Commonly Used Biochemical Parameters In Preeclampsia A Systematic Literature Review

1HARSHA V, 2Dr. PRAJNA SHETTY

1RESEARCH SCHOLAR

1SRINIVAS UNIVERSITY,

2SRINIVAS UNIVERSITY

ABSTRACT

Preeclampsia is a leading cause of maternal and fetal mortality and morbidity worldwide. The early identification of patients with an increased risk for preeclampsia is therefore one of the most important goals in obstetrics. Preeclampsia occurs in 2–5% of pregnancies in the Occident, but it complicates up to 10% of pregnancies in the developing countries. Preeclampsia is a multi-system disorder of pregnancy, which is characterized by new onset hypertension (systolic and diastolic blood pressure of ≥ 140 and 90 mm Hg, respectively, on two occasions, at least 6 hours apart) and proteinuria (protein excretion of ≥ 300 mg in a 24 h urine collection, or a dipstick of ≥ 2+), that develop after 20 weeks of gestation in previously normotensive women. Dependent on the systemic involvement, several other symptoms, such as edema, disturbance of hemostasis, renal or liver failure, and the HELLP syndrome (hemolysis, elevated liver enzymes, and low platelet counts) also complicate the clinical picture. Preeclampsia can have an early onset (preeclampsia starting before 34 weeks of gestation) or late onset (preeclampsia starting after 34 weeks of gestation), can show mild or severe symptoms (systolic blood pressure ≥ 160 mmHg or diastolic blood pressure ≥ 110 mmHg, proteinuria >5 g/24 hours, oliguria, neurological symptoms, other clinical symptoms such as deranged liver function, thrombocytopenia. In addition, it can manifest as a maternal disorder only, with an appropriate fetal growing, or it can present itself with a growth restricted fetus (IUGR)or sudden fetal distress.

KEY WORDS

Preeclampsia, Gestation, proteinuria, Liver enzymes ,Thrombocytopenia

INTRODUCTION

Preeclampsia is a pregnancy-specific multisystem disorder of unknown etiology. The disorder cause maternal and fetal morbidity and mortality . . It is considered severe blood pressure and proteinuria are increased substantially or symptoms of end-organ damage (including fetal growth restriction) occur. There is no single reliable, cost-effective screening test for preeclampsia, and there are no well-established measures for primary prevention. Doppler ultrasonography might be used to assess the velocity of uterine blood flow and indirectly evaluate the trophoblastic invasion of the spiral arteries. The impaired placental perfusion reflects in increased uterine artery pulsatility index (PI).

Uric acid- Increased uric acid in the blood is often the earliest laboratory finding related to preeclampsia. Uric acid is a waste product formed from the breakdown of some protein-rich foods and the breakdown of cells in the body. It is normally filtered from the blood by the kidneys. But if the kidneys have been damaged by preeclampsia, uric acid levels in the blood may rise.

Hematocrit. A high hematocrit value can be a sign of preeclampsia. Hematocrit tells the percentage of red blood cells in the blood-a hematocrit value of 42 means that red blood cells make up 42% of the blood volume. A normal hematocrit value for a nonpregnant woman is between 36% and 44%. During pregnancy, the hematocrit value normally decreases-the fluid in the blood (plasma) increases, making red blood cells less concentrated. But preeclampsia often causes the body's tissues to absorb blood Hematocrit. A decreases-the fluid in the blood (plasma) increases, making red blood cells less concentrated.

Platelets -The number of platelets in the blood may be measured. Preeclampsia may cause an abnormally low platelet count.

Partial thromboplastin time (PTT)- This is a measure of the time it takes blood to clot. Preeclampsia can cause problems with blood clotting that increase the partial thromboplastin time.

Electrolytes- Examples of important electrolytes include sodium, potassium, magnesium, calcium, and chloride. The amounts of electrolytes in the body may change if preeclampsia is causing kidney damage

Kidney function tests.-These tests check the amount of certain substances found in the blood that are normally removed from the body by the kidneys. These substances, which include blood urea nitrogen and creatinine, increase in the blood if the kidneys have been damaged. (For more information, see the topic Creatinine and Creatinine Clearance causing fluid to leak out of blood vessels into surrounding tissues (edema).

Liver function test- AST ,ALT ,ALP

PIGF-measures levels of a protein called placental growth factor (PIGF). If PIGF levels are high, it's highly likely that do not have pre-eclampsia. If your PIGF levels are low, it could be a sign of pre-eclampsia, but further tests are needed to confirm the diagnosis.

Management before the onset of labor includes close monitoring of maternal and fetal status. Management during delivery includes seizure prophylaxis with magnesium sulfate and, if necessary, medical management of hypertension. Delivery remains the ultimate treatment. Accesss to prenatal care, early detection of the disorder, careful monitoring and appropriate management are crucial elements in the prevention of preeclampsia-related deaths.

This review aims to find out biochemical tests which is highly reliable for early detetion of preeclmpsia also which is cost effective and can be done in routine clinical laboratories with minimum cost.

- Preeclampsia is a pregnancy-specific disorder involving widespread endothelial dysfunction and vasospasm that usually occurs after 20 weeks of gestation and can present as late as 4-6 weeks postpartum. It is clinically defined by new-onset hypertension and proteinuria, with or without severe features. In addition to the blood pressure criteria, proteinuria of greater than or equal to 0.3 grams in a 24-hour urine specimen, a protein (mg/dL)/creatinine (mg/dL) ratio of 0.3 or higher, or a urine dipstick protein of 1+ (if a quantitative measurement is unavailable) is required to diagnose preeclampsia. Impaired hepatic function as indicated by abnormally elevated blood concentrations of liver enzymes (to double the normal concentration), severe persistent upper quadrant or epigastric pain that does not respond to pharmacotherapy and is not accounted for by alternative diagnoses, or both (1)
  Progressive renal insufficiency (serum creatinine concentration >1.1 mg/dL or a doubling of the serum creatinine concentration in the absence of other renal disease) New-onset cerebral or visual disturbances, Pulmonary edema ,Thrombocytopenia (platelet count < 100,000/µL).[1] (Kee-Hak Lim, et al august 18 2022) (2)

- Karen S. Greiner (et al September 2022) The rate of preeclampsia with severe features has increased. Previous studies have shown elevated liver enzymes are an indicator of worsening hypertensive disease of pregnancy and adverse outcomes, therefore leading to their inclusion as a diagnostic criterion for severe features of preeclampsia. Despite this, there are limited data to support an aspartate aminotransferase (AST) or alanine aminotransferase (ALT) concentration ≥ two times the upper limit of normal as the critical point at which maternal harm from ongoing pregnancy exceeds neonatal harm from delivery(3)

- Julia T. Stadler et al observe that Preeclampsia (PE) is linked to an overall increased cardiovascular risk for both the mother and child. Functional impairment of high-density lipoproteins (HDL) may contribute to the excess cardiovascular risk associated with PE. In this study, They investigated the effects of PE on maternal and neonatal lipid metabolism, and the parameters of HDL composition and function.. In mothers, early- and late-onset PE was associated with atherogenic dyslipidemia, characterized by high plasma triglycerides and low HDL-cholesterol levels. They observed a shift from large HDL to smaller HDL subclasses in early-onset PE, which was associated with an increased plasma antioxidant capacity in mothers. PE was further associated with markedly increased levels of HDL-associated apolipoprotein (apo) C-II in mothers, and linked to the triglyceride content of HDL. In neonates of early-onset PE, total cholesterol levels were increased, whereas HDL cholesterol efflux capacity was markedly reduced in neonates from late-onset PE. In conclusion, early- and late-onset PE profoundly affect maternal lipid metabolism, potentially contributing to disease manifestation and increased cardiovascular risk later in life. PE is also associated with changes in neonatal HDL composition and function, demonstrating that complications of pregnancy affect neonatal lipoprotein metabolism.(4)

- Kate Duhig,et al (2018 Feb 28) studied Pre-eclampsia is a leading cause of maternal mortality, responsible annually for over 60,000 maternal deaths around the globe. Pre-eclampsia is a multisystem disease featuring hypertension, proteinuria, and renal, hepatic, and neurological involvement. Diagnosis is often elusive, as clinical presentation is highly variable. Even those with severe disease can remain asymptomatic. Angiogenic factors are emerging as having a role in the diagnosis of pre-eclampsia and in prognostication of established disease.(5)

- In a study done by Shahd A. Karrar; Peter L. Hong about preeclampsia, The initial presentation of preeclampsia typically arises in near-term pregnancies. Other significant findings that may or may not be a part of the clinical presentation include proteinuria, signs of end-organ damage, such as thrombocytopenia, impaired liver function, severe persistent right upper quadrant or epigastric pain, excluding all other alternative diagnoses, new-onset headache unresponsive to all forms of management, pulmonary edema, or renal insufficiency with abnormal lab values. Further distinguishing subcategories of preeclampsia include classification into mild or severe, which are deemed so based upon presentation and clinical criteria, to be described further.(6)

- :Phyllis August, MD, MPHBaha M Sibai, observed that Preeclampsia refers to the new onset of hypertension and proteinuria or the new onset of hypertension plus significant end-organ dysfunction with or without proteinuria

in a previously normotensive patient, typically after 20 weeks of gestation or postpartum. They obtain the following laboratory tests when preeclampsia is suspected :Complete blood count with platelets ,Serum creatinine level ,Liver chemistries (aspartate aminotransferase [AST], alanine aminotransferase [ALT]) and bilirubin

Quantitative urinary protein (protein to creatinine ratio in a random urine specimen or 24-hour urine collection for total protein In patients with abnormal liver chemistries, additional laboratory testing includes lactate dehydrogenase (LDH) level. Coagulation studies (prothrombin time, partial thromboplastin time, fibrinogen. In patients with acute upper abdominal or epigastric pain or those found to have severe liver dysfunction, glucose, amylase, lipase, and ammonia levels can help in differential diagnosis.(7)

- The evolution of the diagnostic criteria of preeclampsia-eclampsia by Michael S. Tanner et al -As the understanding of the pathophysiology of preeclampsia has improved, its diagnostic criteria have evolved. The classical triad of hypertension, edema, and proteinuria has become hypertension and organ dysfunction—renal, hepatic, neurologic, hematological, or uteroplacental. However, the most recent definitions have largely been based off consensus and expert opinion, not primary research. In this review, they explore how the criteria have evolved, particularly through the second half of the 20th and the beginning (8)
- Evdokia Dimitriadis et al- Pre-eclampsia is a life-threatening disease of pregnancy unique to humans and a leading cause of maternal and neonatal morbidity and mortality. Women who survive pre-eclampsia have reduced life expectancy, with increased risks of stroke, cardiovascular disease and diabetes, while babies from a preeclamptic pregnancy have increased risks of preterm birth, perinatal death and neurodevelopmental disability and cardiovascular and metabolic disease later in life.(9)
- Liona C. Poon, et al in 2021 studied about practice advice for second and third trimester risk stratification, monitoring, and management of preeclampsia in this study Preeclampsia has been traditionally defined as the onset of hypertension accompanied by significant proteinuria after 20 weeks of gestation. Recently, the definition of preeclampsia has been broadened. Now the internationally agreed definition of preeclampsia is that proposed by the International Society for the Study of Hypertension in Pregnancy (ISSHP). According to ISSHP, pre-eclampsia is defined as systolic blood pressure at ≥140 mmHg and/or diastolic blood pressure at ≥90 mmHg on at least two occasions measured 4 hours apart in previously normotensive women and is accompanied by ≥1 of the following new-onset conditions at or after 20 weeks of gestation: Proteinuria: 24-hour urine protein ≥300 mg/day; spot urine protein/creatinine ratio ≥30 mg/mmoL or ≥0.3 mg/mg, or urine dipstick testing ≥2+ Other maternal organ dysfunction: -Acute kidney injury (creatinine ≥90 μmol/L; >1.1 mg/dL); -Liver involvement (such as elevated liver transaminases >40 IU/L) with or without right upper quadrant or epigastric pain; -Neurological complications (including eclampsia, altered mental status, blindness, stroke, or more commonly hyper reflexia when accompanied by clonus, severe headaches, and persistent visual scotomata); Hematological complications (thrombocytopenia–platelet count <disseminated intravascular coagulation, hemolysis)-Uteroplacental dysfunction (such as fetal growth restriction, abnormal umbilical artery Doppler wave form or stillbirth)(10)
- Mehmet Bulbul et al aimed to evaluate the effectiveness of changes over time in complete blood count (CBC) parameters to estimate the diagnosis of preeclampsia. Data on 161 severe preeclampsia patients and 161 healthy pregnant patients who met the study criteria of pregnant women whose CBC had been measured at 10-12, 22-24 and 28-30 weeks of pregnancy were compared. In the preeclampsia group, an increase in the mean platelet volume (MPV) value and a decrease in the number of platelets were statistically significant in the transition from the second to the third trimester. MPV and lymphocyte counts were more significant in the third trimester and neutrophil lymphocyte ratio (NLR) were more significant in the second trimester(11)
- Lorenz Kuessel et al studied The usefulness of CYFRA 21-1 to diagnose and predict preeclampsia: The ability to identify patients at risk for developing preeclampsia is important for preventing morbidity and mortality in both the mother and child. Although CYFRA 21-1 (a fragment of Cytokeratin 19) is considered a promising biomarker for diagnosing preeclampsia, little is known regarding the levels of CYFRA 21-1 during pregnancy. Here, they measured serum CYFRA 21-1 levels in women with an uneventful pregnancy and in women whose pregnancy

was complicated by preeclampsia. Furthermore we evaluated whether maternal CYFRA 21-1 levels can be used to predict and/or diagnose preeclampsia. he CYFRA 21-1 levels were significantly higher in the PE_state group compared to the control group (p < 0.001). In the PE_long group, CYFRA 21-1 levels were lower from gestational week 11 through 17, but were higher than the control group from gestational weeks 18 through 36. Out of the ROC curves that were calculated to investigate the predictive and diagnostic properties of CYFRA 21-1 levels for preeclampsia, the ROC curve for diagnosing preeclampsia in gestational week 28-32 showed the largest AUC of 0.92, at a cut-off point of 3.1 ng/ml, leading to sensitivity of 92 % and specificity of 80 %.(12)

- Lu HW et al   study aimed to use the combination of maternal-obstetrical characteristics (MOCs) and complete blood cell counts (CBCs) with different red blood cell (RBC) indices as an alternative tool to detect preeclampsia (PE) severity immediately before delivery. The combination of selected variables from MOCs and CBCs with RBC indices before delivery showed satisfactory results for detecting PE severity.(13)

- Xing-Min Li,et al- The aim of their study was to describe and assess a new late pregnancy point-of-care urinary preeclampsia screening test. Urine samples were collected from a consecutive series of 1,532 pregnant women hospitalized at 20–41 weeks gestation in a Chinese single obstetric unit. A simple disposable Congo red based device was newly developed and employed to prospectively test misfolded proteins in pregnant women's urine. A total of 140 preeclampsia cases were clinically diagnosed, 101 severe and 87 pre-term. Detection and false positive rates were similar in the training and validation subsets with combined 74% and 3.0%. The detection rate was 83% in severe, 86% in pre-term, 49% and 50% in mild and term cases (P<0.0001) respectively. In conclusion, a simple point-of-care urinary test for misfolded proteins can be used to screen for preeclampsia in late pregnancy with very high screening performance. To the best of their knowledge, this is the first study to screen for preeclampsia using Congo red based device in Chinese pregnant population.(14)

- Ramadan Dacaj et al   Measurethe level of aminotransferases, lactate dehydrogenase and cholesterol levels in serum of pregnant women and newborns with IUGR allows the differentiation and threatening risk of perinatal complications due to hypoxia. Elevated serum level of AST in preeclampsia is explained by the effect of hypoxia on the liver in preeclamptic pregnancy. Disruption of endothelium leads to a reduction of prostacyclin level and increase of thromboxane level.(15)

- Hypertensive disorders of pregnancy constitute one of the leading causes of maternal and perinatal mortality worldwide. It has been estimated that preeclampsia complicates 2–8% of pregnancies globally (1). In Latin America and the Caribbean, hypertensive disorders are responsible for almost 26% of maternal deaths, whereas in Africa and Asia they contribute to 9% of deaths. Although maternal mortality is much lower in high-income countries than in developing countries, 16% of maternal deaths can be attributed to hypertensive disorders (1, 2). In the United States, the rate of preeclampsia increased by 25% between 1987 and 2004 (3). Moreover,, in comparison with women giving birth in 1980, those giving birth in 2003 were at 6.7-fold increased risk of severe preeclampsia . This complication is costly: one study reported that in 2012 in the United States, the estimated cost of preeclampsia within the first 12 months of delivery was $2.18 billion ($1.03 billion for women and $1.15 billion for infants), which was disproportionately borne by premature births . This Practice Bulletin will provide guidelines for the diagnosis and management of gestational hypertension and preeclampsia.(16)

- Afsane Amirabi e al- Preeclampsia is a serious complication of pregnancy, and it is vital to diagnosis the condition as early as possible. Proteinuria is an important symptom of preeclampsia, and repeated urine analysis to screen for the condition is part of the standard antenatal care. The purpose of their study was to determine the correlation between 4- and 24-hour urine total protein values to examine whether the 4-hour urine samples could be used for the diagnosis of proteinuria in hypertensive disorders of pregnancy. This study showed there was a correlation between 4-hour and 24-hour urine proteins. The finding indicates that a random 4-hour sample might be used for the initial assessment of proteinuria.(17)

- Janina Müller-Deile et al studied preclampsia from a renal point of view they observe proteinuria is a frequently detected symptom, found in 20% of pregnancies. A common reason for proteinuria in pregnancy is preeclampsia. To diagnose preeclampsia clinically and to get new insights into the pathophysiology of the disease it is at first

essential to be familiar with conditions in normal pregnancy. Animal models and biomarkers can help to learn more about disease conditions and to find new treatment strategies. In this article we review the changes in kidney function during normal pregnancy and the differential diagnosis of proteinuria in pregnancy.(18)

- Endalamaw Tesfa,et al conduct a study about Maternal serum uric acid, creatinine and blood urea levels in the prediction of pre-eclampsia.- Pre-eclampsia (PE) is a meta Hence, their study was designed to evaluate serum uric acid, blood urea and creatinine levels in the prediction of PE. Metabolic disorder that adversely affects the lives of mother and their infants. Even though, several studies have been conducted on PE, no effective diagnostic and therapeutic agents were developed so far. Hence, this study was designed to evaluate serum uric acid, blood urea and creatinine levels in the prediction of PE .In this study,They observed a significantly higher concentration of serum uric acid and blood urea values in pre-eclampsia as compared with normotensive pregnant women. Therefore, this suggested that serum uric acid; blood urea and creatinine values can be associated with PE. Moreover, serum uric acid, blood urea and creatinine levels could be carefully utilized as a diagnostic marker for PE, but their inclusion in routine diagnostic test to PE requires large-scale multi-center prospective studies (19)

- Hidajet Pacarizi et al- : Preeclampsia is a disease whose etiology is not very clearly explained. The aim of this study was to investigate the importance of blood urea nitrogen (BUN)/creatinine ratio in diagnosing preeclampsia and evaluating prognosis. BUN/Creatinine ratio in pregnant women with preeclampsia was significantly increased in comparison to the control group. It indicates the prerenal source of azotemia. This index can be important for the evaluation of preeclampsia severity(20)

- Graham J Burton et al -Pre-eclampsia is a common disorder that particularly affects first pregnancies. The clinical presentation is highly variable but hypertension and proteinuria are usually seen. These systemic signs arise from soluble factors released from the placenta as a result of a response to stress of syncytiotrophoblast. There are two sub-types: early and late onset pre-eclampsia, with others almost certainly yet to be identified. (22)

- Early onset pre-eclampsia arises owing to defective placentation, whilst late onset pre-eclampsia may center around interactions between normal senescence of the placenta and a maternal genetic predisposition to cardiovascular and metabolic disease. The causes, placental and maternal, vary among individuals. Recent research has focused on placental-uterine interactions in early pregnancy. The aim now is to translate these findings into new ways to predict, prevent, and treat PE.(23)

- W. Ives MD et al- PE is a hypertensive disorder of pregnancy. It affects 2% to 8% of pregnancies worldwide and causes significant maternal and perinatal morbidity and mortality. Hypertension and proteinuria are the cornerstone of the disease, though systemic organ dysfunction may ensue. The clinical syndrome begins with abnormal placentation with subsequent release of antiangiogenic markers, mediated primarily by soluble fms-like tyrosine kinase-1 (sFlt-1) and soluble endoglin (sEng). High levels of sFlt-1 and sEng result in endothelial dysfunction(24)

- Hypertensive disorders of pregnancy affect up to 10% of pregnancies worldwide, which includes the 3%–5% of all pregnancies complicated by preeclampsia. Preeclampsia is defined as new onset hypertension after 20 weeks' gestation with evidence of maternal organ or uteroplacental dysfunction or proteinuria. Despite its prevalence, the risk factors that have been identified lack accuracy in predicting its onset and preventative therapies only moderately reduce a woman's risk of preeclampsia. Internationally, preeclampsia is defined as new-onset gestational hypertension (systolic blood pressure ≥140 mmHg and/or diastolic blood pressure ≥90 mmHg) associated with new-onset of at least one of proteinuria, maternal organ dysfunction (neurological, haematological, or renal involvement), or uteroplacental dysfunction at or after 20 weeks' gestation . It is important to note that preeclampsia may develop for the first time intrapartum or postpartum. Super-imposed preeclampsia can also be diagnosed in women with chronic hypertension who develop new onset proteinuria, maternal organ, or uteroplacental dysfunction consistent with preeclampsia (Rachael Fox et al) (25)

- Preeclampsia is a pregnancy-specific condition of increased blood pressure accompanied by proteinuria, edema, or both. The incidence of preeclampsia has been reported as ranging from 2.5% to 7%. Risk factors for the development of preeclampsia include young maternal age, previous preeclampsia, twin pregnancy, chronic

hypertension, diabetes mellitus, and hydatidiform mole. Vasospasm is considered central to the pathologic changes of preeclampsia, and the data suggest that this process is triggered by an imbalance between prostacyclin (prostaglandin I2) and thromboxane Ax, biologically active metabolites of arachidonic acid. Preeclampsia has a wide clinical spectrum ranging from mild to severe forms and, potentially, eclampsia with symptoms occurring primarily with severe disease. Preventive strategies under investigation include calcium supplementation and low-dose aspirin supplementation. Prenatal screening, monitoring, and management of preeclampsia are presented (26)

- Jamie Kitt et al- Hypertensive disorders of pregnancy affect up to 10% of pregnancies worldwide, which includes the 3%–5% of all pregnancies complicated by preeclampsia. Preeclampsia is defined as new onset hypertension after 20 weeks' gestation with evidence of maternal organ or uteroplacental dysfunction or proteinuria. Despite its prevalence, the risk factors that have been identified lack accuracy in predicting its onset and preventative therapies only moderately reduce a woman's risk of preeclampsia. Preeclampsia is a major cause of maternal morbidity and is associated with adverse foetal outcomes including intra-uterine growth restriction, preterm birth, placental abruption, foetal distress, and foetal death in utero. Biochemical and ultrasound markers are being investigated as additional predictors for preeclampsia. Foetal factors including genotype and foetal cell-free DNA in maternal blood can influence a woman's risk of preeclampsia . Recently, a genome-wide association study of 4380 cases of preeclampsia and 310,238 controls identified that a variant in the foetal genome near the locus of fms-like tyrosine kinase-1 (Flt-1) is implicated in the development of preeclampsia . Increased cell-free foetal DNA in maternal blood is another potential marker, and is detectable before onset of symptoms . The most promising foetal and placental biomarkers for identifying preeclampsia are placental growth factor (PlGF) and soluble Flt-1 (sFlt-1), which are discussed subsequently. Meta-analyses have described a potential association between preeclampsia and elevated levels of serum triglycerides, cholesterol, and inflammatory markers including CRP, IL-6, IL-8, and TNFα, some of which precede the onset of preeclampsia . Uterine artery Doppler analysis has mixed results in predicting preeclampsia . A recent meta-analysis reported that use between 11 and 14 weeks can predict preeclampsia with similar accuracy as clinical risk factors . Incorporation of specialist tests such as uterine artery pulsatility index and pregnancy-associate plasma protein A (PAPP-A) into clinical risk prediction models can also increase the positive predictive value for detecting women at risk of this condition (27)

- Alice Hurrell, et al observe Recent advances in the diagnosis and management of Pre-eclampsia this disease is challenging to predict. There have been many studies investigating multiple-marker algorithms to predict pre-eclampsia in a similar way to first-trimester aneuploidy screening. It has been demonstrated that there are significant differences in first-trimester levels of pregnancy-associated plasma protein A (PAPP-A), a disintegrin and metalloproteinase 12 (ADAM12), and placental growth factor (PlGF)13; placental protein 1314; angiopoietin 1 and 215; inhibin A and Activin A; soluble endoglin and soluble fms-like tyrosine kinase-1 (sFlt-1)16; and human chorionic gonadotropin (hCG)(28)

- Paulino Vigile et al- The justification for predicting a pathology is to use more effective prevention strategies. There is no test or combinations of tests in the first or second trimester of pregnancy that can predict all cases of preeclampsia far from term or at term . Two strategies have been studied, analyzed, and suggested to predict preeclampsia. One is based on clinical risk factors obtained with the questionnaire and the other on a screening with multiple factors (algorithm): clinical findings, mean arterial pressure, uterine artery pulsatility index determined by Doppler and blood serum placental growth factor (FCP).

  Regarding the strategy based on risk factors, they are divided into high- and moderate-risk [6]. High risk: diabetes, chronic arterial

  hypertension, kidney disease, autoimmune diseases, abnormal uterine artery Doppler (positive), previous history of preeclampsia, or history of fetal or neonatal death associated with preeclampsia. Moderate risk: first pregnancy, family history of preeclampsia, multiple

  pregnancy, age greater than 40 years, (29)

● Circulating cell-free RNA in maternal blood could help predict pre-eclampsia before symptoms develop, providing opportunities for early intervention.(Karen O'Leary et al) (30)

Conclusion

By this review it was concluded that routine laboratory investigations such as renal function tests, liver enzyme study 24 hour urine protein examinations,electrolytes, CBC (total cell count) can help to find out the chances of occurance of preeclampsia in different trimester of pregnancies.

Advanced studies such includes angiogenic/anti-angiogenic factors, placental proteins, free fetal hemoglobin (HbF), kidney markers, ultrasound and maternal risk factors. The specific biochemical markers discussed are: PAPP-A, s-Flt-1/PlGF, s-Endoglin, PP13, cystatin-C, HbF, and α1-microglobulin (A1M). PAPP-A and HbF both show potential as predictive biochemical markers in the first trimester with 70% sensitivity at 95% specificity.

Preeclampsia is a hypertensive disease that occurs during pregnancy. This disease encompasses 2 to 8% of pregnancy-related complications, greater than 50,000 maternal deaths, and over 500,000 fetal deaths worldwide. Early diagnosis and prompt management are essential to prevent morbidity and mortality associated with preeclampsia.

REFERENCES

1.keehak lim

2.Elevated liver enzymes and adverse outcomes among patients with preeclampsia with severe features Karen S. Greiner,Mónica Rincón,Kelli L. Derrah &Richard M. Burwick
Article: 2160627 Received 09 Sep 2022, Accepted 14 Dec 2022, Published online: 04 Jan 2023

3. Preeclampsia Affects Lipid Metabolism and HDL Function in Mothers and Their Offspring
by Julia T. Stadler 1ORCID,Hubert Scharnagl 2ORCID,Christian Wadsack 3,4ORCID andGunther Marsche ,*ORCID

4. Recent advances diagnosis and management of pre-eclampsia by Kate Duhig, Supervision, Writing – Original Draft Preparation, Writing – Review & Editing,1 Brooke Vandermolen, Writing – Review & Editing,1 and Andrew Shennan,

5. Preeclampsia Shahd A. Karrar; Peter L. Hong.

6. DisclosuresPreeclampsia: Clinical features and diagnosis. This topic last updated: (Jun 06, 2023).Phyllis August, MD, MPHBaha M Sibai, MDSECTION EDITOR:Charles J Lockwood, MD, MHCMDEPUTY EDITOR:Vanessa A Barss, MD,

7.) Pre-eclampsia by Evdokia Dimitriadis, Daniel L. Rolnik, Wei Zhou, Guadalupe Estrada-Gutierrez, Kaori Koga, Rossana P. V. Francisco, Clare Whitehead, Jon Hyett, Fabricio da Silva Costa, Kypros Nicolaides & Ellen Menkhorst (Nature Reviews Disease Primers volume20)

8. A literature review and best practice advice for second and third trimester risk stratification, monitoring, and management of pre-eclampsia Compiled by the Pregnancy and Non-Communicable Diseases Committee of FIGO (the International Federation of Gynecology and Obstetrics. Liona C. Poon, Laura A. Magee, Stefan Verlohren, Andrew Shennan, Peter von Dadelszen, Eyal Sheiner, Eran Hadar, Gerard Visser, Fabricio Da Silva Costa, Anil Kapur, Fionnuala McAuliffe … See all authors First published: 29 July 2021 https://doi.org/10.1002/ijgo.13763

9. Can complete blood count parameters that change according to trimester in pregnancy be used to predict severe preeclampsia? Mehmet Bulbul 1, Fatih Uckardes 2, Talip Karacor 1, Mehmet Can Nacar 1, Selcuk Kaplan 1, Pinar Kirici 1, Adem Surucu 1 . PMID: 33645411 DOI: 10.1080/01443615.

10. The usefulness of CYFRA 21-1 to diagnose and predict preeclampsia: a nested case-control study by Lorenz Kuessel 1, Harald Zeisler 2, Robin Ristl 3, Julia Binder 1 4, Petra Pateisky 1, Maximilian Schmid 1, Julian Marschalek 1, Thomas Perkmann

11. Detecting Preeclampsia Severity Using Maternal-Obstetrical Characteristics and Complete Blood Cell count Authors Lu HW , Hsu HSReceived 17 October 2022 Accepted for publication 18 December 2022Published 23 December 2022 Volume 2022:15 Pages 8715—8726 DOI https://doi.org/10.2147/IJGM.S392915

12.) Late pregnancy screening for preeclampsia with a urinary point-of-care test for misfolded proteins

13. Elevated Liver Enzymes in Cases of Preeclampsia and Intrauterine Growth Restriction by

Ramadan Dacaj,1 Sebija Izetbegovic,2 Goran Stojkanovic,2 and Skender Dresha

 14) Elevated Liver Enzymes in Cases of Preeclampsia and Intrauterine Growth Restriction

Ramadan Dacaj,1 Sebija Izetbegovic,2 Goran Stojkanovic,2 and Skender Dresh

19. Elevated Liver Enzymes in Cases of Preeclampsia and Intrauterine Growth Restriction

Ramadan Dacaj,1 Sebija Izetbegovic,2 Goran Stojkanovic,2 and Skender Dreshaj1

Author information Article 14) Elevated Liver Enzymes in Cases of Preeclampsia and Intrauterine Growth Restriction

Ramadan Dacaj,1 Sebija Izetbegovic,2 Goran Stojkanovic,2 and Skender Dreshaj1

Author information Article