Prediction of preeclampsia by gestosis score

Dr Adimulam Vajreswari[1](post graduate) ,Dr PenumakaRose mary[2] (Assistant professor),, Dr Paidisirisha (Assistant professor)

Department of Obstetrics and gynaecology ,King George Hospital, visakhapatnam ,Andhra Pradesh

Abstract
Background
HDP-gestosis score is a risk scoring system (score 1–3) for the development of pre-eclampsia. When a pregnant woman's total score is equal to or greater than 3, she is labelled as "at risk for pre-eclampsia" and is managed accordingly.
Objectives
To determine relation ship between HDP gestosis score and preeclampsia
Methods
This prospective study included 50pregnant women who presented at the department of Obstetrics and Gynaecology, from June 2020 to December 2021. At first antenatal the patients were assessed for the development of pre-eclampsia. Details of age, gravida, obstetric history, menstrual cycle regularity, polycystic ovarian disease history, duration of marriage, parity, past medical and surgical intervention, previous/present medication, and family history were taken. Gestosis score was calculated and classified into mild (score of 1), moderate (score of 2)and high risk (score of ≥ 3) for the development of Pre-eclampsia (PE)
Results50patients were included in the study
34 patients got score above 3 in that 8 patients not developed preeclampsia 26 patients developed preeclampsia 16 patients got score less than 3 in which 14 patients didnot developed preeclampsia 2 patients developed preeclampsia
Conclusion
Gestosis score is a novel early marker for prediction of the development of PE allowing for a prompt management for the patients, thereby curbing the adverse consequences.

I.   Introduction

Pre-eclampsia (PE) is one of the commonest complications of pregnancy, affecting 4.6% pregnancies worldwide [1] and 1.8–16.7% pregnancies in the developing countries [2]. It is identified by systolic blood pressure (SBP) and diastolic blood pressure (DBP) greater than 140 mm Hg and 90 mm Hg, respectively, after 20 completed weeks of pregnancy. As reported in an Indian study, the overall pooled prevalence of PE in India was 11% [3].

PE is the major cause of maternal (that include abruptio placentae, disseminated intravascular coagulation, pulmonary oedema, acute renal failure, heart rhythm disturbances, and effects on other organs like liver, brain and lungs) as well as perinatal (fetal growth retardation, preterm deliveries and fetal deaths) complications worldwide [4].

The grave nature of the condition continues to baffle us to use certain predictive markers in the early part of the pregnancy which may help us to identify the women who may develop PE—so that appropriate preventive measures are begun for the prevention and management.

A plethora of maternal risk factors have been established to be positively linked with the development of PE, which include higher age, parity, comorbidities, family history, previous personal history, ethnicity, investigative markers like thyroid profile, uterine artery Doppler velocimetry, PAPP-A levels, placental IGF levels and certain systemic conditions [5, 6]. As these factors are described by individual researchers, taking all of them into account and devising a scoring system for PE prediction were the need of the hour, especially for countries with limited resources and lack of biomarker testing facility.

A simple risk model named HDP-gestosis score has been devised by Dr GorakhMandrupkar with further modifications by committee including "Dr. Sanjay Gupte, Dr.SuchitraPandit, Dr.Alpesh Gandhi and Dr.GirijaWagh" for effective screening and prediction of Pre-eclampsia [7]. This score considers all of the pregnant woman's present and emerging risk factors. Each clinical risk factor is given a score of 1, 2, or 3 based on its severity in the development of pre-eclampsia. A total score is obtained from detailed history and

examination of the woman. When a pregnant woman's total score is equal to or greaterthan 3, she is labelled as "at risk for pre-eclampsia" and is managed accordingly [7].

Till date, to our knowledge, no study has been conducted in the practical setting to determine the diagnostic accuracy and sensitivity of prediction of Pre-eclampsia for HDP-gestosis score. So this study was conducted wherein HDP-gestosis score was applied and the pregnant women were followed-up to confirm and note the predictive ability for the development of PE.

Objectives
To determine relation ship between HDP gestosis score and preeclampsia

Methods
A prospective study was done wherein100patients who presented in the department of Obstetrics and Gynaecology, kingjeorgehospital, visakhapatnam, over a duration of 18 months from June 2020 to December 2021, were enrolled

The inclusion criteria were: Age more than 18 years, and booked cases
Exclusion criteria are Pregnant patients with COVID-19 disease, malignancy, liver diseases, intake of alcohol, substance abuse and smoking
where individual parameters used inthe gestosis score were analysed for the relative risk in increasing pre-eclampsia. It was noted that mean arterial pressure (MAP) > 85, Dyslipidemia,assisted reproductive techniques, maternal chronic kidney disease,mental disorders (schizophrenia), pregestationaldiabetis mellitus hypertension during previous pregnancy ,multiple pregnancy ,obesity ,Gdm ,excessive weight gain ,chronic vascular disease, Hypothyroidism, family history of HDP, Chronic hypertension, Thrombophilia, autoimmune disease were significant risk factors of Pre-eclampsia
A detailed demographic history about age, gravida, obstetric history, menstrual cycle regularity, polycystic ovarian disease history, duration of marriage, parity, past medical and surgical intervention and previous/present medication were taken, followed by a routine clinical obstetric examination as per hospital protocol. Weight and height was measured based on which body mass index was calculated. Venous blood sample (5 ml) was collected in the antenatal visit (at11–18 weeks of gestation) for assessing complete blood counts, thyroid profile, blood sugar levels, blood grouping and autoantibodies which included anti-TPO, antinuclear antibody (ANA), Rheumatoid factor, anti-dsDNA, SS-A and SS-B antibodies for specific diagnosis of the autoimmune disorders..
Taking all these factors into account, gestosis score was calculated by using the app
(https://m.apkpure.com/hdp-gestosis-score/hdp.gestosis.score) [9] and classified into mild (score of 1), moderate (score of 2) and high risk (score of equal to or more than 3) for the development of PE.

GESTOSIS SCORE(>or=3 HIGH RISK FOR HYPERTENSIVE DISORDERS OF PREGNANCY

MILD RISK FACTORS(SCORE 1)
1. Age older than 35yrs
2. Age younger than 19yrs
3. Maternal Anaemia
4. Obesity (BMI >30)
5. Primigravida
6. Short duration of paternity(cohabitation)
7. woman born as small for G.A.
8. PCOS
9. Interpregnancy interval >5yrs
10. Conceived with ART(IVF/ICSI)
11. MAP>85
12. Chronic vascular disease(Dyslipidimea)
13. Execessive weight gain during pregnancy

MODERATE RISK FACTORS(SCORE2)
1. Maternal hypothyroidism
2. Family h/0 preeclampsia
3. GDM
4. Multiple pregnancy
5. Obesity(BMI>35)
6. Hypertensive disease during previous pregnancy

SEVERE RISK FACTORS(SCORE3)
1. Pregestational DM
2. Chronic Hypertension
3. Mental disorder
4. Inherited/acquired Thombophilia
5. Maternal chronic kidney disease
6. Autoimmune disease(SLE/APLAS/RA)
7. Pregnancy with ART(ODor Surrogacy)

All the parameters mentioned in the gestosis score were assessed from the history and investigations, and a total score was entered in the master chart for every patient. The various parameters and HDP-Gestosis score are shown in the following table

The standards and criteria used in the study for classifying the diseases of the patients were [10–19].

Hypertensive Disease of Pregnancy

Hypertensive disorders during pregnancy (HDP) include 4 categories: "(1) pre-eclampsia/eclampsia; (2) gestational hypertension (GH); (3) chronic hypertension; and (4) pre-eclampsia/eclampsia variants superimposed on chronic hypertension".

Pre-eclampsia

Pre-eclampsia was defined as de novo blood pressure (BP) elevations (Systolic blood pressure of 140 mm Hg or more or diastolic blood pressure of 90 mm Hg or more on two occasions at least four hours apart) after 20 weeks of gestation coupled with proteinuria (300 mg or more per 24 h urine collection or Protein/creatinine ratio of 0.3 mg/dL or more or Dipstick reading of 2 +). Eclampsia is defined as PE with seizures.

Gestational Hypertension

De-novo hypertension that develops at > 20 weeks in absence of features of Pre-eclampsia.

Chronic Hypertension

Elevated BP before 20 weeks of gestation or persisting beyond 12 weeks postpartum.

Chronic Hypertension with Superimposed Pre-eclampsia

Increased BP and new- onset proteinuria or other end- organ dysfunction in addition to preexisting hypertension.

Thyroid Profile

A laboratory normal range of 0.1–3 mIU/L for TSH, 0.9–1.7 ng/dL for fT4 and 0–35 IU/mL for anti-TPO was used to classify thyroid disease. An increase in the TSH levels or fall in the fT4 levels with presence of symptoms was classified as hypothyroidism, and a fall in the TSH levels or rise in the fT4 levels with presence of symptoms (such as fatigue, weight gain/loss,reducedexercise capacity, constipation hair loss, dry skin, and bradycardia/tachycardia) was classified as hyperthyroidism.

PCOS

The guidelines from the Endocrine Society using the Rotterdam criteria for diagnosis were appliedwhich mandate the presence of two of the following three findings—hyperandrogenism, ovulatory dysfunction, and polycystic ovaries.

MAP

$MAP = DBP + 0.33 \times PP$ (SBP-DBP) where PP is the pulse pressure, SBP is systolic blood pressure and DBP is diastolic blood pressure.

Gestational Diabetes Mellitus (GDM)

The diagnosis of GDM was confirmed in the presence of "at least one abnormal value (≥ 92, 180 and 153 mg/dl for fasting, 1-h and 2-h plasma glucose concentrationrespectively), following 75-g oral glucose tolerance test (OGTT)".

Excessive Weight Gain During Pregnancy

A weight gain during the 2nd and 3rd trimester (in kgs) > 18 (among women with BMI < 18.5 kg/m2), > 16 (among women with BMI 18.5–24.9 kg/m2), > 11.5 (among women with BMI 25–29.9 kg/m2) and > 9 (among women with BMI $> = 30$ kg/m2) was considered excess weight gain.

(UCTD), RA, SLE, anti-phospholipid syndrome (APS), Sjögren's syndrome, systemic sclerosis, polymyositis/dermatomyositis and mixed connective tissue disease.

Thrombophilia was diagnosed if there was idiopathic or recurrent venous thromboembolism; a first episode of venous thromboembolism at a "young" age (e.g., < 40 years); a family history of venous thromboembolism; venous thrombosis in an unusual vascular territory; and neonatal purpurafulminans or warfarin-induced skin necrosis.

SLE/APLA/RA/thrombophilia

The American College of Rheumatology has 11 classification criteria for lupus. If a patient meets at least four criteria, lupus can be diagnosed. The criteria include malar or discoid rash; photosensitivity; oral ulcers; arthritis; serositis; abnormal antinuclear antibody (ANA) titers; and renal, neurologic, hematologic, or immunologic disorders.

The participants were tested for the presence of circulating autoantibodies, including ANA. The ANA test was considered positive at a titer $\geq 1:80$. Rheumatic diseases were classified according to widely used criteria for undifferentiated connective tissue disease(UCTD), RA, SLE, anti-phospholipid syndrome (APS), Sjögren's syndrome, systemic sclerosis, polymyositis/dermatomyositis and mixed connective tissue disease.

Thrombophilia was diagnosed if there was idiopathic or recurrent venous thromboembolism; a first episode of venous thromboembolism at a "young" age (e.g., < 40 years); a family history of venous thromboembolism; venous thrombosis in an unusual vascular territory; and neonatal purpurafulminans or warfarin-induced skin necrosis.

Management of PE

The treatment for PE was started if BP remained higher than 140–90 mm Hg. It comprised of labetalol as a first-line therapy at dose of 100 mg BD up to maximum dose of 2400 mg. Nifedipine (preferably extended release) at dose of 10–30 mg OD was prescribed as a second line drug [20]

Results Results50patients were included in the study

34 patients got score above 3 in that 8 patients not developed preeclampsia 26 patients developed preeclampsia
 16 patients got score less than 3 in which 14 patients didnot developed preeclampsia 2 patients developed preeclampsia

II.   Conclusion

Gestosis score is a novel early marker for prediction of the development of PE allowing for a prompt management for the patients, thereby curbing the adverse consequences.
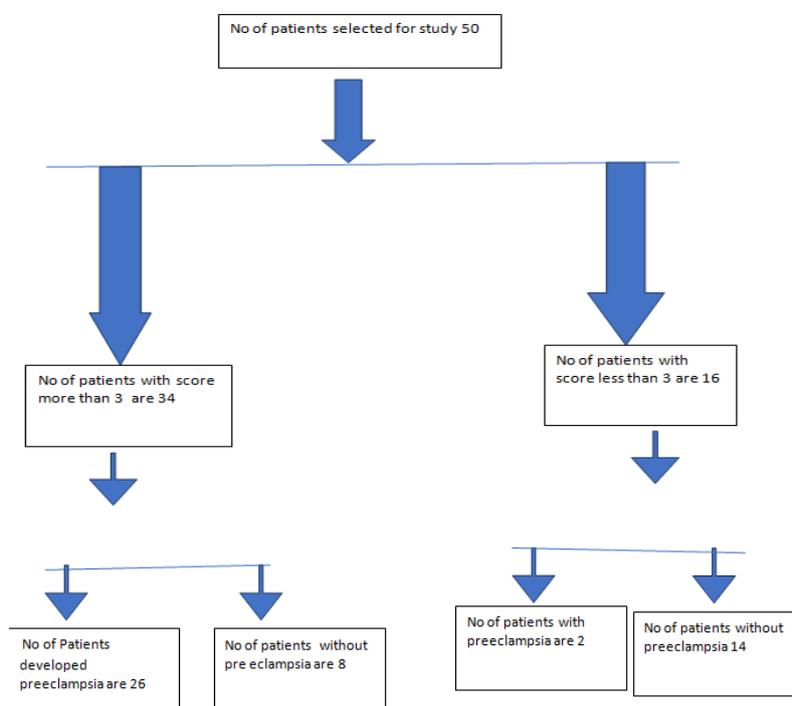
References

[1]. Yang Y, Le Ray I, Zhu J, Zhang J, Hua J, Reilly M. Preeclampsia prevalence, risk factors, and pregnancy outcomes in Sweden and China. JAMA Netw Open. 2021;4(5):e218401. doi: 10.1001/jamanetworkopen.2021.8401. [PMC free article] [PubMed] [CrossRef] [Google Scholar]

[2]. Mou AD, Barman Z, Hasan M, Miah R, Hafsa JM, Das Trisha A, Ali N. Prevalence of preeclampsia and the associated risk factors among pregnant women in Bangladesh. Sci Rep. 2021;11(1):21339. doi: 10.1038/s41598-021-00839-w.PMID:34716385;PMCID:PMC8556297. [PMC free article] [PubMed] [CrossRef] [Google Scholar]

[3]. Dhinwa M, Gawande K, Jha N, Anjali M, Bhadoria AS, Sinha S. Prevalence of hypertensive disorders of pregnancy in India: a systematic review and meta-analysis. J Med Evid. 2021;2:105–112. doi: 10.4103/JME.JME_168_20. [CrossRef] [Google Scholar]

[4]. Gavali S, Patil A, Gavali U. Study of fetomaternal outcome in patients with pregnancy induced hypertension at Sangli district. MedPulseInt J Gynaecol. 2021;20(2):65–69. doi: 10.26611/10122025. [CrossRef] [Google Scholar]

[5]. Poon LC, Shennan A, Hyett JA, Kapur A, Hadar E, Divakar H, et al. The international federation of gynecology and obstetrics (FIGO) initiative on pre-eclampsia: a pragmatic guide for first-trimester screening and prevention. Int J Gynaecol Obstet. 2019;145(Suppl 1):1–33. doi: 10.1002/ijgo.12802. [PMC free article] [PubMed] [CrossRef] [Google Scholar]

[6]. Poon LC, Nicolaides KH. Early prediction of preeclampsia. ObstetrGynecolInt 2014:Article ID 297397. [PMC free article] [PubMed]

[7]. FOGSI-gestosis-ICOG. Hypertensive Disorders in Pregnancy (HDP). Good Clinical Practice Recommendations 2019. https://www.fogsi.org/wp-content/uploads/gcpr/hdp-fogsi-gestosis-icog-gcpr-2019.pdf. Accessed February 2022.

[8]. Mishra SS, Mohanty S, Ghadei R, Pradhan S, Majhi PP. HDP-gestosis score as a predictor of Pre-eclampsia. IJSR. 2020;9(8):25–8. [Google Scholar]

[9]. MCCHS. HDP-gestosis Score, version 1.2. 2021. https://apkgk.com/hdp.gestosis.score. Accessed March 2022.

[10]. Carney LA, Quinlan JD, West JM. Thyroid disease in pregnancy. Am Fam Phys. 2014;89(4):273–278. [PubMed] [Google Scholar]

[11]. Legro RS, Arslanian SA, Ehrmann DA, Hoeger KM, Murad MH, Pasquali R, et al. Endocrine society. Diagnosis and treatment of polycystic ovary syndrome: an endocrine society clinical practice guideline. J ClinEndocrinolMetab. 2013;98(12):4565–92. doi: 10.1210/jc.2013-2350. [PMC free article] [PubMed] [CrossRef] [Google Scholar]

[12]. Rotterdam ESHRE/ASRM-Sponsored PCOS Consensus Workshop Group Revised 2003 consensus on diagnostic criteria and long-term health risks related to polycystic ovary syndrome. FertilSteril. 2004;81(1):19–25. doi: 10.1016/j.fertnstert.2003.10.004. [PubMed] [CrossRef] [Google Scholar]

[13]. Gauer O, Kreislauf des Blutes. Lehrbuch der Physiologie des Menschen. Landois L RH-U. In: Von Urban and Schwarzenberg, 1960.

[14]. Papaioannou TG, Protogerou AD, Vrachatis D, Konstantonis G, Aissopou E, Argyris A, et al. Mean arterial pressure values calculated using seven different methods and their associations with target organ deterioration in a single-center study of 1878 individuals. Hypertens Res. 2016;39(9):640–647. doi: 10.1038/hr.2016.41. [PubMed] [CrossRef] [Google Scholar]

[15]. International association of diabetes and pregnancy study groups recommendations on the diagnosis and classification of hyperglycemia in pregnancy. Diabetes Care 2010;33:676–82. [PMC free article] [PubMed]

[16]. IOM. Weight gain during pregnancy: reexamining the guidelines. Institute of Medicine (US) and national research council (US) and committee to reexamine IOM pregnancy weight guidelines; 2009.

[17]. Guidelines for Referral and Management of Systemic Lupus Erythematosus in Adults American college of rheumatology Ad Hoc committee on systemic lupus erythematosus guidelines. Arthritis Rheum. 1999;42(9):1785–96. doi: 10.1002/1529-0131(199909)42:9<1785::AID-ANR1>3.0.CO;2-#. [PubMed] [CrossRef] [Google Scholar]

[18]. Heit JA. Thrombophilia: common questions on laboratory assessment and management. Hematology. 2007;1:127–135. doi: 10.1182/asheducation-2007.1.127. [PubMed] [CrossRef] [Google Scholar]

[19]. Chau K, Hennessy A, Makris A. Placental growth factor and pre-eclampsia. J Hum Hypertens. 2017;31(12):782–786. doi: 10.1038/jhh.2017.61. [PMC free article] [PubMed] [CrossRef] [Google Scholar]

[20]. Magee LA, von Dadelszen P, Singer J, Lee T, Rey E, Ross S, et al; CHIPS Study Group. The CHIPS randomized controlled trial (Control of hypertension in pregnancy study): is severe hypertension just an elevated blood pressure? Hypertension 2016;68(5):1153–9. [PMC free article] [PubMed]

[21]. Mayrink J, Souza RT, Feitosa FE, Rocha Filho EA, Leite DF, Vettorazzi J, et al; Preterm SAMBA study group. Incidence and risk factors for preeclampsia in a cohort of healthy nulliparous pregnant women: a nested case-control study. Sci Rep 2019;9(1):9517. [PMC free article] [PubMed]

[22]. Poon LC, Shennan A, Hyett JA, Kapur A, Hadar E, Divakar H, et al. The international federation of gynecology and obstetrics (FIGO) initiative on pre-eclampsia: a pragmatic guide for first-trimester screening and prevention. Int J Gynaecol Obstet. 2019;145(Suppl 1):1–33. doi: 10.1002/ijgo.12802. [PMC free article] [PubMed] [CrossRef] [Google Scholar]

[23]. Lewandowska M. The association of familial hypertension and risk of gestational hypertension and preeclampsia. Int J Environ Res Public Health. 2021;18(13):7045. doi: 10.3390/ijerph18137045. [PMC free article] [PubMed] [CrossRef] [Google Scholar]

[24]. Ehrenthal DB, Jurkovitz C, Hoffman M, Jiang X, Weintraub WS. Prepregnancy body mass index as an independent risk factor for pregnancy-induced hypertension. J Women's Health. 2011;20(1):67–72.doi: 10.1089/jwh.2010.1970. [PubMed] [CrossRef] [Google Scholar]

[25]. Lewandowska M, Więckowska B, Sajdak S. Pre-pregnancy obesity, excessive gestational weight gain, and the risk of pregnancy-induced hypertension and gestational diabetes mellitus. J Clin Med. 2020;9(6):1980. doi: 10.3390/jcm9061980. [PMC free article] [PubMed] [CrossRef] [Google Scholar]

[26]. 26. Einarsson JI, Sangi-Haghpeykar H, Gardner MO. Sperm exposure and development of preeclampsia. Am J Obstet Gynecol. 2003;188(5):1241–1243.doi: 10.1067/mob.2003.401. [PubMed] [CrossRef] [Google Scholar]

[27]. McBride CA, Hale SA, Subramanian M, Badger GJ, Bernstein IM. The relationship of a family history for hypertension, myocardial infarction, or stroke with cardiovascular physiology in young women. Reprod Sci. 2014;21(4):509–516. doi: 10.1177/1933719113503402. [PMC free article] [PubMed] [CrossRef] [Google Scholar]

[28]. Medici M, Korevaar TI, Schalekamp-Timmermans S, Gaillard R, de Rijke YB, Visser WE, et al. Maternal early-pregnancy thyroid function is associated with subsequent hypertensive disorders of pregnancy: the generation R

[29]. Kay VR, Wedel N, Smith GN. Family history of hypertension, cardiovascular disease, or diabetes and risk of developing preeclampsia: a systematic review. J ObstetGynaecol Can. 2021;43(2):227–236.e19. doi: 10.1016/j.jogc.2020.08.010. [PubMed] [CrossRef] [Google Scholar]

[30]. Mills G, Badeghiesh A, Suarthana E, Baghlaf H, Dahan MH. Polycystic ovary syndrome as an independent risk factor for gestational diabetes and hypertensive disorders of pregnancy :a population – based study on 9.1 million pregnancies.HumReprod.2020;35(7):1666-74.doi:10.1093/humrep/deaa099[pubmed][Cross Ref][Google scholar]

[31]. Cormick G, Betrán AP, Ciapponi A, Hall DR, Hofmeyr GJ, Calcium and Pre-eclampsia Study Group Inter-pregnancy interval and risk of recurrent pre-eclampsia: systematic review and meta-analysis. Reprod Health. 2016;13(1):83. doi: 10.1186/s12978-016-0197-x. [PMC free article] [PubMed] [CrossRef] [Google Scholar]

[32]. Chih HJ, Elias FTS, Gaudet L, Velez MP. Assisted reproductive technology and hypertensive disorders ofpreganancy : systemic review and metanalysies.BMC pregnancy childbirth.2021;21(1):449.doi:10.1186/s12884-021-03938-8[PMC free article][pubmed][crossRef][Google scholar]

[33]. Tesfa E, Nibret E, Munshea A. Maternal lipid profile and risk of pre-eclampsia in African pregnant women: a systematic review and meta-analysis. PLoS ONE. 2020;15(12):e0243538. doi: 10.1371/journal.pone.0243538. [PMC free article] [PubMed] [CrossRef] [Google Scholar]

[34]. Li X, Shopit A, Wang J. Biochemical and clinical predictors in pregnant women with antiphospholipid syndrome and systemic lupus erythematosus:comprehensive update .Arch Gynecol obstet.2021;304(5):1154-1160.doi:10.1007/s00404-021-06178-5.[pubmed][crossRef][Google scholar]

[35]. Li LJ, Aris IM, Su LL, Chong YS, Wong TY, Tan KH, et al. Effect of gestational diabetes and hypertensive disorders of pregnancy on postpartum cardiometabolic risk. Endocr Connect. 2018;7(3):433–442. doi: 10.1530/EC-17-0359. [PMC free article] [PubMed] [CrossRef] [Google Scholar]

[36]. Chapuis-de-Andrade S, Parisotto A, Pinheiro da Costa BE, Antonello IC. Association between depression and hypertensive disorders during pregnancy: an integrative review. NEREIS. 2019;11:135–45. [Google Scholar]

[37]. Thombre MK, Talge NM, Holzman C. Association between pre-pregnancy depression/anxiety symptoms and hypertensive disorders of pregnancy. J Womens Health (Larchmt) 2015;24(3):228–236. doi: 10.1089/jwh.2014.4902. [PMC free article] [PubMed] [CrossRef] [Google Scholar]

[38]. Bohiltea RE, Cirstoiu MM, Turcan N, Stoian AP, Zugravu CA, Munteanu O, et al. Inherited thrombophilia is significantly associated with severe preeclampsia. ExpTher Med. 2021;21(3):261. doi: 10.3892/etm.2021.9691. [PMC free article] [PubMed] [CrossRef] [Google Scholar]

[39]. Tangren JS, Wan Md Adnan WAH, Powe CE, Ecker J, Bramham K, Hladunewich MA, et al. Risk of preeclampsiaand pregnancy complications in women with a history of acute kidney injury .hypertension.2018;72(2):451-9

[40]. Pan ML, Chen LR, Tsao HM, Chen KH. Prepregnancy endocrine, autoimmune disorders and the risks of gestational hypertension-preeclampsia in primiparas: a nationwide population-based study in Taiwan. Int J Environ Res Public Health. 2020;17(10):3657. doi: 10.3390/ijerph17103657. [PMC free article] [PubMed] [CrossRef] [Google Scholar]