"ASSOCIATION OF CORD BLOOD LACTATE LEVELS IN DELIVERIES WITH MECONIUM STAINED LIQUOR AND NEONATAL OUTCOMES: A CROSS-SECTIONAL STUDY"

By

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Sub: Institutional Ethical Clearance for the study.

With reference to the above, we wish to inform you that your proposed research project titled **"ASSOCIATION OF CORD BLOOD LACTATE LEVELS IN DELIVERIES WITH MECONIUM STAINED LIQUOR AND NEONATAL OUTCOMES: A CROSS - SECTIONAL STUDY"** is ethical and justifiable. The proposed research project has been cleared by the JNMC Institutional Ethics Committee on Human Subjects Research.

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ABBREVIATIONS

APGAR	-	APPEARANCE, PULSE RATE, GRIMACE, ACTIVITY, RESPIRATION
ACOG	-	AMERICAN COLLEGE OF OBSTETRICS AND GYNAECOLOGY
AUC	-	AREA UNDER THE CURVE
AVP	-	ARGININE VASOPRESSIN
BMI	-	BODY MASS INDEX
BRS	-	BEHAVIOUR RATING SCALE
CTG	-	CARDIOTOCOGRAPH
DIPSI	-	DIABETES IN PREGNANCY STUDY GROUP OF INDIA
EDD	-	ESTIMATED DATE OF DELIVERY
EDTA	-	ETHYLENEDIAMINE TETRAACETIC ACID
FGR	-	FETAL GROWTH RESTRICTION
FHR	-	FETAL HEART RATE
HIE	-	HYPOXIC ISCHAEMIC ENCEPHALOPATHY
HIV	-	HUMAN IMMUNODEFICIENCY VIRUS
HLHS	-	HYPOPLASTIC LEFT HEART SYNDROME
IDM	-	INFANT OF DIABETIC MOTHER
IVH	-	INTRAVENTRICULAR HEMORRHAGE
LBW	-	LOW BIRTH WEIGHT
LMP	-	LAST MENSTRUAL BLEEDING
LOD	-	LACTATE OXIDASE
LSCS	-	LOWER SEGMENT CESAREAN SECTION
MDI	-	MENTAL DEVELOPMENT INDEX

MSL	-	MECONIUM STAINED LIQUOR
MSAF	-	MECONIUM STAINED AMNIOTIC FLUID
MAS	-	MECONIUM ASPIRATION SYNDROME
PDI	-	PSYCHOMOTOR DEVELOPMENT INDEX
PIH	-	PREGNANCY INDUCED HYPERTENSION
PPHN	-	PERSISTENT PULMONARY HYPERTENSION OF NEWBORN
POD	-	PEROXIDASE
POG	-	PERIOD OF GESTATION
PPROM	-	PRETERM PRELABOUR RUPTURE OF MEMBRANES
PROM	-	PREMATURE/PRELABOUR RUPTURE OF MEMBRANES
RCOG	-	ROYAL COLLEGE OF OBSTETRICS AND GYNAECOLOGY
ROC	-	RECEIVER OPERATING CHARACTERISTIC CURVE
SBE	-	STANDARD BASE EXCESS
SD	-	STANDARD DEVIATION
TDSC	-	TRIVANDRUM DEVELOPMENT SCREENING CHART
VDRL	-	VENEREAL DISEASE RESEARCH LABORATORY
VLBW	-	VERY LOW BIRTH WEIGHT

ABSTRACT

Background:

Meconium stained liquor possess as a threat to fetal life if not identified within due time. It is a cause of increased perinatal and neonatal morbidity and mortality. In the search for factors to predict adverse neonatal outcomes, lactate has been found as one of the predicting factors of neonatal asphyxia. Studies have been done on lactate in prediction of birth asphyxia but not many studies have been done on its role in meconium stained liquor deliveries. Hence this study was chosen to evaluate and establish if lactate can serve as a predictor of adverse neonatal outcomes in deliveries complicated by meconium stained liquor.

Objectives:

Primary objective-

Evaluation of the association between umbilical cord blood lactate levels in deliveries of meconium stained liquor and neonatal outcomes.

Secondary objective-

To determine the factors contributing to meconium stained liquor.

Material & methods:

All antenatal cases presenting to labour room of Dr. Prabhakar Kore Hospital identified with meconium stained amniotic fluid with ≥ 34 weeks of gestation and willing to participate in the study were included in the study as per the inclusion and exclusion criteria. Cord blood sampling done immediately after birth was transported to the laboratory for analyzing the arterial blood gas and lactate levels. The neonatal outcomes were assessed and the follow-up performed at 6 months for any neurological deficits. The contributing risk factors for the presence of meconium in the amniotic fluid were looked for in our study.

Results

A total of 174 participants were analyzed in our study after excluding the patients lost to 6 month follow-up. The mean lactate level in our study is 39.19 mg/dl (4.35mmol/L). The AUC for Lactate level is 0.792 at cut-off > 77.6mg/dl (8.6mmol/L) with 97.45% sensitivity and 47.06% specificity in predicting neonatal outcome respiratory distress. Anemia, hypertensive disorders of pregnancy, primigravida, FGR, postdatism were found to be an important risk factors for prediction of meconium stained liquor despite which they did not have any statistical significance. In most of the babies milestones appropriate for age were achieved at 6 months.

Conclusion

Association between umbilical cord blood lactate levels in deliveries with meconium stained liquor and adverse neonatal outcomes was found to be significant in our study. Adverse neonatal outcomes can be predicted in cases having higher umbilical cord blood lactate. Among the factors contributing to meconium staining of amniotic fluid, fetal growth restriction and fetal distress was seen to influence meconium passage inutero. In the neurodevelopmental outcomes analysed at 6months follow up, most babies achieved milestones appropriately.

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INTRODUCTION

Meconium staining of liquor identified through the progress of labour is regarded as predictor of adverse neonatal outcomes including meconium aspiration syndrome (MAS), birth asphyxia resulting in increased risk of neonatal and perinatal morbidity and mortality.[(1)] Meconium staining of amniotic fluid (MSAF) is an indicator of fetal hypoxia which could result from multiple factors, of which obstetric factors are mode of onset of labour, prolonged duration of labour, pregnancy beyond 42weeks of gestation, oligohydramnios, Low birth weight (LBW) babies, Pregnancy induced hypertension (PIH), Fetal growth restriction (FGR) and factors such as anemia, higher maternal age at delivery and socio-demographic factors in mother [(2)].

The patho-physiology of passage of meconium in utero is increased neuromuscular stimulation of intestine in response to hypoxic stress. At term, intestinal system is matured and vagal stimulation causes increased peristalsis and sphincter relaxation resulting in passage of meconium, hence postdatism is considered a significant risk factor for meconium staining.[(3)] Severe hypoxia results in shifting of metabolism towards anaerobic glycolysis resulting in rapid development of lactic acidemia, therefore measurement of lactate in cord blood could reflect neonatal metabolic state at birth.[(4)]

Need for Study:

Despite the excellent advances in the field of therapeutic and diagnostic facilities along with the medical advances, presence of meconium staining of amniotic fluid still raises concern in its management. Meconium stained liquor occurs in 5-25% of all births of which it has been shown to occur in 5% of pregnancies before 37 weeks gestation, 25% of births at term pregnancy and in up to 52% in post term pregnancies.[5] Among these 4-5% result in meconium aspiration syndrome resulting in an increased perinatal morbidity and mortality.

Meconium staining of liquor can occur in cases of fetal hypoxia. Hypoxia is known to cause an increase in levels of lactates in the blood. Small amounts of lactate have been identified in serum and urine in few cases of meconium staining which can be indicator of asphyxia in neonates. But not many studies have been done to ascertain use of cord blood lactate in meconium stained liquor deliveries as a predictor of neonatal outcomes. Hence the study is done to determine if lactate levels of umbilical cord blood can be used in predicting and assessing neonatal outcomes in meconium stained liquor deliveries.

Despite numerous studies on neonatal outcomes, long term Neuro developmental outcomes in babies with meconium stained liquor needed assessment. In our study we also attempted at this by following up the neonates of MSL deliveries at 6 months for any developmental delay.

AIMS AND OBJECTIVES

Primary objective-

To evaluate the association between umbilical cord blood lactate levels in deliveries of meconium stained liquor and neonatal outcomes.

Secondary objective-

1. To determine the factors contributing to meconium stained liquor.
2. To assess the neurodevelopmental outcomes at 6 months of life.

REVIEW OF LITERATURE

The birth of a healthy baby is the universal aim. The birth process is described as the hardest journey ever taken by an individual. Fetal heart rate abnormalities and meconium staining have long been known to be danger signals in this journey.(6)

Evory Kenndey once stated, “The discharge of meconium pending labour, in cases where the head presents, is dwelt upon by some as proving the death of the child. But its palpable insufficiency in this respect has been so well pointed out by Dr. Denman and indeed must be so obvious to every practical man that it is deemed unnecessary to dwell upon it here, further than to state that it merits no confidence whatsoever, as a proof of the death of the fetus.” (7)

This part explores the existing literature for the concepts that form the basis of this thesis. It commences with the definitions of meconium, the pathophysiology associated with the passage of meconium in utero, associated perinatal morbidity, the significance of lactate in the prediction of perinatal distress and thereby neonatal outcomes, and involved biochemistry.

Meconium is derived from the Greek word “mekonion,” meaning poppy juice or opium. Aristotle is credited with noting the relationship between the presence of meconium in amniotic fluid and a sleepy fetal state in utero.(8)

The importance of auscultating FHR throughout process of labour was emphasised by Schwartz and Von Winckel (1858). He postulated that the appearance of meconium in labour suggested impending fetal death. (9)In 1925, Schulze et.al conducted a study of 5500 births in California and concluded that in the large majority of cases, passage of meconium during labour was independent of fetal asphyxia, and the presence of old meconium in the amniotic fluid did not have any prognostic significance in the later development of asphyxia.[10] It was observed that there were always changes of the fetal heart rate pattern during labour in cases associated with asphyxia.[11]

In 1958, as per observation by Caldeyro Barcia, Hon and Hammacher, they have reported on various patterns of fetal heart rate associated with fetal distress [9] and Ferton and Steer in 1962 proposed that meconium passage was significant only if the fetal heart rate was less than 110 bpm fetal heart rate was noted.[12]

Vasoconstriction of the fetal gut resulting in fetal hypoxia causes sphincter relaxation and hyperperistalsis resulting in meconium passage as per Postulates of Saling, in 1966.[12]

Based on observation of foetuses in labour who had passed meconium, Brandes et. al, (1973) concluded that they should be delivered within reasonable time because they are in a state of temporary compensated fetal distress. Miller et. al., (1975) could not find any difference in neonatal Apgar between the meconium and non-meconium groups if the fetal heart rate during labour had been normal and concluded that the presence of meconium in the absence of other signs was not a sign of fetal distress. [12]

Meis PJ; Hall. M (1978) observed that thin meconium stained amniotic fluid was not found to be associated with any increased intrapartum or neonatal morbidity or mortality in contrast to thick meconium stained amniotic fluid.[13] Also, Starks et al., (1980) found that thick meconium was associated with lower fetal scalp blood pH than thin or absent meconium and concluded that thick meconium usually indicates fetal hypoxia or acidosis regardless of abnormal fetal heart rate. However, more recent studies have established that infants with normal heart rate patterns have similar outcome whether or not meconium is present in the amniotic fluid.[14]

Krebs and Coworkers (1980) concluded that bradycardia and deceleration are significantly increased in patients with meconium stained liquor. He devised an intrapartum cardiotocographic scoring system.[15]

Benacerraf et. al., (1984) reported the detection of thick meconium by ultrasonography, but further studies showed that vernix can produce a similar picture.[16]

Grant et al., (1989) concluded that using a low 5-minute APGAR score as an endpoint (APGAR < 7) abnormal fetal heart rate has a high negative predictive value of over 90% but a low positive predictive value of 30%. This means that normal trace indicates a fetus is not hypoxic, but abnormal trace is associated with a large number of false positives.[12,17]

In 1993, Steer PJ and Smith R used an optical sensor mounted to an intrauterine probe to study the continuous monitoring of meconium in liquor.[17]

Epidemiology:

Meconium stained amniotic fluid (MSAF) occurs in 5–25% of all births, with 4–5% of these babies suffering from meconium aspiration syndrome (MAS).[1] MAS is a form of aspiration pneumonia that occurs most often in term or post term infants who have passed meconium in utero (7% to 20% of all deliveries).[18] Overall, 2% to 9% of children born through meconium stained fluid are diagnosed with MAS. [19]

MECONIUM:

Meconium is the viscous greenish liquid composed of fetal bowel contents consisting of various secretion products such as glycerophospholipids from the lung, material which collects in distal small intestine and subsequently the colon in normal fetus and consists of intestinal secretion, desquamated cellular products, swallowed amniotic fluid, vernix, bile pigments, bile salts, fetal hair (Lanugo), mucopolysaccharides, proteins and mucoproteins, lipids and cholesterol.[3] The Dark greenish-black appearance of meconium is caused by pigments, especially biliverdin. It is 72% water and nearly 80% of its dry weight is comprised of mucosubstance and 8 percent of dry weight is Fatty acid (47% free fatty acid & 53% fatty acid esters). Normal pH of meconium ranges between 5.5 to 7.[3]

Antonowiez and Eqgermount have shown that meconium contains many enzymes like lysosomal enzyme disaccharides, alkaline phosphates, trypsin, chymotrypsin, and alpha glucosidase. It also contains undigested debris from swallowed amniotic fluid. Bilirubin contributes 1 mg per gram of wet meconium, and more than 32 steroid compounds have been detected.[20]

FORMATION OF MECONIUM:

The gastrointestinal tract originates from both endoderm and splanchnic mesoderm by day 14 after fertilization and is lined by undifferentiated cuboidal cells by day 18.[21] Intestinal villi appear by 7 weeks and active absorption of glucose and amino acids occurs at 10 weeks and 12 weeks respectively. By 12 weeks of gestation, development of Meissner's and Auerbach's plexuses within the intestinal wall coincides with onset of peristalsis of the small intestine and colon. [21]

At approximately 70-85 days gestation, meconium appears in the fetal intestine. Increased anal sphincter tone is responsible for high concentrations of intestinal enzymes in amniotic fluid early in gestation followed by a decline later.[21] Though meconium first appears in the fetal ileum between 10th and 16th week of gestation and meconium staining of amniotic fluid becomes more common as the foetus's gestational age increases. In utero, meconium passage rarely seen in the amniotic fluid in <32 weeks period of gestation. Usually, meconium stained amniotic fluid babies are 37 weeks or older. [4] The incidence of meconium stained amniotic fluid increases with the gestational age, in post term pregnancies, reaching as high as 30%. 60 to 200gm of meconium may be passed by full term neonate at birth. The absence of intestinal bacteria accounts for many of the differences in composition between meconium and adult stool. [3]

Meconium can pass through the mature fetus via normal bowel peristalsis or vagal stimulation. It can also occur when hypoxia stimulates arginine vasopressin (AVP) release from the fetal pituitary gland. AVP stimulates colonic smooth muscle to contract, resulting in intraamniotic defecation.[21]

Meconium is toxic to the respiratory system, and its inhalation can result in meconium aspiration syndrome. Normally, after 38 weeks, the volume of amnionic fluid continues to decline, resulting in oligohydramnios, which may become problematic. Therefore, meconium release into an already reduced amnionic fluid volume results in thick, viscous fluid that may lead to meconium aspiration syndrome, increasing the incidence to 5 percent at 42 weeks.[21]

PATHOPHYSIOLOGY:

Pathophysiologically, the uterine meconium passage is caused by neuromuscular stimulation of the intestinal system of the neonate, usually due to hypoxic stress. When the fetus reaches the term condition, the intestinal system is mature, and the vagal stimulation of the brain or the spinal cord causes peristaltic and rectal sphincter relaxation, which result in the meconium passage. [1]

Meconium passage in utero is relatively rare prior to 38 weeks of gestation because of

a. The hormonal control of fetal meconium passage is maturationally dependent. Motilin, an intestinal peptide is responsible for bowel peristalsis and defecation. This corresponds to the hormonal and neural control of meconium passage, which is also maturationally dependent. Levels of motilin an intestinal hormone responsible for bowel peristalsis and defecation are lower in premature infant and higher in infants who have passed meconium. It was discovered that infants with fetal distress had a fourfold elevation of cord plasma motilin than normal using sensitive radio immune assay measurement of umbilical cord venous plasma motilin. There is also evidence that motilin decreases small intestinal transit time in man. The very high motilin levels seen in infants with fetal distress, therefore expected to deliver rapidly the contents of the small intestine into the large intestine. The motilin could play a part in the abnormal gut motility leading to the passage of meconium seen in prenatal asphyxia.[22]
b. The natural control of meconium passage is dependent on the maturation and myelination of neural plexus of gastrointestinal tract.

Regardless of how meconium reaches liquor amnii there is always a risk of meconium aspiration. Meconium staining of fetus takes 3-4 hours to develop.

ETIOLOGY:

Various factors have been thought to be associated with the occurrence of MSAF, few of which include maternal risk factors such as infertility, advanced gestational age, hypertensive disorders of pregnancy, preeclampsia, cigarette smoking or caffeine use by mother, maternal infections and fetal risk factors including fetal growth restriction, fetal distress- embryonic hypoxia, prolonged labour, prelabour rupture of membranes, and post-dated pregnancy among the others.[2]

MSAF is associated with higher frequencies of adverse perinatal outcomes when compared to clear amniotic fluid in pregnancies complicated by PPROM.(23) Passage of meconium is more common in growth-restricted fetuses, and hypoxia can stimulate respiratory center leading to aspiration of the meconium stained amniotic fluid. Amnioinfusion has been used to attempt to dilute the meconium and avoid aspiration of particulate meconium into fetal airways. Amnioinfusion is only useful in settings where facilities for perinatal surveillance are limited, and it leads to significant improvements in perinatal outcome. It is not clear if the benefits are due to dilution of meconium or an improvement in the amniotic fluid volume. [24,25]

In prolonged pregnancies, the fluid becomes scanty and more viscous and the presence of meconium can lead to severe complication of meconium aspiration syndrome (MAS). Meconium aspiration is eight times more common in prolonged pregnancy, and its complications include pneumonia, pneumothorax, a requirement for assisted ventilation, and the development of pulmonary hypertension. Fetal growth restriction in prolonged pregnancy is often associated with oligohydramnios and meconium aspiration. The cardiotocograph (CTG) in labour will often show abnormal patterns. [24]

Intrauterine meconium passage, in near-term or term fetuses has been associated with fetomaternal stress factors and/or infection, whereas meconium passage in post term pregnancies has been attributed to gastrointestinal maturation.[3] Birth itself is a stressful process and it is possible that fetal stress-mediated biochemical events may regulate the meconium passage occurring either during labour or after birth. Aspiration of meconium during intrauterine life may result in or contribute to meconium aspiration syndrome (MAS), representing a continued leading cause of perinatal death.[3]

Several authors suggest that meconium in the amniotic fluid should be considered an independent risk factor for an adverse fetal and neonatal outcome in various populations. In the absence of other known risk factors for intrapartum complications and poor perinatal outcome, the significance of MSAF has not yet been established.[19]

DIAGNOSIS:

Lactate is the result of anaerobic metabolism during the onset of an asphyxia condition. Lactate is partially metabolized through liver and kidney metabolism and ultimately excreted via the renal tubules. Therefore, increasing lactate levels is very common in severe asphyxia. In the background of asphyxia, continuous lactate secretion can be detected up to 72 hours after the onset of asphyxia. Therefore, it has recently been assumed that traces of lactate in both serum and urine can be a sign of asphyxia in neonates. However, no study has been done on the prognostic value of increasing lactate concentration in umbilical cord blood for predicting the outcomes of MAS, which is our aim in our study[1]

To measure the impact of hypoxia, the measurement of acidosis including lactate, Arterial blood gas analysis is performed.

Fetal circulation comprises - umbilical vein which supplies blood from the placenta to the baby and umbilical arteries which carry blood from the fetus to the placenta. This study was chosen to see if cord blood lactate levels can be used to predict adverse-neonatal outcomes in meconium stained liquor deliveries. The umbilical arterial blood consists of metabolites and hence gives more accurate information on the fetal metabolic condition and correlates better with neonatal outcomes

The umbilical venous blood is easier to sample. The umbilical vein is more compressible and hence venous blood flow decreases in cord compression.

THEORIES OF MECONIUM PASSAGE:

Various theories have been proposed to explain the in utero passage of meconium, Walker found an association between the passage of meconium and reduced umbilical venous blood oxygen saturation. Also, he found that prolonged gestation is associated with a gradual decline in oxygen supply to the fetus is the "diving reflex" by which blood flow is redistributed towards vital organs (heart, brain, adrenal glands). [(26)] Sailing proposed that the fetal gut is subjected to ischemia secondary to mesenteric Vaso-construction as a compensatory response to hypoxia. Ventiere demonstrated that intestinal hypoxia is followed by a transient period of hyperperistalsis. This hyperperistalsis alone or in association with relaxation of the anal sphincter may explain the passage of meconium in hypoxic fetuses.[(9)]

Alternatively, passage of meconium may simply represent a normal physiologic event i.e., maturation of fetal gut, as it is common with increasing gestational age, suggesting an association between meconium release. and maturity. With the maturation of the nervous system (which is also related to gestational age), parasympathetic stimuli generated by vagal stimulation such as umbilical cord or head compression may be propagated to initiate meconium passage. Though meconium is found in ileum as early as 16 weeks of gestation, seldom pass meconium, even when they are asphyxiated, one explanation is relatively poor gut musculature in preterm infants.[3]

The hormonal control of fetal meconium passage is maturation dependent. Motilin, an intestinal peptide responsible for bowel peristalsis as described above and defecation, is higher in the umbilical cord of term infants who have passed meconium compared to preterm infants with clear liquor. The neural control of meconium passage is also dependent on gestational age because maturation and myelination of gastrointestinal tract progresses throughout gestation. Immaturity of intrinsic and extrinsic innervation of the bowel would impair the ability of premature fetus to pass meconium into the amniotic fluid. Furthermore, as the fetus matures, the intestinal tract becomes more responsive to sympathomimetic agents. Parasympathetic stimuli initiate meconium passage after maturation of fetal intestinal tract at 34 weeks. The incidence of meconium passage during labour increases with the gestational age and reaches approximately 30% at 40 weeks and 50% at 42 weeks.[22]

Experimentally, intestinal ischemia produces a transient period of hyperperistalsis and relaxation of anal sphincter tone, leading to the passage of meconium. The fetal diving reflex, which shunts blood preferentially to the brain and heart and away from the visceral organs during hypoxia may enhance intestinal ischemia. [26]

MECONIUM PASSAGE DURING PROGRESS OF LABOUR:

Early latent phase in labour

- Thin meconium - lightly stained amniotic fluid, yellow or greenish in color.

- Thick meconium - Darkly stained amniotic fluid, dark green or black usually thick and tenacious.

Late - Meconium stained fluid passed in the second stage of labour after clear fluid had been noted previously.

Amniotomy also aids in the identification of thick meconium. Thick meconium in the amnionic fluid is particularly worrisome. The viscosity probably signifies the lack of liquid and thus oligohydramnios. Aspiration of thick meconium may cause severe pulmonary dysfunction and neonatal death. [21]

According to the American College of Obstetricians and Gynaecologists (2019a), amnioinfusion does not prevent meconium aspiration syndrome. However, it remains a reasonable treatment approach for repetitive variable decelerations.[25]

The groups of meconium stained amniotic fluid patients differ markedly in the incidence of fetal and neonatal morbidity and death. Patients in the early meconium stained amniotic fluid group constitute 25.2%. In his study he discovered a significantly increased risk of intrapartum and neonatal death. Though neonates are likely to be depressed at birth, few develop MAS but both of these events are encountered less frequently by them than by neonates from the early heavy meconium stained amniotic fluid. Patient with early thin meconium stained amniotic fluid constitute 53% who suffer no fetal or neonatal death. So, the available evidence suggest that thin or light meconium confers similar prognosis to clear fluid.[25]

FETAL ACID BASE PHYSIOLOGY:

Normal fetal metabolism results in the production of acids that are buffered to maintain extracellular pH in a critical range. The major buffers utilized by the fetus for neutralizing hydrogen ion production are plasma bicarbonate and hemoglobin. Inorganic phosphate and erythrocyte bicarbonate play a minor role in fetal acid -base homeostasis. Fetus produces carbonic acid during oxidative metabolism. This carbonic acid dissociates into water and CO2 which diffuses across the placenta which is facilitated by a lower maternal alveolar and arterial co2 during pregnancy due to hyperventilation.(27)

VARIOUS THEORIES OF FETAL DISTRESS:

The relationship of fetal hypoxia and intestinal peristalsis has been a consideration for many years.

Walker (1954), demonstrated that meconium was released more frequently when the oxygen saturation of the umbilical vein was below 30% and that heavy meconium is associated with lower oxygen saturation more often than light meconium.(26)

Hon (1963) suggested that meconium is passed in response to parasympathetic stimulation during cord compression, but Krebs and Associates (1980) found no difference in the frequency of variable decelerations regardless of whether meconium was present.(15) Manning and Coworkers (1990) reported that amniotic fluid meconium was present more than twice as often if the last biophysical profile score was abnormal (6 or less).

When adequate oxygenation of fetus in utero- is impaired, oxidation of carbohydrates to co2 and water is impaired and then metabolism modifies to anaerobic (i.e., metabolism in absence of oxygen) pathway leading to producing lactic and ketoacids. Lactate is a direct end product of anaerobic metabolism and is a predictor of short-term neonatal morbidity [(7)]

Factors that may affect fetal oxygenation in labour depends on the environment. Lactate is the result of anaerobic metabolism during the onset of an asphyxia condition [(28)].

Evaluation of the state of the new born has usually been based on Apgar scores and blood gas parameters of umbilical cord blood. After the classic work of Myers et al describing accumulation of lactic acid in the brain in association with hypoxia, lactate concentration in fetal blood has gained increased attention in peri-natal medicine.[(29)] Studies by Nordstrom have shown that fetus is the main contributor to the fetal lactate increase during labour and not significantly influenced by maternal or by the uteroplacental lactate production.[(30)]

Though a few studies showed no significant correlation between umbilical cord blood lactate and SBE or pH, some found a positive, though not strong, correlation. Lactate concentration in umbilical cord blood at delivery might be a more precise tool in the assessment of fetal metabolic acidosis during labour.[(31)]

Placenta plays a pivotal role helping to maintain bicarbonate pool and buffering the fetus from changes in maternal metabolism. The bicarbonate concentration is helpful in determining base deficit and base excess. A base deficit exists when the fetal serum bicarbonate is below normal whereas when it is above normal, its termed as base excess. Oxygen and nutrients diffuse across the placental membrane from maternal arterial blood and is transported to the fetus via a single large umbilical vein. After utilizing oxygen and nutrients, fetal blood returns to the placenta via two small umbilical arteries which contains products from fetal metabolism. Hence venous cord blood reflects the combined effect of maternal acid - base status and placental function, whereas arterial cord blood reflects neonatal acid base status.[27]

Birth asphyxia is a major cause of perinatal morbidity and mortality. Umbilical cord blood gas sampling is the most objective determinant of fetal metabolic condition at the time of birth. Both ACOG and RCOG recommend cord blood sampling for high-risk pregnancies. [32] Umbilical cord blood gas analysis provides important information about the past, present, and possibly the future condition of the infant. Fetal hypoxia occurs when maternal oxygenation is compromised, maternal perfusion of placenta is decreased or when delivery of oxygenated blood from placenta to fetus is hampered. High risk delivery is associated with hypoxic stress and consequent risk of brain damage. [33]

The ability to identify and manage intrapartum hypoxia is a significant clinical challenge, particularly given that most cases will have no antepartum risk factors, and more than a third will have no obvious intrapartum risk factors. [7] Intrapartum hypoxia often manifests in labour with abnormalities in the fetal heart rate, however the feta cardiotocograph (CTG) has a limited positive predictive value of only 30% for the outcome of acidosis [8]. There is great variability in the use of objective measures of intrapartum compromise such as fetal scalp sampling and assessment of acidosis during labour (using pH or lactate) internationally. While improving the sensitivity of the CTG with intrapartum fetal scalp sampling has been described since the 1960's (with variable results on its ability to reduce intrapartum asphyxia), its use is limited [11].

Reasons for this utilisation include the resources required for fetal scalp sampling, and the contraindications to scalp sampling, including maternal HIV infection and other blood borne viruses. Normal cord blood gas values can rule out intrapartum hypoxia or birth asphyxia.

The Royal College of Obstetricians and Gynaecologists and the Royal college of midwives recommend cord blood acid -base analysis in all caesarean or instrumental deliveries performed because of fetal compromise and consideration of cord blood acid- base analysis in all deliveries [(8)].

The American College of Obstetricians and Gynaecologists states that umbilical artery blood acid -base analysis should be performed after any delivery in which a fetal metabolic abnormality is suspected.[(32)]

ACOG COMMITTEE OPINION for taking umbilical cord blood gas sample:

- Any intrapartum event suspecting adverse outcome of the baby
- All non-elective caesarean sections
- 5-minute APGAR ≤ 3
- Abnormal fetal heart rate tracing
- Severe FGR
- Intrapartum fever
- Maternal thyroid disease
- Multiple gestation. [(32)]

The study conducted to analyse to see if delay in collection or analysis effects the results of parameters of umbilical cord blood measurements found that while immediate collection and analysis of umbilical cord blood is advisable for the greatest accuracy, it is not mandatory.[34] As long as the delay is not excessive, the results can still be used as a useful guide to the biochemical condition of an infant at birth.[34]

Cord blood samples taken after 20 minutes delay are unreliable for lactate measurement, even if the vessel has been doubly clamped to isolate the blood from the placenta. Current guidelines that state that blood can be sampled from a clamped cord for up to one hour after delivery should not apply to the interpretation of lactate or base excess. Delayed sampling from unclamped cords is very unreliable.[27]

Experimentally, intestinal ischemia produces a transient period of hyperperistalsis and relaxation of anal sphincter tone, leading to the passage of meconium. The fetal diving reflex, which shunts blood preferentially to the brain and heart and away from the visceral organs during hypoxia may enhance intestinal ischemia[35]

Infants with meconium stained amniotic fluid should no longer routinely receive intrapartum suctioning, whether they are vigorous or not. In addition, meconium stained amniotic fluid is a condition that requires the notification and availability of an appropriately credentiated team with full resuscitation skills, including endotracheal intubation. Resuscitation should follow the same principles for infants with meconium stained fluid as for those with clear fluid.[36]

COMPLICATIONS:

Meconium itself causes major changes in amniotic fluid, decreases antibacterial activity and thus increases the risk of perinatal bacterial infections. Also, the possibility of the skin toxicity and the occurrence of erythema toxicum are also expected. Therefore, the administration of prophylactic antibiotics for women with MSAF in preterm and term deliveries reduced intra-amniotic infection as MSAF is the risk factor of microbial invasion of amniotic cavity[(19)]

However, the most important consequence of meconium is lung aspiration before and during labor, known as the Meconium aspiration syndrome. This aspiration eventually causes hypoxia through airway obstruction, surfactant impairment, chemical peritonitis and pulmonary hypertension [(37)].

Meconium has been associated with additional adverse events increased preterm labor, altered coagulation profile in the fetus, and neonatal seizures. Although the direct and indirect effects remain uncertain, meconium stained amniotic fluid is consistently identified as a predictor of maternal and perinatal complications[(3)]

Meconium aspiration syndrome (MAS) is defined as a respiratory distress in an infant born through meconium stained amniotic fluid (MSAF) whose symptoms cannot be otherwise explained. Hallmarks of this syndrome include an early onset of respiratory distress in a meconium stained infant, hypoxia and characteristic radiologic lung appearances caused by chemical irritation, and physical partial or complete obstruction of small airways.[(6)]

There are a number of factors associated with an increased risk of developing meconium aspiration syndrome. These include lack of antenatal care, black race, male fetus, abnormal fetal heart rate monitoring, thick meconium, oligohydramnios, operative delivery, poor activity, pulse, grimace, appearance and respiration

(APGAR) scores, no oropharyngeal suctioning and the presence of meconium in the trachea.[8] Surfactant therapy may be beneficial to reduce duration of mechanical ventilation and hospital stay.[38]

MANAGEMENT:

When fetus in cephalic presentation, with passage of meconium fetal heart rate must be vigilantly monitored, if available by continuous external fetal heart rate monitoring. Though, Operative delivery is not indicated on the basis of meconium staining alone, if any significant alteration in the rate and rhythm of the fetal heart is observed, immediate delivery may be warranted to save the child.[6]

Amnioinfusion is associated with improvements in perinatal outcome, particularly in settings where facilities for perinatal surveillance are limited. The trials reviewed are too small to address the possibility of rare but serious maternal adverse effects of amnioinfusion.[39]

Amnioinfusion has been described as a method of preventing or relieving umbilical cord compression during labour [40] or of diluting meconium in the amniotic fluid to try to reduce the risk of meconium aspiration. Saline or Ringer's lactate is infused transcervical through a catheter into the uterine cavity, or transabdominally through a 'spinal' needle when membranes are intact. Amnioinfusion has also been used to facilitate external cephalic version at term [39]

According to the American College of Obstetricians and Gynaecologists (2019a), amnioinfusion does not prevent meconium aspiration syndrome. However, it remains a reasonable treatment approach for repetitive variable decelerations.

NEURODEVELOPMENTAL OUTCOMES:

The term development delay is used when a child's development lags behind established normal ranges (norms) for his or her age in areas of motor, cognitive, language, behavioural, emotional, or social development delay among children of less than 3years of age

At the community level these children are usually not identified due to the lack of a simple tool that can be used by community health worker. Early detection of development delay is important for instituting community-based intervention program as early as possible in an effort to prevent further progression to disability.

To develop and validate a simple screening tool for identifying developmental delay among children of 0-3years of age in the community, a simple, reliable and valid screening tool for developmental delay, enabling early intervention practices, Trivandrum Developmental Screening Chart (TDSC) was designed and developed at the Child Development Centre, SAT Hospital, Medical College, Trivandrum. [41]

The 27-items of Trivandrum Development Screening Chart for children of 0-3 years [TDSC (0-3y)], were carefully prepared from the norms in various existing developmental charts/scales, by experts. One item delay in TDSC (0-3 yrs) considered as 'TDSC delay' (test positive) [42]

According to Beligere et al, although various degrees of neurologic abnormalities are found in infants who survived MAS in the neonatal period, establishing the causation of neurological insult was difficult. However, on later follow-up, subsequent to discharge, when the infants were evaluated in the clinic at 2 months of age, and then every 4 months up to 3 years, 10–20% of infants demonstrated developmental disabilities. The developmental assessment of mental development index (MDI), psychomotor development index (PDI), and behaviour rating scale (BRS) were obtained using the Bayley II infant motor scale, and neurodevelopment evaluation was performed using the Amiel–Tison technique. Speech evaluation was performed in infants >18 months using the Rossetti Infant–Toddler language scale. Infants were considered normal when MDI and PDI scores were >85 to 110; mildly delayed when scores were >70 to 84; and severely delayed if the scores were <69.[43]

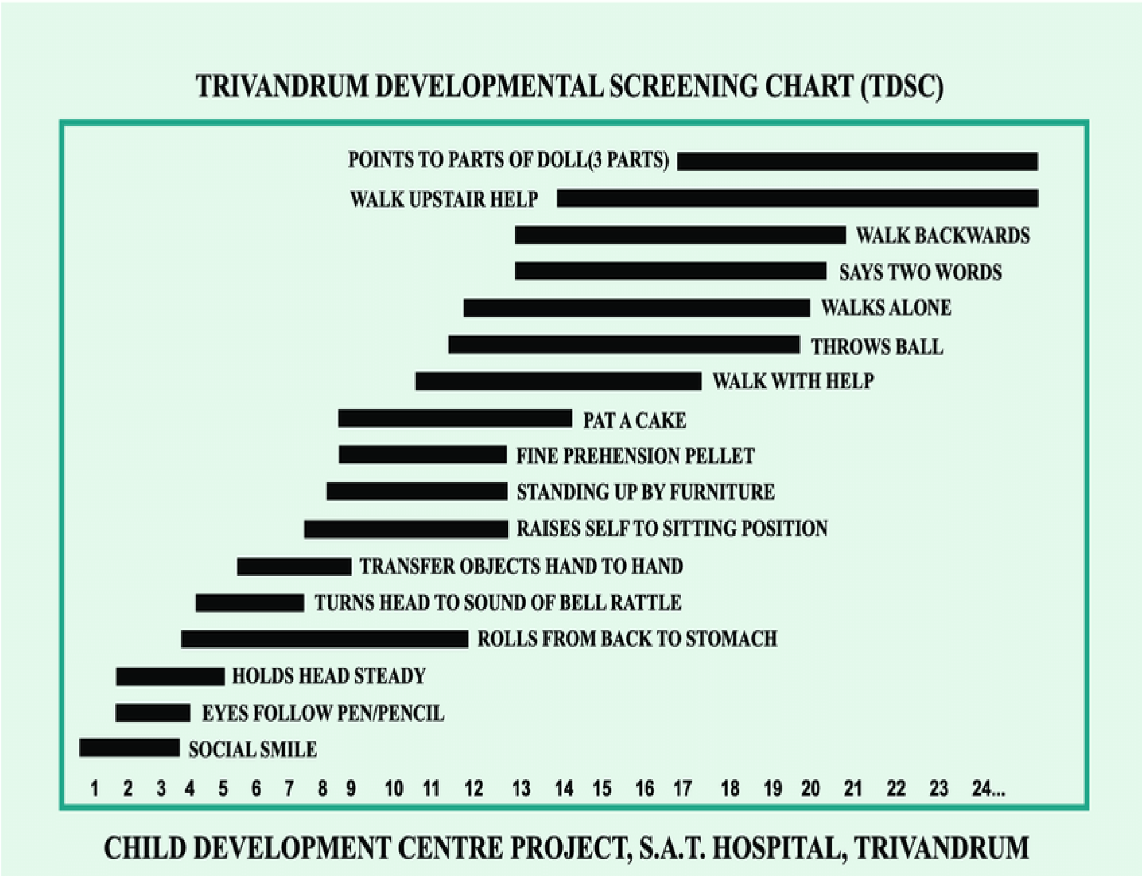


Figure 1: Trivandrum Developmental Screening Chart (TDSC)

Definitions: [21]

Neonatal mortality rate: The number of neonatal deaths per 1000 live births. Perinatal mortality rate. The number of stillbirths plus neonatal deaths per 1000 total births.

Low birthweight: A new born whose weight is less than 2500gms.

Very low birthweight: A new born whose weight is 1500gms.

Extremely low birthweight: A new born whose weight is 1000gms.

Term neonate: A neonate born any time after 37 completed weeks' gestation and up until 42 completed weeks' gestation (260 to 294 days). The American College of Obstetricians and Gynaecologists and Society for Maternal-Fetal Medicine encourage specific gestational age designations (2019a).

Preterm neonate: A neonate born before 37 completed weeks (the 259th day).

A neonate born before 34 completed weeks is early preterm, whereas a neonate born between 34 and 36 completed weeks is late preterm.

Post term neonate: A neonate born any time after completion of the 42nd week, beginning with day 295. the latent phase may be prolonged, which is defined as >20 hours in the nullipara and >14 hours in the multipara.

MATERIALS AND METHODS

- **SOURCE OF DATA:**

All labouring women with >34weeks POG diagnosed with meconium stained liquor in the labour room of KAHER'S Dr. Prabhakar Kore Charitable Hospital, Belagavi.

- **METHOD OF COLLECTION OF DATA**

❑ **STUDY DESIGN-**

Cross sectional study

❑ **STUDY PERIOD-**

Total study period is 1 year 4 months (1^{st} January,2021- 30^{th} April, 2022). Study period for follow up – 6 months

❑ **SAMPLE SIZE - 174**

The minimum sample size formula based on prevalence rate is

$$n = \frac{z_{\alpha}^{2} P(1-P)}{d^{2}}$$

where,

n is the sample size required,

P is the percentage of prevalence and

d is the percentage likely difference in the prevalence.

zα is linked with the level of significance. For 5% level of the significance zα = 1.96.

Reference: According to a study conducted by Ali Mazouri et al lactate levels have found to be high in cases of meconium stained liquor(>4.1mmol/L).[1]

Prevalence of thick meconium stained liquor was found to be present in 40% cases. Using this prevalence with percentage of maximum error as 95% at 95%confidence level.

With P = 40% and d = 20% Zα=1.96, the sample size is 144, but to get more confirmative results the sample size was increased to 174.

- **SAMPLE METHOD:** Cross sectional study, all consecutive patients fulfilling the inclusion criteria were included in the study

- **STATISTICAL METHODS:**

The information collected from the patients was noted in master chart. Data was analyzed using statistical software R version 4.2.1. and Microsoft Excel. Categorical variables are represented by frequency and percentage. Continuous variables given in Mean ± SD / Median (Min, Max) form. Normality of variable is checked by Shapiro Wilk test. Mann Whitney U test is used to compare the distributions over meconium. Chi-square test is used to check the dependency between categorical variables. Wilcoxon signed rank test is used to compare the distribution of APGAR score over two time points. Applicability of Lactate and PH levels to predict neonatal outcomes is checked by Logistic regression and Receiver Operating Characteristic (ROC) curves. Optimal cut off values are obtained by Youden method. Spearman's rank correlation is used to check the correlation between lactate and PH levels. P-value less than or equal to 0.05 indicates statistical significance.

- **Inclusion Criteria:**

All labouring women >34weeks POG with live intrauterine gestation diagnosed with meconium stained liquor in the labour room of KAHER'S Dr. Prabhakar Kore Charitable Hospital, Belagavi irrespective of age, and stage of labour and willing to consent for the study.

- **Exclusion Criteria:**

- Multiple pregnancies
- Fetal malformations
- Women not consenting to participate in the study

- **METHODOLOGY:**

- All labouring women with ≥ 34weeks POG with live intrauterine gestation diagnosed with meconium stained liquor in the labour room of KAHER'S Dr. Prabhakar Kore Charitable Hospital, Belagavi were identified.
- With approval from the institutional ethics committee, written/informed consent was taken from all the participants or legally authorized representatives of the participants enrolled in the study
- Relevant history was noted, data collected from clinical records and relevant investigations including cord blood lactate and sample for arterial blood gas was sent.
- Demographic details of the participants such as age, height, weight, BMI; detailed obstetric history including the parity, period of gestation, factors associated with labour and delivery including the associated factors influencing the passage of meconium were evaluated.
- 2ml of umbilical cord venous blood was sampled after clamping the cord and collected in an EDTA vacutainer and immediately transported to the biochemistry laboratory where the sample was analysed within an hour to give the lactate concentration which was determined in an automated analyser based on the principle of calorimetric assay. (Roche/Hitachi cobas c systems)

- Lactate is oxidized to pyruvate by specific enzyme lactate oxidase (LOD). Peroxidase (POD) is used to generate a coloured dye using the hydrogen peroxide generated in the first reaction.

$$\text{L-lactate} + O_2 \xrightarrow{\text{LOD}} \text{Pyruvate} + H_2O_2$$

$$2\,H_2O_2 + \text{H donor} + 4\,\text{AAP} \xrightarrow{\text{POD}} \text{Chromogen} + 2\,H_2O$$

The intensity of the color formed is directly proportional to Lactate concentration.

- Level of umbilical cord blood lactate was obtained and association with meconium stained liquor and its complications has been analyzed.
- The normal reference range for laboratory values in our laboratory for Lactate are 4.5 – 19.8 mg/dl. The values were obtained in terms of mg/dl which was converted to mmol/l (according to the standard reference) using conversion factor (dividing the value obtained by 1/9)
- Factors contributing to MSL and neonatal outcome were assessed.
- All the neonates were followed up at 6 months (via telephonic conversation), and questionnaire regarding milestones and any hospital admission during the period has been enquired. The developmental assessment at 6 months was planned to be done as per the Trivandrum developmental scale. In view of logistic challenges

due to COVID, telephonic communication was done for assessment of the achievement of milestones in most of the babies.

- The level of lactate and an association with any adverse neonatal outcomes was analyzed in our study.

❑ STROBE DIAGRAM

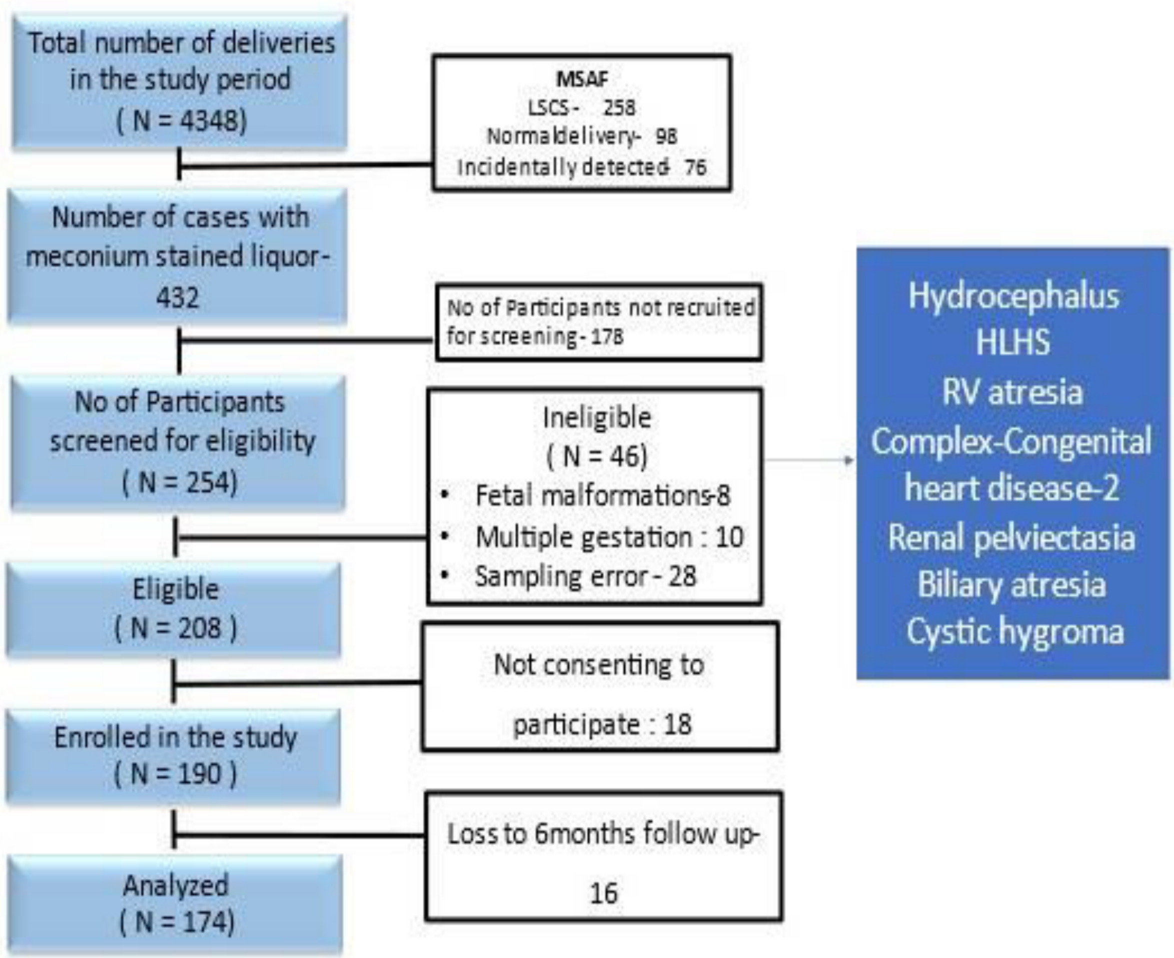
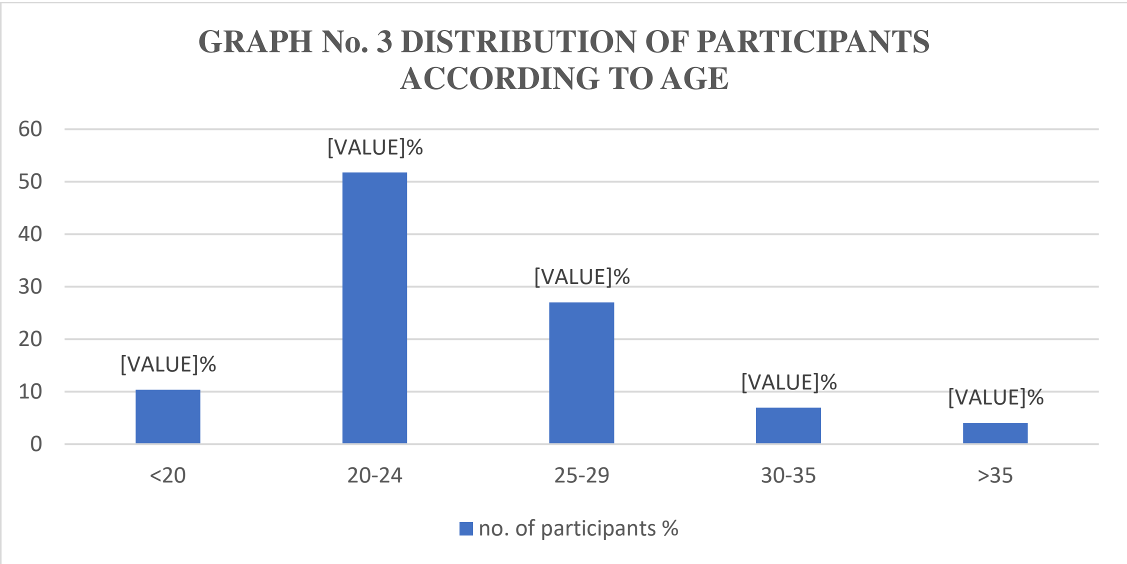


Figure 2 Strobe diagram

RESULTS

Variables	Sub Category	Number of Participants (n=174) (%)
Age (years)	<20	18 (10.34%)
	20-24	90 (51.72%)
	25-29	47 (27.01%)
	30-34	12 (6.9%)
	>35	7 (4.02%)
	Mean ± SD Median (Min, Max)	24.26 ± 4.26 23 (18, 40)

Table no. 1: Distribution of Participants According to Age

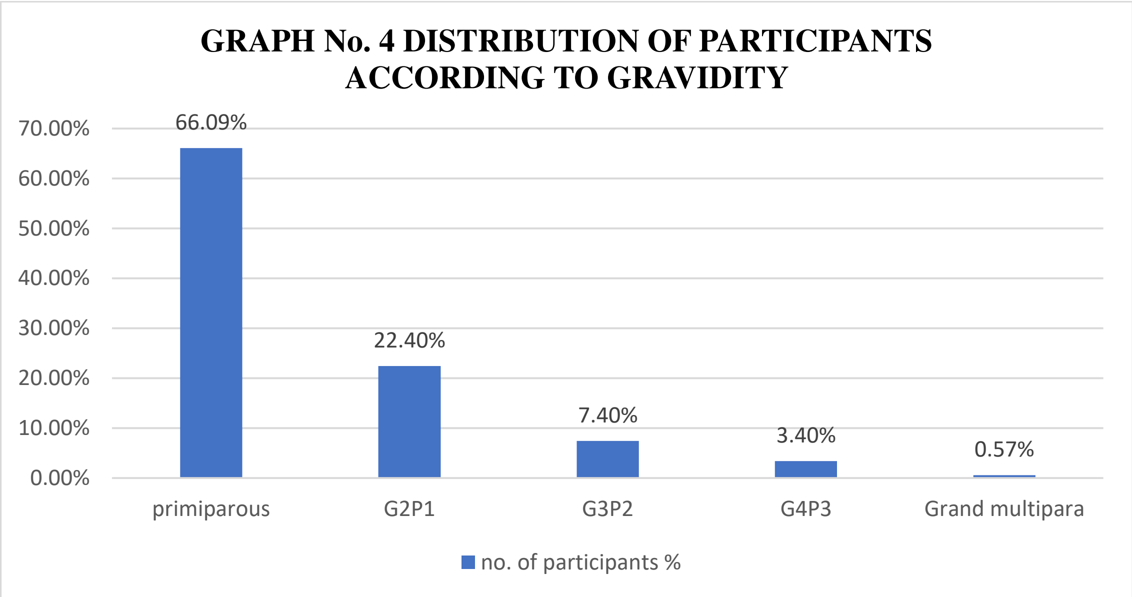


In our present study of 174 participants, age ranged from 18 yrs. to 40 yrs. The youngest participant being 18 yrs. and the oldest being 40 yrs. We observed maximum number of patients in the age group of 20-24yrs i.e., 90 (51.72%), followed by 47 (27.01%) participants in age group of 25-29 yrs. and there were 18 (10.34%) participants less than 20 yrs. of age, remaining 19 participants were in the age group

VARIABLES		NUMBER
Gravidity	Primiparous	115 (66.09%)
	G2P1	39(22.4%)
	G3P2	13(7.4%)
	G4P3	6(3.4%)
	Grand multipara	1(0.57%)

of 30-40 yrs. The mean age of the participants having meconium stained liquor was 24.26yrs ± 4.26.

Table no.2 Distribution of participants according to gravidity



In our study of 174 participants, who presented with meconium stained liquor, 115 (66.09%) participants were primigravida and remaining 59 participants (33.91%)

were multigravida (39 were second gravida, 13 were third gravida, 6 were fourth gravida and 1 was grand multipara) as depicted in the above table no.2.

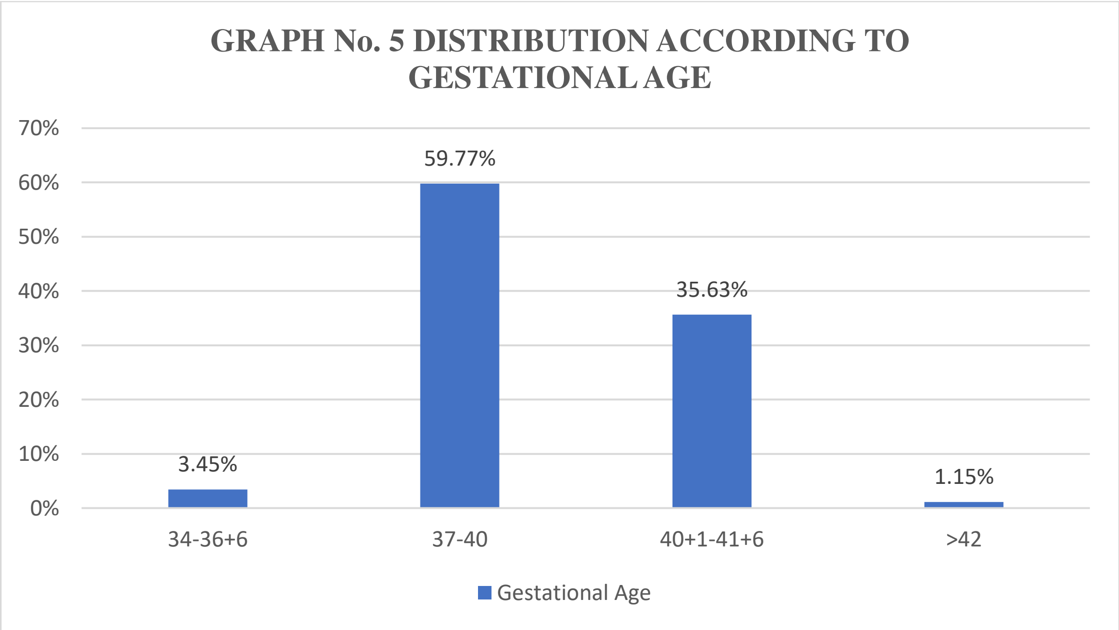
Table no. 3 Distribution according to height, weight, BMI

	VARIABLES	**NUMBER**
Height (cm)	Mean ± SD	153.34 ± 5.14
	Median (Min, Max)	154.5 (138, 166)
Weight (Kg)	Mean ± SD	56.05 ± 6.6
	Median (Min, Max)	56 (44, 83)
BMI (Kg/Cm^2)	Mean ± SD	23.86 ± 2.73
	Median (Min, Max)	23.4 (18.87, 33.25)

We observed in our participants, the mean BMI of 23.86±2.73 (Kg/Cm^2) with highest BMI of 33.25 and lowest being 18.87 as depicted int the above table no. 3. The weight and height of the participant at admission to labour room was used in the calculation of BMI.

VARIABLES (Weeks)		NUMBER
Gestational age	Preterm (34-36+6)	6 (3.45%)
	Term (37-40)	104 (59.77%)
	Post datism (40+1-41+6)	62 (35.63%)
	Post term (>42)	2 (1.15%)

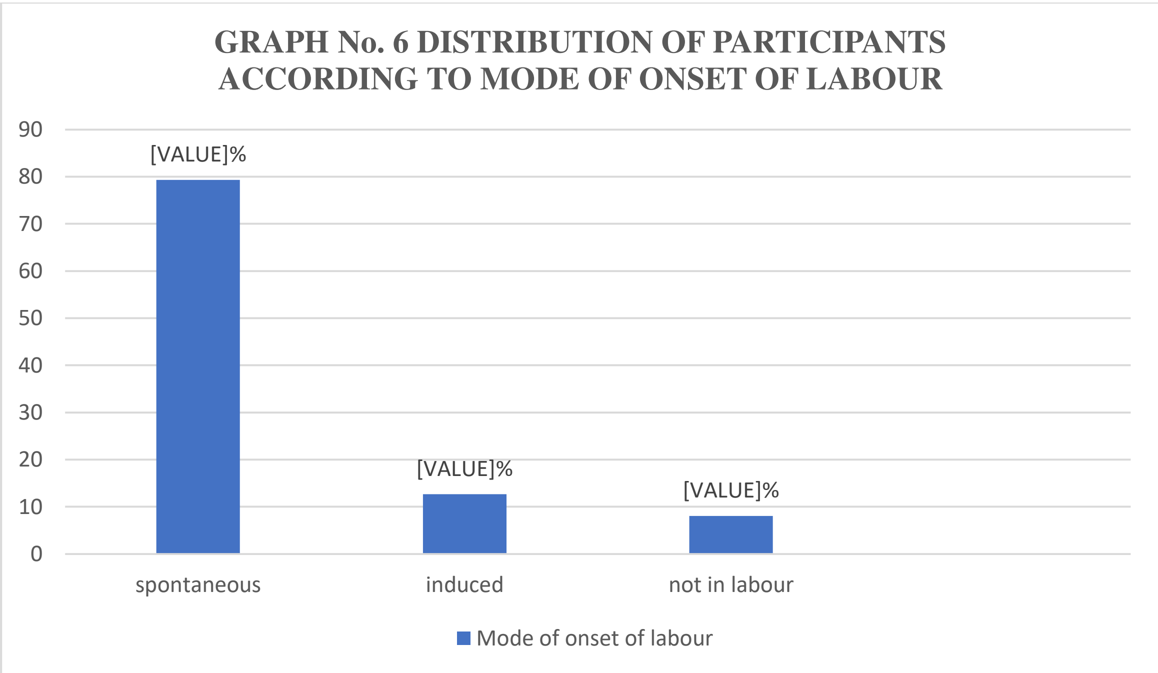
Table no. 4 Distribution according to gestational age



Out of 174 participants, maximum number of participants i.e., 104 (59.77%) were of term gestation, 62 (35.63%) participants were post-dated and 6 (3.45%) participants were preterm. We also observed that 2 (1.15%) participants were post term i.e., more than 42 weeks period of gestation.

Table no. 5 Distribution of participants according to mode of onset of labour

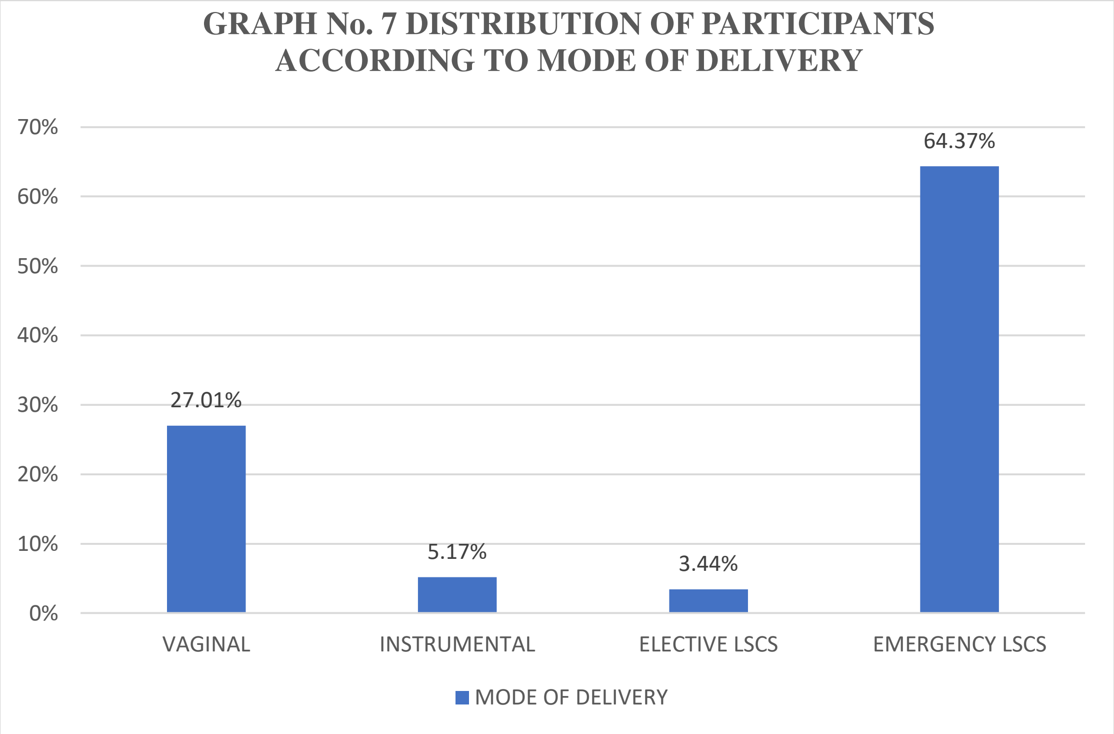
Variables		Number
Mode of onset of labour	Spontaneous	138 (79.31%)
	Induced	22 (12.64%)
	Not in labour	14 (8.05%)



The above table no.4 shows distribution of participants according to the mode of onset of labour categorized as spontaneous onset, induced labour and patients not in labour. 138 (79.31%) participants had spontaneous onset of labour and labour was induced in 22 (12.64%) for various indications and in the remaining 14 participants were not in labour and meconium was identified as an incidental finding during cesarean delivery intraoperatively.

Table no. 6 Distribution of participants according to mode of delivery.

Variables		Number
Mode of delivery	Vaginal	47 (27.01%)
	Instrumental	9 (5.17%)
	Elective LSCS	6 (3.44%)
	Emergency LSCS	112 (64.37%)

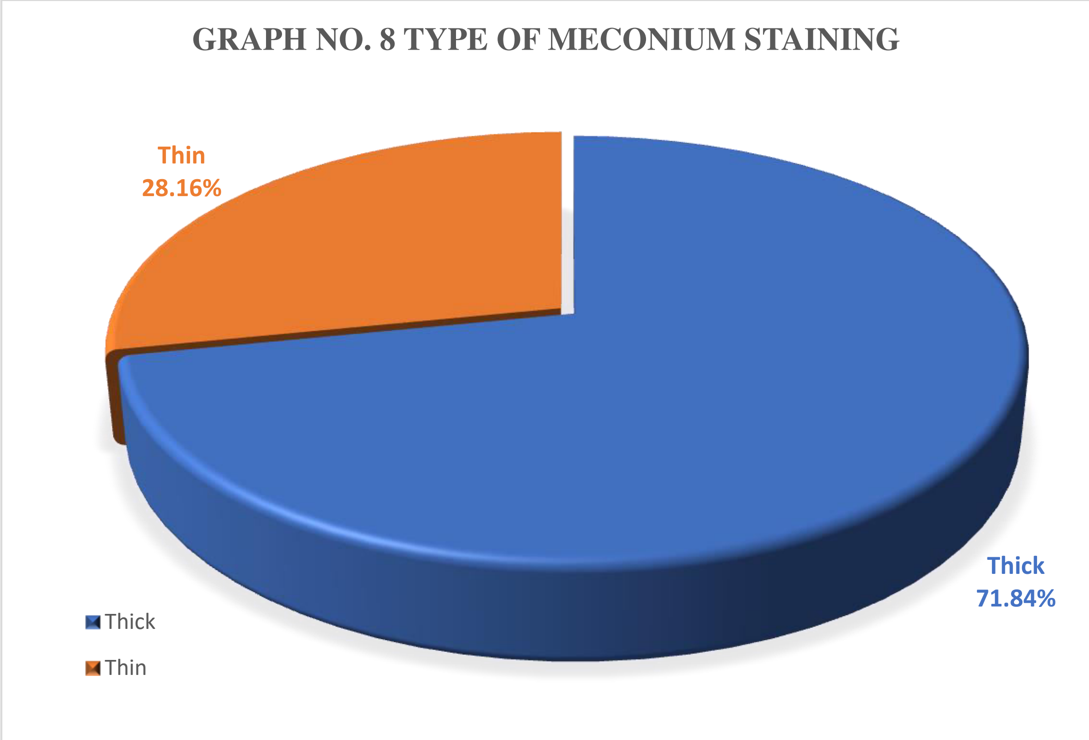


We also collected data based on mode of delivery of our participants and found that emergency LSCS was most common mode of delivery i.e., in 112 (64.37%), followed by vaginal delivery 47 (27.01%)

Only few participants required instrumental delivery 9 (5.17%) and in other remaining participants i.e., 6 (3.44%) meconium was incidentally detected as a part of elective LSCS intraoperatively

Table no 7 Distribution of participants according to type of meconium staining

Variables		Number
Meconium	Thick	125 (71.84%)
	Thin	49 (28.16%)

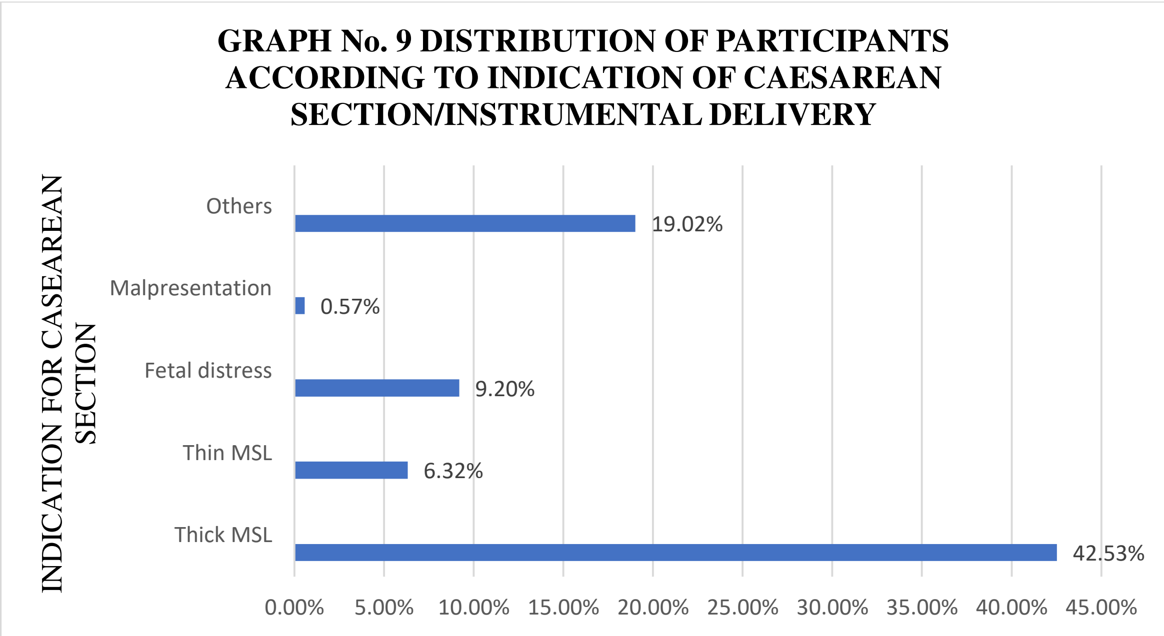


Out of 174 deliveries with meconium stained liquor, 125 (71.84%) had thick meconium and remaining 49 (28.16%) showed thin meconium staining of liquor.

Table no. 8A Distribution of participants according to indication of caesarean section/ instrumental delivery.

Variables		**Number**
Indication for Caesarean	Thick MSL	74 (42.53%)
	Thin MSL	11 (6.32%)

section/instrumental delivery	Fetal distress	16 (9.2%)
	Malpresentation	1 (0.57%)
	Others	35 (19.02%)



In our 174 participants with meconium stained liquor,127 needed intervention in the form of instrumental delivery or cesarean section, and 47 underwent vaginal delivery. The most common indication for intervention was thick MSL, followed by fetal distress seen in 16 (9.2%) and thin MSL 11 (6.32%) and 35 (19.02%) had other indications, few of which had more than one indication as depicted in Table no. 8B below.

Table no. 8B Other indications of caesarean section.

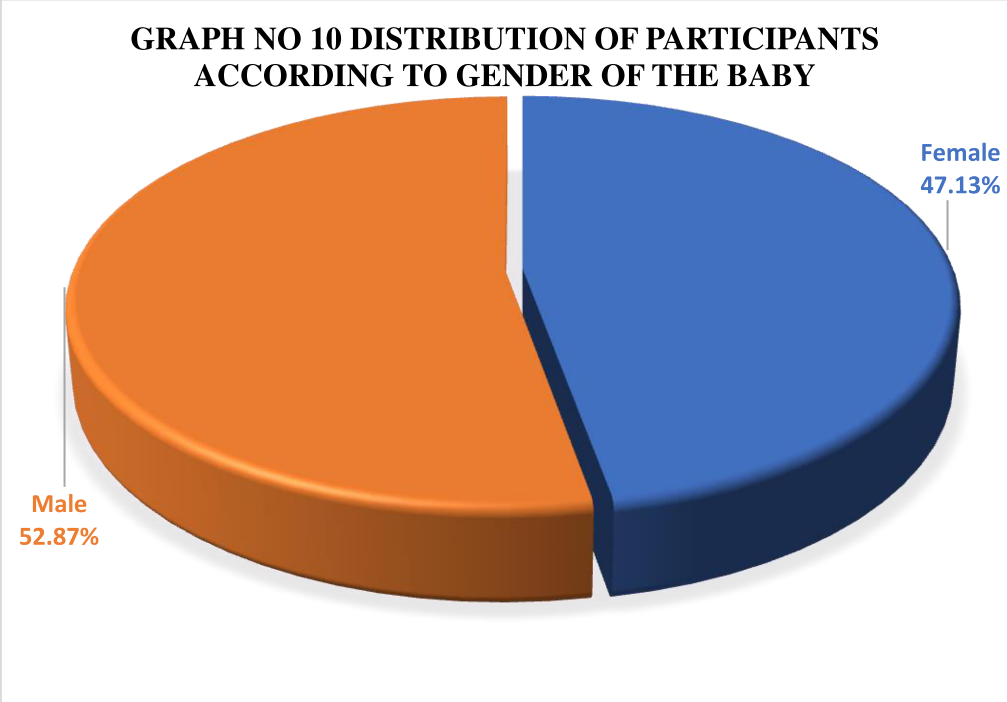
Others(n=35)	
Severe PE	4 (2.3%)
Prev LSCS	10 (5.7%)

Anamnios	2 (1.15%)
Antepartum eclampsia	2 (1.15%)
CDMR	1 (0.57%)
CPD	5 (2.87%)
Pathological trace	4 (2.3%)
Placenta previa	2 (1.15%)
Prev 2 LSCS	5 (2.87%)

Table no. 9 Distribution of participants according to gender of the baby

VARIABLES		NUMBER
Gender of baby	Female	82 (47.13%)

	Male	92 (52.87%)



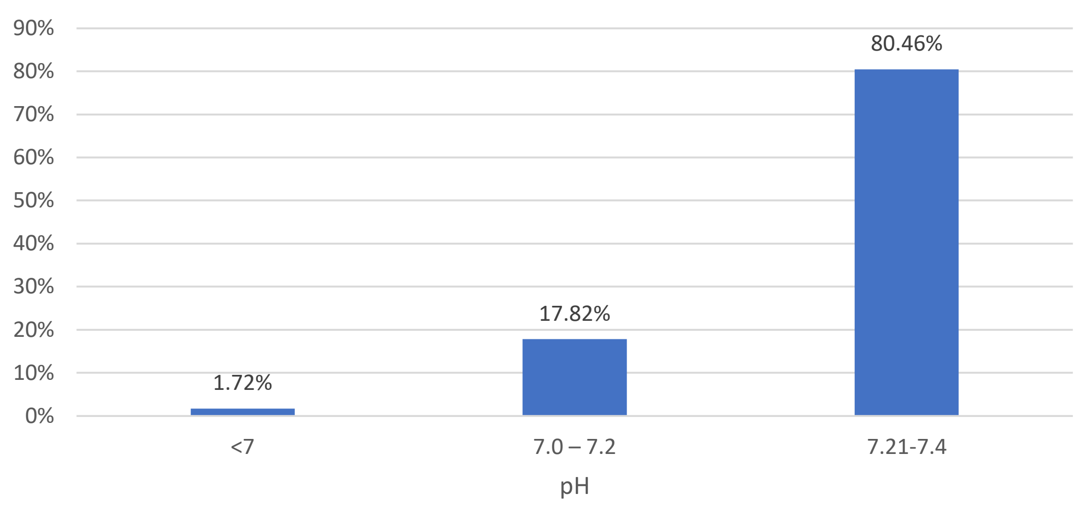
We observed male preponderance among the babies delivered to our 174 participants, i.e., 92 (52.87%) were male babies born. 82 (47.13%) were female babies.

Table no. 10 Distribution of participants according to pH

Variables	Number

pH	<7	3 (1.72%)
	7.0 – 7.2	38 (17.82%)
	7.21-7.4	133 (80.46%)
	Mean ± SD Median (Min, Max)	7.26 ± 0.1 7.28 (6.79, 7.4)

GRAPH No. 11 DISTRIBUTION OF PARTICIPANTS ACCORDING TO pH



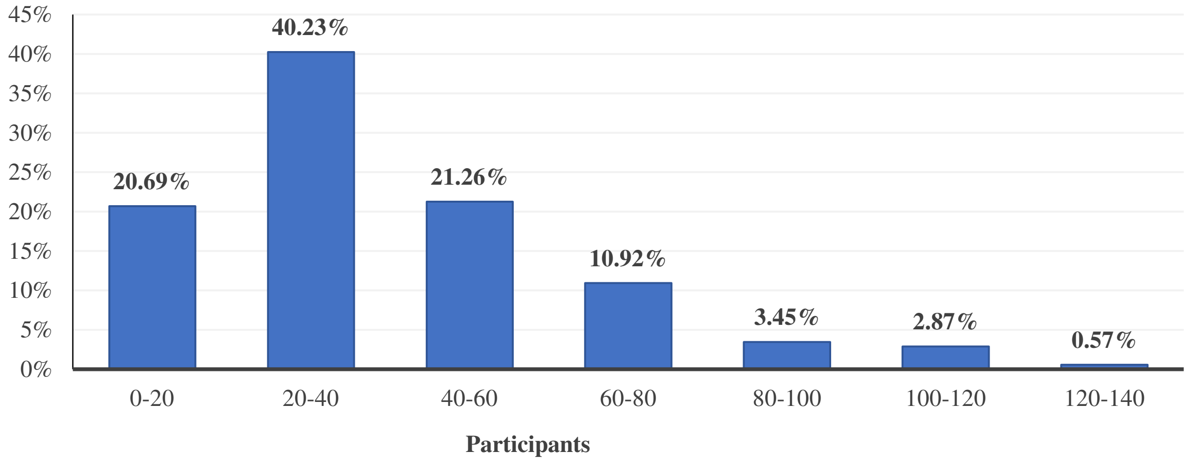
We collected data of arterial blood gas analysis of the cord blood and analyzed for the pH and observed that maximum babies have pH in the range of 7.21-7.4 i.e., 140 (80.46%). 31 (17.82%). Babies cord pH ranged between 7.01-7.2 and 3 (1.72%) have pH of less than 7. The mean pH of cord blood of all babies was 7.26 ± 0.1.

Table no. 11 Distribution of participants according to level of lactate

VARIABLES	NUMBER

Lactate (milligram/decilitre)	0-20	36 (20.69%)
	20-40	70 (40.23%)
	40-60	37 (21.26%)
	60-80	19 (10.92%)
	80-100	6 (3.45%)
	100-120	5 (2.87%)
	120-140	1 (0.57%)
	Mean ± SD Median (Min, Max)	39.19 ± 24.44 31.25 (7.4, 133.3)

GRAPH NO. 12 DISTRIBUTION OF PARTICIPANTS ACCORDING TO LEVEL OF LACTATE

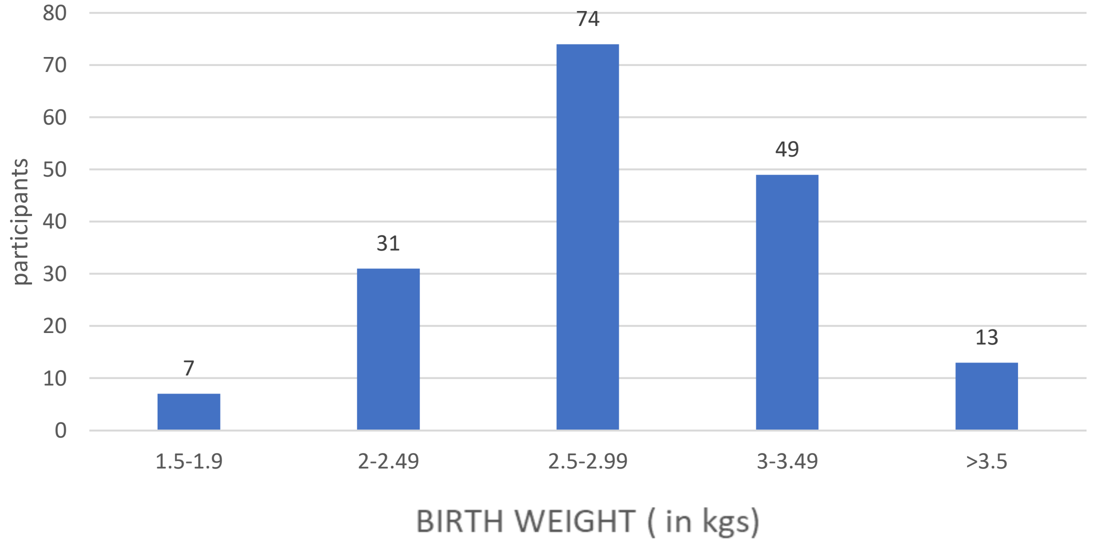


We also analyzed lactate levels of cord blood and the values observed are depicted in above table no. 11. 70 (40.23%) babies lactate levels ranged between 20-40 mg/dl, 37 (21.26%) ranged between 40-60 mg/dl, 36 (20.69%) ranged between 0-20 mg/dl and for 30 babies it ranged from 60-120. only 1 baby had a lactate level more than 120. 39.19 ± 24.44 is the mean lactate levels of cord blood of all babies in our study.

Table no. 12 Distribution of participants according to birth weight.

VARIABLES		NUMBER
Birth Weight (Kg)	1.5-1.9	7 (4.02%)
	2-2.49	31 (17.81%)
	2.5-2.99	74 (42.52%)
	3-3.49	49 (28.16%)
	>3.5	13 (7.47%)
	Mean ± SD Median (Min, Max)	2.78 ± 0.45 2.8 (1.5, 3.8)

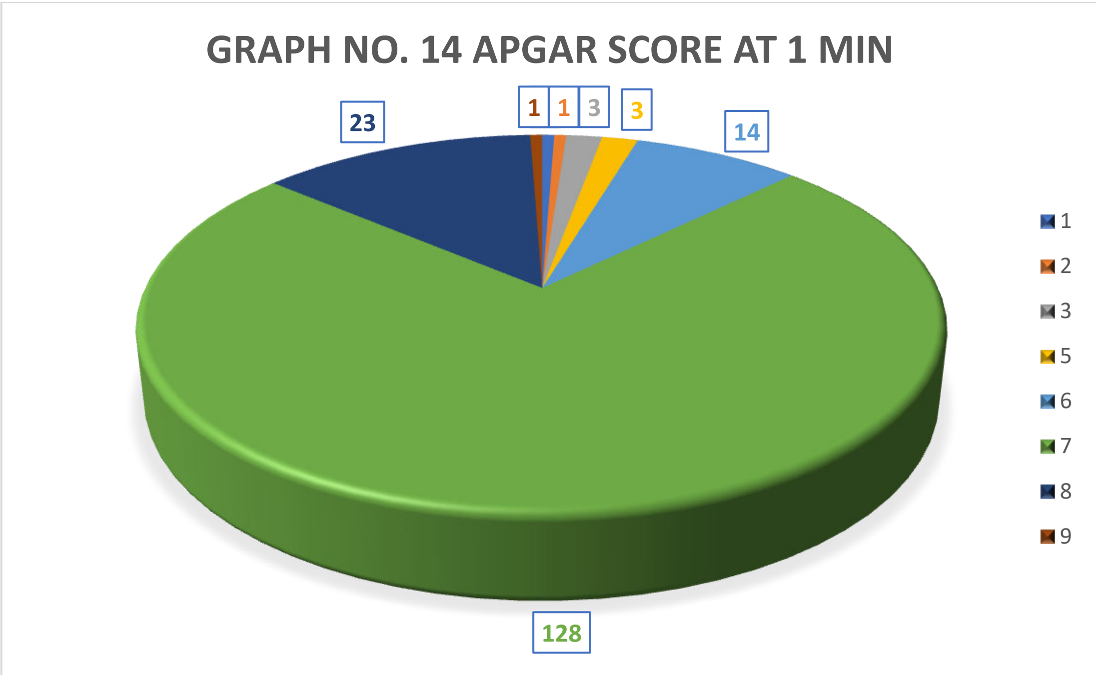
GRAPH NO 13 DISTRIBUTION OF PARTICIPANTS ACCORDING TO BIRTH WEIGHT.



Most of the babies delivered to the participants had birth weight more than 2.5 kgs i.e., 136, 38 babies born were less than 2.5 kgs. The maximum weight was 3.8 kgs and minimum weight of the baby was 1.5 kgs of 174 babies delivered. The mean weight of babies was 2.78 ± 0.45 kgs.

Table no 13 Distribution of participants according to APGAR score at 1 min

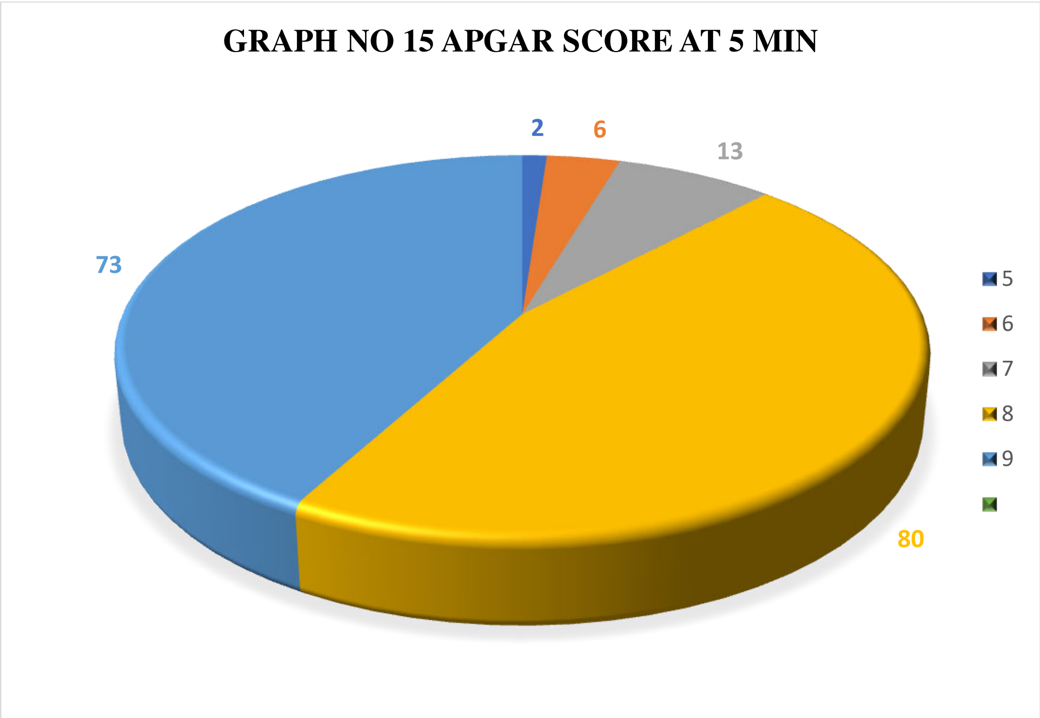
Variables		Number Of Babies
APGAR at 1 min	1	1(0.57%)
	2	1(0.57%)
	3	3 (1.72%)
	5	3 (1.72%)
	6	14 (8.04%)
	7	128 (73.56%)
	8	23 (13.2%)
	9	1(0.57%)
	Mean ± SD Median (Min, Max)	6.89 ± 1.01 7 (1, 9)



The above table no 13 shows APGAR score at 1 min for 174 babies of our participants and majority 128 (73.56%) had APGAR score of 7 and 23 babies (13.2%) had APGAR score of 8, only one baby had APGAR score of 9 and remaining 22 babies had APGAR score less than 7.

Table no. 14 Distribution of participants according to APGAR score at 5 mins

VARIABLES		NUMBER
APGAR at 5 min	5	2(1.25%)
	6	6 (3.44%)
	7	13(7.47%)
	8	80(45.9%)
	9	73(41.95%)
	Mean ± SD Median (Min, Max)	8.07 ± 0.88 8 (5, 9)



Similarly, the above table no.14 shows APGAR score at 5 min for 174 babies of our participants and majority 80 (45.9%) had APGAR score of 8 and 73 babies had APGAR score of 9, remaining 21 babies had APGAR score less than 8.

Table no. 15 Distribution of participants according to neonatal outcome and NICU admission

		Variables	Number
Neonatal Outcome	NICU admission {27(15.51%)}	Respiratory distress	18 (10.34%)
		LBW / prematurity *	4 (2.29%)
		Hyperbilirubinemia	2 (1.15%)
		Infant of Diabetic mother	2 (1.15%)
		Others (1- fever,1-sepsis, 1-HIE*)	3(1.72%)
	Baby with mother		147 (84.49%)

*Note – one baby with HIE and one baby with low birth weight also had respiratory distress additionally.

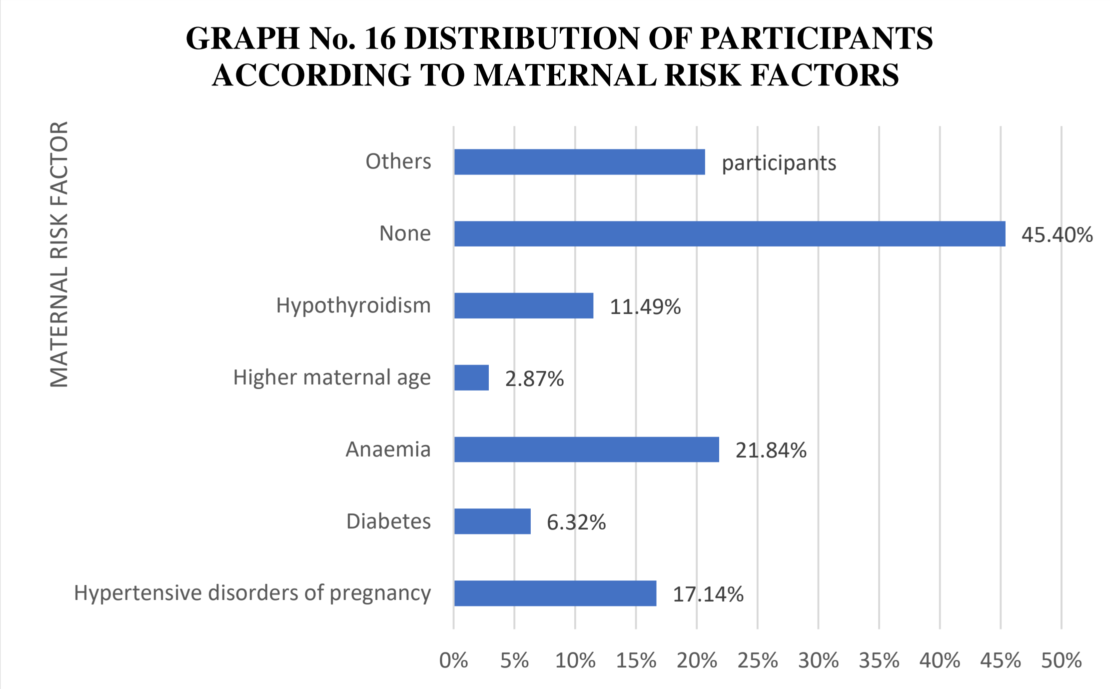
The neonatal outcome of all 174 babies was analyzed and categorized in 2 major groups of babies requiring NICU admission and babies who were directly handed over to mother after delivery which were 27 (15.51%) and 147 (84.49%) respectively. Out of NICU admission, most of the babies had respiratory distress 18 (10.34%) and 4 had low birth weight/prematurity, 2 had hyperbilirubinemia and 2 babies were infants of diabetic mother and 3 babies who needed NICU admission had fever, sepsis and hypoxic ischemic encephalopathy. Among the 18 babies who needed nicu admission for respiratory distress one baby had very low birth weight and one had HIE additionally.

Table no. 16A Distribution of participants according to maternal risk factors

Variables		Number
Maternal risk factors	Hypertensive disorders of pregnancy	30(17.14%)
	Diabetes	11 (6.32%)
	Anaemia	38 (21.84%)
	Higher maternal age	5 (2.87%)
	Hypothyroidism	20 (11.49%)
	None	79 (45.4%)
	Others	39(22.41%)

Table no. 16B Other maternal risk factors

Rh negative	11 (6.32%)
COVID positive	16 (9.2%)
Heart disease	2 (1.15%)
Short stature	4 (2.3%)
Gestational thrombocytopenia	2 (1.15%)
Maternal infections	4 (2.3%)



When an attempt was made to find the maternal risk factors contributing to meconium stained amniotic fluid, we could not ascertain any maternal risk factor in 79 (45.4%) mothers. In most of the mothers 38 (21.84%), anemia was found as one of the major risk factors but not statistically significant. Other risk factors hypertensive disorders of pregnancy 30 (17.14%), hypothyroidism 20 (11.49%), diabetes 11 (6.32%). Higher maternal age i.e., more than 35yrs of age was found in 5 (2.87%) participants.

As depicted in the table 16B , the other analyzed risk factors contributing to meconium staining include corona virus disease in 16 (9.2%) participants, Rh negative pregnancy in 11 (6.32%), 2 (1.15%) had heart disease, short stature and maternal infections were 4 (2.3%) in each group and 2 (1.15%) had gestational thrombocytopenia.

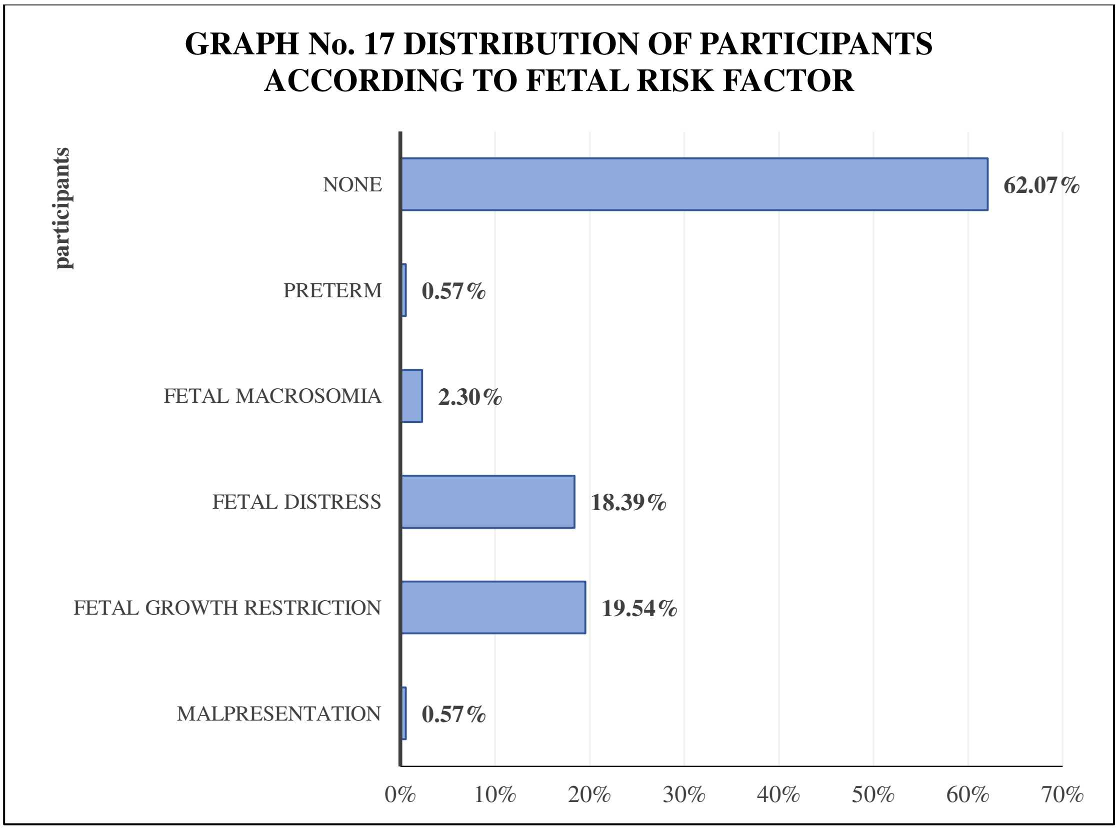
Table no 17 Association of maternal risk factors with neonatal outcome

Variables	Sub Category	Number	NICU admission	p-value
Maternal risk factors	Hypertensive disorder of pregnancy	30	5(18.51%)	0.8011^{MC}
	Diabetes	11	4 (14.81%)	0.0784^{MC}
	Anaemia	38	6 (22.22%)	0.8711^{MC}
	Higher maternal age	5	0	0.7041^{MC}
	Hypothyroidism	20	1 (3.7%)	0.7261^{MC}
	RH negative	11	1 (3.7%)	1^{MC}
	COVID Positive	16	2 (7.4 %)	0.8251^{MC}
	Heart disease	2	1 (3.7%)	0.2484^{MC}

Chi square test was used to find co-relation between maternal risk factor and adverse neonatal outcomes (NICU admission) and found no statistical significance. We found that 5 babies of mother having hypertensive disorder, 6 babies of anaemic mothers and 4 babies of diabetic mother needed NICU admission and other risk factor requiring NICU admission is depicted in above table no.17

Table no. 18A Distribution of participants according to fetal risk factor

Variables		Number
Fetal risk factors	Malpresentation	1 (0.57%)
	Fetal growth restriction	34 (19.54%)
	Fetal distress	32 (18.39%)
	Fetal macrosomia	4 (2.3%)
	Preterm	6 (3.45%)
	None	108 (62.07%)



Variables	Sub Category	Number	NICU Admission	p-value
Fetal risk factors	Malpresentation	1	1 (3.7%)	0.1274^{MC}
	Fetal growth restriction	34	5 (18.51%)	0.076^{MC}
	Fetal distress	32	10 (37.03)	**0.023^{MC}***
	Fetal macrosomia	4	0	1^{MC}
	Preterm	6	2 (7.40%)	0.1274^{MC}

Table no. 18B Association of fetal risk factors with neonatal outcome

Similarly, we also corelated fetal risk factors with neonatal outcome using Chi square test and found that fetal distress led to maximum NICU admissions amongst the fetal risk factors and is statistically significant with p value of 0.023. Other fetal risk factors and their association with neonatal outcome is depicted in the above table no 18A and 18B.

Table no. 19A Distribution of participants according to obstetric risk factor

	Variables	Number
Obstetric Risk Factor	Premature rupture of membrane	19 (10.92%)
	Oligohydramnios	30 (17.24%)
	Prolonged labour	4 (2.3%)
	Post-dated pregnancy	64 (36.78%)
	Low birth weight	38 (21.84%)
	Prematurity	4 (2.3%)
	Cord around neck	7 (4.02%)
	Doppler changes	4 (2.3%)
	APH	1 (0.57%)
	Polyhydramnios	1 (0.57%)
	Multiparity	1 (0.57%)
	None	54 (31.03%)

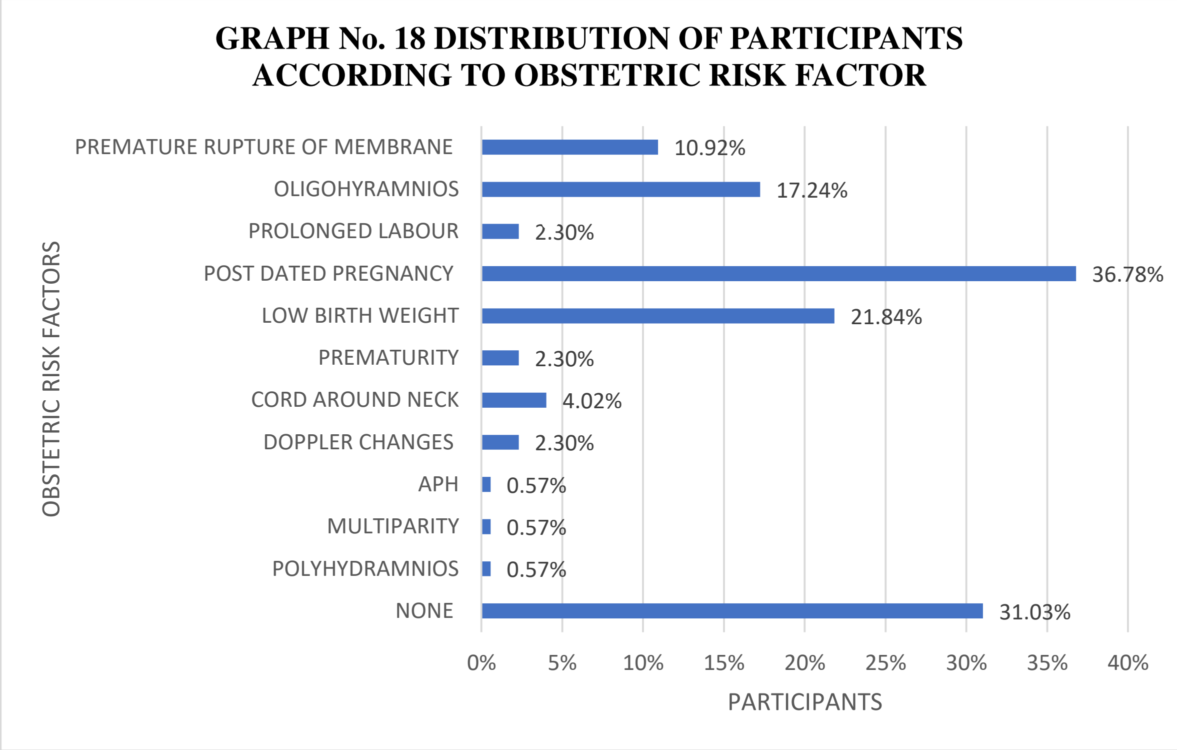


Table no. 19B Association of obstetric risk factors with neonatal outcome

Variables	Sub Category	Number	NICU Admission	p-Value
Obstetric risk factors	Premature rupture of membrane	19	5 (18.51 %)	0.2879^{MC}
	Oligohydramnios	30	4 (14.81%)	0.7356^{MC}
	Prolonged labour	4	0	1^{MC}
	Post-dated pregnancy	64	6 (22.22%)	0.3618^{MC}
	Low birth weight	38	9 (33.33%)	0.7496^{MC}
	Prematurity	4	2 (7.4 %)	0.1274^{MC}
	Cord around neck	7	2 (7.4 %)	0.6453^{MC}
	Doppler changes	4	2 (7.4 %)	0.048^{MC}*

	APH	1	1 (3.7%))	0.1274[MC]

Similarly, when an attempt was made to find obstetric risk factors contributing to meconium stained liquor and their association with neonatal outcome, we found majority of them had post-dated pregnancy i.e., 64 (36.78%) out of which 6 babies required NICU admission, though it was not statistically significant. Out of 4 pregnancies with doppler changes, 2 baby needed NICU care and it was statistically significant with p value of 0.048 as per chi square test. Other obstetric risk factors and their association with neonatal outcome is enlisted in table no 19A and 19B. Among the 9 babies with low birth weight, 1 baby had very low birth weight. 2 of the participants were post term of the 64 cases labelled as post-dated pregnancy.

Table no. 20 Distribution of participants according to follow up at 6 months and hospital admission during the 6 months

Variables		**Number**
Follow Up At 6 Months	Milestones Attained	170 (97.7%)
	Delayed Milestones	4 (2.3%)
Hospital Admission in 6months	No	171 (98.27%)
	Yes	3 (1.72%)

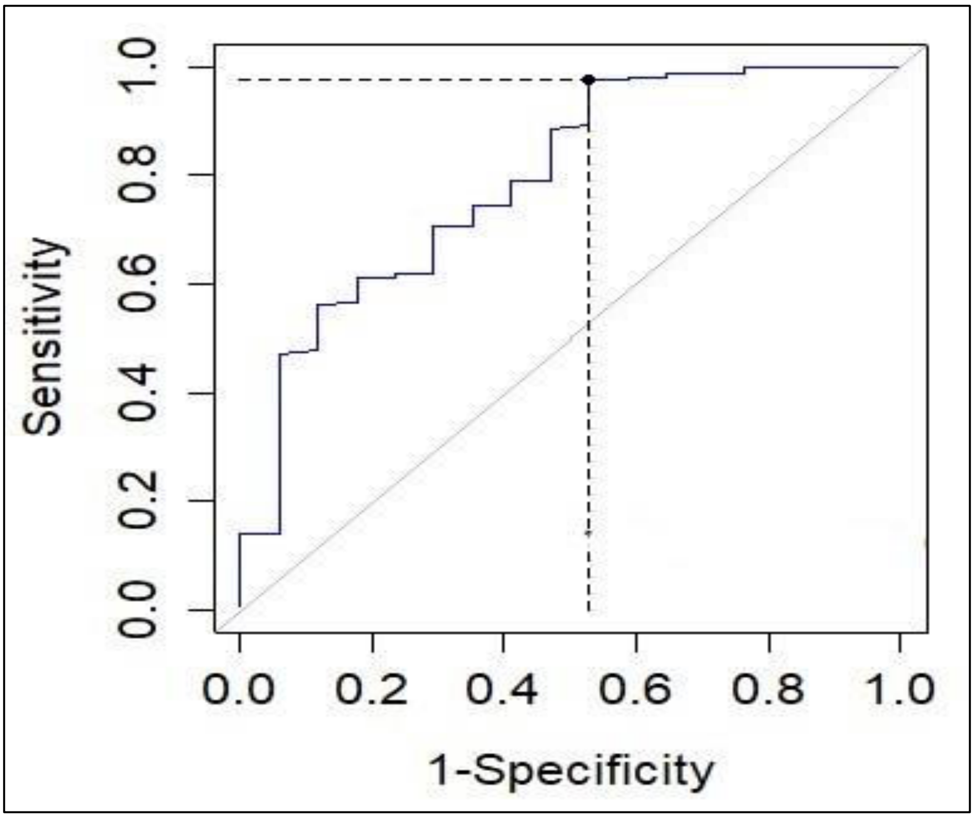
All the babies of our participants were followed up after 6 months in order to see milestones achieved and to see requirement of hospital admission during this period. To our notice it was found that only 3 babies needed hospital admission. We also observed, out of 174, 4 babies had delay in achieving milestones as per their age. (Measured in terms of head control during movement, social smile, turning prone, reaching out for objects and cooing/babbling)

Delayed Neuro developmental outcomes in terms of delay in milestones was analyzed at 6 months as per the TDSC. In our study we observed that the neonate with the highest level of lactate i.e., 133mg/dl at 6 months follow up showed to have delayed developmental milestone in terms of the fine motor skill. Gross motor and language were seen to be appropriate for the age. Among the other 3 babies 2 babies had delayed head holding and one baby had delayed proning. but these babies could not be followed up. (Limitation of our study)

Table no 21 Cut-off and accuracy indices of lactate levels in predicting neonatal outcome respiratory distress.

Variable	Lactate Levels
Cut off	(>) 77.6mg/dl
AU-ROC (95% CI)	0.792 (0.671, 0.914)
Sensitivity (95% CI)	97.45% (93.61% - 99.30%)
Specificity (95% CI)	47.06% (22.98% - 72.19%)
PPV (95% CI)	94.44% (85.09% - 98.44%)
NPV (95% CI)	66.67% (43.35% - 85.38%)

LR +	1.8408 (1.1750 - 2.8837)
LR-	0.0541 (0.0182 - 0.1612)
Odds Ratio (95% CI)	1.0462 (1.0271, 1.0684)
p-value	< 0.001*



GRAPH No. 19 : ROC CURVES FOR LACTATE LEVEL SCORE IN PREDICTING NEONATAL OUTCOME RESPIRATORY DISTRESS.

From logistic regression, it is observed that, lactate level is significantly associated with neonatal outcome respiratory distress (p-value < 0.001). The odds of having neonatal outcome respiratory distress increases by 1.0462 with the unit increase of lactate level. The AUC for Lactate level is 0.792 at cut-off > 77.6 mg/dl with 97.45% sensitivity and 47.06% specificity in predicting neonatal outcome respiratory distress. (Table no 21)

Table no 22 Association of lactate levels with neonatal outcomes for those with pH ≤ 7.2.

Neonatal outcome	Sub Category	Lactate level		p-value
		< 63	≥ 63	
Baby with mother	No	2 (10%)	8 (38.1%)	0.0745^{MC}
	Yes	18 (90%)	13 (61.9%)	
Respiratory distress	No	19 (95%)	13 (61.9%)	0.022^{MC}*
	Yes	1 (5%)	8 (38.1%)	

Neonatal outcomes of the participants having pH less than 7.2 (as per the standard cut-offs) i.e., 41 participants were analyzed and this group was divided into 2 subgroups on basis of lactate levels (< 63mg/dl and > 63mg/dl) as 7mmol/L as a reference cut-off value.[44] It was observed that out of 41 participants, (having pH <7.2), those who had lactate levels <63mg/dl i.e., 20 participants, 18 babies were with mother and only 2 needed ICU admission. Also, in terms of respiratory distress only 1 baby suffered. In those with lactate levels more than 63mg/dl i.e., 21 participants, 8 babies needed NICU admission for respiratory distress and 13 babies were with mother. This was statistically significant with p value of 0.022 after analyzing this data by Chi square with Monte Carlo simulation test.

DISCUSSION

Meconium stained amniotic fluid is really worrisome from both, obstetrician's and paediatrician's points of view, as it increases the caesarean rates, causing birth asphyxia, MAS and increases neonatal intensive care unit (NICU) admissions.(45)

In our present study of 174 participants who had meconium staining of liquor at delivery due to various risk factors, we tried to find out association of umbilical cord blood lactate levels in new-borns, umbilical cord blood gas analysis (pH) and neonatal outcomes at birth and followed up the babies at 6 months for neurodevelopmental outcomes.

In our study of 174 participants, age ranged from youngest 18 yrs. to eldest 40 yrs. We observed maximum number of patients in the age group of 20-24yrs i.e., 90 (51.72%), in 25-29 yrs. age group 47 (27.01%) participants and there were 18 (10.34%) participants less than 20 yrs. of age, remaining 19 participants were in the age group of 30-40 yrs. The mean age of the participants having meconium stained liquor was 24.26yrs ± 4.26 yrs. In the study conducted by Adissu et-al on prevalence of meconium stained liquor, mean age of the study participants was 28.05 years ± 5.1 years. Nearly two third, 344 (69.5%) of mothers were in the age group of <30 years which was similar to our study where 89% participants were less than 30 years of age.(2)

In our study of 174 participants, who presented with meconium stained liquor, 115 (66.09%) participants were primigravida and remaining 59 participants (33.91%) were multigravida (39 were second gravida, 13 were third gravida, 6 were fourth gravida and 1 was grand multipara as depicted in the above table no.2), which is similar to the study conducted by of Naveen Kumar et al, where the incidence of primigravida was

57.14% and 42.86% in multigravida.(46) Adissu et-al. in their study on 495 participants found 50.7% were primigravida, 37.2 % multigravida and 12 % grand multipara unlike our study where we had only one i.e. 0.57% grand multipara.(2)

The mean BMI of 23.86 ± 2.73 (Kg/Cm^2) was observed in our participants, with highest BMI of 33.25 and lowest being 18.87 as depicted in Table no. 3. which is similar to findings by Kandice A et al where they found mean BMI 25.43 ± 0.03.(47) Similarly mean weight was 56.05 ± 6.6 kgs and mean height was 153.34 ± 5.14 cm.

In our study out of 174 participants 104 (59.77%) were of term gestation, 62 (35.6%) participants were post-dated and 6 (3.45%) participants were preterm. We observed 2 participants were post term i.e., more than 42 weeks period of gestation. In a study conducted by Addissu et al, it was observed that 86.1% participants had term gestation and 13% were more than 41 weeks of gestation. (2) In a retrospective analysis of pregnancies continuing beyond their due date, Aseeja V. et al found the incidence of MSL to be 8.13%. In their study they also found the incidence of meconium stained liquor and caesarean sections were higher in women after 41 weeks than those who delivered between 40 and 41 weeks. (48) A study on duration of pregnancy and outcomes on a population in Southern India also showed that pregnancy beyond 40 weeks have a higher rate of meconium stained amniotic fluid and meconium aspiration. The study also found that, between 40 and 41weeks and then beyond 41 weeks, meconium aspiration was two and two and half times more respectively, compared to in those who completed 39 weeks gestation.(49) In a study by Treger et al, meconium stained amniotic fluid and caesarean section were significantly higher with increasing gestational age, hence they suggested that induction of labour should be performed before 42 weeks.(50) In a study by Chhabria et al on 2010 women whose pregnancies carried beyond 40 weeks, intrapartum fetal complications were meconium stained liquor in 18.6%, adverse fetal heart rate patterns in 8.4% and shoulder dystocia in 2%. The study found that a policy of induction of labour reduced risk of perinatal mortality and reduced caesarean sections for fetal distress.[(24)]

Distribution of participants according to the mode of onset of labour categorized as spontaneous onset, induced labour and patients not in labour was done and it was observed that 138 (79.31%) participants had spontaneous onset of labour and labour was induced in 22 (12.64%) for various indications and the remaining 14 (8.05%) participants were not in labour and meconium was found incidentally intraoperatively. In a study by Addissu et. al. they found spontaneous onset of labour in majority of participants i.e., in 85.1% and in remaining 14.9% labour had to be induced almost similar to findings in our study.[(2)]

Data was collected based on mode of delivery of our participants and found that LSCS was the most common mode of delivery i.e., in 118 (67.81%), followed by vaginal delivery 47 (27.01%). Only few participants required instrumental delivery 9 (5.17%). This is in contrast to study by Addissu et.al, where 73.3% were vaginal delivery and 24.2 were LSCS and only 2.4 % required instrumental delivery. [(51)] The most common indication for intervention in our study was thick MSL, followed by fetal distress seen in 16 (9.2%) and thin MSL 11 (6.32%) and 35 (19.02%) had other indications, few of which had more than one indication as depicted in Table no. 8B. In study by Natesan et. al on 2212 participants 4.2% had elective LSCS which is almost similar to our study where 3.44 % of participants had elective LSCS in whom meconium stained liquor was detected incidentally intraoperatively (table no 6).[(52)] Study by Mundra R. et. al. caesarean section was the most common mode of delivery which is similar to findings of our study. [(45)] Gavhane et. al also found increased incidence of operative delivery in their study with overall rate of caesarean section being 65.5%.[53]

Out of 174 deliveries with meconium stained liquor, 125 (71.84%) had thick meconium and remaining 49 (28.16%) showed thin meconium staining of liquor. In the study conducted by Mazouri et. al. on 150 participants thick meconium stained amniotic fluid (TKMSF) was found in 40.0% and thin meconium stained amniotic fluid (TNMSF) in 60.0% which is in contrast to findings in our study. [1] Gavhane et. al reported incidence of thick MSAF slightly higher at 53.5% as compared to thin MSAF at 46.5% comparable to our study. [53] In study by Jain Pooja et al on 1680 deliveries the incidence of MSL in was 11.01% (185 patients). [54] We also observed male preponderance among the babies delivered to our 174 participants i.e., 92 (52.87%) were male babies born similar to Mazouri et. al.[1]

We collected data of arterial blood gas analysis of the cord blood and analysed for the pH and observed that maximum babies have pH in the range of 7.21-7.4 i.e., 133 (80.46%). 38 (17.82%) babies cord pH ranged between 7-7.2 and 3 (1.72%) had pH of less than 7. The mean pH of cord blood of all babies was 7.26 ± 0.1 which is similar to the study done by Bhat et al showing predictive cut off for pH for adverse neonatal outcomes at pH 7.2 in their study population of 231. Among 231 MSAF complicated pregnancies, 25 (10.8%) had MAS. Mean cord pH was significantly lower in neonates with MAS compared to those without MAS (7.15 ± 0.11 vs. 7.26 ± 0.07; $p < 0.001$). [55]

We also analysed lactate levels of cord blood and the values observed are depicted in table no 11. In 70 (40.23%) babies lactate levels ranged between 20-40mg/dl, 37 (21.26%) ranged between 40-60mg/dl, 36 (20.69%) ranged between 0-

20mg/dl and for 30 babies it ranged from 60-120. Only 1 baby had a lactate level more than 120mg/dl i.e., 133.3 mg/dl corresponding to 14.1mmol/L which is significantly higher compared to similar studies. 39.19 mg/dl ± 24.44 is the mean lactate levels of cord blood of all babies in our study. In a study conducted by Tuuli et al. for comparing umbilical arterial lactate with pH for predicting neonatal morbidity at term on their 4997 participants, found mean lactate levels 29.34mg/dl ± 13.3 mg/dl (56) .

Most of the babies delivered to the participants had birth weight more than 2.5kgs i.e., 136, 38 babies born were less than 2.5kgs. The mean weight of babies was 2.78 ± 0.45. In study by Maymon et.al they found mean birth weight of babies with meconium stained liquor to be 3.29 Kg ± 0.46 Kg(19)

APGAR score at 1 min for 174 babies of our participants is depicted in table no 13 and majority i.e., 128 (73.56%) had APGAR score of 7 and 23(13.2%) babies had APGAR score of 8 at 1 min and one baby had APGAR score of 9 at 1 min, remaining 22 babies had APGAR score less than 7. Westgren et al. suggested that factors like lactate, pH and base excess predicts low APGAR scores (31). Similarly, table no.14 shows APGAR score at 5 min for 174 babies of our participants and majority i.e., 80 (45.9%) had APGAR score of 8 and 73 babies had APGAR score of 9, remaining 21 babies had APGAR score less than 8. Lactate being a major specific end product of anaerobic metabolism was analysed by Wiberg et al. among 17,867 new-borns and found that umbilical arterial lactate to be at least as good as a base deficit for predicting 5 minutes of APGAR less than 4 or 7. (57). In our study we have found that 8 babies had an APGAR score of <6 at 1 min and 8 babies <7 at 5 mins, and correspondingly the lactate levels were found to be high in these babies and, 5 among these 8 required NICU admission.

The neonatal outcome of all 174 babies was analysed and categorized in 2 major groups of babies requiring NICU admission and babies who were directly handed over to mother after delivery which were 27(15.51%) and 147 (84.49%) respectively. Out of NICU admission, most common cause was respiratory distress 18 (10.34%) followed by low birth weight/prematurity in 4 babies. 2 babies had hyperbilirubinemia and 2 babies were infants of diabetic mother and other 3 babies who needed NICU admission had fever, sepsis and hypoxic ischemic encephalopathy. In 2016, Allanson et al. analysed lactate as a predictor of neonatal risk and its effect on neonatal outcome. [(58)] In a study by Shawky Elfarargy M. et. al on study of lactate and nucleated RBC as early predictors of HIE, they found that a lactate level of >3.6mmol/L to be diagnostically accurate in prediction of HIE. In our study only one baby had HIE, the lactate level of which was 133.3mg/dl (14.8mmol/L) which was significantly higher compared to their study.[(59)]

When an attempt was made to find the maternal risk factors contributing to meconium stained amniotic fluid, we could not ascertain any maternal risk factor in most of our participants i.e., in 79 (45.4%). Anemia was found as one of the major maternal risk factors in most of the mothers i.e., in 38 (21.84%) but it was not statistically significant. Other risk factors were hypertensive disorders of pregnancy in 30 (17.14%) mothers, hypothyroidism in 20 (11.49 %), diabetes in 11 (6.32%). Higher maternal age i.e., more than 35yrs of age was found to be risk factor in 5 mothers (2.87%). Pooja p et. al. found primigravida and post datism as a major risk factor in their observational study conducted on 100 patients with meconium stained liquor.[(60)] Similar to our study, K. Subba Rao in their study could not ascertain risk factor for MSL in 61% participants while others had more than one risk factor like Anemia and Hypertension[(61)]. MSL was seen in majority of cases of PIH & Eclampsia

(16.25%) and asthma (2.5%), cardiac disease (2.5%) and anemia in only 5% according to the study conducted by Gokhroo et al. which is in contrast to our study where we found anemia as one of the major risk factors. [62]

As depicted in the table 16B, the other analysed risk factors contributing to MSL include Rh negative pregnancy cardiac disease, short stature and maternal infections in 11 (6.32%), 2 (1.15%) 4 (2.3%) participants respectively. It was also found that 16 (9.2%) participants had Corona virus disease and 2 (1.15%) had gestational thrombocytopenia which might also contribute as a risk to MSL delivery. Addisu et al. found Rh negative pregnancy in 13.1% of participants and preeclampsia in 4.4% of the participants as risk factors in their study.[2] When we tried to find correlation between maternal risk factors and adverse neonatal outcomes, we could not find any statistical significance using chi square test.

When we assessed fetal risk factors contributing to MSL we found fetal growth restriction in 34 (19.54%) and fetal distress in 32 (18.39%) as the most important fetal risk factors. Study by Gokhroo et.al found fetal distress was most common fetal risk factor and was present in 44.6% of MSL deliveries[62] and Rao k. et al in his study found FGR as a major fetal risk factor for MSL.[61] Other fetal risk factors and their outcomes are depicted in table no. 18A and 18B. We also correlated fetal risk factors with neonatal outcome using Chi square test and found that fetal distress led to maximum NICU admissions amongst the fetal risk factors and is statistically significant with p value of 0.023. The results of the study by Maymon et al indicated that MSAF during delivery in a very low risk population is a predictor for increased risk of adverse fetal and neonatal outcomes.[19]

Similarly, when an attempt was made to find obstetric risk factors contributing to meconium stained liquor leading to NICU admission, we found majority of them had post-dated pregnancy i.e., 64 (36.78%) out of which 6 babies required NICU admission, though it was not statistically significant. Out of 4 pregnancies with doppler changes, 2 babies needed NICU care and it was statistically significant with p value of 0.048 as per chi square test. Out of 38 babies with low birth weight 9 babies needed NICU though statistically not significant but LBW is an important risk factor predicting neonatal outcome. Other obstetric risk factors are enlisted in table 19A. Rao k. et al found in 10% of his participants had prolonged labour as a risk factor for MSL followed by Oligohydramnios[61]. Burger et al. (1956) studied the effect on the fetus of the intrapartum passage of meconium in 172 cases and in 79 of them no cause for the passage of meconium was found, and they thought that the passage of meconium by itself was not significant other than that it was an alarm signal.[63]

From logistic regression, it is observed that, lactate level is significantly associated with neonatal outcome respiratory distress (p-value < 0.001). The odds of having neonatal respiratory distress increases by 1.0462 with the unit increase of lactate level. The AUC for Lactate level is 0.792 at cut-off > 77.6 with 97.45% sensitivity and 47.06% specificity in predicting neonatal outcome respiratory distress. (Table no 21)

This value of 77.6 mg/dl after conversion to mmol/L as per the standard conversion factor is 8.6mmol/L which was on par to values obtained in study by Karabyair et. al. The study also presented with significantly higher levels of cord blood lactate in MAS group. [64]. The levels were significantly higher as compared to the similar studies conducted by Mazouri et al. In a cross-sectional study performed by Mazouri et al' value of umbilical artery lactate with a rising trend was compared with indices of ABG analysis and found lactate levels as more significant in neonatal outcome prediction. The value of more than 4.1mmol/L with high sensitivity and specificity can determine the severity of MAS as the value of cord blood is higher. Also, increasing serum lactate levels is an accurate indicator for predicting adverse neonatal outcomes. This diagnostic accuracy is even beyond the usual markers for arterial gas analysis, such as pH, PCO2, PO2.[1]

Chou et al. found that the presence of high lactate of over 4.1 mmol/L and a high lactate/ pyruvate ratio predicts neonatal encephalopathy with a 100% sensitivity and 95.4% specificity.[65] This disparity of sensitivity was explained because of a large 4,045 sample size; therefore, we require further a more sample size to achieve the sensitivity. Further lactate/ pyruvate ratio was not calculated in our study. Various studies showed various mean umbilical arterial lactate values which may be attributed to the type of blood (haemolyzed or whole blood) for analysis or differences in the mode of delivery.

Tulli et al. based on the assessment of the area under the ROC curve, the diagnostic value of lactate was significantly higher than pH in the prediction of morbidity (0.84 versus 0.78)[56] which was 3.55 mmol/L. Westgren et al. suggested that lactate like pH and base excess predicts low APGAR scores.[31] Gjerris et. al in their descriptive study of umbilical cord arterial blood samples from 2554 singleton deliveries concluded that lactate in arterial umbilical cord blood might be a more direct and accordingly more correct indicator of fetal asphyxia at delivery than pH and standard base excess. [66]

174 participants were able to be followed up after 6 months in order to see milestones achieved and to see requirement of hospital admission during this period.

To our notice it was found that only 5 babies needed hospital admission. We also observed, out of 174, 4 babies had delay in achieving milestones as per their age. (Measured in terms of head control during movement, social smile, turning prone, reaching out for objects and cooing/babbling). Not many studies have been conducted to look at the long-term outcomes of babies with meconium stained amniotic fluid in association with lactate levels.

Among the 174 participants, 3 babies had delayed attainment of milestones as per the telephonic conversation (2 had delayed head holding and one had delayed proning). One baby with the highest level of umbilical cord blood lactate, at 6 months follow up at high-risk baby clinic had delay in developmental milestone, there was a delay of one month in fine motor skill and requires further follow up to look for any long-term developmental delays.

Among the remaining 170 babies, a few were followed up at the clinic and showed no delay in development, the rest attained milestones appropriate to age as per the telephonic conversation and questionnaire. This being a limitation of our study, as majority of the deliveries occurred during the COVID pandemic and most of our participants were referred for delivery from distant places and could not be follow up despite repeated requests.

In a study conducted by Beligere N et al., on 35 infants admitted to NICU and diagnosed with Meconium aspiration syndrome, 29 babies were analysed, the findings show poor outcome (CP and global delay) in 21% of infants who suffered MAS, even though the majority of the infants (26/29) responded to conventional ventilator support alone, suggesting that infants with the diagnosis of MAS manifest later neurodevelopmental delays, even if they respond well to conventional treatment.[(43)]

In our study 18 babies had respiratory distress and none of them had features of meconium aspiration syndrome. One baby required invasive mechanical ventilation for a brief period of less than 24 hrs. Though as per telephonic conversation the baby has attained milestones appropriate for age, we could not confirm this as the baby did not turn up for follow up.

CONCLUSION

Meconium stained amniotic fluid increases the caesarean rates, causes birth asphyxia, MAS and increases neonatal intensive care unit admissions. Among the factors contributing to meconium staining of amniotic fluid, fetal growth restriction and fetal distress was seen to influence meconium passage in-utero.

In severe hypoxic state there is shift towards anaerobic metabolism causing lactic academia hence lactate and cord blood pH combined together can serve as a better predictor of asphyxia in the neonate when compared with Umbilical cord blood pH alone. Higher levels of lactate in umbilical cord blood can serve as predictors of adverse neonatal outcomes

Adverse neonatal outcomes can be predicted in cases having higher umbilical cord blood lactate. Association between umbilical cord blood lactate levels in deliveries with meconium stained liquor and adverse neonatal outcomes was found to be significant in our study.

In the neurodevelopmental outcomes analysed at 6months follow up, most babies achieved milestones appropriately.

SUMMARY

- Out of 174 subjects, majority (51.72%) subjects were between 20-24yrs (mean age 24.26 ± 4.26 years)
- 66.09% were primiparous and remaining 33.91% were multiparous.
- Majority (59.77%) were term gestation, 36.78 % were post-dated pregnancies.
- Most common mode of delivery was emergency LSCS i.e., in 64.37% subjects.
- Anemia (21.84%) was a most common maternal risk factor followed by hypertensive disorders (17.14%).
- Thick meconium was observed in 71.84% subjects and also most common indication of caesarean section is Thick MSL (42.53%).
- 52.87% babies were male showing a male preponderance.
- pH level was observed to be between 7.21 to 7.4 in 80.46% subjects.
- In 40.23% participants, lactate levels were between 20 to 40 mg/dl.
- 84.49% of babies were with mother while remaining 15.51% had NICU admission among them, fetal growth restriction (19.54%) and fetal distress (18.39%) were the most reported fetal risk factors.
- The AUC for lactate level is 0.792 at cut-off > 77.6mg/dl with 97.45% sensitivity and 47.06% specificity in predicting respiratory distress.
- Optimal cut-off of lactate levels in predicting neonatal outcome respiratory distress is 77.6 mg/dl according to our study which corresponds to 8.62 mmol/lit.
- Follow up at 6 months showed majority of the babies attained developmental milestones appropriately.

LIMITATIONS OF THE STUDY

- Due to a small sample size of 174 participants deductions from this study cannot be assertive.
- The analysis of lactate was performed on the basis of calorimetric assay in contrast to most of the studies in which the test was performed by rapid point of care tests.
- It would have added strength to our study if it would have been conducted as a case control study using controls and cases (meconium stained deliveries).
- Observer bias couldn’t be overcome due to the follow-up being based on telephonic conversation due to the study being conducted during COVID pandemic.

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ANNEXURES - I - INFORMED CONSENT

Title of dissertation:

"ASSOCIATION OF CORD BLOOD LACTATE LEVELS IN DELIVERIES WITH MECONIUM STAINED LIQUOR AND NEONATAL OUTCOMES: A CROSS-SECTIONAL STUDY"– at KAHER'S Dr. Prabhakar Kore Hospital, Belagavi.

NAME OF INVESTIGATOR: REG. NO. BJ0120003

NAME OF GUIDE: DR.___________________

I have been informed by **REG. NO. BJ0120003**, Post Graduate in M.S. Obstetrics and Gynaecology under the guidance of Dr. ____________________, Department of Obstetrics and Gynaecology, J.N. Medical College, Belagavi is conducting a study to determine "ASSOCIATION OF CORD BLOOD LACTATE LEVELS IN DELIVERIES WITH MECONIUM-STAINED LIQUOR AND NEONATAL OUTCOMES: A CROSS-SECTIONAL STUDY"– at KAHER'S Dr. Prabhakar Kore Hospital, Belagavi.

Purpose of the study:

Meconium-stained liquor identified during labour accounts for significant neonatal morbidity including meconium aspiration syndrome, persistent pulmonary hypertension of newborn, requiring ventilatory support, intraventricular hemorrhage. Additionally, it is associated with high mortality if not addressed immediately.

As the incidence of MSL is high, this study aims at assessing the prevalence, maternal risk factors, neonatal outcomes of meconium stained liquor deliveries in our institution and consequently analyse incidence of individual outcomes thus helping in decreasing the perinatal and neonatal morbidity.

All babies with MSL at birth will be recruited for the study.

Procedure Involved:

Once I have signed the informed consent form, the personal details like name, age, place, address, my education, my health, reproductive history and other information will be noted down. Blood will be drawn from the umbilical cord immediately after delivery and cord blood lactate levels will be estimated.

Risks and Benefits:

There are no observable risks associated with the study. The study will help in determining neonatal outcomes.

Withdrawal from study:

If I decide not to participate in the study, I can withdraw at any time from the study and my health care provider will provide the usual standard care during my delivery.

Privacy and Confidentiality:

To protect my privacy, all the collected information will be given a number rather than using my name. Any information collected during the study will remain confidential. My medical files will be reviewed only at the hospital (or study doctor's office) to check the information and verify the result without breaking my confidentiality. Only de-identified information on my pregnancy will be shared so as to learn the results of the study.

Institutional Policy

In case I have any questions related to the study, in future, I can contact **REG. NO. BJ0120003,** Department of Obstetrics and Gynaecology, J. N Medical College, Dr.________________, Dept. Of Obstetrics and Gynaecology, J.N Medical College, Belagavi.

Financial incentive for participation

I will not receive any payment for taking part in this research study.

Authorisation to publish results

The information about me will be analysed together with other study participants. Results of this study will be published and presented to scientific groups for scientific purposes, but I will never be individually identified in the presentation of the study results.

Voluntary Participation

My participation in the study is voluntary. In case I need any further information regarding my rights as study participant, I may contact Dr. Harsha Hegde as Chairman of J. N. Medical College Institutional Ethics Committee on Human Subjects Research, Phone No.0831 2473777 ext-1527 at J. N. Medical College, Belagavi. My doctor will take care of me during this pregnancy or in the future. I am free to stop participation in this study at any time and for any reason.

Consent Statement:

I have read the consent form or the consent form has been read to me in my own vernacular language. I understand the consent and the signature or sign below confirms that I agree to participate in this study (The participant will receive a copy of this form.)

Study identification number: | | | |

______________________________ __________

Signature or thumbprint of participant Date

____

Signature of thumbprint of Legally authorized representative

(Relationship with patient)

____

Investigator's Name and signature

ANNEXURES – II- PROFORMA

SCREENING AND RECRUITMENT FORM

Screening number: ☐☐☐

Date of screening (dd-mm-yyyy): ☐☐ ☐☐ ☐☐☐☐

First name : _________ Middle name : __________ Last name: __________

Age (years): ☐☐

IP number: ☐☐☐☐☐☐☐

Date of admission (dd-mm-yyyy): ☐☐ ☐☐ ☐☐☐

Date of discharge (dd-mm-yyyy): ☐☐ ☐☐ ☐☐☐

Husband's name: _____________

Address: _______________________________

____

Phone number: __________________

Eligible : (YES - 1, NO-2) ☐

Reasons for in eligibility: (YES - 1, NA-2) ☐

i. Multiple pregnancies
ii. Fetal malformations
iii. Intra uterine demise.
iv. Women not consenting to participate in the study

PROFORMA

"ASSOCIATION OF CORD BLOOD LACTATE LEVELS IN DELIVERIES WITH MECONIUM STAINED LIQUOR AND NEONATAL OUTCOMES: A CROSS-SECTIONAL STUDY"

Screening Id: ☐☐☐

Risk factors:

Obstetric history:

Married Life (years): ☐☐

Consanguinity : ☐ (YES - 1, NO-2) , if yes, degree of consanguinity _____

Obstetric score :

Gravida- ☐ Para- ☐ Live ☐ Abortion ☐

Details: ____

Menstrual history:

Menarche (age in years): ☐☐

YES – 1, NO – 2

Regular Past menstrual cycles: ☐

H/O excessive menstrual bleeding: ☐

Last menstrual period (dd-mm-yyyy): ☐☐ ☐☐ ☐☐☐☐

Expected date of delivery (dd-mm-yyyy): ☐☐ ☐☐ ☐☐☐☐

Period of gestation (weeks/ days)

If according to LMP : ☐☐ ☐☐

According to C.EDD : ☐☐ ☐☐

Past History:

YES – 1, NO – 2

Past medical history: ☐

If yes, duration of illness and treatment details.

Past surgical history:

If yes, details of the procedure.

General physical examination- at admission

Height (in centimeters) ☐☐☐

Weight (in kilogram) ☐☐☐

BMI ☐☐☐

Pallor ☐ **(YES – 1, NO – 2)**

Icterus ☐

Pedal Oedema ☐

Pulse rate (beats per minute) ☐☐☐

Blood pressure (mmHg) ☐☐☐ ☐☐

Systemic examination:

Cardiovascular: ____________________

Respiratory : ____________________

Per Abdomen: Uterine size (in weeks): ☐☐

Presentation : ☐☐☐☐☐☐☐☐☐☐

Relaxed : ☐ (YES- 1, NO- 2)

Fetal Heart rate : ☐☐☐ beats per minute

PER VAGINAL EXAMINATION AND CHARTING:

Time							
Dilatation							
Effacement							
Consistency of cervix							
Position							
Station							
Meconium staining							
Uterine contractions							
FHR							

Provisional diagnosis:

INVESTIGATIONS

Hemoglobin (g/dl) : ☐☐.

Packed cell volume (%) : ☐☐

Blood Group: ☐ ☐☐☐☐☐☐☐☐

HIV : ☐ (Non- reactive – 1, Reactive – 2)

HbsAg : ☐ (Non- reactive – 1, Reactive – 2)

VDRL : ☐ (Negative – 1, Positive – 2)

PLATELET (lakhs) : ☐

SR TSH (mu IU/ml) : ☐

DIPSI : ☐

URINE R &M : ☐

Cord blood lactate level : ☐

ABG pH : ☐

LABOUR ROOM DETAILS:

a. mode of onset of labour : ☐ (spontaneous-1 and induced-2)

b. Mode of delivery: Vaginal : ☐ (YES-1 AND NO-2)

Normal: ☐

Assisted : Forceps ☐ Ventouse ☐

Caesarean :

Emergency : ☐

Elective : ☐

Indication : ☐

c. Liquor : Clear : ☐

Meconium stained: ☐

d. Duration of labour: ☐

d. Baby cried immediately after birth: ☐

SEX : ☐

BIRTH WEIGHT (kg) : ☐

DATE OF BIRTH: ☐☐ ☐☐ ☐☐☐☐

TIME OF BIRTH : ☐☐ ☐☐

HISTORY OF FETAL DISTRESS: ☐ (yes-1 /no-2)

APGAR SCORE: ☐☐

(AT 1 AND 5 MINUTES)

NICU ADMISSION: ☐

COMPLICATIONS: ☐ (yes-1 /no-2): if yes ☐ (1-8) Respiratory distress-1; Pulmonary haemorrhage-2; Pneumothorax-3; PPHN -4; Ventilatory support-5; Hypoxic ischemic encephalopathy -6; Intraventricular haemorrhage-7; Sepsis -8

Shock -9, neonatal death-10

DURING ADMISSION:

GESTATIONAL AGE AT DELIVERY ___________

BIRTH WEIGHT - _______

DURATION OF HOSPITAL STAY = ______________

ADMITTED TO:

NICU ☐ **(YES-1, NO-2)**

POST NATAL WARD WITH MOTHER ☐

ADMITTED TO NICU:

DURATION OF HOSPITAL STAY - ______________

OXYGEN REQUIREMENT :

CPAP :

INTUBATED (ON VENTILATOR):

SEIZURES DURING NICU STAY ☐ **(YES-1, NO-2)**

IF YES- DAY OF LIFE - _______________

MEDICATIONS GIVEN - _________________

AT DISCHARGE **(YES-1, NO-2)**

ANTICONVULSANTS CONTINUED ☐

EXCLUSIVE BREAST FEEDING ☐

FOLLOW UP AT 6 MONTHS **(YES-1, NO-2)**

BABY DOING WELL ☐

ANY HOSPITAL ADMISSION ☐

REASON (IF YES) - ______________

ANTICONVULSANTS ☐

FEEDING **(YES-1, NO-2)**

BREAST FEEDING ☐

WEANING STARTED ☐

WHEN - ___________

MILESTONEs	**(YES-1, NO-2)**
SOCIAL SMILE	☐
HEAD CONTROL DURING MOVEMENT	☐
TURNING PRONE	☐
REACHING OUT FOR OBJECTS	☐
COOING / BABBLING	☐

ANNEXURES III - KEY TO MASTER CHART

- GRAVIDITY

1-Primiparous

2-G2P1

3- G3P2

4- G4P3

5- Grand Multipara

- GESTATIONAL AGE

1- Term

2- Preterm

3- Post Datism

4- Post Term

- MODE OF ONSET OF LABOUR

1- Spontaneous

2- Induced

3- Not in Labour

- MODE OF DELIVERY

1- Vaginal Delivery

2- Instrumental Delivery

3- Elective LSCS

4-Emergency LSCS

- INDICATIONS

1- Thick MSL

2- Thin MSL

3- Fetal Distress

4- Malpresentation

5-Others

6-Not Applicable

- MATERNAL RISK FACTORS

1-Hypertensive Disorders of Pregnancy

2-Diabetes

3-Anaemia

4-Higher Maternal Age

5-Hypothyroidism

6-None

7-Others

- FETAL RISK FACTORS

1- Malpresentation

2-Fetal Growth Restriction

3- Fetal Distress

4-None

5-Others

- OBSTETRIC RISK FACTORS

1-Premature Rupture of Membranes

2- Oligohydramnios

3- Prolonged Labour

4- Post Dated Pregnancy

5- Low Birth Weight

6- Prematurity

7- Others

8-None

- GENDER OF BABY

M- Male

F- Female

- NEONATAL OUTCOMES

1- Respiratory Distress

2-Pulmonary Hemorrhage

3- Pneumothorax

4-PPHN

5-Ventilatory Support

6-HIE

7-IVH

8-Low Birth Weight and Prematurity

9-Shock

10-Neonatal Death

11- Baby with Mother

12-Others- Sepsis, Fever, Hyperbilirubinemia ,IDM

- ❑ NICU ADMISSION

1- Yes

2 - No

- ❑ FOLLOW UP AT 6 MONTHS

1- Milestones Attained

2- Delayed Milestones

- ❑ HOSPITAL ADMISSION

1- Yes

2- No

- ❑ MECONIUM STAINING

Tk- Thick MSL

Tn- Thin MSL

S.NO	IP NO.	AGE(yrs)	pH	LACTATE(mg/dl)	GRAVIDITY	HEIGHT OF MOTHER(cms)	WEIGHT OF MOTHER(kgs)	BMI(KG/CM2)	POG(wks)	GESTATIONAL AGE (wks)	MODE OF ONSET OF LABOUR	MODE OF DELIVERY	INDICATIONS FOR LSCS/INSTRUMENT	MATERNAL RISK FACTOR	FETAL RISK FACTOR	OBSTETRIC RISK FACTOR	GENDER OF BABY	BIRTH WEIGHT(Kgs)	APGAR AT 1 MIN	APGAR AT 5 MIN	NEONATAL OUTCOME	NICU ADMISSION	FOLLOW UP AT 6 MONTHS	HOSPITAL ADMISSION DURING 6 MONTHS	MECONIUM STAINING
1	1091404	30	6.79	115.1	3	148	57	26.02	38+2	1	3	4	5-placenta previa	1	4	8	F	2.5	1	7	1	1	1	1	Tk
2	1052880	19	6.87	110.5	1	148	62	28.31	40+2	3	1	1	6	6	4	1,4	M	2.7	2	6	1	1	1	1	Tk
3	1053400	26	6.91	110.7	1	154	64	26.99	38+2	1	1	1	6	3	4	8	M	2.9	3	5	1	1	1	2	Tn
4	1053864	23	7	101.2	2	150	62	27.56	38+2	1	1	4	1	3	4	8	F	3	3	7	11	2	1	2	Tk
5	1050914	21	7.03	95.2	1	147	57	26.38	37+4	1	1	4	1	7-gestational thrombocytopenia	4	8	F	2.5	3	8	1	1	1	2	Tk
6	1056554	24	7.03	89.3	2	147	57	26.38	39+3	1	1	4	1	6	4	8	M	3.2	5	8	11	2	1	2	Tk
7	1063255	27	7.03	35.7	3	154	63	26.56	36+2	2	1	2	5-pathological trace , APH	3	3, 5-preterm	7-APH	M	2.8	5	6	1	1	1	2	Tk
8	1099309	28	7.04	80.1	1	148	50	22.83	37+6	1	1	4	3	2,7-HEART DISEASE	2,3	2,5	F	2	5	8	1	1	1	2	Tk
9	1053774	32	7.05	76.9	4	154	56	23.61	39+3	1	1	4	5-prev lscs	2,7-covid positive	4	1	F	2.7	6	8	11	2	1	2	Tk
10	1058998	22	7.07	73.5	3	156	56	23.01	38+2	1	1	4	5-pathological trace	6	2,3	5,7-doppler changes	M	1.7	6	7	8	1	2	2	Tk
11	1092893	20	7.09	52.1	1	158	60	24.03	39+5	1	1	1	6	6	4	8	M	3.5	6	9	1	1	1	2	Tk
12	1109388	34	7.09	69.5	1	139	52	26.91	39+1	1	2	4	5-cpd	2,3,7-short stature	4	8	M	2.5	6	6	11	2	1	2	Tn
13	1095294	27	7.09	98.5	1	152	52	22.51	38+2	1	1	1	6	6	3	1	M	3	6	6	1	1	1	2	Tk
14	1064444	20	7.1	68.2	1	150	58	25.78	39+5	1	1	4	2	2	4	1,5	M	2.3	6	6	12-idm	1	1	2	Tk
15	1097372	36	7.1	67.8	4	158	52	20.83	40+5	3	1	4	5-previous LSCS not willing for vbac	1,4	2,3	2,4,5	M	2.2	6	8	11	2	1	2	Tk
16	1103536	19	7.12	97.6	1	144	48	23.15	40+1	3	2	1	6	1,3,5	4	4,7-cord around neck	M	3.2	6	8	1	1	1	2	Tk
17	1100218	22	7.12	133.3	1	148	50	22.83	38+5	1	1	2	2,3	1	3	2,5	M	2.49	6	5	1,6	1	2	2	Tn
18	1089369	22	7.13	66	1	152	48	20.78	39+5	1	1	4	3, 5- SEVERER PE	1,5	3	2,5	F	2.4	6	8	11	2	1	2	Tn
19	1059023	19	7.13	63.6	1	158	60	24.03	38	1	1	4	5-pathological trace	6	3	8	M	3.4	6	7	1	1	1	2	Tk
20	1065975	24	7.13	63.6	1	141	48	24.14	39+5	1	1	4	1	1	2	5	F	2.4	6	8	11	2	1	2	Tn
21	1051284	22	7.14	61	1	154	56	23.61	39+1	1	1	4	3	3, 7- COVID POSITIVE	2,3	5	F	2	6	8	11	2	1	2	Tk
22	1052948	19	7.14	57.2	1	159	60	23.73	37+4	1	1	4	1	7-covid positive	2	2	M	2.7	6	9	11	2	1	2	Tk
23	1093310	24	7.14	52.7	1	152	47	20.34	39+5	1	1	4	3	6	3	8	F	3.4	7	9	11	2	1	2	Tk
24	1051371	23	7.14	50.6	1	166	62	22.50	40+6	3	1	4	1	6	4	4	M	3.1	7	9	11	2	1	2	Tk
25	1092910	23	7.16	50.1	1	145	64	30.44	37	1	1	4	1	5	2	1,5	F	1.8	7	9	11	2	1	2	Tk
26	1046393	23	7.16	63.1	1	162	66	25.15	38+4	1	1	1	6	2	5- FETAL MACROSOMIA	8	M	2.8	7	9	11	2	1	2	Tk
27	1089576	20	7.16	46.9	1	156	62	25.48	35+5	2	1	4	5-ANTEPARTUM ECCLAMSIA	1, 7- RH NEGATIVE PREGNANCY	2,5-preterm	5,6,7-DOPPLER CHANGES	M	1.5	7	8	1,8	1	2	2	Tk
28	1093881	24	7.17	46.8	2	156	58	23.83	37+1	1	1	4	5-antepartum ecclampsia	1,3,7-covid +ve	4	8	F	2.5	7	9	12--hyper bili	1	1	2	Tn
29	1093262	21	7.17	46.3	2	152	46	19.91	38+1	1	3	4	5-prev lscs with oligohydromios	3	2	2,5	F	2.2	7	9	11	2	1	2	Tn
30	1060132	19	7.17	46.2	1	152	62	26.84	39+6	1	1	4	1,3	5	3	8	M	2.9	7	8	11	2	1	2	Tk
31	1103842	25	7.17	44.4	1	158	62	24.84	39+3	1	1	4	1	2,3	3	8	M	3.4	7	8	1	1	1	2	Tk

32	1053068	19	7.18	65.9	1	157	49	19.88	40+5	3	1	1	6	1,7-hbsag & covid positive	4	4	M	3	7	8	11	2	1	2	Tk
33	1051922	22	7.18	42	1	160	56	21.88	40+1	3	2	4	2	7-COVID POSITIVE	3	4	F	2.6	7	9	11	2	1	2	Tn
34	1053774	19	7.19	41.3	1	155	52	21.64	36+3	2	2	1	6	3,7-covid positive	2,5-preterm	2,5	F	2.3	7	9	11	2	1	2	Tk
35	1055982	20	7.2	41.8	1	150	63	28.00	41	3	1	4	1	3	4	4	F	2.9	7	9	11	2	1	2	Tk
36	1051620	22	7.2	110.1	1	148	56	25.57	38+5	1	1	1	6	3	4	8	F	2.9	7	8	11	2	1	2	Tk
37	1060426	21	7.2	40.2	1	154	58	24.46	42+5	4	1	4	1	6	4	4	M	3	7	8	11	2	1	2	Tk
38	1053880	22	7.2	43.2	1	160	60	23.44	40+3	3	2	2	6	1,2	2	4,5	F	2.3	7	9	11	2	1	2	Tn
39	1054131	38	7.2	11.5	3	147	62	28.69	40+3	3	3	1	5-prev lscs with severe pe	1,4	4	4	M	3.3	7	9	11	2	1	2	Tk
40	1054401	34	7.2	43.5	3	158	62	24.84	40+5	3	1	1	6	6	4	4	M	2.8	7	8	11	2	1	2	Tn
41	1056296	20	7.2	38.9	2	140	54	27.55	39+1	1	1	4	1	1,7-rh negative	2	5	F	2.3	7	7	11	2	1	2	Tn
42	1054525	26	7.21	60.3	1	158	83	33.25	40+2	3	1	1	6	6	4	4	M	3	7	9	11	2	1	2	Tk
43	1054528	24	7.21	77.2	1	158	60	24.03	40+3	3	1	2	1	3,7-covid positive	4	1,4	F	3.6	7	8	11	2	1	2	Tk
44	1095537	21	7.22	35.5	1	152	55	23.81	38+2	1	1	4	5-PARTIAL HELLP WITH NR NST	1	2	2,5	M	2.4	7	9	11	2	1	2	Tn
45	1055243	23	7.22	35.4	2	148	59	26.94	37	1	1	4	1,4	7	1	5	M	2.2	7	7	1	1	2	1	Tk
46	1049836	23	7.22	35.3	1	152	54	23.37	39+6	1	1	4	1	6	4	7-doppler changes	M	2.9	7	9	11	2	1	2	Tk
47	1055650	32	7.22	50.5	4	160	62	24.22	41	3	1	1	6	3	4	2,4	M	3	7	8	11	2	1	2	Tn
48	1096492	21	7.22	34.2	2	160	50	19.53	42+3	4	1	4	5-ANAMNIOS	3,5	2	4,5	M	2.1	7	8	11	2	1	2	Tk
49	1051909	21	7.22	34	1	155	54	22.48	38+3	1	1	4	1	7-RH NEGATIVE PREGNANCY, COVID POSITIVE	4	8	F	2.5	7	9	11	2	1	2	Tk
50	1049599	19	7.23	33.7	1	147	60	27.77	39+2	1	1	4	1	6	4	1	M	2.6	7	9	11	2	1	2	Tk
51	1054630	19	7.23	59.9	1	156	57	23.42	39+2	1	1	1	6	6	4	8	F	2.6	7	8	11	2	1	2	Tk
52	1091993	22	7.23	32.8	1	152	52	22.51	37+2	1	3	4	1	3	2	2,5	M	1.7	7	8	8	1	1	2	Tk
53	1056121	24	7.24	32.4	1	138	48	25.20	38	1	1	4	1	7-SHORT STATURE	3	8	M	3.1	7	9	1	1	1	2	Tn
54	1103190	22	7.24	32.4	2	148	50	22.83	36+1	2	1	4	1	1,2,3,5	2,5-preterm	5,6	F	2	7	8	11	2	1	2	Tk
55	1056123	20	7.24	32.1	1	152	66	28.57	41	3	1	4	1	6	4	4	M	2.9	7	9	11	2	1	2	Tk
56	1097431	27	7.24	30.7	1	158	49	19.63	38+3	1	1	4	1	5	2	2,5,7-cord around neck	M	2.2	7	9	11	2	1	2	Tk
57	1107981	26	7.24	30.5	3	148	50	22.83	41	3	2	4	1	6	4	4-postdatism	F	2.7	7	8	1	1	1	2	Tk
58	1099490	20	7.25	30.1	1	150	49	21.78	40+3	3	2	4	3	6	3	4	F	2.75	7	9	11	2	1	2	Tn
59	1098622	19	7.25	29.8	1	155	50	20.81	39+5	1	1	4	2	6	3	1	M	3	7	9	11	2	1	2	Tn
60	1038329	22	7.25	29.1	2	155	63	26.22	37+2	1	1	4	1	6	4	1,5	M	2.3	7	8	11	2	1	2	Tk
61	1091601	22	7.25	28.2	2	155	49	20.40	40+1	3	3	4	5-prev lscs with severe pe	1	4	4	M	2.5	7	9	11	2	1	2	Tk
62	1091344	24	7.25	28.2	2	152	48	20.78	37+4	1	1	4	5- PREV LSCS	6	4	1,2,5	F	2.4	7	8	11	2	1	2	Tk
63	1064362	30	7.25	54.9	1	156	52	21.37	39+4	1	1	1	6	6	2	5, 2	M	2.4	7	9	11	2	1	2	Tn
64	1095351	23	7.25	28.1	1	156	56	23.01	39+6	1	1	4	1	6	4	7-cord around neck	F	2.7	7	8	12-Sepsis	1	1	2	Tk
65	1092262	27	7.25	28	1	154	56	23.61	39	1	1	4	1	6	3	2	M	3	7	8	1	1	1	2	Tk
66	1038445	24	7.25	28	1	157	77	31.24	40+1	3	1	4	1	6	4	4	F	2.9	7	9	11	2	1	2	Tn
67	1097414	29	7.26	27.9	1	156	52	21.37	39	1	1	4	1	6	2	2,7-DOPPLER CHANGES	M	2.6	7	7	11	2	1	2	Tk

68	1085689	22	7.26	26.8	1	152	56	24.24	39	1	1	4	2	6	5-fetal macrosomia	8	F	3.4	7	9	11	2	1	2	Tk
69	1056698	25	7.26	26.7	1	158	64	25.64	38+6	1	1	4	2	6	4	8	F	2.8	7	9	11	2	1	2	Tn
70	1069324	26	7.26	56.6	1	152	57	24.67	40+1	3	1	2	1,3	1,7-rh negative	3	4	M	2.7	7	8	11	2	1	2	Tk
71	1070079	25	7.26	31.8	2	156	56	23.01	40+1	3	1	1	6	6	4	4	M	3.3	7	9	11	2	1	2	Tk
72	1102566	20	7.26	26.5	1	152	55	23.81	40+6	3	1	4	3	5	2,3	1,4,5	F	1.8	7	7	8	1	1	2	Tk
73	1068052	23	7.26	15.6	2	152	56	24.24	38+1	1	1	1	6	6	4	8	F	2.7	7	9	11	2	1	2	Tn
74	1079731	26	7.26	23.8	3	154	54	22.77	40+1	3	3	3	5-previous LSCS not willing for vbac	6	4	4	F	2.75	7	9	11	2	1	2	Tn
75	1053589	40	7.27	26.4	4	155	56	23.31	40+2	3	1	4	1	4, 7- COVID POSITIVE	3	4	M	3.2	7	8	11	2	1	2	Tk
76	1052298	26	7.27	26	1	155	56	23.31	40+3	3	1	4	1	1,7-COVID POSITIVE,	4	2,4	F	2.9	7	8	11	2	1	2	Tk
77	1080504	23	7.27	18	2	145	50	23.78	40+1	3	1	1	6	5	4	4	M	3.6	7	9	11	2	1	2	Tk
78	1080736	23	7.27	70	1	148	47	21.46	40+2	3	2	2	6	1	3	4	F	2.7	7	9	11	2	1	2	Tn
79	1070992	19	7.27	39.9	1	161	68	26.23	39+4	1	1	1	6	6	4	8	M	3	7	8	11	2	1	2	Tk
80	1081570	22	7.27	37	2	152	52	22.51	40+2	3	1	1	6	5	4	4	F	3.4	7	8	11	2	1	2	Tn
81	1054679	28	7.27	25.7	1	154	56	23.61	39	1	1	4	1	6	4	1	M	2.7	7	8	11	2	1	2	Tk
82	1071034	24	7.28	46.3	2	158	58	23.23	37+5	1	1	1	6	6	4	8	F	3.1	7	8	11	2	1	2	Tk
83	1082737	24	7.28	41.4	1	150	51	22.67	40+6	3	2	1	6	6	4	4	M	3.6	7	9	11	2	1	2	Tk
84	1079847	25	7.28	48.2	1	148	49	22.37	39+6	1	1	1	5-rh negative	6	4	8	F	2.9	7	8	11	2	1	2	Tk
85	1092993	21	7.28	25.7	1	158	52	20.83	41+4	3	1	4	1	3,5,7- rh negative, covid positive	4	4	F	2.7	7	8	11	2	1	2	Tn
86	1092906	23	7.28	25.7	1	156	55	22.60	38+4	1	1	4	5-cpd	7-covid	4	8	F	2.6	7	9	11	2	1	2	Tn
87	1081275	29	7.28	46.5	1	149	52	23.42	38+6	1	2	1	6	6	2	2,5	F	2.36	7	8	11	2	1	2	Tk
88	1103308	25	7.29	25.7	2	156	58	23.83	39+1	1	2	4	1	6	4	8	M	3.2	7	9	11	2	1	2	Tk
89	1039152	22	7.29	25.5	2	152	66	28.57	39+2	1	1	4	1	1,5	4	8	M	3.1	7	8	11	2	1	2	Tk
90	1099429	20	7.29	25.2	1	155	48	19.98	40+2	3	3	4	1	6	4	2,3,4	M	2.8	7	9	11	2	1	2	Tk
91	1089017	23	7.29	64.3	2	146	49	22.99	40+4	3	1	1	6	5	4	4	F	3.4	7	9	11	2	1	2	Tk
92	1056702	25	7.29	25	2	156	60	24.65	40+1	3	2	4	3	3	4	4	M	3	7	8	11	2	1	2	Tk
93	1089358	21	7.29	16.2	2	158	58	23.23	40+1	3	1	3	5-VBAC	5-PREV LSCS, RH NEGATIVE	4	4	M	2.6	7	6	11	2	1	2	Tk
94	1066497	19	7.29	24.4	1	148	58	26.48	39+3	1	1	4	1	3	4	8	M	3.1	7	8	11	2	1	2	Tn
95	1098355	23	7.3	24	2	152	49	21.21	38+6	1	1	4	5-PREV LSCS	6	4	8	M	2.9	7	9	11	2	1	2	Tk
96	1089977	25	7.3	23.1	1	156	49	20.13	39+1	1	1	4	1	5-URTI	4	8	F	2.5	7	8	11	2	1	2	Tk
97	1089989	24	7.3	30.1	1	156	49	20.13	40+1	3	1	1	6	6	3	4	F	3	7	9	11	2	1	2	Tn
98	1090581	29	7.3	29.7	3	152	60	25.97	40+2	3	1	1	6	6	2	2,4	F	2.5	7	8	11	2	1	2	Tk
99	1090791	26	7.3	47.9	1	156	56	23.01	40+3	3	2	1	6	6	2	4,5	F	2.4	7	9	11	2	1	2	Tn
100	1087661	32	7.3	23	4	155	52	21.64	38+2	1	1	4	3	6	2	5	M	1.8	7	8	11	2	1	2	Tn
101	1089579	24	7.3	95.6	1	154	54	22.77	39+2	1	1	2	1	6	3	8	F	2.8	7	9	11	2	1	2	Tn
102	1106273	24	7.3	22.7	1	155	55	22.89	40+1	3	2	4	1	3,5,7-rh negative	4	4	F	3.1	7	8	11	2	1	2	Tk
103	1058898	33	7.3	22.5	3	160	62	24.22	39+2	1	1	4	1,3	3	3	8	M	2.6	7	7	11	2	1	2	Tn

104	1066462	22	7.3	22.4	1	150	56	24.89	37+1	1	3	4	3	3	2,3	5	M	2.1	7	8	11	2	1	2	Tk
105	1090861	23	7.3	34.6	1	152	46	19.91	39+1	1	1	1	6	6	4	8	M	2.7	7	9	11	2	1	2	Tk
106	1092549	24	7.3	48.5	2	155	58	24.14	40+3	3	1	2	1	7- COVID POSITIVE	4	4	F	3.6	7	8	11	2	1	2	Tn
107	1092902	25	7.31	53.6	1	156	63	25.89	40+1	3	1	1	6	6	4	4	F	2.9	7	9	11	2	1	2	Tk
108	1095657	19	7.31	22.4	1	156	50	20.55	39+6	1	1	4	3	6	3	2	M	2.9	7	8	11	2	1	2	Tk
109	1092048	23	7.31	57.2	2	158	57	22.83	39+4	1	1	1	6	3,5,7- RH NEG	4	8	M	3.7	7	9	11	2	1	2	Tk
110	1094140	28	7.31	21.8	1	150	52	23.11	37+2	1	2	4	1	6	4	2	F	2.5	7	9	11	2	1	2	Tk
111	1066771	38	7.31	21.6	3	154	58	24.46	37	1	1	4	1,3,5-prev 2 lscs	3	2,3	5	M	2.26	7	9	11	2	1	2	Tk
112	1092471	23	7.31	58.1	1	152	46	19.91	39+4	1	1	1	6	3	4	8	F	2.5	7	8	11	2	1	2	Tk
113	1052469	22	7.31	21.1	1	140	52	26.53	40+1	3	1	4	1	2,7-SHORT STATURE, COVID POSITIVE	4	2,4	F	3	7	9	11	2	1	2	Tk
114	1093265	23	7.31	21.1	2	150	55	24.44	40+1	3	3	4	5-prev lscs	3	4	4	F	2.9	7	9	11	2	1	2	Tk
115	1056831	25	7.31	20.9	1	148	57	26.02	40+6	3	1	4	1	6	5-macrosomia	4	M	3.8	7	8	11	2	1	2	Tn
116	1093329	27	7.31	43.2	1	152	53	22.94	40+1	3	1	1	6	6	4	3,4	F	2.7	7	8	11	2	1	2	Tk
117	1039450	25	7.31	20.8	2	156	56	23.01	38+4	1	1	4	1	6	4	1	M	2.8	7	8	11	2	1	2	Tn
118	1105946	18	7.31	20.6	1	160	56	21.88	39+3	1	1	4	1	6	4	8	M	3	7	9	11	2	1	2	Tk
119	1085809	25	7.32	20.5	2	156	67	27.53	40+1	3	1	4	1	3	4	4	M	2.7	7	9	11	2	1	2	Tk
120	1093372	19	7.32	17.8	1	156	66	27.12	39+5	1	1	3	2	7-rh n egative	4	1	M	3.5	7	8	11	2	1	2	Tk
121	1100182	23	7.32	20.5	2	156	59	24.24	40+1	3	2	4	1	7-TORCH INFECTION	2	2,4, 7-cord around neck	F	2.5	7	8	11	2	1	2	Tk
122	1047750	32	7.32	20.4	1	156	67	27.53	41+2	3	2	4	1	6	4	4	F	3.8	7	8	11	2	1	2	Tn
123	1082862	30	7.32	20.3	3	146	49	22.99	38+1	1	3	4	5-CDMR	1,7- RH NEGATIVE	2	5	M	2	7	8	11	2	1	2	Tn
124	1085408	25	7.32	20.3	1	142	44	21.82	39+1	1	1	4	5- SEVERE PE WITH UNCONTROLLED HTN	1,5	4	8	M	3.3	7	9	11	2	1	2	Tk
125	1095460	23	7.32	41.8	1	156	52	21.37	39	1	1	1	6	6	4	8	M	2.8	7	9	11	2	1	2	Tn
126	1093311	22	7.32	20.3	1	148	58	26.48	39+2	1	1	4	1	6	4	1	F	2.5	7	8	11	2	1	2	Tk
127	1065255	35	7.32	20.1	1	152	60	25.97	38+5	1	1	4	1	4,5,7-thrombocytopenia	4	8	F	2.9	7	8	11	2	1	2	Tk
128	1066174	24	7.32	19.6	1	150	65	28.89	39+6	1	1	4	1,5-cpd	1	4	8	F	3.1	7	9	11	2	1	2	Tk
129	1099000	24	7.32	19.6	1	155	55	22.89	40+2	3	1	4	1	1	3	4	M	3.3	7	8	11	2	1	2	Tk
130	1053862	25	7.32	19.3	1	158	83	33.25	37+6	1	1	4	3	6	3	8	M	3.1	7	8	11	2	1	2	Tn
131	1082391	27	7.32	19.2	1	157	52	21.10	41+4	3	1	4	1	5	4	4	M	3.8	7	9	11	2	1	2	Tk
132	1097636	21	7.32	32.2	1	158	49	19.63	38+2	1	2	3	1	6	2	2,5	M	2.2	7	8	11	2	1	2	Tk
133	1096588	23	7.32	18.9	2	155	50	20.81	39+6	1	1	4	1	6	4	8	F	3.1	7	9	11	2	1	2	Tk
134	1055397	23	7.33	18.6	1	156	74	30.41	39+2	1	1	4	1	6	2	8	F	2.5	7	8	11	2	1	2	Tk
135	1098395	23	7.33	18.3	1	155	52	21.64	40+1	3	1	4	1	6	4	2,4	M	3	7	8	11	2	1	2	Tk
136	1107750	22	7.33	18.3	1	155	52	21.64	39+2	1	1	4	1	3	4	8	M	3.2	7	8	11	2	1	2	Tk
137	1098516	27	7.33	64.1	2	159	56	22.15	37	1	3	3	5-PREV 2 LSCS	1	4	8	M	2.6	7	8	11	2	1	2	Tk
138	1082528	22	7.33	17.9	1	154	53	22.35	39+2	1	1	4	1,5-CPD	5	4	8	M	3.4	7	9	11	2	1	2	Tn
139	1100668	28	7.33	38.2	2	156	60	24.65	39	1	1	1	6	6	4	8	M	3	7	7	11	2	1	2	Tn

140	1098657	22	7.33	77.6	1	156	48	19.72	41+6	3	1	1	6	3	3	4,7-cord around neck	F	3	7	7	11	2	1	2	Tk
141	1093130	21	7.33	17.6	1	157	73	29.62	40+5	3	1	4	1	1,3	4	4	F	2.9	7	9	11	2	1	2	Tk
142	1093716	23	7.33	17.5	1	152	48	20.78	40+5	3	1	4	1	7-covid positive	4	1,4	M	3.5	7	8	1	1	1	2	Tk
143	1087598	27	7.34	17.4	1	160	66	25.78	40+1	3	1	4	1	6	4	4	F	2.8	7	8	11	2	1	2	Tk
144	1056992	19	7.34	17.1	1	154	56	23.61	38	1	2	4	2	6	2	8	F	2.8	7	8	11	2	1	2	Tk
145	1054464	30	7.34	17	4	150	63	28.00	36+3	2	3	4	5-prev 2 lscs with severe pe	1	2,5-preterm	2,5,6	F	1.9	7	7	11	2	1	2	Tk
146	1092054	26	7.34	17	2	146	54	25.33	35+1	2	3	4	5-imminent ecclampsia,covid positive	1	5-preterm	5,6	F	2	7	8	11	2	1	2	Tk
147	1068946	22	7.34	16.7	1	150	57	25.33	39	1	1	4	1	6	2	8	F	3.7	7	8	11	2	1	2	Tk
148	1102537	25	7.34	47.1	2	155	52	21.64	37+3	1	1	1	6	6	5-fetal macrosomia	7-cord around neck	F	3	7	9	11	2	1	2	Tn
149	1102745	35	7.34	59.8	5	138	49	25.73	38+1	1	1	1	6	1,3,7-HEART DISEASE		7-MULTIPARITY	F	2.6	7	9	11	2	1	2	Tk
150	1084979	28	7.34	16.4	1	160	64	25.00	40+3	3	1	4	1	6	3	4,7-POLYHYDROMNIOS	M	3.5	7	8	11	2	1	2	Tk
151	1089095	19	7.34	16.3	1	166	52	18.87	40+1	3	1	4	1	6	4	4	M	3	8	8	11	2	1	2	Tn
152	1068276	19	7.34	16	1	138	55	28.88	39+6	1	1	4	5-cpd with short stature	7-short stature	4	8	F	2.9	8	9	11	2	1	2	Tk
153	1099681	21	7.34	15.3	1	160	54	21.09	40+6	3	1	4	2	7-RH NEGATIVE PREGNANCY	4	3,4	F	2.9	8	9	11	2	1	2	Tn
154	1103505	25	7.35	63.3	1	159	58	22.94	38+5	1	1	1	6	6	2	5	F	2.1	8	9	11	2	1	2	Tk
155	1103339	21	7.35	17.7	1	152	49	21.21	40+4	3	1	1	6	6	4	4	M	2.7	8	9	11	2	1	2	Tk
156	1103531	24	7.35	56	1	156	53	21.78	38+1	1	2	1	6	3	4	2	M	2.8	8	7	11	2	1	2	Tn
157	1094390	20	7.35	14.3	1	150	64	28.44	39+3	1	1	4	1	1,3,5-post partum ecclampsia	4	1	F	2.7	8	8	11	2	1	2	Tk
158	1103620	35	7.35	26.8	3	155	56	23.31	40+1	3	1	1	6	4,5	4	4,7-cord around neck	F	2.8	8	9	11	2	1	2	Tn
159	1104926	22	7.35	69	1	155	56	23.31	40+3	3	2	2	2	6	3	4	M	2.8	8	8	11	2	1	2	Tn
160	1106077	28	7.35	32.9	2	158	59	23.63	38+3	1	1	1	6	6	4	5	M	2.4	8	8	11	2	1	2	Tk
161	1107003	22	7.36	20.1	1	156	60	24.65	37+1	1	1	1	6	3,5	4	5	F	2.3	8	8	11	2	1	2	Tk
162	1094513	29	7.36	14.2	1	153	63	26.91	39+3	1	1	4	1	3	4	2	M	2.8	8	8	11	2	1	2	Tk
163	1107386	22	7.36	57.1	1	160	56	21.88	38	1	1	1	6	6	4	5	F	2.3	8	8	11	2	1	2	Tn
164	1102204	21	7.36	13.1	1	150	51	22.67	39+1	1	1	4	1	6	4	1	F	3	8	9	11	2	1	2	Tk
165	1080164	21	7.36	12.7	1	150	58	25.78	38+5	1	1	4	2	6	4	8	F	2.5	8	9	11	2	1	2	Tn
166	1064534	26	7.36	12.4	2	158	62	24.84	39+1	1	1	4	5-previous LSCS not willing for vbac	6	4	8	M	2.8	8	9	11	2	1	2	Tn
167	1102959	26	7.36	12.2	1	150	48	21.33	40+1	3	1	4	1	6	4	2,4	M	2.8	8	9	11	2	1	2	Tk
168	1098420	25	7.36	12	1	158	52	20.83	39+3	1	1	4	1	6	4	1,2	M	3	8	8	11	2	1	2	Tk
169	1093474	33	7.36	26.1	2	155	50	20.81	39+3	1	1	1	6	6	4	8	M	3	8	9	12-fever	1	1	2	Tk
170	1055493	26	7.37	44.3	2	166	56	20.32	37+5	1	3	3	5-prev 2 lscs	2	4	8	M	3	8	8	12-idm	1	1	2	Tk
171	1100636	21	7.37	12	1	152	53	22.94	41	3	2	4	1	3	4	3,4	F	3	8	9	11	2	1	2	Tk
172	1095337	21	7.38	9	2	150	50	22.22	39+4	1	1	4	5-ANAMNIOS	6	4	2	F	2.7	8	9	11	2	1	2	Tk
173	1097789	25	7.4	7.4	2	155	52	21.64	39+2	1	1	4	5-PREV 2 LSCS	2	4	8	F	3	8	9	11	2	1	2	Tk
174	1106619	29	7.4	46.1	3	149	45	20.27	40+4	3	1	1	6	3	4	4,5	M	2.4	9	8	12- hyper bili	1	1	2	Tk

PH	LACTATE
7.14	59.9
7	57.2
7.05	54.9
7.16	52.7
7.14	52.1
7.09	46.9
7.19	46.3
7.09	32.4
7.13	28
7.17	26
7.18	20.1
7.12	19.6
7.16	17.8
7.17	16.3
7.17	15.3
7.12	12

pH	LACTATE(mg/dl)
6.79	115.1
6.87	110.5
6.91	110.7
7	101.2
7.03	95.2
7.03	89.3
7.03	35.7
7.04	80.1
7.05	76.9
7.07	73.5
7.09	52.1
7.09	69.5
7.09	98.5
7.1	68.2
7.1	67.8
7.12	97.6
7.12	133.3
7.13	66
7.13	63.6
7.13	63.6
7.14	61
7.14	57.2
7.14	52.7
7.14	50.6
7.16	50.1
7.16	63.1
7.16	46.9
7.17	46.8
7.17	46.3
7.17	46.2
7.17	44.4
7.18	65.9
7.18	42
7.19	41.3
7.2	41.8
7.2	110.1
7.2	40.2
7.2	43.2
7.2	11.5
7.2	43.5
7.21	38.9
7.21	60.3
7.21	77.2
7.22	35.5
7.22	35.4
7.22	35.3
7.22	50.5
7.22	34.2
7.22	34

7.23	33.7
7.23	59.9
7.23	32.8
7.24	32.4
7.24	32.4
7.24	32.1
7.24	30.7
7.24	30.5
7.25	30.1
7.25	29.8
7.25	29.1
7.25	28.2
7.25	28.2
7.25	54.9
7.25	28.1
7.25	28
7.25	28
7.26	27.9
7.26	26.8
7.26	26.7
7.26	56.6
7.26	31.8
7.26	26.5
7.26	15.6
7.26	23.8
7.27	26.4
7.27	26
7.27	18
7.27	70
7.27	39.9
7.27	37
7.27	25.7
7.28	46.3
7.28	41.4
7.28	48.2
7.28	25.7
7.28	25.7
7.28	46.5
7.29	25.7
7.29	25.5
7.29	25.2
7.29	64.3
7.29	25
7.29	16.2
7.29	24.4
7.3	24
7.3	23.1
7.3	30.1
7.3	29.7
7.3	47.9

7.3	23
7.3	95.6
7.3	22.7
7.3	22.5
7.3	22.4
7.3	34.6
7.3	48.5
7.31	53.6
7.31	22.4
7.31	57.2
7.31	21.8
7.31	21.6
7.31	58.1
7.31	21.1
7.31	21.1
7.31	20.9
7.31	43.2
7.31	20.8
7.31	20.6
7.32	20.5
7.32	17.8
7.32	20.5
7.32	20.4
7.32	20.3
7.32	20.3
7.32	41.8
7.32	20.3
7.32	20.1
7.32	19.6
7.32	19.6
7.32	19.3
7.32	19.2
7.32	32.2
7.32	18.9
7.33	18.6
7.33	18.3
7.33	18.3
7.33	64.1
7.33	17.9
7.33	38.2
7.33	77.6
7.33	17.6
7.33	17.5
7.34	17.4
7.34	17.1
7.34	17
7.34	17
7.34	16.7
7.34	47.1
7.34	59.8

7.34	16.4
7.34	16.3
7.34	16
7.34	15.3
7.35	63.3
7.35	17.7
7.35	56
7.35	14.3
7.35	26.8
7.35	69
7.35	32.9
7.36	20.1
7.36	14.2
7.36	57.1
7.36	13.1
7.36	12.7
7.36	12.4
7.36	12.2
7.36	12
7.36	26.1
7.37	44.3
7.37	12
7.38	9
7.4	7.4
7.4	46.1