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Analysis of a predictive model of preeclampsia risk in Iraqi women

Dr. Amal Abdul Mahdi Kadhim *

M.B.Ch.B. \ D.O.G. \ C.A.B.O.G. \ (Obstetrics and Gynecology)
Ministry of Higher Education and Scientific Research, Jabir Ibn Hayyan Medical University, College of Medicine, Al-Najaf, Iraq

* Corresponding Author email: amal.alrahimi@jmu.edu.iq

Dr. Hayder Majid Ali

Resident Doctor in Obstetrics and Gynecology, Lecturer at Jabir Ibn Hayyan Medical University / College of Medicine / Department of Human Anatomy. Ph. D. Anatomy

Email: hayder.majid@jmu.edu.iq

Dr. Rusul Hadi Hameed

M.B.Ch.B. \ D.O.G. \ C.A.B.O.G. \ (Obstetrics and Gynecology)
Iraqi Ministry of Health, Al-Najaf Health Directorate, Al-Zahraa teaching Hospital, Al-Najaf, Iraq

Email: Russolhadi@gmail.com

Abstract--Two hundred women were collected from different hospitals in Iraq and divided into two groups, the first group is the patients (preeclampsia) and the second group (the control group) and this paper aims to this study aims to develop the prognostic model to calculate the probability of severe preeclampsia of women Iraqi. The criterion for inclusion in the study was the presence in pregnant women of characteristic clinical manifestations of a severe course of pre-eclampsia, confirmed by laboratory changes after 20 weeks of gestation. The severity of preeclampsia was determined based on current clinical guidelines .The analysis of data and demographic information for patients was based on the statistical analysis program SPSS 25, and statistically significant differences were found between the variables for the patient group and the control group, Oz05 The prediction tools developed to determine the risks of pre-eclampsia have low positive predictive values 12,13, which is explained by the low prevalence of pre-eclampsia in Iraqi women (3-5%).

Keywords---pre-eclampsia, pregnancy, hypertension, Diastolic, Systolic.

Introduction

Preeclampsia is a multisystem syndrome of pregnancy and the puerperium in which there is reduced systemic perfusion resulting from vasospasm and activation of coagulation systems.

It occurs after the 20th week of pregnancy, during childbirth, or in the first two weeks after delivery. Characterized by hypertension $>140/90$ mmHg and proteinuria, headache, tinnitus, edema, and abdominal pain

Proteinuria and excessive weight gain affect organs such as the brain, liver, and kidneys; it can also cause placental abruption that could trigger preterm labor and maternal or fetal death.

According to the statistics of the modern world, hypertensive disorders complicate 3-10% of pregnancies and are one of the main factors in maternal and perinatal mortality [1,2,3]. According to recent studies that have established among the causes of maternal mortality during the past ten years, complications of high blood pressure during pregnancy occupied the second and fourth places, accounting for 15.7% in 2017 and 10.2% in 2019 in the overall structure of maternal losses. [4,5].

The importance of the problem and its medical and social significance is also due to the fact that this group of pregnancy complications is the cause of severe morbidity and disability of mothers and their children, which leads to a deterioration in the subsequent quality of life of women, increases the risk of physical injury, neurodevelopmental and psychological disorders in young women and increases the likelihood of developing pathologies physical in the future [6,7,18]

The main directions of modern medicine are a risk-based, predictive approach, which places personalized prediction of pregnancy complications in the category of priority tasks in order to prevent reproductive losses and eliminate preventable maternal deaths caused by three preventable causes - bleeding, sepsis, and hypertension blood [9].

Purpose of study

this study aims to develop the prognostic model to calculate the probability of severe preeclampsia of women in Iraqi.

Material and method

One hundred pregnant women with a severe course of pre-eclampsia and 100 women with uncomplicated pregnancy (comparison group) were collected from different hospitals in Iraq.

The criterion for inclusion in the study was the presence in pregnant women of characteristic clinical manifestations of a severe course of pre-eclampsia and pre-

eclampsia, confirmed by laboratory changes after 20 weeks of gestation. The severity of preeclampsia was determined based on current clinical guidelines.

When examining pregnant women, we used the questionnaires developed by us, in which the data applicable to the woman were taken into account, the study of heredity, clarification of non-venereal diseases, obstetrics and gynecology, and assessment of the course of this pregnancy and childbirth.

To clarify the most important clinical and diagnostic risk factors for pre-eclampsia, one of the methods of statistical analysis, the discriminant method, was used. The basic idea of discriminant analysis is to determine whether populations differ in the mean of a variable (or a linear set of variables) and then use that variable on the members of the population.

Demographic information and data on patients were collected from age, date of birth, family, and body mass index in the first trimester of pregnancy, and the statistical analysis program spss 25 was relied on in the analysis. Diagnosed according to the standards and clinical guidelines of the Iraqi Ministry of Health, and the symptoms found were based on acute arterial hypertension and an increase in protein in the urine of 5 g/L in the urine sample.

By relying on the statistical analysis program, SPSS was found mean value and standard deviation with P-value

Study period

This study was conducted, and all the information and demographic data of patients were obtained from different hospitals in Iraq for a period of time from 2-2-2020 to 19-1-2021.

Aim of research

this study aims to develop the prognostic model to calculate the probability of severe preeclampsia of women in Iraq

Results

Table 1
Characteristics of patients

Variable	Patient N=100	Control N=100	P-value
Age mean± sd	30.74±4.7	30.05±6.5	0.97
BMI (kg/m ²)	28±4.4	27.4±4.3	0.03
diastolic blood pressure N	27	20	0.88

systolic blood pressure N (%)	73	80	0.83
diabetes	54	37	0.67
obesity	39	28	0.91
heart disease	20	16	0.95
Smoking			
non-smoker	90	98	0.93
smoker	10	2	0.77
Socioeconomic status			
High	23	28	0.95
LOW	77	78	0.96
Family history			
yes	19	20	0.99
no	81	80	0.99
Pre-eclampsia description			
Pre-eclampsia n (%)	73	60	≤0.01
Interventions at any time during admission			
Corticosteroid administration n (%)	46	33	0.05
MgSO ₄ administered n (%)	55	33	0.03
Gestational age	30.9±1.2	29.6±1.2	0.1

Figure 1- Diastolic blood pressure of patients

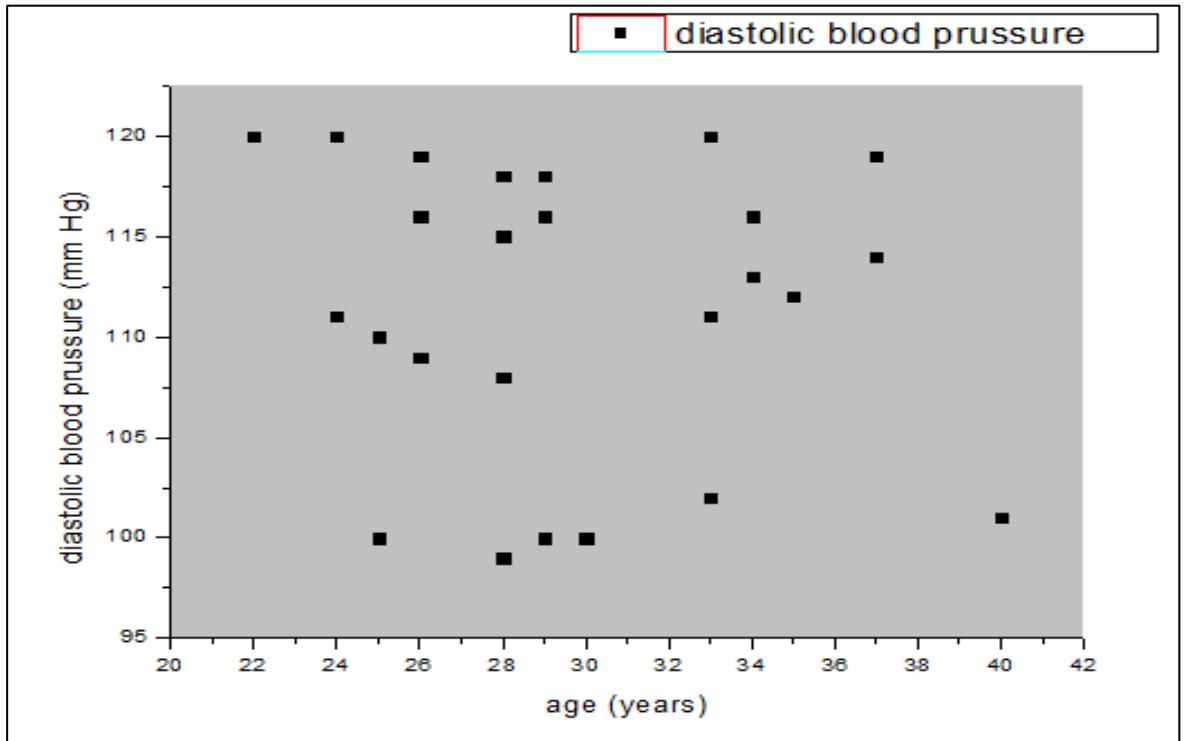


Figure 2- Systolic indications of patients

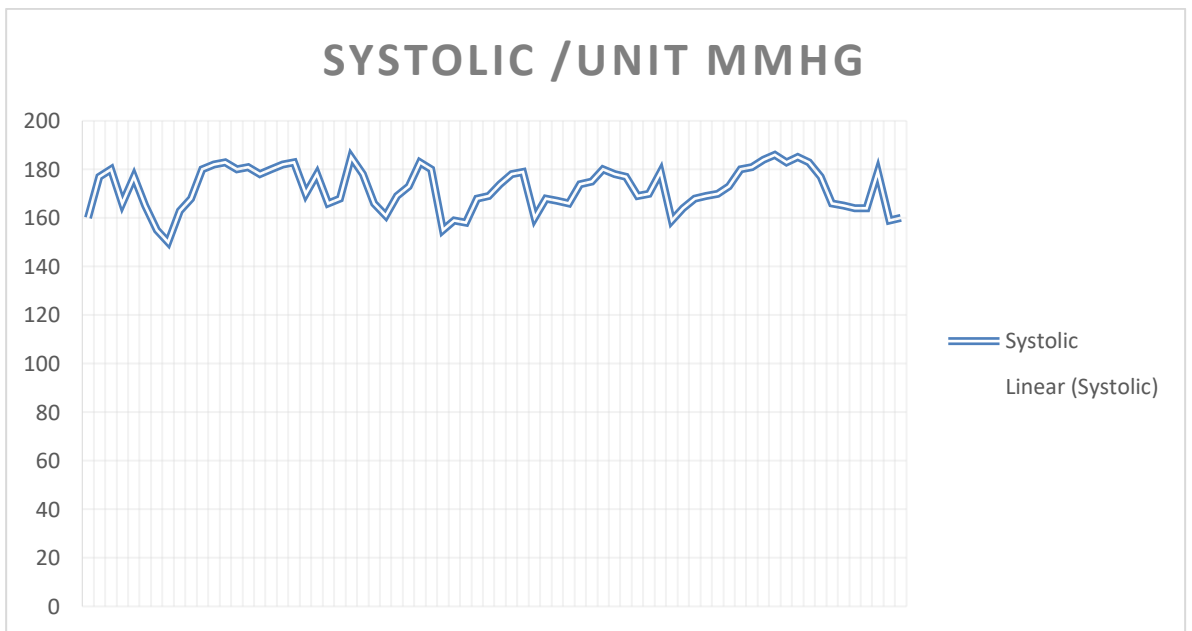


Table 2

Comparison between control and patients according to blood pressure

Statistics

		Diastolic patient	Systolic patient	Diastolic control	Systolic control
N	Valid	28	72	20	80
Mean		111.1481	172.0694	74.4500	129.2658
Std. Error of Mean		1.42994	1.04296	1.08209	.58951
Median		113.0000	173.0000	74.0000	130.0000
Mode		100.00 ^a	180.00	73.00	131.00
Std. Deviation		7.43021	8.84981	4.83926	5.23966
Variance		55.208	78.319	23.418	27.454
Range		21.00	36.00	20.00	31.00
Minimum		99.00	150.00	65.00	111.00
Maximum		120.00	186.00	85.00	142.00
Sum		3001.00	12389.00	1489.00	10212.00
Percentiles	25	102.0000	166.0000	71.2500	127.0000
	50	113.0000	173.0000	74.0000	130.0000
	75	118.0000	180.0000	77.7500	132.0000

a. Multiple modes exist. The smallest value is shown

Table 3
Outcome's pregnancy of fetal patients

Statistics

		Birth weight patient (g)	Gestation at the delivery patient (week)
N	Valid	100	100
	Missing	20	20
Mean		2963	37.0000
Std. Error of Mean		33.83427	0.14213
Median		3000	37
Mode		3000.00 ^a	35.00 ^a
Std. Deviation		338.3	1.42
Range		1600	4.00
Minimum		2200	35.00
Maximum		3800	39
Percentiles	25	2800	36
	50	3000	37
	75	3175	38

a. Multiple modes exist. The smallest value is shown

Table 4- Pregnancy outcomes of fetal control**Statistics**

N	Birth weight control		Gestation at delivery control	
	Valid	Missing	Valid	Missing
		100		100
		20		20
Mean		3709.6200		39.4600
Std. Error of Mean		27.36323		0.14384
Median		3768.0000		39.0000
Mode		3888.00 ^a		39.00
Std. Deviation		273.63235		1.43843
Range		1100.00		5.00
Minimum		3000.00		37.00
Maximum		4100.00		42.00

a. Multiple modes exist. The smallest value is shown

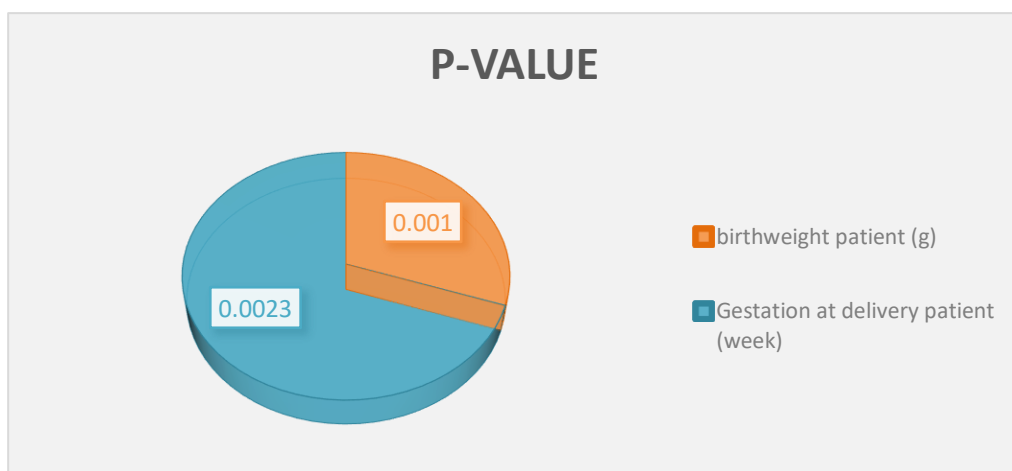
Figure 3- P-value of pregnancy outcomes for fetal

Figure 4- Pregnancy outcomes Preterm birth

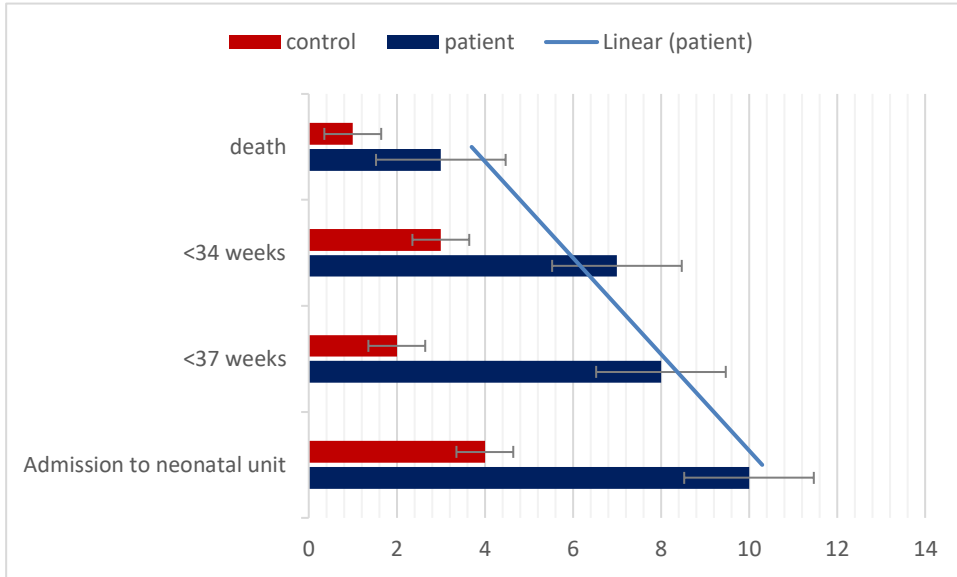


Figure 5- P-value of Preterm birth

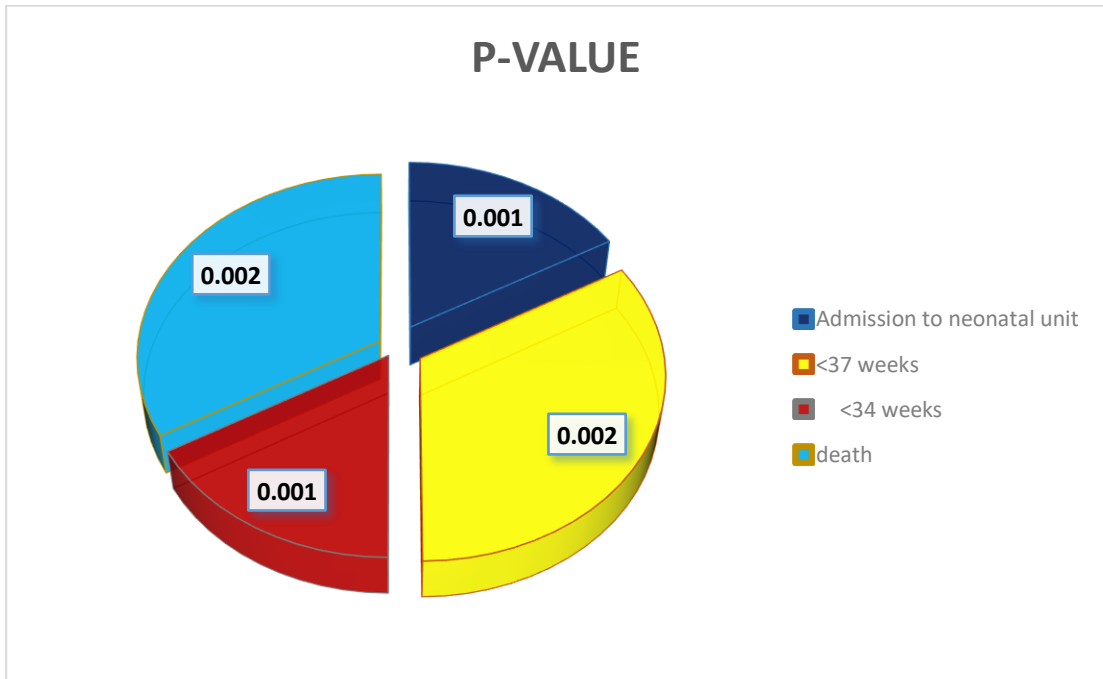
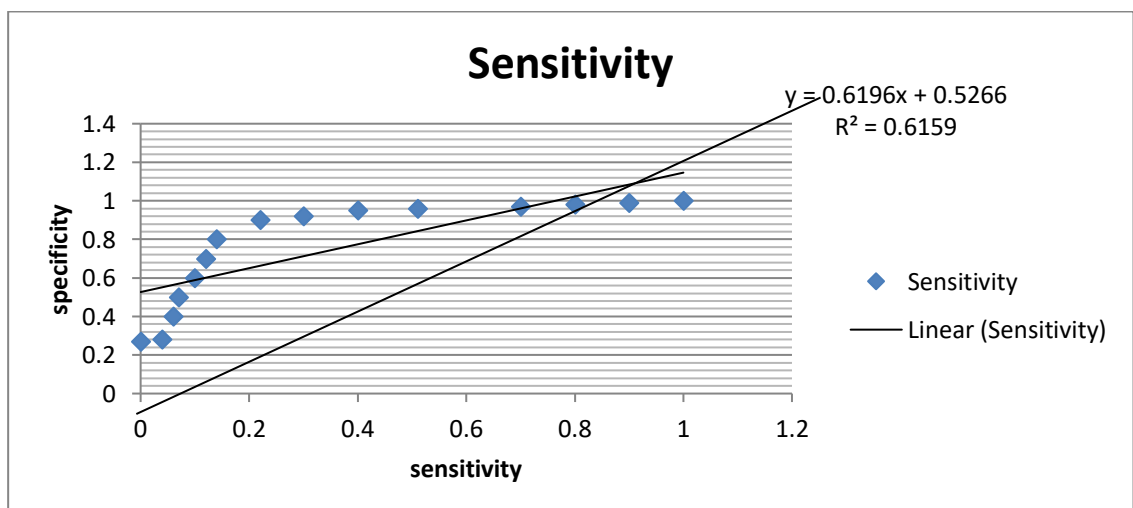


Table 5
Risk factors for preeclampsia and control group

Risk factor	Patient	Control
vaginal bleeding %	12%	3%
weight loss with 560g(Mean±SD)	2990±530	3300±210
Increase BMI(Mean±SD)	29.2±5.5	24.8±5.8
Exist decreasing in age with four years) Mean±SD)	26.7±4.6	27.1±4.7
Chronic arterial hypertension%	17%	4%
Primary arterial hypertension%	13%	2%
Vascular diseases%	11%	2.5%

Figure 6- ROC curve analysis for assessing the likelihood of severe PE prediction according to the developed logistic model



Discussion

In this study, 200 patients were collected and distributed into two groups (patients 100) (control 100). The real value and the arithmetic mean to the age of the patients were (30.74 ± 4.7) (control 30.05 ± 6.5), and it was also noted that the body mass index for the group of patients was higher than the control with a statistical value of 0.03

MEAN value and SD to blood pressure were extracted in both types of diastolic and systolic, where the true value for diastolic for the group of patients was 111.14 ± 7.43 mm Hg, and for the systolic for the group of patients was 172.06 ± 8.84 mm Hg and this indicator was very high compared to the normal situation or compared in the control group, which was low, it was diastolic with a control group of 74.45 ± 4.83 mm Hg.

In the present study, the gestational age of pregnant women subjected to this test ranged from 28 to 32 weeks, with the population with the highest prevalence observed being pregnant women with 32 weeks $n = (40.80\%)$. The results show that the Pre-eclampsia description in this study was 73 patients. For the patient group compared to the control group, that was for 60 patients, possibly due to the fact that most patients were younger than 35 years of age, being a low-risk population. The development of preeclampsia. On the other side

In this investigation, it was found that pregnant women who did not meet these criteria were classified as having high blood pressure during pregnancy,

It is very important to take a good history of the pregnant woman and ask if she has suffered from pre-eclampsia in previous pregnancies; with this information, the pregnant woman can be classified as at risk of suffering from pre-eclampsia.

It was shown in the table that pregnant women had a family history of preeclampsia. Using this data, it is possible to link the rolling test and the history of preeclampsia, as in the study conducted by Canor RD 2009, which concluded that the use of the rolling test is recommended in groups at risk. Therefore, prophylactic treatment of patients with a positive inversion test would be beneficial to avoid complications of the disease. Moreover, in a study by Thompson 11, which prophylactically treated patients with a positive mini-PIERS test, this resulted in a statistically significant reduction in hypertension during pregnancy; therefore, according to the results obtained in this study, the mini-PIERS test is useful as an indicator of Preeclampsia in pregnant women. It is with risk factors.

Pre-eclampsia increases the risk of this condition as the placenta separates from the inner wall of the uterus before delivery, and severe detachment can cause severe bleeding, which can be life-threatening.

Patients' size was calculated to obtain differences with assuming a perinatal risk of developing pre-eclampsia of 5.0% based on previous prospective studies in the same population where sample imputation was increased by 10% to avoid the

mis-recording of blood pressure due to no examination being attended prenatal medical

The mini piers model was used to assign high risk to women and showed logistic regression in this model had an adverse maternal outcome

By improving the ability of care providers to identify women at high risk of adverse outcomes, our specific aim was to reduce triage delays for women with any HDP in LMICs. What may be most useful is to set one threshold of predicted probability of an adverse outcome

Preeclampsia causes a high rate of perinatal maternal morbidity and mortality in Iraq, and thus the rolling test can be widely used in various health centres, from level I to level IV of care.

According to Kaypour found in a study that the PPV of the rolling test was 35.71%, and according to Phelan 2012, he concluded in his study that the rolling test predicted the onset of preeclampsia because 78% of women who got a positive test had gestational hypertension and 96% of those who got a positive test had gestational hypertension. Pregnant women with a negative test remained under normal pressure compared with the results obtained

This discrepancy in the results is due to the same variability in the population; in addition, in the study by Phelan, all hypertensive disorders of pregnancy were generally taken, in contrast to our study, in which only confirmed cases of preeclampsia were taken. In addition, a larger population and a specific age group will be required to get more accurate measurements

Conclusion

The prediction tools that were developed to determine the risks of pre-eclampsia have low positive predictive values 12,13, which is explained by the low prevalence of pre-eclampsia in Iraqi women (3-5%) 14, which justifies the high rate of false positives in the available prediction tools.

Preeclampsia is a condition that affects a pregnant woman when she has high blood pressure and protein in the urine. The reasons for this condition have not been identified. Preeclampsia can cause serious harm to both the health of the mother and the fetus.

It has been shown that low birth weight is more likely to repeat itself in future generations same can be said for pre-eclampsia, and scientists believe that women with a family history of low birth weight or preeclampsia should be closely monitored during pregnancy.

References

1. Ratsiatosika, Andriamanetsiarivo Tanjona, Eric Razafimanantsoa, Valéry Bruno Andriantoky, Noël Ravoavison, Rakotovao Andrianampanalinarivo Hery, Malik Boukerrou, Silvia Iacobelli, and Pierre-Yves Robillard. "Incidence

- and natural history of preeclampsia/eclampsia at the university maternity of Antananarivo, Madagascar: high prevalence of the early-onset condition." *The Journal of Maternal-Fetal & Neonatal Medicine* 32, no. 19 (2019): 3266-3271.
2. Ananth, Cande V., Katherine M. Keyes, and Ronald J. Wapner. "Pre-eclampsia rates in the United States, 1980-2010: age-period-cohort analysis." *BMJ* 347 (2013).
 3. Ngwenya, Solwayo, Brian Jones, Alexander Edward Patrick Heazell, and Desmond Mwembe. "Statistical risk prediction models for adverse maternal and neonatal outcomes in severe preeclampsia in a low-resource setting: proposal for a single-center cross-sectional study at Mpilo Central Hospital, Bulawayo, Zimbabwe." *BMC research notes* 12, no. 1 (2019): 1-11.
 4. Neiger, Ran. "Long-term effects of pregnancy complications on maternal health: a review." *Journal of clinical medicine* 6, no. 8 (2017): 76.
 5. Bilhartz, T.D., Bilhartz, P.A., Bilhartz, T.N. and Bilhartz, R.D., 2011. Making use of a natural stress test: pregnancy and cardiovascular risk. *Journal of Women's Health*, 20 (5), pp.695-701.
 6. Brewster, Shireen, Bernard Zinman, Ravi Retnakaran, and John S. Floras. "Cardiometabolic consequences of gestational dysglycemia." *Journal of the American College of Cardiology* 62, no. 8 (2013): 677-684.
 7. Hermes, W., Franx, A., Van Pampus, M.G., Bloemenkamp, K.W., Bots, M.L., Van Der Post, J.A., Porath, M., Ponjee, G.A., Tamsma, J.T., Mol, B.W.J. and De Groot, C.J., 2013. Cardiovascular risk factors in women who had hypertensive disorders late in pregnancy: a cohort study. *American journal of obstetrics and gynecology*, 208 (6), pp. 474-e1.
 8. Lind, J.M., Hennessy, A. and McLean, M., 2014. Cardiovascular disease in women: the significance of hypertension and gestational diabetes during pregnancy. *Current Opinion in Cardiology*, 29 (5), pp. 447-453.
 9. Metzger, B.E., Coustan, D.R. and Organizing Committee, 1998. Summary and recommendations of the fourth international workshop-conference on gestational diabetes mellitus. *Diabetes care*, 21, p.B161.
 10. Steegers, E.A., Von Dadelszen, P., Duvekot, J.J. and Pijnenborg, R., 2010. Pre-eclampsia. *The Lancet*, 376 (9741), pp. 631-644.
 11. Suryasa, I. W., Rodríguez-Gámez, M., & Koldoris, T. (2021). Get vaccinated when it is your turn and follow the local guidelines. *International Journal of Health Sciences*, 5(3), x-xv. <https://doi.org/10.53730/ijhs.v5n3.2938>
 12. Garovic, V.D. and Hayman, S.R., 2007. Hypertension in pregnancy: an emerging risk factor for cardiovascular disease. *Nature clinical practice Nephrology*, 3 (11), pp. 613-622.
 13. Lee, A.J., Hiscock, R.J., Wein, P., Walker, S.P. and Permezel, M., 2007. Gestational diabetes mellitus: clinical predictors and long-term risk of developing type 2 diabetes: a retrospective cohort study using survival analysis. *Diabetes care*, 30 (4), pp. 878-883.
 14. Ratner, Robert E., Costas A. Christophi, Boyd E. Metzger, Dana Dabelea, Peter H. Bennett, Xavier Pi-Sunyer, Sarah Fowler, Steven E. Kahn, and Diabetes Prevention Program Research Group. "Prevention of diabetes in women with a history of gestational diabetes: effects of metformin and lifestyle interventions." *The Journal of Clinical Endocrinology & Metabolism* 93, no. 12 (2008): 4774-4779.
 15. Ouzounian JG, Elkayam U. Physiologic changes during normal pregnancy and delivery. *Cardiology clinics*. 2012 Aug 1;30(3):317-29.

16. Ødegård, R.A., Vatten, L.J., Nilsen, S.T., Salvesen, K.Å. and Austgulen, R., 2000. Risk factors and clinical manifestations of pre-eclampsia. *BJOG: An International Journal of Obstetrics & Gynaecology*, 107 (11), pp. 1410-1416.
17. Stamilio, D.M., Sehdev, H.M., Morgan, M.A., Propert, K. and Macones, G.A., 2000. Can antenatal clinical and biochemical markers predict the development of severe preeclampsia? *American journal of obstetrics and gynecology*, 182 (3), pp. 589-594.
18. Choi, S.H., Park, Y.S., Shim, K.S., Choi, Y.S., Chang, J.Y., Hahn, W.H. and Bae, C.W., 2010. Recent trends in the incidence of multiple births and its consequences on perinatal problems in Korea. *Journal of Korean medical science*, 25 (8), pp. 1191-1196.
19. English, F.A., Kenny, L.C. and McCarthy, F.P., 2015. Risk factors and effective management of preeclampsia. Integrated blood pressure control, 8, p.7.