women in developing countries where undernutrition during youth can inhibit complete pelvic growth, pregnancy before the pelvis is fully developed is common, and facilities for operative delivery of women with obstructed labor are not consistently available [30]

As Ethiopia is one of the developing country macrosomia poses morbidity and mortality both in mother and neonate, and more data is not available in this area and no data is available in JUSH, this study gives clues on the incidence, risk factors and complication of macrosomia both in the mother and neonate and also recommendation how to decrease the incidence of macrosomia and its complication based on the result of this study.

Macrosomia prevalence increases as the number of parity increases ,and in Ethiopia the fertility rate is 4.8 (2014) and this is very common in the area of Jimma ,and the macrosomia results in uterine rupture, obstetric fistula, PPH and perinatal mortality and morbidity

By using modern effective family planning it is possible to decrease the prevalence and complication of macrosomia in grand multipara and huge grand multipara

2. Literature review

2.1 .1 Incidence of macrosomia

The incidence of macrosomia is differ from country to country and even in a country it differ from state to state and the incidence of macrosomia increased from time to time.

The worldwide prevalence of birth of infants ≥4000 grams is approximately 9 percent and about 0.1 percent of newborns weigh ≥5000 g, [35]

The prevalence of birth weight ≥4000 grams in developing countries is typically 1 to 5 percent, but ranges from 0.5 to 14.9 percent [30]

Impact of pregnancy and labor complications on neonatal outcomes: a retrospective cohort study in a rural hospital of Ethiopia. The research is a retrospective-cohort study including 1,283 women who delivered at Goba Hospital in 2004(EFY) showed that the incidence of macrosomia is 10.7% [25].

A retrospective study done in Ahmadu Be l lo University Teaching Hospital, Zaria, Nigeria on Perinatal Presentation and Outcome of High Birth weight Infants over 4 year period showed that the prevalence of birth weight =4000 grams in the study was 54.49 per 1000 births, that of birth weight =4500 grams was 12.72 per 1000 and that of birth weight =5000 grams was 1.96 per 1000 births[6]

The yearly trends in the prevalence of fetal macrosomia among singleton live term hospital births in Enugu, South East Nigeria. Routinely collected delivery data of three major maternity centers in Enugu were reviewed for the period January 2003 to December 2013.A total of 22,628 singleton live term deliveries were studied. There were 2116 births of macrosomic babies giving a prevalence rate of 9.3% of singleton term deliveries [4]

A retrospective study of all consecutive births in the maternity unit, Jos University Teaching Hospital, Jos, Nigeria, between January 1998 and December 2001.indicates that Macrosomic

infants (4000g and above) were 286 cases representing 2.9% of all deliveries. Ten (3.5%) of the infants with macrosomia were preterm, 90.9% were term, and 5.6% were post-term.[7]
A retrospective and prospective study done in specialized hospital of gynecology and obstetrics of SidiBelAbbes,west Algeria over a one year period for retrospective (970) cases and 130 case for prospective showed that the incidence of macrosomia is 10.19%,[12]

A 3 year retrospective done at Dr. Lufti Kurdar Kartal training and Research Hospital in Istanbul ,Turkey in the year of January 1, 2005 and December 31, 2007 G.C showed that A control group of 854 deliveries weighing between 2500-4000 g was randomly composed.Among a total of 11,827 deliveries, 829 (7%) were macrosomic neonates[5]

A case-control, prospective study performed in the two university hospitals in Tehran during a 36- month period between January 2002 through December 2004 showed that the Prevalence of macrosomic deliveries was 5.8 and prevalence of the deliveries (>4500g or heavier) was0.84%.[2]

A retrospective study on 9241 deliveries performed at maternity and children Hospital(MCH) Buradiah,Al-Qassim region, Kingdom of Saudi Arabia from January 1,2011-to December 30,2011 indicates the incidence of macrosomia 4.5%,[27]

In the United States in 2010, of more than 4 million births, 6.6 percent weighed 4000 to 4499 g; 1 percent weighed 4500 to 4999 g; and 0.1 percent were born weighing 5000 g or more[19]

2.1.2 Risk factors of macrosomia

There are a lot of risk factors associated with macrosomia which includes maternal obesity,diabetesmellitus,GDM,previousmacrosomia,multiparous, postterm pregnancy ,prepregnantweight, maternal older age and maternal height.

A retrospective case control done in Debre Markos referral hospital, Northest Ethiopia done on factors associated with macrosomia from April to march 2014 indicates that a total of 338 macrosomic neonates whose weight is >=4000 gram were selected for Cases and 676 normal birth weight neonates whose weight is between 2,500–3,999 gram were selected for the controls using simple random sampling technique. Neonates born from multiparous women were 1.44 times more likely to have macrosomia as compared to neonates born from primiparus women with 95%CI of AOR (1.05, 1.98). [1]

A retrospective and prospective study done in specialized hospital of gynecology and obstetrics of SidiBelAbbes,west Algeria over a one year period for retrospective (970) cases and 130 case for prospective showed that and macrosomia is common in the multiparous,taller,fundal height>34cm,obese[11].

This is a prospective descriptive study conducted at the department of obstetrics and gynaecology of the Imo state University Teaching Hospital over a period of seven years from June 2004 to June 2011. Only booked grandmultiparae who delivered in our hospital during the study period were included in the study showed that macrosomia were significantly associated with grandmultiparae[15]

Prolonged pregnancy is more likely to result in a macro-somic fetus, presumably because of continued delivery of nutrients and oxygen to the fetus [19],

A 3 year retrospective done at Dr. Lufti Kurdar Kartal training and Research Hospital in Istanbul ,Turkey in the year of January 1, 2005 and December 31, 2007 G.C showed that A control group of 854 deliveries weighing between 2500-4000 g was randomly composed .Statistical analysis showed male predominance (p=0.0001), a significant increase and higher parity for the macrosomic group (p=0.0001)[5]

Occurrence of Fetal Macrosomia Rate and Its Maternal and Neonatal Complications: A 5-Year Cohort Study A cohort study was conducted from 2007 to 2011 at Obstetrics and Gynecology Department, Razi Hospital in Ahvaz city, Iran. Showed Gestational diabetes, maternal obesity (BMI), maternal aged and positive history of previous macrosomia were the major risk factors for macrosomia which were compared with the normal weight infant groups ($P < 0.001$ for all parameters).[3]

A prospective case control study involving a total of 3700 deliveries at term of macrocosmic babies between Jan 2011 to Dec 2012 in Ziauddin Hospital Kemari Campus. The study concerned risk factors, mode of delivery and the incidence of maternal and perinatal complications. The main risk factors of macrosomia identified in our study were multiparty and diabetes mellitus[17],[8]

Maternal obesity is associated with a 3- to 4-fold increased likelihood of fetal macrosomia associated with maternal obesity appears to be independent of comorbidities such as gestational or pregestational diabetes [19],[23]

Prospective study was carried out at the University of Port Harcourt Teaching Hospital(UPTH) between May 2006 and April 2007. A cohort of 150 pregnant women with BMI ≥ 30kg/m2 who registered for antenatal care were identified and compared with a control group of 150 non-obese pregnant women Foetalmacrosomia nd birth asphyxia were significantly higher among the obese group (p=0.001).[13]

Excessive maternal weight gain in pregnancy is associated with macrosomia. A weight gain of more than 40 lb significantly increased the incidence of macrosomia by an odds ratio of 3.3[19]. Neonates born post term were 3.67 time more likely to have macrosomia as compared to preterm deliveries with 95% CI of AOR (1.01, 13.32). Maternal complications were significantly associated with neonatal birth weight with (Linear by linear X^2 value = 35.9, p- value 0.000)[1]. Excessive maternal weight gain during pregnancy is associated with macrosomia. Women with normal prepregnancy body mass index who gained more than 35 lbs (15.9 kg) had an almost 2.5 times greater risk of delivering a LGA infant compared with mothers who gained between 25 and 35 lbs (11.3 and 15.9 lbs) [29,30]

2.1.3 fetal and neonatal outcome of macrosomia

Macrosomia is nightmare of obstetricians because it increases the morbidity and mortality of fetus, neonate and also increases the risk obesity, diabetic mellitus, metabolic syndrome, andasthma, during childhood and adult.

A retrospective study done in Ahmadu Be l lo University Teaching Hospital, Zaria, Nigeria on Perinatal Presentation and Outcome of High Birth weight Infants over 4 year period showed that the common conditions observed are low 5-minutes Apgar Scores in 21 (13.4%) , Hypoglycemia in 12 (7.6%) ,hyperbilirubinaemia in 7 (4.5%), sepsis in 14 (8.9%)and birth trauma in 8 (5.1%), four of which had multiple bruises, three had cephalhaematoma, two had Erb’spalsy, one had clavicular fracture and one had fracture of the humerus [6].

A 3 year retrospective done at Dr. Lufti Kurdar Kartal training and Research Hospital in Istanbul ,Turkey in the year of January 1, 2005 and December 31, 2007 G.C showed thatthe admission frequency of macrosomic deliveries into the NICU was almost two-fold. Birth injuries were found in 53 (6.4%) macrosomic infants, and macrosomic deliveries had a two-fold risk for birth injuries. Statistical analysis showed a significant difference between macrosomic and the control group for the frequency of birth traumas (p=0.0007), hypoglycemia (p=0.0001) and polycythemia (p=0.0006). There were two deaths in macrosomic group versus one among control cases [5].

The risk of fetal brachial plexus injury in macrosomic infants delivered vaginally is 0.3–4%.
Brachial plexus injury with shoulder dystocia is approximately 7% in infants whose birth weightsexceed 4000 g but is 14% for mothers with gestational diabetes.[20]

Shoulder dystocia occurs in 5–24% of vaginally delivered macrosomic fetuses .Approximately 10–15% of infants with shoulder dystocia experience brachial plexus injury; facial nerve injury and fractures of the humerus or clavicle also may be seen [20].
Compared to NBW infants, the risk of birth injuries was twofold, threefold, and fourfold greater for infants with grade 1 (birth weight between 4000 and 4499 g), grade 2 (birth weight between 4500 and 4999 g), and grade 3 (birth weight >5000 g) macrosomia, respectively.(33)
The risk of a five-minute Apgar score lower than three was 1.3 (95% CI 1.21-1.39), 2.0 (95% CI 1.76-2.29), and 5.2 (95% CI times 4.09-6.62) greater for infants with grades 1, 2, and 3 macrosomia, respectively [30,31.32]
In a report based upon data from the Netherlands Perinatal Registry from 1997 to 2002, the incidence of hypoglycemia was about 19 and 15 percent in all LGA infants and in LGA infants of nondiabetic mothers, respectively [33, 34]

2.1.4 maternal outcome of macrosomia

Fetal macrosomia also causes significant complication to the mother especially when the fetal weight exceeds 4500 g and dangerous for developing country as the pelvis is contracted because of chronic malnutrition.

Macrosomia increases the incidence of caesarian section,obstructed labor,PPH and perineal trauma.

Perineal trauma is more likely with a macrosomic pregnancy and is related to an increasedincidence of shoulder dystocia and operative vaginal delivery. Vaginal delivery of a macrosomicinfant increases by 5-fold the risk of third- or fourth-degree laceration. [20]

Prevalence and risk factors for third- and fourth-degree perineal lacerations during vaginal delivery: a multi-country study A total of 214 599 women who underwent vaginal delivery were analyzed.

The prevalence of third- and fourth-degreeMaternal age and BMI were not associated with risk of third- and fourth-degree perineal lacerations, but null parity, high birth weight and forceps-assisted delivery significantly increased the risk in all three regions. [9]

Neonates with a birth weight of at least 4500 g have been reported to have cesarean delivery rates exceeding 50 percent [19]

A retrospective study done in the university teaching hospital south-south Nigeria indicates that the prevalence of macrosomia is 7.4%, cephalopelvic disproportion 43% and rate C/D is 32.6% [12]

A case –control study was conducted at Medani Hospital (Sudan) to investigate the incidence, risk factors, and delivery outcomes of babies with macrosomia. Cases were newborns with macrosomia, which is defined as a neonatal birth weight of 4000g or more while the controls were normal birth weight (2500-3999g).The rate of cesarean delivery (54.9% vs 34.1%, P = 0.007) was significantly higher in the macrosomia group[14]

A retrospective study on 9241 deliveries performed at maternity and children Hospital(MCH) Buradiah,Al-Qassim region, Kingdom of Saudi Arabia from January 1,2011-to December 30,2011 indicates the incidence of macrosomia 4.5%,PPH 1.2%,perineal tear 1.7%,cervical tear 0.7%,shoulder dystocia (9.6%) ,erbs palsy 0.96%,bone fracture (1.4%0,C/D 47.6[27].

2.2 SIGNIFICANCE OF THE STUDY

Now a days across the world the incidence of obesity dramatically increased in both developed nation and developing nations which also increases the incidence of diabetes mellitus and also the macrosomia.

Forthe mothers, there are complications related pregnancy with macrosomia and also affects the fetal and neonatal outcome.

In Ethiopia the incidence of grand multiparty and huge grand multiparty is too high that, the incidence of macrosomia is also high as the parity increases, the fetal weight also increases by 120 gram per parity.

By educating women to use modern family planning possible decrease the incidence of macrosomia and its maternal and neonatal complication.

This study helps the incidence of macrosomia in JUSH which was not done previously and also the birth outcome of macrosomia in JUSH.It is also provide information on the some of the risk factors associated with macrosomia.

Based on the result of this study it was possible recommend how to prevent the increased incidence of macrosomia and its complication once macrosomia suspected or diagnosed and also gives the care that given for the macrosomic baby in Health center,zonal hospital and specialized hospital in Jimma zone ,as well the region and the country. If macrosomia is suspected on clinical diagnosis at the facility where the Comprehensive obstetric and neonate is not given like Health Center,the health profession who works there should refer the patient to where the facility of CeMoc is given as a recommendation

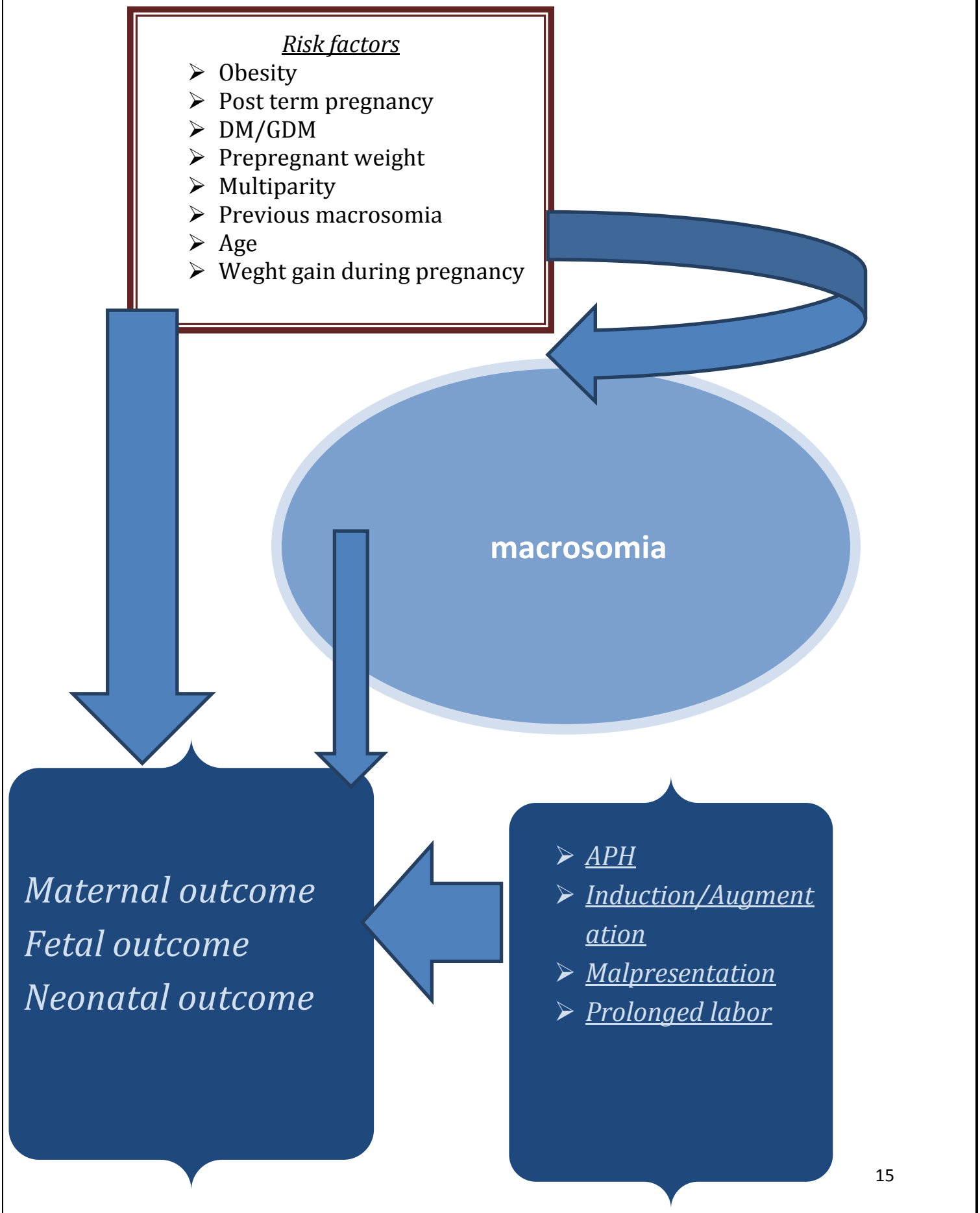
Risk factors
Obesity
Post term pregnancy
DM/GDM
Prepregnant weight
Multiparity
Previous macrosomia
Age
Weght gain during pregnancy
macrosomia
Maternal outcome
Fetal outcome
Neonatal outcome
APH
Induction/Augmentation
Malpresentation
Prolonged labor

Fig 1. Conceptual Frame work

It shows factors that effect of macrosomia and as well from factors that affects maternal outcome like DM ,and the impact of macrosomia on maternal outcome ,fetal outcome and neonatal outcome and as well factors other than macrosomia that affect the maternal, fetal and neonatal outcome

3. OBJECTIVES OF THE STUDY

3.1 General objective:

- To determine the incidence and outcome of macrosomic neonates in Jimma University Specialized Hospital

3.2 Specific objectives:

- To determine the incidence of macrosomia
- To assess risk factors associated with macrosomia
- To determine risk factors for poor maternal outcome
- To determine risk factors for poor fetal and neonatal outcome
- To compare the maternal complication of macrosomia with normal birth weight
- To compare fetal and neonatal complication of macrosomia with normal birth weight

4. METHODS and MATERIALS

4.1 Study area and period

. This study was conducted in the labor and neonatal ward of Jimma University specialized hospital from April 1 – December29, 2015. JUSH is found in Jimma Town which is located 335 Km Southwest of Addis Ababa, the capital of Ethiopia. Currently JUSH is the only teaching and referral hospital in the southwestern part of the country. It has 450 beds and more than 750 staff of both supportive and professional. It provides services for approximately 9000 inpatient and 80000 outpatient attendances per year coming to the hospital from the catchment population of about 15 million people and as well as the neighboring regions like Gambela and some parts of Southern nation nationalities and people regional state like Kafa zone, and Bench Maji zone. The hospital delivers health services in many specialty areas. These include pediatrics and child health, gynecology and obstetrics, surgery, internal medicine, ophthalmology, psychiatry, dentistry and so on. The maternity ward has 40 beds and six 1st stage rooms with 4 delivery couch. It has its own operation and recovery rooms next to the deliver.

Currently the ward is run by 8 specialists, 45 residents and 50 nurses.

4.2 Study design

A hospital based cohort study was conducted on mothers who came to labor ward at JUSH during the study period.

4.3.Study population

All sampled mothers who fulfill inclusion and exclusion criteria were included in the study. Mothers who delivered macrosomia were the exposed group and mothers who delivered normal birth weight were the non-exposed group

4.4 Inclusion and Exclusion criteria

4.4.1 **Inclusion criteria**

- all macrosomic neonate regardless of gestational age and outcome
- all birth weight from 2500 gram to 3999 gram regardless of gestational age and outcome

4.4.2 **Exclusion criteria**

- IUGR
- Congenital anomalies incompatible with life
- Conjoined twin
- For those Destructive delivery wasdone

4.5Sample size determination and sampling technique

From the previous recorded data the average delivery in JUSH was 350 per a month, and all the macrosomia delivery was included in the data with the exception of those included under exclusion criteria and normal birth weight selected as those delivered as the same time to macrosomia or the next nearest except those listed under exclusion criteria.

By considering the 95% confidence interval, at power of 80% taking research done at the Debre Birhan University, Ethiopia taking as reference [1]

$n=(z_1+z_2)^2p(1-p)/(p_1-p_2)^2$

Where;

Z_1 is 1.96 at 95% confidence interval

Z_2 is 0.84 at 80% power

P is the population and it is the average of $p_1+p_{2/2}$

P_1 is the population in the exposed group which is 26.6%, the significant complication compared with the controlled case and p_2 is the proportion in the control group which was 13.8% taken from Debre Birhan University as reference[1]

By feeding data into Epi info the sample size is 122 for case and 244 controlled case using ratio of 1:2

4.6 Study variables

4.6.1Independent variable

1. socio-demographic variables
    - Age
    - Family income

2. Obstetrics variables

- Parity
- Gestational age
- Duration of labor
- Previous macrosomia
- History of diabetes mellitus or GDM
- Induction /Augmentation
- Mal presentation

- APH
- PNA
- MAS
- Neonatal sepsis
- NRFHRP

4.6.2. Dependent variables

2.1 Fetal and Neonatal outcomes

- Poor fetal and Neonatal outcome
- Good fetal and Neonatal outcome

2.2 Maternal outcome

- Poor Maternal Outcome
- Good Maternal outcome

4.7 Data collection tool and techniques

Part one of the structured questionnaire for data collection which comprised of socio-demographic was collected by interviewing the selected mother and also some of part two the structured questionnaire filled by asking the mother.

After delivery, the neonate weight was measured by using the manual weighing scale after calibration (zeroing) was done. Then all the intrapartum condition which included progress of labor, intrapartum intervention, Intrapartum complication, mode of delivery, and complication during delivery, postpartum complication, neonatal condition, reason for referral to NICU, was collected from the woman chart and filled to the structured questionnaire.

The selected mother was followed until she was in the ward and possible complication identified was filled and also the neonates (alive) followed similar to the mother and those referred to NICU was followed by principal investigator and nurse assigned to NICU.

A structured questionnaire for data collection, women's chart, operation and delivery log books, took history of the patient with macrosomia and selected normal birth weight deliveries, patient specific demographic characteristics and information, intra partum and post-partum information on macrosomia and selected normal birth weight deliveries, recorded on the day of deliveries from patients' record and the managing team , when necessary.

The second year Obstetrics & Gynecology residents and six midwifery nurses were oriented on the data collection instruments. Laboring mothers were followed from the time of admission to time of delivery. In addition, each day the responsible ward nurse/resident approaches the mother and/or the fetus to found out any complication until discharge and the principal investigator followed the outcome of both the neonates of exposed and control and as well their mothers until discharged.

4.8 Data quality control

Pretest was made by collecting twenty questionnaires from the targeted group by interviewers. And crosscheck was made before actual data was collected. Questionnaires was prepared in English and revised by advisors, Data collectors were selected from obstetrics and gynecology resident's year- II and mid wifery nurses working at labor and maternity ward.

Vague points and other problems encountered about the questionnaire was given explanation and clarification. Close supervision was undertaken during data collection of residents assigned to labor and maternity ward were trained for on objective of the study every month based on rotation program , each variable on the questionnaire and record reviewing. Each questionnaire was crosschecked daily by the principal investigator.

4.9 Data analysis and presentation

After data collection each questionnaire was checked for completeness. Code was given before data entry. The collected data cleaned, fed to computer every day and finally after all data entry completed analysis was made using SPSS software program version 20. Results were presented by using tables and statistically tested. Chi-square test, Bivariate andmultivariate logisticregression was performed to see the existence of association between dependent and independent variables and outcomes. Final interpretation, discussion and recommendation weremade based on the findings of the research.

4.10 Ethical consideration

Ethical clearance was obtained from the Ethics Review Committee of the College of Public Health and Medical Sciences of Jimma University. Verbal

Informed consent was also obtained from every study participant before the interview by explaining the objective of the study. All the information

Collected from the study participants were handled confidentially through omitting their personal identification, conducting the interview in private place and using the data for the research purpose only.

4.11 Dissemination plan

The final findings of the study will be presented on annual research symposium of the university. Then it will be disseminated to; Jimma University Specialized Hospital, JU College of health sciences, Oromia Regional Health Bureau, the Federal Ministry of Health of Ethiopia, and different organizations that will help to improve and check the health service delivery in the hospitals of the country . And to the ability of the principal investigator all effort will be made to publish the findings in a scientific Journal.

4.12 Operational definition

APGAR: : A score >7 (5^{th} minute score) shows the well-being of neonate

Anemia- when the hct is less than 33% during pregnancy and post partum (WHO)

Asphyxia- defined when 5^{th} min APGAR score less than 3, features of organ damage

Birth weight :Weight of the newborn immediately after birth

<1000 gram ------extreme low birth weight

1000-1499 gram------very low birth weight

1500-2499 gram----- low birth weight

2500-3999 gram-------normal birth weight

4000-4499 gram-------grade 1 macrosomia

4500-4999 gram-------grade 2 macrosomia

≥ 5000 gram------- grade 3 macrosomia

BMI: body mass index (weight in kilogram per meter square)

-<18.5 kg/m^2-------under nutrition

-18.5-24.9 kg/m^2-------- normal birth weight

-25-29.9 kg/m^2----------overweight

-30-34.9 kg/m^2----------class I obesity

-35-39.9 kg/m^2----------class II obesity

$\geq$ 40 kg/m^2 ----------class III obesity

C/D: delivery of the fetus, placenta and fetal membrane by an incision made on the abdominal wall and on an intact gravid uterus after 28 completed weeks of GA.

Erb's palsy-The C5–6 roots join to form the upper trunk of the plexus, and injury leads to paralysis of the deltoid, infraspinatus, and flexor muscles of the forearm.

GDM;is impaired glucose tolerance detected during pregnancy

Hypoglycemia-random blood sugar is below 50gm/dl in term neonate

Klumpke's palsy-Damage to the C8-T1 roots supplying the lower plexus results 1in Klumpke paralysis, in which the hand is flaccid.

lb(pound) –measurement of weight and 1ib is 0.45359 kg

Maternal outcome

-***Poor maternal outcome***--------when there was at least one of the following complication

I. Obstructed labor
II. Cephalopelvic disproportion
III. Post partum hemorrhage
IV. Hysterectomy

-***Good maternal outcome***-------- when there was none of the above listed complication

McRoobert maneuver-This procedure relieves shoulder dystocia via marked cephalad rotation of the symphysis pubis and subsequent flattening the sacrum, thus removing the sacral promontory as an obstruction site

Multipara- when there is delivery of two or more after time of viability regardless of outcome

-*Grand multipra*- delivery of five or more after time of viability regardless of otcome

-*Huge grand multipara*- delivery of ten or more after time of viability regardless of outcome

Neonatal and Fetal outcome

-***Poor neonatal and fetal outcome***------when there was at leat one the following complication

I. Neonatal Hypoglycemia
II. Still birth
III. Neonatal death

-***Good neonatal and fetal outcome***-------none of the above listed complication

Non spontaneous mode of delivery —when labor started with induction ,elective or emergency
Perineal tear: tear that occurred to perineal area associated with delivery

First perineal degree tear: laceration limited to the fourchette or superficial perineal skin or vaginal mucosa

Second degree perineal tear: laceration extends beyond fourchette, perineal skin and vaginal mucosa to perineal muscles and fascia, but not the anal sphincter

Third degree perineal tear: fourchette, perineal skin, vaginal mucosa, muscles, and anal sphincter are torn; third-degree tears may be further subdivided into three subcategories:[3]

3a: partial tear of the external anal sphincter involving less than 50% thickness

3b: greater than 50% tear of the external anal sphincter

3c: internal sphincter is torn

Fourth degree perineal tear: fourchette, perineal skin, vaginal mucosa, muscles, anal sphincter, and rectal mucosa are torn

PPH-Bleeding which occurs after the delivery of the fetus/es defined as more than 500ml forsingleton vaginal delivery, more than 1000ml after cesarean delivery or twin vaginal delivery ormore than 1500ml after peripartum hysterectomy, vital sign derangement or hematocrit drop ofmore than 10% from the baseline value

Prolonged labor:when the duration of labor exceeds 18 hours(WHO)

Prolonged second stage of labor: when the multigravida mother stays one hour or more in the second stage and when the primigravida stays two hours or more in second stage

Rubin maneuver-The Rubin maneuver causes adduction of the fetal shoulder so that the shoulders are displaced from the anteroposterior diameter of the inlet, thereby allowing the posterior arm to enter the pelvis,Under adequate anesthesia, the clinician places one hand in the vagina and on the back surface of the posterior fetal shoulder, and then rotates it anteriorly (towards the fetal face)

Shoulder dystocia-Shoulder dystocia is best defined as the need for additional obstetric maneuvers to effect delivery of the fetal shoulders at the time of vaginal delivery, usually when exceeds more than 60 seconds between delivery of head and shoulder

Term pregnancy-when gestational age is from 37 completed weeks to 41^{+6} weeks

Preterm pregnancy- when gestational age is less than 37 completed weeks

Post term pregnancy- when gestational age is equal or above 42 weeks

Weight gain in pregnancy----weight gain from conception to delivery

Wood's maneuver-The Woods screw maneuver rotates the fetus by exerting pressure on the anterior, clavicular surface of the posterior shoulder to turn the fetus until the anterior shoulder emerges from behind the maternal symphysis

Zavanelli maneuver--- This procedure, also known as the Gunn-Zavanelli-O'Leary maneuver, requires replacement of the fetal head in the pelvis, followed by cesarean delivery

5. RESULT

Three thousand six hundred fifty eight (3,658) mothers admitted to Labor ward from April 1 to December 30, 2015 and there was 122 Macrosomia in the given period and 100% of the sample achieved and also from 3536 Normosomic deliveries 244 normal delivery selected and 100% of the sample achieved.

5.1 SOCIO-DEMOGRAPHIC CHARACTERTICS

Most of the respondents were Oromo by Ethnicity 269(73.4%) and Muslim was the predominant religion, 248(67.5%).

Fifty three(43.4%) and 89 (36.5) of Macrosomia and Normosomia mothers were in the age group of 25-29 and 20-24 years respectively .The Mean age of Macrosomia group 27.16±5.02 (18-42 yrs.,) and of Normosomia the Mean age was 25.41±4.98(16-40 yrs).
Three (2.5%) and sixteen(13.1%) of Macrosomia group was age of below nineteen years and above or equal to thirty five years respectively while eighteen(7.4%) and seventeen(7%) of Normosomia was in the age group of below nineteen and above or equal to thirty five years respectively.

Majority of mothersoccupation were house wives,72(59%) and 172(70.5%) in Macrosomia and Normosomia and also majority of them earns 1000and above ETB 300(82%) per a month which was above the poverty line as per scale of the country and sixty six (18%) of earns below the poverty line.

Forty one (33.6%) and 79(32.8%) of mothers in Macrosomia and Normosomia group cannot read and write and 68(56%) which constitutes the largest group and only 19(15.6%) of Macrosomia group and 28(11.5%) of Normosomia group had Diploma (10^{+3})and above respectively.

Majority of Macrosomia group came from Rural 68(56%) and of Normosomia group came from also from Rural 131(53.7%).(See details in Table 1)

Table 1. Socio-demographic characteristics of the Macrosomic and Normosomic deliveries, in Jimma University Specialized Hospital, Southwest Ethiopia, April to December, 2015

SOCIO-DEMOGRAPHIC VARIABLES		EXPOSURE STATUS		
		MACROSOMIA n=122(n%)	NORMOSOMIA (n=244(n%)	Total n=366(n%)
Age of mothers in years	≤19	3(2.5)	18(7.4)	21(6)
	20-24	29(23.8)	89(36.5)	118(32)
	25-29	53(43.4)	79(32.4)	132(36)
	30-34	21(17.2)	41(16.8)	62(17)
	≥35	16(13.1)	17(7)	33(9)
Ethnicity	Oromo	86(70.5)	183(75)	269(73.4)
	Amhara	18(14.8)	32(13.1)	50(13.7)
	Gurage	14(11.5)	1(0.4)	15(4.1)
	Dawuro	2(1.6)	18(7.4)	20(5.5)
	Others*	2(1.6)	10(4.1)	12(3.3)
Religion	Muslim	78(63.9)	170(69.7)	248(67.75)
	Orthodox	34(27.9)	58(23.8)	92(25.14)
	Protestant	10(8.2)	16(6.5)	26(7.11)
Occupation	House Wife	72(59)	172(70.5)	244(66.7)
	Farmer	10(8.2)	19(7.8)	29(7.9)
	Merchant	22(18)	21(8.6)	43(11.7)
	Civil Servant	18(14.8)	32(13.1)	50(13.7)
Educational status	Cannot Read and Write	41(33.6)	79(32.3)	120(32.8)
	Can Read and Write	8(6.6)	29(11.9)	37(10.1)
	Grade1-8	27(22.1)	62(25.4)	89(24.3)
	Grade9-10	21(17.2)	39(16)	60(16.4)
	Diploma(10^{+})	19(15.6)	28(11.5)	47(12.8)
	Degree and Above	6(4.9)	7(2.9)	13(3.6)
Address	Urban	54(44)	113(46.3)	167(45.6)
	Rural	68(56)	131(53.7)	199(54.4)
House Hold Income	<1000 Birr	21(17.3)	45(18)	66(18
	≥1000 Birr	101(82.8)	199(82)	300(82)

Others*------ includes Yem, Tigre, Welyitta

5.2 OBSTETRICS ANTEPARTUM VARIABLES

Eighty one(66.4%) of Macrosomia group and 128(52.5%)ofNormosomiagroup was Para two and above and the mean parity of Macrosomia group and Normosomia2.91 and 2.15±1.63 (1-11) respectively and forty one (33.6%) and one hundred sixteen (47.5%) of Macrosomia and Normosomia groups were Para one.

Majority of Macrosomia and Normosomia group had ANC follow up 119 (97.5%) and 223 (94.1%)respectively and majority of them had four times which was recommended as by WHO. Gestational age based on LNMP, early Obstetric Ultrasound parameters and Ballard score 92(75.4%) and 148(60.7%) term, 2(1.6%) and 12(4.9%) pre term, 4(3.3%) and 9(3.7%) post term of Macrosomia and Normosomia group respectively and while 99(27%) of total did not know their gestational age based on the above parameters.

Only 33(27%) and 17(13.9%) of Macrosomia group and 42(17%) and 3(1.2) of Normosomiagroup knew their pre pregnant weight and had history of macrosomia in their previous deliveries respectively and there was only one diabetic mother in Macrosomia group and there was no known diabetic mellitus or GDM in Macrosomia group and 37(10.1%) of Macrosomia suspected before delivery and 32(86.5%) confirmed to be macrosomia after delivery.

One hundred twenty one (99.18%) were singleton deliveries and one (0.82%) was twin delivery (TA) from Macrosomia group and 241(98.77%) were singleton while 3(1.23%) of Twin deliveries in Normosomiagroup.

Majority of Macrosomia and Normosomiagroup presented in vertex 101(82.8%) and 222(90.6%) during labor respectively (Details Table 2)

Table2. Obstetrics variables of Macrosomic and Normosomic deliveries, inJimma University Specialized Hospital, Southwest Ethiopia, April 2015 to December 2015.

OBSTETRICS VARIABLE		EXPOSED STATUS		
		MACROSOMIA n=122(n%)	NORMOSOMIA n=244(n%)	Total, n=366(n%)
Parity	1	41(33.6)	116(47.5)	157(43)
	≥2	81(66.4)	128(52.5)	209(57)
Gestational Age	<37 weeks	2(1.6)	12(4.9)	14(4)
	37-42 weeks	92(75.4)	148(60.7)	240(65.5)
	≥ 42 weeks	4(3.3)	9(3.7)	13(3.5)
	Unknown	24(19.7)	75(30.7)	99(27)
ANC follow up	YES	119(97.5)	223(91.4)	342(93.4)
	NO	3(2.5)	21(8.6)	24(6.6)
PrePregnant	YES	33(27)	42(17)	75(20.5)
Weight	NO	89(73)	202(83)	291(79.5)
Previous	YES	17(13.9)	3(1.2)	20(5.5)
Macrosomia	NO	105(86.1)	241(98.8)	346(94.5)
DM	YES	0	1(0.4)	1(0.4)
	NO	122(100)	243(99.6)	365(99.6)
Suspected Macrosomia before delivery	YES	32(26.2)	5(2.04)	37(10.1)
	NO	90(73.8)	239(97.96)	329(89.9)
Presentation	Vertex	101(82.8)	221(90.6)	322(88)
	Breech	7(5.7)	8(3.3)	15(4.1)
	Transverse	2(1.6)	5(2)	7(1.9)
	Face	3(2.5)	2(0.8)	5(1.4)
	Brow	2(1.6)	2(0.8)	4(1.1)
	Parietal presentation	2(1.6)	1(0.4)	3(0.8)
	Compound	0	2(0.8)	2(0.5)
	Un known*	5(4.2)	3(1.3)	8(2.2)
Number of fetus	Singleton	121(99.2)	241(98.8)	362(98.9)
	Twin	1(0.8)	3(1.2)	4(1.1)

5.3 OBSTETRICS INTRAPARTUM VARIABLES

In majority of mothers in Macrosomia group, 115(94.3%) and Normosomia group 229(93.9%) labor was started spontaneously and 9(7.4) in Macrosomia group and 14(5.7%) Normosomia group labor was augmented for arrest and protracted cervical dilatation due to poor uterine contraction five (55%) in Macrosomia group and prolonged latent phase six (42.9%) in Normosomia.

Seventy Seven (63.1 %)was delivered by cesarean delivery in Macrosomic group and 78(32%) was delivered by cesarean section in Normosomic group and spontaneous vaginal delivery was the next mode of delivery after cesarean delivery in Macrosomic group.
Laparotomy (total abdominal hysterectomy) was done for uterine rupture for six and two in Macrosomic group and Normosomic group respectivelyas well as instrumental delivery rate was 13 (10.6%) in Macrosomic group and 14 (5.7%) in Normosomic group.
.(SeeDetails Table 3)

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Table3. Intrapartumobstetrics variables of Macrosomic and Normosomic deliveries, in Jimma University Specialized Hospital, Southwest Ethiopia, April 2015 to December 2015

INTRAPARTUM OBTETRICS VARIABLE		EXPOSED STATUS MACROSOMIA n=122(n %)	NORMOSOMIA (n=244(n %)	Total n=366(n %)
Labor Initiation	Spontaneous	115(94.3)	229(93.9)	344(94)
	Induced	7(5.7)	15(6.1)	22(6)
Augmentation	YES	9(7.4)	14(5.7)	23(2.3)
	NO	113(92.6)	230(94.3)	343(93.7)
Mode of Delivery	Spontaneous Vaginal Delivery	26(21.3)	150(61.5)	176(48.1)
	FAVD	12(9.9)	11(4.5)	23(6.3)
	VAVD	1(0.8)	3(1.2)	4(1.1)
	Cesarean Delivery	77(63.1)	78(32)	155(42.3)
	Laparotomy	6(4.9)	2(0.8)	8(2.2)
Reason for Induction	Post term pregnancy	3(43)	7(47)	10(45.4)
	PROM/Chorioamnionitis	2(28.5)	6(40)	8(36.4)
	Other*	2(28.5)	2(13)	4(18.2)
Reason for Augmentation	Arrest/Protracted of Cervical Dilatation	5(55)	5(35.7)	10(43.5)
	Prolonged Latent Phase	3(33)	6(42.9)	9(39.1)
	Prolonged 2nd stage	1(11)	3(21.4)	4(17.4)
Indication for Instrumental Delivery	NRFHRP	4(30.7)	8(57)	12(44.4)
	To shorten 2nd stage	7(53.8)	3(21.5)	10(37)
	Prolonged 2nd stage	2(15.5)	321.5)	5(18.6)
Indication for Cesarean Delivery	NRFHRP	11(14.4)	32(41)	43(27.7)
	CPD	7(9.1)	11(14.1)	18(11.6)
	Obstructed labor	16(20.7)	12(15.4)	28(18.1)
	Others**	43(55.8)	23(29.5)	66(42.6)

Other*-------Preeclampsia, Eclampsia, Term APH of unknown origin

Others**----Prolonged Latent plus Grade III MSAFL, Breech Plus Big Baby----

5.3.1. **Result incidence of Macrosomia**

A total of 3568 deliveries had been happened during the Study period. The incidence rate of macrosomia deliveries (4000 g and Higher) was 3.3% (122/3658). The rate of the deliveries with 4500 g and heavier (Grade II Macrosomia) was 0.35% (22/3658) and 5000 g or heavier (Grade III Macrosomia) was 0.05% (2/3658)

The mean birth weight was 4217.1±260 g (4000-5000 g) and 3109±355 g (2500-3900g) in the Exposed and Non-Exposed group respectively.

The heaviest newborn of the study group was 5000 g (See Table 4)

Table4. Birth weight outcome Macrosomic and Normosomic deliveries, Jimma University Specialized Hospital, Southwest Ethiopia,April 2015 to December 2015

		MACROSOMIA, n=122(n%)	(NORMOSOMIA), n=244(n%)	Total, n=366(n%)
Sex	M	100(82)	125(51.2)	225(61.5)
	F	22(18)	119(48.8)	141(38.5)
	Mean (in gram	4217.1±260.44	3109.43±354.94	3478.69±616.30
	Median(in gram)	4100	3100	3400
	Minimum(gram)	4000	2500	2500
	Maximum(gram)	5000	3900 gram	5000

Below Table shows that the incidence of macrosomia neonates in total delivery (n=3658) admitted Jimma University Specialized Hospital in the study period.

Table5. Grades of Macrosomic neonates Jimma University Specialized Hospital, Southwest Ethiopia,April 2015 to December 201

Grade	Grade I	GradeII	Grade III
n=122	98	22	2
N=3658	2.67%	0.6%	0.05%

Below Fig. shows that the distributions of macrosomia grades within total macrosomia (n=122) neonates in the study period.

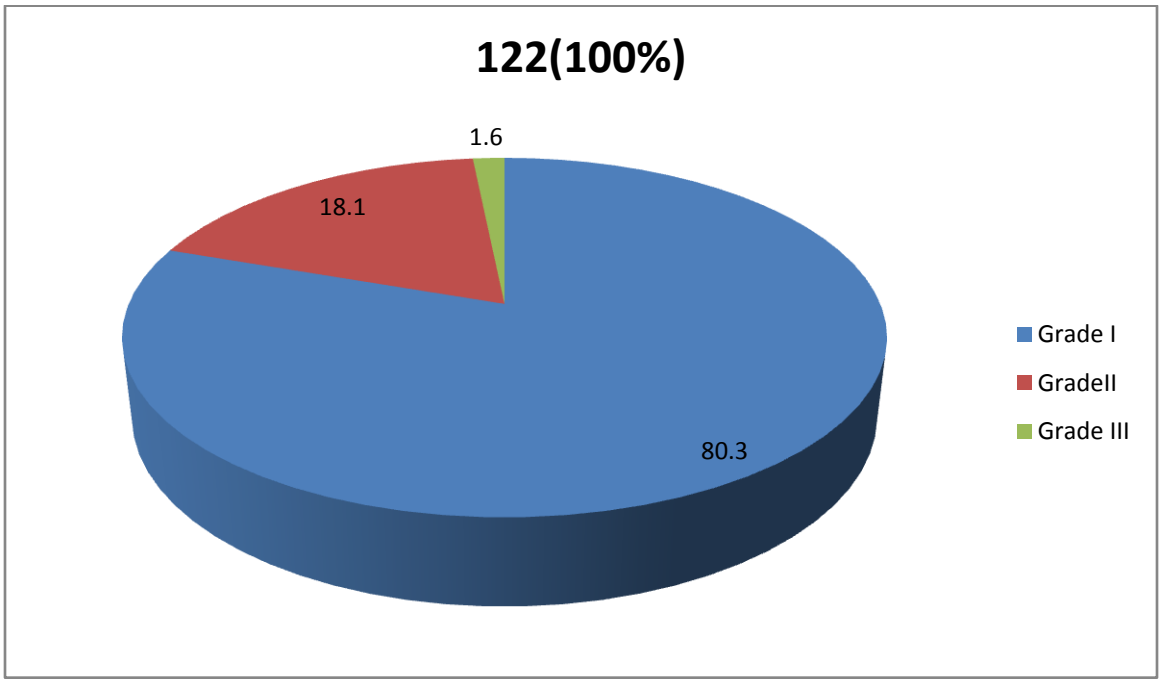

Fig 2. Distribution of Grades of Macrosomia, Jimma University Specialized Hospital April-December 201

5.4 RISK FACTORS IDENTIFIED FOR MACROSOMIA

Sex of the neonate, PrePregnant weight greater than or equal to 70Kg ,type of presentation, previous history of macrosomia, parity , age greater than or equal to 35 years variables were included in multivariate analysis when their P value was less than 0.25 in Bivariate result and family income and gestational were excluded from the multivariate analysis based on the criteria described as above.

Being a male sex was six times a risk factor for Macrosomia as, ARR=5.91(95%CI;1.68-20.07).

age greater than or equal to 35 years 0.6 times associated with macrosomia but was not stastically significant, ARR=0.66(95%CI;0.05-9.05)

Having weight greater or equal to 70 kg, 19(15.6%) and 12(4.9%) before pregnancy had 0.4 times association but stastically not significant, ARR=0.39(95%CI; 0.12-1.26)

Para ≥2 was three times association with macrosomic deliveries but stastically was not significant, ARR= (95%CI; 0.95-10.08)

Having history of previous macrosomic delivery has been associated four to five times with current macrosomia delivery though it was not stastically significant.

(Details Table 6)

Table6. Risk factors of Macrosomia deliveries in Jimma University Specialized Hospital, Southwest Ethiopia, April 2015 to December 2015

Variables		Outcomes	Bivariate Results	Multivariate Results
		Macrosomia(%)	RR (95%CI)	ARR (95%CI)
Gestational age	Post term	4(3.3)	0.75	
	Term	92(75.4)	(0.17-2.71)	
Sex(Male/Female)	Male	100[82	0.62(0.54-0.072)	**5.91 (1.68-20.07**)
	Female	22(18)		
PrePregnant Weight greater than 70 Kg(yes/no	Yes	19(57.6)	1.67(1.07-2.59)	0.39 (0.12-1.26)
	No	14(42.4)		
Presentation	Vertex	101(82.8)	0.48(0.28-0.84)	0.17 (0.03-1.02)
	Non vertex	16(13.1)		
Previous history of macrosomia delivery	Yes	32(26.)	1.07(0.98-1.16)	4.45 (0.39-50.03)
	No	90(73.8)		
Parity	≥2	81(66.4)	0.18(0.03-0.29)	3.11 (0.96-10.08)
	1	41(33.6)		
Age	≥ 35	14(11.5)	0.61(0.31-1.19)	0.66 (0.05-9.05)
	<35	108(88.5)		
Family income	≥1000	101(82.8)		
	<1000	21(17.2)		

5.5 MATERNAL OUTCOME

5.5.1 Risk factors for poor maternal outcome

From the study participants 77(21.04%) had poor maternal outcome while 289(78.96%) had good maternal outcome.

Birth weight, parity , Gestational age, Malpresentation ,genital trauma variables were included in the multivariate analysis because their P value under Bivariate analysis was ≤ 0.25 ,while the above mentioned variables as well instrumental delivery, Induction/Augmentation, APH, age were also included as possible risk factors but their P Value was greater than 0.25 under Bivariate analysis .

Mal presentation (other than vertex) was associated four times higher poor maternal outcome ARR= 3.73 (95% CI:1.70-8.18) ,Genital trauma four to five times risk factor for poor maternal and stastically significant, ARR=4.5 (95% CI :1.15-17.8) and Macrosomia was seven times risk factor for poor maternal outcome at ARR=6.58(95%CI:3.64-11.90)

Para 2 and above was 51(66.2%) and 158 (54.67) was 1.2 times higher in poor maternal outcome but stastically not significant, ARR=1.25(0.68-2.25)

Post term pregnancy was three times associated with .poor maternal outcome even though stastically not significant, ARR=2.95(95% CI; 0.74-11.81)

(See Table 7)

Table7. Risk factors of associated with poor maternal outcome inJimma University Specialized Hospital, Southwest Ethiopia, April 2015 to December 2015

Variables		Maternal outcome		Bivariate Results	Multivariate Results
		Poor (n=77)	Good (n=289)	RR (CI)	RR(CI)
Birth Weight	Macrosomia	53	69	1.7	**6.58**
	NBW	24	220	(1.69-1.78)	**(3.64-11.90)**
Parity	P≥ 2	51	158	0.9	1.25
	P=1	26	131	(0.62-1.6)	(0.68-2.25)
Gestational age	Post term	3	10	0.5	2.95
	Term	59	224	(0.40-0.87)	(0.74-11.81)
Instrumental	Yes	6	30	0.7	
delivery	No	71	259	(0.32-1.74)	
Malpresentation	Yes	18	22	4.4	**3.73**
	No	58	267	(4.03-14.1)	**(1.70-8.18)**
Induction /	Yes	6	32	1.04	
Augmentation	No	71	257	(0.96-1.11)	
APH	Yes	3	14	0.80	
	No	74	275	(0.24-2.73)	
Genital Trauma	Yes	6	7	3.2	**4.5**
	No	71	282	(1.11-9.29)	**(1.15-17.8)**
Age				0.79(0.5-2.86)	

5.5.2 **Maternal complication**

The major maternal complications were significantly higher among macrosomic deliveries as compared with normosomic deliveries; perineal tear which includes first and second degree 27(75 %)vs. 74(45.1%) (RR =3.65; 95%CI: 2.31, 5.6), obstructed labor 16(13.1)Vs 12(4.9%)(RR=2.92; 95%CI: 1.37-6.3) were stastically significant at p=0.000.

Cesarean delivery was done in77 (63.1%) of macrosomic deliveries was four times higher than 78(32%)of normosomic which was stastically significant (RR=3.64; 95%CI: 2.65-4.99), instrumentaldelivery was two time higher in macrosomic group 13(10.7 %) Vs 14(5.7%)(RR=1.96; 95%CI: 0.9-4.22), post-partumhemorrhage (immediate) 21(17.2%) Vs3(1.2%)(RR=16.7; 95%CI=4.98-87.46) seventeen times higher in macrosomic and normosomic deliveries respectively and all the complications except instrumental delivery were stastically significant.

The risk of Puerperal sepsis and anemia was five times and four times higher in macrosomic deliveries than normosomic deliveries (18(14.8%) Vs 8(3.3%), RR=5.11; 95%CI=2.25-12.44),(49(62.8%) Vs34 (45.9%), RR=3.77; 95% CI: 1.29-4.14) respectively.

Obstetric fistula (Vesico-vaginal fistula) 2(1.6%)vs 2(0.8%)(RR=2.02 ;95%CI:0.14-27.8),surgical wound infection3(3.5 %)Vs 1(1.2%)(RR=2.85;CI:0.23-149.9),Adult ICU admission 3(2.5%) Vs 1(0.4%)(R=6.12;95%CI:0.49-321.6) not stastically significant between two groups

The long duration Hospital stay of mothers of macrosomia delivery was higher (mean 83.48±65.34 hrs.(6-336 hrs.) and of Normosomia mothers was mean 34.13±42.9 hrs.(4-168 hrs.) at P=0.000 ,t(364)=8.65

Case fatality rate of macrosomic mothers was 0.8 % and she was died of failed intubation and later developed hypoxic brain injury and passed away after she stayed 8 hrs.

In the ICU on mechanical ventilation, she was pare 1 and delivered by Cesarean section and outcome was still birth. (See Table 8)

Table8. Maternal complications, in Jimma University Specialized Hospital, Southwest Ethiopia, April 2015 to December 2015

MATERNAL OUTCOME		MACROSOMIA, n(n%)	NORMOSOMIA, n(n%)	Total, n(n%)	P-Value	RR(95%CI)
PERINEAL TEAR	YES	27(75)	74(45.1)	101(50.5)	0.000	3.65(2.31-5.62)
	NO	9(25)	90(54.9)	99(49.5)		
CPD	YES	17(68)	8(32)	25(6.8)	0.000	2.21(1.62-3.02)
	NO	105(30.8)	236(69.2)	341(93.2)		
OBSTRUCTED LABOR	YES	16(13.1)	12(4.9)	28(7.7)	0.005	2.92(1.37-6.33)
	NO	106(86.9)	232(95.1)	328(92.3)		
CESEARAN DELIVERY	YES	77(63.1)	78(32)	155(42.3)	0.000	3.64(2.65-4.99)
	NO	45(36.8)	166(68)	211(57.7)		
POST PARTUM HEMORRHAGE	YES	21(17.2)	3(1.2)	24(6.6)	0.000	16.7(4.98-87.46)
	NO	101(10.8)	241(98.8)	342(93.4)		
INSTRUMENTAL DELIVERY	YES	13(10.7)	14(5.7)	27(7.3)	0.087	1.96(0.90-4.22)
	NO	109(89.3)	230(94.3)	339(92.7)		
PUERPERAL SEPSIS	YES	18(14.8)	8(3.3)	26(7.1)	0.000	5.11(2.25-12.44)
	NO	104(85.2)	236(96.7)	340(92.7)		
ANEMIA	YES	49(62.8)	34(45.9)	83(54.6)	0.000	3.77(1.29-4.14)
	NO	29(37.2)	40(54.11)	69(45.4)		
OBSTETRIC FISTULA	YES	2(1.6)	2(0.8)	4(1.1)	0.808	2.02(0.14-27.8)
	NO	120(98.4)	242(99.2)	362(98.9)		
SURGICAL SITE INFECTION	YES	3(3.5)	1(1.2)	4(2.4)	0.662	2.85(0.23-149.9)
	NO	83(96.5)	79(98.8)	162(97.6)		
ICU ADMISSION	YES	3(2.5)	1(0.4)	4(1.1)	0.214	6.12(0.49-321.6)
	NO	119(97.5)	243(99.6)	362(98.9)		
MATERNAL OUTCOME	ALIVE	121(99.2)	244(100)	365(99.7)		
	DEAD	1(0.8)	0	1(0.3)		

5.6 FETAL and NEONATAL OUTCOME

5.6.1. Risk factors for poor fetal and neonatal out come

From 366 groups of study 44 (12.02%) had poor fetal and neonatal outcome while 322(87.98%) had good fetal and neonatal outcome.

Birth weight, PNA, MAS, neonatal sepsis, NRFHRP, sex were the variables associated with poor fetal and neonatal outcome included in the multivariate analysis and in addition to the above criteria gestational age included in bivariate analysis but not in multivariate analysis because the P value was greater than 0.25.

Macrosomia was associated with poor outcome 32(72.7%) seven times higher than of good outcome 12(3.7%) and statically not significant. ARR=7.13(95%CI; 2.34-21.71).

PNA4(9.1%) vs 4(1.24%) was associated 1.2 times with poor fetal and neonatal outcome, ARR=1.19(95% CI; 0.17-8.49) while neonatal sepsis 9(20.45%) vs 13 (4.04%) four to five times higher in poor outcome but both stastically not significant, ARR=4.49(0.93-21.62).

MAS 9 (20.45%) vs 12(3.73 %) was associated four times, ARR=4.03(95%CI: 0.75-21.59)and male sex was associated two times, ARR=2.11(95%CI; 0.59-7.45) with poor fetal and neonatal outcome but stastically significant.

NRFHRP 10(22.7%) vs 48(14.91%) was two times higher in poor fetal and neonatal outcome but stastically not significant ARR=2.02(95%CI; 0.67-6.16).

Table9. Risk factors for poor neonatal outcome, in Jimma University Specialized Hospital, Southwest Ethiopia, April 2015 to December 2015

Variable		Fetal and Neonatal outcome		Bivariate result	Multivariate result
		Poor (n=44)	Good (n=322)	RR (95%CI)	ARR(95%CI)
Birth weight	Macrosomia	32	44	2.6 (2.02-3.35)	**7.13 (2.34-21.71)**
	Normosomia	12	90		
PNA	Yes	4	4	12 (3.28-46.89)	1.19 (0.17-8.49)
	No	22	318		
MAS	Yes	9	12	9.28 (4.31-19.98)	4.03 (0.75-21.59)
	No	17	310		
Neonatal sepsis	Yes	9	13	8.57 (4.05-18.15)	4.49 (0.93-21.62)
	No	17	308		
NRFHRP	Yes	10	48	1.52 (0.83-2.79)	2.02 (0.67-6.16)
	No	34	274		
Gestational age	Yes	9	0	0.79 (0.68-0.92)	
	No	35	322		
Sex	M	34	191	1.89 (1.85-1.92)	2.11 (0.59-7.45)
	F	10	131		

5.6.2 Fetal complications

The risk of Birth trauma in macrosomic fetus was 8.5 times higher than that of normosomic fetus 14(12.7%) Vs 4(1.7%)(RR=8.53; 95%CI=2.94-30.11) which includes cephal hematoma in majority followed by subgeleal hemorrhage and facial bruises and facial palsy.

Thirty five (31.8 %of macrosomic fetus and 25.4% of normosomic fetus had low 1st min Apgar score and as well 7(6.4 %)of macrosomic fetus and 6(4.6%) of normosomic fetus had low fifth min Apgarscore, for whom advanced resuscitation was done for 13(11.8%) of macrosomic fetus and 20(8.4 %) for Normosomic fetus but statistically not significant

NRFHRP (fetal bradycardia and tachycardia) was 20(16.4%)Vs 38(15.6%)in macrosomicfetus and normosomic fetus for whom in majority cesarean delivery was done not stastically significant(RR=1.06;95%CI:0.61-1.82)

Still birth rate was four times in macrosomic fetus than normosomic fetus 12(4.9%) Vs6(2.5%)(RR=4.32;95%CI:1.5-14.05)(Details Table 10)
Perinatal mortality rate for macrosomia was 4.65 per 1000 deliveries while for Normosomia it was 2.19 per 1000 deliveries

Table10. Fetal complicationsin, Jimma University Specialized Hospital, Southwest Ethiopia, April 2015 to December 2015

Fetal complications		Exposure status MACROSOMIA n(n%)	NORMOSOMIA n(n%)	Total, n(n%)	P-Value	RR (95%CI)
Out come	alive	110(95.1)	238(97.5)	348(95.1)	0.005	4.32
	dead(SB*)	12(4.9)	6(2.5)	18(4.9)		(1.50-14.05)
1st min APGAR score	<7	35(31.8)	63(25.4)	98(28.2)	0.222	1.29 (0.83-1.99)
	≥ 7	75(68.2)	175(73.5)	250(71.8)		
5th min score APGAR	<7	7(6.4)	11(4.6)	18(5.2)	0.487	1.40 (0.51-3.63)
	≥ 7	103(93.6)	227(95.4)	330(94.8)		
Advanced resuscitation	yes	13(11.8)	20(8.4)	33(9.5)	0.291	1.46
	no	97(88.2)	218(91.6	315(90.5)		(0.71-2.93)
Birth trauma	yes	14(12.7)	4(1.7)	18(5.2)	0.000	8.53
	no	96(87.3)	234(98.3)	330(94.80		(2.94-30.11)
NRFHRP*	yes	20(16.4)	38(15.6)	58(15.8)	0.816	1.06
	no	102(83.6)	206(84.4)	308(84.2)		(0.61-1.82)

SB* --------Still Birth

NRFHRP*------ Non Reassuring Fetal Heart Rate Pattern

5.6.3 **Neonatal complications**

Hypoglycemia and neonatal sepsis was ten times and three times higher in macrosomic neonates than normosomic neonates16 (14.5%) vs 4(1.7%), 12(10.7%) Vs10(4.2 %) (RR=9.96; 95%CI: 3.21-40.93, RR=2.79; 95%CI: 1.11-7.214) respectively.
MAS 10(9.1%) vs 11(4.6%) was two time higher in Macrosomia group to Normosomia group at P value =0.150, RR=2.06; CI 0.79-5.35

Forty (40%) of macrosomic neonate referred to NICU ,5(4.5%) of them died after they stayed from 3hrs-13 days with possible cause of death two of them multiorgan failure,3 underlying illness(respiratory failure and sepsis and 26(10.6%) of normosomic admitted to NICU and 2(0.2%) of them died from multi organ failure after stayed 3 and 5 days in NICU but stastically not significant(RR=5.62; 95%CI: 0.92-59.01) (Details Table 11)

Table11. Neonatal complications, Jimma University Specialized Hospital, Southwest Ethiopia, April 2015 to December 2015

Neonatal Complications		Exposed status				
		MACROSOMIA n=100(n %)	NORMOSOMIA (n=238(n%)	Total, n=348 (n %)	P-Value	RR (95%CI)
PNA*	Yes	6(5.5)	2(0.8)	8(2.3)	0.025	6.81 (1.21-68.97)
	No	104(94.5)	236(99.2)	340(97.7)		
MAS*	Yes	10(9.1)	11(4.6)	21(6)	0.150	2.06 (0.795.35)
	No	100(90.9)	227(95.4)	327(94)		
Hypoglycemia	Yes	16(14.5)	4(1.7)	20(5.7)	**0.000**	**9.96 (3.21-40.93)**
	No	94(85.5)	234(98.3)	328(94.3)		
Neonatal Sepsis	Yes	12(10.7)	10(4.2)	22(6.3)	0.028	2.79 (1.11-7.214)
	No	100(89.3)	227(95.8	327(93.7)		
Neonatal out come	Alive	105(95.5)	236(99.2)	341(98)	0.062	5.62 (0.92-59.01)
	Dead	5(4.5)	2(0.2)	7(2)		

PNA*----------Perinatal Asphyxia

MAS*---------Meconium Aspiration syndrome

6. DISCUSSION

6.1 Incidence of Macrosomia

The study evaluated the incidence rate of macrosomia, risk factors and its maternal and neonatal complications during 10 months period. This study showed that the incidence of macrosomia was 3.3% during the study period and .the incidence of birth weight heavier than 4500 gram was 0.6%.was comparable with different studies.

.The incidence of macrosomia varies from different countries to countries and generally it was ranges from 3-15%.[1,2,3,4,7,19,25,27]

Though study which was done in Bale, Ethiopia was higher than our finding,10.7% in other Africa countries seems comparable,2.9% in Nigeria(7) ,4.2% Northern Nigeria(36),3.8%in Sudan(),5.8% in Turkey(2) and Saudi Arabia 4.5%(3,4,27), 3.4% in University of Transkei, Eastern Cape (34)

The prevalence of birth weight 4500 g or above was 0.84% in Tehran, 1.4% in Parkland Hospital (19)

6.2 **Risk factors for Macrosomia, Poor Maternal outcome, fetal and Neonatal outcome**

In this study the mean age of macrosomic mothers was 27.16 yrs while of control group was 25.41,so that as the age increases the risk of macrosomia also increases and being a male increases the risk of macrosomia by seven times.(RR=6.91, 95% CI

A study done by Essel JK on 348 pregnancies show that male infants had a higher risk for macrosomia(34), done in Istanbul, Turkey showed being a male was a risk factor macrosomia(5) Study done in Algeria showed macrosomia as a risk factor of neonatal morbidity por maternal outcome,4.55%(11)(5,6).

6.3 **Maternal complications**

In our study macrosomia has been associated with maternalcomplication which includes obstructed labor (three times), RR=2.92. (95%CI: 1.37-6.33).

In study done in Jimma University, 8.9% of macrosomia complicated by obstructed labor (28), in Bale retrospective study macrosomia complicated by obstructed labor (25).

Cephalo pelvic disproportion was two times higher in macrosomia group (RR= 2.2, 95%CI: 1.62-3.02) and similarly study done in Nigeria shows the cephalopelvic disproportion rate was 43 % (12),

Postpartum hemorrhage was seventeen times(RR=16.7, 95%CI: 4.98-87.46) higher in macrosomia group and a lot of study shown high association of macrosomia with postpartum hemorrhage (1,27,29),

Perineal injury four times (RR=3.65, 95%CI: 2.31-5.62) and after delivery macrosomic deliveries four times risk to develop anemia(RR=3.77, 955CI:1.29-4.14)

Study conducted in DebreBirhan showed the perineal tear in macrosomia delivery was 18%, Kingdom of Saudi Arabia 1.7% (9,20,27),

Cesarean delivery rate was four times in macrosomic group than normosomic group (RR=3.64, 95%CI:2.65-4.99) and study conducted in South-South University of Nigeria prevalence of Cesarean delivery rate was 32.6 % ,45.72% in Algeria(11), (5, 6, 12,14,19, 34, 35,)

In our study 14.8% of Macrosomic deliveries developed puerperal sepsis which was five times higher than (RR=5.11,95%CI:2.25-12.44) than Normosomia mothers because of high obstructed labor, increased incidence of cesarean delivery, high prevalence of anemia in Macrosomia group.

6.4 Fetal and Neonatal complications

The rate of still birth was four times (RR=4.32, 95%CI:1.50-14.05) higher than that of control group because of high rate of uterine rupture and obstructed labor Macrosomiagroup.

A study done by Cheng Yk, on fetal and maternal macrosomic complications done at Hong-Hong showed two to three increase of still birth rate (29)

The rate of birth trauma observed in Macrosomia group was eight to nine times(RR=8.53,95%CI: 2.94-30.11) of Normosomia group and mainly the type of birth trauma seen was cephalhaematoma in this study.

A three year study conducted at Turkey shown the prevalence of birth trauma in macrosomia was 6.4%(5) ,3.04% study conducted in Tehran, Iran(2), 5.1% in Zaria, Nigeria(6),(20,29,33).

The rate of neonatal hypoglycemia was ten times higher in the macrosomia group (RR=9.96, 95%CI: 3.21-40.93) which is compatible with the data in the literature

Study done in Chinese ,2.4% of hypoglycemia in Macrosomia(29), 10% Tehran, Iran(2), five times in Shiraz, Iran(35),7.6% in Zaria, Nigeria(6)

7. Limitations of the study

Our study has some strength. It was a Cohort study and the maternal and fetal outcomes followed but has also a limitation which includes first almost all mothers from Rural area and majority of mothers from urban did not know their PrePregnant, weight body mass index, previous history of infant birth weight to assess risk factors and second most of mothers with complication came from nearby health centers and difficulty to assess BMI,weight gain during pregnancy which is also an important risk factor for macrosomia group

Mothers delivered by Spontaneous vaginal delivery and by instrumental assisted vaginal delivery discharged from the ward as early as six hours and difficult follow them after a discharge.
Few neonates admitted to NICU disappeared from the ward and also lack of investigation for the neonate was also a limitation to assess some of the complication.
OGTT is not done in place of this study and also nearby of health centers and difficulty to diagnose GDM and cases of GDM missed.
After Macrosomia baby and mother was identified there was lack of investigation like RBS or FBS for both mother and neonate especially after vaginal delivery.
There was overlapping complications and difficulty to control confounding factors for maternal and neonatal complications.
Small sample size and short duration also one of the limitation of study

8. Conclusion

In conclusion the Incidence of Macrosomia was 3.3% in total deliveries of a given period

Male neonate was an independent risk factor for macrosomia for our study group and macrosomia associated with poor maternal outcome seven times(ARR=6.58 95%CI:3.64-11.90), and Poor Neonatal Outcome seven times (ARR=7.13,95%CI:2.34-21.71)

Obstructed labor was three times, CPD was two times, PPH was seventeen times, and perineal tear was four times higher in Macrosomic group compared to Normosomic group

Mode of delivery by Cesarean section was four times higher in macrosomic group than Normosomic group because of higher incidence of obstructed labor and CPD in macrosomic group

After Delivery Anemia and Puerperal sepsis was the complication noticed in macrosomic mothers four and five times respectively because of higher Cesarean delivery, obstructed labor and PPH in macrosomic group

Hypoglycemia was ten times common in macrosomia, birth trauma eight to nine times higher in macrosomia than normosomic group.

Even when other risk factor for poor neonatal outcome controlled macrosomia was an independent risk factor for poor neonatal outcome.

9. Recommendations

➢ To the Hospital

- ✓ To give emphasis on the clinically suspected macrosomia
- ✓ To have OGTT screening at least for mothers have history of previous macrosomia delivery at ANC follow up
- ✓ To have schedule screen for mothers of macrosomia after six weeks of delivery
- ✓ To investigate mother and neonate of macrosomia after delivery at least RBS
- ✓ To give feedback and training how to estimate clinically macrosomia and early referral for nearby health centers

➢ To the Health centers

- ✓ Early referral for labor abnormality in case of clinically suspected macrosomia
- ✓ To be familiar clinical estimation of macrosomia

➢ To the Researcher

- ✓ Further study with large sample size and longer study period are required

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Annexes

1. Patient Information Sheet

Name of the Principal investigator: Dereje Lemma

Name of study area: Jimma University Specialized Hospital, paediatric ward

Research Budget covered by: Jimma University

Research objective: incidence and outcome of macrosomia deliveries at JUSH in labor ward.

Significance of the study: The study finding will be used to help improve management of complication of macrosomia.

Study procedure: The data collectors will extract data from patient chart and interview patients' caregivers using questionnaires after obtaining consent from the patients' care giver.

Risks: No risks except the time you spent during the interview.

Participant role: volunteerism and helping in providing information to the data collectors during the interview.

Participant right: They have a right to stop the interview at any time, or to skip any question that he/she does not want to answer.

Beneficial: The study is beneficial for patient's to manage their complication associated with macrosomia

Incentives: Participants will not be provided any specific incentive for taking part in the research other than acknowledgment.

Confidentialities: The study result will not include patient's name and address and information specific to the patient will not be shared with the medical team or any others.

Agreement: Patient's, caregivers are expected to be fully voluntary to participate in the study.

Whom to contact: If you have any kind of inconveniencies about the study, you can contact the following individuals:

- Dereje Lemma (principal investigator)
  Tel: 09-12-20-88-96

- Email: lemma.dereje@yahoo.com

2. Written Consent

Name of principal investigator: Dereje Lemma (Jimma University)

Research title: incidence, outcome of macrosomia deliveries at labor wards of Jimma University Specialized Hospital

Card number_____

Code number_____

1. I confirm that I understand the information sheet for the above study and have had the opportunity to ask questions.
2. I understand that my participation is completely voluntary and that I am free to withdraw at any time, without giving any reason, without my child's medical care or legal rights being affected.
3. I understand that my medical notes will be looked at by data collectors of this study and necessary information will be extracted. I give permission for these individuals to have access to my record.

I would like to confirm my agreement by signing.

Participant's name (caregiver)_____Signature_____ date_____

Name of the data collector: _____signature: _____date_____

Name of the principal investigator: DerejeLemma Signature: _____ date_____

Thank you for your participation and Co-operation!

Barefammaaeeyyamma

- **Maqaisaaqo'annagagessu**: DarajjeeLammaa

- **Matadureeqo'annoo:** rakkinaDaa'imannireefuudhalatankankiilooisaanguddaa(afur) oliiqabanrakkinaisaanirragahuufihadhaaisaanirragahuHospitalaaaddaaUniveersitiiJimmaakutaada'uu msattiilaaluf

Lakk.kaardii _____ Lakk. Kodii _____

1) Oddeeffannooqo'annoo kana huubachuukoonaanmirkanessacaaragaaffiwwan kana gaafachuu lee argadheerraa.
2) Hirmaanankoogutummaagututtifedhiikooirrattiakkanihunda'enaafgaalerraayoonaatihintoolesaababba a male tajajjiilimucakootifkenemuuttuuhinhubamiindhisedemmuuakkandanda'unaanbekka.
3) Akkakaardiinkooyookiinkandaa'makooodeffenooqo'annookanafwarasasabaninakkaniillalamufiodeffa nnonbarbachisoota'anakkakessaafudhatamunaaf gala. Kanafuuannieyyammaissanifkenukoonaanmirkanessa.

Waaligalteekoomaalatookottinibsuunaanfedhaa.

- Maqaissaaqo'annooirrattiihirmaatu(waarramuccaa) _____ maalattoo_____
- Maqaissaqo'annoogegessuu_____ maalattoo_____ guyyaa_____
- Maqaissaaodeffaannoofunanu: DarajjeeLammaamaalattoo_____ guyyaa_____

Gargarsaafiirrattihirmaanagotaanifgaalanikenyaaguddadha!

3. Questionnaires

Part one:- sociodemographic information		
001	Card number	
002	Date of admission	
003	Age in years	
004	Address	1. Jimma 2. Out of Jimma if out of Jimma where_____
005	Religion	1. Muslim 2. Orthodox 3. Protestant
006	Ethnicity	1. Oromo 2. Amhara 3. Tigre 4. Dawuro 5. Gurage 6. Other(specify)_____
007	Occupation	1. House wife 2. Farmer 3. Merchant 4. Civil servant 5. Other(specify)
008	Educational status	1. Can't write and read 2. Read and write only 3. Grade 1-8 4. Grade 9-10 5. Diploma(10^{+})

		6. Degree and above
009	Marital status	1. Married 2. Single 3. Widowed 4. divorced
010	Income of family	_____ birr per a month _____ birr per year
Part two. Obstetrics Conditions		
201	Parity	_____
202	If she is multiparous mothers, any history of previous macrosomia delivery	1. Yes 2. No
203	If Yes to Q.202 how many times	_____
204	What is the previous weight in kilogram if known	1st child----------Kg 2nd child----------Kg 3rd child----------Kg
205	Was LNMP known ?	1. Yes 2. No
206	If yes to Q.205 what is the GA?	_____
207	If No to Q.205 what method used for determination of GA(write GA on given space and circle method used	1. Duration of Amenorrhea _____ 2. Early U/S_____ 3. Ballard score_____ 4. Early urine HCG_____
208	ANC follow up	1. Yes 2. No
209	If Yes Q.208 how many times do you have?	_____
210	Do you know your prepregnancy weight?	1. Yes 2. No
211	If yes to Q.210 How much ?	_____
212	Do you have history diabetes mellitus before pregnancy?	1. Yes 2. No
213	If yes to Q.212 what is the duration, if it is before pregnancy?	1. < 6 months 2. 6 months-1 year 3. > 1 yr- 3 yrs 4. > 3 yrs
214	If yes to Q.212 what is the recent	_____

	FBS?(	
215	and when was done before delivery	1. < 7 days 2. 1-4 weeks 3. ≥1month-6 months 4. > 6 months
216	If yes to Q.212 what type of medication do you take for you diabetic?	1. Insulin 2. Daonil 3. Insulin and daonil 4. Metformin
217	Do you have history of GDM?	1. Yes 2. No
218	If Yes to Q.217 at what gestational age detected	_____
219	Did you have history of GDM on the last pregnancy?	1. Yes 2. No
220	If yes to Q.219 what was weight of the neonate?	_____
221	If yes to Q.219 what type of management do you get?	1. Insulin 2. Diet only 3. Insulin plus diet
222	What is the dose of the insulin,if Yes to Q.219?(write Dose	_____Am_____Pm
223	If yes to Q.219 what is the recent FBS?	1. < 60 mg/dl 2. 60-100 mg/dl 3. 101-140 mg/dl 4. 141-199 mg/dl 5. ≥200 mg/dl
224	and when was done before delivery if yes to Q.219?	1. < 7 days 2. ≥1 wks-4 wks 3. ≥4 wks- 8 weeks 4. ≥ 9 wks-12 wks 5. ≥ 12 wks and above
225	Pre delivery hct	_____
Part three :- labor and delivery condition		
301	Duration of labor in hrs	_____
302	Was macrosomia suspected before	1. Yes

	delivery?	2. No
303	What was the method of labor initiation?	1. Spontaneous 2. Induced
304	If method of labor initiation was by induction what was the reason?	1. Post term pregnancy 2. Medical problems(specify)_____ 3. Chorioamnionitis 4. Others(specify)_____
305	What was the presentation?	1. Vertex 2. Breech 3. Tranverse lie 4. Brow 5. Face 6. Others(specify)_____
306	If labor started spontaneously was there any need of augementation?	1. Yes 2. No
307	If Yes to Q.306 what was the reason?	1. Arrest of cervical dilatation 2. Protracted cervical dilatation 3. Prolonged latent phase 4. Prolonged second stage 5. Others_____
307	What was the mode of delivery ?	1. Spontaneous 2. FAVD 3. VAVD 4. C/D 5. Laparotomy
308	If mode of delivery was spontaneous vaginal delivery how was the perineum?	1. Intact 2. First degree perineal tear 3. Episiotomy 4. Third degree perineal tear 5. Fourth degree perineal tear
309	If mode of delivery was by instrumental delivery what was the indication?	1. NRFHRP 2. Prolonged second stage 3. To shorten second stage of labor 4. Others(specify)_____

310	Was there any complication to the mother?	1. Yes 2. No
311	If yes to Q.310 what was the complication	1. Obstetric fistula(VVF/RVF) 2. Cervical laceration 3. Third degree perineal tear 4. Fourth degree perineal tear 5. Uterine rupture 6. Shoulder dystocia 7. Others (specify)
312	if there was shoulder dystocia what maneuver was used to deliver?	1. Suprapubic pressure plus McRoobert 2. Wood 3. Rubin 4. Posterior release 5. Humeral/clavicular fracture 6. Zavanelli 7. Others(specify)_____
313	Did the mother have PPH?	1. Yes 2. No
314	If yes to Q.313 ,what was the cause of PPH?	1. Uterine atone 2. Genital tract trauma 3. Retained placenta 4. Coagulopathy 5. Uterine rupture 6. Others(specify)_____
315	If mode of delivery was by emergency C/D what was the indication?	1. NRFHRP 2. CPD 3. Obstructed labor 4. Declined VBAC 5. Others(specify)
316	If mode of delivery was by Elective C/D what was indication?	1. APH secondary to placenta previa(Major degree) 2. Decline VBAC 3. Previous one C/D plus mal presentation(breech,tranverse lie) 4. Malpresentation (tranverse lie, breech and

		X factor) 5. Others(specify)_____
317	Any problem encountered during C/D?	1. Yes 2. No
318	If yes to Q.316 what problem encountered?	1. PPH 2. Extension 3. Bladder injury 4. Difficulty in extraction 5. Others(specify)
Part four:Post partumAssesment		
401	Was there any problem encountered after delivery?	1. Yes 2. No
402	If yes to Q. 401 what was the problem identified?	1. Puerperal sepsis 2. Anemia 3. Surgical site infection 4. Episiotmy infection 5. Fistula 6. Others(specify)_____
403	was need of ICU admission	1. Yes 2. No
404	What was the indication to admit to ICU?	1. Hemorrhagic shock 2. Septic shock 3. Respiratory failure 4. Unable maintain saturation 5. Others(specify)
405	Duration of Hospital stay?	1. ≤ 6 hrs 2. 6-24 hrs 3. If more than 24 hrs write the days of stay_____
406	condition at discharge	1. Improved 2. Transferred 3. Dead 4. Other(specify)_____
407	If there was maternal death what was the cause?	1. Hemorrhage 2. Sepsis 3. Respiratory failure

		4. Others(specify)_____
408	post deliveryhct	_____
409	post delivery RBS/FBS if done for mother	_____
Part five :- Neonatal Assessment		
501	Fetal Outcome	1. Alive 2. dead
502	Sex	1. Male 2. Female
503	Weight in gram	_____
504	1st and 5th minute APGAR score	1st min._____5th min._____
505	Was there any complication to the neonate?	1. Yes 2. No
506	If yes to Q. 505 what was the complication?	1. Cephalhematoma 2. Subgeleal hemorrhage 3. Abrasion/laceration of face 4. Facial nerve injury 5. Femoral,humeralor clavicular Fracture or dislocation 6. Retinal hemorrhage 7. Other(specify)_____
507	Was there need for advanced resuscitation?	1. Yes 2. No
508	Was there need for referral to neonatal unit	1. Yes 2. No
509	If Yes to Q.508 what was the indication for referral?	1. MAS 2. PNA 3. Sepsis 4. Birth trauma 5. Hypothermia 6. Hypoglycemia 7. Polycythemia 8. observation 9. Others (specify)
510	If indication was birth trauma what type it was?	1. Clavicular fracture 2. Humeral fracture

		3. Femoral fracture 4. Skull fracture 5. Cephalhematoma 6. Subgeleal hemorrhage 7. Erb's /klumpke palsy 8. Others (specify)_____
511	What was the RBS of neonate if done	_____
512	Condition on discharge of neonate	1. Improved 2. Dead 3. Transferred 4. Others (specify)_____
513	If there was neonatal death, what was the cause?	1. Sepsis 2. Respiratory failure 3. Multiorgan failure 4. Hypoglycemia 5. Hypothermia 6. Others (specify)_____
Name of Data collector_____sign_____date_____ Thank You Very Much for Your Time !		