



## Comparative Study for the Early Detection of the most Important Factors Leading to Preeclampsia

Aseel Mubdir Dawood Al-Marsuomy  
Middle Technical University of  
Administration-Rusafa, Baghdad, Iraq  
[almarsoumy66@yahoo.com](mailto:almarsoumy66@yahoo.com)

Mustafa Mohammed Subhi Fadhel  
Ministry of Education, Baghdad, Iraq  
[mustafa.fadhel.1986@gmail.com](mailto:mustafa.fadhel.1986@gmail.com)

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### Abstract:

The aim of this research is to determine the most important and main factors that lead to Preeclampsia. It is also about finding suitable solutions to eradicate these factors and avoid them in order to prevent getting Preeclampsia. To achieve this, case study sample of (40) patients from Medical City - Oncology Teaching Hospital was used to collect data by questionnaire which contained (17) reasons to be investigated. The statistical package (SPSS) was used to compare the results of the data analysis through two methods (Radial Bases Function Network) and (Factorial Analysis). Important results were obtained, the two methods determined the same factors that could represent the direct reason which causes Preeclampsia. But the first method of analysis was more precise and accurate in identifying these factors. Concerning both methods the focus was on the factors of (following a good nutritious diet, a dysfunction in the placenta, and suffer from high blood press before pregnancy) had a major effect on their potential susceptibility of Preeclampsia.

**Keywords:** Factorial Analysis, Radial Bases Function Network, Gaussian Function, Preeclampsia.

## 1. Introduction:

Preeclampsia is one of the complications that can occur during pregnancy which would threaten the health and the normal growth of the baby. It can occur after the 20th week of pregnancy (the middle of the fifth month) as in the second trimester. It usually occurs when the pregnant female develops high blood pressure of more than 90/140 mm Hg. It is accompanied by protein present in the urine which is an indicator that there is a problem with the kidneys. Preeclampsia can cause severe complications that can affect the mother and the baby. It can cause acute neurological spasms that may lead the doctor to perform caesarean births despite the danger threatening the baby in order to save the mother's life. Preeclampsia increases for older pregnant women. Studies showed that women who get pregnant after the age of 40 are more prone to get Preeclampsia. It reaches the percentage of 5-8%. The statistical methods that were used in data analysis are: (Radial Bases Function Network) and (Factorial Analysis). These two methods were chosen specifically because of linear relationship between the variables acquired. The number of variables was large which required the use of the two methods to reduce the large number of variables in order to compare both of them which would help determine the common factors in the two methods that would have a major effect in developing the condition [1], [3].

Shedding some light on the importance of determining the main causes for Preeclampsia in women by using (Radial Bases Function Network) and (Factorial Analysis) where through these methods reducing the factors and focusing on the important and main factors in infection the disease and then comparing the results from the two methods to get to the direct and real factors in infected with the disease.

The importance of the research lies in using (Radial Bases Function Network) and (Factorial Analysis) as two statistical tools working on reducing the effective factors and to get through them to the factors that cause the disease.

## 2. The Preliminary Conceptions

### (2-1) The Research Hypothesis:

The hypothesis can be formed as follows:

$H_0$ : The data that were acquired as explanatory data for the factors leading to the Infected with Preeclampsia. It indicates that there are no effective factors that lead to Infect with Preeclampsia

$H_1$ : The data that were acquired as explanatory data for the factors leading to the Infected with Preeclampsia. It indicates that there are effective and major factors that lead to Infect with Preeclampsia that must be avoided and treated in order to prevent the disease.

### (2-2) Research Sample:

The data used in this research were acquired from Medical City (oncology Teaching Hospital) with a sample size of (40) patients and (17) causes ( $X_i$ ) with different effects that leads to developing the disease and they are as follows:

X1: Age more than 40 years

X2: Is there a previous condition of Preeclampsia

X3: Are there problems with blood vessels and having high levels of fat in blood.

X4: Is it the first pregnancy

- X5: Are you pregnant with twins or more  
X6: Do you suffer from polycystic ovaries  
X7: Do you follow a good nutritious diet.  
X8: Is there a dysfunction in the placenta  
X9: do you exercise during pregnancy  
X10: do you suffer from kidney disease  
X11: Is there a long period of time between the current pregnancy and the previous one  
X12: do you have a family member who has the disease (hereditary)  
X13: is there a shortage of blood supply for the baby  
X14: is there deficiency in vitamins E and C and magnesium for the pregnant woman  
X15: do you suffer from high blood press before pregnancy  
X16: do you suffer from weakened immune system  
X17: are you suffering from being overweight

**(2-3) Research Problem:**

Studying the effective factors in Infection with Preeclampsia and according the reports from the Iraqi Ministry of Health indicates the increase of Infection the disease in Iraq and it is obligatory to determine the direct factors of the disease.

**(2-4) Research Structure:**

The research was divided into four main chapters where in chapter one deals with the preliminary frame of the research structure and the concept of developing Preeclampsia and types of diagnosis. As for chapter two, it deals with the theoretical part of the main concept of the two methods that were used in data analysis (Radial Bases Function Network), and (Factorial Analysis). Wherein chapter three deals with the applicable part using the package (spss). Chapter four has the conclusions and recommendations.

**(2-5) Preeclampsia (Causes and Prevention and Treatment) [14], [15]:**

Some pregnant women can suffer from Preeclampsia in the second trimester, at the beginning of the fourth month and up until the sixth month. It occurs because of the inability of the placenta to function properly and supply the baby with nutrition.

**❖ Symptoms of the Disease:**

The Symptoms of Preeclampsia overlap with other diseases and the most common symptoms are:

1. High blood pressure.
2. Swelling of the face.
3. Swelling of the hands.
4. Headache.
5. Abnormal weight gain.
6. Vomiting.
7. Blurry vision.
8. Difficulty in urinating.
9. Stomach ache, especially the upper right side.

**❖ Causes of the Disease:**

Doctors do not know for a fact the causes of Preeclampsia, but it is thought to be outcome of the abnormal formation in the placenta function which can happen due to the following causes:

1. Chronic high blood pressure.
2. Who suffers from high blood pressure during pregnancy?
3. Age can be one of the danger factors, she who is older than 35 or younger than 20 is More prone for Preeclampsia being pregnant with two or three babies.
4. Diabetes or any other condition that affects the blood vessels.
5. Kidney patients.
6. The increase of protein levels in the urine.
7. Malnutrition and severe unweight for the mother.

**❖ Prevention and Treatment:**

How does Preeclampsia affect your baby?

Preeclampsia affects the placenta which is the organ that supplies oxygen and nutrients from the mother to the baby. High blood pressure lessens the flow of blood through the vessels and the placenta would not function properly. That may lead to underweight after birth or other health problems. In cases of placenta problems require premature birth for the health and safety of the baby because Preeclampsia could lead to the baby's death if the placenta was affected greatly.

**❖ Diagnosis:**

If you were diagnosed of Preeclampsia or had a history of Preeclampsia, the doctor would ask for a test to determine if you might suffer from it again. If worried about some symptoms he would do the following tests:

**1. Blood Tests:**

Your doctor may ask for various types of blood tests to evaluate the patient's condition. These tests include complete blood picture which determine the number of red blood cells and the number of platelet which estimates the extremity of blood clotting. These tests will also help in checking liver and kidney functions.

**2. Creatinine Test:**

High level of Creatinine suggests Preeclampsia but it is conclusive.

**3. General Urine Examination:**

The doctor would ask for general urine examination to check for presence of protein.

**❖ Treatment:**

If the mother was suffering from mild Preeclampsia, the doctor would look for the reason causing it after medical tests and prescribe the following treatment:

1. Prescribe to the patient some medicine to increase the blood flow to supply the baby with nutrients through placenta.
2. Prescribe medicine to lower high blood pressure.
3. Complete rest.
4. Injecting the mother with corticosteroids to help baby's lungs mature in case of premature birth.

5. If Preeclampsia was severe or at a late stage, the mother would be injected with corticosteroids and undergoes premature birth to ensure the safety of the mother and baby.

### 3. The Theoretical Conceptions:

In this Section, we are going to deal with a number of important and necessary definitions to understand the theoretical part of the research

#### (3-1) Important definitions of Radial Bases Function Network [4,6,7,8,9,10,11]:

##### ❖ Radial Bases Function Network (RBFN):

It consists of two layers excluding the input layer and they are the hidden layer and the output layer. The reason for calling it Bases Function because the cells of the middle layer represent a group of functions like (Gaussian Function) and scatter plot of the data resembles a ray and that is why it is called as such (Rena's, 1989) (Feral, 1997). The (RBFN) is considered a hybrid network of a group of characteristics in some types of artificial neural networks like (Single layer Preceptor) and (Error back propagation) where the network acquired the property of error back propagation from the aforementioned networks.

##### ❖ Constructing Radial Bases Function Network:

It consists of three layers of cells and they are: input layer, hidden layer, and output layer and each layer in this network is connected with the layer that follows which means any cell from the input layer connects with all cells in the hidden layer and all cells from hidden layer sends its output to every cell in the output layer. The numbers of cells in the input layer depend on the application given to the network and the numbers of hidden cells depend on the degree of complication in the problem. The following figure explains the Radial Bases Function Network which consists of three layers (Kiernan, 1996).

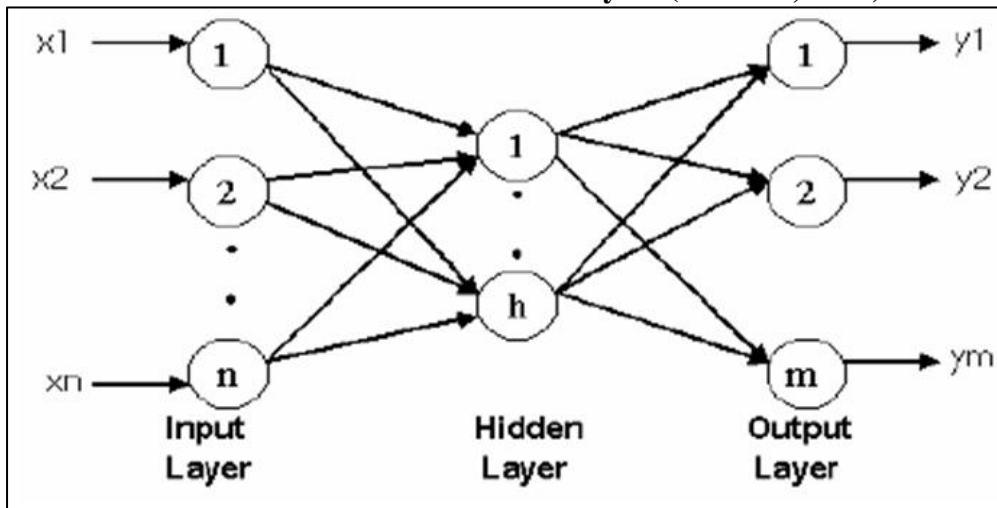


Figure 1: Construction of Radial Bases Function Network

##### ❖ Weights in (RBFN):-

Primary weights are prepared for first processing (hidden layer) and so for the output layer with random numbers between [0-1] as for changing weights for the layers it would be as follows (Leonard 1991).

1. Hidden layer: No changing weights in this layer.

2. Output layer: Changing weights when we don't get the required output and that is done through Mathematical equations explained in the algorithm of the Radial Bases Function.

### (3-2) Important Definitions of Factorial Analysis:

#### ❖ Factorial Analysis [2,3,5]:

It is a group of statistical methods that aim to reduce the number of variables or data related to a certain phenomenon. It is used in data analysis or correlation matrices or variance matrices of variables and the results of their multiplications. The aim would be to explain the relationships between the variables and it results in a number of numerous changes or hypothetical and they are called factors. It aims to analyses a group of correlation coefficients between the number of variables and it reduces them to a lesser number of factors which would help in comprehending the formation of the correlation matrix or the covariance matrix through lesser number of factors.

#### ❖ Eigen values:

It is a sum of squares of every variable on each factor from the matrix factors on its own and it indicates the amount of variance which the factor contributes.

#### ❖ Commonality:

The sum of contributions of the variable in different factors which can be concluded from the factorial matrix and wherein each variable contributes in different amounts in each factor and whether its contributions are fundamental or non-fundamental and so the sum of squares of these contributions of matrix factors is the value of commonality for the variable or contributions.

#### ❖ Rotation:

After the factors reaches its saturation the process of rotating the factors to another place where it can be explained. The main aim of rotating factors is to reach a suitable combination for factors that can be explained and so rotating factors helps in explaining factors a logical explanation.

#### ❖ Gaussian Function

In the hidden layer, the Gaussian function is used. The mathematical structure is used (Buck, 2002):

$$O_i = \exp[-(X - W)^2 / 2\sigma^2]$$

Whereas:

$O_i$ : represent the actual output of the cell (i) and the output value would be between [0-1].

$X$ : is the input vector of the network.

$W$ : is the escort vector weights for the inputs and they are randomly generated values.

❖ **KMO Test:**

We use the test of (Kaiser, Meyer, Olkin) to calculate the sufficiency of the sample and to test whether or not the partial correlations between the variables are small and ranges between (0 to +1) wherein the values close to (+1) indicates to the sufficiency of the sample or that it is adequate.

**(3-3) Types of Factorial Analysis:**

**First:** - exploratory factorial analysis:

It is used in discovering the factors that the variables can be classified into considering the factors are categories of these variables.

**Second:** - Confirmatory factorial analysis

**(3-4) The Conditions of Factorial Analysis:-**

- 1.The identical distribution of variables.
- 2.The level of measuring the variables from the categorical level or relative.
- 3.The existence of linear relationships between the variables.
- 4.The chosen sample must be random, large, and represents the population
- 5.(For every variable at least 10 individuals).
- 6.The independence of errors in every variable and the independence of variables themselves.

**4. The Application Part**

The applicable part includes the analysis of the sample with available statistical methods. As for the research under study two methods were used through programmed (SPSS) and they are: (Radial Bases Function Network) and (Factorial Analysis) and that is for the purpose of comparing the results of the two analyses to obtain the least error in the estimation.

**(4-1) The Results of Data Analysis using Neural Networks:**

Because of the scientific advancement in all fields especially in the medical field, it has become necessary to build and develop methods of analysis that specializes in this field. As it has been explained, the research focuses on the most important factors that lead to developing breast cancer using artificial neural network which is a RBFN. It is a function that was counted on during the analysis in this programmer (SPSS) and that is because this method of analysis is compatible with the nature of the problem under study.

Table 1: Case Processing Summary

	N	Percent
Sample Training	32	80.0%
Testing	8	20.0%
Valid	40	100.0%
Excluded	0	
Total	40	



Table 2: Network Information

<b>Input Layer</b>	<b>Covariates</b>	1	X1
		2	X2
		3	X3
		4	X4
		5	X5
		6	X6
		7	X7
		8	X8
		9	X9
		10	X10
		11	X11
		12	X12
		13	X13
		14	X14
		15	X15
		16	X16
			17
	<b>Number of Units</b>	17	
<b>Hidden Layer</b>	<b>Rescaling Method for Covariates</b>		<b>Standardized</b>
	<b>Number of Units</b>		5 <sup>a</sup>
	<b>Activation Function</b>		Softmax
<b>Output Layer</b>	<b>Dependent Variables</b>	1	Y
	<b>Number of Units</b>		2
	<b>Activation Function</b>		Identity
	<b>Error Function</b>		Sum of Squares

Where (a) is: Determined by the testing data criterion the "best" number of hidden Units are the one that yields the smallest error in the testing data.

Table 3: Model Summary

<b>Training</b>	<b>Sum of Squares Error</b>	2.392
	<b>Percent Incorrect Predictions</b>	12.5%
	<b>Training Time</b>	0:00:00.06
<b>Testing</b>	<b>Sum of Squares Error</b>	1.397 <sup>a</sup>
	<b>Percent Incorrect Predictions</b>	37.5%



Where (Y) is: Dependent Variable and (a) is: The number of hidden units is determined by the testing data criterion: The "best" number of hidden units is the one that yields the smallest error in the testing data.

Table 4: Parameters Estimates

Predictor		Predicted						
		Hidden Layer <sup>a</sup>					Output Layer	
		H(1)	H(2)	H(3)	H(4)	H(5)	[Y=0]	[Y=1]
Input Layer	X1	-2.009-	.372	.372	.372	.372		
	X2	-.559-	-.559-	.254	.254	.254		
	X3	.536	-.473-	-.113-	-.473-	.215		
	X4	.317	.317	-.166-	-1.372-	.317		
	X5	.317	.317	-.648-	.317	.010		
	X6	.117	-.298-	-.120-	1.360	-.336-		
	X7	.013	-.789-	-.904-	.313	.814		
	X8	.013	.814	-.331-	.313	-.279-		
	X9	-.114-	-.568-	.081	1.137	-.155-		
	X10	-.719-	-.322-	.585	.868	-.214-		
	X11	-.473-	-.473-	.608	.158	-.014-		
	X12	-.712-	.117	.176	.842	-.147-		
	X13	.712	.712	-1.360-	.194	.147		
	X14	.424	-.661-	.424	-.254-	-.069-		
	X15	-1.034-	.317	-.166-	.317	.317		
	X16	.762	.356	-1.271-	.762	.023		
	X17	.818	-.372-	-.372-	1.116	-.372-		
Hidden Unit Width		1.718	1.289	1.516	1.575	1.340		
Hidden Layer	H(1)						.203	.797
	H(2)						1.570	-.570-
	H(3)						1.052	-.052-
	H(4)						-.087-	1.087
	H(5)						-.402-	1.402

Where (a) is Displays the center vector for each hidden unit.

**Table 5: Classification**

Sample	Observed	Predicted		
		Not Infected	Infected	Percent Correct
Training	Not Infected	10	3	76.9%
	Infected	1	18	94.7%
	Overall Percent	34.4%	65.6%	87.5%
Testing	Not Infected	2	3	40.0%
	Infected	0	3	100.0%
	Overall Percent	25.0%	75.0%	62.5%

Where (Y) is Dependent Variable.

**Table 6: Independent Variable Importance**

	Importance	Normalized Importance
X1	.083	57.2%
X2	.060	41.1%
X3	.054	36.8%
X4	.071	48.5%
X5	.071	48.7%
X6	.031	21.1%
X7	.146	100.0%
X8	.052	35.4%
X9	.046	31.5%
X10	.024	16.6%
X11	.042	28.9%
X12	.021	14.2%
X13	.065	44.8%
X14	.040	27.4%
X15	.063	43.4%
X16	.058	40.1%
X17	.075	51.2%

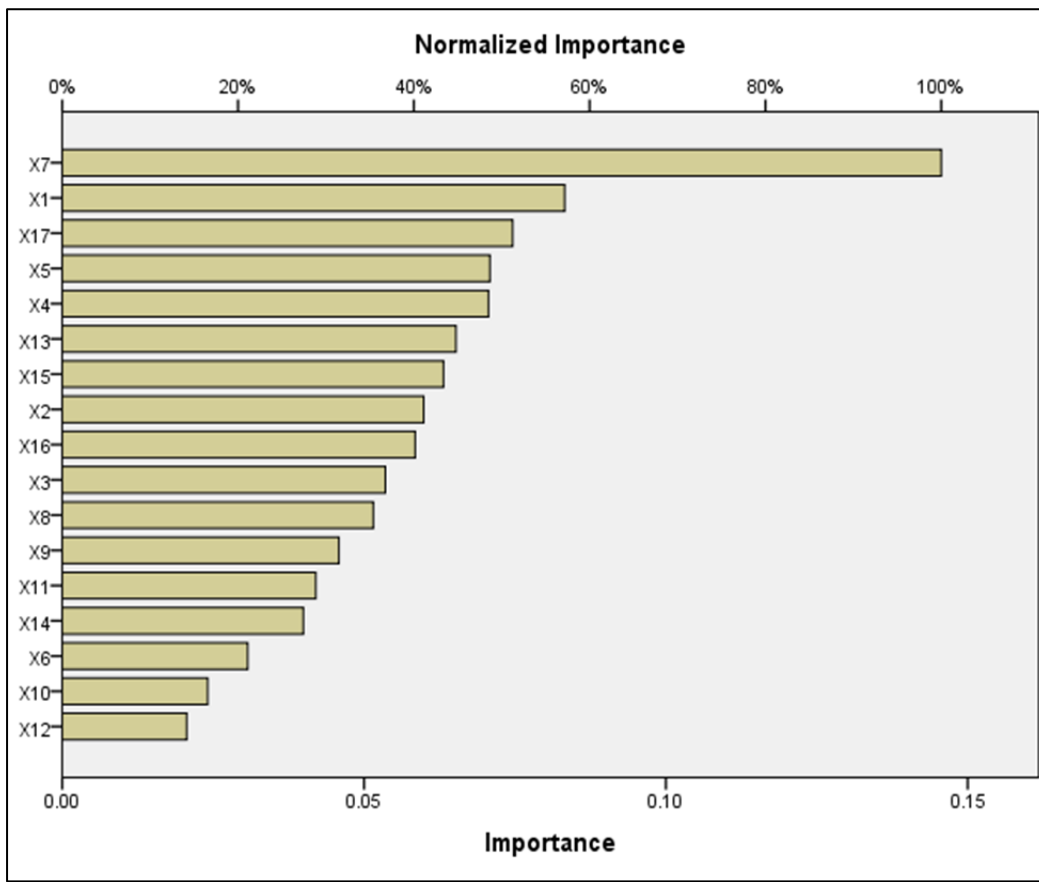


Figure 2: Normalized Importance

**(4-2) The Results of Data Analysis the Factorial Analysis Method:-**

The applicable part includes the data analysis of the sample using the factorial analysis method through the statistical programmer (spss), before conducting the analysis we tested the sample to know the extent of its sufficiency using the KMO test as it is shown in table No. (7)

Table 7: The sufficiency of the size of the sample for data of Preeclampsia in women.

KMO and Bartlett's Test (1)		
665Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.503
Bartlett's Test of Sphericity	Approx. Chi-Square	278.824
	Df	153
	Sig.	.000

From table (7): we notice that the measurement value of the (KMO) test is (0.503) and as long as the value is larger than (0.5) so the size of the sample is considered adequate for the factorial analysis. As for the (Bartlett's) test the significance level was (0.000) which is less than the accredited significance level (0.5) which indicates that the matrix represents the identity matrix.

**Table 8: The contribution of data in effecting the development of Preeclampsia in women**

<b>Communalities</b>		
	<b>Initial</b>	<b>Extraction</b>
<b>Age older than 40 year old</b>	<b>1.000</b>	<b>0.727</b>
<b>Is there previous case of Preeclampsia</b>	<b>1.000</b>	<b>0.865</b>
<b>Are there problems with blood vessels and high level of fat in blood</b>	<b>1.000</b>	<b>0.753</b>
<b>Is it the first pregnancy</b>	<b>1.000</b>	<b>0.674</b>
<b>Is the pregnancy with twins or more</b>	<b>1.000</b>	<b>0.639</b>
<b>Do you suffer from polycystic ovaries</b>	<b>1.000</b>	<b>0.630</b>
<b>Do you follow a nutritious diet</b>	<b>1.000</b>	<b>0.889</b>
<b>Is there a dysfunction in placenta</b>	<b>1.000</b>	<b>0.791</b>
<b>Do you exercise during pregnancy</b>	<b>1.000</b>	<b>0.705</b>
<b>Do you have kidney disease</b>	<b>1.000</b>	<b>0.842</b>
<b>Is there a long period of time between the current pregnancy and the previous one</b>	<b>1.000</b>	<b>0.762</b>
<b>Do you have members of family with the disease (hereditary)</b>	<b>1.000</b>	<b>0.748</b>
<b>Is there a deficiency in blood supply for the baby</b>	<b>1.000</b>	<b>0.805</b>
<b>Is there a deficiency in vitamins E and C and Magnesium for the mother</b>	<b>1.000</b>	<b>0.822</b>
<b>do you suffer from high blood pressure</b>	<b>1.000</b>	<b>0.808</b>
<b>do you have a weakened immune system</b>	<b>1.000</b>	<b>0.815</b>
<b>are you suffering from overweight</b>	<b>1.000</b>	<b>0.640</b>
<b>Extraction Method: Principal Component Analysis.</b>		

The common abstract value for the first variable indicates to (0.727) of the data in the values of the first variable (age) explained by the common factors which is (0.630) (did you use contraception pills)

Table 9: The variance of effective factors

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.803	21.128	21.128	3.803	21.128	21.128	2.454	13.631	13.631
2	2.754	15.301	36.429	2.754	15.301	36.429	2.418	13.435	27.066
3	2.074	11.523	47.952	2.074	11.523	47.952	2.180	12.112	39.178
4	1.777	9.871	57.822	1.777	9.871	57.822	2.020	11.225	50.403
5	1.222	6.788	64.610	1.222	6.788	64.610	1.892	10.514	60.917
6	1.086	6.031	70.641	1.086	6.031	70.641	1.508	8.378	69.295
7	1.000	5.557	76.198	1.000	5.557	76.198	1.243	6.903	76.198
8	.865	4.808	81.007						
9	.628	3.488	84.494						
10	.570	3.166	87.661						
11	.481	2.670	90.330						
12	.436	2.421	92.751						
13	.398	2.209	94.960						
14	.293	1.630	96.590						
15	.212	1.179	97.769						
16	.175	0.974	98.743						
17	.143	0.792	99.535						

Extraction Method: Principal Component Analysis.

We notice that: there are 18 linear relationships with the data. The value of the Eigen values for the first factor reached (3.803) where it explains the variations of this factor (21.128%) from total variance as for the value of Eigenvalues for the second factor reached (2.754) and explains (15.301%) as for the third factor it was (2.074) and explains (11.523%) of the total variance. As for the fourth factor it was (1.777) and explains (9.871%) of the total variance. As for the fifth factor it was (1.222) and explains (6.788%) of the total variance. As for the sixth factor it was (1.086) and explains (6.031%) of the total variance. As for the seventh factor its value was (1.000) and the variations of this factor explains (5.557%) of total variance. Despite that these factors include different proportions of the variance, at the end of the table it is mentioned that the sum of variance (total variance) of the factors is (76.198%).

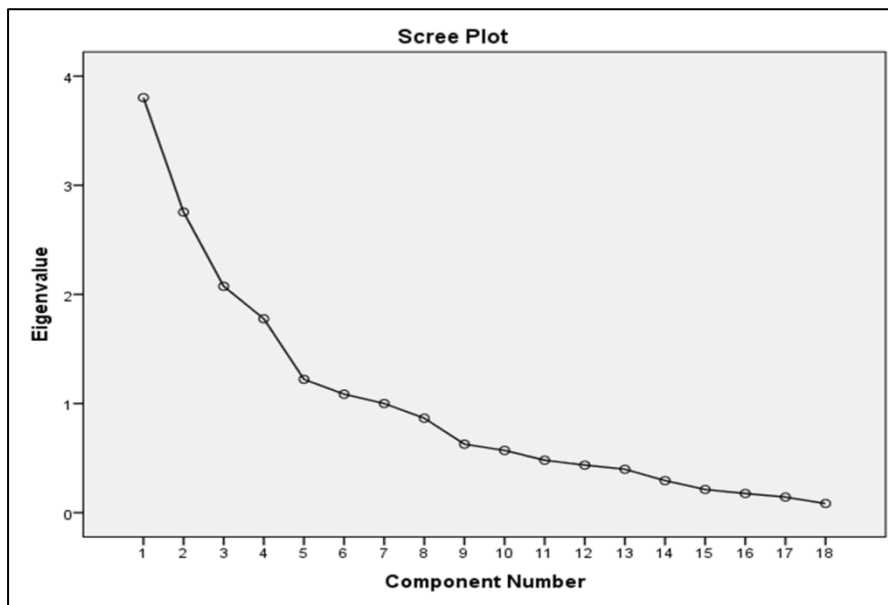


Figure 3: The variance of effective factors

It is another criterion to determine the factors in the factorial analysis and to only keep the ones in the extreme slope (criterion for keeping factor that has an Eigen value more than a whole one)

Table 10: Component Matrix

	Component						
	1	2	3	4	5	6	7
Age more than 40	.601	.218	-.358-	-.167	-.274		.287
Is there a previous case of Preeclampsia	.456	.122	-.310	.485	.361	.375	-.199-
Are there problems with blood vessels and high level of fat	-.236-			.295	.759	-.170-	
Is it the first pregnancy	.276	.679			.109	.192	-.290-
Is the pregnancy with twins or more	-.528-	-.178-	-.311-	.324	-.249	.252	
Do you suffer from polycystic ovaries	.105	.638	.374	-.262-			
Do you follow a nutritious diet	-.281-		.247	.236	.168	.479	.656
Is there a dysfunction in the placenta	-.414-		.207	-.461-		.408	_.445-
Do you exercise during pregnancy	.655	.201	.360	.257	-.191		
Do you have kidney disease	-.344-	.341	.341	.520	-.391		-.247
Is there a long period of time between the current previous one	.484	-.295-	.643				.141
Do you have members of family with the disease (hereditary)		.368	.686	-.173-	.189	.254	
Is there a deficiency in blood supply for the baby		.605	-.262	-.545-	.135	-.204-	

Is there a deficiency in vitamins E and C and Magnesium for the mother	-.527-	.586		.331	-.186	-.239-	
Do you suffer from high blood pressure	-.800-	-.104-		-.281	-.142	.205	.129
Do you have a weakened immune system	-.267-	.708	-.439			.141	.169
Are suffering from overweight	.657	.243	-.192	.276	-.176		
Extraction Method: Principal Component Analysis.							
a. 7 components extracted.							

The matrix shows the factors before rotation and shows every factor containing some variable. The seven factors are

The first factor: it contains four variables (age older than 40 years old, is there a dysfunction in the placenta, are you suffering from overweight, is there environmental pollution.)

The second factor: it contains five variables (is the first pregnancy, do you suffer from polycystic ovaries, is there a weakened immune system, is there a deficiency in vitamins E and C and Magnesium for the mother, is there a deficiency in blood supply for the baby.)

The third factor: it contains two variables (is there a long period of time between the current pregnancy and the previous one, do you have member of your family with the same disease (hereditary))

The fourth factor: it contains three variables (is there a previous condition of preeclampsia, do you get pregnant with twins or more, are you suffering from kidney disease).

The fifth factor: it contains one variable (are there problems with blood vessels and high level of fat).

The sixth factor: it contains two variables (is there a dysfunction in the placenta, do you suffer from high blood pressure before pregnancy)

The seventh factor: it contains one variable (do you follow a nutritious diet).



Table 11: Rotated Component Matrix

	Component						
	1	2	3	4	5	6	7
Age older than 40 years old	.253	.108	-.315	-.447	.181	.565	
Is there a previous condition of preeclampsia				-.210	.880	-.149	
Are problems in blood vessels and high level of fat					.129	-.851	
Is it the first pregnancy	.381	.505	.117		.478		-.164
Do get pregnant with twins or more	.129	-.624	.338	.264			.212
Do you suffer from polycystic ovaries	.201	.732	.183			.134	
Do you follow a nutritious diet							.932
Is there a dysfunction in placenta		.157		.870			
Do you exercise during pregnancy	-.369	.421	.150	-.412	.351	.260	
Do you suffer from kidney disease			.891	.122	.108		
Is there a long period of time between the current pregnancy and the previous one	-.734	.362	-.143	-.238			
Do you have a member of family with the disease (hereditary)	-.160	.769		.184			.290
Is there a deficiency in blood supply for the baby	.693	.439	-.229		-.162		-.211
Is there a deficiency in vitamins E and C and Magnesium for the mother	.433		.761		-.172	-.144	
Do you suffer from high blood pressure before pregnancy	.237	-.251	.131	.595	-.478		.300
Is there a weakened immune system	.843		.219		.114		.191
Are you suffering from overweight				-.552	.457	.332	
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. a. Rotation converged in (11) iterations.							

The table contains the same data as in table no. (10), but summarizes the diagnosis for each factor acquired after rotation.

The first factor: it contains two variables (is there a deficiency in blood supply for the baby, is there a weakened immune system).

The second factor: it contains five variables (is it the first pregnancy, do you suffer from polycystic ovaries, do you exercise during pregnancy, is there a long period of time between the current pregnancy and the previous one, do you have member of the family with the same disease (hereditary)).

The third factor: it contains three variables (do you get pregnant with twins or more, do you suffer from kidney disease, is there a deficiency in vitamins E and C and Magnesium for the mother).

The fourth factor: it contains two variables (is there a dysfunction in the placenta, do you suffer from high blood pressure before pregnancy).

The fifth factor: it contains four variables (is there a previous condition of preeclampsia, are there problems with blood vessels and high level of fat, is there environmental pollution.).

The sixth factor: it contains one variable (age older than 40 years old).

The seventh factor: it contains one variable (do you follow a nutritious diet).

### **5. Conclusions:**

- 1.Using the Factorial Analysis leads to reducing the number of variables to a number of explainable factors.
- 2.The result of Factorial Analysis discovered that lifestyle has an effect on the physical readiness to develop preeclampsia.
- 3.From the results of Radial Base Function Network that any dysfunction in the placenta and suffering from high blood pressure prior to pregnancy and a weakened immune system for a woman has a major effect on developing preeclampsia

### **6. Recommendations:**

1. Throughout research and studies of the problem (preeclampsia), there should be awareness about nutrition since childhood must depend on nutritional elements that fortify the immune system
2. Every woman must do a periodic check-up for blood pressure and inform the supervising doctor in case she was suffering from high blood pressure and also do a periodic (continuous) fetal ultrasound to ensure the condition of the placenta.

## References

1. Al-Bayati, Mahmoud, Data Analysis by using the Statistical Program (SPSS) , Al-Hamed House and Library, Amman, 2004.
2. Buck, Sbastian,2002, "A C++ Library for Function Approximation using Networks of Radial Basis Functions", Munich University of Technology. <http://www.in.tum.de/people/buck/index-e.html>.
3. Dr. Al-Baldawi. Abdel-Hamid Abdel-Majid , Methods of Statistics, Wael Publishing House , First Edition.(2009)
4. Ferat ,Sahin ,1997, "A Radial Basis function Approach To a color Image Classification Problem in a Real Time Industrial Application", formerly the scholarly communications projects, Electrical engineering.
5. Keirnan, L., al., 1996, "Robust Initialisation of Gaussian Radial Basis Function Networks Using Partitioned K-means Clustering," Electronic Letters, vol. 32, no.7, pp. 671-3.
6. Konig, A., et., 1994 , "A Novel Method for the Design of Radial Basis Function Networks and Its Implication for Knowledge Extraction," IEEE International Conference on Neural Networks. IEEE World Congress on Computational Intelligence, p.7 vol. 1804-9 vol. 3.
7. Leonard, J. A. and M. A. Kramer, 1991, "Radial Basis Function Networks for Classifying Process Faults," IEEE Control Systems Magazine, vol. 11, no.3, pp.31-8 .
8. Martin D. Buhmann, M. J. Ablowitz (2003). "Radial Basis Functions : Theory and Implementations". Cambridge University.
9. Renals, S., 1989, "Radial Basis Function Network for Speech Pattern Classification," Electronics Letters, vol. 25, pp. 437-439.
10. Shin, C., et al., 1996, "Radial Basis Function Network Design for Chaotic Time Series Prediction," Transactions of the Korean Institute of Electrical Engineers, no. 4, pp. 602-11.
11. Yee, Paul V. and Haykin, Simon (2001). "Regularized Radial Basis Function Networks: Theory and Applications". John Wiley. <http://en.wikipedia.org/w>
12. Internet Sources ,<https://www.webteb.com> .
13. Internet Sources ,<https://www.ibtesamah.com> .

## Appendix Questionnaire

The questionnaire in your hands is a part of the requirement for the research entitled for the health statistical study on (The Early diagnosis of Breast Cancer and the Most Important Factors that Leads to Developing Breast Cancer)

Please place (√) in the suitable place.

	Yes	No
1. Age older than 40 years old	1	0
2. Is there a previous condition of preeclampsia	1	0
3. Are there problems with blood vessels and high levels of fat	1	0
4. Is it the first pregnancy	1	0
5. Do you get pregnant with twins or more	1	0
6. Do you suffer from polycystic ovaries	1	0
7. Do follow a nutritious diet	1	0
8. Is there a dysfunction in the placenta	1	0
9. Do you exercise during pregnancy	1	0
10. Do you suffer from kidney disease	1	0
11. Is there a long period of time between the current pregnancy and the previous one	1	0
12. Do you have family member with the disease (hereditary)	1	0
13. Is there deficiency in blood supply for the baby	1	0
14. Is there deficiency in vitamins E and C and Magnesium for the mother	1	0
15. Do you suffer from high blood pressure prior to pregnancy	1	0
16. Do you have a weakened immune system	1	0
17. Do you suffer from overweight	1	0
18. Is there environmental pollution	1	0

## دراسة مقارنة للكشف المبكر عن اهم العوامل المؤدية للإصابة بمرض تسمم الحمل للمرأة

مصطفى محمد صبحي فاضل

وزارة التربية، بغداد، العراق

[mustafa.fadhel.1986@gmail.com](mailto:mustafa.fadhel.1986@gmail.com)

أسيل مبدر داوود المرسومي

الجامعة التقنية الوسطى / معهد إدارة رصافة، بغداد، العراق

[Almarsoumy66@yahoo.com](mailto:Almarsoumy66@yahoo.com)

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### المستخلص:

يهدف البحث إلى معرفة أهم العوامل الرئيسية والمهمة المؤدية للإصابة بمرض تسمم الحمل ووضع الحلول المناسبة لمكافحة هذه العوامل والعمل على تجنبها للوقاية من الإصابة بالمرض. ولتحقيق هدف البحث تم استخدام عينة حجمها (40) اربعون مريضة من دائرة مدينة الطب - مستشفى التمريض التعليمي حيث تم الاعتماد على الإستبانة لجمع البيانات وتكونت من (17) سبعة عشر سبب ليتم تفصيلها. وتم استخدام الحزمة الأحصائية (SPSS) للمقارنة بين نتائج تحليل البيانات بطريقتي (شبكة دالة القاعدة الشعاعية) و (التحليل العائلي) وقد تم إستحصال نتائج مهمة هي ان الطريقتين حددت نفس العوامل التي كانت سبباً مباشراً تسبب الإصابة بالمرض. ولكن الطريقة الاولى في التحليل كانت اكثر تحديداً ودقة في تشخيص هذه العوامل وفي الحالتين كان التركيز على العوامل (اتباع نظام غذائي جيد ومغذٍ ، وخلل في المشيمة ، وتعاني من ارتفاع ضغط الدم قبل الحمل) لها تأثير كبير على الاستعداد للإصابة بمرض تسمم الحمل.

**المصطلحات الرئيسية للبحث:-** التحليل العائلي، شبكة دالة القاعدة الشعاعية، دالة كاوس، تسمم الحمل.