"TO FIND THE ASSOCIATION BETWEEN INTRAPARTUM AMNIOTIC FLUID LACTATE LEVEL AND LABOUR OUTCOME"

DESSERTATION SUBMITTED IN FULFILMENT OF THE REGULATIONS FOR THE AWARD OF

MD OBSTETRICS AND GYNAECOLOGY

DIVISION OF OBSTETRICS AND GYNAECOLOGY

PSG INSTITUTE OF MEDICAL SCIENCES AND RESEARCH

THE TAMILNADU DR.M.G.R.MEDICAL UNIVERSITY

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Certificate

CERTIFICATE

This is to certify that **Dr. ARAVIND CHANDER.V** has prepared this dissertation entitled **"TO FIND THE ASSOCIATION BETWEEN INTRAPARTUM AMNIOTIC FLUID LACTATE LEVEL AND LABOUR OUTCOME".** under my overall supervision and guidance in the Institute of PSG Institute of Medical Science and Research, Coimbatore in partial fulfilment of the regulations of Tamil Nadu **Dr. M.G.R Medical University** for the award of **M.D. Degree in Obstetrics and Gynaecology.**

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Declaration

DECLARATION

I hereby declare that dissertation entitled **“TO FIND THE ASSOCIATION BETWEEN INTRAPARTUM AMNIOTIC FLUID LACTATE LEVEL AND LABOUR OUTCOME’”** was prepared by me under the guidance and supervision of **Dr.SEETHA PANICKER MD DGO., DNB,** PSG Hospitals Coimbatore.

The dissertation is submitted to the Dr. M.G.R. Medical University in partial fulfilment of the University regulations for the award of MD degree in Obstetrics and Gynaecology. This dissertation has not been submitted for the award of any Degree or Diploma.

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DR. V.ARAVIND CHANDER

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Introduction

INTRODUCTION

The most important cause for operative delivery in the obstetric practice is when the patient is in labor mainly dysfunctional labor.

The major cause for perinatal mortality and morbidity is the birth asphyxia secondary to abnormalities during the labor. many trails have been done since many years in the past for detection of the abnormalities in labor, so that early intervention will reduce the adverse perinatal outcome. The introduction of the terminology abnormal labor or dysfunctional labor dates back to the time of Friedman, when he introduced the use of Partogram in active labor. Many modifications are being done till date, while the first partogram was based on the cervical dilatation against the descent of the fetal presenting part. The modern partogram has got many components like fetal heart rate, maternal contractions, usage of drugs, intravenous fluids, color of the liquor, presence of moulding and caput, maternal

pulse, blood pressure, temperature and urine output. The most important part being the alert line and the action line, the alert line is drawn from the starting of active phase of labor i,e from 3 to 4 cm dilatation upto 10 cm and an action line is drawn 4 hours after the alert line, x axis will plot time and y axis shows the cervical dilatation and descent of the presenting part. Any measurements which crosses the action line indicates prolonged labor which demands for active intervention.

However the use of partogram alone for assessing the dysfunctionl labor was not sufficient. Many labors which was shown as abnormal had normal parturition without any adverse perinatal outcome, so there is a need for supplementary test for early prediction of adverse labor outcome. So trials and research are being carried out in this direction.

Studies have shown that if there is any increased muscle activity there is accumulation of lactate in response to it. The same principle holds good for the uterine musculature, which is composed of smooth muscle cells. These are called the myocytes, interposed by connective tissue in between. The

mechanism of energy metabolism and uterine contraction is not well established. In cases of prolonged labor due to exhaustion of uterine musculature and hypoxia , there is to accumulation of lactate. So based on this principal assessment of lactate in the amniotic fluid will help in the diagnosis of dysfunctional labor to be more precise in diagnosis prolonged labor which causes adverse perinatal outcome.

The main principle behind the above study is that during the smooth muscle contraction the myocytes, will produce the compound lactate, which is not appreciably detected in the amniotic fluid, where as in case of prolonged labor, due to smooth muscle hypoxia the lactate production will increase making it detectable in the amniotic fluid

So, the resulting increase in the acidity in the uterus is the cause for the decreased force of further contractions which will lead to dysfunctional labour. The increased level of lactic acid value in the uterus is measured by using amniotic fluid sample assessment.

Therefore it is believed that the raised AFL levels are mostly associated with dysfunctional labour,

Level of amniotic fluid lactate may provide useful clinical informations while assessing progress of labour. Lactate is historically said as the end result of anaerobic metabolism, probably due to decreased oxygen supply and cell fatigue.

Uterine musculature is considered as the major source of lactic acid. The Lactate levels are detectable at increased levels in the amniotic fluid. Trails have shown that the lactate levels are many times lesser in the maternal and fetal blood when compared to amniotic fluid. .

Dysfunctional labour the major concern in modern obstetrics because, it is associated with prolonged labor which increases the risk of infection and blood loss in mother. It is also associated with increased risk for operative vaginal delivery, neonatal depression, low apgar score, NICU admission. So there is a need for an investigation which will be useful in reducing

the adverse perinatal and maternal outcome by early intervention.

According to the studies conducted earlier .the **normal level of AFL**, indicates that there is no anticipated adverse neonatal outcome, so that patient can be allowed for normal delivery if all other parameters for the delivery is normal.

A **higher level of AFL, showed** that the probability of normal delivery is less, if at all present it is almost always associated with instrumental delivery, and may have abnormal CTG findings.

We, by doing the above study wanted to find if there is an association between the intrapartum amniotic fluid lactate and labour outcome.

Many trails done by research workers like Wiberg, wanted to prove the fact that, lactate is produced by the myometrium and it is carried to the amniotic fluid by means of a transport protein. So studies done by Akerrud, gave an explanatory model for the above statement. Serial sampling was done from the different sites involved in the mechanism of getting the lactate

to amniotic fluid like, uterine myometrium, amniotic fluid, cord blood and placenta, 60 from 60 antenatal mothers who had normal delivery, and immunohistochemical studies were done to find out the transporter protein for lactate.

They were able to demonstrate 2 protients, called MCT1 and MCT4.They also said that MCT1 was present in all the samples where as MCT4 was seen only in patients whos had abnormal labor. They concluded saying that MCT1 is found in all patients, but MCT4 was only see in the patients with dysfunctional labor. So assessment of MCT4 protein transporter may be useful in predicting the perinatal outcome, but larger randomized trails are needed to prove the efficacy.

Review of Literature

REVIEW OF LITERATURE

The review of literature of this study is being organized under the following categories.

1. **Introduction of Lactate**

2. The Energy metabolism

3. The Lactate hypothesis

4. The uterus and lactate correlation

5. Labor and lactate correlation

6. Amniotic fluid physiology

7. Lactate in Amniotic Fluid, a recent diagnostic tool in labor

1. Introduction of Lactate

If there is a discussion of exhaustion or muscle fatigue anywhere, people will quote the lactate accumulation as a first and foremost cause. Accumulation of lactate occurs in blood and also in tissues while exercise when there is a oxygen lack.

Lactate levels are high when there is a maximum exhaustion. Lactate is considered a final end waste product as a result of hypoxia and as a result of fatigue.In the tissue damage which may be due to acidosis induced, lactate is considered as a main key factor from olden days till now (Brooks 1986, 2002;)

Lactate is now not considered as a harmful waste end product, it is mainly a key factor in cellular metabolism and whole human body metabolism. There happens to be an accumulation of lactic acid intracellular when glycogen breakdown occurs in the anaerobic cycle. Lactic acid in general is a strong monocarboxylic acid , it dissociates readily at its natural physiological pH into hydrogen ions (H+) and lactate. The lactate has a very meager effect on contractions of muscles. But in general increased H+ ions production and decreased pH ,acidosis occurs mainly due to muscle fatigue. This reduced ph and increased H+ ions due to muscle fatigue has been objected (Karrlsson et al.1975). However recent consideration also has the view that similar to lactate increase, phosphate also increases

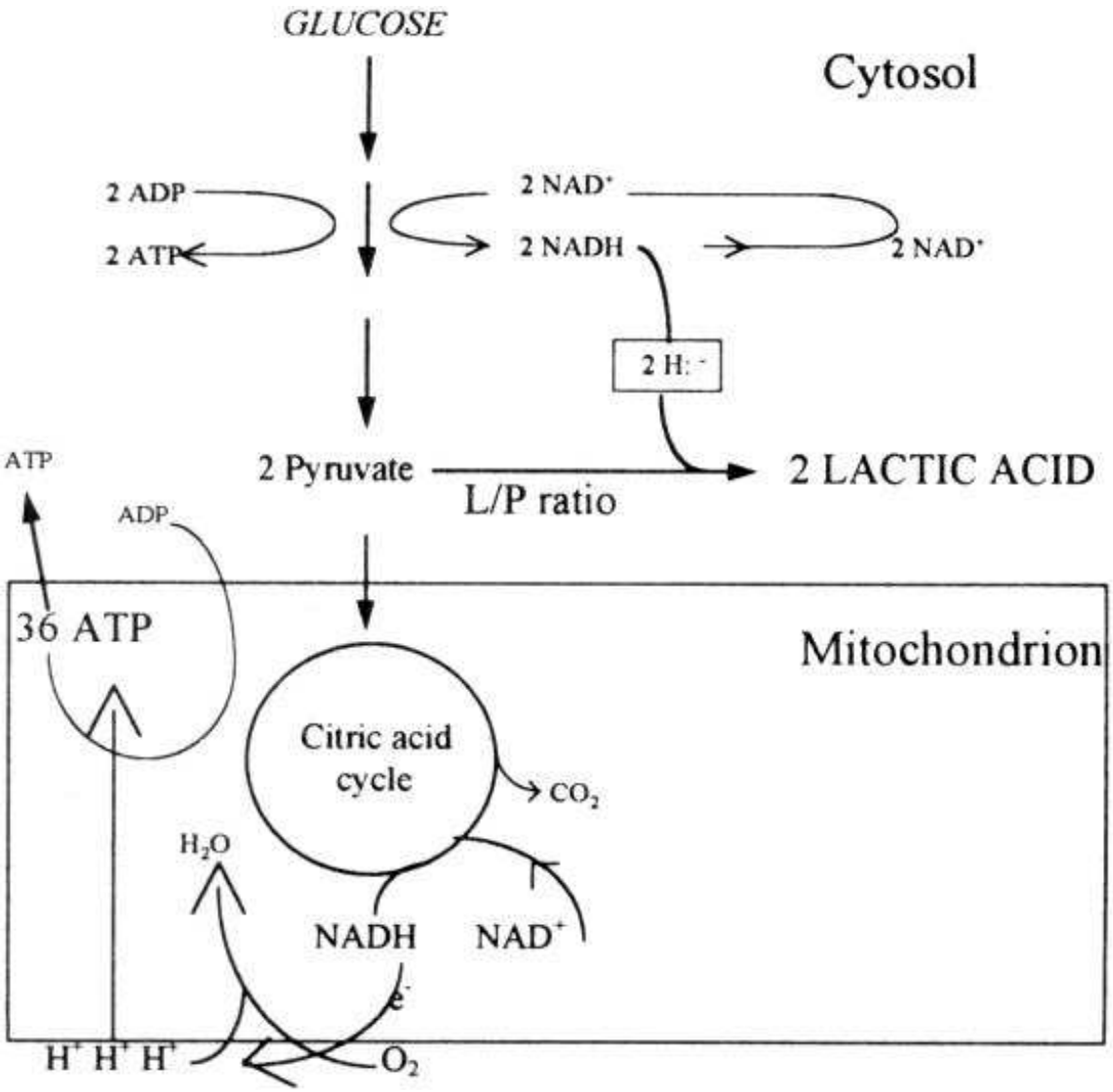
due to anaerobic metabolism. (Westerrblad & Allen 2002;Allen et al. 2002)this has a more significant role in the muscle fatigue.

One important finding, that originates this study and also accepted ny all is that the myometrium is also a very good lactate producing area (Taggarrt & Wrray 1993; Taggarrt et al. 1996; Taggarrt et al. 1997; Taggarrt & Wrray 1998; Wrray et al. 2003; Quenby et al. 2004), the level of lactate increases when oxygen deficiency occurs.

The significant function of the (AF)amniotic fluid is to protect the fetus because of its own cushioning effect always. This fluid provides the fetus, the space to expand and grow,it permits to undergo a `physical´ development. This Amniotic Fluid function is helpful and a very important protective mechanism for the fetus from general trauma and maintains a thermogenic balance. The nutritive functions is also considered to be mild to moderate by all the researches till now.

2. The energy metabolism

The glucose is always a main substrate of the energy metabolism (Meyyer 1920). An aerobic metabolism always ensues when there is a sufficient oxygen supply.m occurs. Here the glucose enters the glycolytic pathway, and is broken down and so that the resultant is pyruvate which then eventually enters citric acid cycle



(**Source**: Intrapartum Fetal Hypoxia and the Biochemical Markers; a review) (Norsddstrom & Arul kumaran 1998).

This chart is briefed out here. The end product Energy is generated from the glycolytic pathway, with the help of CO2 and water. (NAD+) Nicotinamide adenine dinucleotid is generally a H+ acceptor which is always powerful. In the citric acid cycle, NADH is produced after the NAD+ accepts a hydrogen ions. O2 is consumed in this reaction, and a maximum amount of energy is released because of the increased ATP(36 ATP is hence formed).

The metabolism will likely become an anaerobic mode if there is a critical low level of oxygen supply. Lactic acid and hydrogen ions are reduced from the pyruvate when the citric cycle is not entered. LDH catalyses this reaction and there is an involvement of oxidation of NADH to NAD+. The glycolysis generates this NADH, and then further it is reoxidised into NAD+. The oxidation is impaired under the anaerobic

conditions, and finally there is an accumulation of NADH, which helps in promoting conversion to lacate from pyruvate . There is a constant state of relation between (L/P)lactic acid/pyruvate and this is accepted by all. If there is deficient o2 supply, then gradually progressive lactic academia ensues (metabolic acidosis). Only less energy is produced from anaerobic metabolism (2 ATP/glucose) when it is compared with aerobic conditions in general (36 ATP/glucose).

2.1Production of cellular energy:

When there is a prolonged lack of energy, because of anaerobic metabolism, then there exists a difficulty in cellular integrity maintenance. Cellular functions mainly depends on the ion gradients present in the cell membranes. ATP function is mainly required by the Ion pumps. If the anaerobic metabolism continues then sufficient amount of ATP cannot be produced. The basic cellular function during the presence of catabolic situation fails. The 3 cellular energy statuses (different types) are being briefed out here (Nordsstrom & Arulkumaran 1998).

The first one is aerobic, which produces maximum amount of energy in ATP form when there exists a sufficient amount of oxygen. This is a main mode of energy production which is efficient and which is very important. The other two are also dependent upon the level of oxygen supply throughout, and if the situation is being compromised or not. Lactate and hydrogen ions are produced because of anaerobic metabolism when there is a lack of oxygen or its deficiency. Energy is being produced in a limited amount here. The cellular energy status gets compensated when there is a disparity in supply of energy.

This keeps on continues as long as the energy demand and production of energy (ATP) is in balance. If this situation progresses to a irreversible level, then the regeneration or excess production of ATP can’t be kept up with the excess demands and finally in a course of time the cellular energy status will gets into decompensation levels.

2.2 The Buffering systems

The buffering systems of any individuals will have the capacity to maintain a physiologic range of pH. It is mandatory for all the organisms and individuals to maintain the stable range of pH. The cell is in a very dangerous state if there is a fluctuation in pH. If the H+ increases then this disturbs the cellular function and finally the activity of cellular enzymes gets affected. There exists a lot of different buffering systems in any organism. The two important most systems are HCO3 and the protein buffer systems. They help in neutralizing the H+ ions which is a resultant product of anaerobic metabolism. The Role of the H2CO3 buffer is to maintain equilibrium between all these three which is showed in the equation. CO2 + H2O <=> H2CO3 <=> H+ + HCO3 - (Sigard- Anderson 1971).

In this reaction shown above the CO2 passes through and finally at the end it is converted to the bicarbonate. The equation shown goes from left along to the right and then back again until a steady state forms for several times . At a stable

steady state, the total CO2 production intracellular will be equal to elimination of CO2.

3. The Lactate hypothesis

The lactate is a rapidly changing field even from its origin till now. From the understanding of the lactate and its metabolism, it has been dramatically changing from its classical historic views held in 19th century. The era of lactic acids began in 1808,by Mr.Beerzelius at Karolinska Stockholm Institute, in the muscles of hunted stags he discovered the increased concentrations of the lactate (Berzelius 1808). In 1891 Araki showed in the animal muscles that was exhausted the lactic acid concentration was always proportionally equalent to the amount of oxygen availability and exercise. the lactic acid appeared because of muscle contraction in the human muscle, this was demonstrated few 100 years after Berzelius, Hopkins, Fletcher (Fletccher and Hopkinns 1907).They showed that when the oxygen became available the accumulated lactate disappeared. The `lactic- acid-cycle´ then was described, and

the details of two distinct pathways , aerobic metabolism and anaerobic metabolism was told.

From early 1930's , lactic acid was found to be the end product of glycolysis which occurs due to muscle hypoxia.(Meyerhoff 1920; Hill's 1922). The muscle fatigue was generally attributed to lactic acid build up. From 1970's, a revolution in favour of lactate has occurred (Wassermann 1984). The lactate shuttle hypothesis has ushered us into an era in which lactate is no more seen as a dead-end metabolite. Now with the introduction of lactate shuttle hypothesis, we are in the centre of lactate shuttle era.(Brookks GA.1986,2000; 2002).

3.1 The Mechanisms of Muscle fatigue

It is a clear known that with increased muscle activity, the muscle performance decreases, mainly if there is a lack of adequate o2. This fall is explained as muscle fatigue. Irrespective of the cause of fatigue, the consequences are drastic reduction in power output. A practical illustration of this would be an inability to engange in endurance sports once the muscles

are fatigue. There happens to be an occurance of increased acidity when the muscle goes off into fatigue due to decreased o2.

The is a short of energy between the need and the supply during the muscle exhaustion. So ultimately the muscle enters the anaerobic metabolism and the energy is derived from anaerobic metabolism. There is an accumulation of lactic acid and other inorganic acids once the muscle enters the anaerobic metabolism. Lactic acid is one of the stronger acids and it splits to lactate and hydrogen ions easily at normal body temperature. Lactate has a very little effect of its own in muscle contraction. Traditionally it has been thought that the pH change resulting from hydrogen ions creation was responsible for muscle fatigue.

The latest data suggest that acidosis has a limited suppressive effect on muscle contractions. The energy utility and demands and supply during uterine muscle contractions in labor is still considered to be a grey area. Energy formed

because of glycolysis results in formation of pyruvate along with ATP.

In multiple different studies it was found that the human myometrium consumes glucose as a main constituent energy at term pregnancy. Its found that uterine smooth muscles produce lactate at a higher rate than striated mucle even under aerobic conditions. The different constituents of muscle metabolism keeps on changing when there is a muscle fatigue and each of this play a major role in muscle contraction regulation. Even after 2 century years of research of muscle function , we are no were near solving the question of muscle fatigue.

3.2 The Lactate shuttles

Lactate transport was previously thought to be a passive diffusion process occurring across a pH gradient. (Crone 1963; Brooks 2002; Philp et al. 2005). Then as days progressed certain studies showed that lactate was transported across membranes with the help of a carrier protein. The huge variety of lactate

transporter across the cells was found to be the (MCT) monocarboxylate transport proteins (Bonen et al. 1997; 1999; Bonnen 2000; 2001). The lactate and H+ is transported across the tissue principally through MCT1 and MCT4 during muscle exercise. There exists a minimal quantity of lactate which is undissociated between the muscles at rest. During contraction of uterine smooth muscles, if hypoxia occurs , force of contraction is found to be diminished. Commonly myometrial lactic acidosis is named as the culprit during dysfunctional labor.

Lactate transport across muscles is a dynamic process. There is a simultaneous release and uptake of lactate across the cells at rest and also at exercise. During rest the lactate is not only slowly released into the surrounding fluids, but there occurs a small uptake also. Lactate is produced rapidly during exercise. There is a resultant increased lactate concentration intra cellularly in the muscle cells and leading to an increased net output of lactate to surrounding fluids. There is an increased uptake of lactate in the fluids when the muscle is at rest, also at

times when contracting at a low or moderate intensity. During low or moderate intensity of uterine smooth muscle contractions, paradoxically there may actually be a net lactate uptake because of this in the end. Lactate is now being seen as a useful intermediate metabolite that can be rapidly exchanged across the tissue compartments (Brookks 2002). In aerobic conditions lactate automatically becomes a substrate.

4. The Uterus and Lactate correlation

Uterine muscles in general has a bimodal function. Sheltering the growing fetus during pregnancy inside the uterine cavity is considered a primary function. The human uterus is constructed interestingly to fulfill the demands of child bearing. The myocytes in the smooth muscle of uterine cavity are arranged in bundles which are embedded in the connective tissues. This makes the uterus more elastic and enables the transmission of contractile forces which are generated by individual muscle fibres. The uterine smooth muscle is in a relatively relaxed state during pregnancy. Next , when the

process of labor starts, then the uterine smooth muscles becomes a highly active muscle. The ovarian and the uterine artery provides the main blood supply. The radial artery penetrates the myometrium and finally supplies the myometrium and placenta throughout the pregnancy and during labor. The increase in volume and size of the uterus is due to the hypertrophy and hyperplasia of the uterine myocytes, which leads to an increased demand to maintain an adequate circulation.

In the later part of pregnancy,during the preparation for labor, the uterus goes through a series of changes to maintain the ion and hormone balance during effective and synchronized contractions. In the uterine smooth muscles the gap junctions increase in number along with calcium concentration while NO decreases. The increased contracting property of the myocytes is because of Oxytocin which acts via oxytocin receptors . previously it was thought to be because of hormonal control. The ultimate effects of oxytocin, gestgens and estrogens are

assumed to be modified because of the local factors in tissues such as metabolites(Roy & Arulkumaran 1991; Spenncer et al. 2005). Its important to have an extensive knowledge about these metabolites which is of importance, in understanding the clinical expression of labor dystocia (Steingrimsdottir et al. 1995). Many studies in the later part of the last century were published on myometrial activity during 1980's and 90's .(Weddenberg et al. 1990; Weddenberg et al. 1991; Ronquisst et al. 1993; Steingrimmsdottir et al. 1995; Weddenberg et al. 1995). They have proved that the pregnant myometrium has a low energy charge (EC). EC is considered to be an index of energy status compared to cardiac and striated muscles.

The fastidious energy requirements of the uterine musculature is responsible for the variation in EC when compared to other muscles. Cardiac muscle works incessantly with short periods of rest during diastole. Striated muscles have the luxury of workingly only on command. A state(labor) in which strong contractions are required arise only for short

intervals and are interspersed with long intervals of rest. Needless to say that this is a high energy demanding situation. (Stteingrimmsdottir et al. 1993;Steingrimsdottir et al. 1995; 1997; 1999). Compared to early pregnancy and the non-pregnant uterus the pregnant uterus has been shown to stack up more glucose. There is also a documented arteriovenous difference in the glucose levels across the uterus. The above findings can only be seen as proof that the major energy source of the pregnant uterine muscle is glucose. (Steingrimmsdottir et al. 1999).

The myometrium has an increased propensity for anaerobic metabolism when compared to other striated muscle. Pregnant myometrium has been found to have a higher lactate/pyruvate ratio thereby corroborating the previous statement. (Steingrimmsdottir et al. 1995). The skeletal muscle has only half the lactate content of the pregnant uterine muscle – a clear indication of more vigorous glycolysis in the active uterus.

The uterus anticipates a hypoxic condition during labour and undergoes a general metabolic preparation in late gestation. There is a physiological alkalinization of the myometrium as the uterus approaches term and subsequently. (Parat et al. 1995). This antagonizes the acidity produced during normal uterine contractions during labour and prevents the weakening of the force of uterine contractions as the acidity builds up.

Myometrial acid-base balance and its relation to inefficient contractions and dysfunctional labour is the topic of many a study published in recent times. It is important to note that lactate accumulation of lactate leading to acidification of the uterine smooth muscles leading to the progressive decrease in the local pH during contractions can dampen the force of subsequent contractions. This can in effect lead to dysfunctional labor.

The myometrial capillary blood lactate in woem undergoing emergency caesarean following dysfunctional labour

is found to be significantly higher than in women undergoing elective caesarean section or women undergoing operative vaginal delivery with normal uterine contractions. In vitro studies of myometrial strips have shown that a reduced pH and raised lactate alter the rhythmicity of contractions and lead to irregular low amplitude contractions. Occlusion of vascular supply during contractions can be cited as one clinical explanation for the above phenomenon. Furthermore the irregular contracting pattern during dysfunctional labour may lead to prolonged occlusion of the uterine vessels which leads to decreased oxygenation of the myometrium and further increase in lactic acid levels. This shows that despite inefficient contractions there is a deficient reoxygenation of the myometrium. It is of course a given that there exists a difference in the response of individual women to intermittent hypoxia especially in the recovery period from the low oxygen episode after an occlusion.

The 1970s saw the emergence of the knowledge that amniotic fluid contained high lactate concentrations for the first time. While some studies do a convincing job of suggesting that the amniotic fluid lactate is by the fetus itself through urine and pulmonary excretion the major bulk of studies say that the myometrium is the most important lactate producer. The amniotic fluid lactate is 4-6 times higher when compared to the lactate in fetal or maternal blood. From where this high amniotic fluid lactate is derived is yet to be ascertained.

5. The Labor and lactate correlation

5.1The Normal delivery

Normal childbirth is defined as a spontaneous delivery of a newborn beginning after a term pregnancy, with absence of any risk factors and/or complications. A healthy mother with a healthy baby is the ideal goal of all deliveries and a positive experience of giving birth can never be over-emphasized. The first stage of labour sees a gradual increase in the frequency and amplitude of uterine contractions.

Freedman’s seminal work in the 1950’s has lead to the acceptance that rate of normal cervical dilatation in the first stage of labour is 1cm/hour giving a mean duration of 4.5 hrs to the first stage. Any delay in opening stage of more than 2-3 hrs is considered extended or dystocic labour. (Friedman 1955).

5.2 Labor dystocia

One ubiquitous problem worldwide calling for an operative intervention during parturition is labour dystocia. It is clinically defined as the slow or arrest of progression during labour. It can involve both cervical dilatation or the descent of the presenting part. It occurs in 20% of all deliveries worldwide. However a precise definition for the diagnosis of dystocia is still elusive. Traditionally, the partogram with its ‘alert line’ drawn to represent a cervical dilatation of 1cm/hr and an ‘action line’ drawn 4 hrs to the right is the usual method to identify labor dystocia (Philppot 1972). The clinicallydystocia is detected when the plotted rate of progress veers to the right of the action line or there has been no progress for over 2 hrs(Lavender

2008). Labour abnormalities, the increased need for operative or instrumental delivery, decreased 5min APGAR and prolonged newborn care are some of the risks associated with labor dystocia. Dystocia also has a higher percentage of post-partum infections, increased estimated maternal blood loss and also an increased hospital stay for both the mother and the newborn.

5.3 Partogram

The World Health Organization(WHO) mandates that every delivery in the world should be monitored with a partogram (Kwasst et al 1994). The partogram facilitates early detection of maternal and fetal complications and the progress of labor. Due credit has to be given to Friedman who devised the partogram or the cervicoplot in the 1950s. What Friedman did was to meticulously analyze the average speed of cervical dilatation in the active phase of around 10% women with the slowest progression of labour. He put the estimate of a normal progression at 1 cm/hr. The original partographic curves were sigmoid showing a clear demarcation between the first and the

second stages of labour. As late as 1950s the important tool for labour monitoring was developed which is called the partogram.

The very first partogram was developed by Philpot – castle's work on this field. The sigmoid curve that was developed first is now converted into a straight line withlabour progress of 1cm/hour. This line that is plotted in almost all partograph is called alert line and this expresses the expected normal labour progress. Every health attendant must give more attention if the line tends to shift to the right from the expected labor course. In due course the (ACL)action line was added to the right of alert line. A diagnosis of dysfunctional labour is made once the action line has been crossed , then intervention is mandatory either with amniotomy or with syntocin. ACL in India is 4-hours from the alert line.

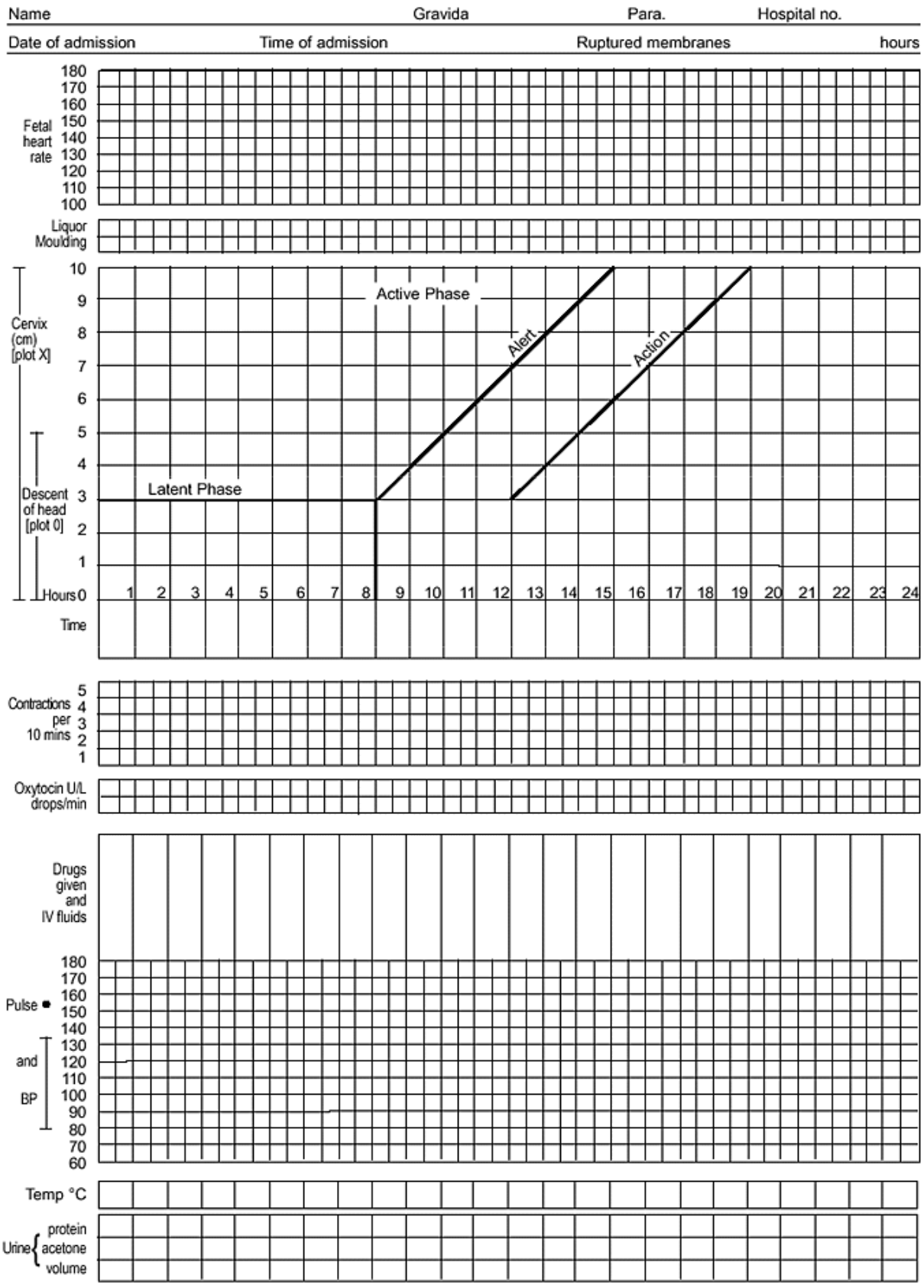


Diagram : The Partogram by WHO

WHO has adviced the mandatory use of partogram in all deliveries.(1994 Kwasst et al). the use of the partogram and without using such a one was compared but no definitive benefits were made out. Various studies were conducted in the different placements of action line. The results were ambiguous and finally using partogram the caesarian rate was not reduced or either benefits of increased apgar happened. Action Line containing shift in 2-hours sometimes culminates in a better labor experience, but infact no additional benefits were made out. In general, the partograph use is questioned by many and not accepted by all, increasingly there happened to be a need for alternative methods to monitor in labor.

5.4 Active management of labor

In 1960s o'´driscol and workers ,Dublin Maternity Hospital , Ireland, did some fantastic work on the normal labour/dysfunctional labour (1969 o'driscol et al. 1973). They came with a concept of management

of labor in nulliparous women which is now practiced as active management of labour across the globe. The methods are shown as 1. Diagnosis of labour by a Strict criteria, 2. Rupture of amniotic membranes as early, 3. Prompt intervention with oxytocics if needed and 4. And finally, committed attendants who never leave a woman unmonitored. These are the components of active management of labor. Major trials have been conducted to assess the importance of each of the above criterias individually but unfortunately most of these studies were conducted during normal labour and not dystocia labour which is more the need of the day. This approach featuring aggressive intervention earlier in the course of labour has received very little criticism. Again there are very few studies carried out on ` total package of management of labor´ (Akkoury et al 1988; Turnner et al. 1988; Boyllan et al 1991; Loppez-Zeno et al 1992; Friggoletto et al 1995), and only one of those studies showed significant odds ratio reduction in casarean delivery with active management of labour(Loppez-Zenno et

al 1992). Continuous professional support during every step of the labour process has positively shown to reduce operative delivery rates.

6. Amniotic fluid physiology

6.1 The formation of amniotic fluid:

The amniotic fluid cushions the growing womb. It provides the fetus the needed space to grow and allow it to have the needed development. Additionally it also have a protective effect from trauma and temperature maintaining. The nutritional function of the fetus is taken care minimally by the amniotic fluid. In the first trimester the AF is nothing but the the ECF composition, which depends upon the fetal weight and fetal skin has no barrier for the transport of the fluids.AF is nothing but the mimic of fluid of extra cellular space. Keratinisation of fetal skin takes place beyond 20 weeks and the mimic of extracellular fluid is lost. AF then becomes a completely different fluid as it is no longer able to equilibriate with the mother or the fetus. AF osmolarity decreases subsequently. It denotes the change in

renal maturity of the fetus. The urine is produced by the fetal kidneys at about 11-12 weeks gestational age. The minimal osmolarity provides a larger potential osmotic force for movement of the water across trans and intramembranes pathways.

AF production is mainly controlled at three levels. The placental control of AF over fluid and electrolyte concentration, in and outflow from the fetus. Fetal urine production fetal liquor swallowing. Then fluid filtrate from placenta and membranes play a major role. The volume of AF corresponding to each week varies and has a basic relationship with the curve formed according to the gestational age. In a normal physiologic pregnancy, AF volume peaks at 32 to 34 weeks, with an average of 800 ml. Thereafter it declines, decrease occurs mainly post date.

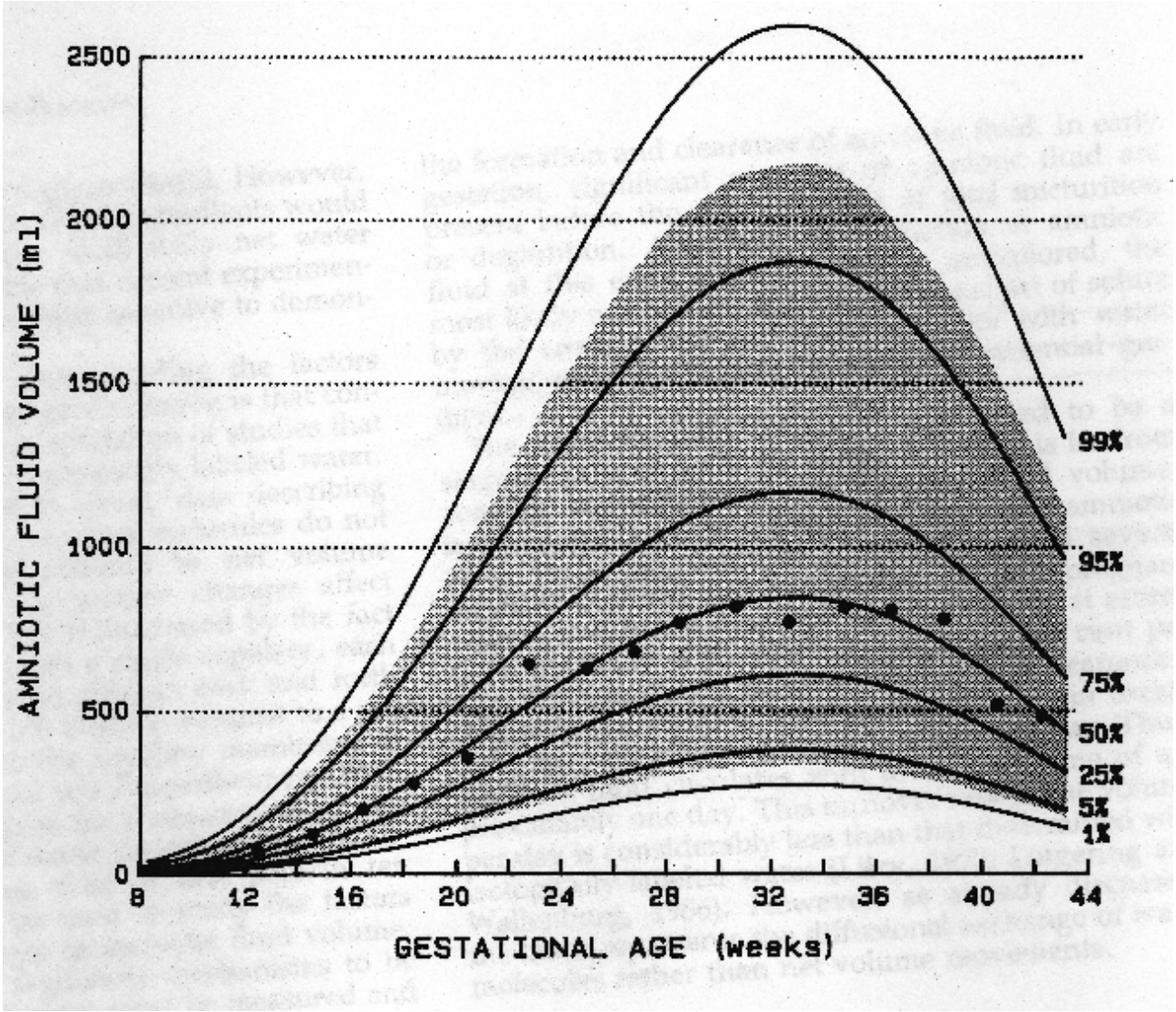


Diagram: AF volume depicted as function of gestational age. Dots measurement done 2 weekly interval . The shaded area represents confidence interval of 95% . (From: Obstetrics book by William's 21st edition).

7. Lactate in Amniotic Fluid, new diagnostic tool in labor

Department of OBG at the South General Hosp, in Stockholm performed prospective observational study between 2003-04 (Wilsberg-Itel et.al 2008). The inclusion criteria was set as women having a healthy and normal pregnancy with a spontaneous onset of labour. A group of 75 women fitting the criteria were chosen and amniotic fluid was taken via intrauterine pressure catheter every thirty minutes during the active phase of labour. This was analyzed after blinding. The results were compared with the obstetric outcome. It was found that higher levels of lactate in the AF (>10.1mmol/l) showed an increased chance of a diagnosis of dystocia.

Another prospective study in the same hospital analysed AF during around 2006-08 from 850 healthy normal deliveries, AF were collected at every vaginal examination in the process of labour monitoring. Once again the samples were analyzed after suitable bliniding. The objective was to analyze the complementary effect of lactate alongwith WHO partogram in

monitoring labour and predicting outcomes. The study showed that together both the entities proved a better tool for detecting and managing arrest of labour. 80% women in the study who ended up having operative delivery had an AF lactate >10.1mmol/l. Elevated lactate was also associated with prolonged duration of labour.

Aims & Objectives

AIM OF THE STUDY

To find the association between intrapartum amniotic fluid lactate level and labour outcome

OBJECTIVES

- To find the association between intrapartum amniotic fluid lactate level and labour outcome
- Mode of delivery
- Need of instrumentation / LSCS
- Apgar score at birth

Materials and Methods

MATERIALS AND METHODS

The study was conducted in the department of Obstetrics and Gynaecology, PSG Hospitals, Coimbatore from September 2012 to September 2013.

STUDY DESIGN

Prospective study

STUDY POPULATION

Study group consisted of low risk pregnant women at term admitted to PSG Hospitals who entered into active labour either by spontaneous/ induced

SELECTION CRITERIA

- Women in active labour without any obstetrical complications
- Vertex, Breech presentation
- Term, Postdated pregnancy

EXCLUSION CRITERIA

- < 37 Weeks not in active labour
- Obstetrical complication
- Biohazard
- Multiple gestation
- Absent/Ruptured Membranes

METHODOLOGY

Women in active labour without any obstetrical complications are selected who may be either a Term/ Postdated

This a Prospective study involving all low risk antenatal patients who entered into active labour were selected for the study.

Basic assessment for risk factors is done in antenatal patients with spontaneous onset of labour and induced labour and if the patient comes under uncomplicated term and post dated gestation, she is included in the study

Women were included in the study group if their gestational age was atleast 37 weeks at admission to labour ,who carried a singleton pregnancy either a vertex or breech presentation who were without any other obstetrical or medical complications. Both spontaneous and induced labour were chosen.

Excluded women were the ones who presented with pre-term labour with any other obstetric and medical complication ,

Biohazard , Multiple gestation and patients who came with either absent/ruptured membranes

All consecutive patients who entered into labour who are eligible for the study were explained about the study after excluding other women who were not eligible for the study. After obtaining informed and written consent regarding the study these patients were followed up accordingly.

Once if a patient has come with spontaneous labour or when the patient is in induced labour, initial PV is done and Bishop Score is assessed.The pelvis of the mother must be adequate and satisfactory. After a soap water enema, patient is allowed to progress on her own or after further induction or augumentation in induced labour. Next PV is repeated after 6 or 12 hrs if it's a PgE2 gel 0.5 mg, 24 hours later if the labour is induced by Foleys induction with or without extra amniotic saline infusion, 6 hours later if induced with oral misoprostol 25 mcg, 4 hours if augumented with vaginal misoprostol 25 mcg.

Once the patient enters into active labour, active management of labour is done. labour progress is monitored with partograph and the patient is prepared for an ARM. After the patient empties her bladder,the patient is put in dorsiflexion postion and under aseptic precautions ARM is done per speculum when the patients cervix is atleast 2.5cm to 3 cm dilated under visual guidance by a torch light by a medical attender who is involved in assisting. If a repeat PV examination finding crosses the alert line, labour is augmented with syntocin or patients labour is augumented with syntocin depending upon the progress with 2.5 Units or 5 Units of syntocin in 500 ml of Ringer Lactate drips monitored and infused with infusion pump which is increased in 4 drops per minute every half an hour once.. labour analgesia is given either with inj pethidine 50 mg and inj phenergan 12.5 mg or by epidural analgesia selected according to the patients wish. Entonox gas inhalation also used in needed once.

The amniotic fluid of atleast 2 ml which is collected in a syringe after doing an ARM is trasfered into a biochemistry laboratory container and it is labeled with the patients details (name and unique in patient medical records number) so that the sample is analysed automatically by a automated lactate analyser in our in house biochemistry laboratory. The amniotic fluid is sent for the study if it is clear and not meconium stained. The sample reaches the laboratory within 5 minutes through the pneumatic system in our hospital. The amniotic fluid sample is centrifuged in the laboratory and analysed immediately as soon as the sample is received, and the reporting is done in computer immediately. So the delay in reporting is prevented. The report is viewed in the labour ward complex.

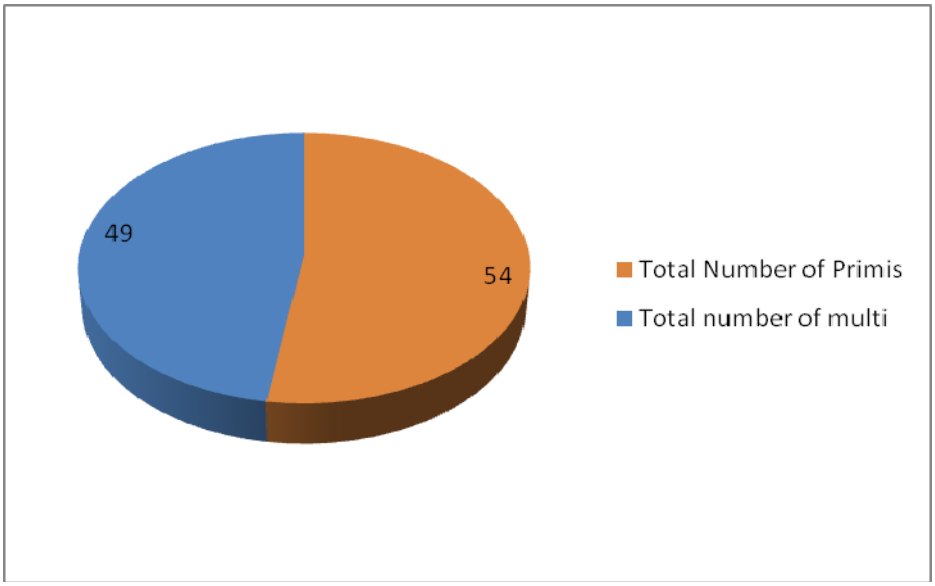
Once the patient enters the second stage of labour after the cervix is fully dialted the patient is encouraged to bear down after confirming the dilatation by per vaginal examination . The patient is shifted to second stage room once the crowning of fetal head is seen and the obstetrics and neonatology team are

ready for delivery and neonatal resustication. Normal delivery is done either with or without episiotomy. Instrumental delivery is done either with vacuum (silastic cup or metal cup)or forceps(outlet and low cavity) depending upon the obstetric indication. The babys delivery time, weight, initial 5 mins and 10 mins apgar score are noted. The patient may end into an emergency LSCS if indicated. The same details of the baby are noted down even after LSCS. The indication of LSCS and instrumental delivery is also noted down. All the details are noted down in the study proforma and the results were analysed after statistical analysis finally.

Results

RESULTS

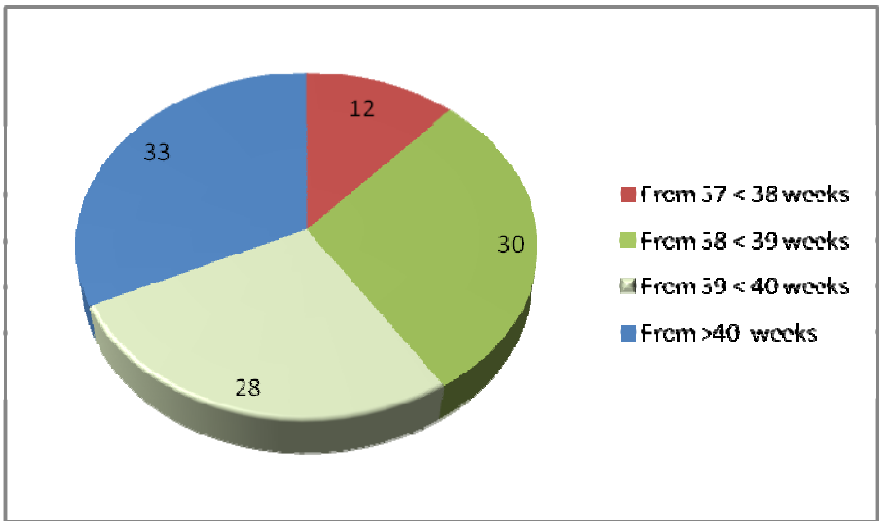
1	**Total number of patients**	**103**
	Total Number of Primis	**54**
	Total number of multi	**49**



Out of the total number of patients 103 involved in study, 54 patients were primis and 49 patients were multi

2 Gestational Age

Total number of patients	**103**
From 37 < 38 weeks	**12**
From 38 < 39 weeks	**30**
From 39 < 40 weeks	**28**
From >40 weeks	**33**



Out of the total number of patients 103,

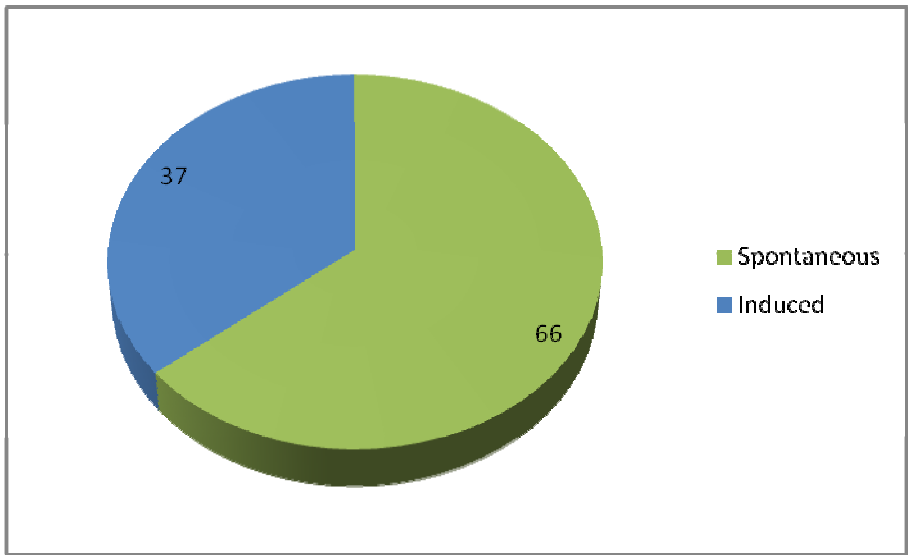
12 patients were from 37- < 38 weeks,

30 patients were from 38-<39 weeks,

28 patients were from 39-<40 weeks,

33 patients were from > 40 weeks

3	**Mode of Onset of Labour**	
	Spontaneous	**66**
	Induced	**37**

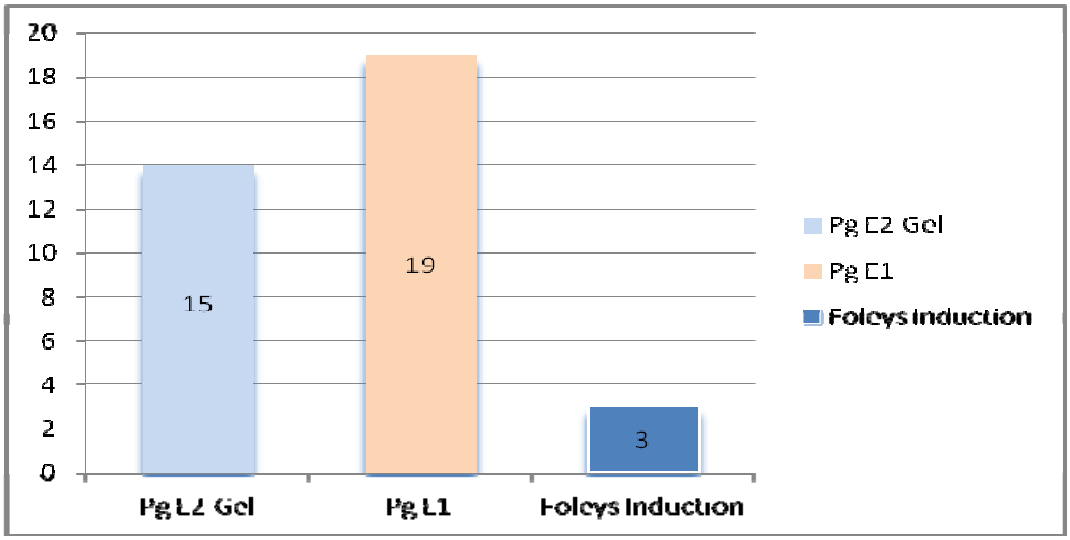


Out of the patients 103,

66 patients had spontaneous mode of delivery,

37 had induced mode of labour

4	**Mode of Induction**	
	PG E2 Gel	**15**
	PG E1	**19**
	Foleys Induction	**3**



Out of the total number of induced patients 37,

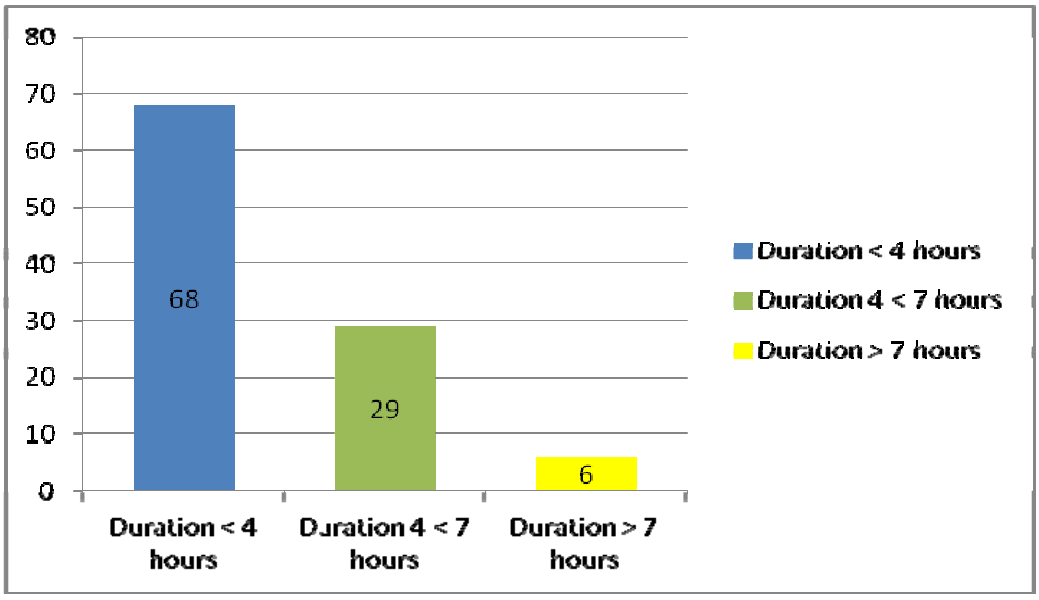
15 were induced with pge2 gel,

19 were induced with pge1,

3 were induced with Foleys induction

5 Duration of Active Stage

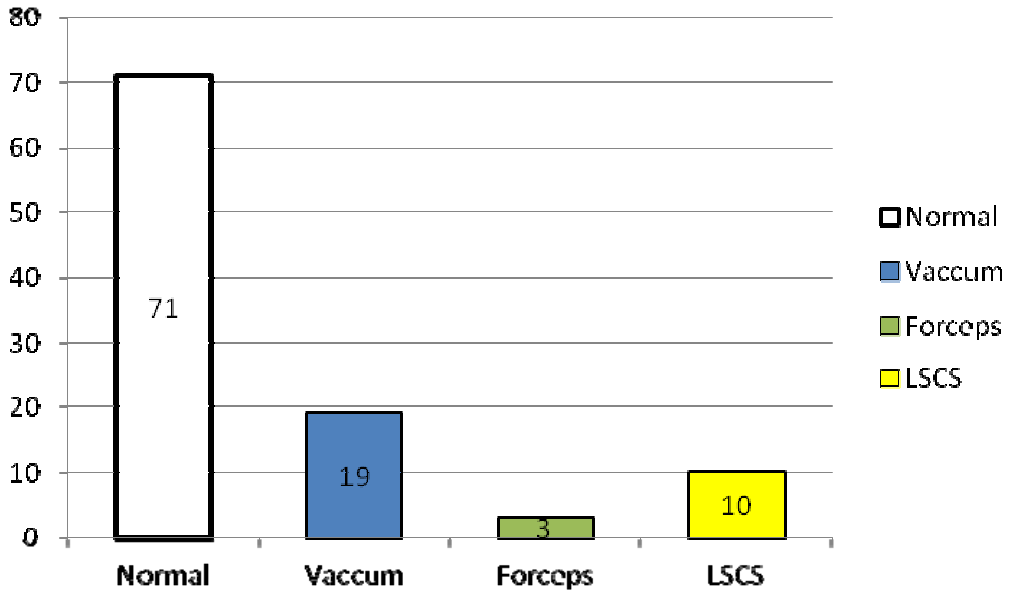
Duration < 4 hours	**68**
Duration 4 < 7 hours	**29**
Duration > 7 hours	**6**



Out of the total number of patients 103, 68 patients had duration of active stage < 4 hours, 29 had duration of active stage 4-<7 hours, 6 patients had duration of active stage > 7 hours

6 Mode of Delivery

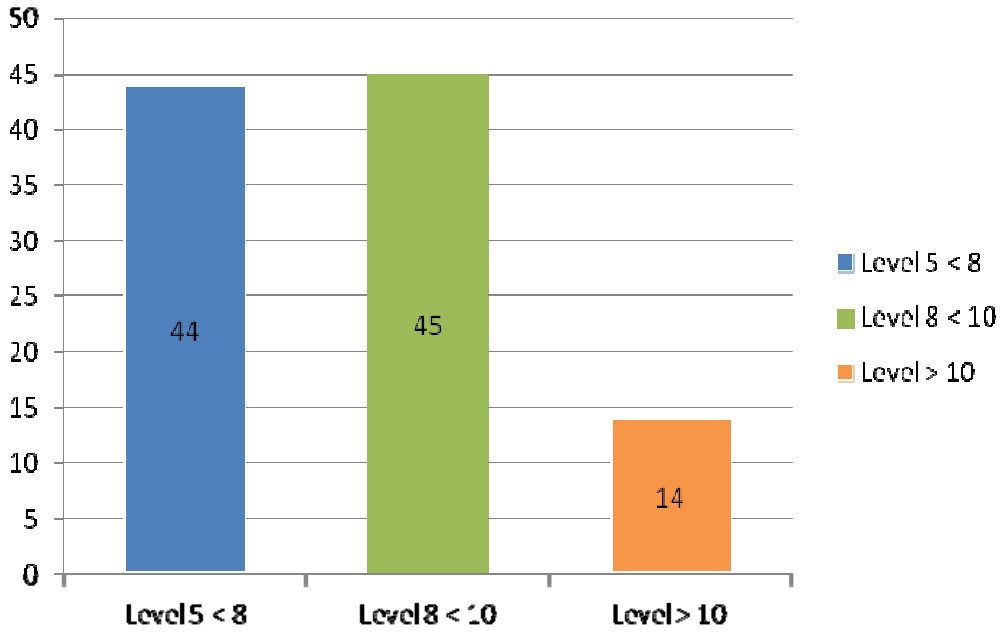
Normal	**71**
Vaccum	**19**
Forceps	**3**
LSCS	**10**



Out of the total number of patients 103, 71 had normal delivery, 19 had vacuum delivery, 3 had delivery by forceps, 10 had delivery by LSCS

7 Aminiotic Fluid Lactate

Level 5 < 8	**44**
Level 8 < 10	**45**
Level > 10	**14**



Out of the total number of patients 103,

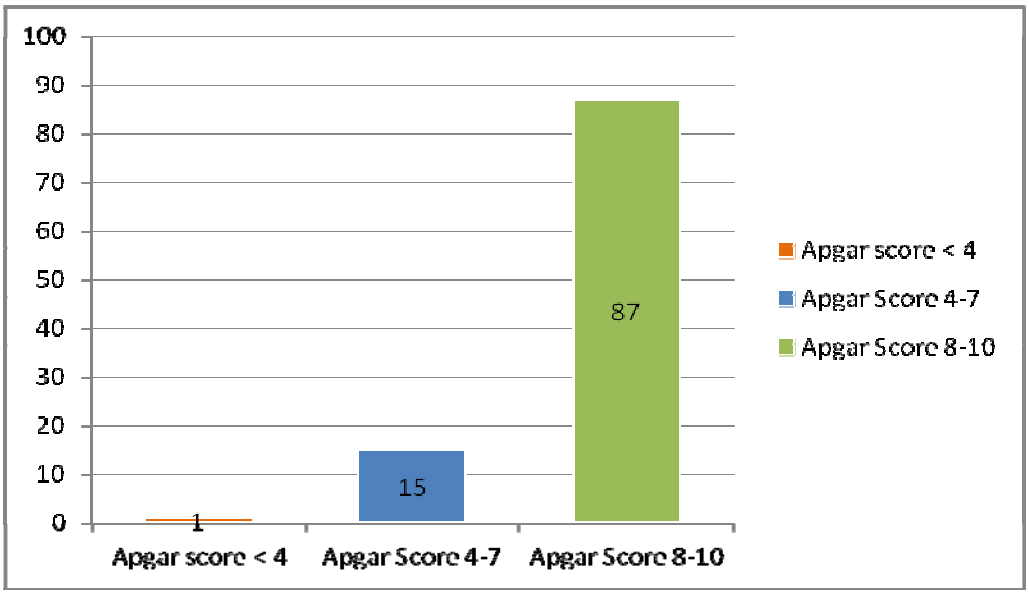
44 had amniotic fluid lactate levels 5-< 8,

45 had amniotic fluid lactate levels 8-<10,

14 had amniotic fluid lactate levels >10.

8 Apgar Score

Apgar score < 4	**1**
Apgar Score 4-7	**15**
Apgar Score 8-10	**87**



Out of the total number of patients 103,

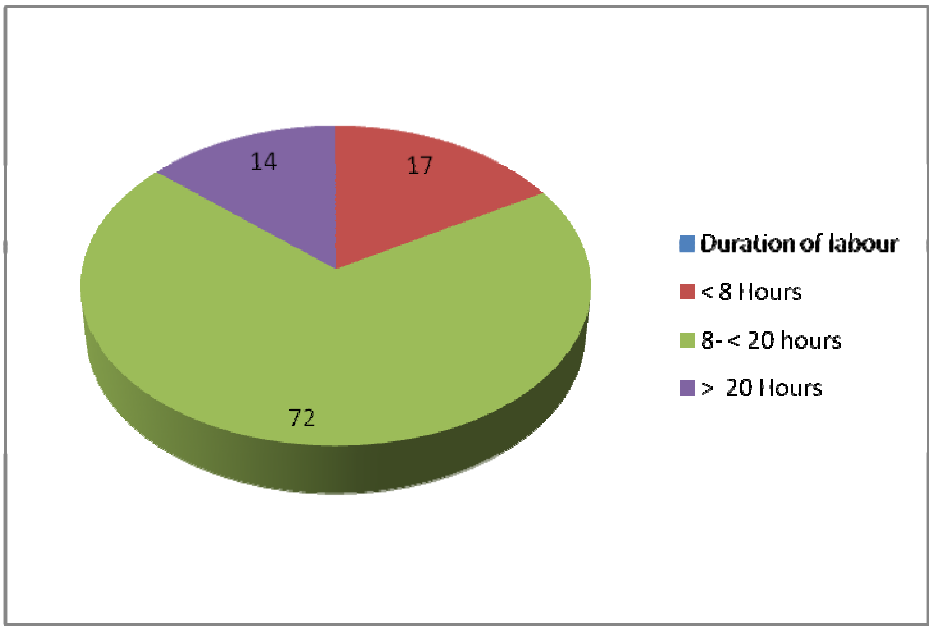
1 Neonates had apgar score of < 4,

15 Neonates had apgar score of 4-7,

87 Neonates had apgar score of 8-10

9 Duration of Labour

< 8 Hours	**17**
8- < 20 hours	**72**
> 20 Hours	**14**



Out of the total number of patients 103,

17 patients had duration less than 8 hours,

72 patients had duration of labour 8-<20 hours,

14 patients had duration more than 20 hours

Statistical analysis:

The objectives are to correlate

1) Amniotic fluid lactate levels with duration of labour

2) Amniotic fluid lactate levels with mode of delivery

3) Amniotic fluid lactate levels with apgar score

LACTATE LEVELS AND DURATION OF LABOUR

			DURATION OF LABOUR			
			<8 hrs	8-<20 hrs	>=20 hrs	Total
Lactate	5-<8	Count	9	31	4	44
		% within lactate	20.5%	70.5%	9.1%	100.0%
		% within duration of labor	52.9%	43.1%	28.6%	42.7%
	8-<10	Count	6	32	7	45
		% within lactate	13.3%	71.1%	15.6%	100.0%
		% within duration of labour	35.3%	44.4%	50.0%	43.7%
	>=10	Count	2	9	3	14
		% within lactate	14.3%	64.3%	21.4%	100.0%
		% within duration of labour	11.8%	12.5%	21.4%	13.6%
Total		Count	17	72	14	103
		% within lactate	16.5%	69.9%	13.6%	100.0%
		% within duration of labour	100.0%	100.0%	100.0%	100.0%

	Value	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.222	P=0.695

Pearson chi square = 2.222,

P value =0.695

Around 70 % of the study group whose lactate levels were 5-<8 had duration of labour within 8-<20 hours. Of the patients whose duration of labour were in 8-<20 hours, 88 % had lactate levels less than 10. This shows a good negative predictive value.In the group of 14 patients whose duration of labour >20 hours, 11 patients had normal lactate levels.

We were not able to repeat the lactate levels just before the delivery due to difficulty in collection.

AMNIOTIC FLUID LACTATE VS MODE OF DELIVERY

			MODE OF DELIVERY				Total
			NORMAL	VACCUM	FORCEPS	LSCS	
Lactate	5-<8	Count	30	7	1	6	44
		% within lactate	68.2%	15.9%	2.3%	13.6%	100.0%
		% within Delivery mode	42.3%	36.8%	33.3%	60.0%	42.7%
	8-<10	Count	31	10	1	3	45
		% within lactate	68.9%	22.2%	2.2%	6.7%	100.0%
		% within Delivery mode	43.7%	52.6%	33.3%	30.0%	43.7%
	>=10	Count	10	2	1	1	14
		% within lactate	71.4%	14.3%	7.1%	7.1%	100.0%
		% within Delivery mode	14.1%	10.5%	33.3%	10.0%	13.6%
Total		Count	71	19	3	10	103
		% within lactate	68.9%	18.4%	2.9%	9.7%	100.0%
		% within Delivery mode	100.0%	100.0%	100.0%	100.0%	100.0%

	Value	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.868[a]	.825

When lactate levels were more than 10, 10 patients had normal vaginal delivery

When the mode of delivery were analysed there was no statistically significant correlation between amniotic fluid lactate and mode of delivery.

Pearson chi square=2.868

P value=0.825

AMNIOTIC FLUID LACTATE VS APGAR SCORE

			apgarscore			Total
			<4	4-7	8-10	
Lactate	5-<8	Count	1	3	40	44
		% within lactate	2.3%	6.8%	90.9%	100.0%
		% within apgar score	100.0%	20.0%	46.0%	42.7%
	8-<10	Count	0	7	38	45
		% within lactate	.0%	15.6%	84.4%	100.0%
		% within apgar score	.0%	46.7%	43.7%	43.7%
	>=10	Count	0	5	9	14
		% within lactate	.0%	35.7%	64.3%	100.0%
		% within apgar score	.0%	33.3%	10.3%	13.6%
Total		Count	1	15	87	103
		% within lactate	1.0%	14.6%	84.5%	100.0%
		% within apgar score	100.0%	100.0%	100.0%	100.0%

	Value	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.376[a]	.079

When we analysed amniotic fluid lactate and apgar score

In lactate levels 5-<8 – 9.1% had apgar < 7

In lactate levels 8-<10 - 15.6 % had apgar score < 7

But in lactate levels > 10- 35.7 % had low apgar score

Pearson chi square= 8.376

P value=0.079

CORRELATION BETWEEN LACTATE LEVELS AND APGAR SCORE SPEARMANS RHO CORRELATION COEFFICIENT= -0.20, P <0.05

			lactate	apgarscore
Spearman's rho	lactate	Correlation Coefficient	1.000	-.200*
		Sig. (2-tailed)	.	.043
		N	103	103
	apgarscore	Correlation Coefficient	-.200*	1.000
		Sig. (2-tailed)	.043	.
		N	103	103
*. Correlation is significant at the 0.05 level (2-tailed).				

However spearman rank correlation showed a correlation of -0.20 with $P < 0.05$

Data were analysed using SPSS PC 19. Pi diagram and Bar diagrams were drawn from the data with the help of excel software.

Chi square were used to find correlation between lactate level and duration of labour , mode of delivery and apgar score

In addition Spearman Rank correlation were also done to observe correlation between lactate levels and apgar score

DISCUSSION

DISCUSSION

A prospective study was conducted in PSG Hospital, Coimbatore in the department of obstetrics and gynaecology during the month of August 2012 to 2013.

A total of 103 patients were taken into the study for amniotic fluid lactate analysis during labour, out of which 54 patients were primis and 49 patients were multi .All were low risk who were at 37 weeks completed, without any complications. Preterm was avoided from the study fearing there might be a change in lactate levels in that group. Both spontaneous and induced labour were selected in the study group as this does not affect the lactate levels.

Amniotic fluid lactate levels were measured during active phase of labour, and the mode of delivery, duration of labour and the apgar score were noted down and correlation was analysed for these three.

Our aim was to find the correlation between intrapartum amniotic fluid lactate levels and labour outcome.

Results of Correlating amniotic fluid lactate levels and duration of labour

Around 70 % of the study group whose lactate levels were 5-<8 had duration of labour within 8-<20 hours. Of the patients whose duration of labour were in 8-<20 hours, 88 % had lactate levels less than 10.

This shows a good negative predictive value.

In the group of 14 patients whose duration of labour >20 hours, 11 patients had normal lactate levels.

Results of Correlating amniotic fluid lactate levels and mode of delivery

When lactate levels were more than 10, only 14% had normal vaginal delivery When the mode of delivery were analysed there was no statistically significant correlation between amniotic fluid lactate and mode of delivery

Results of Correlating amniotic fluid lactate levels and apgar score When we analysed amniotic fluid lactate and apgar score

In lactate levels 5-<8 – 9.1% had apgar < 7

In lactate levels 8-<10 - 15.6 % had apgar score < 7

But in lactate levels > 10- 35.7 % had low apgar score

.

We were not able to repeat the lactate levels just before the delivery due to difficulty in collection. But if the lactate levels were repeated just before delivery then further correlation could have been found out.

CONCLUSION

CONCLUSION

- The uterine myometrium has an increased propensity for anaerobic metabolism when compared with other types of mucles.

- The myometrial capillary blood lactate increases in women following prolonged labour.

- The amniotic fluid lactate is 4-6 times higher when compared with fetal and maternal blood, which occurs mainly during dysfunctional labour.

- The traditional partogram is a good tool used for diagnosing dysfunctional labour. The combination of intrapartum amniotic fluid lactate levels along with WHO partogram could be used as a better tool in diagnosing dysfunctional labour.

- According to our study, the intra partum amniotic fluid lactate levels had a good negative predictive value when it was compared with the duration of labour .

- Of the patients whose duration of labor were 8-<20 hours, 88% had amniotic fluid lactate levels < 10.

In lactate levels 5-<8 – 9.1% had apgar < 7

In lactate levels 8-<10 - 15.6 % had apgar score < 7

But in lactate levels > 10- 35.7 % had low apgar score <7

- Amniotic fluid lactate levels had better correlation with duration of labour and apgar score.

- The lower the amniotic fluid lactate levels, the better is the apgar score.

- Better correlation could have been observed if amniotic fluid lactate levels were seen every 3-4 hours during active labor. However this was not possible due to practical difficulty in collection of sample.

- Lactate analysis is a simpler, easier method of analyzing the labour outcome and the results of this test can be obtained very fast since its analyzed with auto analyzer.

- The laboratory results are also standard since its done with the auto analyzer.

- The intrapartum amniotic fluid lactate levels can be correlated with umbilical cord blood lactate and fetal scalp blood lactate for further analysis.

Appendix

PROFORMA

1) NAME OP NO IP NO

2) AGE

3) OBSTETRIC SCORE

4) GESTATIONAL AGE AT ONSET OF LABOUR

5) MODE OF ONSET OF LABOUR

SPONTANEOUS	INDUCED

IF INDUCED – METHOD USED

6) DATE & TIME OF ONSET OF LABOUR PAIN

7) LATENT PHASE DURATION

8) ACTIVE PHASE DURATION

S NO	TIME	CONTRACTIONS	FHR	REMARKS

9) ARM TIMING

10) TIMING OF COLLETION OF AMNIOTIC FLUID LACTATE

11) DURATION OF SECOND STAGE:

12)MODE OF DELIVERY:

TIME OF DELIVERY

IF INSTRUMENTATION

INDICATION

IF LSCS

INDICATION

13) APGAR: 1MIN- 5MIN-

14) BABY CONDITION

PSG Institute of Medical Sciences & Research
Institutional Human Ethics Committee

POST BOX NO. 1674, PEELAMEDU, COIMBATORE 641 004, TAMIL NADU, INDIA
Phone : 91 422 - 2598822, 2570170, Fax : 91 422 - 2594400, Email : psgethics2005@yahoo.co.in

Proposal Number	:	**12/091**
Project Title	:	**To find the association between intrapartum amniotic fluid lactate level and labour outcome**
Investigator(s)	:	**Dr V Aravind Chander**
Institution	:	**PSGIMS & R**
Name of the Guide(s)	:	**Dr Seetha Panicker**
Institution	:	**PSGIMS & R**
Waiver of Consent	:	**No**
Review Type	:	**Exempt**
Date of the Meeting	:	**N/A**
Decision	:	**Approved**
Approval Date	:	**18.07.2012**
Validity of the Approval	:	**One year**

Approval for this study is given under the following terms and conditions:

1. Non-adherence to the Standard Operating Procedures (SOP) of the Institutional Human Ethics Committee (IHEC) and national and international ethical guidelines shall result in withdrawal of approval (suspension or termination of the study). SOP will be revised from time to time and revisions are applicable prospectively to ongoing studies approved prior to such revisions.

2. PIs are required to send progress reports (in the form of an extended abstract with publications if any) to the IHEC every six months (and a month before expiry of approval date, if renewal of approval is being sought).

3. Request for renewal must be made at least a month ahead of the expiry of validity along with a copy of the progress report.

Dr Y S Sivan
Member - Secretary

SECRETARY
PSG IMS & R
COIMBATORE-641 004
INSTITUTIONAL HUMAN ETHICS COMMITTEE

INTRODUCTION

The most important cause for operative delivery in the obstetric practice is when the patient is in labor mainly dysfunctional labor.

The major cause for perinatal mortality and morbidity is the birth asphyxia secondary to abnormalities during the labor. many trails have been done since many years in the past for detection of the abnormalities in labor, so that early intervention will reduce the adverse perinatanl outcome. The introduction of the terminology abnormal labor or dysfunctional labor dates back to the time of Friedman,when he introduced the use of Partogram in active labor. Many modifications are being done till date, while the first partogram was based on the cervical dilatation against the descent of the fetal presenting part.the modern partogram has got many components like fetal heart rate, maternal contractions, usage of drugs, intravenous

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Assignment Inbox: The Tamil Nadu Dr. M.G.R. Medical University

	Info	Dates	Similarity	
Medical	ⓘ	Start 13-Nov-2013 12:50PM Due 31-Dec-2013 11:59PM Post 13-Nov-2013 3:00PM	11%	Resubmit View

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PSG Institute of Medical Science and Research, Coimbatore
Institutional Human Ethics Committee
INFORMED CONSENT

I , Dr.V.Aravind Chander MD.,(OG) postgraduate from the department of Obstetrics and Gynecology of PSG Institue of Medical Science & Research (PSGIMS&R), am carrying out a study on the topic:" To find the association between intrapartum amniotic fluid lactate and labour outcome" to under the aegis of the Department of Obstetrics and Gynecology, PSGIMSR

The objectives of this study are:

To find the association between intrapartum amniotic fluid lactate and labour outcome"

Sample size: 100

Respondants are term antenatal patients who are low risk are in active labour in PSG hospitals – Labour Ward, Coimbatore

Consent: The above information regarding the study, has been read by me/ read to me, and has been explained to me by the investigator/s. Having understood the same, I hereby give my consent to them to interview me. I am affixing my signature / left thumb impression to indicate my consent and willingness to participate in this study.

Signature / Left thumb impression of the Study Volunteer / Legal Representative:

Signature of the Interviewer with date: Witness:

Master Chart

S . NO	GRAVIDA		GESTATIONAL AGE				MODE OF ONSET		MODE OF INDUCTION			DURATION OF LABOUR					MODE OF DELIVERY				AMNI FLUID LACT			APGAR		
	PRIMI	MULTI	37-<38	38-<39	39-<40	>40	SPONT	INDUCED	PGE2 GEL	PGE 1	FOLEYS	LATENT	1-<4 HRS	4-<7 HRS	>7HRS	TOTAL	NORMAL	VACCUM	FORCEPS	LSCS	5-<8	8-<10	>10	<4	4,5,6,7	8,9,10
1		2		2			1					5	1			7	1				1					3
2		2		2			1					9 .5	1			12	1				1					3
3	1				3		1					8	1			11	1					2				3
4		2		2				2		2		7		2		13	1					2				3
5	1				3		1					5		2		11		2				2			2	
6	1					4		2		2		10		2		16			3			2			2	
7		2	1				1					5		2		11	1					2				3
8	1					4		2		2		12			3	20				4			3		2	
9	1					4		2		2		8		2		13	1				1					3
10		2			3		1					5	1			7	1					2				3
11		2			3		1					6	1			9	1					2				3
12		2				4	1					8	1			11	1						3			3
13		2				4		2	1			19	1			22	1					2				3
14	1		1				1					6	1			9	1					2				3
15	1			2			1					8	1			10	1				1					3
16		2		2			1					14	1			17	1					2				3
17	1			2			1					9	1			12		2				2				3
18	1				3		1					18			3	27				4	1				2	
19		2		2				2	1			14		2		20	1					2				3
20		2				4	1					5	1			8	1				1					3
21		2		2				2	1			9	1			12	1						3			3
22		2		2			1					4	1			7	1						3			3
23	1				3		1					10	1			13	1					2				3
24		2				4	1					12	1			15.5	1						3			3
25		2				4		2		2		18	1			21				4		2				3
26		2			3		1					6	1			8	1				1					3
27	1			2			1					12	1			14	1					2				3
28		2				4		2		2		12	1			14	1				1					3
29		2	1				1					7		2		13		2				2				3
30		2				4	1					2	1			5	1					2				3
31		2				4	1					7	1			10			3				3		2	
32	1				3		1					14		2		20	1					2				3
33	1				3		1					10		2		16		2				2			2	
34	1			2			1					18		2		23		2				2				3
35		2	1					2		2		28	1			30	1				1					3
36	1					4		2	1			14	1			16				4	1					3
37		2				4		2	1			18	1			21				4		2				3
38	1			2			1					7	1			9		2				2				3
39	1					4		2				20		2		26				4		2				3
40		2				4		2	1			8	1			11	1				1					3
41		2		2			1					6	1			8	1				1					3
42		2			3		1					6	1			9	1				1					3
43	1			2				2	1			14	1			17	1					2				3
44	1		1				1					18		2		24	1						3		2	
45	1					4	1					8		2		12		2			1					3
46	1				3		1					18	1			20	1					2				3
47	1				3		1					8	1			11	1						3			3
48		2				4		2	1			5	1			7	1				1					3
49	1					4		2	1			7	1			9	1					2			2	
50		2				4		2		2		14		2		19	1				1					3
51	1				3		1					6	1			9		2			1					3
52		2		2				2		2		9.5	1			11.5	1				1					3
53	1				3			2		2		8	1			11	1				1					3
54		2		2			1					18		2		23	1				1					3
55		2		2				2	1			15	1			17	1					2				3
56		2				4	1					5	1			7	1						3			3
57	1				3			2			3	24			3	31				4	1					3
58	1			2			1					6	1			8	1				1					3
59	1				3			2		2		14		2		20	1					2				3
60	1					4	1					12	1			14	1					2				3
61	1				3		1					6	1			9.5		2			1					3
62		2			3		1					6	1			8	1					2			2	
63		2		2			1					5	1			8.5	1					2				3

S . NO	GRAVIDA		GESTATIONAL AGE				MODE OF ONSET		MODE OF INDUCTION			DURATION OF LABOUR					MODE OF DELIVERY				AMNI FLUID LACT			APGAR		
	PRIMI	MULTI	37-<38	38-<39	39-<40	>40	SPONT	INDUCED	PGE2 GEL	PGE 1	FOLEYS	LATENT	1-<4 HRS	4-<7 HRS	>7HRS	TOTAL	NORMAL	VACCUM	FORCEPS	LSCS	5-<8	8-<10	>10	<4	4,5,6,7	8,9,10
64	1			2			1					2		2		8	1					2				3
65		2		2				2		2		6	1			905	1					2				3
66	1			2			1					6.5		2		12.5			3		1					3
67		2		2			1					1	1			4	1					2			2	
68		2		2			1					6	1			9.5	1					2				3
69	1					4		2			3	10		2		16				4	1					3
70	1				3			2		2		8	1			11.5	1				1					3
71	1					4		2		2		6			3	17				4	1					3
72	1					4	1					3.5		2		9.5	1				1					3
73	1				3		1					5	1			8	1				1					3
74		2				4		2		2		12		2		18		2					3			3
75	1		1					2		2		20	1			23	1						3		2	
76		2				4		2		2		4	1			7	1					2				3
77		2		2				2		2		6	1			9		2				2				3
78		2	1				1					1	1			3	1				1					3
79	1			2			1					9	1			12.5	1				1					3
80		2			3		1					6	1			8		2			1					3
81	1		1				1					24		2		30	1						3			3
82		2				4		2			3	6			3	14		2			1					3
83		2			3		1					6	1			9	1					2				3
84	1		1					2	1			10	1			13	1				1					3
85	1					4	1					8		2		13		2			1					3
86	1			2			1					4		2		9	1						3			3
87		2		2			1					30	1			33	1					2				3
88	1		1					2		2		6	1			9.5				4	1				2	
89	1				3		1					8	1			11.5		2					3		2	
90	1		1				1					10		2		16	1				1					3
91		2		2			1					6	1			9.5	1				1					3
92		2			3		1					6	1			9	1				1					3
93	1				3			2	1			24		2		30.5		2				2				3
94		2				4	1					6	1			9	1				1				2	
95	1					4	1					7	1			10	1				1					3
96		2	1				1					6	1			8.5	1					2				3
97	1				3		1					10	1			13		2				2			2	
98	1					4		2	1			8			3	16		2				2				3
99		2			3		1					11		2		17	1				1					3
100	1					4		2	1			12	1			15	1					2				3
101	1					4	1					12	1			14.5	1				1					3
102	1			2			1					8		2		14	1					2				3
103	1				3		1					12		2		17		2			1			1		
			12	60	84	132	66	74	14	38	9		68	58	18		71	38	9	40	44	90	42	1	30	261