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BUILDING A MULTIPLE LOGISTIC REGRESSION MODEL TO IDENTIFY FACTORS INFLUENCING AUTISM PATIENTS IN DHI QAR GOVERNORATE

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Abstract:
The most commonly used statistical method in the field of categorical data analysis is logistic regression, which can be used as a linear model in the field of data classification without assuming the conditions for the distribution of independent variables. The meaning and importance of the description lies in the relationship between the dependent variable and the explanatory variable, and this study focuses on the multi-responsive logistic regression model and the process of formulating the probability of the logistic regression model after estimating its coefficients. The method of maximum probability, when the dependent variable follows the Bernoulli distribution, is the probability of taking the value 1 is p, and the probability of taking the value (0) is 1-p, called binary logistic regression, i.e. response and non-response, in our research was used a multi-responsive logistic regression model, used for dependent variables is nominal and consists of more than two levels, where the basic concepts of binary and multiple logistic regression were touched upon and touched on the most important methods of estimation its features and touched on the methods of testing the model.

Keywords:

INTRODUCTION

Models of logistic regression have witnessed interest by researchers in many years as it is widely used in life experiments, which is one of the main interests of the countries of the world because of its relationship to human life and development by finding the appropriate method to provide the best services in the fields of pharmaceuticals, vaccines, vitamins, pesticides, hormones and others.

Logistic regression is one of the important statistical methods that are concerned with the analysis of classified data, especially in the case of the response variable, which returns variables of the nominal or numerical type and consisting of two classifications or more and that the goal of using logistic regression, which is the dragon, is the presence of a certain characteristic or phenomenon depending on the values of a variable or a set of other independent variables that have to do with the dependent variable and divides the analysis regression in this method into two types, the first is the binary regression model is when the variable is The dependent is descriptive and divided into two categories, and this type is characterized by the fact that independent variables can be descriptive or quantitative variables, while the other type, which is the multiple logistic regression model, which is an extension of the binary logistic regression model when the dependent variable falls into more than two categories, while the analysis of logistic regression is one of the important statistical methods that are concerned with the analysis of classified data, especially in the case of the response variable that returns to variables of the nominal or hierarchical type consisting of two levels (two classifications) and more if The main objective of multiple logistic regression analysis is to find the best reconciliation of a model by describing the relationship between the response variable (dependent) and the same (independent) explanatory variable or for several explanatory variables (independent) and the method of logistic regression analysis does not impede any conditions related to the distribution of explanatory variables as this method is relatively more immune than linear discriminatory analysis and is flexible and simple and gives a clear explanation and has significance and meaning to describe the relationship between the response variable and the illustrative variables and divides logistic regression models into

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Two types are the first is the two-response logistic regression model and this model is used in the case of a response variable consisting of only two levels (two classifications) and the second is a multi-response logistic regression model and is used in the case of a response variable of three levels or more and the second model will be focused on in this study.

STUDY PROBLEM:-

Statistics is one of the important means in scientific research through the use of its rules and laws and a method in collecting data and information necessary for scientific research and analyzing these data and information in order to reach the results that the aim of research is to use the statistical method in scientific research on the phenomenon and study it in that research, develop future plans by predicting the results and reach the most important factors affecting the dependent variable.

RESEARCH OBJECTIVE:-

Specific research objectives (including ideal, general, specific, and practical goals):

This study was conducted with the aim of identifying the most important factors influencing the development of autism and providing a brief introduction to what is known about the nature of the disease in general and the influencing factors or psychological state of the patient in particular through

1- Identify the most important factors that affect the development of autism.
2- Find the effect of each of these factors through the use of a multiple logistic regression model.
3- The ability of the specific influencing factors on the level of autism and their ranking in terms of preference in the model.
4- Determine the probability ratio between the factors influencing the detection of their impact and identify how they are interpreted in the estimated multiple logistic regression model.

LOGISTIC REGRESSION CONCEPT

Logistic regression is a statistical model belonging to linear regression models that enables the modeling of a bilimit variable in terms of a set of expected random variables, whether numerical or categorical. Logistic regression is used to predict the probability of an event with additional knowledge of the values of variables that could be explained or related to that event[(2005)Sanford, W.] . Logistic regression uses several predictable variables that can be numerical or categorical. Logistic regression is also known by the designations of the Logit model or the general classification of entropy. This modeling is widely used in many scientific and commercial applications and is one of the most applied modeling methods in the field of machine learning, where it is classified as an observer machine learning method [(2012)Shim, J. Y.] .

The importance of logistic regression, when compared to other statistical methods (linear regression and discriminatory analysis), lies in the fact that logistic regression is a more powerful tool because it provides a test of the morality of coefficients, and it also gives the researcher an idea of how much the independent variable affects the dependent variable of the value (Izzi (2017)].

In addition, logistic regression arranges the effect of independent variables, allowing the researcher to conclude that one variable is stronger than the other variable in understanding the appearance of the desired result, and the analysis of logistic regression can include qualitative independent variables as well as the effect of the interaction between independent variables in the dependent variable of dual value, and one of the advantages of using logistic regression is that it is less sensitive to deviations from the normal distribution of study variables, comparing other statistical methods such as analysis. Discriminatory and linear regression, logistic regression can also transcend many of the limiting assumptions of using the Least Squares (OLS) method of linear regression, which ultimately makes logistic regression analysis the best method in the case of the binary logistic regression variable [Metwally (2013)].

What we use in our research is the Multinomial Logistic used in the case of a multivalued dependent variable (more than two values) and there is also a third type of logistic regression called ordinal logistic regression which is used in cases where the dependent variable is a hierarchical variable as we use the three-value dependent variable (1,2,3) and not other forms of coding [(2018) Suliyanto] .

We also find that there are several definitions of the logistic regression model, including:

The logistic regression model can be defined as the statistical method used to examine the relationship between the dependent variable and one or more independent variables, i.e. it is the third dependent of the levels and the variable of one or more independent variables of any kind and is called here the analysis of multiple logistic regression (Multinomial Logistic) [Al-Nuaimi (2018)].

It can be expressed in the following format:

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$$P_i = \frac{e^{\beta_0 + \sum_{j=1}^{k} \beta_j X_{ij}}}{1 + e^{\beta_0 + \sum_{j=1}^{k} \beta_j X_{ij}}} \dots\dots\dots\dots\dots\dots(1)$$

$$q_i = 1 - P_i = \frac{1}{1 + e^{\beta_0 + \sum_{j=1}^{k} \beta_j X_{ij}}} \dots\dots\dots\dots\dots\dots(2)$$

where

$\beta_0, \beta_1, \dots\dots, \beta_k$ Unknown landmarks are estimated.

X_{ij} Independent variables (explanatory variables).

$i = 1, \dots\dots$, m, (m) totals of views.

$j = 1, \dots\dots, k$, (k) the number of independent variables.

Multiple Logistic Regression Analysis

Logistic regression analysis is used in epidemiological and medical studies through which quantitative and qualitative independent variables that affect the probability of occurrence of the resulting variable are determined when the logistic regression is applied, the result variable must be more than two categories **[Shihab (2017)].**

In recent years, the applications of some modern statistical models in the analysis of categorical data, especially in the fields of medical, social, agricultural and other research, and that regression analysis is one of those statistical methods that are used to describe the relationship between two or more variables, that regression proliferation is divided into two types, the first type is known as linear regression models and the second type is called nonlinear regression regression and as it is known that many natural phenomena when studying their behavior we find them behaving non-linear behavior and to analyze those phenomena Nonlinear models are used to describe and analyze these phenomena and in fact because of the difficulty of using these models linear regression models are often used for this purpose and that for the treatment of logistic regression is one of these statistical models that are used to describe and analyze these phenomena [(2011)Tomas,M.] .

The importance of using logistic analysis has increased day by day because it is concerned with the analysis of data with a three-level response, in which there is usually a three-level dependent variable, in the case of the first type of disease, the response variable takes the value (1), in the case of the second type of disease it takes the value (2), and in the case of the third type of disease takes the value (3) and uses a logistic model to describe the relationship between the response variable (Y) and independent variables (explanatory) (X) [valid) 2011)[.

Hypotheses of the Multiple Logistic Regression Model [Barricade (2013)] :-

1. The dependent variable is one or more binary descriptive variables and the conditional average of this variable (E(x) is a variable limited by period (1,3), while independent variables can be quantitative (continuous or interrupted) or descriptive (binary or multiple) and it is assumed that independent variables are measured without errors.

2. The relationship between the dependent variable and the independent variables is a non-linear function relationship

3 - The error limit follows the two-border distribution with the expectation of zero and variance (p(x)(1-p(X)

1- There is no self-correlation between the limits of random errors in EN (e_i, e_j)E

2- There is no correlation between the random error limit and the independent variables to (e_i , x_j)E

3- There is no linear duplication between independent variables as related variables should be omitted.

Appreciation. Model parameters. Multiple logistic regression. Response:-

will The parameters of the logistic regression model are estimated Multi-response in the way of the Emwas The Greatest [(1944)Berkson,J.] , which can be described as follows:

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The probability density function of a finite multiple distribution is

$$P_r(Y_{i1} = y_{i1}, \dots\dots\dots, Y_{ij} = y_{ij}) = \left\{ \begin{matrix} n_i \\ y_{ij}, \dots\dots, y_{ij} \end{matrix} \right\} \pi_{y_{i1}}^{y_{i1}}, \dots, \pi_{y_{ij}}^{y_{ij}} \quad \dots (6)$$ 3

Whereas:

$\pi_{y_{i1}}^{y_{i1}}, \dots\dots\dots., \pi_{y_{ij}}^{y_{ij}}$ *Represents the percentage of response totals in the community.*

$$L(\beta) = \prod_{i=1}^{n} \prod_{j=1}^{J} [\, \pi_j(x)]^{y_{ij}}$$

By taking the logarithm for the possible function we get:

$$Ln\ L(\beta) \sum_i \sum_j Log\ \pi_j(x) \quad \dots\dots\dots (7)$$ 4

In compensation for: $\pi_j(x)$

$$= \sum_i \sum_j y_{ij}\ (\alpha_i + \beta_j' x\ ) - \sum_i \sum_j y_{ij}\ Log\ (1 + \sum_{i=1}^{j} e^{\alpha_i + \beta_j' x})$$

$$Ln\ L(\beta) \sum_i \sum_j y_{ij}\ Log\ \frac{e^{\alpha_i + \beta_j' x}}{(1 + \sum_1^j e^{\alpha_i + \beta_j' x})} \quad \dots\dots\dots (8)$$ 5

And by deriving a function of greater *possibility for the vector of the parameters* (β)

$$\frac{\partial LnL(\beta)}{\partial(\beta)} = \frac{\sum_i \sum_j y_{ij}\ (\alpha_i + \beta_j' x\ )}{\partial(\beta)} - \frac{\sum_i \sum_j y_{ij}\ Log\ (1 + \sum_{i=1}^{j} e^{\alpha_i + \beta_j' x})}{\partial(\beta)} \quad \dots (9)$$ 6

And when the $\left(\frac{\partial LnL(\beta)}{\partial(\beta)} = 0 \right)$ *derived is equal to zero, we get the natural equations and that*

The roots of these equations represent the values of the estimating parameters resulting from the maximization process and because the equations are non-linear, we resort to the use of one of the methods of repetition (Newton Rafson) which produces appropriate estimates [(2017)Bertsimas, D.] *, according to the following formula:*

$$\beta(t+1) = \beta(t) + \{\, X' v(t) X\}^{-1}\, X' r(t) \quad \dots\dots\dots (10)$$ 7

Whereas:-

T : The number of successive cycles.

R : Residual vector with dimension $[N(g-1),]1$

V: It is and that each is a square matrix written as follows:$(\ v_1 \dots\dots v_n) v_i$

$$v_i = n_i \{\, P_s(X_i) \big(\delta_{si} - P_i(X_i)\big) \} S_i$$

And that is Delta Kronker and knows the following:-δ_{si}

$$\delta_{si} = \begin{bmatrix} 1 & S = t \\ 0 & S \neq t \end{bmatrix}$$

It can start from elementary values by equating features with zero, and in the binary case the graph or the method of ordinary least squares can be used or the estimates of the linear differentiation function can be used as elementary values in estimating features since their use will reduce at successive cycles, and when obtaining the required convergence between cycles, these estimates are the question and required.

Properties of M.L.E. -

For the greatest possible properties [(2005)Fox.J], the following:

- Estimates of the greatest possibility are consistent.
- The probability distribution of the greatest potential is due to the normal distribution when the sample size is large.
- If (T) is sufficient estimator for z(θ) (where θ is the probability distribution parameter f (x; θ)) The equation of the greatest possibility is a function of the statistic T.
- The appreciation of the greatest possibility does not necessarily have to be an unbiased estimate.
- If there is a T is an efficient estimator for z (θ) then for θ is the distribution parameter f (x; θ), the method of greatest possibility produces T.

Characteristics of the logistic regression model [(1995)Wand, M.P.].

1- This model does not place any preconditions on explanatory variables.

2. The model does not specify which vectors the new observations belong to, but it also determines the probability of this affiliation, and can be used to analyze the binary and multiple descriptive dependent variable.

3- The Great Possibility (ML) method is used to estimate its features and thus the availability of quality conditions in these variables

4- Ease of calculations used in the form format.

With these characteristics, logistic regression becomes one of the most appropriate models for the analysis of

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the binary and multiple descriptive dependent variable [(2005)Greiner A.] .

What distinguishes logistic regression from linear regression:

Logistic regression must meet the following assumptions:

1 The existence of a linear relationship between explanatory variables and the deliberate variable

2- The distribution of variables should be a natural distribution

3 - Achieve the property of stability of contrast (homogeneity of contrasts)

Either linear regression must meet the following conditions [(2013) Griggs, W.] :-

1- The relationship should be linear between the independent variables and the dependent variable

2- The variances should be naturally distributed to the independent variables and the dependent variable

3 Dependent variable values must be at least of the ordinal level

Multi-collinearity Problem Test

The problem of linear multiplicity appears when there is a linear relationship between some or all of the explanatory variables and that the correlations between these variables are known as linear multiplicity The most important of these tests [(2012)Hansen, B,E.] , it is:-

1- Variance Inflation Factors (VIF)

In 1967, the researchers Farrar & Glauber proposed a scale to detect the existence of the problem of linear multiplicity, which the researcher (Marquardt) called (1970) the measure of the factor of inflation of variance.

Variance Inflation Factors(VIF)Its mathematical formula [(2010)Irizarry,R.A.], as follows:

$$\mathrm{VIF} = \frac{1}{1-\mathrm{R}_j^2} \quad ,j = 0,1,2,\dots,k \qquad \dots\dots\dots(28)$$

Whereas:

R j ²: Coefficient of determination for the regression of the explanatory variable X_j over the rest of the explanatory variables in the model () whose value ranges between .$j = 0,1,2,\dots,k\left(0 \le R_j^2 \le 1\right)$

Neter et al. (1996) believe that linear multiplicity is only severe when either $VIF > 10$Rogerson (2001) recommends that a value greater than 5 or a value greater than $VIF4$ is what we find in Pan and Jackson (2008).

2. Condition Index (CI)

The conditional guide (CI) is used to diagnose linear polygamy based on the characteristic roots (eigen values) (which show the amount of total variations between variables, the characteristic roots when they are equal to zero indicates the presence of perfect multiconllinearity), but if the characteristic roots are close to zero it indicates the presence of high linear polyicity, and if they are equal to (1)) This is the ideal case in the absence of linear polygamy. [(2008)Jeffrey S. R.], and the mathematical formula of the conditional guide (CI) is written as follows:

$$CI = \sqrt{\frac{Maximum\ eigenvalue}{Minimum\ eigenvalue}} = \sqrt{k} \qquad \dots\dots\dots(29)$$

Where k represents the conditional number, which is also an indicator for detecting the problem of linear polygamy and its mathematical formula is as follows:

$$k = \frac{Maximum\ eigenvalue}{Minimum\ eigenvalue} \qquad \dots\dots\dots(30)$$

If the value of k is between 100 and 1000, this indicates the existence of a moderate to strong linear multiplicity problem, while if the value of k exceeds 1000, there is a severe linear multiplicity problem.

As for the CI conditional guide, if its value is between 10 and 30, this indicates the existence of a moderate to strong linear multiplicity problem, while if its value exceeds 30, there is a severe linear multiplicity problem.

Practical aspect

Boot

The subject of the study has been devoted to the research of the use of statistical methods in health aspects to contribute to increasing knowledge of statistical methods and their applications to identify the pattern of influence of many factors and we will focus our attention on autism as one of the health problems in the world.

For the purpose of achieving the above goal and based on the theoretical study data and the data available in health institutions, this chapter includes an applied study of the logistic regression model represented by autism, where the dependent variable represented (the severity of the injury was taken in terms of the type of injury) and the factors influencing this disease, as well as tests related to the model and estimating its parameters, and extracting results and statistical indicators using the program (SPSS.V.28).

Description of data

The data for the research was collected from the Nasiriyah Model Center for Autism, Imam Hussein Center for the Treatment of Autism Children in Dhi Qar Governorate / Iraq through the examinations of autism diseases for each patient, and a group of doctors specialized in the disease was used to classify the most important factors affecting the disease, as a sample size (203) patients were taken from (Nasiriyah Model Center for Autism, Imam Hussein Center) from the year 1/1/2010 to 1/7/2022

They are:-

Y: - The type ofinjury where it takes three ranks (Rett syndrome 1), (Canner syndrome 2) and (Asperger's syndrome 3) which represents the dependent variable.

- Rett syndrome

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Ret autism affects females only according to recent medical results and research, and the observation of this type of autism begins with the eighth month where the growth of the circumference of the baby's head stops and may even be smaller than normal, and the condition begins to lose control of limbs such as hands and legs and move them vaguely.

- Canner syndrome

Kaneer autism or classical autism is one of the types of autism and is developed by many children and is characterized by constant and clear symptoms starting from the age of two months, namely distraction, speech delay, lack of response to feelings and social interaction around them.

- Asperger's syndrome

Asperger's most famous stage of autism is characterized by a large percentage of autistic children around the world, and the children of this syndrome are somewhat distinct from other types, as they do not suffer from poor mental and linguistic abilities but their main problem is poor communication and social interaction with others, they do not have a desire to socialize, and do not succeed in mixing with friends or in establishing any social relationship.

:X_1- Sex of the patient (male = 1) and (female = 2).

The sex factor is important in knowing the percentage of injuries that occur.

:- Child's age rank (1) (from 2 months to 4 years), rank (2) (from $X_2$5-8 years), rank (3) (from 9-12 years).

The age of the child is important in determining the incidence rate and knowing which age is most affected by autism.

:- Having brain tumors $X_3$of rank (1) (not infected), rank (2) (benign tumors), rank (3) (malignant tumors).

The growth of tumors in the brain, whether benign or malignant, causes autism according to research and medical studies reached by some doctors

:- Genetic factors rank (1) (hereditaryX_4), rank (2) (non-hereditary).

There may be some genetic genes that may cause a defect in the development of the fetal nervous system leading to autism.

Grade (1) (X_5safe feeding), rank (2) (unsafe lactation).

Not only does it protect your baby during pregnancy, but it extends until the lactation period, so be careful not to take drugs that cause a defect in the chemistry of the body's genes and nervous system, as they may be the cause of this disease.

:X_6- Exposure to environmental toxins rank (1) (radiation), grade (2) (pesticides), grade (3) (minerals).

Environmental pollution is a major and pivotal cause of many diseases of the age, including autism, where direct exposure to radiation and to pesticides and dangerous metals such as radiation, lead and mercury is now widespread.

:X_7- Biological causes

The biological causes are disorders and abnormalities that may occur in the genes of the fetus during pregnancy, which causes this child to develop autism, such as any problem or malfunction in the growth and development of the brain and nervous system.

:X_8- Unsafe gestation Period Rank (1) (infected with German measles), Rank (2) (with fragile chromosome syndrome), Rank (3) (Humpback sclerosis).

- Measles: In many countries, rubella is rare or non-existent. However, because the vaccine is not used everywhere, the virus still causes serious problems for babies whose mothers became infected during pregnancy.
- Fragile X syndrome is an inherited syndrome that leads to mental dysfunction.
- Tuberous sclerosis that leads to the formation and development of tumors in the brain.

:- X_9Age of the parents at the child's upbringing rank (1) (from 15-25 years), rank (2) (from 26-35 years), rank (3) (over 35 years).

Researchers tend to believe that parenting at a later age may increase the likelihood of autism. Very comprehensive research has shown that children born to men over the age of forty are 6 times more likely to develop autonomy than children born to parents under the age of thirty and the research shows that the age of the mother has a marginal effect on the likelihood of developing autism.

Statistical analysis

This data for research is analyzed through the statistical program (SPSS.V.28,) to know the importance of variables and their impact on autism through the following tables:

Type of Injury :-

Table (1): Distribution of the sample by type of injury

Type of injury	Iteration	Percentage relativity
Rett syndrome	64	31.5%
Canner syndrome	58	28.6%
Asperger's syndrome	81	39.9%
Total	203	100%

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Where it is shown from the above table that the percentage of people with Rett syndrome (which is considered the least severe injury and affects females mostly) where their number reached (64) infected and a percentage (31.5%) and the percentage of people with Canner syndrome (which is considered the injury is moderate and the incidence of males and females) where their number reached (58) by a percentage (28.6%) and reached the highest incidence of Asperger's syndrome (and is considered the strongest injury to the patient, that is, he suffers from strong autism) where their number reached (81) by a percentage (39.9%).

Table of Descriptive Statistics (2)

		N	Marginal Percentage
Type of injury	Rett syndrome	64	31.5%
	Canner syndrome	58	28.6%
	Asperger's syndrome	81	39.9%
Sex	male	119	58.6%
	female	84	41.4%
Age of the child	2 months-4years	85	41.9%
	5-8years old	84	41.4%
	9-12 years old	34	16.7%
Brain tumors	Not infected	65	32.0%
	benign tumors	62	30.5%
	Malignant tumors	76	37.4%
Genetic factors	Legacy	105	51.7%
	Non-hereditary	98	48.3%
Lactation	Safe breastfeeding	96	47.3%
	Unsafe breastfeeding	107	52.7%
Exposure to environmental toxins	Radiation	66	32.5%
	exterminators	61	30.0%
	minerals	76	37.4%
Unsafe pregnancy period	He has German measles.	55	27.1%
	She has fragile chromosomal syndrome	65	32.0%
	Tuberous sclerosis	83	40.9%
Age of parents at the child's upbringing	15-25 years old	52	25.6%
	26-35 years old	53	26.1%
	More than 35 years old	98	48.3%
Valid		203	100.0%
Missing		0	
Total		203	
Subpopulation		192[a]	

a. The dependent variable has only one value observed in 191 (99.5%) subpopulations.

Table No. (3) Testing the Significance of the Model

Model Fitting Information				
Model	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood	Chi-Square	Df	Sig.
Intercept Only	440.526			
Final	66.182	374.344	28	.000

It can be seen from the above table that the results of the test of the significance of the relationship between the dependent variable and the independent variables and based on statistical analysis The final value of the

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test Chi-Square has reached (374.344) and that (Sig) its probability value has reached (0.000) which is less than the level of significance (0.05) This means rejecting the null hypothesis that there are no significant differences between the model in terms of the fixed limit (without independent variables) and accepting the alternative hypothesis that states the significance of the model.

Table No. (4) Model Reconciliation

Goodness-of-Fit			
	Chi-Square	Df	Sig.
Pearson	198.638	354	1.000
Deviance	64.796	354	1.000

It is clear from the results in the table above the test (Pearson) that the results of the non-parametric test of the quality of matching the model based on the statistic of (Chi-Square) between the viewing values and the expected values if the distribution of Chi-Square to detect deviations of the logistic regression model as we note through table (11) that the probability value (Sig.) has reached (1) the value of (Chi-Square)) of (198.638) which is greater than the level of significance (0.05) if we accept the null hypothesis H 0 and reject the alternative hypothesis H 1 and this confirms the quality of the reconciliation of the model as well as the test (Deviance) where it reached (64.796) and that the probability value (Sig.) has reached (1) its own and is greater than the level of significance (0.05) if we accept the hypothesis of non-H_0 and reject the alternative hypothesis H_1 This confirms that the data fits the model

Table No. (5) Test Similar to the Determination Coefficient Test

Pseudo R-Square	
Cox and Snell	.842
Nagelkerke	.949
McFadden	.847

From the above table, it is clear that the results of Pseudo R-Square, which is similar to the test of the coefficient of determination R^2, where the value of (Cox and Snell) has reached (0). 842) Shows the extent to which independent variables are affected by the dependent variable where (84.2%) of the phenomenon was explained and the remaining percentage is due to other factors that did not enter the model as well as the value of (Nagelkerke) (0.949) and that this value the larger and close to the one indicates the strength of the test analysis of the logistics model as the larger the sample size, the greater the test strength of the model.

Table No. (6) Results of the Possibility Ratio Test

Likelihood Ratio Tests				
Effect	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood of Reduced Model	Chi-Square	Df	Sig.
Intercept	66.182[a]	.000	0	.
Biological causes	74.528	8.346	2	.015
Sex	74.742	8.560	2	.014
Age of the child	76.062	9.880	4	.043
Having brain tumors	95.661	29.479	4	.000
Genetic factor	72.678	6.496	2	.039
Lactation	74.586	8.404	2	.015
Exposure to environmental toxins	113.534	47.352	4	.000
Unsafe pregnancy	87.612	21.430	4	.000
Age of parents at the time of childbirth	85.646	19.464	4	.001

It is clear from the above table that the probability value (Sig) of the Chi-Square test is significant for all study variables because it is below the level of significance (0.05), that is, all variables are important in the model.

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Test the problem of linear multiplicity

Table No. (7) Variance Inflation Coefficient (VIF)

Variables	VIF
X_1	1.548
X_2	1.041
X_3	2.444
X_4	1.568
X_5	1.032
X_6	3.314
X_7	1.021
X_8	3.254
X_9	3.746

The above table shows that there is no multicollinearity. Table 14 shows that there is no such problem using the variance inflation factor, as all the values of the VIF coefficient for independent variables are less than 4.

Estimating the parameters of the multiple logistic regression model

The parameters of multiple logistic regression were estimated according to the method of greatest possibility and the following table summarizes the parameters of the optimal model and the table includes all the parameters of the estimated model and the standard error of each parameter and the statistics of the test (Wald) for each of the parameters of the model and the number of degrees of freedom and significance of the parameters.

Table No. (8) Estimating the parameters of the Parameter Estimates

Noon injury [a]		*B*	*Std. Error*	*Wald*	*Df*	*Sig*	*Exp(B)*	*95% Confidence Interval for Exp(B)*	
								Lower Bound	Upper Bound
Canner syndrome	Intercept	-1.849-	3.051	.367	1	.544			
	Biological causes	.178	.114	2.438	1	.118	1.195	.955	1.495
	Gender = 1	1.725	1.429	1.458	1	.227	5.615	.341	92.416
	Gender = 2	0[b]	.	.	0	.	.	.	.
	Child age=1	1.426	1.257	1.286	1	.257	4.162	.354	48.922
	Child age=2	1.800	1.647	1.194	1	.275	6.051	.240	152.778
	Child age=3	0[b]	.	.	0	.	.	.	.
	Brain tumors=1	-.795-	1.590	.250	1	.617	.452	.020	10.195
	Brain tumors=2	2.756	1.735	2.524	1	.112	15.737	.525	471.461
	Brain tumors=3	0[b]	.	.	0	.	.	.	.
	Genetic factor = 1	.159	1.132	.020	1	.889	1.172	.127	10.781

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	Genetic factor = 2	0^b	.	.	0	.	.	.	.
	Lactation = 1	-2.061-	1.346	2.343	1	.126	.127	.009	1.782
	Lactation = 2	0^b	.	.	0	.	.	.	.
	Exposure to environmental toxins=1	-6.789-	2.302	8.699	1	.003	.001	1.237E-5	.103
	Exposure to environmental toxins=2	-2.192-	1.851	1.402	1	.236	.112	.003	4.204
	Exposure to environmental toxins=3	0^b	.	.	0	.	.	.	.
	Unsafe pregnancy=1	4.997	2.160	5.353	1	.021	148.018	2.147	10205.609
	Unsafe gestation = 2	2.727	1.430	3.635	1	.057	15.284	.926	252.154
	Unsafe pregnancy=3	0^b	.	.	0	.	.	.	.
	Parental age when the child grew up = 1	-23.642-	.000	.	1	.	5.401E-11	5.401E-11	5.401E-11
	Parental age at the child's upbringing = 2	.852	1.111	.588	1	.443	2.344	.266	20.689
	Parental age when the child grew up = 3	0^b	.	.	0	.	.	.	.
Asperger's syndrome	Intercept	12.688	4.371	8.427	1	.004			
	Biological causes	-.132-	.119	1.226	1	.268	.877	.694	1.107
	Gender = 1	4.070	1.725	5.565	1	.018	58.567	1.990	1723.234
	Gender = 2	0^b	.	.	0	.	.	.	.
	Child age=1	-1.552-	1.758	.779	1	.377	.212	.007	6.645
	Child age=2	3.786	1.887	4.027	1	.045	44.095	1.092	1780.546
	Child age=3	0^b	.	.	0	.	.	.	.
	Brain tumors=1	-7.484-	2.527	8.773	1	.003	.001	3.969E-6	.080
	Brain tumors=2	-3.369-	1.740	3.747	1	.053	.034	.001	1.043
	Brain tumors=3	0^b	.	.	0	.	.	.	.
	Genetic factor = 1	-2.385-	1.289	3.423	1	.064	.092	.007	1.152
	Genetic factor = 2	0^b	.	.	0	.	.	.	.
	Lactation = 1	-4.193-	1.734	5.847	1	.016	.015	.001	.452
	Lactation = 2	0^b	.	.	0	.	.	.	.
	Exposure to environmental	-10.471-	2.910	12.943	1	.000	2.835E-5	9.444E-8	.009

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	toxins=1								
	Exposure to environmental toxins=2	-8.865-	2.746	10.425	1	.001	.000	6.501E-7	.031
	Exposure to environmental toxins=3	0^b	.	.	0	.	.	.	.
	Unsafe pregnancy=1	-6.127-	2.894	4.482	1	.034	.002	7.506E-6	.635
	Unsafe gestation = 2	-.230-	1.492	.024	1	.877	.794	.043	14.782
	Unsafe pregnancy=3	0^b	.	.	0	.	.	.	.
	Parental age when the child grew up = 1	3.282	2.730	1.445	1	.229	26.629	.126	5614.222
	Parental age at the child's upbringing = 2	-2.160-	1.407	2.359	1	.125	.115	.007	1.816
	Parental age when the child grew up = 3	0^b	.	.	0	.	.	.	.
	a. The reference category is:Rett syndrome. b. This parameter is set to zero because it is redundant.								

One increase in the rate of biological causes leads to an increase in the ratio of (0.178) of the likelihood of developing Canner syndrome versus Rett syndrome and that the incidence of autism of the type of Canner syndrome versus the incidence of Rett syndrome increases by (1.725) if the sex moves rank (2) which is females to the rank (1) which is males and that the relative risk coefficient (Exp(B) if the sex moves from rank (2) which is female to rank (1) which is male, the risk ratio is high (5.615) and the value of (Sig) for the Wald test of (0.277) is insignificant when compared to the significance level (0.05).

The inclination of autism of the type of Canner syndrome versus Rett syndrome increases by (1.426) if the age of the child moves rank (3) which is the age group (from 9-12 years) to rank (1) which is the age group (from 2 months to 4 years) and that the relative risk coefficient (Exp(B) if the age of the child moves from rank (3) to rank (1), the risk ratio is high (4.162) and the value of (Sig) for the test (Wald) of (0.257) is not significant when compared to the level of significance (0.05).

The incidence of autism of the type of Canner syndrome versus Rett syndrome increases by (1.800) if the age of the child moves from rank (3) which is the age group (from 9-12 years) to rank (2) which is the age group (from 5-8 years) and the relative risk coefficient (Exp(B) If the age of the child moves from rank (3) to rank (2), the risk ratio is high (6.051) and the value of (Sig) for the (Wald) test of (0.275) is not significant when compared to the level of significance (0.05).

The incidence of autism of the type of Canner syndrome versus Rett syndrome decreases by (-0.795) if the incidence of brain tumors moves rank (3) which is the category (malignant tumors) to the rank (1) which is the category (uninfected) and that the relative risk coefficient (Exp(B) if the incidence of brain tumors moves from rank (3) to grade (1), the risk ratio is low (0.452) and the value of (Sig) for the (Wald) test of (0.617) is not significant when compared to the level of significance (0.05)

The incidence of autism of the type of Canner syndrome versus Rett syndrome increases by (2.756) if the incidence of parasitic tumors moves from rank (3) which is the category (malignant tumors) to the rank (2) which is the category (benign tumors) and the relative risk coefficient (Exp(B) if the incidence of brain tumors moves from rank (3) to class (2), the risk ratio is very high (15.737) and the value of (Sig) for the (Wald) test of (0.112) is not significant when compared to the level of significance (0.05).

The inclination of canner syndrome autism versus Rett syndrome increases by (0.159) if the genetic factor moves rank (2) which is non-hereditary to the rank (1) which is hereditary and that the relative risk coefficient (Exp(B) if the genetic factor moves from rank (2) to rank (1) the risk ratio is high (1.172) and the value of (Sig) for the (Wald) test of (0.889) is not significant when compared to the level of significance (0.05).

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The inclination of autism of the type of Canner syndrome versus Rett syndrome decreases by (-2.192) if the lactation moves rank (2) which is unsafe lactation to the rank (1) which is safe lactation, and the relative risk coefficient (Exp(B) if lactation moves from grade (2) to class (1), the risk ratio is medium (0.127) and the value of (Sig) for the (Wald) test of (0.126) is not significant when compared to the level of significance (0.05).

The incidence of autism of the type of Canner syndrome versus Rett syndrome decreases by (-6.789) if exposure to environmental toxins moves to rank (3), which is the category (minerals) to the rank (1), which is the category (radiation), and the relative risk coefficient (Exp(B) if the incidence of brain tumors moves from grade (3) to class (1), the risk ratio is very low (0.001) and the value of (Sig) for the (Wald) test of (0.003) is significant when compared to the level of significance (0.05).

The incidence of autism of the type of Canner syndrome versus Rett syndrome decreases by (-2.192) if exposure to environmental toxins moves from grade (3) which is the category (minerals) to class (2) which is the category (pesticides) and the relative risk coefficient (Exp(B) if the incidence of brain tumors moves from grade (3) to class (2), the risk ratio is medium (0.112) and the value of (Sig) for the (Wald) test of (0.236) is not significant when compared to the level of significance (0.05).

The predominance of Kanner syndrome autism versus Rett syndrome increases by (4.997) if the unsafe gestation period moves rank (3) which is the category (tuberous sclerosis) to rank (1) which is the category (infected with German measles) and the relative risk coefficient (Exp(B) if the pregnancy period moves unsafe from rank (3) to grade (1) the risk ratio is very high (148.018) and the value of (Sig) for the test (Wald)) of (0.021) is significant when compared to the level of significance (0.05).

The incidence of autism of the type of Canner syndrome versus Rett syndrome increases by (2.727) if the unsafe gestation period moves from rank (3) which is the category (tuberous sclerosis) to the rank (2) which is the category (with fragile chromosomal syndrome) and that the relative risk coefficient (Exp(B) if the pregnancy period moves unsafe from rank (3) to rank (2), the risk ratio is very high (15.284) and the value of (Sig) for the Wald test) of (0.057) is insignificant when compared to the level of significance (0.05).

The incidence of autism of the type of Canner syndrome versus Rett syndrome decreases by (-23.642) if the age of the parents at the birth of the child moves rank (3) which is the category (over 35 years) to the rank (1) which is the category (from 15-25 years) and the relative risk coefficient (Exp(B) if the age of the parents at the birth of the child moves from rank (3) to rank (1) then the risk ratio is very high (5.401) and the value of (Sig) for the Wald test) of (0) is significant when compared to the level of significance (0.05).

The incidence of autism of the type of Canner syndrome versus Rett syndrome increases by (0.852) if the age of the parents at the birth of the child moves from rank (3) which is the category (over 35 years) to the rank (2) which is the category (from 26 to 35 years) and that the relative risk factor (Exp(B) if the age of the parents at the birth of the child moves from rank (3) to rank (2) then the risk ratio is high (2.344) and the value of (Sig) for the Wald test) of (0.443) is insignificant when compared to the level of significance (0.05).

From Table No. (15) above on Canner syndrome, we note that the third safe variable, which represents the unsafe gestational period, has a greater impact on the injury process through the logistic regression model after that the fourth variable, which represents the incidence of brain tumors after that the third variable represents the age of the child after that the third variable represents the age of the child after that the second variable represents Sex after that Ninth variable represents the age of the parents when the child is raised After that the first variable represents biological causes After that the fifth variable represents the genetic factor after that the seventh variable represents exposure to environmental toxins and the last variable the first variable is lactation.

A single increase in the rate of biological causes leads to a decrease in the ratio of (-0.132) of the probability of developing Asperger's syndrome versus Rett syndrome, and that the probability of developing autism of the type of Asperger's syndrome versus the incidence of Rett syndrome increases by (4.070) if the sex moves rank (2) which is females to the rank (1) which is male, and that the relative risk coefficient (Exp(B) if the sex moves from rank (2) which is female to rank (1) which is male, the risk ratio is high (58.567) and that The value of the SIG of the Wald test of (0.018) is significant when compared to the level of significance (0.05).

The incidence of autism of Asperger's syndrome versus Rett syndrome decreases by (-1.552) if the child's age moves rank (3), which is the age group (from 9-12 years) to rank (1) which is the age group (from 2 months to 4 years), and the relative risk coefficient (Exp(B) if the age of the child moves from rank (3) to rank (1), the risk ratio is low (0.212) and the value of (Sig) for the (Wald) test of (0.377) is not significant when compared to the level of significance (0.05).

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The incidence of autism of the type of Asperger's syndrome versus Rett syndrome increases by (3.786) if the age of the child moves from rank (3) which is the age group (from 9-12 years) to rank (2) which is the age group (from 5-8 years) and the relative risk coefficient (Exp(B) If the age of the child moves from rank (3) to rank (2), the risk ratio is high (44.095) and the value of (Sig) for the test (Wald) of (0.045) is significant when compared to the level of significance (0.05).
The incidence of autism of Asperger's syndrome versus Rett syndrome decreases by (-7.484) if the incidence of brain tumors moves rank (3), which is the category (malignant tumors) to the rank (1) which is the category (uninfected), and the relative risk coefficient (Exp(B) if the incidence of brain tumors moves from grade (3) to grade (1), the risk ratio is low (0.001) and the value of (Sig) for the (Wald) test of (0.003) is significant when compared to the level of significance (0.05).
The predominance of autism of Asperger's syndrome versus Rett syndrome decreases by (-3.369) if the incidence of parasitic tumors moves from rank (3) which is the category (malignant tumors) to the rank (2) which is the category (benign tumors) and the relative risk coefficient (Exp(B) if the incidence of brain tumors moves from rank (3) to grade (2), the risk ratio is very low (0.034) and the value of (Sig) for the (Wald) test of (0.053) is not significant when compared to the level of significance (0.05).
The incidence of autism of Asperger's syndrome versus Rett syndrome decreases by -2.385 if the genetic factor moves rank (2) which is non-hereditary to the rank (1) which is hereditary, and the relative risk coefficient (Exp(B) if the genetic factor moves from rank (2) to rank (1), the risk ratio is very low (0.092) and the value of (Sig) for the Wald test of (0.064) is not significant when compared to the level of significance (0.05).
The incidence of autism of Asperger's syndrome versus Rett syndrome decreases by (-4.193) if the lactation moves rank (2) which is unsafe lactation to the rank (1) which is safe lactation and the relative risk coefficient (Exp(B) if lactation moves from grade (2) to class (1) the risk ratio is very low (0.015) and the value of (Sig) for the (Wald) test of (0.016) is significant when compared to the level of significance (0.05).
The incidence of autism of the type of Asperger's syndrome versus Rett syndrome decreases by (-10.471) if exposure to environmental toxins moves rank (3) which is the category (metals) to the class (1) which is the category (radiation) and the relative risk coefficient (Exp(B) if the incidence of brain tumors moves from grade (3) to class (1), the risk ratio is very high (2.835) and the value of (Sig) for the (Wald) test of (0.000) is significant when compared to the level of significance (0.05).
The incidence of autism of Asperger's syndrome versus Rett syndrome decreases by -8.865 if exposure to environmental toxins moves from grade (3) which is the category (minerals) to class (2) which is the category (pesticides) and the relative risk coefficient (Exp(B) if the incidence of brain tumors moves from rank (3) to class (2) where there is no risk ratio (0.000) and the value (Sig) of the (Wald) test of (0.001) is significant when compared to the level of significance (0.05).
The predominance of Asperger's syndrome versus Rett syndrome decreases by -6.127 if the unsafe gestation period moves from rank (3) which is the category (tuberous sclerosis) to rank (1) which is the category (infected with German measles) and the relative risk coefficient (Exp(B) if the pregnancy period moves unsafe from rank (3) to grade (1), the risk ratio is very low (0.002) and the value of (Sig) for the Wald test) of (0.034) is significant when compared to the level of significance (0.05).
The incidence of autism of Asperger's syndrome versus Rett syndrome decreases by -0.230 if the unsafe gestation period moves from rank (3) which is the category (tuberous sclerosis) to rank (2) which is the category (with fragile chromosome syndrome) and that the relative risk coefficient (Exp(B) if the pregnancy period moves unsafe from rank (3) to grade (2), the risk ratio is low (0.794) and the value of (Sig) for the Wald test) of (0.877) is insignificant when compared to the level of significance (0.05).
The incidence of autism of the type of Asperger's syndrome versus Rett syndrome increases by (3.282) if the age of the parents at the birth of the child moves rank (3) which is the category (over 35 years) to the rank (1) which is the category (from 15 to 25 years) and that the relative risk coefficient (Exp(B) if the age of the parents at the birth of the child moves from rank (3) to rank (1) the risk ratio is very high (26.629) and the value of (Sig) for the Wald test) of (0.229) is insignificant when compared to the level of significance (0.05).
The inclination of autism of the type of Asperger's syndrome versus Rett syndrome decreases by (-2.160) if the age of the parents at the birth of the child moves from rank (3) which is the category (over 35 years) to the rank (2) which is the category (from 26 to 35 years) and that the relative risk coefficient (Exp(B) if the age of the parents at the birth of the child moves from rank (3) to rank (2) then the risk ratio is low (0.115) and the value of (Sig) for the Wald test) of (0.125) is insignificant when compared to the significance level (0.05).

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From Table No. (15) above on Asperger's syndrome, we note that the second variable represents sex has a greater impact on the process of injury through the logistic regression model after that third variable represents the age of the child after that variable IX represents the age of the parents when the child grows up after that seventh variable represents exposure to environmental toxins after that fourth variable which represents Brain tumors after that the third variable is safe, which represents the period of pregnancy is unsafe, then the first variant that represents lactation, then the fifth variable represents the genetic factor and the last variable represents biological causes.

Table No. (9) Expected Values

Classification				
	Predicted			
Observed	Rett syndrome	Canner syndrome	Asperger's syndrome	Percent Correct
Rett syndrome	60	3	1	93.8%
Canner syndrome	0	55	3	94.8%
Asperger's syndrome	2	1	78	96.3%
Overall Percentage	30.5%	29.1%	40.4%	95.1%

The above table shows the field of the number of cases of Rett syndrome, where the number of cases that were predicted for Rett syndrome (60) cases took rank (1) and by a percentage (93.8%) and it is expected to be rank (1) which was correct and which was not predicted correctly and took the rank (2) of Canner syndrome with the number of (3) cases It was noted that it was supposed to be rank (1) but was expected (2) and rank (3) Asperger's syndrome with the number of (1) cases observed that it is supposed to be It was to be rank (1) but it was expected (3).
The above table also shows the field of the number of cases of Canner syndrome, where the number of cases that were predicted for Canner syndrome (55) cases took the rank (2) and by a percentage (94.8%) and it is expected to be the rank (2) which was correct and which was not predicted correctly and took the rank (3) Asperger's syndrome with the number of (3) cases It was noted that it was supposed to be the rank (2) but was expected (3).
It is also shown through the table above the field of the number of incidences of Asperger's syndrome, where the number of cases that were predicted for Rett syndrome (78) cases took rank (3) and by a percentage (96.3%) and it is expected to be rank (3) which was correct and which was not predicted correctly, so the rank (1) was taken with Rett syndrome by the number of (2) cases It was noted that it was supposed to be rank (3) but was expected (1) and rank (2) Canner syndrome with the number of (1) cases It was noted that from It was supposed to be rank (3) but it was expected (3).

CONCLUSIONS: -

1. It is clear from the results that the percentage of people with Rett syndrome (which is considered the least severe injury and affects females mostly) where their number reached (64) infected and a percentage (31.5%) and the percentage of people with Canner syndrome (which is considered the injury is moderate and the incidence of males and females) where their number reached (58) by a percentage (28.6%) and reached the highest incidence of Asperger's syndrome (and is considered the strongest injury to the patient, that is, he suffers from strong autism) where their number reached (81) by a percentage (39.9%) where it was found that the lowest incidence was a syndrome Caner.
2. It is shown from the results that the test of the significance of the relationship between the dependent variable and the independent variables and based on statistical analysis the final value of the test Chi-Square has reached (374.344) and that (Sig) its probability value has reached (0.000) which is below the level of significance (0.05) This means rejecting the null hypothesis that there are no significant differences between the model in terms of the fixed limit (without independent variables) and accepting the alternative hypothesis that states the significance of the model.
3. It is clear from the results that the Pearson test that the results of the non-parametric test of the quality of the conciliation of the model based on the statistic of (Chi-Square) between the viewing values and the expected values if the distribution of Chi-Square to detect deviations of the logistic regression model as we note through Table (11) that the probability value (Sig.) has reached (1) the value of (Chi-Square)) of (198.638) which is greater than the level of significance (0.05) if we accept the null hypothesis H0 and reject the alternative hypothesis H1 and this

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confirms the quality of the reconciliation of the model as well as the test (Deviance) where it reached (64.796) and that the probability value (Sig.) has reached (1) of its own and is greater than the level of significance (0.05) if we accept the hypothesis of no-H0 and reject the alternative hypothesis H1 and this confirms that the data fits the model.

4. Through the results that (Pseudo R-Square) which is similar to the test of the coefficient of determination R2 where the value of (Nagelkerke) has reached (0.949) and that this value whenever it is large and close to the one indicates the strength of the interpretation of the variables independent of the model.
5. It is clear from the results to test the significance of the variables where it was shown that the probability value (Sig) of the test (Chi-Square) is significant for all the variables of the study because it is below the level of significance (0.05), that is, all variables are important in the model.
6. The results show that the test of the problem of multicollinearity is tested. It is noted that this problem does not exist using the variance inflation factor, as all the values of the VIF coefficient for independent variables are less than (4).
7. It is clear from the results in Table 8 of Canner syndrome that the third safe variable, which represents the unsafe gestational period, has a greater impact on the injury process through the logistic regression model after that the fourth variable, which represents the incidence of brain tumors after that the third variable represents the age of the child and then the third variable represents the age of the child After that the second variable represents sex after that the ninth variable represents the age of the parents when the child is raised after that the first variable represents biological causes after that the fifth variable represents the genetic factor after that the seventh variable represents exposure to environmental toxins and the last variable the first variable is lactation.
8. It is clear from the results in Table 8 of Asperger's syndrome that the second variable represents sex has a greater impact on the process of injury through the logistic regression model after that the third variable represents the age of the child after that variable IX represents the age of the parents when the child grows up after that variable VII represents exposure to environmental toxins after that variable IV, which represents the incidence of brain tumors after that variable VIII, which represents the unsafe period of pregnancy after that variable. The first variant representing lactation then the fifth variable represents the genetic factor and the last variable the first variable represents biological causes.
9. The results show the values that were expected, where it is shown through the field of the number of cases of Rett syndrome, where the number of cases that were predicted for Rett syndrome (60) cases took rank (1) and by a percentage (93.8%) and it is expected that the rank (1) which was correct and which was not predicted correctly, so the rank (2) of Canner syndrome was taken by the number of (3) cases It was noted that it was supposed to be the rank (1) but was expected (2) and the rank (3) Asperger's syndrome With (1) cases it was observed that it was supposed to be rank (1) but was expected (3). The above table also shows the field of the number of cases of Canner syndrome, where the number of cases that were predicted for Canner syndrome (55) cases took the rank (2) and by a percentage (94.8%) and it is expected to be the rank (2) which was correct and which was not predicted correctly, so it took the rank (3) Asperger's syndrome with the number of (3) cases It was noted that it was supposed to be the rank (2) but was expected (3). It is also shown through the table above the field of the number of incidences of Asperger's syndrome, where the number of cases that were predicted for Rett syndrome (78) cases took rank (3) and by a percentage (96.3%) and it is expected to be rank (3) which was correct and which was not predicted correctly, so the rank (1) was taken with Rett syndrome by the number of (2) cases It was noted that it was supposed to be rank (3) but was expected (1) and rank (2) Canner syndrome with the number of (1) cases It was noted that from It was supposed to be the rank (3) but it was expected (3)

RECOMMENDATIONS: -

1. We recommend developing a health education plan in areas with a low social and environmental level with the aim of reducing the incidence of autism.
2. We recommend that the Dhi Qar Health Department carry out campaigns to remove radioactive materials as well as pesticides and

minerals in cooperation with the concerned authorities.

3. We recommend that the Dhi Qar Health Department cooperate with civil society organizations, schools and print and visual advertisements in order to raise the awareness of parents in terms of marriage at an early age and on the safe feeding of the child.
4. We also recommend the need to raise the level of health of citizens in general and pregnant women in particular who are most vulnerable to infection by encouraging breastfeeding and complementary foods suitable for children, maintaining foods safe to eat, maintaining their nutritional properties and avoiding drinking medicines during lactation are important measures in the prevention of autism.
5. The need to encourage and expand health research related to autism by collecting data on the prevalence of the disease, the incidence rate and the factors accompanying its emergence and the importance of government hospitals relying on the method of accurate diagnosis of autism.
6. Use other methods to estimate the logistic regression function such as the Bizia methods in statistical analysis.
7. The use of nonlinear regression models of several types to analyze health and biological phenomena .

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