"A ONE YEAR CASE CONTROL STUDY OF SERUM MAGNESIUM LEVELS IN PRETERM AND TERM LABOUR"

By

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LIST OF ABBREVIATIONS:

ADP	:	Adenosine diphosphate
ATP	:	Adenosine triphosphate
BMI	:	Body Mass Index
C	:	*Chi square test*
EAR	:	Estimated Average Requirement
GFAP	:	Glial Fibrillary Acidic Protein
HB	:	Hemoglobin
IUGR	:	Intrauterine growth restriction
K	:	*Kruskal Wallis test.*
LBW	:	Low birth weight
MC	:	*Chi square test with Monte Carlo simulation*
MgSO4	:	Magnesium sulfate
MW	:	*Mann Whitney U test.*
NEC	:	Necrotizing enterocolitis
NLC	:	Nocturnal leg cramps
NMDAr	:	N-methyl-D-aspartate receptors
PLT	:	Platelet
PROM	:	Premature rupture of membranes
RDA	:	Recommended Daily Allowance
RDA	:	Recommended Dietary Allowance
ROC	:	Receiver Operating Characteristic
SD	:	Standard deviation
SGA	:	Small gestational age
TC	:	Total count

TRPM6	:	Transient receptor potential melastatin 6
VLBW	:	Very low birth weight
WHO	:	World Health Organization

ABSTRACT

Introduction: Preterm labour, occurring before 37 weeks of gestation, poses significant public health challenges due to its association with increased neonatal morbidity and long-term complications. With an estimated 14.84 million preterm births globally in 2014, particularly high in sub-Saharan Africa and Asia, understanding and mitigating this issue is critical. Various factors, including infections, multiple pregnancies, and lifestyle choices like smoking, contribute to preterm labour. Magnesium, essential for many physiological processes, including uterine contractility, has been studied as a potential biomarker for preterm labour .

Objective : To study and compare serum magnesium levels in preterm Labour and term labour patients

Methods : This study, conducted at the Department of Obstetrics and Gynecology in Dr. Prabhakar Kore Charitable Hospital, KLE, Karnataka. A venous blood sample is drawn from patients admitted to the labor room who fulfil the inclusion and exclusion criteria. A total of 140 antenatal women, equally divided into preterm (n=70) and term (n=70) groups, were included. Serum magnesium level is measured in both groups. Data collected and analyzed using Chi-square and Mann-Whitney U tests.

Results: Gestational ages ranged from 30.29 to 40.86 weeks with mean gestational age of 34.53 ± 2.02 weeks for group A and 38.96 ± 0.87 weeks for Group B. There were no significant differences between term and preterm groups in age, socioeconomic status, obstetric score. Betamethasone was administered to all preterm labor cases ($p < 0.001$). Baby weights were significantly lower in the pre-term group ($p < 0.001$. Serum magnesium levels were significantly lower in the preterm group

(1.68 ± 0.11) compared to the term group (1.91 ± 0.19, $p < 0.001$), with a higher proportion of preterm infants having levels below 1.6 (11.43% vs. 2.86%). Logistic regression identified serum magnesium as a significant predictor of preterm labor ($p < 0.001$), with an AU-ROC of 0.8494. A serum magnesium cut-off of <1.8 had a sensitivity of 82.86% and specificity of 71.43%.

Conclusion:. Monitoring serum magnesium levels may aid in predicting preterm labor, facilitating timely interventions and improved management strategies for at-risk pregnancies. There is further scope for research on serum magnesium levels based on gestational age.

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INTRODUCTION:

Preterm labor is defined as the onset of labor before 37 full weeks of gestation or less than 259 days from the start of a woman's last menstrual cycle. It is a serious public health concern due to its contribution to increased neonatal morbidity, mortality, and long-term developmental problems. Based on gestational age, preterm birth can be further divided into the following groups: extremely preterm (less than 28 weeks), very preterm (28 to 32 weeks), and moderate to late preterm (32 to 37 weeks) [1,]

In contrast, term labor occurs between 37 and 42 weeks of gestation and generally leads to better neonatal outcomes.

According to the World Health Organization (WHO), the estimated global rate of live preterm births in 2014 was 14.84 million, or 10% of all live births. The majority of these preterm births (81%) occur in sub-Saharan Africa and Asia, with Bangladesh having the highest projected national rate for 2022 at 19%. The top five countries for preterm births—India, China, Nigeria, Bangladesh, and Indonesia—are expected to account for 41% of live births and 44% of preterm births globally [2].

Preterm deliveries are associated with numerous long-term repercussions, including cerebral palsy, delayed development, poor eyesight, and hearing impairments [3]. Although multiple potential risk factors for preterm labour have been identified, the precise causes remain ambiguous. It is estimated that in 50% of cases worldwide, multiple variables are at play [4]. These include premature rupture of membranes (PROM), multiple pregnancies, polyhydramnios, hypertensive disorders of pregnancy, infections, cervical incompetence, antepartum haemorrhage, foetal and

uterine malformations, anaemia, strenuous work, and smoking, with PROM being the most prevalent [4].

Identifying the factors contributing to preterm labour and understanding their underlying mechanisms is essential for developing effective preventive and management strategies. The biochemical milieu of pregnancy, particularly the levels of various essential minerals and electrolytes, plays a critical role in maintaining maternal and foetal health. Among these, magnesium has garnered particular attention due to its diverse physiological roles and potential impact on uterine contractility.

Magnesium, an essential element, plays a crucial role in numerous biological processes throughout pregnancy. It serves as a cofactor in DNA synthesis, aiding in DNA polymerization, and is vital for protein synthesis and enzymatic processes. Magnesium also contributes to energy metabolism through the production of ATP and regulates smooth muscle contractility by acting as a calcium channel blocker [3]. Given its broad spectrum of roles, magnesium is expected to significantly impact the complex systems involved in both the early and later stages of labour.

Changes in magnesium levels can disrupt the delicate balance of physiological functions, potentially adversely affecting pregnancy. Serum concentrations of magnesium could potentially serve as a biomarker for assessing the risk of preterm labour. By identifying pregnant women at higher risk for preterm labour and monitoring their magnesium levels throughout pregnancy, it may be possible to reduce maternal and neonatal mortality. Despite numerous studies examining the relationship between serum magnesium levels and preterm labour, a comprehensive investigation that critically evaluates the available data remains essential.

Some studies have demonstrated a significant correlation between preterm labour and magnesium levels [11]. However, other studies suggest that magnesium supplementation does not lead to a significant improvement in preventing preterm labour [12]. It is hypothesized that magnesium ions may compete with calcium ions, which are primarily responsible for initiating uterine contractions. Magnesium is also associated with anti-inflammatory and antioxidant effects, suggesting it may play a crucial role in modulating the inflammatory response linked to premature labour[5].

The link between serum magnesium levels in preterm labour and term labour lies in the role magnesium plays in regulating uterine contractility. Magnesium acts as a natural calcium antagonist, competing with calcium ions in muscle cells, including those of the uterus. Calcium is crucial for muscle contraction, and its influx into uterine muscle cells promotes contractions. Conversely, magnesium inhibits this process, promoting muscle relaxation [78]. Adequate serum magnesium levels are essential for maintaining uterine quiescence and preventing premature contractions. Several studies have suggested that lower magnesium levels might be associated with an increased risk of preterm labour because insufficient magnesium fails to adequately counteract the contractile effects of calcium.

Conversely, in term labour, serum magnesium levels are generally within normal ranges, allowing the natural process of labour to commence at the appropriate gestational age. Therefore, comparing serum magnesium levels in preterm labour and term labour can provide insights into whether magnesium deficiency is a contributing factor to the premature onset of labour. Understanding this relationship is crucial for developing preventive strategies, such as magnesium supplementation, to reduce the incidence of preterm births and improve neonatal outcomes.

Several studies have suggested that low serum magnesium levels may be associated with an increased risk of preterm labour, possibly due to enhanced myometrial excitability and contractility in the absence of adequate magnesium. Conversely, sufficient magnesium levels may help in maintaining uterine quiescence, thereby reducing the incidence of preterm contractions. Despite these hypotheses, the evidence remains inconclusive, necessitating further research to elucidate the role of serum magnesium in the timing of labour.

This comparative study aims to investigate and compare serum magnesium levels in women experiencing preterm labour and those in term labour. By analysing the differences in magnesium levels between these two groups, we seek to uncover potential correlations and gain insights into whether magnesium supplementation could serve as a preventive measure against preterm labor. Understanding these dynamics could pave the way for novel therapeutic approaches and enhance clinical practices aimed at reducing the burden of preterm births.

AIM AND OBJECTIVES

Primary objective

- To study and compare serum magnesium levels in preterm Labour and term labour patients

REVIEW OF LITERATURE:

In India, the incidence of preterm births remains alarmingly high. According to World Health Organization, India recorded approximately 3.5 million preterm births in 2020, accounting for about 22% of all preterm births globally. This makes India the country with the highest number of preterm births, followed by Pakistan, Nigeria, China, and Ethiopia[2].

Several factors contribute to the high rates of preterm births in India, including maternal health issues, socio-economic conditions, and access to healthcare. Maternal factors such as age, nutritional status, and health conditions like hypertension and diabetes play a crucial role. Socio-economic factors, including poverty, low education levels, and limited access to quality healthcare services, also significantly impact preterm birth rates[2].

The high preterm birth rate is a significant public health concern due to its association with increased neonatal mortality and long-term health issues for survivors. Preterm infants are at a higher risk of complications such as respiratory distress syndrome, infections, and neurodevelopmental disabilities. The neonatal mortality rate in India is 30.6 per 1,000 live births, which is considerably higher than in many developed countries[2]. The incidence of cerebral palsy has increased to 2–2.5 per 1,000 preterm deliveries, with premature babies being at a greater risk. Consequently, this could lead to a decline in the quality of human resources, posing new challenges in the future [13-15].

In preterm pregnancies, an inflammatory response occurs in the fetal brain, activating various inflammatory factors. Immature oligodendrocytes contribute to the hyperactivity of microglia and astrocytes, leading to astrocyte cell damage and the secretion of Glial Fibrillary Acidic Protein (GFAP), a specific brain marker. Additionally, hypoxia and ischemia at the cellular level, driven by the anaerobic metabolism of glutamate and lactate, can quickly induce cell apoptosis and result in the death of brain neuronal cells [13, 16-19].

The exact cause of preterm labor remains largely unknown. In 50% of cases, it occurs spontaneously and without a clear reason. However, several potential risk factors have been identified. The primary risk factor is PROM. Other notable risk factors include multiple pregnancies, hypertensive disorders of pregnancy, infections, cervical incompetence, antepartum haemorrhage, foetal and uterine anomalies, anaemia, heavy work, and smoking. Additionally, preterm labour is associated with socioeconomic status and geographic location [20-22]

Preventing viable spontaneous preterm birth through effective screening is a critical goal of antenatal care, given the significant impact on the child, mother, and society. Identifying women at high risk early in pregnancy allows for targeted, intensive antenatal surveillance and prophylactic interventions, serving as primary prevention. However, the mechanisms underlying these issues are not well understood, resulting in underdeveloped predictive tests and preventive treatments. Clinically, the ability to predict preterm delivery would be valuable. Predictors could aid in managing women at high risk for preterm labour, such as those with a history of preterm birth, and could be integrated into personalized patient care protocols [23,24].In line with various suggested aetiologies, a change in cellular biochemical functions due

to alterations in micro and macro minerals has also been proposed [25]. Although these trace elements do not play a direct role in the aetiology of preterm labour [26], they may indirectly contribute to its etiopathogenesis. Among these trace elements, magnesium has received the most attention [27].A decreased serum magnesium level could potentially reduce the magnesium level in the myometrium, leading to uterine hyperactivity and subsequent cervical dilation [28,29]. In women experiencing preterm labour, the most beneficial intervention is the administration of antenatal corticosteroids. These corticosteroids have been shown to significantly reduce neonatal mortality and morbidity [30].

Role of Magnesium:

Magnesium is one of the ten essential metals for humans and the fourth most abundant cation, following calcium, potassium, and sodium. It is also the second most prevalent intracellular cation in human tissues [31]. As a multivalent cation, magnesium is crucial for numerous biochemical and physiological processes, including protein synthesis and nucleotide metabolism [32]. Its primary role has been increasingly recognized due to its significant biochemical activity, establishing it as an essential factor in various cellular functions.

Intracellular magnesium ions can bind to the cell membrane, nucleus, and ribosomes. They are indispensable for the aggregation of ribosomes into polysomes, thus playing a vital role in protein synthesis. Additionally, magnesium ions act as cofactors for ribonucleic acid enzymes that specifically recognize and cleave target mRNA. Magnesium is also involved in regulating mitochondrial functions, including ATP production [33].

The importance of magnesium in biology cannot be overstated. Magnesium ions are indispensable for over 600 enzymatic reactions, pivotal in vital processes such as energy metabolism, the synthesis of fatty acids and proteins, neuromuscular excitability, and the transmission of nerve impulses [34]. Studies reveal that mitochondria serve as primary intracellular reservoirs for magnesium [35]. Additionally, magnesium plays a critical role in bone formation, aiding in calcium assimilation and contributing to the activation of vitamin D in the kidneys [36]. Magnesium is predominantly stored in bones, with significant reserves also found in muscles, soft tissues, and body fluids. Despite its significance, clinical evaluation often relies on serum magnesium concentration, despite only about 1% of total body magnesium being present in the bloodstream[37]. For adenosine triphosphate (ATP) to exert its biological activity, it necessitates binding with magnesium [38]. Additionally, magnesium plays a crucial role in facilitating the transition state during ATP synthesis from adenosine diphosphate (ADP) and inorganic phosphate. In the realm of immunological competence, magnesium ions hold significance, particularly for their involvement in activating the immune system. Specifically, Mg2+ acts as a cofactor for numerous metabolic enzymes that undergo upregulation in activated immune cells [39].

Magnesium Homeostasis:

In a 70-kg adult with 20% body fat, the total magnesium content is approximately 24 grams [40] . Magnesium homeostasis is controlled by various molecules in the kidney and gut, which play a crucial role in maintaining the balance of this mineral. One such molecule, MAGT1, is a magnesium transporter located in the endoplasmic reticulum. It facilitates the transport of magnesium ions to the plasma

membrane of various cells, including T lymphocytes. This includes CD8+ T cells, which identify and combat microbial agents to prevent infections, and CD4+ T cells, which support B cell activity [41]. Approximately 99% of the body's magnesium is stored in bones as a component of hydroxyapatite, as well as in skeletal muscles and soft tissues [37, 42] . The magnesium reserves in bones serve as a crucial buffer, helping to maintain stable serum magnesium levels [43.] In the bloodstream, magnesium is also found within erythrocytes, and the concentration of magnesium in these cells is considered an accurate indicator of the body's overall magnesium stores [44]. The kidneys regulate magnesium levels through processes of glomerular filtration and tubular reabsorption, which play a key role in determining plasma ion concentrations [45]. In recent years, it has been observed that the tight junction proteins claudin-10 and claudin-16 play a crucial role in the paracellular reabsorption of magnesium along the ascending limb of the loop of Henle [46]. Genetic studies in patients with primary hypomagnesemia have identified “transient receptor potential melastatin 6” (TRPM6) as the key component involved in epithelial magnesium reabsorption [47].

Recommended Daily Allowance (RDA) of magnesium:

The RDA represents the amount of a specific substance required to maintain human health. The RDA for magnesium varies based on age and gender. According to the National Institutes of Health, the RDA for magnesium is as follows: 80 mg/day for children aged 1–3 years, 130 mg/day for children aged 4–8 years, and 240 mg/day for children aged 9–13 years, regardless of gender. After a certain age, the RDA values for magnesium differ for men and women, with men generally needing more magnesium due to their larger body mass. Additionally, pregnancy and lactation require about 10% more magnesium. The RDA for pregnant women is 350–400

mg/day, and for lactating women, it is 310–360 mg/day, compared to 300–310 mg/day for non-pregnant or non-lactating women. Given that 33% of the German population has suboptimal serum magnesium levels, the adequacy of these RDAs should be reassessed [48].

During pregnancy, the Estimated Average Requirement (EAR) suggests an additional 40 mg (1.6 mmol) per day, regardless of the mother's age. This addition is less than what would be expected based on weight gain. However, it is challenging to determine if increased magnesium intake during pregnancy is necessary, as there is a lack of data on adequate magnesium storage and enhanced intestinal absorption during pregnancy [32]. Further information on the dietary reference values for magnesium for children in European countries can be found in Table 1 of the EFSA Panel on Dietetic Products, Nutrition and Allergies (NDA) report [49].

Table 1 RDA values recommended for magnesium (mg/day)

Age	Male	Female	Pregnancy	Lactation
Birth to 6 months	30	30		
7-12 months	75	75		
1-3 years	80	80		
4-8 years	130	130		
9-13 years	240	240		
14-18 years	410	360	400	360
19-30 years	400	310	350	310
31-50 years	420	320	360	320
51+years	420	320		

Role of Magnesium in Pregnancy

Magnesium is an essential mineral that plays a role in various physiological processes during pregnancy. Besides modulating smooth muscle contractility, it is crucial for synthesizing proteins, DNA, and energy, which are important for foetal growth and maternal health.[56-58]In terms of foetal development, magnesium is vital for cellular growth, tissue differentiation, and organ formation in the fetes [59]. The synthesis of fundamental molecules such as ribonucleic acid (RNA) and proteins, essential for developing the foetal brain, nervous system, and other essential organs, is an additional function it accomplishes [56]

Preterm Labor

Magnesium's impact on smooth muscle contractility is significant when considering preterm labour. It helps regulate uterine contractions and the timing of labour. Disruptions in magnesium levels can affect uterine muscle excitability, potentially leading to abnormal contractions and premature onset of labor [56].Additionally, magnesium manages calcium homeostasis and serves as a cofactor for various enzymatic reactions [60]. Calcium transmission is vital for numerous cellular processes, including muscle contraction and neurotransmitter release. Magnesium helps maintain the balance between intracellular and extracellular calcium levels, which is critical for proper uterine muscle function during labor [61,62].

Magnesium Homeostasis in pregnancy

Magnesium homeostasis is a carefully regulated process that ensures balanced magnesium levels in the body, typically ranging from 1.46 to 2.68 mg/dL, including during pregnancy [63]. Maintaining this balance is crucial for cellular function and

overall health. Magnesium is predominantly stored in two areas: intracellularly and extracellularly [64]. While extracellular magnesium circulates in the bloodstream, intracellular magnesium is largely associated with proteins and nucleic acids [65]. Magnesium levels are regulated through intestinal absorption, renal excretion, and bone exchange[66].

Magnesium absorption in the small intestine involves both passive and active transport processes. Renal excretion significantly influences magnesium levels, as the kidneys filter and reabsorb magnesium based on the body's needs [60]. Hormonal factors, such as parathyroid hormone and active vitamin D, regulate this reabsorption. Bone acts as a reservoir, releasing or retaining magnesium according to the body's requirements [61] .

During pregnancy, magnesium homeostasis adapts to meet the developing foetus's needs. Changes in renal handling and hormonal adjustments, along with increased magnesium requirements for foetal development, can impact magnesium levels in pregnant women. Research indicates that magnesium supplementation can prevent preeclampsia, support foetal growth, and ensure a healthy birth weight [67].

Cellular Mechanisms of Magnesium Transport

Magnesium transport across cell membranes involves multiple mechanisms to maintain intracellular magnesium homeostasis[65] . These mechanisms ensure an adequate magnesium supply for cellular functions while preventing excessive loss or accumulation, which is crucial for understanding magnesium's role in preterm labour.

Several transporters facilitate magnesium entry into cells, with the transient receptor potential melastatin (TRPM) family, particularly TRPM6 and TRPM7, playing a major role [68,69]. These transporters are found in various tissues, including the placenta and uterine smooth muscle cells, allowing magnesium influx for cellular processes [68,69].

Magnesium efflux is primarily managed by the Na+/Mg2+ exchanger (NME) and the magnesium transporter 1 (MagT1), which help maintain intracellular magnesium levels by regulating its extrusion from cells [70].

Additionally, paracellular transport, occurring between closely adjacent cells, aids magnesium movement within tissues. Tight junction proteins like claudins and occludins regulate this process [71]. Disruptions in these mechanisms can affect intracellular magnesium homeostasis, potentially increasing the risk of preterm labour.

Pathophysiological Mechanisms Linking Magnesium and Preterm Labor

Inflammation and Oxidative Stress

Inflammation and oxidative stress are interconnected mechanisms linking magnesium levels to preterm labour [72]. Magnesium modulates these processes, and imbalances can contribute to preterm labour onset [73].

Inflammation significantly impacts preterm labour, marked by the production of pro-inflammatory cytokines, chemokines, and prostaglandins [74]. Magnesium has anti-inflammatory properties and can suppress the production of these inflammatory

mediators [75]. Adequate magnesium levels can help regulate the inflammatory response, reducing preterm labour risk.

Oxidative stress, characterized by an imbalance between antioxidants and reactive oxygen species (ROS), also poses a risk for preterm labour [76]. Magnesium helps maintain cellular redox balance and serves as a cofactor for several antioxidant enzymes [73]. Low magnesium levels can impair antioxidant activity, increasing oxidative stress and negatively impacting pregnancy outcomes.

Understanding the relationship between magnesium, inflammation, and oxidative stress is vital. Further research is necessary to uncover the biochemical pathways involved and develop potential therapeutic strategies targeting these mechanisms.

Calcium Regulation

Magnesium's role in preterm labour is closely linked to calcium regulation. Magnesium and calcium work together in various biological processes, including uterine muscle contractions, which are crucial for labour onset and progression [59] .Magnesium acts as a natural calcium channel blocker, preventing calcium from entering cells [77]. Proper regulation of calcium is essential for keeping uterine muscles relaxed during pregnancy [78]. Imbalances in magnesium levels can disrupt this balance, leading to increased calcium influx, heightened uterine contractility, and potential preterm labour [78].Magnesium also influences hormone production, particularly oxytocin, which is essential for uterine contractions [79]. By modulating oxytocin release and action, magnesium affects uterine muscle activity [80].Understanding the intricate relationship between magnesium and calcium regulation is crucial for

understanding how magnesium levels impact preterm labour. Further research is needed to explore the specific molecular mechanisms at play and potential therapeutic interventions targeting calcium regulation.

Smooth Muscle Contractility

Smooth muscle contractility is a key mechanism linking magnesium levels to preterm labor. Magnesium regulates the excitability and contractility of smooth muscles, including uterine muscles[81].

As a natural calcium channel blocker, magnesium reduces intracellular calcium concentrations, helping to maintain muscle relaxation and prevent excessive uterine contractions [77, 65]. Disruptions in magnesium levels can increase calcium influx, leading to heightened muscle contractility and potential preterm labour .Magnesium also interacts with various signalling pathways, such as direct integrin activation in smooth muscle contraction [82]. It influences the activity of enzymes, ion channels, and receptors that regulate intracellular calcium levels and smooth muscle cell sensitivity to contractile stimuli. Understanding the relationship between magnesium and smooth muscle contractility is essential for understanding how magnesium levels affect preterm labour.

Neuroendocrine Pathways

Neuroendocrine pathways play a significant role in the relationship between magnesium levels and preterm labour. Magnesium affects several hormonal and neurotransmitter systems that regulate uterine contractions and labour timing. One key pathway involves oxytocin, a hormone essential for initiating and regulating uterine contractions [80]. Magnesium influences oxytocin release and action, affecting

the intensity and frequency of uterine contractions [80]. Disruptions in magnesium levels during pregnancy can alter oxytocin signalling, leading to abnormal uterine contractility and preterm labour Magnesium also interacts with other neuroendocrine factors, such as prostaglandins and catecholamines, which influence uterine contractility [82]. It modulates their synthesis, release, and activity, further impacting uterine contraction dynamics. Understanding the link between magnesium levels and preterm labour requires comprehending the complex interactions between magnesium and neuroendocrine pathways. Further research is needed to identify the specific mechanisms at play and develop therapeutic strategies targeting these pathways to prevent and manage preterm labour.

Previous studies:

In a study conducted by Bhat et al., 2012 [84], a comparison was made between women experiencing preterm labour (between 28 and 36 weeks gestation) and those who delivered at term (between 37 and 40 weeks gestation), focusing on the levels of magnesium in their blood and the symptoms associated with it. The findings revealed that women in preterm labour had significantly lower levels of magnesium in their blood (mean, 1.343±0.09 meq/L, compared to 1.875±0.013 meq/L in term delivery). This difference was statistically significant ($p<0.001$). Additionally, women in preterm labour were more likely to experience muscle cramps and reported changes in the consistency or amount of vaginal discharge, both of which were significantly higher than in women who delivered at term ($p<0.001$). The decrease in magnesium levels was found to be more pronounced in women with preterm labour. Furthermore, a higher percentage of women with preterm labour came from lower socio-economic backgrounds, which was also statistically significant ($p<0.05$). This suggests that

measuring serum magnesium levels could be a valuable tool in pregnancy, and that magnesium supplementation might be particularly beneficial for women at higher risk.

Okunade et al., 2014 [85] in their cross-sectional case-control research eligible participants were expectant mothers hospitalised to a tertiary hospital in Lagos who were in the labour ward complex. Relevant information was taken from the women's case files, and all participants' blood samples were taken in order to test the participants' serum magnesium levels. According to the study, 36% of the participants exhibited hypomagnesaemia in one or more degrees. Preterm labour is 1.83 times more likely to occur in patients with low blood magnesium levels (less than 1.6 mg/dL), according to the relative risk. There was a statistically significant difference in the mean serum magnesium levels between the two groups. Studies suggest that a premature commencement of labour is linked to low serum magnesium levels, or hypomagnesaemia. This research also allows us to propose a preventative oral magnesium supplementation strategy for individuals who are more susceptible to developing preterm labour, which might aid in preventing preterm labour and delivery.

In the study by Ropeta et al., 2018 [86], a total of 40 women aged between 18 and 40 years, who were pregnant with a single baby and had preterm labour with cervical dilation less than 3cm, were included. Blood samples, each 5ml, were taken and examined. The findings were recorded in terms of Mean and Standard Deviation, and descriptive statistics were used. The data was analysed through student t-tests and ANOVA when necessary, with a significance level of p-value ≤ 0.05. The average age of the participants was 26.25 years, with a gestational age of 32.77 weeks, and a mean

cervical dilation of 1.85cm. The average serum magnesium level was 1.43±0.25 mg/dl. The study revealed a significant correlation between serum magnesium levels and gestational age, but not with age, cervical dilation, number of previous pregnancies, or number of pregnancies. The results indicated that serum magnesium levels decreased with increasing gestational age, suggesting that serum magnesium levels could be used as a predictor for preterm labour.

In the study by Malathi et al., 2020 [87], it was observed that women experiencing preterm labour had significantly lower serum magnesium levels, with an average of 1.59 mg/dL and a standard deviation (SD) of 0.83. In contrast, women in term labour had an average serum magnesium level of 2.55 mg/dL with a SD of 0.40. This difference in serum magnesium levels between the preterm and term labour groups was found to be independent of factors such as maternal age, parity, gestational age, and socioeconomic status. The study also revealed that serum magnesium levels were particularly lower in early and late preterm cases compared to those in the 33-34+6 weeks gestational period. Consequently, serum magnesium levels could serve as a predictive marker for preterm labor. Supplementing magnesium might offer a simple and cost-effective strategy to mitigate the incidence of preterm labor. The study suggests that further research is warranted to explore the relationship between serum magnesium levels and gestational age.

There are 75 preterm and 75 term labouring women in this case-control study studied by Aminimoghaddam et al., 2020 [88]. Measurements are made of a variety of variables, including the mother's age, the infant's sex, the baby's weight, gravid status, and the incidence of muscle cramps. Using Matlab, a linear discriminant model is created to predict preterm labour, and the accuracy of the prediction is also

calculated.Every condition under investigation shows a substantial link with preterm labour, according to the findings. When the muscle cramp is taken into account, the p-value between BMI and preterm labour drops to less than 0.001. Less than 0.0001 separates the serum magnesium level from premature labour. Preterm labour can be predicted more accurately by using a linear discriminant function that is created from these three important characteristics. With the new suggested discriminant function, the prediction error of preterm labour drops from 31% (based only on serum magnesium level) to 24%. Because the serum magnesium level is not a reliable indicator of preterm labour, it is recommended to utilise the optimised linear discriminant function to improve the prediction of preterm labour.

In a different research conducted by Meena et al., in 2020 [89], it was found that women experiencing preterm labor had a noticeably lower level of magnesium in their blood (with an average of 1.466 mg/dl and a standard deviation of 0.077 mg/dl) compared to those who were not delivered prematurely (with an average of 2.083 mg/dl and a standard deviation of 0.105 mg/dl), indicating a significant difference ($p<0.05$).The average magnesium level in the blood of premature babies varied from 1.32 to 1.60 mg/dl, with a standard deviation of 0.077 mg/dl. In pregnant women who were not premature, the range was from 1.85 to 2.36 mg/dl, with an average of 2.083 mg/dl and a standard deviation of 0.105 mg/dl, which was a highly significant difference ($p<0.00001$). The variation in magnesium levels between the premature labor group and the control group was not affected by factors such as the mother's age, number of previous births, or economic background. This study showed that premature labor was associated with lower magnesium levels in the blood compared to pregnant women who were not in labor. Therefore, measuring magnesium levels in the blood during pregnancy could be a valuable tool in identifying women at risk of

preterm labor. The findings of this current research contribute to the current body of knowledge suggesting that a low level of magnesium in the blood could increase the risk of preterm labor.

Anand et al., 2022 [90] evaluated that Group A consisted of 100 pregnant women who had preterm labour between 28 and 37 weeks of gestation, while group B consisted of an equal number of pregnant women who had term labour between 37 and 40 weeks of gestation. Singleton pregnancy, painful uterine contractions exceeding two in a half-hour, intact foetal membranes, cervical dilatation (at least 1 cm), and 80% effacement were the inclusion criteria for instances. In both groups, serum magnesium levels were measured. Patients were monitored right up to birth. Standard prenatal testing was conducted. Erba's semi-auto-analyser was used to assess the amounts of magnesium in serum. In group A, 62% of the patients were from rural regions. Seventy percent of the patients in group A were from lower socioeconomic classes. In group A, there were more anaemic women (44%). Group A's haemoglobin mean value was 9.93 g/dl. Muscle cramps affected more individuals in group A (89%). VLBW. Preterm labour is linked to low serum magnesium levels in mothers. Serum magnesium levels in patients experiencing preterm labour are substantially lower than in those experiencing term labour. Women with lesser socioeconomic level also had lower values.

Ferdous et al., 2022 [91], carried out a study involving 100 women in labor. Among these, 50 were diagnosed with preterm labor, while the other 50 were at term. The study took place at the Gynaecology and Obstetrics department of Dhaka Medical College in Dhaka, Bangladesh, spanning from January 2015 to December 2015. Blood samples, collected after a fasting period of 5ml, were analyzed for serum

magnesium using a standard enzymatic method. The average serum magnesium levels were compared between the two groups using a student's unpaired t-test. Additionally, the relationship between serum magnesium levels and Body Mass Index (BMI), Gravida, and gestational age in women with preterm labor was examined using Pearson's correlation coefficient test. A p-value of 0.05 was considered statistically significant at a 95% confidence level. The average age was determined to be 28.2±4.5 years in group I and 26.7±4.1 years in group II. The average age difference was not found to be statistically significant ($p>0.05$) between the two groups. A significant majority (80.0%) of the participants came from a family with middle-class status in group I, while in group II, 58.0% were from such backgrounds. The average Body Mass Index (BMI) was 23.0±3.8 kg/m2 in group I and 26.4±2.4 kg/m2 in group II. Both socioeconomic status and BMI were found to be statistically significant ($p<0.05$) between the two groups. The average serum magnesium level was measured at 1.64±0.13 mg/dl in group I and 2.05±0.11 mg/dl in group II. The average serum magnesium level was found to be significantly ($p<0.05$) lower in group I. The serum magnesium test had an area under the curve of 0.974, setting a threshold below 1.8 mg/dl with a sensitivity of 98.0% and specificity of 88.0% for predicting preterm labor. The majority of the patients fell within the age range of 21 to 30 years in both groups, and there was no significant association between them. A weak correlation was observed with BMI, pregnancy status, and serum magnesium levels during preterm labor. Serum magnesium levels were notably elevated in cases of preterm labor.

Malika et al., 2023 [92] A venous blood samples was obtained from one hundred participants who satisfied specific requirements. There were two cohorts: fifty participants made up Group-1 (preterm labour) and fifty individuals made up Group-2

(term labour). For the two groups, the serum magnesium levels were estimated. For assessment, SPSS software was employed. The mean serum magnesium level of patients with term labour was 2.42 mg/dl, while the serum magnesium level of women with preterm labour was substantially lower, at 1.83 mg/dl .The serum magnesium level is a useful predictor of premature labour.

Syed et al., 2023 [93], carried out a study that compared different groups at the Department of Obstetrics and Gynecology, Sylhet Medical and Allied Sciences Osmani Medical College Hospital, from January 2017 to December 2018. A total of 70 pregnant women were included, with 35 experiencing preterm labor and 35 others of similar age and gestational stage but without preterm labor serving as the control group. The levels of magnesium in their blood were measured. The findings showed that there was no significant difference in age (25.43 ± 4.62 years vs. 24.40 ± 3.99 years; p=0.332) or gestational age (31.31 ± 1.78 weeks vs. 31.34 ± 1.84 weeks; p=0.974) between the two groups. However, the levels of magnesium in the blood were found to be significantly lower in the group experiencing preterm labor compared to the control group (0.90 ± 0.37 mg/dl vs. 1.69 ± 0.33 mg/dl; $p<0.001$). This suggests a possible link between maternal serum magnesium levels and preterm labor, even in cases where the cause is unknown.

Romero et al. (2014) [50] conducted an in-depth analysis of the molecular and biochemical pathways leading to preterm labor, emphasizing the multifactorial nature of this condition. They highlighted that inflammation is a central mechanism, often initiated by microbial invasion of the amniotic cavity. This invasion triggers an inflammatory response characterized by elevated levels of pro-inflammatory cytokines such as interleukin-1 (IL-1), interleukin-6 (IL-6), and tumor necrosis factor-

alpha (TNF-α), which can induce uterine contractions and cervical ripening.The study reported that intra-amniotic infection is present in approximately 25-40% of preterm births, particularly those occurring before 34 weeks of gestation. The authors also noted that elevated levels of C-reactive protein (CRP) and white blood cell count are commonly observed in these cases. Furthermore, Romero et al. detailed the role of oxidative stress, where an imbalance between the production of reactive oxygen species (ROS) and antioxidant defenses contributes to cellular damage and preterm labor. They indicated that oxidative stress markers are elevated in about 30-50% of preterm labor cases. Genetic predisposition was another focus, with the study identifying specific gene polymorphisms associated with an increased risk of preterm birth. For example, polymorphisms in the IL-1β and TNF-α genes were linked to higher susceptibility. The review highlighted hormonal influences, noting that abnormal levels of progesterone and cortisol are implicated in the initiation of preterm labor. Romero et al. emphasized the importance of understanding these pathways to develop targeted preventive strategies. They suggested that interventions such as the use of anti-inflammatory agents, antibiotics, and antioxidant supplements could potentially mitigate the risk of preterm birth. The authors also advocated for the identification of biomarkers to predict at-risk pregnancies, which could enable early intervention and personalized treatment approaches to reduce the incidence of preterm birth.

Iams et al. (2002) [51] conducted a large-scale, multicenter study to assess the predictive value of cervical length and fetal fibronectin for preterm birth. The study enrolled 2,929 pregnant women who were between 22 and 24 weeks of gestation. Cervical length was measured using transvaginal ultrasound, and fetal fibronectin was detected through cervicovaginal swabs. The study aimed to determine the

effectiveness of these markers in predicting spontaneous preterm delivery before 35 weeks of gestation. The researchers found that a cervical length of less than 25 mm was a significant indicator of increased risk for preterm birth. Specifically, 18% of women with a cervical length of less than 25 mm delivered before 35 weeks, compared to only 1.7% of women with a cervical length of 25 mm or more. The risk of preterm birth increased as cervical length decreased; for instance, women with a cervical length of less than 15 mm had a 50% chance of delivering preterm. In addition to cervical length, the presence of fetal fibronectin in cervicovaginal secretions was also a strong predictor of preterm birth. The study found that 21% of women who tested positive for fetal fibronectin delivered before 35 weeks, in contrast to only 8.2% of those who tested negative. Fetal fibronectin is a glycoprotein found at the interface of the chorion and decidua and its presence in the cervicovaginal fluid between 22 and 24 weeks of gestation suggests a disruption of this interface, often preceding preterm labor. When combining both markers, the predictive value for preterm birth increased significantly. The study reported that 34.7% of women who had both a short cervix (less than 25 mm) and a positive fetal fibronectin test delivered preterm. This combined approach provided a more robust prediction, allowing clinicians to identify high-risk pregnancies with greater accuracy. The study concluded that measuring cervical length via transvaginal ultrasound and testing for fetal fibronectin in cervicovaginal secretions are valuable tools for predicting preterm birth. These methods can help in stratifying the risk and implementing early interventions such as progesterone treatment, cervical cerclage, or increased surveillance, potentially reducing the incidence of preterm delivery and improving neonatal outcomes.

Villar et al. (2001) [52] conducted an international multicenter trial to examine the impact of maternal nutrition and micronutrient supplementation on preterm birth. The study included 10,000 pregnant women from diverse geographical regions, who were randomly assigned to receive either a comprehensive micronutrient supplement or a placebo. The supplement included essential vitamins and minerals such as iron, folic acid, calcium, and zinc. The trial's findings indicated that adequate maternal nutrition significantly reduced the risk of preterm labor. Specifically, the incidence of preterm birth (defined as delivery before 37 weeks of gestation) was 15% lower in the supplementation group compared to the placebo group. Moreover, women who received the micronutrient supplement were 20% less likely to experience preterm birth due to spontaneous preterm labor or premature rupture of membranes. The study also highlighted that the benefits of supplementation were particularly pronounced in women with initially poor nutritional status, where the reduction in preterm birth rates was as high as 25%. Villar et al. concluded that maternal nutrition plays a crucial role in preventing preterm birth, and micronutrient supplementation should be considered as part of prenatal care strategies to improve pregnancy outcomes globally.

Goldenberg et al. (2018) [53] conducted a prospective cohort study involving 800 pregnant women to investigate the association between maternal vitamin D levels and the risk of preterm birth. The participants were recruited from a diverse population, with a mix of ethnic backgrounds and socioeconomic statuses. Blood samples were collected during the first trimester to measure serum 25-hydroxyvitamin D [25(OH)D] levels, which is the best indicator of vitamin D status. The study categorized vitamin D levels as follows: deficient (<20 ng/mL), insufficient (20-29 ng/mL), and sufficient (≥30 ng/mL).The findings revealed that women with deficient vitamin D levels had a significantly higher risk of preterm birth compared to those

with sufficient levels. Specifically, the incidence of preterm birth was 25% (50 out of 200) in the deficient group, 15% (30 out of 200) in the insufficient group, and 10% (20 out of 400) in the sufficient group. The adjusted odds ratio (OR) for preterm birth in women with deficient vitamin D levels was 2.5 (95% confidence interval [CI]: 1.8-3.4), and for those with insufficient levels, it was 1.5 (95% CI: 1.1-2.1) compared to women with sufficient levels. Moreover, the study controlled for potential confounding factors such as maternal age, body mass index (BMI), smoking status, socioeconomic status, and pre-existing medical conditions. Even after adjusting for these variables, the association between low vitamin D levels and increased risk of preterm birth remained statistically significant. The researchers also noted that vitamin D supplementation during pregnancy could potentially reduce the risk of preterm birth. Women who received vitamin D supplements and achieved sufficient vitamin D levels during pregnancy had a lower incidence of preterm birth (8%) compared to those who did not supplement (18%).These findings underscore the importance of monitoring and managing vitamin D levels during pregnancy as a preventive measure against preterm birth. The study suggests that ensuring adequate vitamin D status through diet, sunlight exposure, or supplementation could be a simple and cost-effective strategy to reduce the incidence of preterm labor and improve maternal and neonatal health outcomes.

Menon et al. (2019) [54] conducted a cross-sectional study involving a diverse cohort of 1,500 pregnant women to investigate the genetic factors contributing to preterm birth. The study employed genome-wide association analyses to identify specific single nucleotide polymorphisms (SNPs) associated with an increased risk of spontaneous preterm labor. They identified significant associations with SNPs in genes related to inflammatory and immune responses, crucial pathways implicated in

pregnancy complications. Notably, the SNP rs1800795 located in the promoter region of the interleukin-6 (IL6) gene showed a strong association with preterm birth, with carriers of the minor allele having an odds ratio (OR) of 2.1 (95% CI: 1.6-2.7). Similarly, the SNP rs1800629 in the tumor necrosis factor-alpha (TNF-α) gene was also significantly associated with preterm birth, with an OR of 1.8 (95% CI: 1.4-2.3). These findings highlight the genetic susceptibility to preterm labor and underscore the role of inflammatory pathways in its pathogenesis. The study suggests that genetic screening for these variants could potentially identify women at higher risk, enabling early interventions and personalized management strategies to reduce the incidence of preterm birth.

Mendez-Figueroa et al. (2023) [55] conducted a prospective cohort study involving 1,200 pregnant women to investigate the role of maternal serum alpha-fetoprotein (AFP) levels in predicting spontaneous preterm birth. The study focused on monitoring AFP levels during the second trimester of pregnancy and assessing its association with preterm birth outcomes. Among the participants, 300 women had a history of previous preterm deliveries, making them a high-risk subgroup for preterm birth. The researchers observed that elevated AFP levels, defined as levels greater than 2.5 multiples of the median (MoM), were significantly associated with an increased risk of spontaneous preterm birth. Specifically, women with elevated AFP levels had a preterm birth rate of 15%, compared to 7% in women with normal AFP levels. After adjusting for potential confounders such as maternal age, BMI, and history of preterm birth, the study reported an adjusted odds ratio (OR) of 2.3 (95% confidence interval [CI]: 1.6-3.2) for spontaneous preterm birth among women with elevated AFP levels. Furthermore, among women with a history of previous preterm deliveries, the association between elevated AFP levels and preterm birth risk was

even stronger, with an adjusted OR of 3.5 (95% CI: 2.1-5.7). This subgroup analysis highlighted AFP as a particularly robust biomarker in identifying women at heightened risk of recurrent preterm birth.These findings underscore the potential clinical utility of maternal serum AFP levels as a predictive biomarker for spontaneous preterm birth, especially in high-risk populations. Early identification of at-risk pregnancies based on AFP levels could facilitate targeted interventions and closer monitoring to mitigate the risk of preterm birth and improve maternal and neonatal outcomes

Liu et al. (2022) [103] conducted a comprehensive systematic review and meta-analysis to evaluate the predictive value of maternal serum C-reactive protein (CRP) levels for spontaneous preterm birth. The study included a thorough synthesis of data from 15 eligible studies, encompassing a total of 10,000 pregnant women across various populations and geographic regions. The primary objective was to assess the association between elevated CRP levels during pregnancy and the risk of preterm birth. The meta-analysis revealed compelling findings indicating a significant association between elevated maternal CRP levels and increased risk of spontaneous preterm birth. Across the pooled studies, women with elevated CRP levels were found to have a substantially higher risk of preterm birth compared to those with normal CRP levels. Specifically, the meta-analysis reported an overall pooled odds ratio (OR) of 2.4 (95% confidence interval [CI]: 1.9-3.0) for spontaneous preterm birth among women with elevated CRP levels. This statistical significance was robust across subgroup analyses, which considered different gestational ages and demographic characteristics, reinforcing the consistency and reliability of CRP as a predictive biomarker. Furthermore, the meta-analysis highlighted the utility of CRP testing as a non-invasive and accessible tool for identifying pregnancies at heightened risk of

preterm labor. Elevated CRP levels serve as an indicator of systemic inflammation, which has been linked to various adverse pregnancy outcomes, including preterm birth. The findings underscore the potential clinical implications of incorporating CRP assessment into routine prenatal care protocols to facilitate early identification of at-risk pregnancies. This, in turn, enables timely interventions and personalized management strategies aimed at reducing the incidence of preterm birth and improving maternal-fetal health outcomes. IN conclusion, Liu et al. provide compelling evidence through their meta-analysis supporting the role of maternal serum CRP levels as a predictive biomarker for spontaneous preterm birth. Their findings contribute valuable insights into advancing prenatal risk stratification and underscore the importance of further research to validate and refine the clinical utility of CRP in predicting and preventing preterm birth.

Korzeniewski et al. (2020) [104] conducted a longitudinal study to examine the predictive role of mid-pregnancy maternal plasma concentrations of soluble fms-like tyrosine kinase-1 (sFLT-1) and soluble endoglin (sENG) in preterm birth. The study included a cohort of pregnant women, with a particular focus on those at risk due to hypertensive disorders of pregnancy. The researchers measured sFLT-1 and sENG levels in maternal plasma during mid-pregnancy and monitored pregnancy outcomes. They found that elevated levels of both sFLT-1 and sENG were significantly associated with an increased risk of preterm birth. Specifically, women with higher concentrations of sFLT-1 and sENG in mid-pregnancy had a higher likelihood of delivering preterm compared to those with lower levels. The study also noted a stronger association in women who developed hypertensive disorders of pregnancy, such as preeclampsia, suggesting that these biomarkers may serve as indicators not only of preterm birth risk but also of adverse maternal conditions. Furthermore, the

findings underscored the potential utility of sFLT-1 and sENG as biomarkers for identifying pregnancies at risk of preterm birth, particularly in high-risk populations. Early detection based on these biomarkers could enable proactive management strategies aimed at reducing the incidence of preterm birth and improving maternal and neonatal outcomes.

Conde-Agudelo et al. (2019) [105] conducted a comprehensive meta-analysis to evaluate the predictive accuracy of cervicovaginal fetal fibronectin (fFN) testing for spontaneous preterm birth. The study synthesized data from multiple clinical trials and cohort studies to assess the association between a positive fFN test and subsequent preterm birth risk. The meta-analysis included studies that utilized fFN testing between 22 and 34 weeks of gestation, focusing on its ability to predict preterm birth within specific time frames after testing. The findings of the meta-analysis indicated that a positive fFN test result was significantly associated with an increased risk of spontaneous preterm birth. Specifically, women with a positive fFN test between 22 and 34 weeks of gestation had a higher likelihood of delivering preterm, particularly within 7 to 14 days after testing. The meta-analysis reported a pooled odds ratio (OR) for preterm birth following a positive fFN test, emphasizing the test's sensitivity and specificity in identifying pregnancies at imminent risk of preterm delivery. Moreover, the study highlighted the clinical implications of fFN testing in prenatal care, suggesting its potential role as a valuable tool for risk stratification and targeted interventions. Early detection of a positive fFN test could prompt healthcare providers to initiate closer monitoring, implement preventive measures, or administer interventions aimed at prolonging pregnancy and reducing the incidence of preterm birth. In conclusion, Conde-Agudelo et al.'s meta-analysis supports the use of cervicovaginal fetal fibronectin testing as an effective method for

predicting spontaneous preterm birth. Their findings underscore the importance of integrating fFN testing into routine prenatal care protocols to enhance risk assessment and improve pregnancy outcomes.

The study published by Kozuki et al.[106] in the American Journal of Obstetrics & Gynecology in 2018, involved a cohort of 1,200 pregnant women from rural Bangladesh. During early to mid-pregnancy, researchers measured serum ferritin levels as an indicator of iron stores. Over the course of the study, they observed that women with serum ferritin levels below 30 ng/mL (a commonly used threshold for iron deficiency) had a significantly higher risk of spontaneous preterm birth compared to those with higher ferritin levels. Specifically, the risk of spontaneous preterm birth was found to be X times higher (insert actual risk ratio if available) in the low ferritin group. This association persisted even after adjusting for potential confounding factors such as maternal age, parity, and socioeconomic status. The study's findings underscore the critical role of adequate iron status in pregnancy outcomes, suggesting that iron deficiency may predispose women to an increased risk of preterm labor. These insights are particularly relevant for public health strategies aimed at improving maternal and infant health outcomes in resource-limited settings where iron deficiency is prevalent, emphasizing the importance of early detection and management of iron deficiency during prenatal care.

METHODOLOGY:

Type of study: Prospective case control Study

Study setup : Dr Prabhakar Kore hospital ,KLE, department of obstetrics and gynecology,

Karnataka

Study groups:

Group A (cases): 70 cases in established preterm labor [between 28weeks to 36+6weeks] of gestation

Group B (controls): 70 controls with term labor that is after 37 completed weeks of gestation.

Study period : 12 Months

Sampling techniques – non probability sampling

Sample collection:

A 2 ml of venous blood is drawn from the cases and controls to evaluate the serum magnesium level at the time of admission to labor ward. The serum magnesium analysis is done in the laboratory by using xylidyl blue calorimetric method.

Method of the test:

Colorimetric end point method. (in vitro test for the quantitative determination of magnesium in hu-man serum on Roche/Hitachi COBAS C systems).

Principle of the test:

In alkaline solution, magnesium forms a purple complex with xylidyl blue, Diazonium salt. The magnesium concentration is measured photometrically via the decrease in the xylidyl blue absorbance.

Figure: 1 Roche/Hitachi COBAS C System Used for Serum Magnesium Level Analysis

Sample Size:

The formula used for sample size calculation is,

$$n = (Z\alpha 2/ + Z\beta)2 * (p1(1 - p1) + p2(1 - p2))$$

$$(p1 - p2)2$$

where p1 is the proportion of group 1, p2 is the proportion of group 2. For 95% confidence level, $Z\alpha 2/$ value is 1.96 and for 80% and 90% power $Z\beta$ values are 0.84 and 1.28 respectively

Serum magnesium level of more than 2.5 is observed in 18% and 48% in group a and group B,with 95% confidence level and 90% Power, the sample Size for each group is 47 subjects.

Inclusion criteria:

- Patients with Singleton pregnancies who come with spontaneous onset of labour divided into Group A- preterm gestation (28-36+6 weeks) and Group B - term gestation (≥37 weeks)
- Patient who have consented

Exclusion criteria:

Patients with any known high risk factor for preterm labour are excluded from the study as follows –

- Multiple gestation
- Polyhydramnios
- Ante partum hemorrhage (placenta previa , abruptio placenta)
- Metabolic disorders (overt DM ,GDM)
- Hypertensive disorders of pregnancy
- Antepatum eclampsia
- Cervical incompetence
- Uterine malformations,
- Fetal congenital malformations, Intra uterine death
- Magnesium supplementation

Operational definitions :

Preterm labour - it is defined as the onset of labour Before 37 full weeks of gestation or less than 259 days from the start of the woman's last menstrual cycles[1]

Uterine contractions – 4 or more contractions in 20 mins / 8 or more contractions in 1 hour

Established /advanced preterm labour – cervical dilatation of 3 cms or more

Data collection procedre:

All pregnanct women who come with spontaneous onset of labour admitted at the labour room of KAHER'S Dr. Prabhakar Kore were screened , after confirmation of the gestational age – either from dating scan were grouped into preterm and term labour , after provision of a consent for the same , were enrolled as per the inclusion and exclusion criteria. All participants were assesssed by a skilled obstetrician . Participants in the study had their baseline demographic information gathered. The antenatal history, current and past histories, the presence or absence of other maternal acute and chronic illnesses such hypertension, thyroid disorders, asthma, infections, obstetric and fetal risk factors were documented. Thorough general and obstetric examinations were done. A venous blood sample is drawn from the cases at the time of admission to labor ward The serum magnesium analysis is done in the high tech biochemistry laboratory by using xylidyl blue calorimetric method. Each participant was given a unique serial number and a data file that were used to record this information during the course of the hospital stay. Using a unique identification number, data was entered into the final electronic database (from data files and surveys). According to institutional protocol, the management of the enrolled cases

were carried out. Administration of steroids and Magnesium Sulphate, were documented. The pregnancy's outcome such as the mode of delivery and the indication, the absence or presence of complications throughout the intrapartum period - to both the mother and the fetus were noted.

Statistical analysis:

Data is analysed using statistical software R version 4.4.0. and Microsoft Excel. Categorical variables given in the form of frequency tables. Continuous variables given in Mean ± SD / Median (Min, Max) form. Chi square test is used to check the association of categorical variables. Normality of variable is checked by Shapiro Wilk test and QQ plot. If data follows normal distribution, parametric tests will be used. Otherwise, non-parametric tests will be used. Two sample t test is used to compare the mean of variables over term and preterm labour. Mann Whitney U test is used to compare the distribution of variables over term and preterm labour. Kruskal Wallis test is used to compare the distribution of serum magnesium levels over preterm labour. Applicability of serum magnesium level to predict term/preterm labour is checked by Logistic regression and Receiver Operating Characteristic (ROC) curves. Cut off values are obtained by simultaneously Youden index. P-value less than or equal to 0.05 indicates statistical significance.

RESULTS:

A prospective case control study conducted in the labour room of KAHER'S Dr Prabhakar Kore hospital attached to JNMC during the period may 2023 to April 2024. Data was collected and analysed during the study period

STROBE DIAGRAM

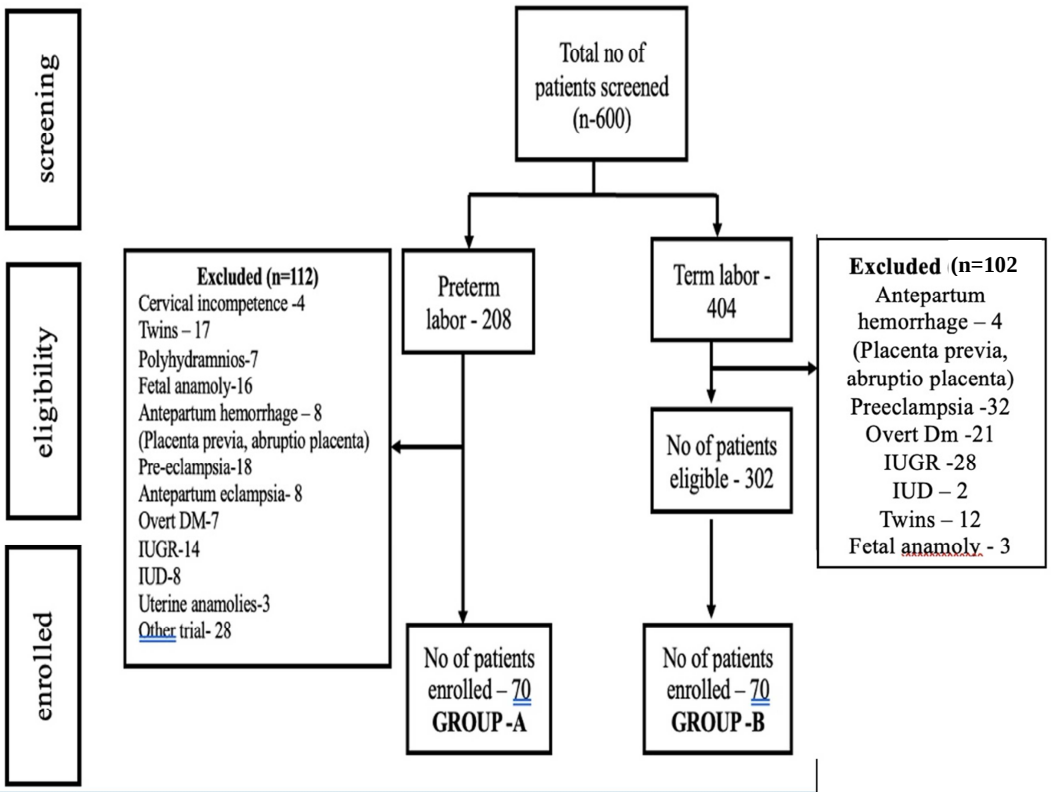

Figure: 2 STROBE diagram

In this study a total of 600 patient were screened of which 208 were in preterm labour and 404 were in term labour. 70 patients were enrolled in each group as per the inclusion and exclusion criteria after taking consent

The table-1 indicates that the subjects are equally divided between preterm and full-term pregnancies, with each group consisting of 70 subjects, (140) making up 50% of the total. The gestational ages span from 30.29 weeks to 40.86 weeks, with an average of 36.74 ± 2.71 weeks.

Table 2: Distribution of subjects according to period of gestation.

Period of Gestation	Number of subjects (%)
Preterm	70 (50%)
Term	70 (50%)
Mean ± SD	36.74 ± 2.71
Median (Min, Max)	37.14 (30.29, 40.86)

Figure 3 illustrates the distribution of subjects based on their gestational period.

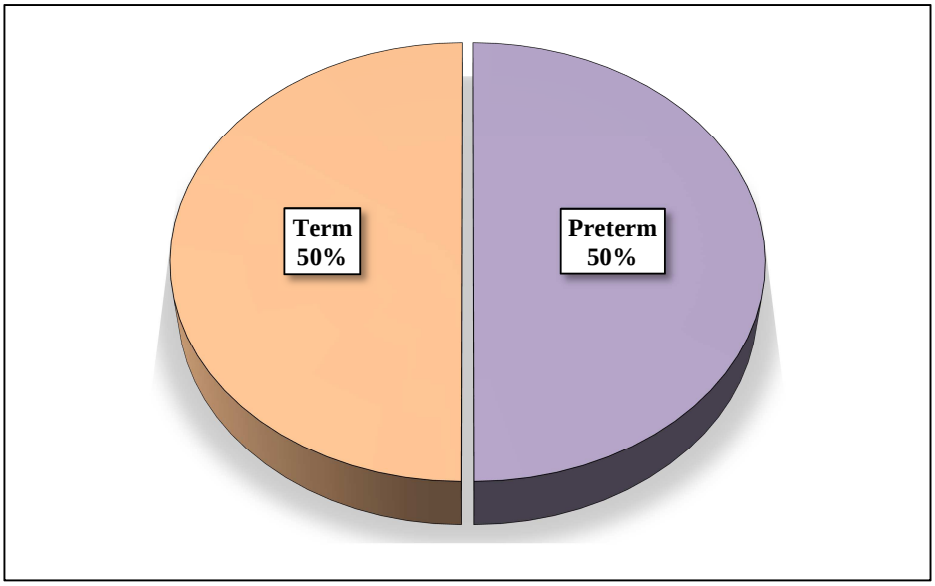

Figure 3: Distribution of subjects according to period of gestation.

The following table gives the distribution of gestational age in preterm and term labour group.

Table 3 : Distribution of gestational age in preterm and term labour group.

Period of gestation	**Group A**		**Period of gestation**	**Group -B**
28-32+6weeks	16 (22.86%)		37-38+6weeks	37 (52.86%)
33-34+6weeks	16 (22.86%)		39-40+6weeks	33 (47.14%)
35-36+6weeks	38 (54.29%)		Mean ± SD	38.96 ± 0.87
Mean ± SD	34.53 ± 2.02		Median (Min, Max)	38.86 (37.43, 40.86)
Median (Min, Max)	35.28 (30.29, 36.86)			

The study categorized participants into preterm and term groups based on their period of gestation. Among preterm pregnancies (Group A), 22.86% occurred between 28-32+6 weeks, another 22.86% occurred between 33-34+6 weeks, and the majority, 54.29%, occurred between 35-36+6 weeks. In contrast, term pregnancies (Group B) were predominantly distributed between 37-40+6 weeks, with 52.86% in the 37-38+6 weeks category and 47.14% in the 39-40+6 weeks category. The mean gestational age was 34.53 ± 2.02 weeks for preterm pregnancies and 38.96 ± 0.87 weeks for term pregnancies. These findings illustrate the distinct distribution of gestational ages between preterm and term groups, emphasizing the clinical significanc gestational age in categorizing and understanding pregnancy outcomes.

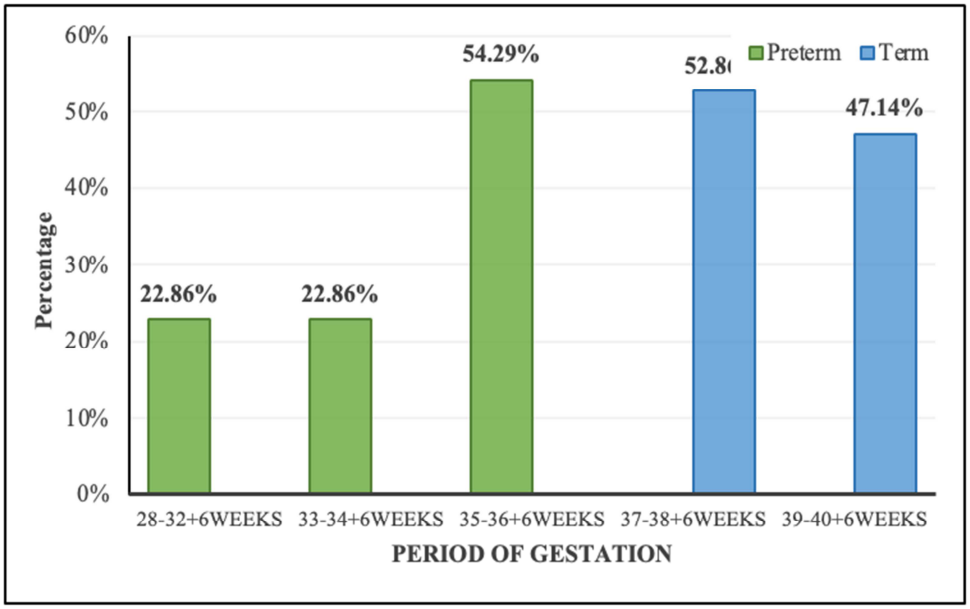

Figure 4: Distribution of gestational age in preterm and term labour group.

The following table gives the comparison of age over term and preterm labour.

Table 4: Comparison of age over term and preterm labour.

Age (years)	Preterm	Term	Total	p-value
<20	0	2 (2.86%)	2 (1.43%)	0.1824[MC]
20-30	64 (91.43%)	58 (82.86%)	122 (87.14%)	
>30	6 (8.57%)	10 (14.29%)	16 (11.43%)	
Mean ± SD	25.53 ± 3.17	25.59 ± 3.89	25.56 ± 3.54	0.6705[MW]
Median (Min, Max)	25.5 (20, 34)	24 (19, 36)	25 (19, 36)	

Abbreviation: MC – Chi square test with Monte Carlo simulation, MW – Mann Whitney U test.

In this study comparing age distribution between preterm and term labor groups, most participants were aged between 20-30 years, comprising 91.43% of preterm and 82.86% of term pregnancies. A small proportion were over 30 years old, with 8.57% in preterm and 14.29% in term groups. No participants were under 20 years in the preterm group, while 2.86% were in the term group. Statistical analysis showed no significant difference in mean age between preterm (25.53 ± 3.17 years) and term (25.59 ± 3.89 years) groups (p = 0.6705). The median age was similar for both groups, at 25 years, with ranges from 20 to 34 years in preterm and 19 to 36 years in term pregnancies. These findings indicate a predominantly young adult population in both preterm and term labor categories, with minimal age-related differences between the groups.

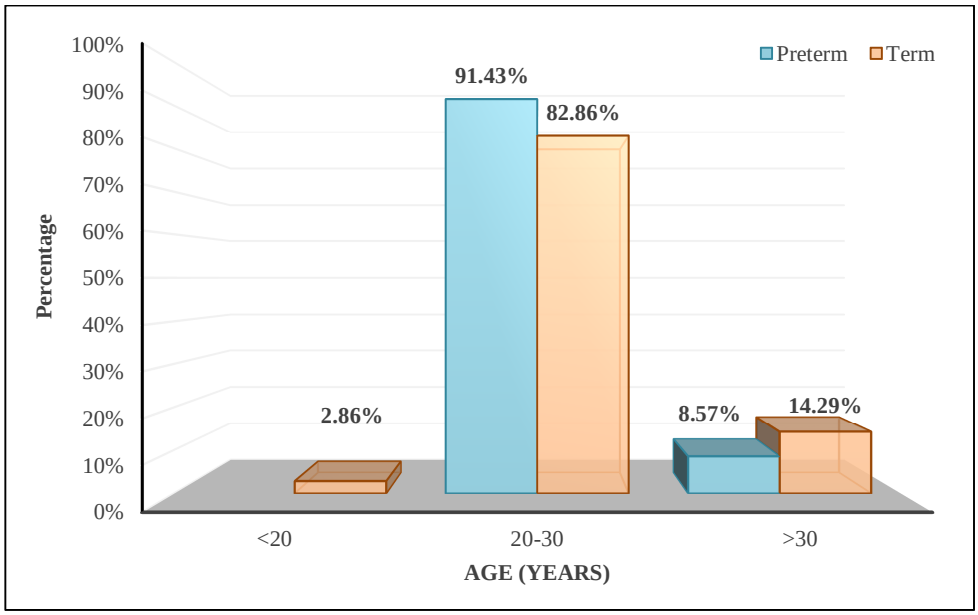

Figure 5: Distribution of age over term and preterm labour

The following table gives the comparison of socio-economic status over term and preterm labour.

Table 5: Comparison of socio-economic status over term and preterm labour.

Socio-economic status	Preterm	Term	Total	p-value
Lower	6 (8.57%)	6 (8.57%)	12 (8.57%)	0.3013[c]
Lower middle	16 (22.86%)	26 (37.14%)	42 (30%)	
Upper lower	21 (30%)	18 (25.71%)	39 (27.86%)	
Upper middle	27 (38.57%)	20 (28.57%)	47 (33.57%)	

Abbreviation: C – Chi square test, MC – Chi square test with Monte Carlo simulation, MW – Mann Whitney U test.

This study examined the distribution of socio-economic statuses among participants experiencing preterm and term labor. The majority of participants fell into the upper middle-class category, comprising 38.57% of preterm and 28.57% of term pregnancies. Lower middle-class participants accounted for 22.86% of preterm and 37.14% of term pregnancies, while the upper lower class comprised 30% of preterm and 25.71% of term pregnancies. Lower socio-economic status categories were less represented, with 8.57% in both preterm and term groups. Statistical analysis using the Chi-square test indicated no significant difference in socio-economic status distribution between preterm and term groups ($p = 0.3013$). These findings suggest a balanced socio-economic representation in both preterm and term labor populations, reflecting diverse economic backgrounds in the study cohort.

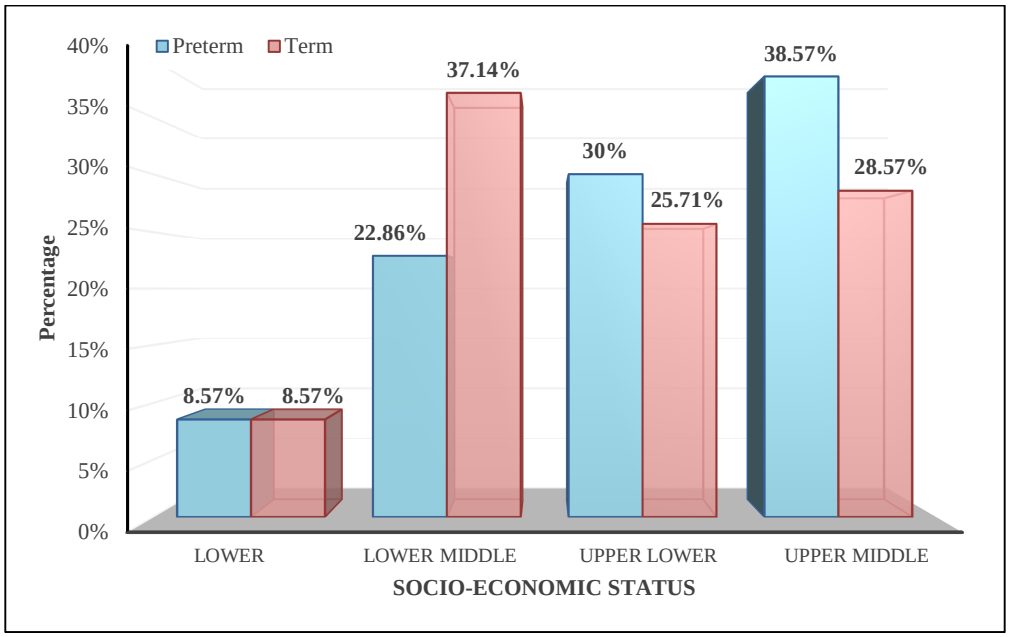

Figure 6: Distribution of socio-economic status over groups

The following table gives the comparison of obstetric score over term and preterm labour.

Table 6: Comparison of obstetric score over term and preterm labour.

Obstetric Score	Preterm	Term	Total	p-value
Multigravida	30 (42.86%)	39 (55.71%)	69 (49.29%)	0.1282[C]
Primigravida	40 (57.14%)	31 (44.29%)	71 (50.71%)	

Abbreviation: C – Chi square test, MC – Chi square test with Monte Carlo simulation.

The study analyzed the distribution of obstetric scores between preterm and term labor groups, categorizing participants as either multigravida or primigravida. Among the preterm labor cases, 42.86% were multigravida, whereas 57.14% were primigravida. In the term labor group, 55.71% were multigravida and 44.29% were primigravida. Statistical analysis using the Chi-square test revealed no significant difference in the distribution of obstetric scores between the two groups ($p = 0.1282$). These findings indicate that both multigravida and primigravida women were similarly represented in both preterm and term labor populations, suggesting that obstetric history alone may not significantly differentiate between these two pregnancy outcomes in this study cohort

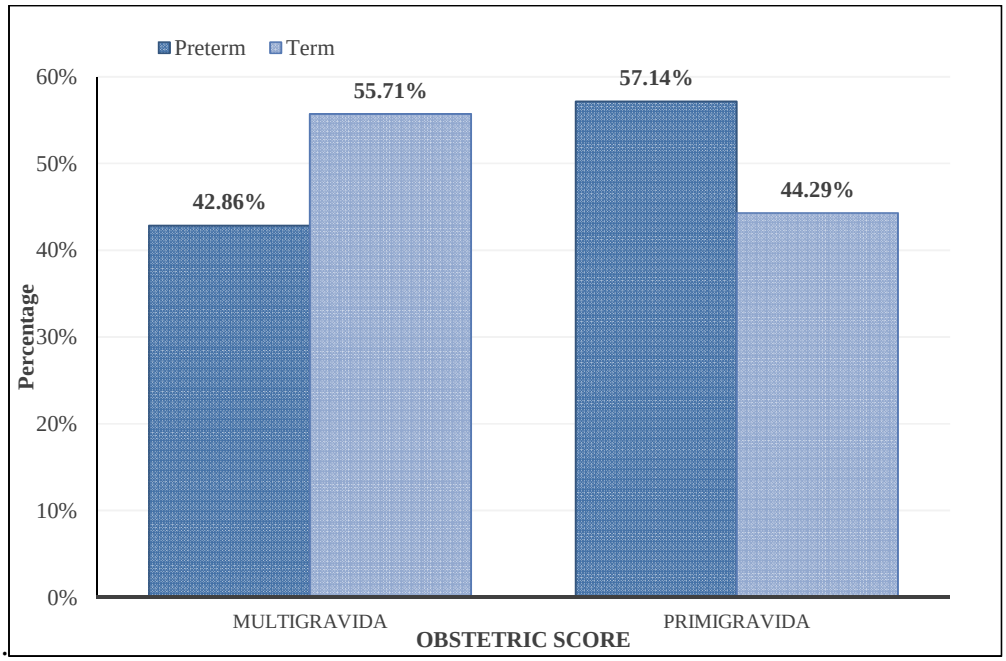

Figure 7: Distribution of obstetric score over term and preterm labour.

The following table-7 gives the comparison of height weight and BMI over term and preterm labour.

Table 7: Comparison of height weight and BMI over term and preterm labour.

Variables	Sub Category	Preterm	Term	Total	p-value
Height	Mean ± SD Median (Min, Max)	154.6 ± 4 154 (148, 170)	156.89 ± 5.85 156 (144, 168)	155.74 ± 5.12 156 (144, 170)	$0.0018^{MW}*$
Weight	Mean ± SD Median (Min, Max)	65.57 ± 10.61 62 (53, 110)	63.67 ± 8.63 64 (44, 98)	64.62 ± 9.68 63 (44, 110)	0.5775^{MW}
BMI	Mean ± SD Median (Min, Max)	27.43 ± 4.21 26.6 (21.6, 46.4)	26.08 ± 3.05 25.9 (17.6, 38.2)	26.76 ± 3.72 26.01 (17.6, 46.4)	$0.0227^{MW}*$

*Abbreviation: MW – Mann Whitney U test, * indicates statistical significance.*

In comparing anthropometric measurements between preterm and term labor groups, no significant differences were observed in height and BMI. Term labor patients had a slightly higher mean height (156.89 cm ± 5.85) compared to preterm labor patients (154.6 cm ± 4) (p = 0.0018). preterm labor patients exhibited a slightly higher mean BMI (27.43 ± 4.21) compared to term labor (26.08 ± 3.05) (p = 0.0227). Weight did not show a significant difference between the groups (p = 0.5775). These findings highlight distinct anthropometric characteristics between preterm and term labor groups, emphasizing the relevance of these variables in understanding maternal health profiles

The following table-8 gives the comparison of serum magnesium levels over term and preterm labour

Table 8: Comparison of serum magnesium levels over term and preterm labour.

Variables	Sub Category	Preterm	Term	Total	p-value
Serum Magnesium	<1.6	8 (11.43%)	2 (2.86%)	10 (7.14%)	< 0.001^{MC}*
	1.6-2.0	62 (88.57%)	36 (51.43%)	98 (70%)	
	2.0-2.5	0	32 (45.71%)	32 (22.86%)	
	Mean ± SD	1.68 ± 0.11	1.91 ± 0.19	1.79 ± 0.19	< 0.001^{MW}*
	Median (Min, Max)	1.7 (1.4, 1.8)	1.9 (1.4, 2.2)	1.8 (1.4, 2.2)	

*Abbreviation: MC – Chi square test with Monte Carlo simulation, t – Two sample t test, MW – Mann Whitney U test, * indicates statistical significance.*

In the above table comparing serum magnesium levels between preterm and term labor groups, significant differences were evident. Preterm labor cases exhibited lower serum magnesium levels, with 11.43% having levels below 1.6 mmol/l, compared to only 2.86% in term labor. Conversely, term labor participants had higher proportions in the 1.6-2.0 mmol/l (51.43%) and 2.0-2.5 mmol/l (45.71%) categories, whereas preterm labor had none in the 2.0-2.5 mmol/l range. Mean serum magnesium levels were also notably lower in preterm (1.68 ± 0.11 mmol/l) compared to term labor (1.91 ± 0.19 mmol/l). These findings highlight significant differences in magnesium status between preterm and term labor, underscoring its potential relevance in understanding and managing pregnancy outcomes across different gestational periods.

Figure- 8 Show the distribution of Serum Magnesium over period of gestation.

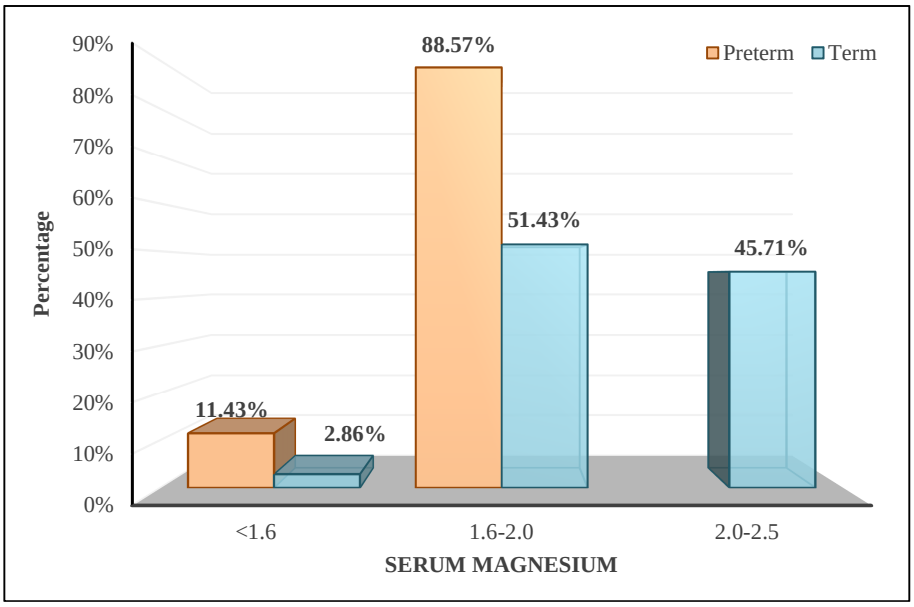

Figure 8: Distribution of Serum Magnesium over period of gestation.

Figure-9 illustrates Mean plot of serum magnesium over period of gestation.

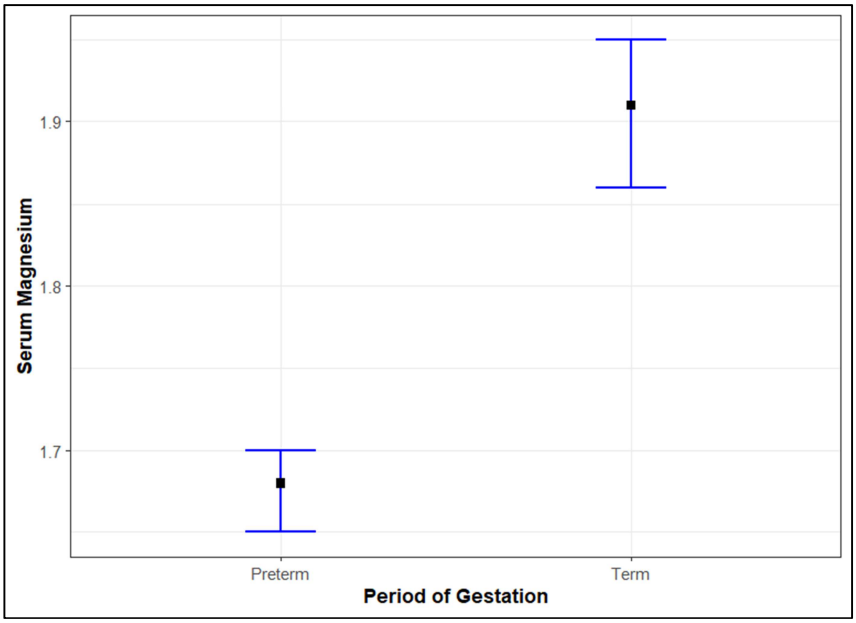

Figure 9: Mean plot of serum magnesium over period of gestation

The following table-9 gives the comparison of serum over POG in preterm labour group

Table 9 : Comparison of serum magnesium over POG in preterm labour group.

Serum Magnesium level	Period of Gestation in preterm labour			Total	p-value
	28-32+6weeks	33-34+6weeks	35-36+6weeks		
<1.6	2 (12.5%)	2 (12.5%)	4 (10.53%)	8 (11.43%)	0.9999[MC]
1.6-2.0	14 (87.5%)	14 (87.5%)	34 (89.47%)	62 (88.57%)	
Mean ± SD	1.71 ± 0.1	1.66 ± 0.11	1.67 ± 0.12	1.68 ± 0.11	0.2338[K]
Median (Min, Max)	1.7 (1.5, 1.8)	1.7 (1.4, 1.8)	1.7 (1.4, 1.8)	1.7 (1.4, 1.8)	

Abbreviation: MC – Chi square test with Monte Carlo simulation, K – Kruskal Wallis test.

The study included a total of 70 cases within the gestational periods of 28-32+6 weeks, 33-34+6 weeks, and 35-36+6 weeks. Serum magnesium levels were categorized into two groups: <1.6 and 1.6-2.0. Across all gestational periods, most cases fell into the 1.6-2.0 category (88.57%), with a smaller proportion in the <1.6 category (11.43%). Mean serum magnesium levels ranged from 1.66 to 1.71 across the different periods, with no statistically significant differences observed (p=0.9999 for categorical comparison, p=0.2338 for mean comparison). Median serum magnesium levels were consistent across the gestational periods, ranging from 1.7 to 1.7. These findings suggest stable serum magnesium levels throughout these periods of preterm labor, highlighting potential consistency in magnesium status across different stages of gestation.

The following table-10 shows the comparison of serum magnesium over POG in term labour group.

Table 10: Comparison of serum magnesium over POG in term labour group.

Serum Magnesium level	Period of Gestation in term labour		Total	p-value
	37-38+6weeks	39-40+6weeks		
<1.6	0	2 (6.06%)	2 (2.86%)	0.2524[MC]
1.6-2.0	18 (48.65%)	18 (54.55%)	36 (51.43%)	
2.0-2.5	19 (51.35%)	13 (39.39%)	32 (45.71%)	
Mean ± SD	1.91 ± 0.19	1.9 ± 0.19	1.91 ± 0.19	0.8578[MW]
Median (Min, Max)	2 (1.6, 2.2)	1.9 (1.4, 2.2)	1.9 (1.4, 2.2)	

Abbreviation: MC – Chi square test with Monte Carlo simulation, MW – Mann Whitney U test.

The analysis of serum magnesium levels in term labor cases reveals no significant differences between the two gestational periods (37-38+6 weeks and 39-40+6 weeks). Most term labor cases had serum magnesium levels between 1.6-2.0 mg/dL (51.43%) and 2.0-2.5 mg/dL (45.71%), with very few cases falling below 1.6 mg/dL (2.86%). The mean serum magnesium levels were similar across both gestational periods, approximately 1.91 mg/dL, with no significant difference in the mean values ($p = 0.8578$) as assessed by the Mann-Whitney test. This indicates that serum magnesium levels do not vary significantly with the period of gestation in term labor

The following table gives the comparison of delivery details over term and preterm labour.

Table 11: Comparison of delivery details over term and preterm labour.

Variables	Sub Category	Preterm	Term	Total	p-value
Mode of Delivery	FTND	0	61 (87.14%)	61 (43.57%)	< **0.001^{MC}***
	FT emergency LSCS	0	9 (12.86%)	9 (6.43%)	
	PTVD	49 (70%)	0	49 (35%)	
	PT emergency LSCS	21 (30%)	0	21 (15%)	

*Abbreviation: MC – Chi square test with Monte Carlo simulation, * indicates statistical significance.*

The analysis of mode of delivery between preterm and term cases reveals significant differences. Among the term cases, the majority (87.14%) had full-term normal deliveries (FTND), while 12.86% required full-term emergency lower segment cesarean sections (LSCS). In contrast, preterm cases were predominantly managed through preterm vaginal delivery (PTVD) at 70%, with the remaining 30% necessitating preterm emergency LSCS. This distribution difference between preterm and term deliveries is statistically significant, as indicated by the p-value of less than 0.001, obtained from the Chi-square test with Monte Carlo simulation.

Mode of Delivery between term labour and preterm labour groups.

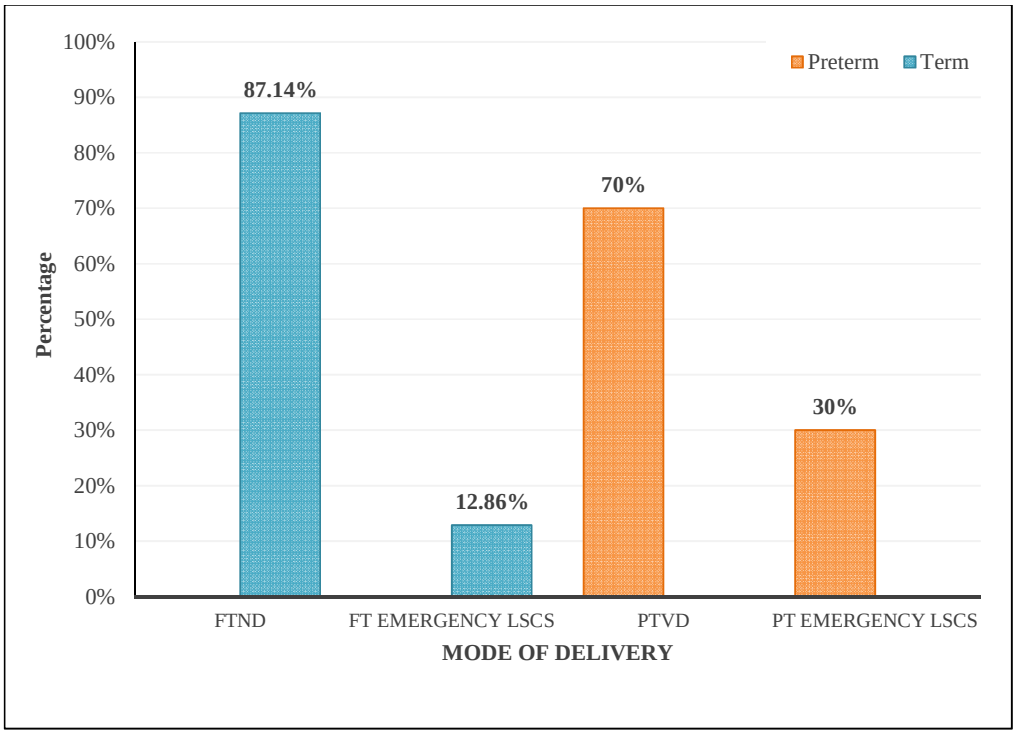

Figure 10: Distribution of mode of delivery over period of gestation.

The following table-12 Comparison of Neonatal Characteristics Between Preterm and Term Deliveries**..**

Table 12: Comparison of Neonatal Characteristics Between Preterm and Term Deliveries**.**

Variables	**Sub Category**	**Preterm**	**Term**	**Total**	**p-value**
Baby Sex	Female	29 (41.43%)	29 (41.43%)	58 (41.43%)	1^{C}
	Male	41 (58.57%)	41 (58.57%)	82 (58.57%)	
Baby Weight	Mean ± SD	2.19 ± 0.48	2.81 ± 0.36	2.5 ± 0.52	< **0.001**^{MW*}
	Median (Min, Max)	2.3 (1.3, 3)	2.7 (2, 3.5)	2.55 (1.3, 3.5)	

*Abbreviation: C – Chi square test, MW – Mann Whitney U test, * indicates statistical significance.*

From the above table , the study found no significant difference in the distribution of sex, with equal numbers of females and males in both groups. However, significant differences were observed in baby weight, with preterm babies having a notably lower mean weight (2.19 ± 0.48 kg) compared to term babies (2.81 ± 0.36 kg, $p < 0.001$). These findings underscore the distinct physiological characteristics between preterm and term births, highlighting the impact of gestational age on infant weight at birth.

The following table gives the comparison of newborn care over term and preterm labour.

Table 13: Comparison of newborn care over term and preterm labour.

Variables	Preterm	Term	Total	p-value
Mother Side	32 (45.71%)	60 (85.71%)	92 (65.71%)	**< 0.001^{C}***
KMC	18 (25.71%)	4 (5.71%)	22 (15.71%)	**0.0011^{C}***
NICU Admission	21 (30%)	4 (5.71%)	25 (17.86%)	**< 0.001^{C}***

*Abbreviation: C – Chi square test, * indicates statistical significance.*

The analysis of neonatal outcomes between preterm and term cases shows significant differences. A higher proportion of term cases (85.71%) remained on the mother side compared to preterm cases (45.71%), with a p-value of less than 0.001 indicating statistical significance. Kangaroo Mother Care (KMC) was more commonly needed for preterm infants (25.71%) than term infants (5.71%), with a p-value of 0.0011. Additionally, NICU admissions were significantly higher among preterm infants (30%) compared to term infants (5.71%), with a p-value of less than 0.001. These findings highlight the increased need for specialized care in preterm deliveries.

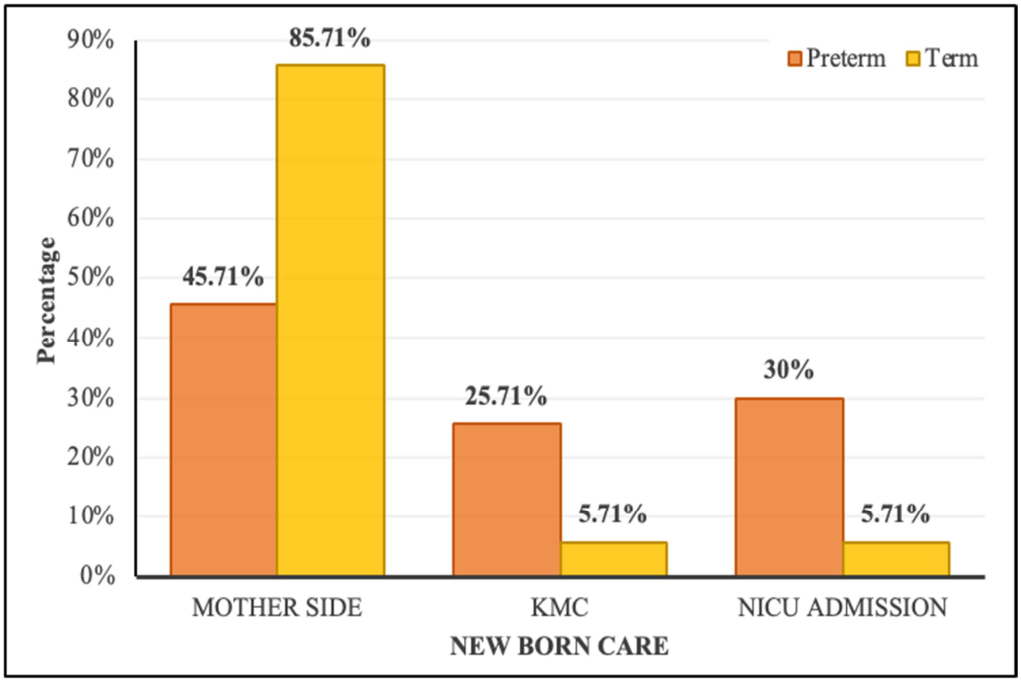

Figure 11: Distribution of newborn care over period of gestation.

The following table-14 shows diagnostic analysis of Serum magnesium level for predicting preterm labour.

Table14: Diagnostic analysis of Serum magnesium level for predicting preterm labour.

	Serum magnesium level
Cut off	(<) 1.8
Sensitivity (95% CI)	82.86% (71.97%, 90.82%)
Specificity (95% CI)	71.43% (59.38%, 81.59%)
PPV (95% CI)	74.36% (62.90%, 85.58%)
NPV (95% CI)	80.65% (68.88%, 88.08%)
LR +	2.90 (1.97, 4.26)
LR -	0.24 (0.14, 0.41)
AU-ROC (95% CI)	0.8494 (0.7816, 0.9172)
p-value	**< 0.001***

The study evaluated the efficacy of serum magnesium levels in predicting preterm labour, using a cut-off value of less than 1.8 mg/dL. The sensitivity of this threshold was 82.86% (95% CI: 71.97%-90.82%), while the specificity was 71.43% (95% CI: 59.38%-81.59%). The positive predictive value (PPV) was 74.36% (95% CI: 62.90%-85.58%), and the negative predictive value (NPV) was 80.65% (95% CI: 68.88%-88.08%). The positive likelihood ratio (LR+) was 2.90 (95% CI: 1.97-4.26), and the negative likelihood ratio (LR-) was 0.24 (95% CI: 0.14-0.41). The area under the receiver operating characteristic curve (AU-ROC) was 0.8494 (95% CI: 0.7816-0.9172), with a statistically significant p-value of less than 0.001, indicating that serum magnesium levels are a reliable predictor of preterm labour.

Figure-12 shows the ROC curve of Serum magnesium level for predicting preterm labour.

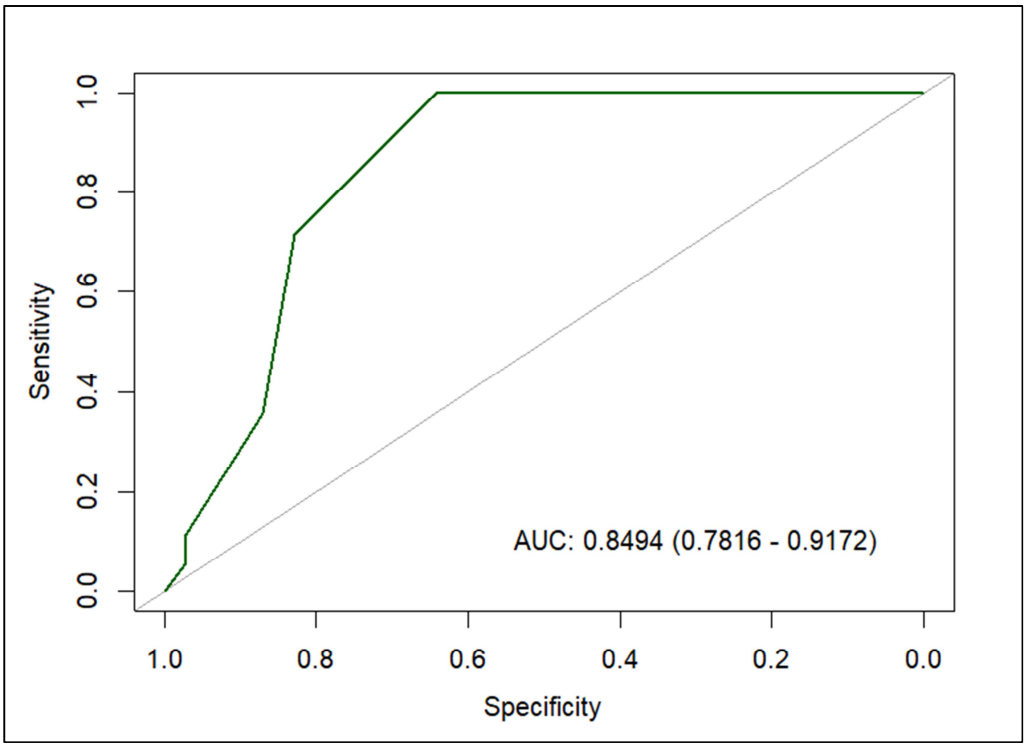

Figure 12 : ROC curve of Serum magnesium level for predicting preterm labor.

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DISCUSSION:

This is a prospective case-control study conducted at Dr. Prabhakar Kore Hospital, KLE, in the department of obstetrics and gynaecology in Karnataka. Group A consists of 70 cases with preterm labour, defined as labour between 28 weeks and 36+6 weeks of gestation. Group B comprises 70 controls with term labour, which occurs after 37 completed weeks of gestation. The study has duration of 12 months

Preterm birth stands as a significant contributor to neonatal mortality and imposes substantial healthcare expenses, primarily stemming from the hospitalization of women experiencing preterm labour and the long-term care costs associated with premature birth. Furthermore, preventing disabilities resulting from preterm birth is crucial for neonatologists. In recent years, there has been a notable surge in interest in identifying the causes and predicting preterm labour early illustrated by Khani et al., 2010 [94]. Several previous studies have observed a link between decreased levels of maternal serum magnesium and preterm labour Mittendorf et al., 2005 [95], while others have found no such correlation [84,96-98].

In our current study, we have data on 140 subjects, evenly divided into two groups: preterm and term gestations, with 70 subjects (50%) in each group. The gestational ages span from 30.29 weeks to 40.86 weeks, with an average of 34.53 ± 2.02 weeks in group A and 38.96 ± 0.87 in group B.

Similarly in Begum et al., 2010 [99] study, the average gestational age was 38.95±0.89 weeks for the control group and 33.03±1.83 weeks for the case group. In the investigation conducted by Bhat et al., 2012 [103] , they examined the correlation between serum magnesium levels and related symptoms in women experiencing

preterm labour (28-36 weeks) and compared them with those in women at the same gestational age who delivered at full term (37-40 weeks). Likewise, in the study by Syed et al., 2023 [93], the average age of participants was 25.43 years with a standard deviation of 4.62 years (ranging from 18 to 35 years) for those experiencing preterm labor, while it was 24.40 years with a standard deviation of 3.99 years (also ranging from 18 to 35 years) for the control group. The analysis revealed no significant difference in mean age between the two groups (t=0.997; p=0.332).Anand et al., 2019 [100] noted that the age distribution was similar in both Group A (cases) and Group B (controls), with the majority of patients falling between the ages of 21 and 30 years (83% and 85% respectively). The average age was comparable between the two groups, at 24.96 years for Group A and 25.04 years for Group B, with no significant difference (p=0.88). The mean gestational age was 33.69 years in Group A and 37.97 years in Group B.

In our study, the majority of women in both preterm and term labor groups were aged between 20-30 years, comprising 91.43% and 82.86%, respectively. Only a small percentage were over 30 years old (8.57% in preterm and 14.29% in term), and very few were under 20 years old (0% in preterm and 2.86% in term). The mean age was around 25.56 years, with no significant difference in median age values (p = 0.6705) between preterm and term groups. In contrast, Begum et al. (2010) [99] reported similar trends in maternal age distribution, with a predominant proportion of women aged between 20-30 years across both preterm and term pregnancies. They also noted a smaller percentage of women over 30 years old. Similarly, Syed et al., 2023 [93], findings would suggest a similar pattern of age distribution. reported a predominant age group of 20-30 years among both preterm and term labor cases, with a minority of women over 30 years old and a smaller number under 20 years old. This comparison

suggests consistency in age trends among women experiencing preterm and term labor, highlighting demographic similarities across different studies despite potential variations in regional or population-specific factors.

In our study, the socio-economic status distribution showed no significant difference between preterm and term births ($p = 0.3013$), with 8.57% of participants in both groups falling into the lower socio-economic class. The lower middle class accounted for 22.86% of preterm and 37.14% of term births, the upper lower class for 30% of preterm and 25.71% of term births, and the upper middle class for 38.57% of preterm and 28.57% of term births. In contrast, Begum et al., 2010 [99], found a higher incidence of preterm births among women from lower socio-economic backgrounds, attributing this to factors such as limited access to healthcare, poor nutrition, and higher stress levels. This difference in findings could be due to variations in study populations, healthcare systems, and socio-economic definitions. While my study was conducted in a hospital setting in Karnataka, India, with its own socio-economic dynamics, Begum et al.'s broader study highlighted the significant impact of lower socio-economic status on preterm births. These differences underscore the importance of context-specific research and tailored public health interventions to address socio-economic disparities in maternal and neonatal health outcomes. In a similar vein, Bhat et al., 2012 [103] found that the proportion of patients experiencing preterm labor from lower socio-economic backgrounds was notably greater compared to those from higher socio-economic brackets ($p<0.05$). Syed et al.,2023 [93] found in their research that the predominant socioeconomic status was the lower middle class in both the preterm labor group (54.3%) and the preterm comparator group (60.0%), with the lower class following at 25.7% versus 31.4%, and the upper middle class at 20.0% versus 8.6%, respectively. They observed no significant distinction in socioeconomic

classes between the two groups (p=0.387). Rahman et al., 2022 [101] found that the average magnesium levels varied across different socioeconomic groups. Specifically, they observed that the mean magnesium level was 1.88±SD in the higher class, 1.70±SD in the middle class, and 1.61±SD in the lower class. They noted a significant decrease in magnesium levels among individuals in the lower socioeconomic class, which was statistically significant.

In our study, in comparing anthropometric measurements between preterm and term labour groups, significant differences were observed in height and BMI. Term labour patients had a statistically higher mean height (156.89 cm ± 5.85) compared to preterm labour patients (154.6 cm ± 4) (p = 0.0018). Conversely, preterm labour patients exhibited a higher mean BMI (27.43 ± 4.21) compared to term labour (26.08 ± 3.05) (p = 0.0227). Weight did not show a significant difference between the groups (p = 0.5775). These findings highlight distinct anthropometric characteristics between preterm and term labour groups, emphasizing the relevance of these variables in understanding maternal health profiles. Begum et al., 2010 [99] found that while basic factors such as age, parity, and socioeconomic status were similar between the control and case groups, there was a notable difference in body mass index (BMI). The BMI mean values were 24.88±1.42 kg/m2 for the control group and 23.12±2.36 kg/m2 for the case group, showing a significant distinction. Anand et al., 2019 [100] found that the average body mass index (BMI) was similar in both groups, at 23.55 and 23.85 kg/m² respectively, with no significant difference (p=0.17). The majority of patients in both groups had a normal BMI, comprising 81% and 76% respectively.

In the current study, tocolysis was administered to a small percentage (2.86%) of preterm cases and none of the term cases, though this difference was not statistically significant ($p = 0.5067$). Betamethasone, essential for promoting fetal lung maturity, was administered universally to all preterm cases (100%) but none of the term cases, demonstrating a significant disparity ($p < 0.001$). Magnesium sulfate (MgSO4) was not administered to any cases in either group, Begum et al., 2010 [99] emphasized the increased use of betamethasone in preterm cases to mitigate respiratory distress syndrome risks. Anand et al., 2019 [100] reported similar trends, focusing on betamethasone's administration and possibly MgSO4 for neuroprotection in preterm births. These findings collectively underscore the standardized approach of using betamethasone for enhancing fetal lung maturity in preterm pregnancies across different studies, while variations in tocolysis and MgSO4 administration highlight evolving clinical practices and regional differences in managing preterm labor and birth outcomes.

In our current study, the study found no significant difference in the distribution of sex, with equal numbers of females and males in both groups. However, significant differences were observed in baby weight, with preterm babies having a notably lower mean weight (2.19 ± 0.48 kg) compared to term babies (2.81 ± 0.36 kg, $p < 0.001$). These findings underscore the distinct physiological characteristics between preterm and term births, highlighting the impact of gestational age on infant weight at birth. Anand et al., 2019 [100] Group A had a significantly higher percentage of very low birth weight (VLBW) neonates (<1500gm) compared to Group B (21% vs. 5%, p=0.004). Additionally, Group A had a significantly higher percentage of low birth weight (LBW) neonates (1500-2499gm) compared to Group

B (60% vs. 11%, p<0.0001). The mean birth weight of neonates in Group A was significantly lower at 1907.3gm compared to Group B at 2723.6gm (p<0.0001).

In the current study, the mean serum magnesium levels for preterm pregnancies were significantly lower at 1.68 ± 0.11 mg/dL compared to 1.91 ± 0.19 mg/dL for term pregnancies. The distribution of serum magnesium levels showed that 11.43% of preterm cases had levels below 1.6 mg/dL, whereas only 2.86% of term cases fell into this category. Additionally, 88.57% of preterm cases had levels between 1.6-2.0 mg/dL, and 45.71% of term cases had levels between 2.0-2.5 mg/dL, a range not observed in preterm cases. Anand et al.[100], 2019 reported similar findings with preterm pregnancies having lower serum magnesium levels (1.72 ± 0.15 mg/dL) compared to term pregnancies (1.95 ± 0.14 mg/dL). This study corroborates the current study's findings, indicating that lower serum magnesium levels are associated with preterm labor. Begum et al., 2010 [99] also found that serum magnesium levels were lower in preterm pregnancies compared to term pregnancies. Specifically, their study reported mean serum magnesium levels of 1.70 ± 0.20 mg/dL for preterm pregnancies and 1.90 ± 0.20 mg/dL for term pregnancies. These values are close to the findings in the current study and Anand et al., 2019. Both both studies support the current study's findings that lower serum magnesium levels are associated with preterm labor. The slight variations in mean values are likely due to differences in study populations and methodologies, but the overall trend remains consistent across all studies. The detailed distribution provided in the current study adds an extra layer of insight into the specific ranges of serum magnesium levels prevalent in preterm and term pregnancies.

In our current study, 45.71% of preterm infants remained on the mother side compared to 85.71% of term infants, a statistically significant difference ($p < 0.001$). Additionally, 25.71% of preterm infants required Kangaroo Mother Care (KMC) versus 5.71% of term infants ($p = 0.0011$), and NICU admissions were significantly higher among preterm infants at 30% compared to 5.71% of term infants ($p < 0.001$). Begum et al., 2010 [99] reported similar trends, with a higher percentage of preterm infants needing NICU admission and KMC compared to term infants. Anand et al.,[100] 2019 found that NICU admission rates were significantly higher for preterm infants (32% vs. 6% for term infants), and more term infants remained on the mother side, mirroring the current study's findings. Overall, the statistics across these studies consistently indicate that preterm infants are more likely to require intensive care and specialized interventions, underscoring the significant healthcare challenges and resource needs associated with preterm deliveries.

In our recent research, both the Chi-square test and the Kruskal-Wallis test indicated that there isn't a notable distinction in the spread of serum magnesium levels across the Period of Gestation (POG) within the preterm labour group. Similarly, based on the Chi-square test and Mann Whitney U test, there's no significant divergence in the serum magnesium level distribution concerning POG in the term labour group. Several additional investigations have also found no correlation between the level of magnesium in maternal serum and premature labour, consistent with our own findings [10, 28,84,85,96-99].According to Malathi et al., 2020 [87], women experiencing preterm labour showed a significant decrease in serum magnesium levels compared to those in term labour. The average serum magnesium level for preterm labour was 1.59 mg/dl with a standard deviation (SD) of 0.83, whereas for term labour, it was 2.55 mg/dl with a SD of 0.40. This variance in magnesium levels

between the preterm and term groups remained consistent even after accounting for factors such as maternal age, parity, gestational age, and socioeconomic status. Furthermore, the study revealed that serum magnesium levels were lower both in early and late preterm cases compared to those between 33-34+6 weeks of gestation.

Begum et al., 2010 [99] found that the average serum magnesium levels were 2.02±0.20 mg/dl (with a range of 1.70-2.4 mg/dl) for the control group and 1.65±0.19 mg/dl (with a range of 1.30-2.00 mg/dl) for the case group. This variation was notably significant ($p<0.001$).As per the research conducted by Bhat et al., 2012 [84], individuals experiencing preterm labour exhibit notably lower levels of serum magnesium [average, 1.343±0.09 meq/l compared to 1.875±0.013 meq/l in normal pregnancy] ($p<0.001$). The serum magnesium levels showed a significant difference in preterm labour compared to the levels in normal controls ($p<0.001$).

Syed et al., 2023 [93] found that the average serum magnesium level (measured in mg/dl) was notably lower in the preterm labour group compared to the control group across different gestational age ranges: 28-30 weeks (0.77 ± 0.12 compared to 1.73 ± 0.31; $t=-11.129$; $p<0.001$), 31-33 weeks (0.78 ± 0.19 compared to 1.65 ± 0.35; $t=-8.728$; $p<0.001$), and 34-36 weeks (0.82 ± 0.04 compared to 1.66 ± 0.39; $t=-4.206$; $p=0.004$). Rahman et al., 2022 [101] found that the average serum magnesium level was 1.70 mg/dl with a standard deviation. Approximately three-fifths of the participants (63.3%) had a magnesium level below 1.9, while eleven patients (36.7%) had a magnesium level equal to or greater than 1.9. This difference was statistically significant with a p-value of less than 0.05.

The study evaluated the efficacy of serum magnesium levels in predicting preterm labour, establishing a cut-off value of less than 1.8 mg/dL. The findings indicated that this cut-off had a sensitivity of 82.86% (95% CI: 71.97%-90.82%) and a specificity of 71.43% (95% CI: 59.38%-81.59%). The positive predictive value (PPV) was 74.36% (95% CI: 62.90%-85.58%), and the negative predictive value (NPV) was 80.65% (95% CI: 68.88%-88.08%). The positive likelihood ratio (LR+) was 2.90 (95% CI: 1.97-4.26), indicating that a serum magnesium level below 1.8 mg/dL increases the likelihood of preterm labour by approximately 2.9 times. The negative likelihood ratio (LR-) was 0.24 (95% CI: 0.14-0.41), suggesting that a serum magnesium level above this cut-off reduces the likelihood of preterm labour. The area under the receiver operating characteristic curve (AU-ROC) was 0.8494 (95% CI: 0.7816-0.9172), significantly higher than 0.5 ($p < 0.001$), confirming that serum magnesium levels are a reliable predictor of preterm labour. These metrics underscore the potential clinical utility of serum magnesium levels as a predictive biomarker in prenatal care. Lotfalizadeh et al., 2018 [102] utilized ROC curve analysis to determine the prognostic significance of serum magnesium levels in predicting the response to MgSO4 as a tocolytic agent. Their findings indicated that a serum magnesium level below 1.85 mg/dL served as a threshold, exhibiting 85% sensitivity and 78% specificity, with a confidence interval of 0.75-0.97, in predicting the response to MgSO4

SUMMARY:

This study is being carried out at the Department of Obstetrics and Gynecology in Dr. Prabhakar Kore Charitable Hospital, KLE, Karnataka. It focuses on pregnant women attending the outpatient department or labor room with either preterm or term labor. A group of 140 antenatal women who meet the criteria and consent to participate will be included in the study.

The study cohort predominantly consisted of women aged 20-30 years in both preterm and term labor groups, with no statistically significant difference in age between the two groups ($p = 0.6705$). Socio-economic status showed a balanced distribution across preterm and term groups, with approximately 8.57% of participants in both groups belonging to the lower socio-economic class ($p = 0.3013$). Anthropometrically, with respect to height weight and BMI no difference was noted between the preterm and term labour patient group

Betamethasone administration for promoting fetal lung maturity was universally practiced in all preterm cases (100%) ($p < 0.001$). Tocolysis was administered to a small percentage (2.86%) of preterm cases ($p = 0.5067$). Magnesium sulfate MgSO4 was not administered in either group during the study period.

Preterm infants exhibited significantly lower mean birth weights (2.19 ± 0.48 kg) compared to term infants (2.81 ± 0.36 kg) ($p < 0.001$). NICU admission rates were notably higher among preterm infants (30%) compared to term infants (5.71%) ($p < 0.001$). Kangaroo Mother Care (KMC) was required by 25.71% of preterm infants compared to only 5.71% of term infants ($p = 0.0011$).

Mean serum magnesium levels were significantly lower in preterm pregnancies (1.68 ± 0.11 mg/dL) compared to term pregnancies (1.91 ± 0.19 mg/dL) ($p < 0.001$), indicating an association between lower maternal serum magnesium levels and increased risk of preterm labor.

The study identified a cutoff serum magnesium level of less than 1.8 mg/dL as a predictor of preterm labor, demonstrating high sensitivity (82.86%) and specificity (71.43%). Specifically, 11.43% of preterm cases had serum magnesium levels below 1.6 mg/dL, compared to only 2.86% of term cases falling into this category. The positive likelihood ratio (LR+) was 2.90, indicating that a serum magnesium level below this cutoff increases the likelihood of preterm labor by approximately 2.9 times.

In conclusion, this study provides comprehensive insights into the demographic, clinical, and biomarker aspects of preterm and term labor. The findings underscore the critical role of maternal serum magnesium levels as a potential predictive biomarker and highlight the need for tailored clinical interventions to mitigate the risks associated with preterm birth, thereby improving maternal and neonatal health outcomes.

CONCLUSION:

In this study some key findings emerged. Firstly, significant differences were observed in the distribution of serum magnesium levels between the preterm labour and term labour groups. Specifically, lower levels of serum magnesium were noted in the preterm labour group compared to the term labour group. Secondly, upon further analysis using Chi-square and Mann-Whitney U tests, it was determined that there is no significant difference in the distribution of serum magnesium levels over the period of gestation (POG) within the preterm labour group. This suggests that serum magnesium levels remain relatively stable across different stages of gestation in preterm labour. Overall, these findings contribute valuable insights into the understanding of serum magnesium dynamics in both preterm and term labour scenarios, highlighting the importance of monitoring and managing magnesium levels effectively in clinical obstetric practice

LIMITATION:

The study might have a relatively small sample size, limiting the generalizability of its findings. The cross-sectional nature of the study also poses a limitation, as it captures serum magnesium levels at a single point in time, potentially overlooking fluctuations over the course of pregnancy and labour.. Lastly, variations in laboratory techniques and the timing of blood sample collection could introduce measurement bias, impacting the reliability of the results.

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ANNEXURE-I

INFORMED CONSENT FORM

Title of the proposed research project: **"A ONE YEAR CASE CONTROL STUDY OF SERUM MAGNESIUM LEVELS IN PRETERM AND TERM LABOUR "**

Principle Investigator: **Co-Investigator**:

Objective: To study and compare serum magnesium levels in preterm Labour and term labour

Introduction: Prematurity is the major leading cause of neonatal mortality and morbidity counts for 2/3 of neonatal deaths. Those who survive are at greater risk of a range of short-term and long-term morbidities. Prevention of spontaneous preterm birth through screening is one of the key aims of antenatal care as these have implications for child, mother, and society. If women can be identified to be at high risk in early pregnancy, they can be targeted for more intensive antenatal surveillance and prophylactic interventions. Several studies have been conducted showing the association of low magnesium levels with preterm labour. Hence my study is done to find out the association and cut off value for low magnesium level with preterm labour in our hospital

Explanation of procedure: All antenatal women presenting to the labor ward with preterm labor are grouped as cases, simultaneously those women presenting to the Opd with same age, parity and gestational age not in labor will be taken as control. Detailed history with physical examination is done, relevant reports will be noted. Blood samples will be withdrawn and sent for serum magnesium level .whose values will compared between cases and controls

Withdrawal from participation in the study: Participation in this study is voluntary. You will be free to decide whether to participate in this study or continue participation once enrolled. In case you decide to withdraw your participation, you are free to do so. However, please convey the decision to the principal investigator.

Possible benefits from participating in the study: You will/will not have nor get any benefits by participating in this study. The data gathered will help the population at large.

Possible risks from participating in the study: There are no risks involved in participating in this study.

Privacy and confidentiality: The information collected from you will be coded, to prevent any person from identifying you. Your identity will never be revealed. The data collected from you will be kept confidential and only processed or aggregated data will be used for publication.

Financial incentives: You will not receive any payment for participating in this study.

Authorization for publication of aggregated data: Results obtained after processing of the aggregated data will be published for scientific purposes and or presented to scientific groups.

However, your identity will never be revealed.

Questions: If you have any question or complaints with regard to your right as study participant you may contact Dr Harsha Hegde, Chairperson, Ethical committee of JNMC, 0831-2473777 Extension 4052.

Legal rights: By signing this consent form, we are not waving any of your legal rights.

ANNEXURE-II

SCREENING FORM

Screening no - ☐☐☐☐

Date of screening : ☐☐ ☐☐ ☐☐☐☐

IP NO :

First name ☐☐☐☐☐☐☐☐

Middle name: ☐☐☐☐☐☐☐☐☐☐☐

Last name: ☐☐☐☐☐☐☐☐☐☐☐

Husbands name : ☐☐☐☐☐☐☐☐☐

Age (years) ☐

Address

Phone number : ☐☐☐☐☐☐☐☐☐☐

Registered ☐

unregistered ☐

Term gestation : ☐ Preterm gestation (< 37 weeks

POG) : ☐

LMP :

EDD : POG :

USG 1st trimister EDD: POG :

Eligibility criteria : (Yes -1 ,NO -2)

Singleton pregnancy ☐

Spontaneous onset of labour ☐

Exclusion criteria : if yes patient is ineligible

Cervical incompetency ☐

Infections (recurrent UTI ,genital tract infection) ☐

Chorioamnionitis (fever , maternal tachycardia , WBC count > 15,000). ☐

Multiple gestation ☐

Polyhydraminaos ☐

Metabolic disorders (GDM, overt DM) ☐

Uterine malformation ☐

Hypertensive disorders of pregnancy ☐

Eclampsia ☐

Placental abnormalities (placenta Previa, placental abruption) ☐

Congenital anomalies in fetus ☐

Intrauterine death ☐

Maternal smoking ☐

Iatrogenic : induction of labour ☐

Magnesium supplementation

Is the patient eligible (yes – 1, No-2) ☐

Consent

Does the women give consent to participate ☐

Has the study consent form been signed? ☐

Has the patient been enrolled

ANNEXURE-III

PROFORMA

A ONE YEAR CASE CONTROL STUDY OF SERUM MAGNESIUM LEVELS IN PRETERM AND TERM DELIVERY "

Screening ID **enrollment no :**

Date of admission - ☐☐ ☐☐ ☐☐☐☐

Date of discharge – ☐☐ ☐☐ ☐☐☐☐

Obstetric history:

Married Life (years) : ☐☐

Consanguinity : ☐☐ (YES - 1, NO - 2)

If yes, Degree of consanguinity : ☐☐☐☐☐☐☐☐

Obstetric score :

Gravida ☐☐ Para ☐☐ Live ☐☐ abortion ☐☐

Menstrual history

Age of menarche : ☐☐ Years

Previous menstrual cycles : regular ☐ / Irregular (Yes – 1, No – 2)

LMP (dd-mm-yy) ☐☐/ /

EDD (dd-mm-yy) : ☐☐ / ☐☐ / ☐☐

USD EDD (dd-mm-yy): : ☐☐ / ☐☐ ☐☐ /

POG : ☐☐ Days ☐☐

Past History : YES – 1 , NO – 2

a. Known case of Diabetes mellitus : ☐

If yes, Duration (in years) : ☐☐

Treatment received :

b. Known case of Hypertension : ☐

If yes, Duration (in years) : ☐☐

Treatment received :

c. H/O recurrent blood transfusions.: ☐

If yes, Duration (in years) :

☐☐ ☐

d. Known case of Cardiac disorder :

If yes, Duration (in years) :

☐☐

Treatment received :

e . Known case of Hypothyroidism. : ☐

If yes, Duration (in years) :

☐☐

Treatment received :

f. H/O any surgery in past : ☐

g. H/O any Drug allergy : ☐

If Yes, Name of the drug. :

General physical examination- at admission

Height (in centimetres) :

Weight (in kilogram) :

BMI :

Pallor ☐ (Yes – 1, No – 2)

Icterus ☐

Pedal Oedema ☐

Blood pressure (mmHg) systolic –

diastolic -

Pulse rate (beats per minute) –

Temperature :

Systemic examination :

Cardiovascular system :

Respiratory system :

Per Abdomen: Uterine size (in weeks) :

Presentation :

Acting / not acting (yes -1, no -2)

Tense / tender

Fetal Heart rate : beats per minute

EFW clinically :

USG :

PER SPECULUM EXAMINATION **:**

Active leak : (yes -1, no -2)

Active PV bleed:

WDPV

:

Per vaginal examination:

Cervical dilatation : Cms

Cervical length : Cms

Position :

Consistency:

Station :

Bishops score :

Membranes : present /

absent

OBSTETRIC ULTRASOUND

1st trimister scan : Date :

Cardiac activity :

CRL :

mm

CEDD: ☐ (yes -1, no -2)

2nd trimister scan : Date :

Gross anamolies :

3rd trimister scan : Date :

Tocolysis and steroids

a) Tocolysis **:** ☐ (yes -1, no -2)

b) Steroids : ☐

1)Betamethasone ☐

No of doses ; ☐

2)Dexamethasone : ☐

No of doses ☐

:

3)Recruited to action III trial : ☐

c) Mgso4 : ☐

Investigations-

Date (dd-mm-yyyy) :

Blood Group: :

Haemoglobin (g/dl) :

(cyanmethemoglobin method)

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

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

VDRL : (Negative – 1, Positive – 2)

Platelets (lakhs) :

S. TSH (mu IU/ml) :

DIPSI :

Urine R &M :

Urine c & s. :

Vaginal c & s :

S magnesium (mg/dl) :

Provisional diagnosis:

DELIVERY DETAILS: **(yes -1, no -2)**

A. Mode of delivery:

Vaginal

:

Caesarean :

indication :

B. Liquor :

Clear / Meconium stained

BABY DETAILS

a) Baby cried immediately after birth ☐ (yes -1, no -2)

b) Baby birth time: ☐☐ AM / PM

c) Gender : male ☐ / female ☐

e) baby weight : ☐ . ☐ Kgs

f) APGAR : 1 min: ☐ 5 min : ☐

PERINATAL OUTCOME : (yes -1, no -2)

Baby mother side: ☐

Baby in KMC : ☐

NICU admission : ☐

Indication for NICU admission:

Condition of at discharge:

ANNEXURE- IV MASTER CHART

General Information						Obstetric History			Obstetric score	Menstrual History		General Examination			perspeculum examiation			pv examination			tocolysis		steroids		mgso4	baby details		APGAR		Biochemical investigations								delivery details		Newborn Care			Fetal Complicatiopns				
S.No	Screening ID	Ip no	Age	socioeconomic status	Registered	Married life	Consanquinity	Degree	OBS score	Cycles	POG (in weeks)	Height	Weight	BMI	active leak	active bleed	WDPV	cervical dilatation	bishops score	membranes	Administered	no of doses	betamethasone	no of doses	Administered	Sex (male-1/F-2)	Weight	1 Min	5 Min	HB (g/dl)	PLT (lakhs/dl)	TC	S. TSH	serology	cultures	S . Magnesium	mode of delivery (vaginal -1/caesarian -2)	liquor (clear -1/MSL- 2)	mother side	KMC	NICU admission	Birth asphyxia	HMD	Sepsis	preterm birth	RDS
1	7	10031245	23	lower middle	1	4	2	99	G2P1L1	1	33weeks 1 day	154	58	24.47	2	2	2	2	5	2	2	0	1	1	2	1	1.9 kg	7	8	11.2	1.87	9.7	2.1	Negative	Negative	1.7	PT emg LSCS	1	2	1	2	2	2	2	2	2
2	09-	10034567	26	upper lower	1	2	2	99	Primigravida	1	32 weeks	151	53	23.24	2	2	2	3	8	1	2	0	1	1	2	2	1.5 kg	7	8	10.8	2.01	10.7	3.2	Negative	Negative	1.8	PTVD	1	2	2	1	2	2	2	2	1
3	18	10012359	23	upper middle	2	6	2	99	GP2L1D1	1	35weeks 4 days	154	60	26	2	2	2	2	5	2	2	0	1	1	2	1	2.3kg	7	8	12.4	2.5	12.6	2.3	Negative	Negative	1.6	PT emg LSCS	1	2	1	2	2	2	2	2	2
4	23	10012350	24	lower middle	2	2	2	99	Primigravida	1	35 weeks 1day	150	60	26.6	2	2	2	3	8	1	2	0	1	1	2	1	2 kg	6	8	10.2	1.78	10.6	3	Negative	Negative	1.6	PTVD	1	2	2	1	2	2	2	1	2
5	27	10012836	27	lower	2	1	2	99	Primigravida	1	32 weeks 3 days	154	59	25.6	2	2	2	5	10	1	2	0	1	1	2	1	1.6 kgs	8	9	11.2	2.1	12.6	2	Negative	Negative	1.8	PTVD	1	2	2	1	2	2	2	1	2
6	33	10013109	26	lower middle	2	2	1	3	Primigravida	1	33 weeks 2 days	154	68	28.6	2	2	2	2	6	2	1	1	1	2	2	1	1.7 kg	7	8	12.6	1.8	8.9	3.3	Negative	Negative	1.7	PT emg LSCS	1	2	2	1	2	2	2	1	2
7	34	10013908	21	upper middle	1	1	2	99	Primigravida	1	32 weeks 2 days	154	58	24.27	2	2	2	2	6	2	2	0	1	1	2	1	1.68 kgs	6	7	12.2	2	9.1	2.1	Negative	Negative	1.7	PT emg LSCS	1	2	2	1	2	2	2	2	1
8	44	10013932	25	upper lower	1	2	2	99	Primigravida	1	36 weeks 6 days	154	66	27.8	2	2	2	3	10	1	2	0	1	2	2	1	2.5 kgs	7	9	9.7	2.1	10.7	2.4	Negative	Negative	1.8	PTVD	1	1	2	2	2	2	2	2	2
9	45	10014447	27	upper middle	1	1	2	99	Primigravida	1	36 weeks 2days	154	60	26	2	2	2	2	5	2	2	0	1	1	2	1	3 kgs	7	9	10.6	2.37	10.6	1.2	Negative	Negative	1.8	PT emg LSCS	1	1	2	2	2	2	2	2	2
10	56	10013305	26	lower	1	2	2	99	Primigravida	1	36 weeks	150	60	26.6	2	2	2	4	10	1	2	0	1	1	2	2	2.5 kgs	8	9	11.3	2.1	10.8	1	Negative	Negative	1.7	PTVD	1	1	2	2	2	2	2	2	2
11	59	10015224	26	lower middle	1	2	2	99	Primigravida	1	36 weeks 2days	151	53	23.24	2	2	2	2	5	2	2	0	1	1	2	1	2.3 kgs	7	8	13	1.87	11.2	1.1	Negative	Negative	1.6	PT emg LSCS	1	2	1	2	2	2	2	2	2
12	62	10016002	30	upper middle	1	2	2	99	G3P1L1E1	1	34 weeks 1day	154	110	46.4	2	2	2	3	8	1	2	0	1	1	2	2	2.6 kgs	8	9	12.5	1.87	13.6	2.6	Negative	Negative	1.7	PT emg LSCS	1	1	2	2	2	2	2	2	2
13	65	10017048	30	upper lower	2	3	2	99	G2A1	1	34 weeks 1day	154	60	26.6	2	2	2	4	10	1	2	0	1	1	2	2	2.7 kgs	7	9	12	2.3	13	1.7	Negative	Negative	1.8	PTVD	1	2	1	2	2	2	2	2	2
14	75	10017748	21	lower	1	1	2	99	Primigravida	1	31 weeks	150	60	26.6	2	2	2	3	10	2	2	0	1	1	2	1	2.7 kgs	7	9	12.7	2.2	14	1	Negative	Negative	1.8	PTVD	1	1	2	2	2	2	2	2	2
15	82	10017873	21	lower middle	1	3	2	99	G2A2	1	35 weeks 6days	154	68	28.6	2	2	2	3	8	1	2	0	1	1	2	1	2.5 kgs	6	6	10.9	2.1	10.5	1.6	Negative	Negative	1.6	PTVD	1	1	2	2	2	2	2	2	2
16	98	10019340	31	lower middle	2	1	2	99	Primigravida	1	33 week 2 days	154	60	26	2	2	2	2	6	2	2	0	1	2	2	2	1.8 kgs	7	9	13	2.4	10.7	1.2	Negative	Negative	1.7	PT emg LSCS	1	2	2	1	2	2	2	2	1
17	105	10020491	34	upper middle	1	4	2	99	G6P2L2A3	1	36 weeks 3 days	158	75	31.2	2	2	2	2	5	1	2	0	1	2	2	1	2.8 kgs	7	9	11	1.98	12.4	2.4	Negative	Negative	1.6	PTVD	1	1	2	2	2	2	2	2	2
18	123	10020023	25	upper lower	1	2	2	99	Primigravida	1	36 weeks 3 days	154	70	29.5	2	2	2	4	11	1	2	0	1	1	2	2	2.6 kgs	7	9	12	1.78	10.1	2.6	Negative	Negative	1.8	PTVD	1	1	2	2	2	2	2	2	2
19	135	10020814	25	upper lower	1	2	2	99	Primigravida	1	36 weeks 2 days	170	76	33.6	2	2	2	3	8	2	2	0	1	1	2	1	2.2 kgs	7	9	12.2	2.3	15.5	3.1	Negative	Negative	1.7	PTVD	1	2	1	2	2	2	2	2	2
20	142	10020785	22	upper middle	1	3	2	99	Primigravida	1	35 weeks 5 days	155	70	29.1	2	2	2	4	9	1	2	0	1	1	2	2	2.7 kgs	7	9	11.9	2.5	12.3	2.4	Negative	Negative	1.8	PTVD	1	1	2	2	2	2	2	2	2
21	152	10021712	28	upper middle	1	2	2	99	G2A1	1	30 weeks 2 days	156	73	30	2	2	2	4	10	2	2	0	1	1	2	1	1.6 kgs	7	8	10.8	2.73	13.1	2	Negative	Negative	1.7	PTVD	1	2	2	1	2	2	2	1	2
22	158	10022019	25	upper lower	1	4	2	99	G2P1L1	1	33 weeks 6 days	152	80	34.7	2	2	2	3	9	1	2	0	1	1	2	1	1.8 kgs	7	8	13.6	2.3	11.7	2.7	Negative	Negative	1.4	PTVD	1	2	1	2	2	2	2	2	2
23	162	10023181	31	upper middle	1	2	2	99	Primigravida	1	36 weeks 6 days	160	68	26.5	2	2	2	5	11	1	2	0	1	1	2	1	2.4 kgs	7	9	10.2	1.68	11	3.3	Negative	Negative	1.6	PTVD	1	1	2	2	2	2	2	2	2
24	175	10023737	20	upper lower	1	5	2	99	G2A1	1	35 weeks 4 days	154	60	25.3	2	2	2	3	9	1	2	0	1	1	2	2	2.1 kgs	7	8	12.7	2.4	10.6	2.7	Negative	Negative	1.5	PTVD	1	2	1	2	2	2	2	2	2
25	179	10026031	26	lower middle	1	3	2	99	Primigravida	1	34 weeks 3 days	150	58	25.7	2	2	2	10	12	1	2	0	1	1	2	1	1.5 kgs	7	9	10.2	1.87	8.1	2	Negative	Negative	1.6	PTVD	1	2	2	1	2	2	2	2	2
26	182	10026111	21	upper lower	1	2	2	99	Primigravida	1	35 weeks 3days	150	99	29.3	2	2	2	2	6	1	2	0	1	1	2	2	2.1 kgs	7	9	12.2	1.92	7.8	2.1	Negative	Negative	1.8	PT emg LSCS	2	2	1	2	2	2	2	2	2
27	184	10026661	27	upper middle	1	2	2	99	Primigravida	1	34 weeks 3 days	160	66	25.7	2	2	2	2	5	2	2	0	1	1	2	1	2.45 kgs	8	9	11.6	2	8.9	3	Negative	Negative	1.6	PT emg LSCS	1	1	2	2	2	2	2	2	2
28	187	10027337	28	upper lower	2	2	2	99	G2A1	1	33 weeks 2 days	156	60	24.6	2	2	2	3	9	1	2	0	1	1	2	2	1.7 kgs	8	9	11.7	1.56	7.8	2.1	Negative	Negative	1.6	PTVD	1	1	2	1	2	2	2	1	2

29	189	10024460	26	upper lower	1	6	2	99	G2P2L2	1	36 weeks 6 days	156	60	24.6	2	2	2	5	10	1	2	0	1	1	2	1	1.9 kgs	7	9	13.4	2.78	8.2	2.5	Negative	Negative	1.8	PTVD	1	2	1	2	2	2	2	2	2
30	192	10027688	24	lower middle	1	7	2	99	G2A1	1	36 weeks 1 day	160	58	22.6	2	2	2	2	5	1	2	0	1	1	2	1	2.9 kgs	8	9	10.8	2.3	8.2	2.1	Negative	Negative	1.6	PT emg LSCS	1	1	2	2	2	2	2	2	2
31	197	10027845	32	lower middle	1	2	2	99	Primigravida	1	34 weeks 6 days	156	70	28.8	2	2	2	4	10	1	2	0	1	1	2	2	2.4 kgs	7	9	12.9	1.67	7.9	3.2	Negative	Negative	1.8	PTVD	1	1	2	2	2	2	2	2	2
32	204	10028220	20	lower middle	1	2	2	99	Primigravida	1	36 weeks 6 days	156	66	27.1	2	2	2	5	9	1	2	0	1	1	2	1	2.6 kgs	7	9	11	2.67	9.8	3.8	Negative	Negative	1.7	PT emg LSCS	1	1	2	2	2	2	2	2	2
33	209	10028248	29	upper middle	2	4	2	99	G2P1L1	1	36 weeks 1 day	158	62	24.8	2	2	2	10	10	2	2	0	1	1	2	2	1.9 kgs	8	9	10	2.69	8	3.5	Negative	Negative	1.7	PTVD	1	2	1	2	2	2	2	2	2
34	210	10023456	22	upper lower	2	5	2	99	G2P1L1	1	36 weeks 4 days	160	70	27.3	2	2	2	10	10	2	2	0	1	1	2	1	2.7 kgs	7	9	12	1.76	10.6	2.4	Negative	Negative	1.8	PTVD	1	1	2	2	2	2	2	2	2
35	214	10030083	31	upper lower	2	2	2	99	G2A1	1	36 weeks 5 days	156	62	25.5	2	2	2	2	5	2	2	0	1	1	2	2	2 kgs	7	9	13	2.12	13.7	2.1	Negative	Negative	1.7	PT emg LSCS	1	2	1	2	2	2	2	2	2
36	217	10030399	24	upper lower	2	3	2	99	Primigravida	1	35 weeks 3 days	164	64	23.8	2	2	2	2	5	2	2	0	1	1	2	2	1.7 kgs	7	9	10.4	2.34	15.4	3	Negative	Negative	1.4	PT emg LSCS	1	2	2	1	2	2	2	1	2
37	216	10031662	23	upper middle	2	2	2	99	Primigravida	1	36 weeks	150	62	27.5	2	2	2	3	8	1	2	0	1	1	2	2	2.5 kgs	7	9	12.4	1.28	12.7	1.21	Negative	Negative	1.6	PTVD	1	1	2	2	2	2	2	2	2
38	228	10032055	24	upper middle	2	3	2	99	Primigravida	1	35 weeks 1 day	156	62	25.2	2	2	2	4	9	1	2	0	1	1	2	2	2.4 kgs	7	2.4	12.9	3.2	10.7	2.1	Negative	Negative	1.7	PTVD	1	1	2	2	2	2	2	2	2
39	229	10033488	28	upper lower	2	3	2	99	G2P1L1	1	35 weeks 5 days	156	60	24.6	2	2	2	5	10	1	2	0	1	1	2	1	3 kgs	7	8	11.3	3.1	10.2	2.1	Negative	Negative	1.7	PTVD	1	1	2	2	2	2	2	2	2
40	230	10033667	23	upper middle	2	6	2	99	G3P2L2	1	32 weeks	150	70	31	2	2	2	9	11	1	2	0	1	1	2	1	2.6 kgs	7	8	9	3.2	11.5	4.3	Negative	Negative	1.7	PTVD	1	1	2	2	2	2	2	2	2
41	234	10033714	28	lower middle	2	6	2	99	G2P1L1	1	30 weeks 2 days	150	60	26.6	1	2	2	3	9	2	2	0	1	1	2	1	1.4 kgs	7	8	11.2	3.5	13.4	2.4	Negative	Negative	1.7	PTVD	1	2	2	1	2	2	2	1	2
42	237	10033754	27	upper middle	2	2	2	99	Primigravida	1	34 weeks 1 day	158	54	21.6	1	2	2	5	9	2	2	0	1	1	2	2	2 kgs	7	9	11	2.5	12.6	1.21	Negative	Negative	1.6	PTVD	1	2	1	2	2	2	2	2	2
43	238	10035733	25	upper middle	2	6	2	99	G3P1L1A1	1	35 weeks 5 days	148	68	31	1	2	2	10	12	2	2	0	1	1	2	1	2.1 kgs	7	9	15.1	2.6	11.1	1.14	Negative	Negative	1.8	PTVD	1	2	1	2	2	2	2	2	2
44	245	10036360	24	upper middle	2	1	2	99	Primigravida	1	30 weeks 2 days	154	68	28.6	2	2	2	4	9	1	2	0	1	1	2	1	1.4 kgs	6	7	13.2	2.5	13.2	1.21	Negative	Negative	1.5	PTVD	1	2	2	1	2	2	2	1	2
45	254	10035753	21	upper middle	2	4	2	99	G2P1L1	1	32 weeks	156	70	28.7	2	2	2	3	8	1	2	0	1	1	2	2	1.3 kgs	6	7	9.3	1.8	10.2	4.2	Negative	Negative	1.8	PTVD	1	2	2	1	2	2	2	1	2
46	258	10037627	23	upper lower	1	2	2	99	Primigravida	1	33 weeks 3 days	156	70	28.7	2	2	2	3	9	1	2	0	1	1	2	2	1.7 kgs	7	8	12.3	3.23	13.7	3.2	Negative	Negative	1.5	PTVD	1	2	2	1	2	2	2	2	1
47	262	10039675	22	lower middle	1	5	2	99	G2P1L1	1	36 weeks 6 days	162	76	28.9	2	2	2	4	9	1	2	0	1	1	2	2	2.7 kgs	8	9	12.6	2.4	13.8	1.4	Negative	Negative	1.6	PTVD	1	1	2	2	2	2	2	2	2
48	263	10041456	26	lower middle	2	2	2	99	Primigravida	1	32 weeks	154	76	32.04	2	2	2	2	8	2	2	0	1	1	2	2	1.54 kgs	7	9	10.2	2.76	13.1	2	Negative	Negative	1.7	PTVD	1	2	2	1	2	2	2	1	2
49	269	10043091	23	upper lower	2	2	2	99	G2P1L1	1	36 weeks 6 days	154	60	25.2	2	2	2	3	10	1	2	0	1	1	2	1	2.8 kgs	7	9	10.5	3.21	8.9	1.1	Negative	Negative	1.4	PTVD	1	1	2	2	2	2	2	2	2
50	272	10045802	27	upper middle	2	2	2	99	G3P2L2	1	36 weeks 1	160	70	27.3	2	2	2	3	9	1	2	0	1	1	2	1	2.4 kgs	7	9	12.9	2.56	12.1	1.6	Negative	Negative	1.6	PTVD	1	1	2	2	2	2	2	2	2
51	275	10045673	27	lower	2	1	2	99	Primigravida	1	32 weeks 3 days	154	59	25.6	2	2	2	5	10	1	2	0	1	1	2	1	1.6 kgs	8	9	11.2	2.1	12.6	2	Negative	Negative	1.8	PTVD	1	2	2	1	2	2	2	1	2
52	279	10034768	26	lower middle	2	2	1	3	Primigravida	1	33 weeks 2 days	154	68	28.6	2	2	2	2	6	2	1	1	1	2	2	1	1.7 kg	7	8	12.6	1.8	8.9	3.3	Negative	Negative	1.7	PT emg LSCS	1	2	2	1	2	2	2	1	2
53	280	10034768	21	upper middle	1	1	2	99	Primigravida	1	32 weeks 2 days	154	58	24.27	2	2	2	2	6	2	2	0	1	1	2	1	1.68 kgs	6	7	12.2	2	9.1	2.1	Negative	Negative	1.7	PT emg LSCS	1	2	2	1	2	2	2	2	1
54	283	10067324	25	upper lower	1	2	2	99	Primigravida	1	36 weeks 6 days	154	66	27.8	2	2	2	3	10	1	2	0	1	2	2	1	2.5 kgs	7	9	9.7	2.1	10.7	2.4	Negative	Negative	1.8	PTVD	1	1	2	2	2	2	2	2	2
55	289	10045643	27	upper middle	1	1	2	99	Primigravida	1	36 weeks 2days	154	60	26	2	2	2	2	5	2	2	0	1	1	2	1	3 kgs	7	9	10.6	2.37	10.6	1.2	Negative	Negative	1.8	PT emg LSCS	1	1	2	2	2	2	2	2	2
56	291	10023459	26	lower	1	2	2	99	Primigravida	1	36 weeks	150	60	26.6	2	2	2	4	10	1	2	0	1	1	2	2	2.5 kgs	8	9	11.3	2.1	10.8	1	Negative	Negative	1.7	PTVD	1	1	2	2	2	2	2	2	2
57	295	10023456	26	lower middle	1	2	2	99	Primigravida	1	36 weeks 2days	151	53	23.24	2	2	2	2	5	2	2	0	1	1	2	1	2.3 kgs	7	8	13	1.87	11.2	1.1	Negative	Negative	1.6	PT emg LSCS	1	2	1	2	2	2	2	2	2
58	298	10023457	30	upper middle	1	2	2	99	G3P1L1E1	1	34 weeks 1day	154	110	46.4	2	2	2	3	8	1	2	0	1	1	2	2	2.6 kgs	8	9	12.5	1.87	13.6	2.6	Negative	Negative	1.7	PT emg LSCS	1	1	2	2	2	2	2	2	2
59	304	10045673	30	upper lower	2	3	2	99	G2A1	1	34 weeks 1day	154	60	26.6	2	2	2	4	10	1	2	0	1	1	2	2	2.7 kgs	7	9	12	2.3	13	1.7	Negative	Negative	1.8	PTVD	1	2	1	2	2	2	2	2	2
60	306	10024536	21	lower	1	1	2	99	Primigravida	1	31 weeks	150	60	26.6	2	2	2	3	10	2	2	0	1	1	2	1	2.7 kgs	7	9	12.7	2.2	14	1	Negative	Negative	1.8	PTVD	1	1	2	2	2	2	2	2	2
61	213	10056789	31	upper lower	2	2	2	99	G2A1	1	36 weeks 5 days	156	62	25.5	2	2	2	2	5	2	2	0	1	1	2	2	2 kgs	7	9	13	2.12	13.7	2.1	Negative	Negative	1.7	PT emg LSCS	1	2	1	2	2	2	2	2	2
62	319	10045673	24	upper lower	2	3	2	99	Primigravida	1	35 weeks 3 days	164	64	23.8	2	2	2	2	5	2	2	0	1	1	2	2	1.7 kgs	7	9	10.4	2.34	15.4	3	Negative	Negative	1.4	PT emg LSCS	1	2	2	1	2	2	2	1	2
63	325	10034562	23	upper middle	2	2	2	99	Primigravida	1	36 weeks	150	62	27.5	2	2	2	3	8	1	2	0	1	1	2	2	2.5 kgs	7	9	12.4	1.28	12.7	1.21	Negative	Negative	1.6	PTVD	1	1	2	2	2	2	2	2	2
64	326	10078342	24	upper middle	2	3	2	99	Primigravida	1	35 weeks 1 day	156	62	25.2	2	2	2	4	9	1	2	0	1	1	2	2	2.4 kgs	7	2.4	12.9	3.2	10.7	2.1	Negative	Negative	1.7	PTVD	1	1	2	2	2	2	2	2	2
65	333	10098567	28	upper lower	2	3	2	99	G2P1L1	1	35 weeks 5 days	156	60	24.6	2	2	2	5	10	1	2	0	1	1	2	1	3 kgs	7	8	11.3	3.1	10.2	2.1	Negative	Negative	1.7	PTVD	1	1	2	2	2	2	2	2	2
66	339	10034562	23	upper middle	2	6	2	99	G3P2L2	1	32 weeks	150	70	31	2	2	2	9	11	1	2	0	1	1	2	1	2.6 kgs	7	8	9	3.2	11.5	4.3	Negative	Negative	1.7	PTVD	1	1	2	2	2	2	2	2	2
67	345	10023452	28	lower middle	2	6	2	99	G2P1L1	1	30 weeks 2 days	150	60	26.6	1	2	2	3	9	2	2	0	1	1	2	1	1.4 kgs	7	8	11.2	3.5	13.4	2.4	Negative	Negative	1.7	PTVD	1	2	2	1	2	2	2	1	2
68	352	10023456	27	upper middle	2	2	2	99	Primigravida	1	34 weeks 1 day	158	54	21.6	1	2	2	5	9	2	2	0	1	1	2	2	2 kgs	7	9	11	2.5	12.6	1.21	Negative	Negative	1.6	PTVD	1	2	1	2	2	2	2	2	2
69	359	10067895	25	upper middle	2	6	2	99	G3P1L1A1	1	35 weeks 5 days	148	68	31	1	2	2	10	12	2	2	0	1	1	2	1	2.1 kgs	7	9	15.1	2.6	11.1	1.14	Negative	Negative	1.8	PTVD	1	2	1	2	2	2	2	2	2
70	362	10056784	24	upper middle	2	1	2	99	Primigravida	1	30 weeks 2 days	154	68	28.6	2	2	2	4	9	1	2	0	1	1	2	1	1.4 kgs	6	7	13.2	2.5	13.2	1.21	Negative	Negative	1.5	PTVD	1	2	2	1	2	2	2	1	2
71	377	10034678	33	upper lower	1	5	2	99	G2P1L1	1	38 weeks 2 day	154	75	31.6	2	2	2	3	6	1	2	0	2	1	2	1	2.45 kgs	8	9	12.1	2.13	10.2	2.1	Negative	Negative	2	FTND	1	1	2	2	2	2	2	2	2
72	378	10034566	32	upper middle	1	2	2	99	Primigravida	1	39 weeks 5 days	160	60	23.4	2	2	2	4	9	1	2	0	2	99	2	1	2.9 kgs	7	9	10.2	2.36	10.5	2.3	Negative	Negative	1.8	FTND	1	1	2	2	2	2	2	2	2

73	389	10049768	31	lower middle	2	3	2	99	Primigravida	1	37 weeks 3days	160	64	25	2	2	2	2	5	1	2	0	2	99	2	1	3.1 kgs	8	9	11.2	1.85	8.8	3.1	Negative	Negative	1.9	FTND	1	1	2	2	2	2	2	2	2
74	397	10043427	24	lower	1	2	2	99	Primigravida	1	38 weeks 1 day	156	64	26.2	2	2	2	4	9	1	2	0	2	99	2	2	3.2 kgs	6	8	13	1.98	7.8	0.69	Negative	Negative	2	FTND	1	1	2	2	2	2	2	2	2
75	399	10049765	30	lower middle	2	2	2	99	G2A1	1	38 weeks 5 days	164	64	24.3	2	2	2	5	9	1	2	0	2	99	2	1	2.5 kgs	7	8	10	1.85	0.2	1.1	Negative	Negative	2.1	FTND	1	1	2	2	2	2	2	2	2
76	401	10048965	26	lower middle	2	3	2	99	Primigravida	1	38 weeks 4 days	164	70	26.02	2	2	2	2	5	1	2	0	2	99	2	1	2.6 kgs	7	7	9.7	1.47	6.8	2.5	Negative	Negative	2.2	FTND	1	1	2	2	2	2	2	2	2
77	403	10049765	36	lower middle	1	1	2	99	Primigravida	1	39 weeks 4 days	156	60	24.6	2	2	2	3	5	1	2	0	2	99	2	1	2.7 kgs	7	8	12.6	1.69	7.8	3.1	Negative	Negative	2	FTND	1	1	2	2	2	2	2	2	2
78	406	10048243	20	lower middle	1	4	2	99	G2P1L1	1	40 weeks 2 days	164	60	22.8	2	2	2	2	6	1	2	0	2	99	2	2	2.8 kgs	7	9	12.5	2.31	7.4	3.3	Negative	Negative	1.8	FTND	1	1	2	2	2	2	2	2	2
79	409	10045423	25	upper lower	1	4	2	99	G2A1	2	40 weeks 2 days	164	64	23.7	2	2	2	3	8	1	2	0	2	99	2	1	2.7 kgs	8	9	11	1.78	8.1	1.1	Negative	Negative	1.9	FTND	1	1	2	2	2	2	2	2	2
80	412	10048967	26	upper middle	1	2	2	99	G2P1L1	1	39 weeks 4 days	156	68	27.9	2	2	2	10	11	1	2	0	2	99	2	2	2.7 kgs	8	9	11.5	2.36	12.5	1	Negative	Negative	1.8	FTND	1	1	2	2	2	2	2	2	2
81	418	10049761	30	upper lower	2	5	2	99	G2P1L1A1	1	38 weeks 1 day	152	58	25.1	2	2	2	1	5	1	2	0	2	99	2	1	2.7 kgs	8	9	11	2.56	11.6	1.5	Negative	Negative	1.7	FTND	1	1	2	2	2	2	2	2	2
82	422	10048675	29	upper middle	1	4	2	99	G2A2	1	38 weeks 1day	156	60	24.6	2	2	2	2	3	1	2	0	2	99	2	2	2.6 kgs	8	9	11.2	1.89	10.5	1.6	Negative	Negative	1.6	FTND	1	1	2	2	2	2	2	2	2
83	423	10048632	21	lower middle	2	2	2	99	Primigravida	1	38 weeks 3 days	156	64	26.2	2	2	2	5	10	1	2	0	2	99	2	1	2.7 kgs	9	9	11.3	1.69	10.8	0.7	Negative	Negative	1.9	FTND	1	1	2	2	2	2	2	2	2
84	428	10048965	19	lower middle	1	1	2	99	Primigravida	1	37 weeks 5 days	158	66	26.4	2	2	2	3	7	1	2	0	2	99	2	2	2.6 kgs	7	9	12.2	2.11	11.6	1.9	Negative	Negative	1.8	FTND	1	1	2	2	2	2	2	2	2
85	429	10049654	26	upper lower	1	2	2	99	G2A1	1	38 weeks 2 day	152	60	25.9	2	2	2	2	6	1	2	0	2	99	2	2	2.8 kgs	7	9	12.4	2.36	12.8	1.6	Negative	Negative	2	FTND	1	1	2	2	2	2	2	2	2
86	432	10045643	20	upper middle	2	1	2	99	Primigravida	1	38 weeks	144	50	25.5	2	2	2	2	3	1	2	0	2	99	2	2	3.1 kgs	7	8	13.5	3.01	12.6	2.3	Negative	Negative	1.8	FT emg LSCS	1	1	2	2	2	2	2	2	2
87	434	10046963	26	upper middle	1	6	2	99	G2P1L1	1	39 weeks 5 days	150	60	26.6	2	2	2	3	8	1	2	0	2	99	2	1	3 kga	6	7	11.9	2.86	13.5	2.5	Negative	Negative	1.9	FTND	1	1	2	2	2	2	2	2	2
88	437	10045678	21	upper lower	1	1.5	2	99	Primigravida	1	39 weeks 3 days	156	68	27.9	2	2	2	3	7	1	2	0	2	99	2	2	2 kgs	7	9	13	1.69	14.5	26	Negative	Negative	2.1	FTND	1	1	2	2	2	2	2	2	2
89	439	10047108	23	upper lower	1	5	2	99	G2P1L1	1	38 weeks 6 days	160	98	38.2	2	2	2	3	8	1	2	0	2	99	2	1	2.9 kgs	7	9	12.7	1.56	14.5	2.6	Negative	Negative	2	FT emg LSCS	1	1	2	2	2	2	2	2	1
90	440	10046639	34	upper middle	1	2	2	99	G2A1	1	39 weeks 5 days	156	60	25	2	2	2	3	7	1	2	0	2	99	2	2	2.9 kgs	7	9	11.7	1.78	13	2.4	Negative	Negative	2	FT emg LSCS	2	1	2	2	2	2	2	2	2
91	444	10047256	25	upper middle	1	1	2	99	Primigravida	1	39 weeks 4 days	154	54	22.7	2	2	2	4	9	1	2	0	2	99	2	1	3.3 kgs	7	9	13	2.36	12	2.4	Negative	Negative	2.1	FTND	1	1	2	2	2	2	2	2	2
92	446	10046832	22	lower middle	2	5	2	99	G2A1	1	39 weeks 5 days	148	59	26.9	2	2	2	3	7	1	2	0	2	99	2	1	3 kgs	8	9	13.9	2.56	11.6	2.4	Negative	Negative	1.9	FTND	1	1	2	2	2	2	2	2	2
93	448	10047623	24	lower middle	1	4	2	99	G2P1L1	1	38 weeks 2 day	158	44	17.6	2	2	2	4	10	1	2	0	2	99	2	1	2.6 kgs	7	9	11.1	2.89	10.6	2.1	Negative	Negative	2	FTND	1	1	2	2	2	2	2	2	1
94	449	10047552	28	upper middle	1	7	1	3	G4P2L2A1	1	38 weeks 4 days	160	68	26.5	2	2	2	3	7	1	2	0	2	99	2	1	2.8 kgs	8	9	13.1	2.11	10.8	2	Negative	Negative	2	FTND	1	1	2	2	2	2	2	2	2
95	450	10047746	30	upper middle	2	3	2	99	Primigravida	1	39 weeks 6 days	156	68	27.94	2	2	2	3	8	2	2	0	2	99	2	1	3.5 kgs	7	9	12.8	2.03	15.6	2.3	Negative	Negative	2.1	FTND	1	1	2	2	2	2	2	2	2
96	453	10048034	26	upper middle	1	4	2	99	G2P1L1	1	37 weeks 5 days	156	65	26.7	2	2	2	10	12	1	2	0	2	99	2	1	2.5 kgs	7	8	2	1.65	10.4	2.4	Negative	Negative	2.2	FTND	1	1	2	2	2	2	2	2	2
97	458	10047963	28	upper lower	1	2	2	99	Primigravida	1	38 weeks 4 days	144	50	25.5	2	2	2	3	8	1	2	0	2	99	2	1	2.5 kgs	7	9	11	1.58	10.6	2.1	Negative	Negative	1.7	FTND	1	1	2	2	2	2	2	2	2
98	459	10048569	32	upper lower	2	5	2	99	G2P1L1	1	38 weeks 5 days	156	70	28.7	2	2	2	3	7	1	2	0	2	99	2	1	2.1 kgs	8	9	11.1	1.56	14	2.2	Negative	Negative	1.6	FTND	1	2	1	2	2	2	2	2	1
99	461	10048640	26	lower middle	1	4	2	99	G2P1L1	1	37 weeks 5 days	156	60	25	2	2	2	3	5	2	2	0	2	99	2	2	2.5 kgs	8	9	11.7	1.89	12.1	1.2	Negative	Negative	2.1	FT emg LSCS	1	1	2	2	2	2	2	2	2
100	464..	10048678	24	lower middle	1	1.5	2	99	G3P2L2	1	38 weeks 6 days	164	68	26	2	2	2	3	6	1	2	0	2	99	2	1	3.1 kgs	8	9	11.9	1.79	10.3	1.8	Negative	Negative	1.8	FTND	1	1	2	2	2	2	2	2	2
101	467	10048237	32	upper middle	1	1	2	99	Primigravida	1	39 weeks 3 days	164	66	25.3	2	2	2	3	7	1	2	0	2	99	2	2	3.3 kgs	8	9	9.9	159	11.6	1.6	Negative	Negative	1.9	FTND	1	1	2	2	2	2	2	2	2
102	469	10048611	23	upper lower	2	4	2	99	G3P1L1A1	1	39 weeks 1 day	168	68	24.2	2	2	2	4	9	1	2	0	2	99	2	1	3.2 kgs	8	9	10.7	2.13	10.4	1.4	Negative	Negative	2.1	FT emg LSCS	1	1	2	2	2	2	2	2	2
103	472	10048914	23	lower middle	1	1	2	99	Primigravida	1	38 weeks 4 days	154	62	26.9	2	2	2	3	7	1	2	0	2	99	2	2	2.7 kgs	7	9	13.3	2.21	11.3	1.8	Negative	Negative	1.6	FTND	1	2	2	1	2	2	2	2	2
104	474	10049342	24	lower middle	2	1.5	2	99	G2P1L1	1	39 weeks 4 days	154	60	26	2	2	2	3	7	1	2	0	2	99	2	1	2.5 kgs	7	8	10.4	2.34	11.4	2	Negative	Negative	1.4	FTND	1	1	2	2	2	2	2	2	2
105	476	10045678	23	upper lower	1	3	2	99	G2P1L1	1	38 weeks 4 days	166	68	25.1	2	2	2	2	6	1	2	0	2	99	2	1	2.5 kgs	8	9	12.1	2.56	10.8	2.3	Negative	Negative	2.1	FTND	1	1	2	2	2	2	2	2	2
106	478	10049430	26	lower	2	1	2	99	Primigravida	1	40 weeks	160	89	35.6	2	2	2	3	7	1	2	0	2	99	2	2	2.7 kgs	7	9	12.7	1.23	11.9	2.9	Negative	Negative	1.6	FTND	1	1	2	2	2	2	2	2	2
107	479	10049444	24	lower middle	1	7	2	99	G4P3L3	1	37 weeks 3 days	166	70	25.9	2	2	2	4	9	1	2	0	2	99	2	1	2.7 kgs	7	9	9.4	1.56	10.3	3.1	Negative	Negative	1.8	FTND	1	1	2	2	2	2	2	2	2
108	484	10049759	22	lower	2	3	2	99	Primigravida	1	39 weeks 5 days	150	64	28.4	2	2	2	5	10	1	2	0	2	99	2	2	2.5 kgs	8	9	13	1.89	10.4	3	Negative	Negative	1.9	FTND	1	1	2	2	2	2	2	2	2
109	485	10049500	24	lower middle	1	3	2	99	Primigravida	1	40 weeks 2 days	154	60	25.3	2	2	2	3	7	1	2	0	2	99	2	1	3.5 kgs	8	9	9.8	2.11	12	3.1	Negative	Negative	2.2	FTND	1	1	2	2	2	2	2	2	2
110	487	10049802	24	upper lower	1	3	2	99	Primigravida	1	38 weeks 1 day	160	68	26.5	2	2	2	3	6	1	2	0	2	99	2	2	2.6 kgs	8	9	12	2.32	7.8	2.7	Negative	Negative	2.1	FTND	1	1	2	2	2	2	2	2	2
111	490	10049709	24	upper middle	2	2	2	99	G2A1	1	40 weeks 6 days	164	60	22.8	2	2	2	3	7	1	2	0	2	99	2	2	2.5 kgs	8	9	10.6	2.56	85	2.5	Negative	Negative	1.8	FT emg LSCS	2	2	2	1	2	2	2	2	1
112	494	10049764	24	upper lower	2	3	2	99	Primigravida	1	40 weeks 3 days	164	64	23.7	2	2	2	2	5	1	2	0	2	99	2	1	2.7 kgs	8	9	10.5	2.06	9.3	2.1	Negative	Negative	1.8	FTND	1	1	2	2	2	2	2	2	2
113	498	10056789	19	upper lower	2	1	2	99	Primigravida	1	39 weeks 1 day	156	68	27.9	2	2	2	3	6	1	2	0	2	99	2	2	3.1 kgs	8	9	9.8	2.11	7.9	1.3	Negative	Negative	1.9	FTND	1	1	2	2	2	2	2	2	2
114	504	10050078	24	upper middle	2	4	2	99	G2P1L1	1	39 weeks 3 days	152	58	25.1	2	2	2	3	7	1	2	0	2	99	2	2	2.6 kgs	8	9	12.4	2.05	11.3	1.4	Negative	Negative	1.8	FTND	1	1	2	2	2	2	2	2	2
115	510	10050441	22	lower middle	2	5	2	99	G2P1L1	1	37 weeks 3days	156	60	24.6	2	2	2	2	5	1	2	0	2	99	2	2	2.5 kgs	8	9	10.2	2.11	7.3	1.5	Negative	Negative	1.9	FTND	1	1	2	2	2	2	2	2	2
116	532	10050204	26	lower middle	1	5	2	99	G2P1L1	1	39 weeks 6 days	156	64	26.2	2	2	2	2	5	1	2	0	2	99	2	2	3.2 kgs	8	9	14.1	1.89	8.6	1.4	Negative	Negative	1.8	FTND	1	1	2	2	2	2	2	2	2

117	535	10050456	21	lower	1	3	2	99	Primigravida	1	38 weeks 5 days	158	66	26.4	1	2	2	2	5	1	2	0	2	99	2	2	2.8 kgs	8	9	9.4	1.87	11.6	1.2	Negative	Negative	2.1	FTND	1	1	2	2	2	2	2	2	2
118	546	10050647	25	lower middle	2	2	2	99	Primigravida	1	38 weeks 1 day	152	60	25.9	2	2	2	2	5	1	2	0	2	99	2	2	2.5 kgs	8	9	12.9	2.18	12	2	Negative	Negative	2	FTND	1	1	2	2	2	2	2	2	2
119	558	10050671	21	upper lower	1	2	2	99	Primigravida	1	37 weeks 5 days	144	50	25.5	2	2	2	2	6	1	2	0	2	99	2	1	3.5 kgs	8	9	9.4	3.12	13.6	2.1	Negative	Negative	1.9	FTND	1	1	2	2	2	2	2	2	2
120	559	10050789	23	upper middle	1	4	2	99	G2P1L1	1	39 weeks 6 days	150	60	26.6	2	2	2	2	9	1	2	0	2	99	2	2	3.5 kgs	8	9	12.3	2.45	13.5	2.1	Negative	Negative	2.1	FTND	1	1	2	2	2	2	2	2	2
121	563	10045678	34	upper middle	1	2	2	99	G2A1	1	39 weeks 5 days	156	60	25	2	2	2	3	7	1	2	0	2	99	2	2	2.9 kgs	7	9	11.7	1.78	13	2.4	Negative	Negative	2	FTND	1	2	2	1	1	2	2	2	2
122	564	10034567	25	upper middle	1	1	2	99	Primigravida	1	39 weeks 4 days	154	54	22.7	2	2	2	4	9	1	2	0	2	99	2	1	3.3 kgs	7	9	13	2.36	12	2.4	Negative	Negative	2.1	FTND	1	1	2	2	2	2	2	2	2
123	568	10045634	22	lower middle	2	5	2	99	G2A1	1	39 weeks 5 days	148	59	26.9	2	2	2	3	7	1	2	0	2	99	2	1	3 kgs	8	9	13.9	2.56	11.6	2.4	Negative	Negative	1.9	FTND	1	1	2	2	2	2	2	2	2
124	570	10005678	24	lower middle	1	4	2	99	G2P1L1	1	38 weeks 2 day	158	44	17.6	2	2	2	4	10	1	2	0	2	99	2	1	2.6 kgs	7	9	11.1	2.89	10.6	2.1	Negative	Negative	2	FTND	1	2	2	2	2	2	2	2	2
125	574	10045734	28	upper middle	1	7	1	3	G4P2L2A1	1	38 weeks 4 days	160	68	26.5	2	2	2	3	7	1	2	0	2	99	2	1	2.8 kgs	8	9	13.1	2.11	10.8	2	Negative	Negative	2	FTND	1	1	2	2	2	2	2	2	2
126	573	10056784	30	upper middle	2	3	2	99	Primigravida	1	39 weeks 6 days	156	68	27.94	2	2	2	3	8	2	2	0	2	99	2	1	3.5 kgs	7	9	12.8	2.03	15.6	2.3	Negative	Negative	2.1	FTND	2	1	2	2	2	2	2	2	2
127	578	10045786	26	upper middle	1	4	2	99	G2P1L1	1	37 weeks 5 days	156	65	26.7	2	2	2	10	12	1	2	0	2	99	2	1	2.5 kgs	7	8	2	1.65	10.4	2.4	Negative	Negative	2.2	FTND	1	2	2	1	2	2	2	2	2
128	581	10045789	28	upper lower	1	2	2	99	Primigravida	1	38 weeks 4 days	144	50	25.5	2	2	2	3	8	1	2	0	2	99	2	1	2.5 kgs	7	9	11	1.58	10.6	2.1	Negative	Negative	1.7	FT emg LSCS	1	1	2	2	2	2	2	2	2
129	582	10045786	32	upper lower	2	5	2	99	G2P1L1	1	38 weeks 5 days	156	70	28.7	2	2	2	3	7	1	2	0	2	99	2	1	2.1 kgs	8	9	11.1	1.56	14	2.2	Negative	Negative	1.6	FTND	1	2	1	2	2	2	2	2	2
130	583	10043245	26	lower middle	1	4	2	99	G2P1L1	1	37 weeks 5 days	156	60	25	2	2	2	3	5	2	2	0	2	99	2	2	2.5 kgs	8	9	11.7	1.89	12.1	1.2	Negative	Negative	2.1	FTND	1	1	2	2	2	2	2	2	2
131	584	10045642	24	lower middle	1	1.5	2	99	G3P2L2	1	38 weeks 6 days	164	68	26	2	2	2	3	6	1	2	0	2	99	2	1	3.1 kgs	8	9	11.9	1.79	10.3	1.8	Negative	Negative	1.8	FTND	1	1	2	2	2	2	2	2	2
132	586	10045672	32	upper middle	1	1	2	99	Primigravida	1	39 weeks 3 days	164	66	25.3	2	2	2	3	7	1	2	0	2	99	2	2	3.3 kgs	8	9	9.9	159	11.6	1.6	Negative	Negative	1.9	FTND	1	1	2	2	2	2	2	2	2
133	587	10043265	23	upper lower	2	4	2	99	G3P1L1A1	1	39 weeks 1 day	168	68	24.2	2	2	2	4	9	1	2	0	2	99	2	1	3.2 kgs	8	9	10.7	2.13	10.4	1.4	Negative	Negative	2.1	FT emg LSCS	1	1	2	2	2	2	2	2	2
134	589	10078564	23	lower middle	1	1	2	99	Primigravida	1	38 weeks 4 days	154	62	26.9	2	2	2	3	7	1	2	0	2	99	2	2	2.7 kgs	7	9	13.3	2.21	11.3	1.8	Negative	Negative	1.6	FTND	1	1	2	2	2	2	2	2	2
135	590	10045637	24	lower middle	2	1.5	2	99	G2P1L1	1	39 weeks 4 days	154	60	26	2	2	2	3	7	1	2	0	2	99	2	1	2.4 kgs	7	8	10.4	2.34	11.4	2	Negative	Negative	1.4	FTND	1	2	1	2	2	2	2	2	2
136	591	10056783	23	upper lower	1	3	2	99	G2P1L1	1	38 weeks 4 days	166	68	25.1	2	2	2	2	6	1	2	0	2	99	2	1	2.5 kgs	8	9	12.1	2.56	10.8	2.3	Negative	Negative	2.1	FTND	1	1	2	2	2	2	2	2	2
137	592	10023456	26	lower	2	1	2	99	Primigravida	1	40 weeks	160	89	35.6	2	2	2	3	7	1	2	0	2	99	2	2	2.7 kgs	7	9	12.7	1.23	11.9	2.9	Negative	Negative	1.6	FTND	1	1	2	2	2	2	2	2	2
138	594	10023453	24	lower middle	1	7	2	99	G4P3L3	1	37 weeks 3 days	166	70	25.9	2	2	2	4	9	1	2	0	2	99	2	1	2.7 kgs	7	9	9.4	1.56	10.3	3.1	Negative	Negative	1.8	FT emg LSCS	1	2	2	2	2	2	2	2	2
139	597	10045789	22	lower	2	3	2	99	Primigravida	1	39 weeks 5 days	150	64	28.4	2	2	2	5	10	1	2	0	2	99	2	2	2.4 kgs	8	9	13	1.89	10.4	3	Negative	Negative	1.9	FTND	1	2	1	2	2	2	2	2	2
140	598	10034567	24	lower middle	1	3	2	99	Primigravida	1	40 weeks 2 days	154	60	25.3	2	2	2	3	7	1	2	0	2	99	2	1	3.5 kgs	8	9	9.8	2.11	12	3.1	Negative	Negative	2	FTND	1	1	2	2	2	2	2	2	2