A DISSERTATION ON

"ELEVATED BETA HUMAN CHORIONIC GONADOTROPHIN IN SECOND TRIMESTER IN COMPARISON TO ROLL OVER TEST AS A PREDICTOR FOR PRE ECLAMPSIA"

A Dissertation submitted in partial fulfillment of the requirements for the degree of

M.D. DEGREE EXAMINATION
BRANCH II – OBSTETRICS & GYNECOLOGY
STANLEY MEDICAL COLLEGE, CHENNAI.

Dissertation Submitted to

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

APRIL 2011

INSTITUTIONAL ETHICAL COMMITTEE, STANLEY MEDICAL COLLEGE, CHENNAI-3

Title of the Work :	Elevated Beta Human Chorionic Gonadotrophin in Second Trimester in Comparison to roll over test as a predictor for pre eclampsia
Principal Investigator	: Dr.S.Vidhubala
Designation	: PG in MD(O&G),
Department	: O&G

The request for an approval from the Institutional Ethical Committee (IEC) was considered on the IEC meeting held on 15.04.2010 at the Modernised Seminar Hall, Stanley Medical College, Chennai-1 at 2PM

The members of the Committee, the secretary and the Chairman are pleased to approve the proposed work mentioned above, submitted by the principal investigator.

The Principal investigator and their team are directed to adhere to the guidelines given below:

1. You should inform the IEC in case of changes in study procedure, site investigator investigation or guide or any other changes.
2. You should not deviate form the area of the work for which you applied for ethical clearance.
3. You should inform the IEC immediately, in case of any adverse events or serious adverse reaction.
4. You should abide to the rules and regulation of the institution(s).
5. You should complete the work within the specified period and if any extension of time is required, you should apply for permission again and do the work.
6. You should submit the summary of the work to the ethical committee on completion of the work.

18/5/10

SECRETARY
IEC, SMC, CHENNAI

SECRETARY
ETHICAL COMMITTEE,
STANLEY MEDICAL COLLEGE
CHENNAI-600 001.

CERTIFICATE

This is to certify that the dissertation titled, **"ELEVATED BETA HUMAN CHORIONIC GONADOTROPHIN IN SECOND TRIMESTER IN COMPARISON TO ROLL OVER TEST AS A PREDICTOR FOR PRE ECLAMPSIA"** is an original work done by **Dr.S.VIDHUBALA**, Post Graduate Student, Govt. RSRM Lying in Hospital attached to Stanley Medical College, Chennai-1, under my supervision and guidance.

Dr.C.VAMSADHARA, M.D.,Ph.D.,
Dean
Stanley Medical College
Chennai-1

Dr.SHANTHI DINAKARAN, M.D., D.G.O.
Superintendent,
Govt. RSRM Lying in Hospital,
Stanley Medical College
Chennai -1

Place: Chennai-1
Date :

ACKNOWLEDGEMENT

I owe my thanks to **Dr.C.Vamsadhara,M.D,Ph.D.,** Dean, Government Stanley Medical College for allowing me to avail the facilities needed for my dissertation work.

I am grateful to **Prof.Dr.Shanthi Dinakaran, M.D,D.G.O** Superintendent of Government RSRM – Lying in Hospital for permitting me to do the study and for her encouragement.

I express my sincere gratitude to **Prof.Dr.N.Hepzibha Kirubamani, M.D,D.G.O.,PhD.,** under whose expert guidance and encouragement, I was able to complete this study.

I express my deep sense of sincere thanks to **Prof.DrN.Bagyalakshmi, M.D, D.G.O,** for her guidance and suggestions for the completion of this study.

I am extremely thankful to **Prof.Dr.K.Rukmani, M.D, D.G.O** for her valuable suggestions.

I owe my sincere gratitude to our **Prof.Dr.Kalaivani, M.D, D.G.O** and **ProfDr.D.Tamilselvi M.D** for their constant guidance and encouragement.

I am also thankful to Mr.Sathish, Thyrocare laboratories for helping me to get lab values fastly for the study.

Last, but not the least my sincere thanks to all the patients who co-operated for this study without whom this study could not have been completed.

CONTENTS

INTRODUCTION

coming events cast their shadow before

INTRODUCTION

Gestational hypertension is a multisystem disorder, affecting virtually every organ and system in the body. Pre eclampsia denotes development of proteinuria >1+ along with gestational hypertension. Pre-eclampsia develops usually after 20 weeks of pregnancy. It is a major cause of maternal, fetal, neonatal morbidity and mortality.

If we wish to prevent such disorder we must seek ways of preventing the disease process. In preventing this disorder the most important limiting factor is lack of timely prediction. Several methods of identifying pregnant women who are at risk for pre eclampsia have been proposed. These include the use of angiotension II pressor response, roll over test, the isometric hand grip exercise test and the mean arterial pressure test. Many tests have limitations as screening tools in the clinical setting because of either their complexity, the high incidence of false positive results or the subjective nature of result interpretation.

HCG has been acknowledged as hormone for years. Recent studies have revealed its immunological role. Placental function changes in the form of increased Serum Beta HCG has been documented and several prospective studies showed changes in the hormone level which may present before the clinical diagnosis of pre-eclampsia. Many reasons have been postulated for suspecting the role of HCG in predicting immunological condition in obstetrics (Sayeed et al 1984).

The purpose of this study is to determine whether elevated Serum Beta HCG in (early) second trimester in comparison with roll over test is a better predictor of Pre-eclampsia.

REVIEW OF

LITERATURE

REVIEW OF LITERATURE

Hypertensive disorders are the most common medical complications of pregnancy. Pre-eclampsia / Eclampsia have been recognized as clinical entity since the time of Hippocrates.

In 1916 zweiff first termed pre-eclampsia as “TOXEMIA” the disease of theories

Beverage wrote hat eclampsia was mentioned in the ancient Egyptian, Chinese, Indian and Greek literature. Probably the oldest reference is in the Atharva Vedha 200 BC.

Rossilin (1513) described convulsion as one of the ominous sign during pregnancy.

Bossier coined the word eclampsia differentiating eclampsia from epilepsy.

Lever (1843) discovered proteinuria in pre-eclampsia.

The most common forms of hypertension are gestational hypertension which accounts for 70% of hypertension during pregnancy and pre-existing chronic hypertension which is responsible for most of the remaining cases.

Hypertensive disorders are associated with increased maternal and perinatal mortality and present a wide spectrum of disorders, ranging from minimal elevation of blood pressure alone to severe hypertension with multiple organ dysfunction.

Incidence and pre disposing factors

Incidence of pre eclampsia is commonly cited to be about 5% - 10%, although remarkable variations are reported. According to Michael and Deswiet the incidence in primi, fluctuated between 3.0 to 13.7% since 1950 epidemiology. .

Incidence is influenced by parity, race, and genetic factors

Risk factors for Pre-eclampisa

Maternal factors:

1.Primigravidity

Mc.Gillivray in 1959 postulated that primigravidae are fifteen times more likely to develop proteinuria than parous women.

2.Primi paternity

The first conception by the current partner causing pre-eclampsia is also a risk factor (Deswiet 2002).

3. Short period of co habitation

Stable cohabitation with a single partner seems to reduce the risk of pre-eclampsia in the first pregnancy by that partner (Deswiet-2002).

4.**Extremes of age.**

Robillard and Halsey (1992) explained special predisposition to develop pre-eclampsia among teenage pregnant women. The risk increases slightly with age, but is not affected by social class (Baird 1977).

5.Family history of preeclampsia

The predisposition to pre-eclampsia is in part inherited (Chesley and Cooper) (1986), so that a positive family history is a risk factor (Cincotta and Brennecke 1998). Daughters of eclamptic patients have a 3% risk of developing pre-eclampsia (Johnstudd 14th edition)

However there is poor concordance between identical twin sisters (Thornton and Macdonald 1999) so that maternal genes are not a dominant factor.

6. **Previous preeclampsia**

The risk of recurrence varies from 1.9 to 24.9% (Johnstudd, 14th edition).

7.**Obesity**

Obese women are particularly susceptible (Sibai et al., 1997; Ros et al., 1998) although in one series of eclampsia the women tended to be under weight (Obesley 1984).

Obesity is associated with constellation of other medical problems including type II diabetes and hypertension (Syndrome X). The separate parts of this constellation of having all been associated with an increasing tendency to pre eclampsia (Kaaja et al., 1999)

8.**Medical disorders.**

i. Diabetes increased incidence of hypertensive disorder in pregnant diabetic females with combined incidence of 30%.

ii. Chronic Hypertension → Women with chronic hypertension are 3-7 times more likely to develop higher blood pressure combined with proteinuria.

iii. Chronic renal disease :Women having renal disease are more prone to develop hypertension,superimposed preeclampsia.

iv. Migraine → pre-eclamptics had been repeatedly associated with the condition (Moox and Redman 1983; Marcoux et al., 1992).

v. Antiphospholipid antibody syndrome and thrombophilia; The association with APLA is strong (Branch et al., 1989). Because of the very intense growth restriction that occurs it is said due to poor placentation.

Antiphospholipid antibodies are an acquired cause of thrombophilia. This is a term used to describe a constitutional tendency to thrombo embolism some of which are genetically determined for example possession of factor V leiden gene or antithrombin III deficiency. Thrombophilia is associated with more pregnancy complications and preinatal losses, including pre-eclampsia (Kupfermine et al., 1999).

Asthma: Recently asthma has also been identified as a risk factor (Demissic et al., 1998), although there is evidence that this may

be more associated with coincidental corticosteroid therapy than the disease itself (Schatz et al., 1997).

9.**Stressful Job**

There are a number of reports (for example Klonoff Cohen et al., 1996) suggesting that stress at work may increase the risk of pre-eclampsia.

PLACENTAL / FETAL FACTORS

Considering pre-eclampsia is primarily a placental disease. It is not suprising that placental or fetal factors may increase the risk.

i. Advancing gestational age.

ii. Poor placentation

If it is considered that it is a separate condition that may or may not be associated with pre-eclampsia then it must be also considered to be a powerful predisposing factor (Redman et al., 1999).

iii. Multiple pregnancy (Mac. Gillivray 1959)

iv. Placental hydrops (Jeffcoate and Scott, 1959)

v. Hydatiform mole (Chun et al., 1964)-onset<20 weeks.

vi. Triploidy (Rijhsinghani et al., 1997)

Trisomy-13 (Boyd et al., 1987)

Trisomy-16 mosaicism (Brandenburg et al., 1996).

They all increase the risk by placental mechanisms presumably.

vii. Polyhydramnios (Mac.Gillivray 1959).

viii. Secondary sex ratio

Butter observed an excess of male fetuses in Pre-eclampsia.

GESTATIONAL HYPERTENSION

National high blood pressure education programme working group report on high blood pressure in pregnancy (2000) defines → Gestational hypertension as

- Blood pressure $\geq$ 140/90mm Hg for the first time during pregnancy.
- No proteinuria
- Blood pressure returns to normal $\leq$ 12 weeks postpartum
- Final diagnosis made only postpartum
- May have other signs of pre-eclampsia, for example, epigastric discomfort or thrombocytopenia.

PRE-ECLAMPSIA – CRITERIA

- Blood pressure of more than 140/90mm Hg after 20 weeks if gestation.
- Proteinuria of more than 300mg in 24 hrs or more than 1 + dipstick.

David K.James in his High risk pregnancy defines the criteria for severe pre-eclampsia as one or more of the following.

- Blood pressure reading with the patient at bed rest of atleast 160/110mm Hg on two occasions atleast 6 hours apart.
- Proteinuria levels of atleast 5g in 24 hours urine collection (or 3 + to 4 + on semiquantitative assay)
- Oliguria: 24 hours urinary output of less than 400-500ml
- Cerebral or visual disturbances – altered consciousness, headache, scotomata or blurred vision.
- Pulmonary edema or cyanosis
- Epigastric or right upper quadrant pain – caused by stretching of glisson's capsule. Occasionally the pain precedes hepatic rupture.

- Impaired liver function of unclear etiology.
- Thrombocytopenia (Postulated to be caused by platelet adherence to collagen exposed at sites of disrupted vascular endothelium) below 1 lakh per cubic mm.
- Intra uterine growth restriction or oligohydramnios with abnormal umbilical artery Doppler readings.
- **HELLP** syndrome.

Eclampsia - is the occurence of convulsions in a woman with pre-eclampsia. Eclampsia was not differentiated from Epilepsy until 1739. Ven De Sacevages wrote – all convulsions of acute causation as eclampsia.

THEORIES OF CAUSATION OF PRE-ECLAMPSIA

1.ENDOTHELIAL DYSFUNCTION

Immunologically mediated deficiency in trophoblast invasion of placental bed spiral arterioles lead to poorly perfused fetoplacental unit. This leads to secretion of factors of vascular endothelium. Damaged endothelium aggravates coagulation and increases sensitivity to vasopressor agents.

2.VASOACTIVE COMPOUNDS

A variety of cellular and serum vasoactive factors play a role in the etiology / pathogenesis of pre-eclampsia. Endothelins are potent vasoconstrictors and Endothelin 1 produced by human endothelium is increased in pre-eclamptic females. [Clark 1992, Mastrogiannis 1991, Nover 1991, Schiff 1992]. Nitric oxide, a potent vasodilator synthesized by endothelial cells is shown to be decreased in preeclampsia (Chang and Colleagues in 1992).

Williams obstetrics twenty first edition published the study of Benedetto and associates (2000) that the Nitric oxide production appears to be increased in severe preeclampsia. It appears to be a consequence of hypertension and not the inciting event (Morris and Colleagues, 1996).

In preeclampsia there is increased thromboxanes resulting in increased vasospasm and platelet destruction and increased lipid peroxide induced endothelial damage.

3.IMMUNOLOGICAL MECHANISM

Risk of preeclampsia is enchanced in circumstances where formation of blocking antibodies to antigenic sites in the placenta is impaired. This may arise when numbers of antigenic sites are greater (Beer, 1978) or where immunization by previous pregnancy is lacking.

4.GENETIC PREDISPOSITION

Copper + Liston (1979) suggested that pre-eclampsia is dependent on single recessive gene. Hayward and Co-workers (1992) reported an association between the histocompatibility antigen (HLA-DR 4) and proteinuric hypertension.

Ward and lindheimer (2009) found that specifically seven out of 70 genes found to closely related to development of pre-eclampsia genes for MTH FR, F5 (leiden), AGT, HLA (Various), NOS 3 (Glu 298 ASP),Prothrombin Gene mutation20210A, (ACE I/D at intron 10) polymorphism causes pre-eclampsia. These are called as **candidate genes**.

5.INFLAMMATORY FACTORS

Cytokines, including tumour neurosis factor (TNF α) and the interleukins may contribute to the oxidative stress associated with pre-eclampsia.In this scheme, oxygen free radicals lead to the formation of self-propagating lipid peroxides that in turn propagate highly toxic radicals, which inturn, injure endothelial cells.

PATHOLOGY

Pre-eclampsia is defined as a two stage disorder. According to Redman and colleagues (2009) stage 1 is caused by endovascular trophoblastic remodeling that downstream causes the stage 2 clinical syndrome. Importantly stage 2 is susceptible to modification by pre-existing maternal conditions that include cardiac or renal disease, diabetes, obesity or hereditary influences (Williams obstetrics 23rd edition).

Abnormal trophoblastic invasion.

In pre-eclampsia there may be incomplete trophoblasticinvasion,the deeper myometrial arterioles do not lose their endothelial lining and musculoelastic tissue and their mean external diameter is only half that of vessels in normal placentas (Fisher and colleagues 2009)and remain responsive to vasoconstrictor stimuli (Dixon and Robertson 1961, Broges et al., 1972, Roberston 1976).

Thus it is likely that the abnormally narrow arterioles impair placental flow.Diminished perfusion and a hypoxic environment eventually lead to release of placental debris that incites a systemic inflammatory response.

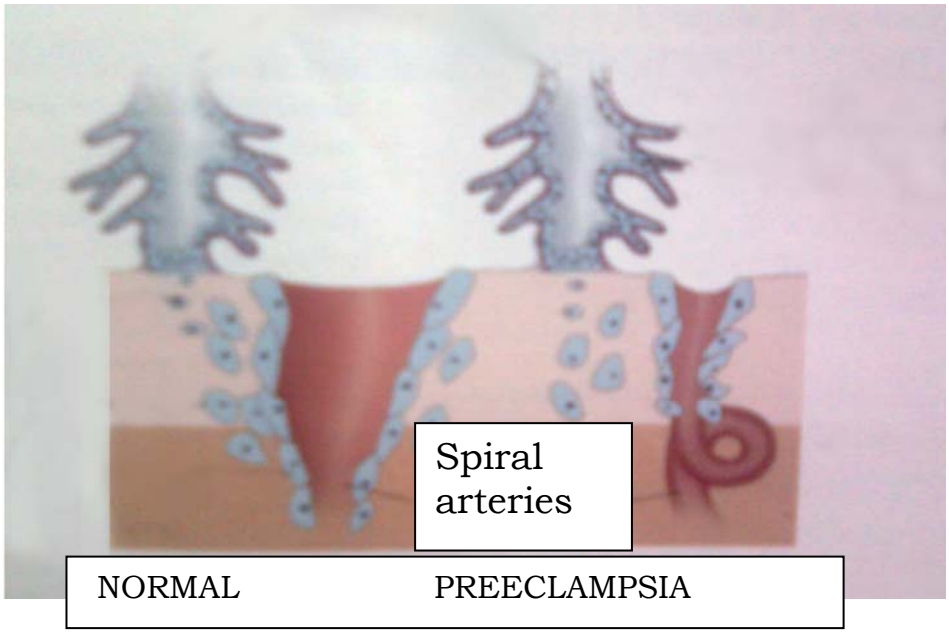
(Redman and Sargent,2008)

ACUTE ATHEROSIS

In spiral arteries, accumulation of lipid in muscle cells in the media which are then taken up by macrophages to produce “Acute atherosis”. (Teek and Assali 1930).This leads to thrombosis and poor placental perfusion.

VASOSPASM

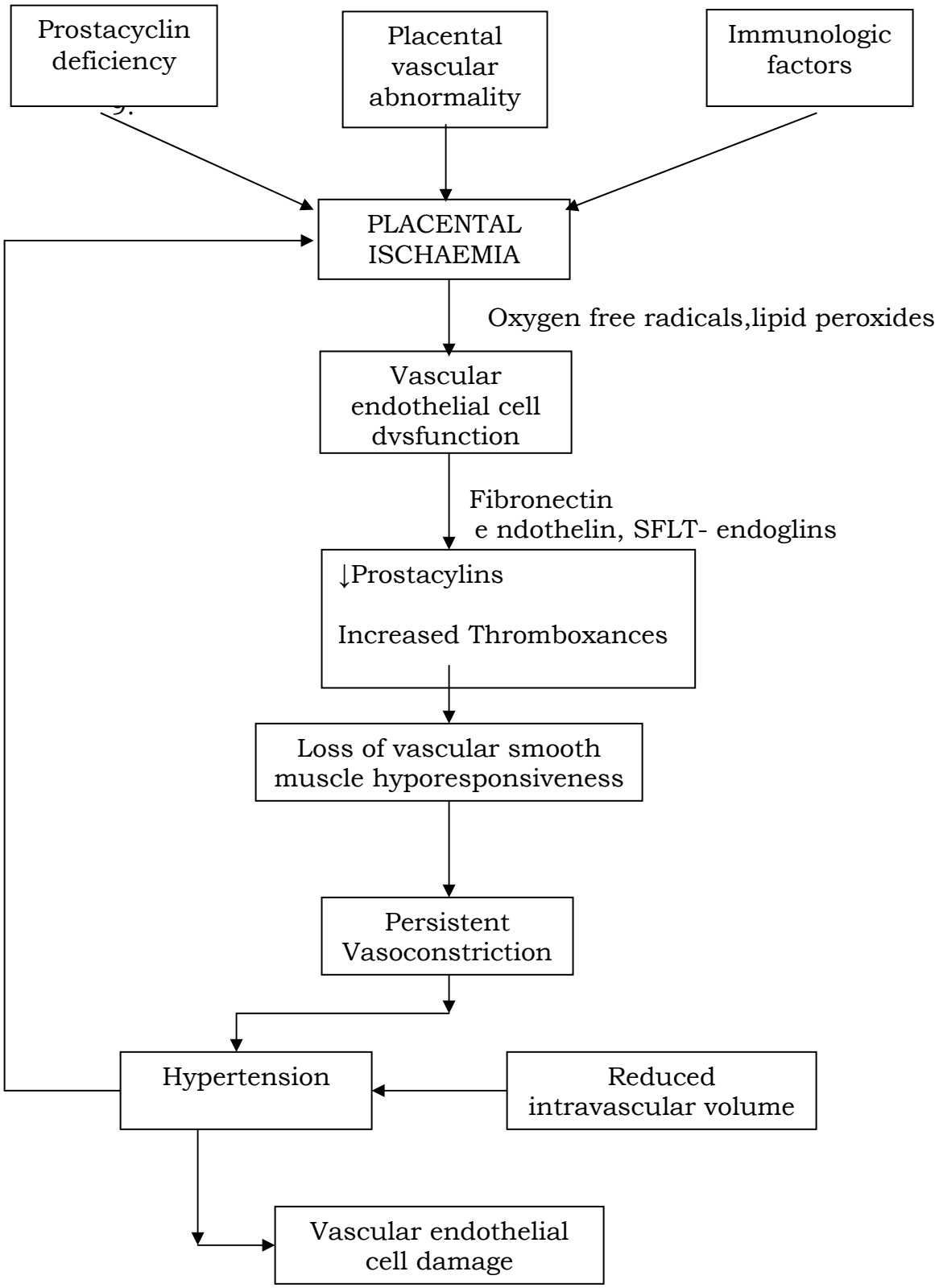
It is the basic factor in preeclampsia. Hypoxia that results leads to the injury that releases thromboplastic substances by placenta into the blood steam which later leads to intravascular coagulation.



Classification of hypertensive disorders in pregnant woman.

1. Gestational hypertension
2. Pre-eclampsia
3. Eclampsia
4. Chronic hypertension
5. Super imposed pre-eclampsia on chronic hypertension

PATHOPHYSIOLOGY OF PRE-ECLAMPSIA



MATERNAL AND FETAL COMPLICATIONS IN PREECLAMPSIA

1. CARDIOVASCULAR CHANGES

i. Increased arterial sensitivity to angiotensin II.

ii. Increased pulse rate and hyperdynamic ventricular function. (Beneditti 1980, Hawkins 1984)

iii. Increased blood pressure.

iv. Decreased circulating blood volume and hemoconcentration.

2. RENAL SYSTEM

i. Decreased renal perfusion and glomerular filtration rate.

ii. Increased serum uric acid (Chesley and Williams 1945).

iii. Serum Creatinine level is elevated two to three times.

iv. Serum Sodium level is increased.

v. Decreased urinary excretion of calcium due to increased tubular reabsorption.

vi. Proteinuria develops later.

Albuminuria occurs due to increased permeability to large molecular weight proteins.

vii. Histopathological lesion is glomerular capillary endotheliosis.

3. LIVER

Derangement in hepatic function occurs. Delayed excretion of Bromosulfothalein and increased SGOT (Serum Oxaloacetate glutamate Transaminase) and Serum Alkaline phosphatase occurs (Combes and Associates and Adam et al., 1972).

Hyperbilirubinimia is uncommon with Pedal edema (Pritchard in 1976).

Anatomical lesion which is the periportal haemorrhagic necrosis in the periphery of the liver lobules leads to increased liver enzymes.

4. COAGULATION SYSTEM

i. Thrombocytopenia occurs in Preeclampsia (Leduc. 1992). Overt decrease to less than 1 lakh per micro litre is an ominous sign.

ii. Disseminated intravascular coagulation occurs.

iii. Serum fibrin degradation products load increase.

iv. Microangiopathic hemolysis occurs.

v. Plasma fibrinogen does not differ unless some degree of placental abruption occurs.

5. BRAIN

i. Edema, hyperemia, thrombosis and haemorrhage occurs in association with pre-eclampsia.

ii. Most women with varying degree of amaurosis are found to have extensive occipital lobe hypodensities with vasospasm of ophthalmic arteries (Williams 1992).

6.HELLP SYNDROME

Liver involvement in pre-eclampsia is accompanied by hemolysis and thrombocytopenia. [De Boer 1991, Pritchard 1954, Weinstein 1985]. It is associated with a high incidence of recurrent pre-eclampsia, pre-term delivery, fetal growth restriction, placental abruption and caesarean deliveries.

Diagnosis of HELLP syndrome

1.Hemolysis

Schistocyte in blood smear

Elevated Serum indirect bilirubin

Absent plasma haptoglobin.

2.Increased Liver enzymes

Serum Oxaloacetate glutamate transaminase more than 72 IU/L.

Lactate dehydrogenase more than 600IU/L.

3.Decreased Platelet count

Platelets less than 1 lakh per cubic milli liter.

CLINICAL FEATURES

Most of the pregnant women are unaware of the two most important signs of pre-eclampsia, hypertension and proteinuria. By the time the symptoms such as head-ache, visual disturbances or epigastric pain develop, the disorder is severe.

SYMPTOMS

Head-ache

Head-ache is often frontal but may be occipital. It invariably precedes severe pre-eclampsia and may be a symptom of imminent eclampsia. The pain may be pulsatile or dull, may occur simultaneously with visual

symptoms and may frequently be intense, especially when preceding the onset of convulsions. This may be due to cerebral artery vasospasm.

Epigastric Pain

It is a symptom of severe pre-eclampsia and occurs due to hepatocellular necrosis,ischaemia,edema that stretches glisson's capsule. This is accompanied by elevated liver enzymes in serum.

Visual Disturbances

Visual disturbances are common with severe pre-eclampsia,.
Retinal artery vasospasm may also be associated with visual disturbances (Ohno and Colleagues, 1999).Blindness can occur either alone or accompanies convulsion.

Decreased urinary output

Patient can have decreased urinary output.

SIGNS

Blood pressure

Diastolic pressure is probably a more reliable prognostic sign than systolic blood pressure.

In severe pre-eclampsia the systolic blood pressure is more than 160 mm Hg and the diastolic blood pressure is more than 110 mmHg.

Blood pressure should be taken in the sitting posture, with the apparatus at the level of the heart with appropriate size cuff. Based on the recent evidence, the ISSHP (International society for the study of hypertension in pregnancy) has agreed that the Korotkoff V (K5) sound be used as a measure of diastolic blood pressure. The K4/K5 difference is smaller in hypertensive than in normotensive pregnant women and K5 is closer to the actual intra arterial pressure &is more reliably detected and is reproducible. The universal adoption of K5 is recommended (John Studd 14th edition).

Proteinuria

It usually follows or appears simultaneously with hypertension and is non-selective. Proteinuria is a valuable prognostic sign. Frequent monitoring of the amount of protein excreted in the urine should be done and a significant increase in proteinuria indicates worsening of the disease.

Normal person excrete about 30-60 mg and even upto 200 mg of protein per day. Proteinuria is the presence of urinary protein in concentrations greater than 0.3g in a 24 hrs collection (1 + or 2 + by

standard turbidimetric method) on two or more occasions at least 6 hours apart. The urine must be a clean voided midstream specimen. Proteinuria may be the most ominous sign of pre-eclampsia.

A combination of 2+ (proteinuria) or 1g/litre and hypertension at least doubles the perinatal mortality rate. De Alvarez, (1976). Maccartney and Co-workers (1971) in their extensive experience studying renal biopsy specimens of hypertensive pregnant women invariably found that proteinuria was present ,when the glomerular lesion considered to be characteristic of pre-eclampsia was evident. (Glomerular endotheliosis).

Proteinuria may help us to differentiate eclamptogenic toxemia from other disorders of pregnancy. In Orthostatic proteinuria, the commonly used 24 hours urine sample demonstrates 1 or 2 mgs per 24 hours collection ,while the nephritic syndrome is indicated by a loss of 10 to 15 gms/day. The usual protein content in a 24 hours specimen is .03g to 2 gms in pre-eclampsia.

Edema

It is the accumulation of fluid in the extra cellular spaces. High oestrogen levels in pregnancy contribute to the generalized edema occurring in some pregnancies (Mudaliar and Menon, Ninth edition). Edema has been abandoned as a diagnostic criteria because it occurs in too many normal pregnant women to be discriminant.

Fundus changes

Grade 0	Normal fundus
Grade 1 and 2	Arteriovenous narrowing
Grade 3	Haemorrhage, exudates
Grade 4	Papilledema

COMPLICATIONS OF SEVERE PRE-ECLAMPSIA

MATERNAL COMPLICATIONS

1.Central Nervous System

- Eclamptic Convulsions

- Cerebral haemorrhage
- Cerebral edema
- Cortical blindness

2. Renal System

- Renal cortical necrosis
- Renal tubular necrosis

3. Respiratory System

- Laryngeal edema
- Pulmonary edema

4. Liver

- Jaundice
- Hepatic infarction
- HELLP syndrome
- Hepatic rupture

5. Coagulation System

- Disseminated intravascular coagulation
- Microangiopathic hemolysis
- HELLP syndrome

6. Placenta

- Placental infarction
- Retroplacental bleeding and Abruptio Placentae

7. Eye

- Papilledema
- Cortical blindness
- Retinal detachment

Fetal Complications

1.Intra uterine death – spasm of uteroplacental circulation leading to abruption and acute hypoxia.

2.Intra uterine growth retardation due to placental insufficiency and chronic hypoxia.

3.The fetus is often malnourished and small for gestational age (Moore and Redman, 1983)

4.Iatrogenic Prematurity

5.Birth Asphyxia.

SCREENING TESTS

1.Estimation of Beta human chorionic gonadotrophin in (early) second trimester as a predictor for pre-eclampsia.

Serum Beta HCG shows as elevated level in mid trimester in patients prone to develop pre-eclampsia. This may probably due to impaired placental function and a reflection of sub optimal utero placental blood flow. Among all the predictor tests, a test which estimated BHCG will be a better marker since the pathophysiology of gestational hypertension is mainly due faulty placentation and reduced placental perfusion.

BHCG has now established its immunological role. At the same time pre-eclampsia of early onset (<28 weeks of gestational age) is now accepted as having a strong immunological basis. Examination of serum BHCG at 16-20 weeks of gestational age will predict the pre-eclampsia. Explanation as to why BHCG may rise in gestational hypertension is

given by Heloner et al., (1996) who said that this rise was probably a secondary response of the trophoblasts to an immunological insult.

Serum Beta Human chorionic gonadotrophin (BHCG) in normal pregnancy and in pre-eclampsia

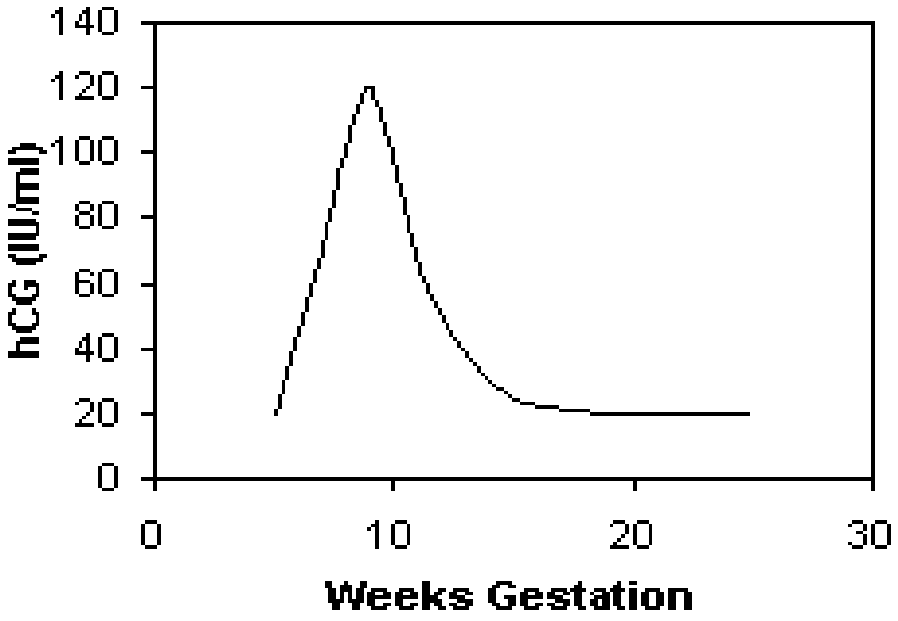
BHCG is a pregnancy hormone. It is a glycoprotein with biological activity similar to Leuteinising hormone (LH), both of which acts on the plasma membrane of LH/HCG receptor. HCG is produced exclusively in the placenta, the detection of HCG in blood and urine is almost always indicative of pregnancy.

Levels of BHCG in pregnancy

The hormone is produced exclusively by the syncytiotrophoblast. As production begins very early in pregnancy certainly by the day of implantation, with the sensitive test it can be detected in maternal serum or urine by 8 to 9th day after conception. The doubling time of serum BHCG concentration is 1.4 to 2 days. It

reaches a peak at about 60-70 days. Thereafter the concentration declines slowly until a nadir is reached at about 100-130 days.

HCG CURVE IN NORMAL PREGNANCY



HOW TO DETECT BHCG

Many different testing systems are available in kit form.Each is dependent upon the same principle, recognition of HCG (or a subunit) by an antibody to the HCG molecules or epitopes of the Beta subunit.

LH, TSH, BHCG have structurally similar (alpha) subunit. But their beta subunit were structurally distinct. Specific antibodies were developed for beta subunit of BHCG to avoid cross reactivity against LH, TSH (thyroid stimulating hormone) immunoassay without radio isotopes.

ELISA – Chemiluminescent immuno assay

It is useful for quantification of extremely small amount of hormones. ELISA test uses monoclonal antibody bound to a solid phase support (usually plastic) which binds the HCG in the sample. A second antibody is added to 'sand wich' the test sample HCG. As it is the second antibody to which enzyme such as alkaline phosphatase is linked, when substrate for this enzyme is added, a blue colour develops, intensity of which is proportional to the amount of enzyme and thus to

the amount of second antibody bound. This in turn indicates the quantity of HCG in the test sample. The sensitivity of ELISA for BHCG is serum is 50 MIU/ML. The method is said to be chemiluminescent assay.

BHCG ANALYSER	ELISA KIT

Sensitivity80% ,Specificity90% ,PPV75 ,NPV90. (Luckas et al study 1998)

2.**ROLL OVER TEST**

Gant et al (1974) elicited marked pressor response by turning from lateral to supine recumbency in whom later developed pre-eclampsia.

This test done in pregnant women between 18-22 weeks of gestational age (Referral Iandonald's – sixteenth edition).

The woman lay on left side, blood pressure taken and then turned on their back,again blood pressure recorded. The blood pressure was taken on one and five mintues interval after change in position. The diastolic pressure rose by 20 mmHg in women who later developed pre-eclampsia.

This roll-over rest seems to have Sensitivity of 80% in predicting later pre-eclampsia, Positive predictive value is (PPV) 33%.


ROLL OVER TEST IN LEFT LATERAL AND SUPINE POSITION

3.MIDTRIMESTER BLOODPRESSURE MEASUREMENT

Blood pressure normally falls at the beginning of pregnancy and reaches its lowest level in the second trimester. The use of mid trimester blood pressure recording as a screening test for pre-eclampsia is done during fifth and sixth month of gestation. A mean arterial pressure (which is diastolic pressure plus one third of pulse pressure) of more than 90 mm hg increased the risk of gestational hypertension. Sensitivity 44%, specificity 87%, PPV 90%, NPV 98%, (Conde-Agudelo et al., 1993).

There are several factors which influence blood pressure measurement. The position of the arm relative to the heart also affects recording each centimeter of vertical height above or below the level of heart being equivalent to a difference of pressure .7 mm Hg. There is also variation of blood pressure with the circadian rhythm, values being highest during afternoon and early evening. Also blood pressure is found to be elevated under stressful condition. For methods based on blood pressure measurements to be effective increased uniformity of recording measurement is necessary (Arias – third edition).

4.HAND – GRIP TEST

Isometric exercise is known to cause a general sympathetic activation and to increase systemic arterial pressure in healthy adults. After a constant baseline diastolic blood pressure has been established, each of 100 subjects compressed an inflated sphygmomanometer cuff for a period of 3 minutes at maximal and then at 50% maximal voluntary contraction. A rise of 20 mmHg in diastolic pressure was considered positive on 50% of maximal voluntary contraction. This test is done between 28-32 weeks of gestation. Sensitivity 81.8%, Specificity (68.4%), but the test has poor reproducibility (Ian Donald 16th edition).

5.ANGIOTENSIN – II CHALLENGE TEST

This test is based on the loss of refractoriness to angiotensin II in pregnant woman who later develop pre-eclampsia. In normal pregnancy, 12 ng of angiotensin-II/kg per minute is needed to increase the diastolic pressure of at least 20 mm hg. But woman prone to develop pre-eclampsia needed only 8 ng angiotensin II/kg per minute to increase diastolic blood pressure. Sensitivity 91%. However the test is expensive, time consuming and at times unreliable (Ian Donald's 16th edition).

6.DOPPLER ULTRA SOUND

In gestational hypertension, the physiological invasion of spiral arteries is incomplete. Doppler wave forms appear to be abnormal in some hypertensive pregnancy. Doppler velocimetry at 22-24 weeks is useful to identify women destined to develop pre-eclampsia, the sensitivity of a pulsablity index above the 95th percentile or the presence of bilateral notching with decreased diastolic flow in detecting women destined to develop pre-eclampsia with fetal growth restriction was 69%

and pre-eclampsia without fetal growth restriction was 24%. The sensitivity increased to 93 and 80% respectively for woman developing severe forms of these complications requiring delivery before 32 weeks.The positive likelihood ratio is 6.61. Though better test it can be confirmatory at 22-24 weeks only and Doppler ultrasound not available in every nook corner. (Arias 3rd edition)

ROUTINE BLOOD TESTS

SERUM URIC ACID

Serum uric acid levels is a better indicator of fetal prognosis than blood pressure. Serial uric acid measurements gave warning of the disorder before the appearance of other clinical features in woman who subsequently develop gestational hypertension.

PLATELET COUNT

Studies suggested that platelet count reduction occurred in pre-eclampsia.(especially associated with HELLP) .

URINE ASSAYS

1.Urinary protein excretion normally increases in pregnancy and may occasionally rise to 200mg/24 hours, but it is usually undetectable by conventional laboratory test.

2. A study found that fasting urinary albumin creatinine ratio of 16 or over was taken to indicate a positive screening test.

3.Another study found that microalbuminuria > 11 mg/ml as a positive test for predicting pre-eclampsia.

4. Urinary kallikrein to ,protein excretion ratio in a random sample collected at the booking visit (16-20 weeks) could be used to predict pre-eclampsia.False positive rate 50%.False negative rate 10%.

There is difficulties in its assay.

5..Urine calcium / creatinine ratio

Determination of calcium/creatinine ratio in a randomly obtained urine sample ,if< 0.03 $\pm$ 0.03 indicates women prone to develop pre-

eclampsia (Normal is 0.44 $\pm$ 0.32) . PPV is 85%, NPV – 91%. (Arias 3rd edition)

Other predictive tests for development of the pre-eclampsia syndrome (Adapted from conde-agudelo and associates 2009)

	Testing related to	**Examples**
1.	Placenta perfusion / vascular resistance	24 hours ambulatory blood pressure monitoring.
2.	Fetoplacental unit endocrine dysfunction	Alpha feto protein, estriol, PAPP-A, inhibin-A, activin-A.
3.	Renal dysfunction	Microtransferrinuria, Nacetyl B glucosaminidase.
4.	Endothelial dysfunction / oxidant stress	Fibronectin, prostaglandin, thromboxane, CRP, leptin, P-selectin SF lt-1 (Fms like tyrosine kinase receptor-1.)
5.	Other / miscellaneous	Antithrombin – III, atrial natriuritic peptide free fetal DNA, serum proteonomic markers ,B2 micro globulin, genetic markers.

COMPARISON OF SENSITIVITY AND SPECIFICITY OF VARIOUS SCREENING TEST WITH BHCG ESTIMATION AND ROLL OVER TEST

S. No	NAME OF SCREENING TEST	GESTATIONAL AGE AT WHICH DONE	SENSITIVITY	SPECIFICITY	PPV	NPV
1.	Mid trimester BP	(20-22 wks)	44	87	90	98
2.	Hand grip test	(28-32 wks)	81.8	68.4	81	96
3.	Doppler USG	(23-24 wks)	93	80	85	95
4.	Roll over test	18-22 wks	80	90	33	-
5.	BHCG	16-2o wks	80	90	75	90
6.	Urinary Calcium / creatinine ratio		70	91	85	91

PREVENTION OF PRE-ECLAMPSIA

Primary prevention of Pre-eclampsia (Deswiet, fourth edition)

Probably or definitely ineffective	**May be effective**
Weight restriction	Low dose aspirin
Salt restriction	Anti-oxidants
Diuretics	
Antihypertensive agents	
Calcium supplements	
Fish oil supplements	

Low-Dose Aspirin

The benefits of Aspirin (75mg OD) appear to be greatest in preventing early onset pre-eclampsia (relatively lesser) and least in preventing the disorder at term (which is common) (CLASP, 1994)

Antioxidants

Antioxidant therapy significantly reduced endothelial cell activation and there was a definite reduction in the incidence of pre-eclampsia in those women given Vitamin C and E (Chappel 1999).

ANTI HYPERTENSIVE LINE OF MANAGEMENT

It is usually recommended when systolic blood pressure exceeds 140 mm hg or diastolic blood pressure exceeds 90 mm hg. Drugs widely used are methyldopa, nifedipine, labetalol, hydralazine.

DRUG	MODE OF ACTION	PHARMACOLOGICAL ACTION	DOSAGE	ADVERSE EFFECT
Methyldopa	Induces the synthesis of alphamethyl nor epinephrine which stimulates alpha receptors and decreases the sympathetic outflow from the central nervous system.	After3-6 hours of oral administration the hypotensive effect appears. It causes decrease in cardiac output and total peripheral resistance.	250mg tds,.. increased upto 500mg tds.	Sedation, fatigue, decrease in intellectual drive, drowsiness, fever, altered liver function test
Nifedipine	Calcium channel blocker (introduced in clinical practice by Flert eaten in 1970)	Blocks calcium transport through its channel-inhibits the entry of extracellular ca $^{2+}$ necessary for excitation contraction so vasodilation of vessel, decrease in resistance.	10mg tds	Head ache, tachycardia, dizziness, fatigue, orthostatic hypotension.

Labetalol	Acts by decreasing peripheral vascular resistance. It is both alpha and Beta receptor blocker.	Rapid reduction of blood pressure.	If given IV 20mg as initial dose, followed by 40-80mg every 10 minutes. It can be given IV drop 250mg in 250 ml of NS and giving 20ml / minute.	Contraindicated in congestive cardiac failure, bronchial asthma, can cause fatigue, insomnia, hypoglycemia.
Hydralazine	Vasodilator	Rapidly lowers blood pressure, increases cardiac output and plasma volume.	5-10mg IV that are repeated at 10-20 min intervals.	Head ache, anxiety, nausea, vomiting, facial flushing, SLE like syndrome in slow acetylators.

MANAGEMENT OF SEVERE PRE-ECLAMPSIA

Definitive Management

Prevent convulsion (Magnesium sulfate)

Control blood pressure (Nifedipine)

Deliver by vaginal or caesarean birth (depending on fetal and maternal condition) having stabilized the maternal condition (if time permits) and obtained an update on renal, hepatic and hematologic status.

Prevention of convulsions

Magnesium sulphate has been shown in randomized trials to be the preferred agent for prevention and treatment of eclamptic convulsions.

Intravenous loading dose of 4g results in immediate plasma concentration of 5-9mg/dl and it falls to 3-4mg/dl in 60 minutes. It is excreted almost solely by kidney. Then 4 gms in each buttock I.M is given. This is repeated every 4 hours.

Its action is to be mainly at peripheral neuromuscular transmitter junction with minimum central effects. NMDA (N-methyl, D-aspartate) receptor is the excitatory aminoacid receptor subtype. It is blocked by mg 2+ ions(cotton and associates1992) have shown that hippocampal

seizures could be blocked by magnesium. Treatment should be continued upto 24 hours after the last convulsion or at least 24 hours post partum.

Expectant management of severe pre-eclampsia less than 36 weeks (Arias 3rd edition – high risk pregnancy and delivery)

- Bed rest
- Daily weight
- Antihypertensive treatment
- Steriod for pulmonary maturity
- RFT
- LFT
- D-dimer evaluation
- CBC

Every other day

- Daily questioning about head-aches, visual disturbances, epigastric pain and fetal movement.
- Daily non-stress test.
- Daily FKC
- AFI every week.

If gestational age more than 37 weeks, or those who develop complications, pregnancy is to be terminated with oxytocin or lower segment caesarean section

Recurrence of pre-eclampsia in subsequent pregnancies

Probability of recurrence is 30%

it depends on,

a. At which gestation age previous pre-eclampsia developed

   [If - <30 weeks developed, recurrence is 70%

   30-37 weeks – 40%

   >37 weeks – 25%]

b. Multiparous (50% chance of developing hypertension in later pregnancies)

c. Persistent hypertension for more than 10 days in the immediate post partum period

d. Maternal obesity

e. Severity of hypertension and symptoms

f. Developing pre-eclampsia – later more prone to develop chronic hypertension (Pritchard & Pritchard 1977)

g. If complicated by eclampsia in subsequent pregnancy development of

   Mild pre-eclampsia – 19.5%

   Severe pre-eclampsia – 25.9%

Recurrence of eclampsia – 1.4% can occur.

33.8% had chronic hypertension (charley 1978) later in life.

AIM OF THE STUDY

AIM OF THE STUDY

The aim of this study is to compare the elevated serum beta human chorionic gonadotrophin in second trimester (16-20 weeks) with roll over test(18-22) in asymptomatic pregnant women to predict the development of pre-eclampsia.

MATERIALS AND METHODS

MATERIALS AND METHODS

This study was a prospective study.

This study was conducted at department of obstetrics, gynecology, RSRM lying in hospital attached to Stanley medical college from October 2009 to October 2010.

150 normal pregnant women between 16 and 22 weeks of gestation who come to antenatal O.P ,under gone both the tests.

a. Serum BHCG estimation done between 16-20 weeks and
b. Roll over test done between 18-22 weeks

Exclusion criteria for the study were

1. Multiple gestation
2. Diabetes mellitus
3. Previous h/o chronic hypertension
4. Renal disease
5. Congenital anomalies of the baby
6. previous h/o pre-eclampsia / still births / repeated abortions, elderly primi

For BHCG estimation

5ml of blood collected from the women between 16-20 weeks of gestation and sent to thyrocare lab. There by enzyme linked chemiluminescent immuno assay method, they quantified the BHCG level. If BHCG >2 M.O.M for the gestational age it predicts development of pre-eclampsia later.

Reference Range of BHCG

GESTATIONAL WEEKS	**BHCG RANGE**
1 -2	10 - 94 MIU/ml
2 -3	61 -2922
3 -4	66 -18900
4 -5	1536 -49380
6- 7	13860 -90600
7 -11	12540 -174600
11 -16	3684 -61800
16 -20	2882 -48060(median value25100)
21 -39	1620 -46860
Nonpregnant	< 10MIU/ML

For roll over

The same women first in supine position in the right arm blood pressure measured.Then the women lies on left lateral position after 5 minutes and again blood pressure checked.

If diastolic pressure rise by 20 mm Hg the test said to be positive which indicates she may develop preeclampsia later.

RESULTS AND ANALYSIS

RESULTS

The incidence of preeclampsia in RSRM since 2005 varied between 8.5%-10.2%.

Between 2009 March-2010 March-Total number deliveries 12738,

PIH cases 1224

the incidence is 9.6%.

The sample size is 150.Patients enrolled were 150.

Among 150 persons, (After excluding 4 persons due to non-compliance 2,developed GDM 2)rest 146 persons followed up.

Among 146 persons, 20 developed pre-eclampsia.

The incidence of pre-eclampsia in the study is 13.6%.

15 were primi and 5 were multi.

TABLE – 1

DISTRIBUTION OF PATIENTS WITH PRE-ECLAMPSIA ACCORDING TO AGE

Age	**Study group**	
	Total No	**Pre-eclampsia Positive (%)**
17 – 20	34	8(23%)
21 – 25	47	3(6.4%)
26 – 30	42	3(7.1%)
31 – 34	23	6(26%)
Total	146	20

Above table shows the distribution of person with pre-eclampsia. Pre-eclampisa was high between 17-20 yrs (23%) and 31-34 years(26%).

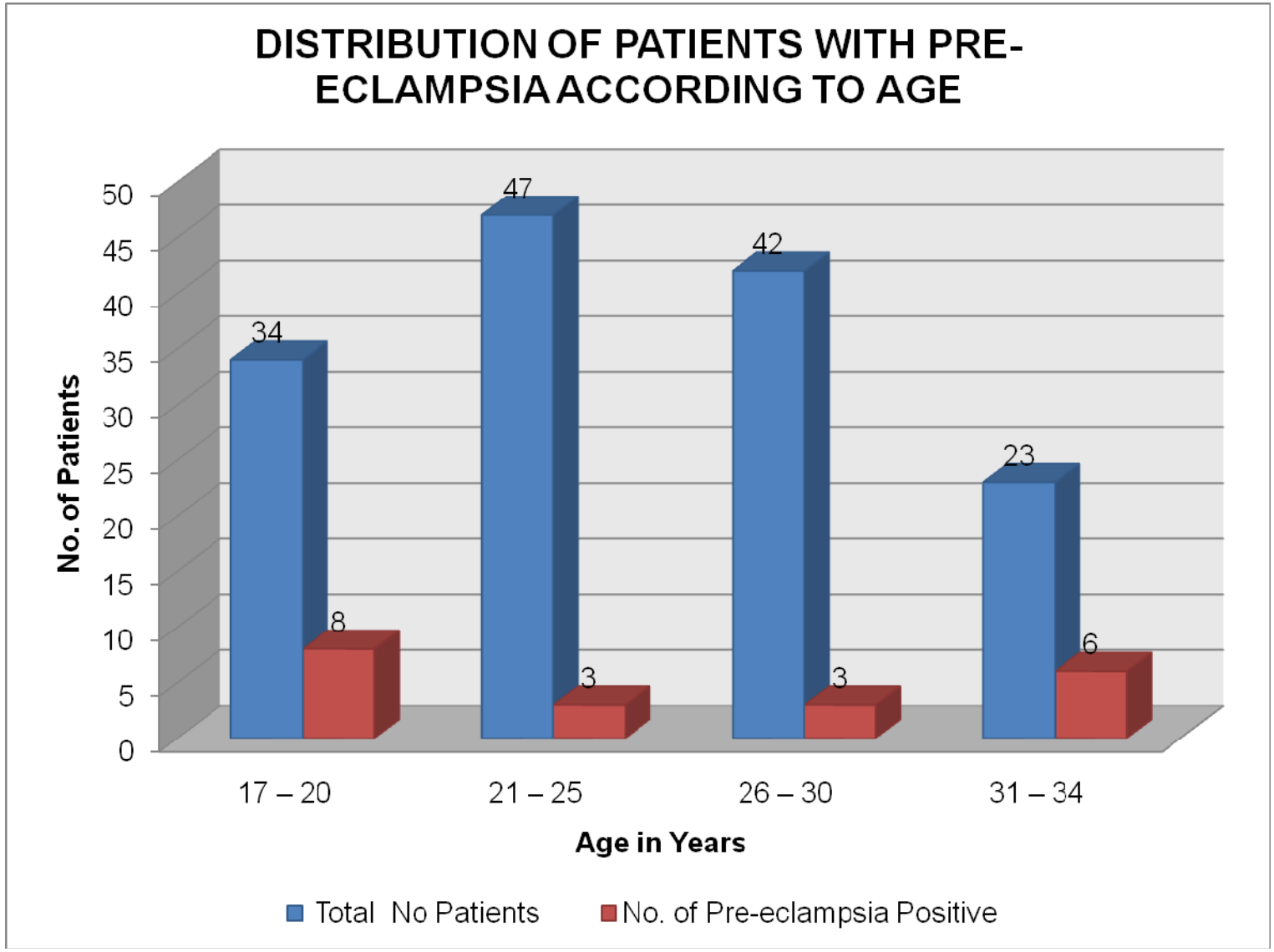

DISTRIBUTION OF PATIENTS WITH PRE-ECLAMPSIA ACCORDING TO AGE
No. of Patients
50
45
40
35
30
25
20
15
10
5
0
34
8
47
3
42
3
23
6
17 – 20
21 – 25
26 – 30
31 – 34
Age in Years
Total No Patients
No. of Pre-eclampsia Positive

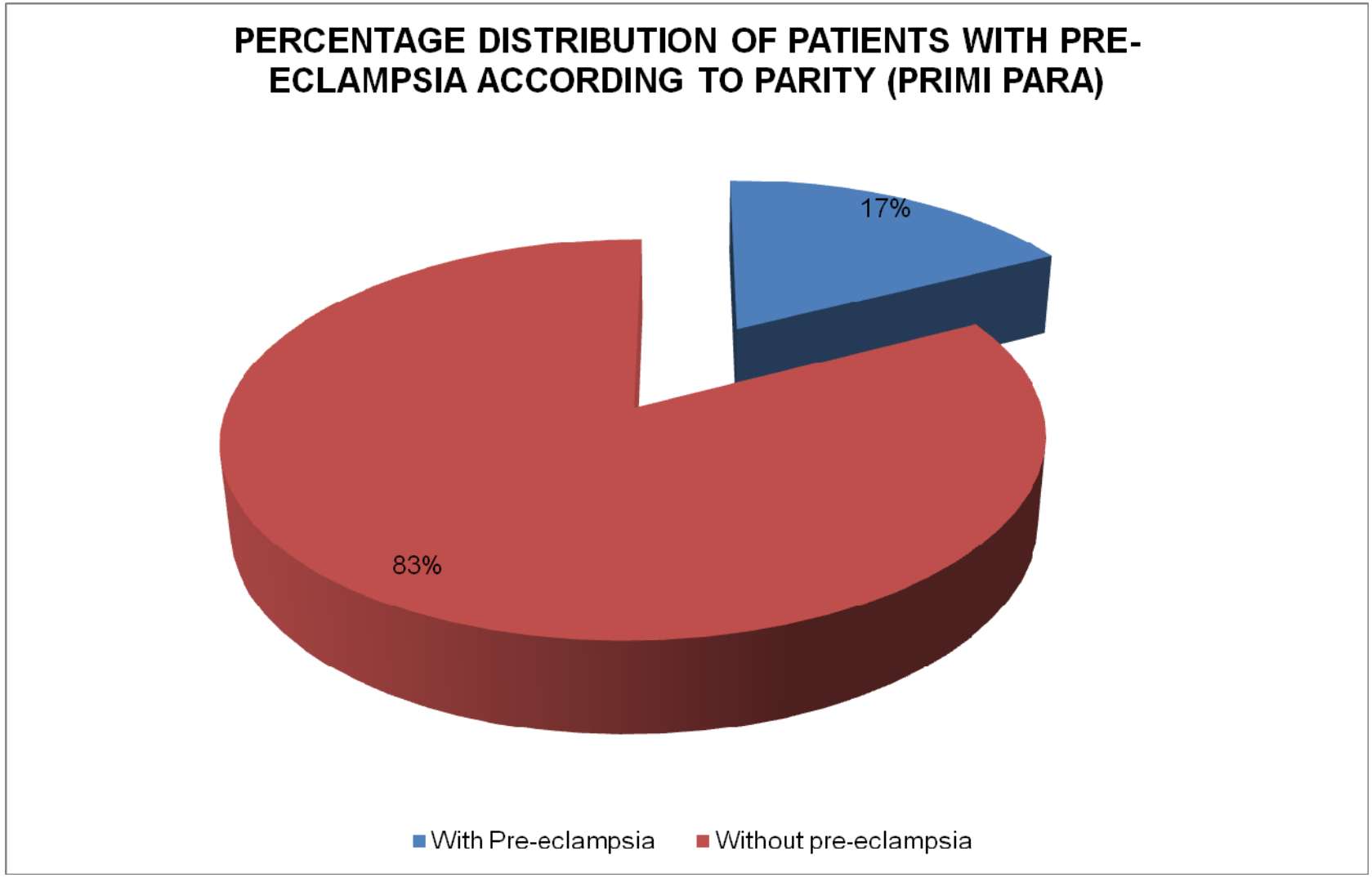
TABLE –2

DISTRIBUTION OF PATIENTS WITHI PRE-ECLAMPSIA ACCORDING TO PARITY

PARITY	TOTAL	PRE-ECLAMPSIA POSITIVE	%
Primipara	86	15	75%
Multiparous	60	5	25%

Above table shows the distribution of patients with pre-eclampsia according to parity. It shows high incidence of pre-eclampsia in primiparous women (75%) than in multiparous women.

Among 86 primi ,15 developed preeclampsia.the incidence is 17.4% and 8.3% for multi in my study**.**


PERCENTAGE DISTRIBUTION OF PATIENTS WITH PRE-ECLAMPSIA ACCORDING TO PARITY (PRIMI PARA)
17%
83%
With Pre-eclampsia
Without pre-eclampsia

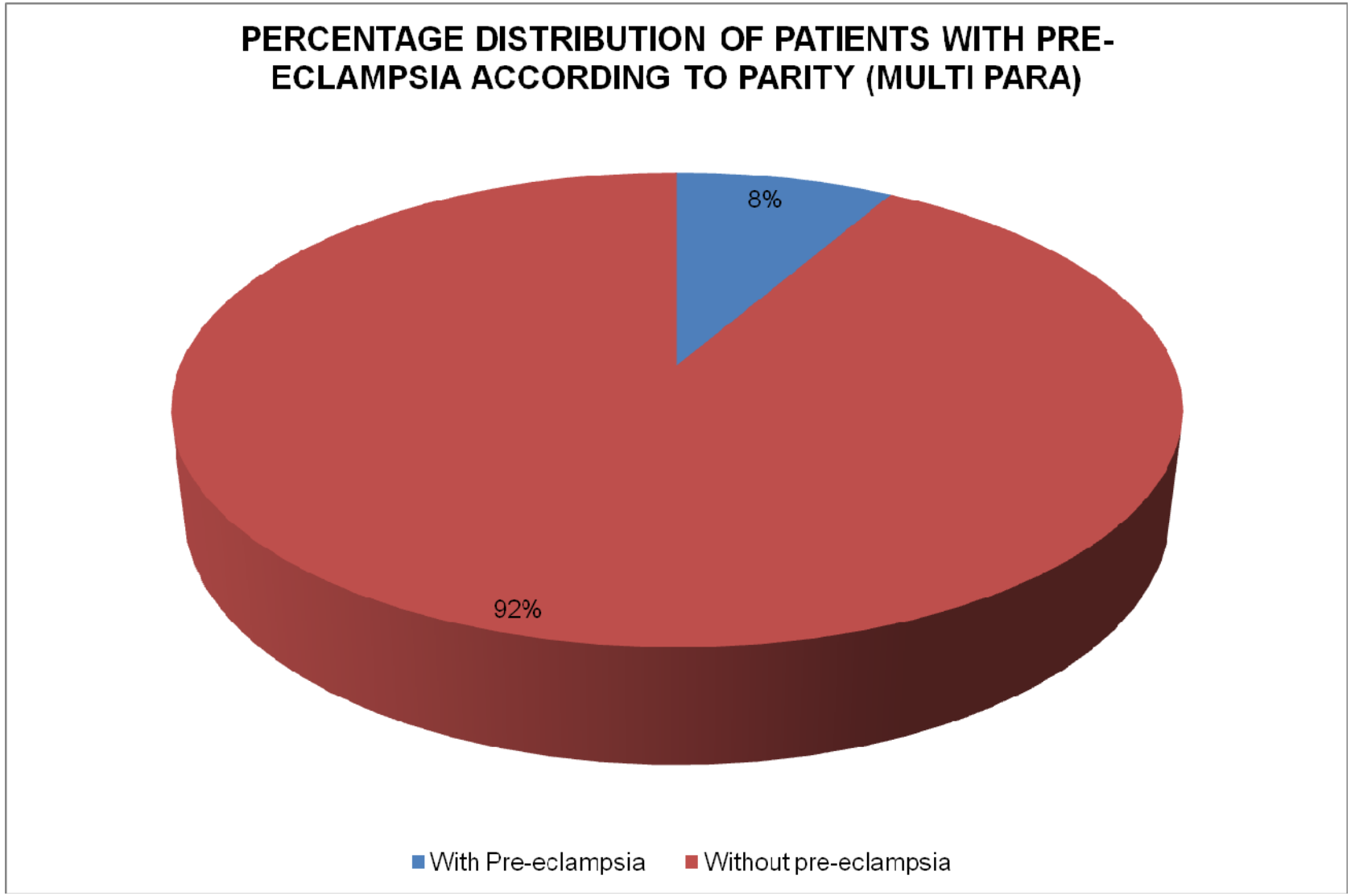

PERCENTAGE DISTRIBUTION OF PATIENTS WITH PRE-ECLAMPSIA ACCORDING TO PARITY (MULTI PARA)
8%
92%
With Pre-eclampsia
Without pre-eclampsia

TABLE - 3

DISTRIBUTION OF PRE-ECLAMPSIA PATIENTS ACCORDING TO THEIR FIRST APPEARANCE OF PRE-ECLAMPSIA (IN WEEKS).

Gestational age in weeks	No of patients
20 -24	2
24 -28	2
28 -32	2
32 -36	4
36 -40	10

The above table shows highest incidence of pre-eclampsia between 36-40 weeks of gestation.

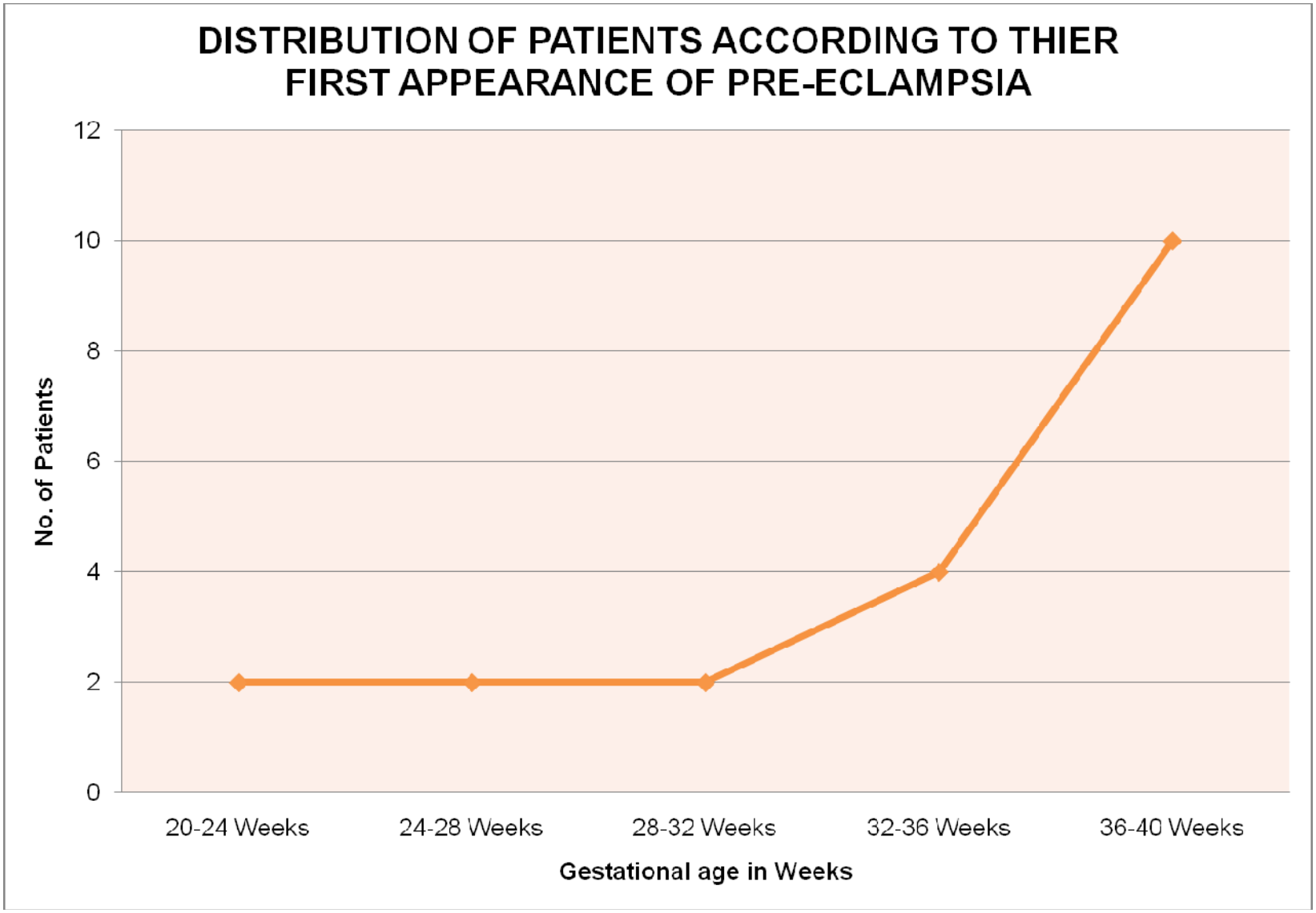

DISTRIBUTION OF PATIENTS ACCORDING TO THIER FIRST APPEARANCE OF PRE-ECLAMPSIA
No. of Patients
0
2
4
6
8
10
12
20-24 Weeks
24-28 Weeks
28-32 Weeks
32-36 Weeks
36-40 Weeks
Gestational age in Weeks

TABLE – 4

RELATIONSHIP OF BHCG >2 M.O.M AND DEVELOPMENT OF PRE-ECLAMPSIA

Group (BHCG)	**Pre-eclampsia Positive**		**Pre-eclampsia Negative**	
	No	%	No	%
> 2 MOM n = 22	18	81.8%	4	18.2%
< 2 MOM n = 124	2	1.6%	122	98.4%

Above table shows the relationship of BHCG >2 MOM developing pre-eclampsia. About 81.8%(PPV) of persons with BHCG >2 MOM develop pre-eclampsia. 98.4%(NPV) of person with BHCG <2 MOM does not develop pre-eclampsia.

Out of 20 preeclampsia patients, with BHCG >2MOM 18 developed preeclampsia with Sensitivity of 90%,

Specificity of 96.8%.

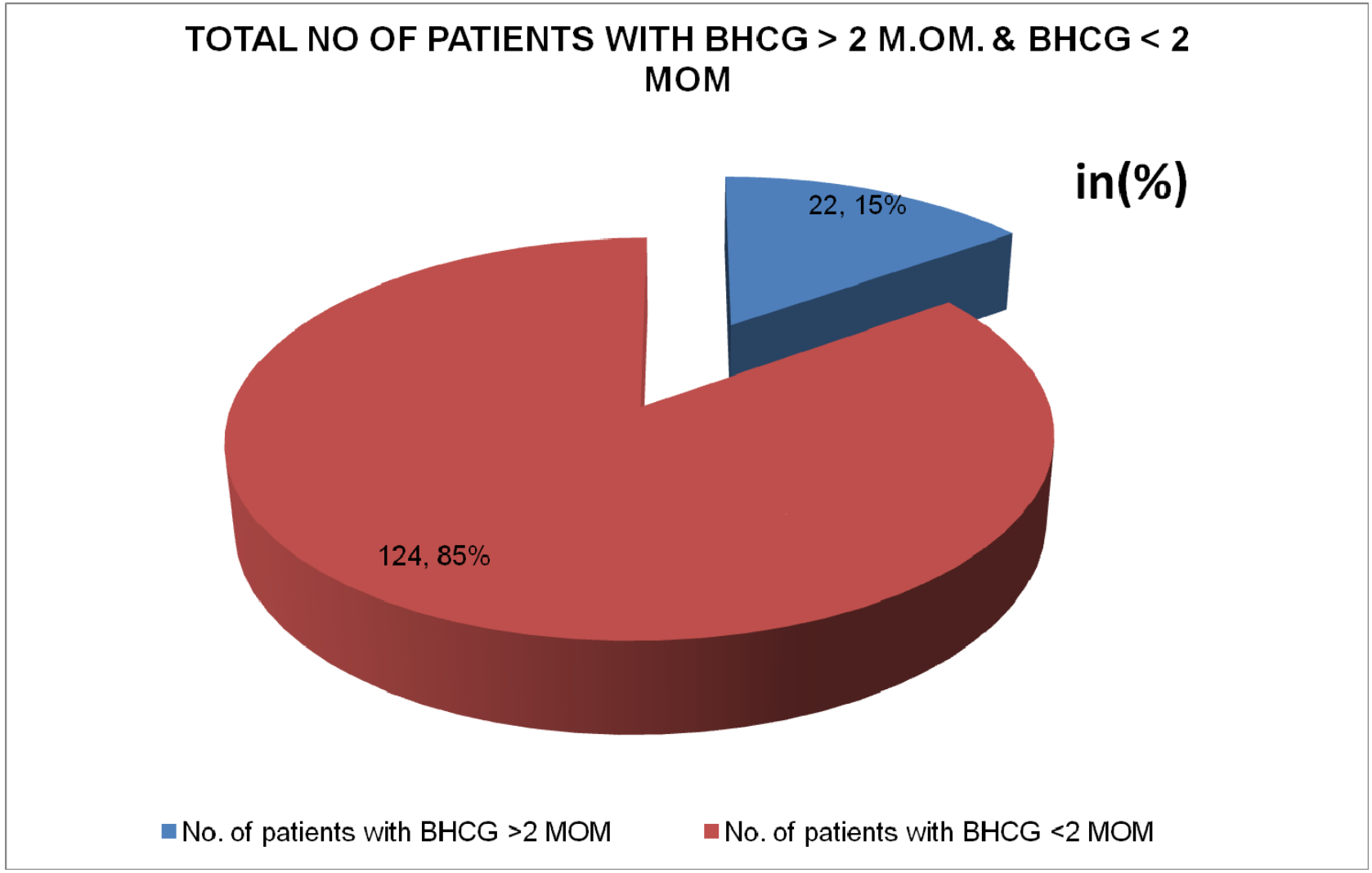

TOTAL NO OF PATIENTS WITH BHCG > 2 M.OM. & BHCG < 2 MOM
in(%)
22, 15%
124, 85%
No. of patients with BHCG >2 MOM
No. of patients with BHCG <2 MOM

TABLE – 5

RELATIONSHIP OF ROLL OVER TEST AND DEVELOPMENT OF PRE-ECLAMPSIA

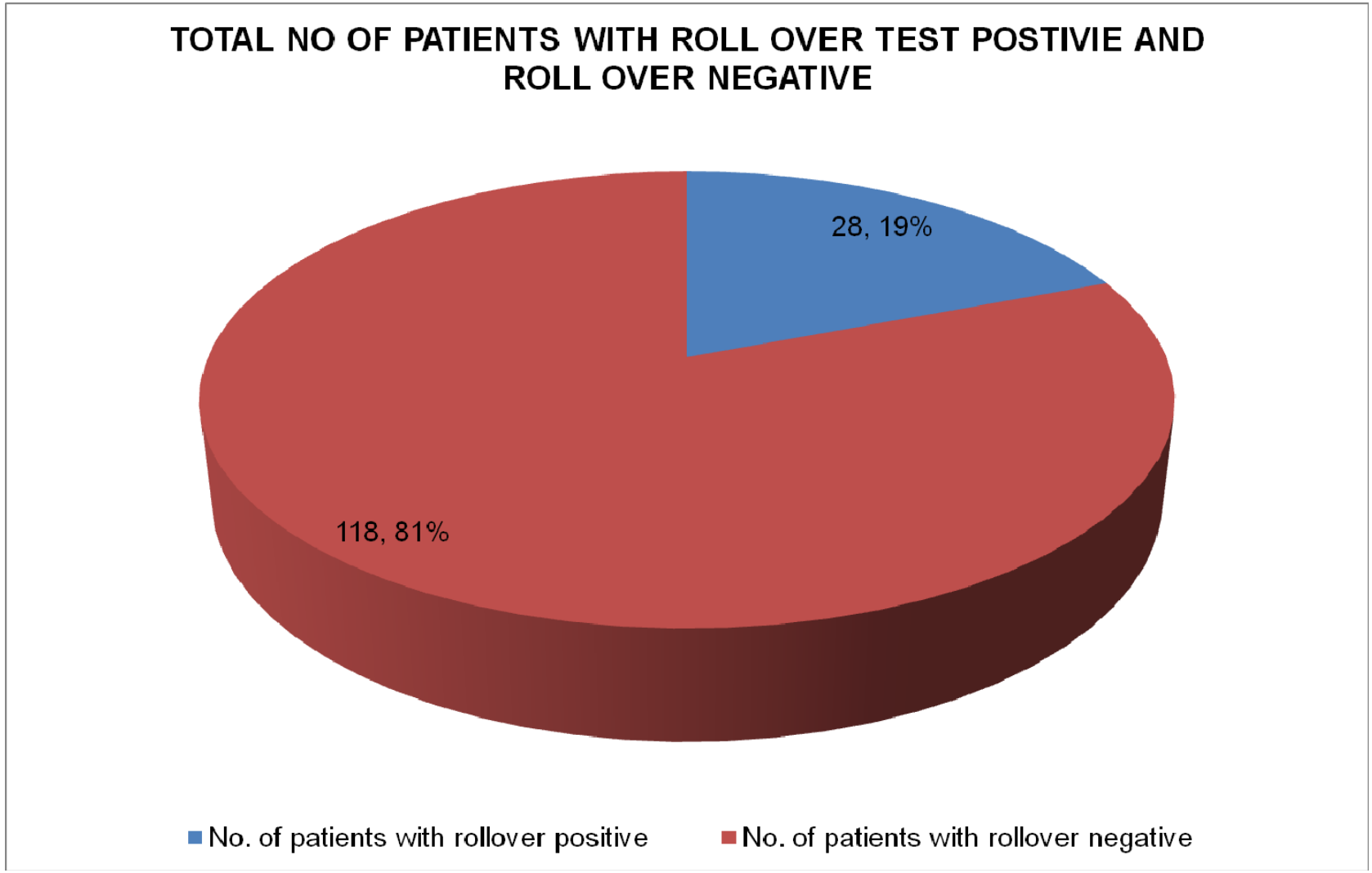
Roll over test group	**Pre-eclampsia Positive**		**Pre-eclampsia Negative**	
	No	%	No	%
Roll over test positive n = 28	14	50%	14	50
Roll over test negative n = 118	6	6%	102	94%

Above table shows the relationship of roll over test positive persons developing pre-eclampsia.

About 50%(PPV) of persons with roll over test posistive develop pre-eclampsia. 94% (NPV)of persons with roll over test negative does not develop pre-eclampsia.

Among 20 preeclampsia patients,14 with roll over test positive developed the disease with Sensitivity 70%,

Specificity 86.6%


TOTAL NO OF PATIENTS WITH ROLL OVER TEST POSTIVIE AND ROLL OVER NEGATIVE
28, 19%
118, 81%
No. of patients with rollover positive
No. of patients with rollover negative

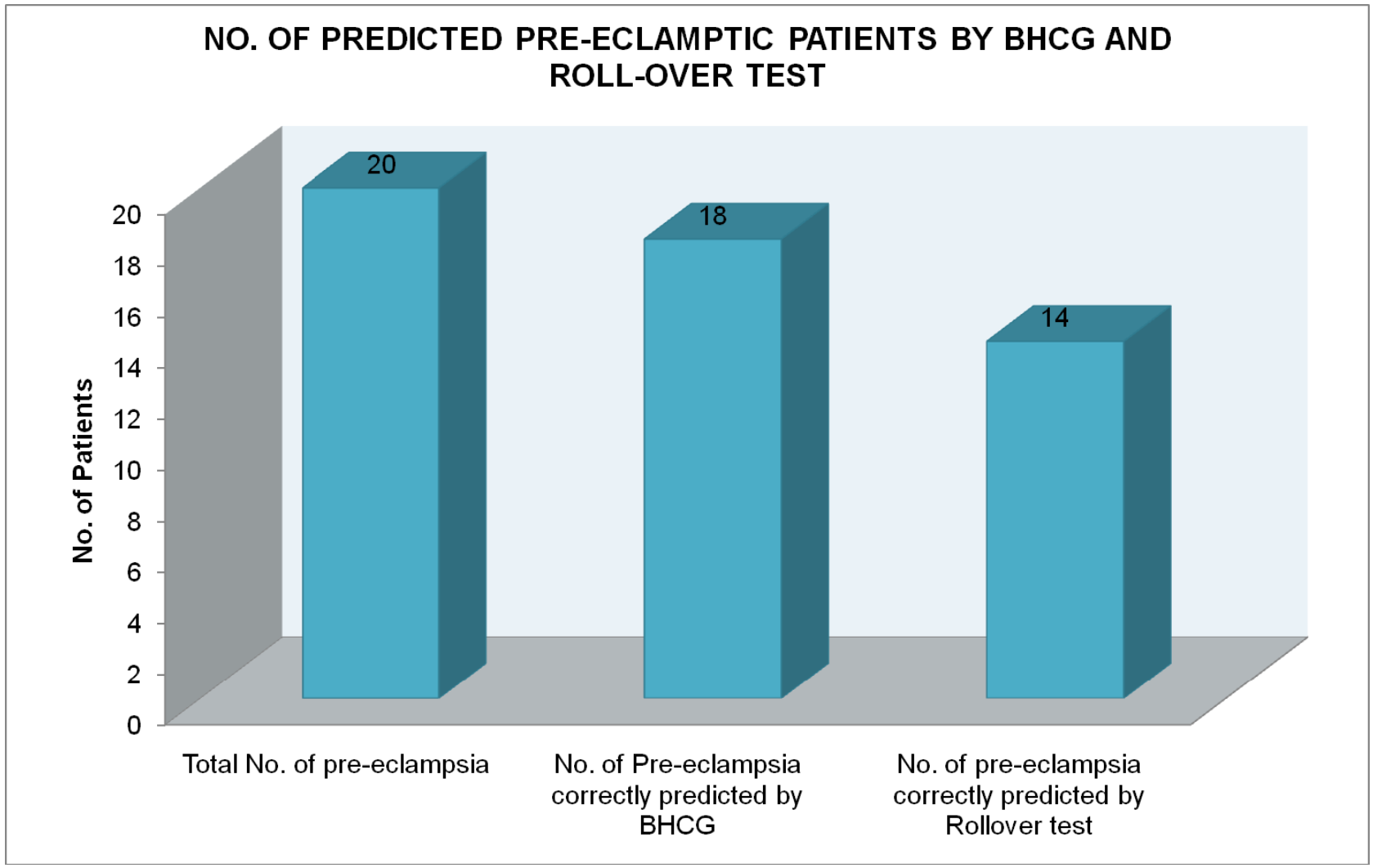

NO. OF PREDICTED PRE-ECLAMPTIC PATIENTS BY BHCG AND ROLL-OVER TEST
No. of Patients
0
2
4
6
8
10
12
14
16
18
20
20
18
14
Total No. of pre-eclampsia
No. of Pre-eclampsia correctly predicted by BHCG
No. of pre-eclampsia correctly predicted by Rollover test

TABLE – 6

Both tests positive	**Pre-eclampsia positive**		**Pre-eclampsia negative**	
	No	%	No	%
n= 14	12	85.7%	2	14.3%

RELATIONSHIP OF BOTH BHCG > 2 MOM + ROLL OVER TEST POSITIVE GROUP WITH DEVELOPMENT OF PRE-ECLAMPSIA

Above table shows development of pre-eclampsia when both tests are positive.

85.7% of persons with both test positive developed pre-eclampsia.

RELATIONSHIP OF BOTH BHCG >2 MOM + ROLL OVER TEST POSITIVE GROUP WITH DEVELOPMENT OF PRE-ECLAMPSIA

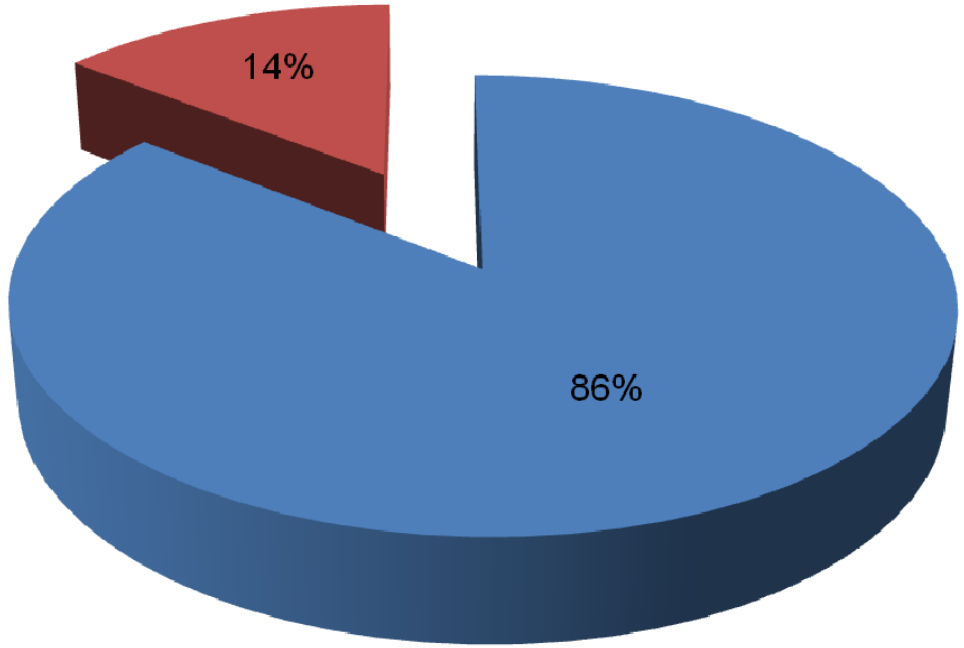


TABLE - 7

RELATIONSHIP OF BOTH (BHCG & ROLL OVER TEST)

NEGATIVE BUT DEVELOPED PRE-ECLAMPSIA

Both tests Negative	**Pre-eclampsia positive**		**Pre-eclampsia negative**	
	No	%	No	%
110	2	1.8%	108	98.2%

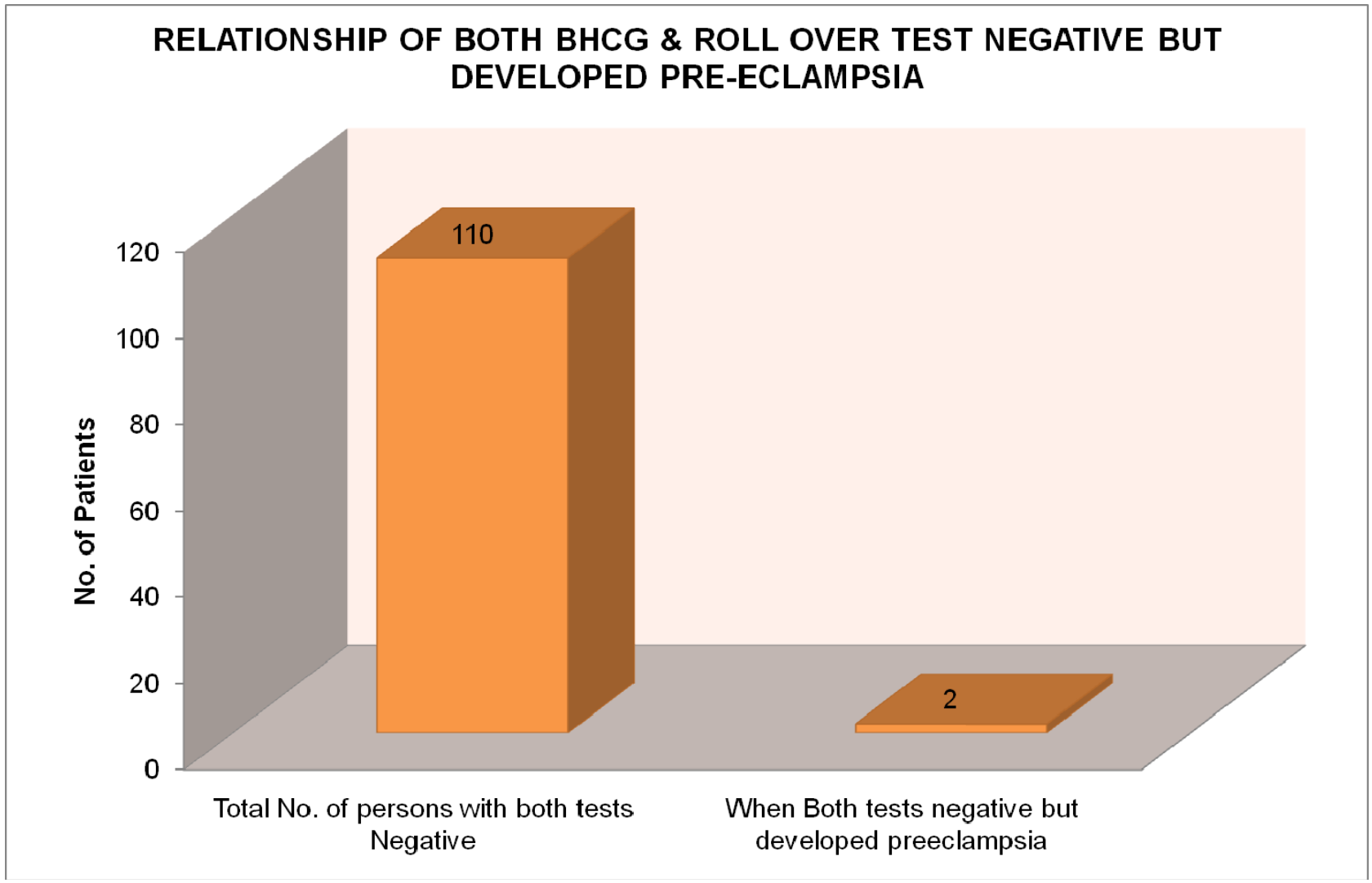
Above table shows development of pre-eclampsia when both tests were negative only 1.8% of persons with both tests negative developed pre-eclampsia

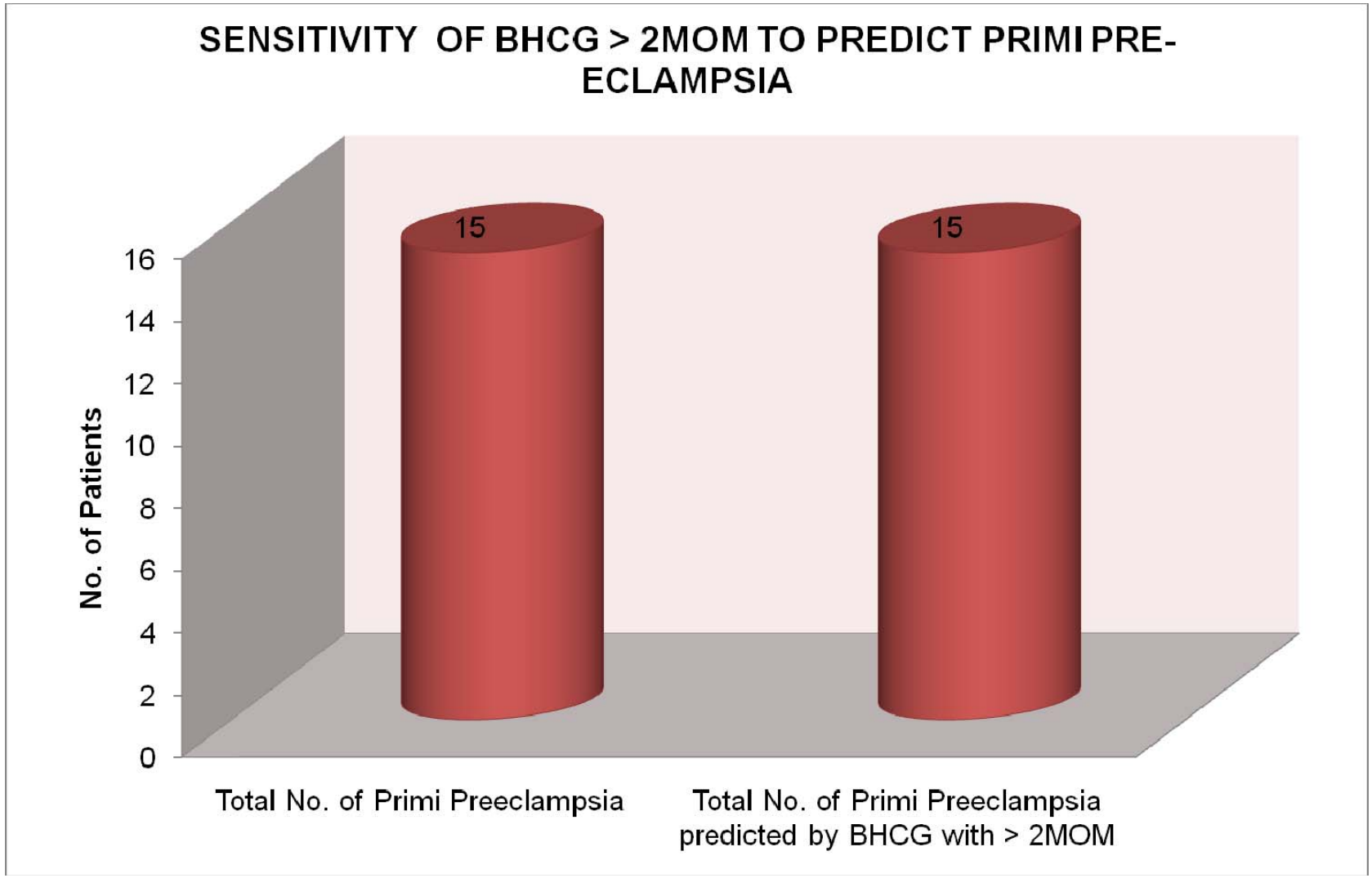
TABLE - 8

Distribution of persons developed pre-eclampsia in relation to parity with BHCG > 2 MOM

Parity	**BHCG > 2 MOM**	
	No	**%**
Primipara n=15	15	100%
Multipara n=5	3	60%

Above table shows that 100% of primipara with BHCG > 2 MOM developed pre-eclampsia, but 60% of multipara with BHCG > 2 MOM developed pre-eclampsia. This shows BHCG has increased sensititivy to predict nullipara pre-eclampsia.


RELATIONSHIP OF BOTH BHCG & ROLL OVER TEST NEGATIVE BUT DEVELOPED PRE-ECLAMPSIA
No. of Patients
120
100
80
60
40
20
0
110
2
Total No. of persons with both tests Negative
When Both tests negative but developed preeclampsia


SENSITIVITY OF BHCG > 2MOM TO PREDICT PRIMI PRE-ECLAMPSIA
No. of Patients
0
2
4
6
8
10
12
14
16
15
15
Total No. of Primi Preeclampsia
Total No. of Primi Preeclampsia predicted by BHCG with > 2MOM

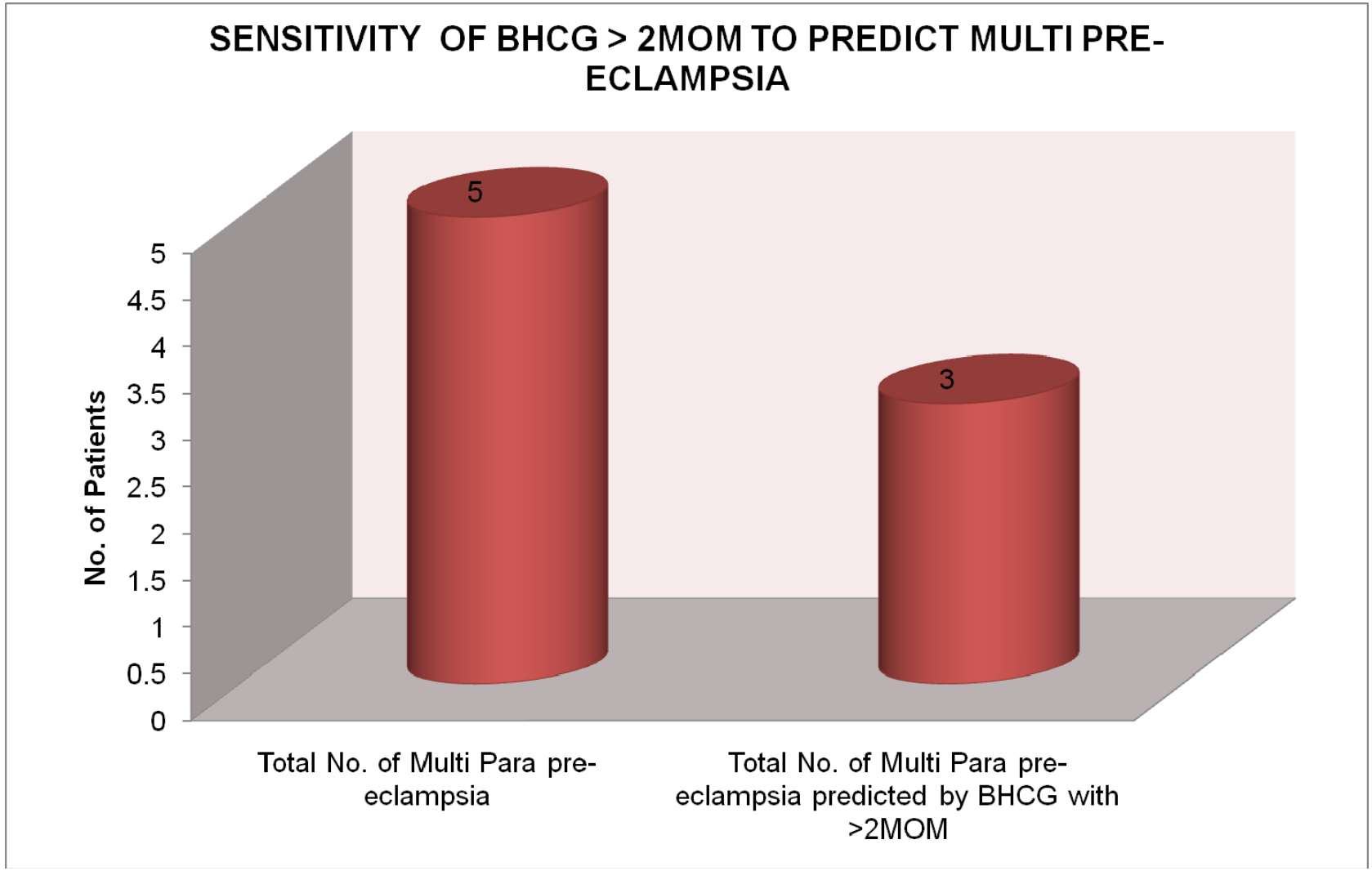
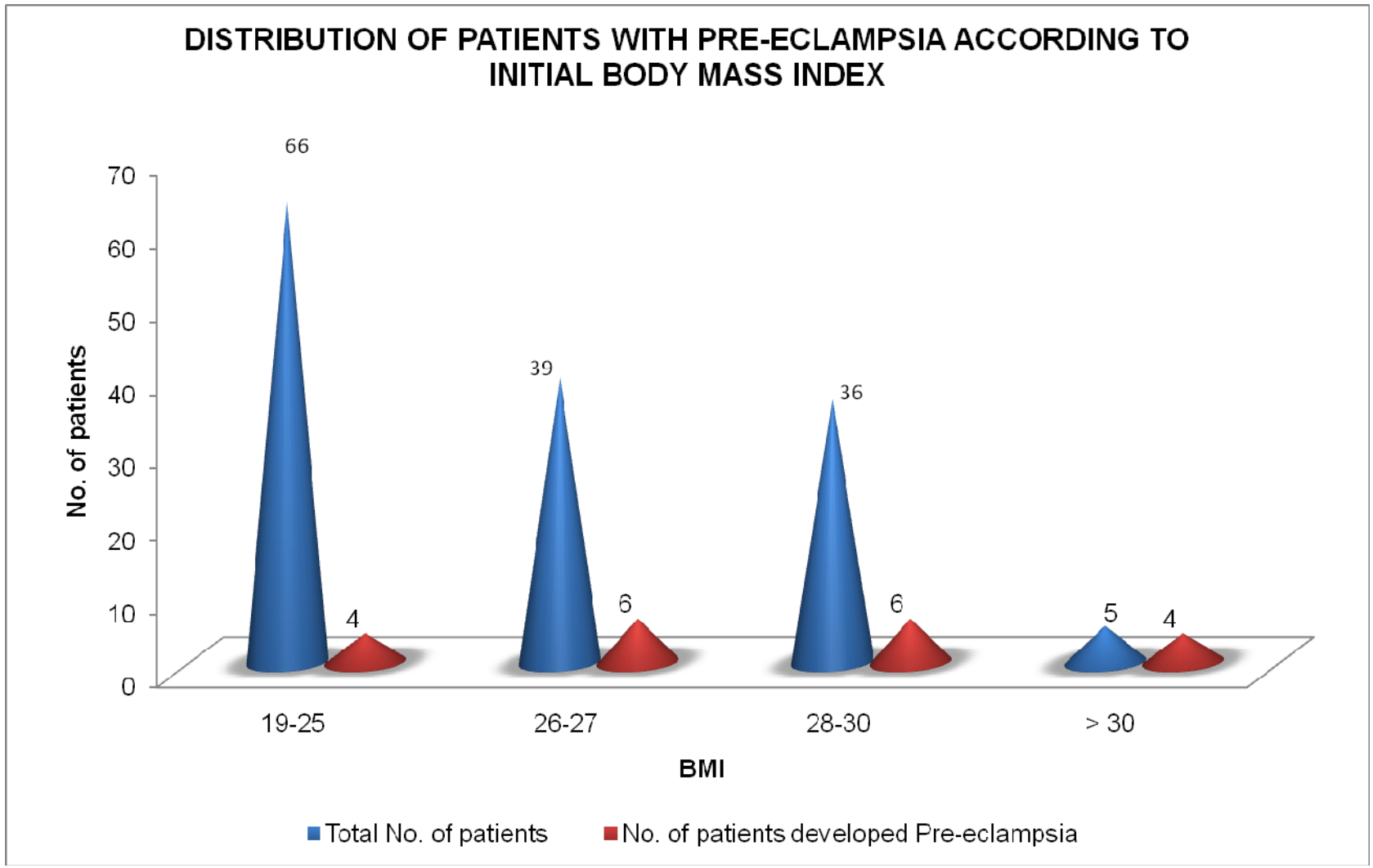

SENSITIVITY OF BHCG > 2MOM TO PREDICT MULTI PRE-ECLAMPSIA
No. of Patients
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
5
3
Total No. of Multi Para pre-eclampsia
Total No. of Multi Para pre-eclampsia predicted by BHCG with >2MOM

TABLE - 9

DISTRIBUTION OF PATIENTS WITH PRE-ECLAMPSIA ACCORDING TO INITIAL BODY MASS INDEX (BMI) AND BHCG ELEVATION

INITIAI BMI	**TOTAL**	**PREECLAMPSIA PPSITIVE**	**BHCG>2MOM**
19-25	66	4	2
26-27	39	6	6
28-30	36	6	6
>30	5	4	4

Above table shows that BMI > 25 is associated with BHCG > 2 MOM and increased development of pre-eclampsia.


DISTRIBUTION OF PATIENTS WITH PRE-ECLAMPSIA ACCORDING TO INITIAL BODY MASS INDEX
No. of patients
70
60
50
40
30
20
10
0
66
4
39
6
36
6
5
4
19-25
26-27
28-30
> 30
BMI
Total No. of patients
No. of patients developed Pre-eclampsia

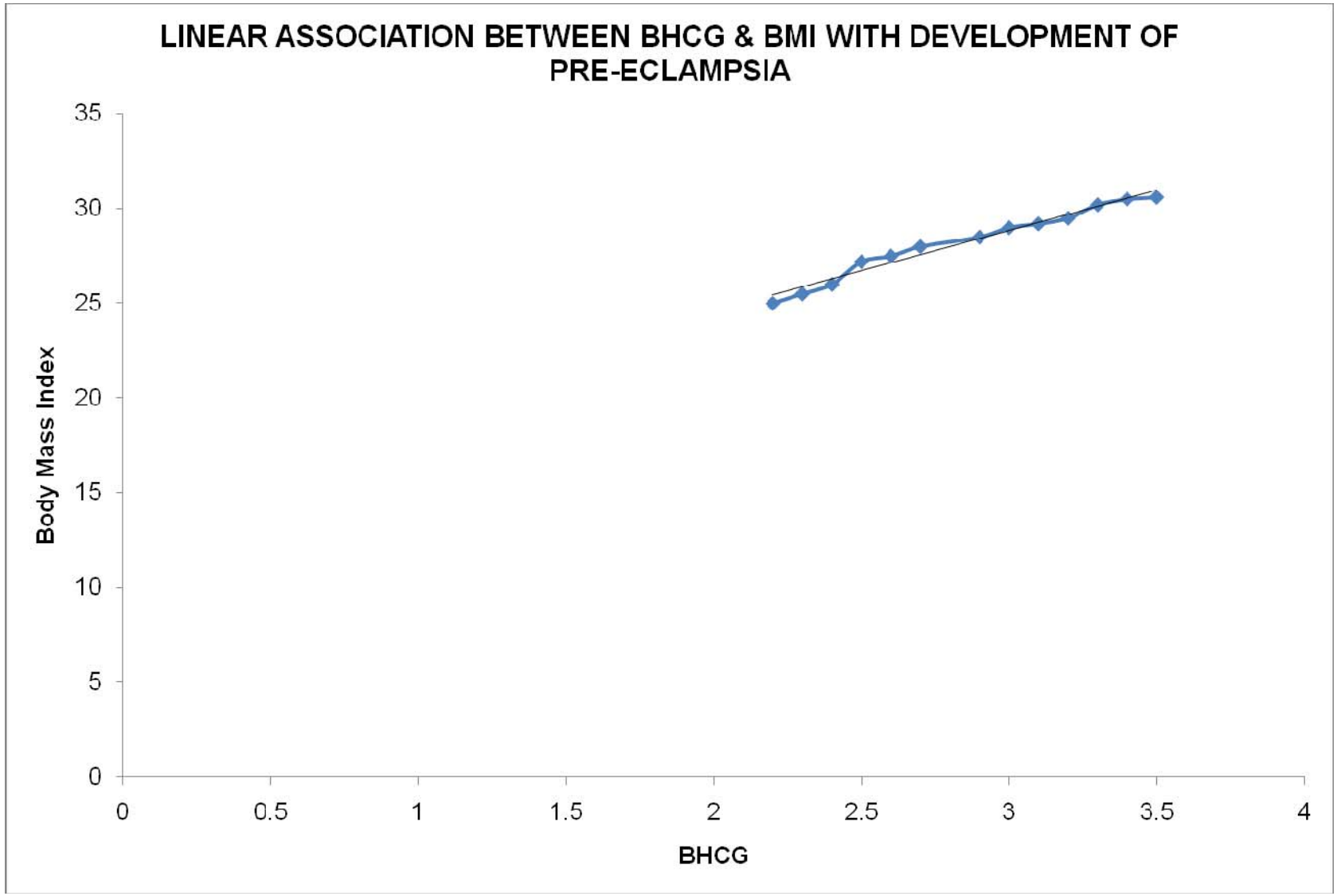
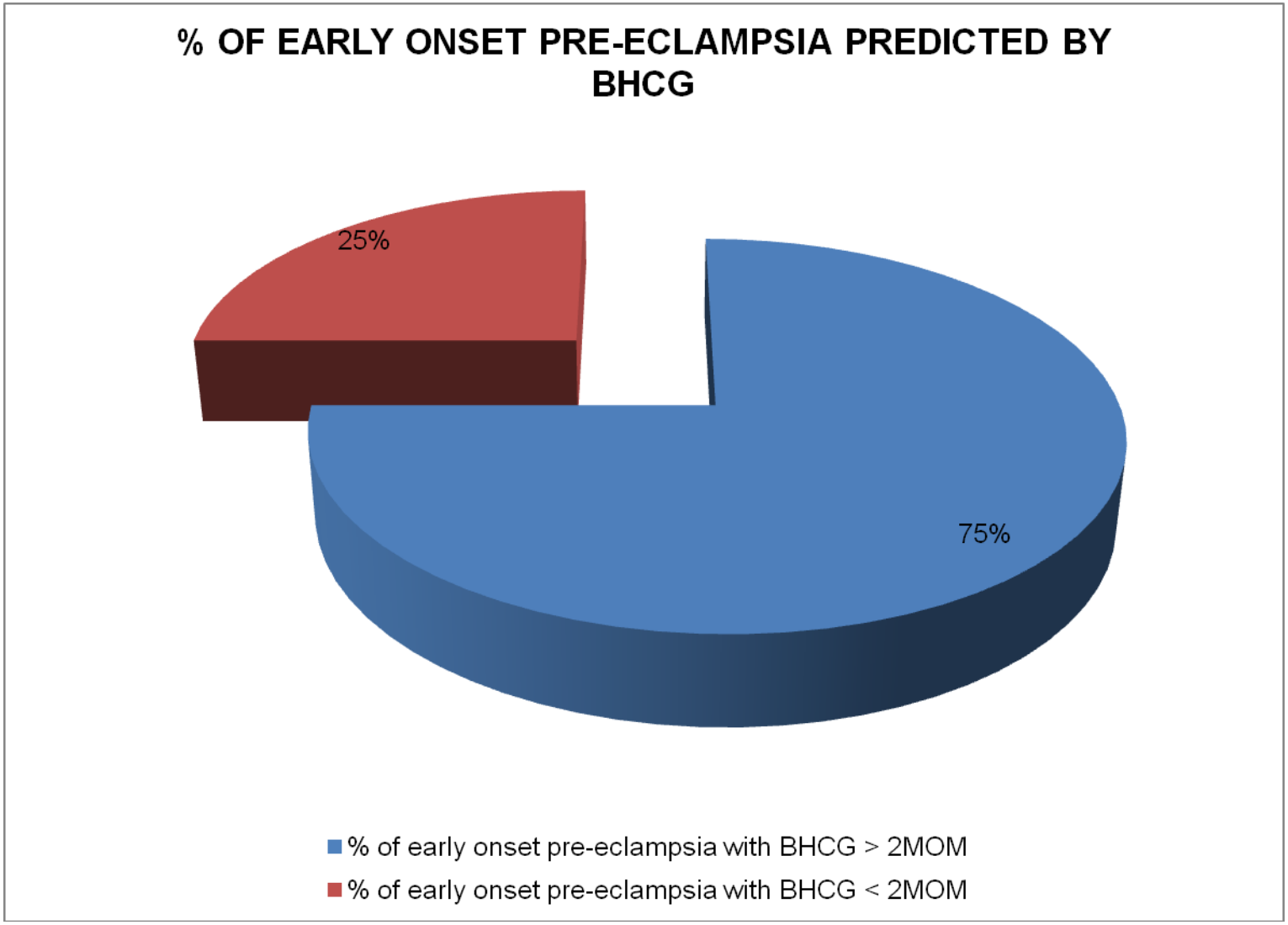

LINEAR ASSOCIATION BETWEEN BHCG & BMI WITH DEVELOPMENT OF PRE-ECLAMPSIA
Body Mass Index
35
30
25
20
15
10
5
0
0
0.5
1
1.5
2
2.5
3
3.5
4
BHCG

TABLE - 10

DISTRIBUTION OF PERSONS DEVELOPED EARLY ONSET PRE-ECLAMPSIA PREDICTED BY ROLL OVER TEST POSITIVE GROUP & BHCG > 2 MOM GROUP.

EARLY ONSET PRE-ECLAMPSIA	**ROLL OVER TEST POSITIVE**		**BHCG > 2 MOM**	
	No	%	No	75%
N=4	1	25%	3	75%

Above table shows that 75% of persons with early onset pre-eclampsia had BHCG > 2 MOM, but 25% persons had roll over test positive.


% OF EARLY ONSET PRE-ECLAMPSIA PREDICTED BY BHCG
25%
75%
% of early onset pre-eclampsia with BHCG > 2MOM
% of early onset pre-eclampsia with BHCG < 2MOM

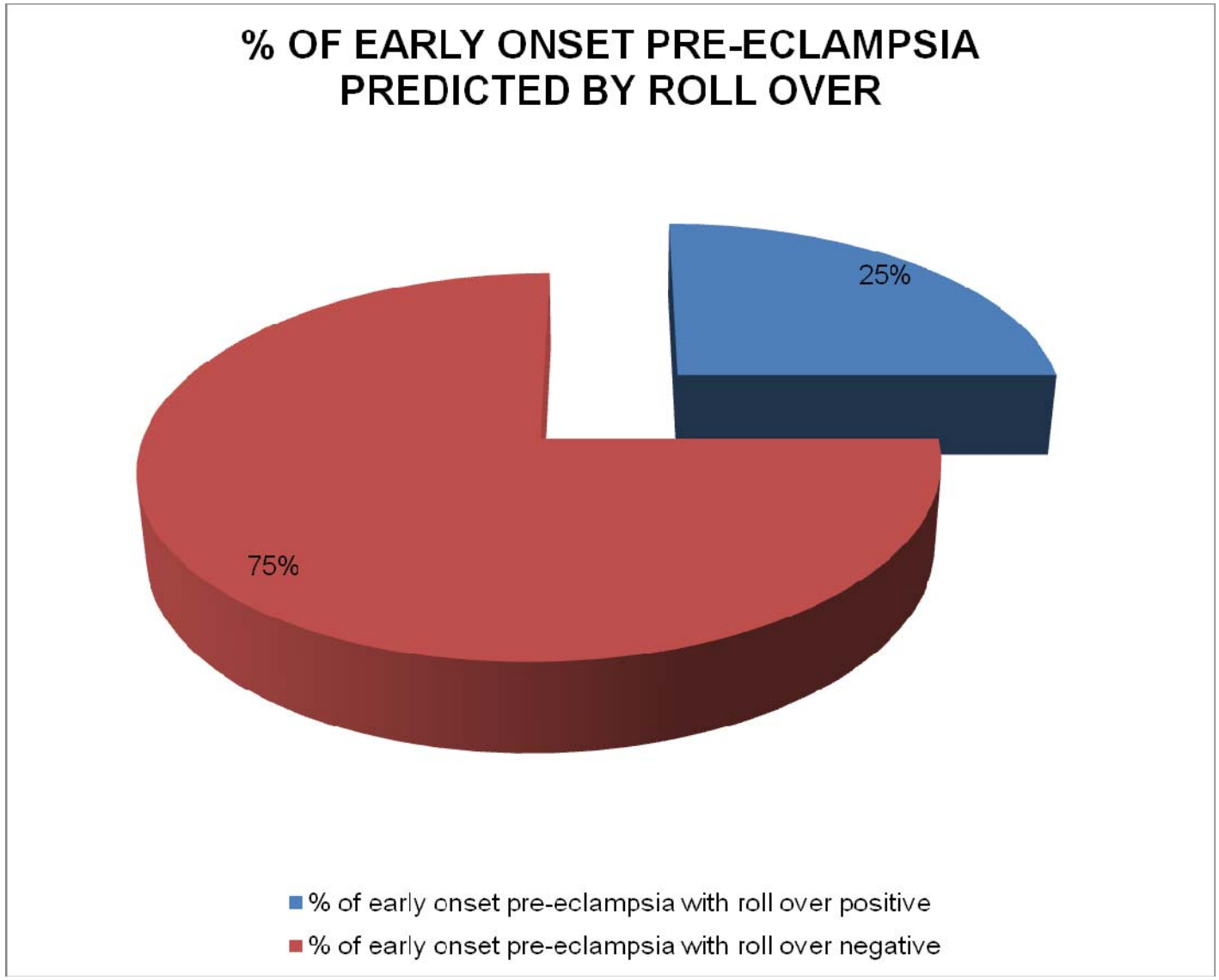

% OF EARLY ONSET PRE-ECLAMPSIA PREDICTED BY ROLL OVER
25%
75%
% of early onset pre-eclampsia with roll over positive
% of early onset pre-eclampsia with roll over negative

TABLE - 11

RELATIONSHIP OF BHCG > 2 MOM AND DEVELOPING PRE-ECLAMPSIA WITH INTRAUTERINE GROWTH RETARDATION (IUGR)

Total No	**BHCG > 2 MOM**		**Roll over Positive**	
	No	%	No	%
3	3	100%	1	25%

100% of IUGR women had BHCG>2MOM and

BHCG is highly predictive of severe preeclampsia with IUGR

DISCUSSION

DISCUSSION

Study Comprised of 150 asymptomatic pregnant who undergone both serum BHCG estimation and roll over test between 16-20 weeks and 18-22 weeks of gestational age respectively.

Among them 4 women excluded due non-compliance and development of gestational diabetics mellitus.

But women with history of chronic hypertension, family history of hypertension, diabetes, renal disease, elderly primi, previous obstetric history with still birth & pre-eclampsia, abruption, intrauterine fetal death, congenitally anomalous baby were excluded. These have been excluded because of their influence with BHCG estimation. BHCG estimation done by chemiluminiscent immuno assay method.

INCIDENCE

Out of 146 patients, 20 developed pre eclampsia with incidence of13.6% who were diagnosed with high blood pressure and proteinuria. Rodriquez et al (1988) have reported an incidence of 10% . RituKamra et al 1997 has reported an incidence of 13.8%.

AGE DISTRIBUTION

In this study, most of the pre-eclampsia developed between 17-20 years of age group and between 31-34 years, this correlates with the incidence of pre-eclampsia is more common with extremes of age as cited in many studying .

Lehman analysed severe preeclampsia cases during 1970-1990 and found the incidence highest at extremes of child bear age.

Therefore this study shows that extremes of age probably acts as one of the risk factors of developing pre-eclampsia.

PARITY

Incidence of pre-eclampsia (17.4%) is high in primiparous women. This in concordance with reported incidence in India and western studies, showing and incidence of 16% in nullipara and 7% in multipara.

Also 75%developed preeclampsia are primi and 25% are multi.

In Parkland patients 70% were primi. Sibai and colleagues (1995) confirmed the higher risk of developing hypertension in the first pregnancy.

SOCIO ECONOMIC STATUS

Preclampsia is common in low-socio economic group than high socio-economic group., since most of patients in RSRM belonged only to low

socio-economic group, a comparison could not be done between socio-economic groups in this study,

OBESITY

Also pre-eclampsia is high(20%) in patients with high body mass index (>25). This study showing high pre-eclampsia incidence with high BMI in concordance with many other reported studies in India.Walker(2000) study shows that ai incidence of 13.3% in those with a BMI >30.

BHCG ESTIMATION

22 patients out of 146 had BHCG > 2 MOM out of which 18 developed pre-eclampsia and remaining 4 did not develop pre-eclampsia. Sensitivity being 90%, Specificity 96.8%. the Positive predictive value 81.8%, Negative predictive value 98.4%.

ODDS ratio, 274 P= < 0.001 (using chisquare yates correction)

The tables given below compare the sensitivity, specificity, positive and negative predictive value of BHCG with other studies.

Author	**Year**	**No.of Patients**	**Parity**	**Pre-eclampsia incidence**	**Sensitivity**	**Specificity**	**PPV**	**NPV**
Pankaj desai et al	(1995-2000)	220	Both multi and primi	16.15%	71%	65%	40	95
Luckas et al	1998	430	Primi	13.5%	80%	90%	75%	90%
Roiz Hernandez et al	2006	784	Both multi Primi	12%	92%	92%	46	98%
Present study	2009 oct_ 2010 oct	150	Both multi primi	13.6%	90%	96.8%	81.8%	98.4%

This table shows comparing the sensitivity, specificity and positive and negative predictive value of roll over test with others study.

Author	**Year**	**No.of Patients**	**Parity**	**Pre-eclampsia incidence**	**Sensitivity**	**Specificity**	**PPV**	**NPV**
Gant et al	1974	438	Primi	5.8%	80%	90%	33%	90%
Narvaez et al	1988	782	Primi	8.10%	70%	95%	88%	92.5%
Present study	2009 oct to 2010 oct	150	Both multi primi	13.6%	70%	86.6%	50%	94%

BHCG ESTIMATION

The sensitivity(90%) and specificity(96.8%) of our present study were similar to the study of Roiz Hernandez et al (2006).

The PPV of the study was similar to Luckas et al.

The NPV was similar to Pankaj desai et al (1995-2000),Roiz Hernandez et al(2006).

Also BHCG has high predictictability for primi para preeclampsia(100%) than multi(60%)This is similar to Francoise muller et al(1996).

BHCG is highly valuable for early onset preeclampsia(75%).This was similar to the study of Sayeed et el-80%(1995).But roll over predicts only (25%) of cases.

Also BHCG predicts 100% cases of severe preeclampsia with IUGR.This is similar to L.S.Ondero et al study (1997).

ROLL OVER TEST

28of 146 patients had roll test positive.But 14 only developed preeclampsia,with sensitivity 70%,specificity 86.6%,PPV 50%,NPV94%.ODDS RATIO 15.Pvalue<0.01(using chi square Yates correction).

The sensitivity of the test is similar to the Narvaez et al.(1998)

The specificity is simslar to Gant et al(1994) study.

The NPV of the study is similar to Narvaez et al(1988).

Roll over test is a simple test to perform,but having high sensitivity specificity,NPV.

But it has some flaws. Some patients have unusually low diastolic pressure in the left lateral position,thus creating a false positive results when compared with the reading in the supine position.

An artifact arises when the patient rolls from the left lateral position to ths supine position, as the position of the sphygmomanometer cuff relative to heart altered.

Inter observer variation and poor reproducibility are the other disadvantages.

SUMMARY

SUMMARY

Following conclusions are drawn from the study.

1.The present study compared BHCG elevation in comparison to roll over test among 150 asymptomatic pregnant women.

2. The incidence of pre-eclampsia in the study is 13.6%.

3.Primiparity was found to be significant risk factor.

4.High body mass index, extremes of age (i.e) <20 years and >30 years are associated with increased risk of developing pre-eclampsia.

5.BHCG >2 MOM found in 22 persons among which 18persons developed pre-eclampsia. Sensitivity 90% specificity 96.8%, positive predictive value 81.8%, Negative predictive value 98.4%, ODDS ratio 274 and P<0.001.

6.A pregnant woman with multiparity or extremes of age or with high.

7.Body mass index along with raised BHCG is at a high risk for development preeclampsia.

8.Also early onset preeclampsia <28 weeks, severe pre-eclampsia with IUGR are predicted by BHCG estimation with sensitivity of 75% and 100% respectively.

9.Also predicting primipara pre-eclampsia by BHCG is more(100%) than predicting multipara pre-eclampsia.

10.Roll over test found positive in 28 persons among which 14 persons developed pre-eclampsia. Sensitivity 70%, specificity 86.6%, positive predictive value 50%, negative predictive value 94% OPPs ratio 15 and P <0.01.

11.Due to some technical errors, roll over tests shows high false positive results.

CONCLUSION

CONCLUSION

1.The study shows that BHCG>2 MOM in early second trimester is an excellent screening tool for the prediction of pre-eclampsia with sensitivity of 90% and specificity of 96.8% , positive predictive value of 81.8%, Negative predictive value of 98.4%.

2. This test is ideal because it is now a days readily available, relatively cheap, cost effective, safe, easy to perform, readily interpretable.

3. It has a good predictive value especially for early onset pre-eclampsia and severe pre-eclampsia with IUGR which are said to have poor progmosis .

4. A primi para of extremes of age group with high body mass index with a high BHCG is especially at a high risk for development of pre-eclampsia.

5. In our study BHCG >2MOM is a better predictor than roll over test for preeclampsia.

PROFORMA

PROFORMA

NAME: AGE: OP NO:

ADDRESS: REG NO:

SOCIO ECONOMIC STATUS: DATE:

GRAVIDA PARA ABORTION

LIVE BIRTH

LMP

EDD

MENSTRUAL HISTORY

MARITAL HISTORY

MEDICAL HISTORY

DIABETES

HYPERTENSION

EPILEPSY

RENAL DISEASE

HEART DISEASE

PAST OBSTETRIC HISTORY:-

H/O STILL BIRTHS

ABRUPTION

RECURRENT ABORTIONS

GESTATIONAL HYPERTENSION

FAMILY HISTORY:-

DIABETES

HYPERTENSION

GESTATIONAL HYPERTENSION

TWINS

CONGENITAL ANOMALIES

ON GENERAL EXAMINATION

PATIENT

- BUILT
- TEMPERATURE
- ANEMIA
- PULSERATE
- BLOOD PRESSURE AT SITTING POSTURE
- PEDAL EDEMA
- HEIGHT
- WEIGHT
- BREAST
- THYROID

CVS

RS

PER ABDOMEN

FUNDAL HEIGHT

WHETHER ACTING OR NOT

INVESTICATIONS:

HB%

URINE – ALBUMIN

SUGAR

BLOOD – SUGAR

- HIV
- BLOOD GROUPING
- BLOOD FOR BHCG ESTIMATION

(Between 16-20 weeks)

- ROLL OVER TEST

(Between 18-22 weeks)

- ULTRA SOUND
- Ist TRIMESTER IInd TRIMESTER IIIrd TRIMESTER

FOLLOW UP

Specific Symptoms	Weight	Pedal Edema	Blood Pressure	Urine Protein	P/A	USG Findings

BIBLIOGRAPHY

BIBLIOGRAPHY

1. Desai P Rao. S predictive value of raised mid-trimester Beta HCG in pregnancy induced hypertension. Indian journal of obstetrics and gynaecology 2002, 52 (1); 68
2. Satyanarayanan. K, Sowhney.H, Vashista. K associative between second trimester HCG levels and pregnancy induced hypertension(Indian journal of obstetrics and Gynaecology 2001 51(5); 85)
3. Reproductive biology and Endocrinology by Estaun-Ram – 2005 by 42 related articles.
4. Screening for placental insufficiency in high risk pregnancies by SL Costa 2008 cited by 7 related articles.
5. Sibai BM Ewall M, Levine RJ etal, Risk factors associated with pre-eclampsia in healthy nulliparous women. American Journal Obstetrics and Gynaecology 177; 1003, 1997.
6. Review article Immunological factors in pre-eclampsia by DA Clark 2008 cited 12-related articles.
7. Elevated mid trimester maternal serum BHCG is chromosomally normal fetuses by S.Heinonen 1996 cited by 19 related articles.

8. Gant VF, Chand S, Worley RJ etal, A clinical test useful for predicting the development of acute hypertension in pregnancy. American Journal of Obstetrics and Gynaecology 120:1,1974.

9. Conde Agudelo A, Romero lind heimer MD, tests to predict pre-eclampsia. In lind heimer MD, Roberts JM, Cunnighim FG (eds), Cherley's hypertensive disorders of pregnancy 3rd edition, Newyork, Elsevier 2009, P.19.

10. Progress in O & G by John stud (14th Edition)

11. William's obstetrics, 23rd edition.

12. Iandonald's practical obstetrical problems – 6th edition.

13. Practical guide to high risk pregnancy and delivery by Fernando Arias, 3rd Edition.

14. Ian Mac Gillivray – University of Aberden. Etiology of pre-eclampsia. Journal of applied medicine Dec 1988-87; 963.

15. Cherley LC, Diagnosis of pre-eclampsia (O& G) 1985, 65: 423-425.

16. Clinical hypertension by Norman.M.Kaplan-8th Edition.

17. Dewhursts Text book of O & G for postgraduats 6th edition P (167-169).

18. Medical disorders in obstetric practice by Michael de sweet-4th Edition.

19. Mudaliar and Menon's clinical obstetrics-10th edition.

20. Luckas et al – BHCG in early second trimester as a predictor for pre-eclampsia.Journal O & G 201; 190; 2001.

21. Reiz Hernandez at al – An evaluation of predictor tests for pre-eclapsia – Journal of O& G 272;109;2005.

22. Conde Agudelo A Belzan JM lede. R etal what does an elevated mean arterial pressure in the second half of pregnancy predict Gestational hypertension or pre-eclampsia. AMJ Obstetrics Gynaecology 1993; 169, 509-14.

23. Fisher KA luger A, Spargo BH etal hypertension in pregnancy, clinical, pathological to realtions and remote prognosis. Medicine (Battimore) 1981; 60; 267-76.

24. Kaur.D, Saini AS, Kaur.A, etal evaluation of Isometric exercise as a predictor of PIH. Journal of O & G India 2003; 53; 115.

25. Lieberman et al The value of elevated second trimester BHCG in predicting development of preeclampsia,AJOG,1993-002-9388.

26. L.S.Ondero et al Elevated second trimester BHCG level associated with adverse pregnancy outcome,IJOG Vol 56,issue 3, March 1997.

27.Bojana brajenovic milic et al Elevated second trimester free BHCGas an isolated finding and pregnancy outcome, Fetal diagnostic therapy,2004,19;483-487.

28.Knobil and neills physiology of reproduction vol 2 page 2881.

29.Bassamhaddad et al Predictive value of early BHCG serum profiles for Fetal growthrestriction ,Oxford journals ,vol 14,issue11,pages 2872-2875.

30.K.yousef nedad et alSerum BHCG in diagnosis of preeclampsia and management.J Med science 8; 722-727. Maternal HCG 31.Gerelyn et al Second trimester level of Maternal HCG and inhibin A as a predictors of preeclampsia,Reproductive sciences ,may and june 2000,vol no3170-174.

31.Francoise muller et al Maternal serum HCG level at 15 weeks is a predictor for preeclampsiaAJOG VOL 175 ISSUE 1,page 37-40.july 1996.

32.Schachidandham kanagasabai, Biochemical markers of preeclampsia Are we there yet?internet journal of o&g2010 vol 14,no 1.

33.Zahra basirat et al Serum BHCG level & preeclampsiaSaudi j o&g 2006; vol 27(7) 1001-1004.

34.Fen q et al,Clinical significance of BHCG & HPLin serum of normal pregnancies and PIH.

35. Davidson BJ et al Maternal serum Activin. Inhibin. BHCG.aipha feto proteinas second trimester prediction of preeclampsia,BJOG 2003,110,46-52.

36. Gurbuza et al Can serum BHCG levels be used in differential diagnosis of PIH?Hypertens pregnancy2004;23,1-12.

37.Bartha AJ et al,BHCG & VEGFin normal and complicated pregnancies,IJOG 2003 ,102,995-997.

38. CasartAC etal Bioactivity of BHCG preeclampsia Obs&gynae2001,98,463-465 .

39.Ashour am et al The value of elevatedsecond trimester BHCG in predicting development of preeclampsia,AJOG1997,176,438-442.

40.Morssent et al The association between PIH and abnormal second trimester maternal HCG& alpha feto protein,Obste&gynae1997,90,480-481.

41.Steir j a et al HCG & TESTOSTERONE in normal &preeclamptic pregnancies in relation to fetal sexObstetri&gynae,2002,100.170-174 .

42.Vaimant P;Validity in nullipara of increased BHCG at mid term for predicting PIH with proteinuria and IUGR nephron,AJOG 1996,72,557-563.

43HSC et al ,ELEVATED HCG as evidence of secretory response in severe preeclampsia AmJOG,1994,170,1135-1138.

44.The role of HCG in reproductive medicine,BJOG,Nov 2004, vol 1 11,pp1218-1228.

45.J S Barron et al, HCG In human,placentas from normal & preeclamptic pregnancies,Archives of Gynae&Obste vol 266.

46.David LWalton et al; Second trimester HCG Concentrate &complication and outcome of pregnancy Eng J M 1999,341,2033-2038.

47.Yemin M ET AL; Predictive value of roll over test in women with mild preeclampsia AmJOG 1985,SEP .153(1).77-78.

48.Luix francis et al;ROLL over test in primi gravidae attending a public primary care Sa Paulo MJ Sep/OCT1997.

ABBREVIATIONS

ABBREVIATIONS

Sflt-1	-	Serum fms like tyrosine Kinase receptor -1
IU/L	-	International Units / Litre
BHCG	-	Beta human chorionic gonadotrophin
PPV	-	Positive Predictive Value
NPV	-	Negative Predictive Value
CRP	-	C-reactive Protein
PAPP-A	-	Pregnancy associated placental Protein-A
RFT	-	Renal Function Tests
LFT	-	Liver Function Tests
CBC	-	Complete hemogram
FKC	-	Foetal Kick Chart
AFI	-	Amniotic fluid index
MOM	-	Multiples of Median
HLA	-	Human Leucocyte Antigen
MTHFR	-	Methylene tetra hydro folate reductase

MASTER CHART

MASTER CHART

S.No	Name	OP.No	Age	S/E	Obstetric status	BMI	BHCG	Roll over test	Remarks
1.	Malini	11776	19	V	Primi	23	< 2 MOM	Negative	
2.	Priya	11706	21	V	Primi	22	< 2 MOM	Positive	
3.	Punitha	10766	17	V	G2P1L1	22	> 2 MOM	Positive	
4.	Angammal	11780	20	V	Primi	25	> 2 MOM	Positive	
5.	Syednisha	10788	22	V	Primi	28	< 2 MOM	Negative	Developed Mild Pre-eclampsia
6.	Akila	10700	24	V	G2P1L1	25	< 2 MOM	Negative	
7.	Tamilarasi	10005	25	V	G2P1L1	27	> 2 MOM	Positive	Developed Mild Pre-eclampsia
8.	Indhira	2881	34	V	Primi	29	> 2 MOM	Positive	Developed early onset pre-eclampsia
9.	Gowri	2851	28	V	G2P1L1	30	< 2 MOM	Negative	
10.	Rangalakshmi	3678	20	V	Primi	26	< 2 MOM	Negative	
11.	Vijaya	3679	27	V	Primi	25	< 2 MOM	Negative	
12.	Devi	6509	26	V	Primi	26	> 2 MOM	Positive	Developed Mild Pre-eclampsia
13.	Lakshmi.K	6016	28	V	Primi	25	< 2 MOM	Negative	
14.	Vidhya	6210	25	V	Primi	25	< 2 MOM	Negative	
15.	Mahadevi	12140	20	V	Primi	27	> 2 MOM	Positive	Developed Mild Pre-eclampsia
16.	Maya	2820	26	V	Primi	24	< 2 MOM	Negative	
17.	Hashish	2888	31	V	Primi	23	< 2 MOM	Negative	
18.	Vanaja	11920	18	V	G2P1L1	24	> 2 MOM	Positive	Developed Mild Pre-eclampsia
19.	Lakshmi.	10906	27	V	G2P1L1	23	< 2 MOM	Negative	
20	Shanthi	8455	25	V	G2P1L1	24	< 2 MOM	Negative	

S.No	Name	OP.No	Age	S/E	Obstetric status	BMI	BHCG	Roll over test	Remarks
21.	Sheela	8655	27	V	G2P1L1	25	< 2 MOM	Negative	
22.	Thenmozhi	8771		V	G3P2L2	24	< 2 MOM	Positive	
23.	Yasoda	8661		V	G3P2L2	22	< 2 MOM	Positive	
24.	Jayashree	9553		V	Primi	25	< 2 MOM	Positive	
25.	Dhanam	9672		V	Primi	22	< 2 MOM	Negative	
26.	Madhamma	2372		V	Primi	26	< 2 MOM	Negative	
27.	Latha	6320		V	G2P1L1	23	< 2 MOM	Positive	
28.	Rengaal	6000		V	Primi	21	< 2 MOM	Negative	
29.	Erulaaya	321		V	Primi	21	< 2 MOM	Negative	
30.	Janagi	6307		V	G2P1L1	27	< 2 MOM	Negative	
31.	Parveen	6352		V	G2P1L1	25	< 2 MOM	Negative	
32.	Selvi	3321		V	G2P1L1	27	< 2 MOM	Negative	
33.	Hemalatha	5005		V	Primi	23	< 2 MOM	Negative	
34.	Ramadevi	11672	26	V	Primi	24	< 2 MOM	Negative	
35.	Varalakshi	11680	28	V	Primi	23	< 2 MOM	Negative	
36.	Saseekala	11075	29	V	Primi	22	< 2 MOM	Negative	
37.	Amsha	11680	30	V	Primi	25	< 2 MOM	Positive	
38.	Usha	11673	32	V	G2P1L1	26	< 2 MOM	Negative	
39.	Kalaivani	11688	24	V	G2P1L1	20	< 2 MOM	Positive	
40.	Rukku	11700	22	V	G3P2L2	21	< 2 MOM	Negative	

S.No	Name	OP.No	Age	S/E	Obstetric status	BMI	BHCG	Roll over test	Remarks
41.	Saradha	11750	25	V	G2P1L1	23	< 2 MOM	Negative	
42.	Sarawathi	11850	23	V	G2P1L1	29	< 2 MOM	Negative	
43.	Poongodi	11860	31	V	Primi	30	< 2 MOM	Negative	
44.	Maheswari	13321	28	V	Primi	23	> 2 MOM	Negative	
45.	Nandhini	2321	33	V	G2P1L1	32	< 2 MOM	Negative	
46.	Kavitha	7252	26	V	Primi	34	> 2 MOM	Positive	Developed Mild Pre-eclampsia
47.	Violet		30	V	G2P1L1	30	< 2 MOM	Negative	
48.	Mohana	7777		V	Primi	26	> 2 MOM	Positive	Developed Mild Pre-eclampsia
49.	Nirmala	1673	27	V	Primi	24	< 2 MOM	Negative	
50.	Lurthumary	1688	30	IV	G2P1L1	25	< 2 MOM	Negative	
51.	Sulthana	1781	33	V	G2P1L1	28	< 2 MOM	Negative	
52.	Rajeswari	1785	31	V	G2P1L1	28	< 2 MOM	Negative	
53.	Rajini	1882	27	V	G3P2L2	26	< 2 MOM	Negative	
54.	Shripriya	1990	26	V	G4P2L1A1	22	< 2 MOM	Positive	
55.	Bharathi	2232	27	V	Primi	25	> 2 MOM	Negative	
56.	Deivanai	2588	25	IV	Primi	25	< 2 MOM	Negative	
57.	Fathima	2001	28	IV	Primi	21	< 2 MOM	Negative	
58.	Shahitha	2090	29	IV	Primi	20	< 2 MOM	Positive	
59.	Mehapoob	2098	28	IV	Primi	27	< 2 MOM	Negative	
60.	Sulochana	10850	29	IV	Primi	27	< 2 MOM	Negative	

S.No	Name	OP.No	Age	S/E	Obstetric status	BMI	BHCG	Roll over test	Remarks
61.	Ramamani	6667	19	IV	Primi	27	> 2 MOM	Positive	Developed Mild Pre-eclampsia
62.	Manpreeth	4231	30	IV	Primi	28	< 2 MOM	Negative	
63.	Nirmala	4561	30	V	G2P1L1	29	< 2 MOM	Negative	
64.	Lilli	4451	18	V	G2P1L1	30	< 2 MOM	Negative	
65.	Annalakshi	4621	18	V	G2P1L1	31	< 2 MOM	Negative	
66.	Parvathi	12001	18	V	Primi	27	< 2 MOM	Negative	
67.	SagayaMary	12012	19	V	Primi	26	< 2 MOM	Negative	
68.	Usha Samuvel	12017	21	V	G2P1L1	26	< 2 MOM	Negative	
69.	Anitha	12064	19	V	G2P1L1	24	< 2 MOM	Negative	
70.	Sangeetha	12100	30	V	Primi	22	< 2 MOM	Negative	
71.	Saranya	12085	24	V	G2P1L1	20	< 2 MOM	Negative	
72.	Kumutha	12088	22	V	Primi	20	< 2 MOM	Negative	
73.	Ethar	12093	21	V	Primi	18	< 2 MOM	Negative	
74.	Zinath	12201	19	V	Primi	25	< 2 MOM	Negative	
75.	Ponamani	12204	19	V	G3P1A1	25	< 2 MOM	Positive	
76.	Jebaselvi	12260	17	V	G2P1L1	27	< 2 MOM	Negative	
77.	Velanganni	12268	17	V	G2P1L1	27	< 2 MOM	Negative	
78.	Ayishabanu	13078	18	V	Primi	24	< 2 MOM	Negative	
79.	Samshath	8878	27	V	Primi	27	< 2 MOM	Negative	
80.	Nalayini	8890	28	V	Primi	22	< 2 MOM	Negative	

S.No	Name	OP.No	Age	S/E	Obstetric status	BMI	BHCG	Roll over test	Remarks
81.	Manimehalai	8320	33	V	Primi	22	< 2 MOM	Negative	
82.	Koushalya	8991	23	V	Primi	29	< 2 MOM	Negative	
83.	Kuppu	8995	20	V	Primi	28	< 2 MOM	Negative	
84.	Dharani	6121	24	V	Primi	31	> 2 MOM	Negative	Developed early onset pre-eclampsia
85.	Kannmani	8890	34	V	Primi	29	< 2 MOM	Negative	
86.	Ananthi	9025	21	V	G3P1A1	27	< 2 MOM	Negative	
87.	Kowsor	9028	25	V	Primi	24	< 2 MOM	Positive	
88.	Sudha	9063	25	V	Primi	25	< 2 MOM	Negative	
89.	Ramya	9960	26	IV	Primi	24	< 2 MOM	Positive	
90.	Shoba	9265	26	IV	Primi	23	< 2 MOM	Negative	
91.	Shophia	9385	29	IV	Primi	29	< 2 MOM	Negative	Developed Mild Pre-eclampsia
92.	Govindhammal	6127	22	IV	G3P2L2	24	> 2 MOM	Negative	
93.	Marypunitha	9388	30	IV	Primi	21	< 2 MOM	Negative	
94.	Chellammal	9408	32	IV	Primi	26	< 2 MOM	Negative	
95.	Roshini	9510	30	IV	Primi		> 2 MOM	Negative	
96.	Dheepu	12230	18	IV	Primi	32	> 2 MOM	Positive	Developed early onset pre-eclampsia
97.	Muniammal	9660	31	IV	Primi	27	< 2 MOM	Negative	
98.	Kannammal	9638	23	IV	Primi	27	< 2 MOM	Negative	
99.	Vaheetha	8321	21	V	Primi	25	< 2 MOM	Negative	
100.	Vijayalakshmi	8327	24	V	Primi	24	< 2 MOM	Negative	

S.No	Name	OP.No	Age	S/E	Obstetric status	BMI	BHCG	Roll over test	Remarks
101.	Yamuna	8330	17	V	Primi	23	< 2 MOM	Negative	
102.	Thavamani	8419	17	V	Primi	23	< 2 MOM	Negative	
103.	Menaha	8420	18	V	G2P1L1	20	< 2 MOM	Positive	
104.	Alamelu	8505	20	V	Primi	21	< 2 MOM	Negative	
105.	Roopavathi	8507	21	V	Primi	27	< 2 MOM	Negative	
106.	Alphonsa	6531	33	V	Primi	28	> 2 MOM	Negative	Developed severe Pre-eclampsia with IUGR
107.	Vasuki	8003	23	V	Primi	27	< 2 MOM	Negative	
108.	Periyamma	8590	23	V	G3P2L2	26	< 2 MOM	Negative	
109.	Jothi	8661	25	V	Primi	25	> 2 MOM	Negative	Developed Mild Pre-eclampsia
110.	Sapna	8708	25	V	Primi	24	< 2 MOM	Negative	
111.	Reshma	8503	27	V	Primi	23	< 2 MOM	Negative	
112.	Jeevitha	8888	30	V	Primi	23	< 2 MOM	Negative	
113.	Geetha	6101	30	IV	Primi	24	< 2 MOM	Negative	
114.	Sudarmani	5217	29	V	Primi	23	< 2 MOM	Negative	
115.	RejinaMary	6555	31	IV	G2P1L1	32	> 2 MOM	Positive	Developed Mild Pre-eclampsia
116.	Ranjitha	5333	27	V	Primi	24	< 2 MOM	Negative	
117.	Manonmani	5389	23	V	Primi	21	< 2 MOM	Negative	
118.	Muthukumari	5390	25	V	Primi	21	< 2 MOM	Negative	
119.	Shree	5399	22	V	Primi	20	< 2 MOM	Negative	
120.	Velammal	2332	34	IV	Primi	29	> 2 MOM	Negative	Developed severe Pre-eclampsia with IUGR

S.No	Name	OP.No	Age	S/E	Obstetric status	BMI	BHCG	Roll over test	Remarks
121.	SelvaMary	6010	21	V	Primi	25	< 2 MOM	Negative	
122.	Nagajothi	6111	19	V	Primi	20	< 2 MOM	Negative	
123.	Suganya	6212	19	V	Primi	20	< 2 MOM	Negative	
124.	Pradeepa	12111	24	V	Primi	23	> 2 MOM	Negative	Developed Mild Pre-eclampsia
125.	Malathi	6236	17	V	Primi	20	< 2 MOM	Negative	
126.	Subha	6337	23	V	Primi	21	< 2 MOM	Negative	
127.	Nithya	6837	18	V	Primi	21	< 2 MOM	Negative	
128.	Yogalakshmi	6890	18	V	G2P1L1	21	< 2 MOM	Negative	
129.	Ramani	7110	21	V	G2P1L1	29	< 2 MOM	Negative	
130.	Sonali	7029	27	V	Primi	26	< 2 MOM	Negative	
131.	Preethi Kour	2916	21	V	Primi	22	< 2 MOM	Negative	
132.	Priyanka	2902	32	V	G2P1L1	26	> 2 MOM	Positive	Developed Mild Pre-eclampsia
133.	Ishwarya	2920	20	V	Primi	24	< 2 MOM	Negative	
134.	Ponni	3020	22	V	G2P1L1	23	< 2 MOM	Negative	
135.	Sarala	3221	21	V	Primi	21	< 2 MOM	Positive	Developed Mild Pre-eclampsia
136.	Yeswathbegam	3226	21	V	Primi	21	< 2 MOM	Negative	
137.	Chitra	3418	33	IV	Primi	26	< 2 MOM	Negative	
138.	Fathima	3510	32	IV	G2P1L1	28	< 2 MOM	Negative	
139.	Hemavathi	6363	20	IV	Primi	26	> 2 MOM	Positive	Developed early onset Pre-eclampsia & IUGR
140.	Zarena	3030	22	IV	Primi	25	< 2 MOM	Negative	

S.No	Name	OP.No	Age	S/E	Obstetric status	BMI	BHCG	Roll over test	Remarks
141.	Vijayarani	3552	32	IV	G2A1	25	< 2 MOM	Negative	
142.	Masthani	2319	32	IV	Primi	25	> 2 MOM	Negative	
143.	Radhika	3555	23	IV	G2A1	25	< 2 MOM	Negative	
144.	Vimala	8120	21	IV	Primi	24	< 2 MOM	Negative	
145.	Parimala	8005	28	IV	Primi	24	< 2 MOM	Negative	
146.	Nazimunisha	8017	25	IV	G2A1	24	< 2 MOM	Negative	
147.	Malar	8018	26	IV	G2P1L1	24	> 2 MOM	Negative	Developed GDM
148.	Sujatha	8111	22	IV	G2P1L1	24	< 2 MOM	Negative	Non compliant
149.	Jaya	8330	32	V	Primi	22	< 2 MOM	Negative	Developed GDM
150.	Subhathra	8342	34	V	Primi	23	< 2 MOM	Negative	Non compliant

ABBREVIATIONS

GDM	-	Gestational diabetes mellitus
OP No	-	Out patient number
S/E	-	Socio-economic status
S.No	-	Serial Number
G2P1L1	-	Gravida 1 Para 1 Live 1
G2A1	-	Gravida 2 Abortion 1
G3P2L2	-	Gravida 3 Para 2 Live 2
G4P2A1	-	Gravida 4 Para 2 Abortion 1