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The Application of Machine Learning Techniques for Investigating and Analyzing Student Bullying Phenomenon: A Practical Binary Logistic Regression Study

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Abstract
The aim of the current research is to determine the factors influencing the spread of bullying in secondary schools. The sample consisted of (15) students participating in the teacher training adaptation program at the University of Hildesheim. To achieve the research objectives, a questionnaire was created that identified the most influential factors in the prevalence of bullying in school, consisting of six statements, all of binary type. The results showed that four variables (Electronic games that incite violence - The bullying student's environment helps him to bully his colleagues-Neglect of school administration and Negligence of punishment-Neglect of parents) had an influence on school dispersion During the the remaining independent variables (parental separation & There is no strong bond between parents and school) had no significant and noticeable influence on the prevalence of bullying in school.

Keywords: Ordinal Logistic Regression, Bullying, High School Students, Student Teachers

1. Introduction

The school phase is one of the most important phases of human life due to its essential role in the education of the individual, in which he acquires experiences that lead to the formation of his values, tendencies and behaviors that accompany him throughout his life stages. Thus, this phase receives the attention of many scholars and specialists in many fields. However, this phase is not without many behavioral disorders that negatively impact the mental health of the student, as some of these disorders pose a great threat to the individual, family or society at large.

Bullying at school, with its aggression towards others, is one of the problems that has a negative impact, whether on the bully, the victim of bullying, the students who witness this behavior or the entire school environment. The bully shows many behavioral disorders such as: aggressive, chaotic behavior, poor social adjustment, antisocial behavior [17], and we will shed light on this in the current research.

In this context, predictive science and machine learning can be used as effective tools to address these risks in students. For example, predictive methods can be used to analyze student behavior and identify potential patterns of bullying and behavioral problems. Based on these analyses, educational and social measures can be taken to prevent and deal with bullying.

In this way, predictive science and machine learning can help improve the learning environment and promote the mental health of students in elementary school.

2. Research Problem

Victims of school bullying are characterized by many characteristics that hinder their normal development, prevent good mental health and affect their education in the classroom and their interaction with those around them, be it with their peers, family or school and the negatively impact their healthy development. Therefore, it is pointed out that the victim of school bullying is characterized by many characteristics, including loneliness, poor psychological and social adjustment, shyness, deficiencies in social relationships and low self-esteem [8].

If the student falls victim to bullying at school, he or she faces a range of problems that extend beyond adolescence and adulthood [11].

Victims of School Bullying have many characteristics that prevent them from enjoying good mental health and as a result, without other students, they will Victims of School Bullying Victims of School Bullying Victims of School Bullying often scream and run away and react to many situations in inappropriate ways and they are ridiculed by others as they lose many of their personal belongings.

Bullying in schools also affects the safety, psychological and social structure of society, so a physical collision with these bullies in schools harms students at all levels of education and makes the student who is a victim of bullying feel rejected, unwanted, fear and discomfort feels withdrawn from participating in school activities or runs away from school due to fear of bullying [13].

Due to the negative effects of the problem of bullying in school, researchers were interested in studying its causes and consequences and they were also interested in developing many programs to reduce this problem, whether by introducing the victim or bystanders to it problem of bullying or by providing counseling programs for teachers and parents. What makes the problem even bigger is that many see it as bullying in the early school years is normal, but in fact it is a big problem because it harms students physically and psychologically and the occurrence of bullying causes chaos in the classroom, as it hinders the learning process and limits the benefits of educational programs [16].

From the above it is clear that there are many problems associated with bullying at school, be they academic problems such as: the student's low level of education, his frequent absences or psychological problems such as: anxiety, psychological loneliness, isolation, anxiety and low self-esteem…. and other social problems such as: lack of social skills, social anxiety...etc. The fact that a student is a victim of bullying at school poses many problems for students, peers, school and parents.

In this context, predictive science and machine learning can play a role in identifying students at increased risk of bullying and providing timely support and intervention. By using AI techniques, schools can also analyze data to identify patterns of bullying behavior and take preventative measures.

In summary, bullying at school causes many problems for students, teachers, schools and parents. By using technologies such as machine learning and predictive science, we can hopefully help identify and address these issues to create a safer and healthier learning environment. Therefore, in the current research, these reasons were examined and interpreted to draw conclusions that can help limit such phenomena in schools.

3. Research Question

Which of the following variables "parental neglect, the bullying student's environment, school administration neglect, electronic games that encourage violence, parental separation, and no strong bond between parents and school" has a significant impact on the prevalence of bullying in the school among the high school students from the perspective of the teacher training students?

4. Research Objectives

The current research aims to examine the moral implications of each of the issues presented in "Parental Neglect, The Bullying Student's Environment, School Administrative Neglect, Electronic Games Inciting Violence, Parental Separation, and No Strong Parent-School Bond." To identify research variables and show their importance in the increase in school bullying towards students and to explain these factors individually.

In this context, machine learning and predictive science can play a crucial role. By using machine learning, we can identify patterns in the data that indicate which of these factors have a significant impact on the occurrence of bullying. Based on these findings, preventive measures can be developed that specifically target the identified risk factors. In addition, predictive models can be developed to predict the occurrence of bullying and initiate timely interventions.

Combining machine learning and predictive science allows us to develop evidence-based approaches to reduce bullying in schools and thereby promote student mental health and well-being.

5. Research Importance

The importance of the current research arises from the following points:

1. The current research is characterized by the application of the logistic regression model in relation to bullying in schools. This makes it possible to identify the main factors influencing the occurrence of bullying in schools. This is where machine learning comes into play, as this model is a statistical method capable of analyzing complex relationships between variables and recognizing patterns.
2. This research can solve some of the problems related to school bullying among students and help interested researchers and researchers find the factors that influence the increase of this phenomenon.
3. This study derives its theoretical significance from addressing a problem with a certain degree of severity, namely "bullying," since studies have shown the negative impact of this problem on the psychological, emotional and mental aspects of both bullies and victims.

6. Limitations of Research

1. **Spatial boundaries:** Germany.
2. **Time limits:** 2021.
3. **Human Limits:** Student Teachers.

The results of the current research were limited to identifying the most important factors influencing the increase in bullying at school from the perspective of student teachers.

7. Research Terms Define

7.1 Logistic Regression Model: Stéphane defines it as a type of regression in which the dependent variable can take two values (binary logistic regression) and more than two peaks (multiple logistic regression). However, in logistic regression, our goal is not to explain the change in the values of the dependent variable, but to interpret the probability of occurrence and non-occurrence of the phenomenon under study [18].

The researcher defines it as a suitable statistical method that helps him to determine the most important factors influencing the increase in the phenomenon of bullying among students from the perspective of student teachers.

7.2 Mobbing: Horwood, Waylen, Herrick, Williams & Wolke defines it as: "A behavior that occurs when a student is repeatedly exposed to aggressive behaviors or practices from other students with the intent to harm him and it is usually an imbalance of power, which is either as physical as hitting, verbal as calling for titles, or emotional as provoking feelings, social exclusion or abuse" [7].

The researcher defines it as a form of widespread violence experienced by high school students and the intended behavior causes harm or inconvenience to one or more people.

8. Theoretical Literature

8.1 Logistic Regression Model

Rakotomalala points out that regression analysis is generally a model that analyzes and explains the relationships between the dependent variable and the explanatory variables by relating these variables to a mathematical equation. After determining the shape of this relationship, we estimate the parameters of the model that express the influence of the dependent variable on the explanatory variables for the purpose of interpretation or prediction according to the type of study. The logistic regression model is used to predict the probability of an event to find the fit of the data to a logistic curve. Logistic regression uses multiple predicted variables that can be numerical or categorical. The logistic regression equation is as follows [14]:

$$P_i = E(Y_i / X_i) = \frac{e^{(\beta_0 + \beta_1 X_1 + \ldots\ldots + \beta_k X_k)}}{1 + e^{(\beta_0 + \beta_1 X_1 + \ldots\ldots + \beta_k X_k)}} \quad (1)$$

So that:

P_i: Represents the probability of occurrence of the class or attribute i of the dependent variable.

β: Represents the parameters of the model.

Through the equation it is clear that the relationship between the dependent variable and the independent variables is nonlinear, therefore there are several transformations that can be performed to make the relationship linear. One of the most famous of these transformations is the logit transformation, so the previous equation has the following form:

$$L = Ln\left(\frac{P_i}{1 - P_i}\right) = \beta_0 + \beta_1 X_1 + \ldots\ldots + \beta_k X_k \quad (2)$$

$\frac{P_i}{1 - P_i}$: Represents the weight ratio, which is the main stone in interpreting the parameters of the model, this ratio is interpreted according to the type of explanatory variables.

- **Estimating Model Parameters**

Commonly, the least squares method is used to estimate the parameters of the normal regression model. This method is not suitable for the logistic regression case. Therefore, the maximum likelihood method is used to return the adjusted number of returns.

- **Model Evaluation**

Before relying on the results of the model's estimation for the purposes of interpretation or prediction, these models must pass several statistical tests to demonstrate their fitness for use. We can divide these tests into two parts:

1. **Overall Assessment of the Model:** This is done through the quality standards of mediation and tests for the overall significance of the model.
2. **Mediation Quality Criteria:** These are statistical criteria that measure the significance of the model. These standards will be considered as alternatives to the determinants of linear regression. They are called approximation coefficients and are calculated by comparing the explanatory power of the model without explanatory variables with that of the model after introducing explanatory variables. The most famous include: R-deux by Nagelkerke, R-deux by Cox & Snell.

- **Test for Overall Significance of the Model**

The purpose of this test is to determine the overall significance of the model parameters. With others Words: Are all parameters of the interpreted variable equal to zero or is there at least one parameter that is not zero? To perform this test we use the same principle as normal regression. We compare the expected values of the model without independent variables with the expected values of the model with independent variables. This test is called the Hosmer-Lemeshow test.

- **Classification Tables**

These are tables consisting of the seen classification of cases and the classification generated by the model. Using these tables we can determine the correct classification rate and the incorrect classification rate. The higher the correct classification rate, the better the predictive ability of the model. These tables are often used when the purpose of model construction is predictive rather than explanatory. Parameter significance modeling test performed to determine the statistical significance of each variable separately. Commonly used is the Wald test or the weighting test, and each of these tests has its own characteristics and shortcomings. It should be noted that the logit parameters are evaluated using a maximum likelihood method; It is one of the best-known estimation methods in statistics and measures the maximum likelihood function (ML). Let () be the probability of considering the n number of independent variables $P_1, P_2, P_3, \ldots\ldots\ldots\ldots, P_n$ lying in the sample, and the sum of multiplying these probabilities represents the maximum likelihood function [1]:

$$M.L = prob(P_1, P_2, P_3, \ldots\ldots\ldots\ldots, P_n$$

8.2 Bullying

- **Bullying Phenomenon at School**

Given the negative impact of school bullying on the bully, we must give importance to this aspect of bullying in the field of scientific research in order to explain such phenomena and find solutions that can help limit these phenomena We cannot deny, that the bullies suffer from loneliness, poor psychological and social adjustment, lack or scarcity of friends, lack of social relationships, shyness, low self-esteem, social withdrawal, fear of going to school, lack of social skills, daydreaming and low academic levels. All these things would hinder the proper growth of the student [4, 6, 8].

If the bully spends their time at school in fear, worrying about the bullies and what they will do next time, they may experience pain and discomfort if the bullying is physical and the bully may begin to withdraw from school activities. They drop out of school because of fear of bullying and, in the worst case, many bullies become sick, frustrated and can commit suicide [13].

- **Effects and Symptoms of Bullying in Students**

Victims of school bullying suffer from persecution, low self-esteem, anxiety and a feeling of isolation, they do not stay in

school, have poor academic performance and develop risky behavior to engage in violent behavior [3].

Sampson has shown that victims of school bullying often miss school, cannot concentrate on schoolwork, lack self-confidence, suffer from depression that can last for years, and have poor social adjustment, anxiety and insomnia at night. Bullying affects the victim because these victims pretend not to go to school and they are busy watching the lessons in the classroom and thinking about how to avoid the bullying. The bullying leaves a negative impact on the victim's personality as the friends try not to build a relationship with him on the grounds that these victims voluntarily surrender to the bully, which creates a negative impact on the victim's personality [15].

The bully suffers short- and long-term consequences; As for the short-term consequences, if the victim is physically injured, loss of self-confidence, loss of trust in friends and their ability to protect and support him, feeling good at the end of the week and during school holidays, loss of appetite due to Anxiety, insomnia, lots of nightmares, anger at school and with teachers. If bullying is not prevented, the long-term consequences include holding on to negative thoughts about oneself, failure at work, excessive pessimism, social anxiety and isolation, and increased suicidal desire [10].

This was confirmed by Fleming & Towey that victims of school bullying face many problems such as: depression, loneliness, anxiety, school avoidance and their absence from school are great. The problems caused by bullying at school and the characteristics that characterize the victim of bullying include anxiety, depression, psychological loneliness, lack of psychological security, low self-esteem and poor academic performance. He becomes a victim of bullying without other students. Several studies have recommended the need to develop various programs to reduce school bullying [5].

Victims of school bullying are also exposed to physical and psychological problems such as: stress, low self-esteem, friendship problems, fear of transportation, fear of using toilets and entering closed spaces, fear of going to school for fear of bullying, and the desire to change schools, escape them, take revenge, and attempt suicide [9].

This problem is further exacerbated by the fact that school professionals' responses to this problem are weak and victims of bullying do not tell anyone that they have become victims of bullying for many reasons, including: fear of confrontation, embarrassment at their inability to defend themselves, fear of being bullied, not believing them, not wanting to upset their parents, believing that nothing would change if they told them, their belief that parents and teachers would make the problem much worse, theirs Fear that their teachers would tell the perpetrator who told them [15].

Students who have been victims of school bullying also show many symptoms that can be recognized as victims of school bullying, including: inexplicable reluctance to go to school, unusual fear and anxiety, difficulty sleeping, nightmares, vague complaints, Headache, colic, loss of personal items, tears his clothes, destroys his personal items [12].

There are also many reasons why a student falls victim to bullying at school, including family reasons, environmental reasons, or school reasons, including reasons related to the student himself, while many previous studies and theoretical frameworks have suggested that this problem is related to many variables related to the student, such as: Lack of social skills, parental treatment methods The inappropriateness... and others.

9. Field Research Procedures and Methodology

The analytical-descriptive approach was used, taking into account the literature on the subject and studying the concept of two-response multiple logistic regression on the one hand and the factors that influence the prevalence of bullying in school on the other, to explain and discuss the causes.

- **The research sample**

The study sample consisted of (15) students from the participants in the adaptation program for teachers at the University of Hildesheim, they were simply collected randomly, they were contacted via WhatsApp, email and distribution of the questionnaire.

- **The research tool and its variants**

A questionnaire was created to identify the causes most influential in the spread of bullying at school, consisting of six statements, all binary to facilitate answering, and the data collection as follows:

1. Dependent variable: In your opinion, do high school students get bullied? “Occurrence of bullying in high schools”? (No=0, yes=1)
2. Independent variables (explanatory variables): In your opinion, does one of the following reasons play the greatest role in the increase in the phenomenon of bullying among high school students (more than one reason can be chosen)?

- The first explanatory variable (EV.1): parental neglect. (No=0, yes=1).
- The second explanatory variable (EV.2): The bullying student's environment helps him to bully his colleagues. (No=0, yes=1).
- The third explanatory variable (EV.3): school administration neglect and punishment negligence. (No=0, yes=1).
- The fourth explanatory variable (EV.4): Electronic games that encourage violence. (No=0, yes=1).
- The fifth explanatory variable (EV.5): parental separation. (No=0, yes=1).
- The sixth explanatory variable (EV.6): There is no strong bond between parents and school. (No=0, yes=1).

- **Used Statistics processors**

To carry out the statistical analyses, the program (SPSS), version (25) was used as a multiple logistic regression model was used with two responses as follows:

1. **Maximum Likelihood**: To find the appropriate equations, we solve these equations **numerically** through iterative methods.
2. **Forest**: To clarify the meaning of the logistic regression coefficients, by comparing the probability values, the statistical forest with the significance level previously determined by the researcher, to find out whether the variable in question is statistically significant or not, to know the statistical significance of each variable separately.
3. **Hosmer-Lemeshow:** To find out whether the model is the best representation of the data. This test aims to know the overall significance of the parameters of the

model, that is, are all the parameters of the explanatory variables equal to zero or is there at least one parameter that differs from zero. For this test we use the same principle as in the case of normal regression, that is, comparing the expected values in the case of the model without independent variables with the expected values in the model containing the independent variables.

4. **Goodness of fit**: To find out how well the proposed regression models fit the data.
5. **Likeability:** It indicates that a person is a nice and has a sense of fun when he is with others. It consists of 6 items (1, 8, 15, 23, 28, and 34).
6. **Morality:** refers to the characteristics of the individual which are generally evaluated as good desirable and qualities. It consists of 6 items (6, 11, 18, 21, 26, and 32).

10. Research Results and their Interpretation

- **Results of the Research Question**

Which of the following variables "parental neglect, the bullying student's environment, school administration neglect, electronic games that encourage violence, parental separation, and no strong bond between parents and school" has a significant impact on the prevalence of bullying in the school among the high school students from the perspective of the teacher training students?

To answer this question, SPSS, the inclusion method was used and descriptive information was found for the study sample and is presented in the following table:

Table 1: Coding more dependent variables

Occurrence of bullying in high schools	Internal value
No	0
Yes	1

Table No. (1) Presents the coding of dependent variables

Table 2: Summary of Case Processing

Unweighted Casesa		N	percent
Selected cases	Included in analysis	15	100.0
	Missing cases	0	**0,0_**
	In total	15	100.0
Not selected cases		0	**0,0_**
In total		15	100.0
a. When the weighting is in effect, you can find the total number of cases in the classification table.			

Table No. (1) summarizes the data entered into the analysis, the size of the sample examined and missing cases. To calculate the number of iterative cycles for the derivatives of the maximum possibility function to obtain the smallest value of the negative double logarithm of the maximum possibility function to obtain the optimal estimate of the model parameters, Table (3) was prepared:

Table 3: Iteration protocols a, b, c, d

iteration		-2 log likelihood	Coefficients						
			constant	EV.1	EV.2	EV.3	EV.4	EV.5	EV.6
Step 1	1	11,345	,645	,323	,194	1,161	1,290	-,25	-2.64
	2	8.86	2.51	-,36	-.92	2.02	3.44	-1.55	-3.36
	3	7.41	5.86	-1.62	-3.27	3.06	6.63	-3.86	-3.89
	4	6.82	9.21	-2.74	-5.55	4.18	9.84	-6.15	-4.80
	5	6.61	12.28	-3.76	-7.61	5.20	12.90	-8.22	-5.81
	6	6.53	15.31	-4.77	-9.63	6.20	15.93	-10.24	-6.81
	7	6.50	18.32	-5.77	-11.64	7.20	18.94	-12.24	-7.81
	8	6.49	21.33	-6.77	-13.64	8.20	21.94	-14.25	-8.81
	9	6.49	24.33	-7.77	-15.64	9.20	24.94	-16.25	-9.81
	10	6.49	27.33	-8.77	-17.64	10.20	27.94	-18.25	-10.81
	11	6.49	30.33	-9.77	-19.64	11.20	30.94	-20.25	-11.81
	12	6.49	33.33	-10.77	-21.64	12.20	33.94	-22.25	-12.81
	13	6.49	36.33	-11.77	-23.64	13.20	36.94	-24.25	-13.81
	14	6.49	39.33	-12.77	-25.64	14.20	39.94	-26.25	-14.81
	15	6.49	42.33	-13.77	-27.64	15.20	42.94	-28.25	-15.81
	16	6.49	45.33	-14.77	-29.64	16.20	45.94	-30.25	-16.81
	17	6.49	48.33	-15.77	-31.64	17.21	48.94	-32.25	-17.81
	18	6.49	51.33	-16.77	-33.64	18.21	51.94	-34.25	-18.81
	19	6,491	54,333	-17.77	-35.64	19.21	54.94	-36.25	-19.81
	20	6.49	57.33	-18.77	-37.64	20.20	57.94	-38.25	-20.81
	21	6.49	57.33	-18.77	-37.64	20.20	57.94	-38.25	-20.81

a. Method: Inclusion
b. Constant included in the model
c. Initial-2 log likelihood: 20.72
d. Estimation stopped at iteration number 20 because the maximum number of iterations was reached. The tool was applied on a pilot sample; this is done by arrange

The results in the previous table show the method of estimating the parameters of the logistic regression model in an iterative manner, which means that the calculation process is repeated until the parameter values converge at a certain allowable error and at the smallest value of the possibility function That the values of step 20 are equal to the values of Step 21 when 0.001(is rounded, where in Step 21 we obtained the derivative of the negative double of the maximum potential function to its lowest value (20.728), i.e. (-2Log-Likelihood =20.728). We have stopped at this step because the change in the coefficients became less than 0.001, and we stopped at step 20. We considered its parameters to be the best result that can be obtained for the parameters since the negative double of the logarithm of the function of the largest Probability in this step is 20 at the minimum end and this indicates that there is a relationship

between the dependent variable and the explanatory variables.

The parameters of the optimal model that we obtained in cycle 20 were also found from Table (3) and all the estimated parameters of the model were clarified (constant, b1,…, b8), and standard error for each parameter as shown in Table (4) shown:

Table 4: Variables in the equation

		Regression coefficient B	Standard error	Forest	df	Sig.	Exp (B)
Step 1 [a]	EV.1	-18,779	13316.06	2.57	1	0.02*	2,670
	EV.2	- 37,647	19720.81	1.20	1	0.03 *	1,542
	EV.3	20,208	13165.98	0, 13	1	0.03 *	597237401.32
	EV.4	57,947	29547.45	0.38	1	0.04*	1.466E+25
	EV.5	-38,252	19720.81	0.001_	1	0.99 _	0.00
	EV.6	-20,813	13165.98	***3 0.00_***	1	0.99	0.00
	constant	57,333	30345.73	0, 112	1	0.99	7.936E+24

a. Variables entered in step 1: EV.1, EV.2, EV.3, EV.4, EV.5, EV.6

From Table (4), we note that the coefficients of the attached model, given in log-odds units, and the model equation are as follows:

$$\textbf{Log [p^/(1-p^)]} = 57{,}333-18{,}779\ X_1 -37{,}647\ X_2 +20{,}208\ X3 +57{,}947\ \_\ X_4 -38{,}252\ X_5 -20{,}813\ X_6$$

p^: The probability of receiving an answer (no bullying in high schools) and these estimates show the relationship between the independent variables and the dependent variable in logit units, and from the same Table (4) we find the following results:

1. He ranked first (EV.4) "Electronic games that encourage violence" in the effect on the dependent variable (Y) "Occurrence of bullying in high schools", and regression coefficient (B=57.947), the explanatory variable, in the logarithm of the preference for the dependent variable will increase by (57,947) times, with the stability of the effect of the remaining variables, and that this coefficient has significant significance for the dependent variable at the significance level (0.05), for (df =1), where is the value of (Sig = 0.048) and the value of the Wald statistic (W=0.387), The value of (Exp (B) = 1.466E+25), which means that the possibility or Chance of bullying at school due to "electronic games that encourage violence" is (1,466E+25) times higher than those that do not occur for the same reason.

This result explains the current development in technology and the anchoring of this technology in the minds of students. If not controlled by parents, the student spends many hours playing electronic games and in this critical age period for the student in high school, it leads to a state of total imitation of the personality of the violent hero of the game, killing and destroying enemies, to achieve his goal. In addition, the student becomes socially isolated, interacts with a machine and lives in his own virtual world, at this age the student does not realize the difference between the virtual world that the game represents and reality. It is not necessary that he acts violently immediately after playing, but stores images of violence in the subconscious and dumps it into the school environment. The student's stay in these games for hours makes him antisocial, introverted and selfish, unlike other games that require a partner. In general, most students affected by these games have a propensity for violence and bullying in and outside of high school and the game is a catalyst for the development of these negative behaviors in students. It is well known that video and computer games contain multiple stages in the game and every time the player passes a difficult stage, other more difficult stages appear and so on ad infinitum, stimulating the challenge. In addition, some parents do not pay attention to the instructions in the game booklet and buy the game at random without considering whether it is suitable for the student's age or not, even though electronic game manufacturers indicate the age for which the game is suitable.

2. It ranked second (EV.2) "The bullying student's environment helps him to bully his peers" in influencing the dependent variable (Y) "Occurrence of bullying in high schools", and it was the regression coefficient (B=37,647), that is, the change in the interpreted variable will increase by (37,647) times in the logarithm of the preference for the dependent variable, with the effect of the remaining variables fixed, and that this coefficient has a significant significance for the dependent variable showed at the significance level (0.05) for (df =1), where the value of (Sig = 0.038) and the value of the Wald statistic is (W=0.387) and the value of (Exp (B) = 1.542), that is, the possibility or chance of bullying at school because of "The bullying student's environment helps him to bully his colleagues" is (1.542) times higher than the possibility of not occurring for the same reason.

This phenomenon is explained by the aggressive environment that surrounds the student and its role in the increase of the phenomenon of bullying at school, the role of the home environment associated with mother and father and its great role for the student at this age. He may acquire aggressive behavior from the environment at this stage, especially if there are problems within the family, such as violence of all kinds, be it verbal, physical or psychological, when the father carries out these actions on the mother, which the student is in front of him sees. The student can also acquire aggression through his brothers, for example, the older brother enforces his control over his brothers at home or the student is encouraged by his family to exert his control over his sister; This increases his aggressive behavior.

3. It ranked third (EV.3) "Neglect of school administration and negligence of punishment" in influencing the dependent variable (Y) "Occurrence of bullying in high schools" and it was the regression coefficient (B=20,208), i.e. the Change in explanatory variables will increase according to (20,208). Once in the logarithm of the preference for the dependent variable, with the stability of the effect of the remaining variables, and that this coefficient showed significant significance for the dependent variable at the significance level (0.05), for (df =1), where the value of (Sig= 0.038) and

the value of the forest statistics (W= 0.132), The value of (Exp (B)=597237401.322), that is, the possibility or chance of bullying in school due to "neglect of the school administration and negligence of the Punishment" is 597237401, 322 times greater than the possibility that it did not occur for the same reason.

This is explained by the fact that some cases of bullying of the student are affected by his poor academic adjustment and through his academic work it is noticed that the student suffering from academic delays pushes him to feelings of inferiority and lack of self-confidence. Therefore, we find him unable to participate with the group in its activities and this is all due to his failure in class, to the neglect he receives from the school or even from his comrades. It causes him to use compensatory methods that manifest themselves in aggressive behavior without his awareness and his goal is to prove himself and attract the attention of others and confirm his importance as an individual among them.

4. On the last rank (EV.1), "parental neglect" in influencing the dependent variable (Y) "occurrence of bullying in high schools", was the regression coefficient (B=18,779), that is, the change in the explanatory variable by (18,779) times, in The logarithm of the preference for the dependent variable, with the stability of the effect of the remaining variables, and that this coefficient demonstrates significant significance for the dependent variable at the (0.05) level of significance for (df = 1). Showed, where is the value of (Sig =0.029) and the value of the Wald statistic is (W=2.573) and the value of (Exp (B)= 2.670), which means that the possibility or chance of bullying in school due to "parental neglect" (2,670) is times greater than the possibility that it occurs for the same reason.

This explains that parental neglect is one of the most important factors in the increase of the phenomenon of bullying in school and the reason for this is either the indifference of the parents towards the student and his needs due to the ignorance or selfishness of the student-parents or their preoccupation with earning a living or with the nonsense of life because they do not know their responsibility towards their children. These students lack parental concern and monitoring of their proper behavioral development. The parents may be busy with their work or other interests that are in the material interest of the family or that are one of the factors destroying the family unit. In both cases, parents' busyness day and night can lead them to not think about giving even a little of their time to their children. In such an atmosphere, the student lacks the necessary care for his psychologically healthy development and the older he gets, the less his share of attention or the negative behavior of the children.

5. The remaining variables **(**EV.6, EV.5), which are (Separation of parents & There is no strong bond between parents and school), had no significant influence on the dependent variable (Y) "Incidence of bullying in high schools ", with values Significant.

To test the adequacy of the entire model and its (goodness of fit) in linear regression, in the case of the logistic model we use F and 2R in the linear regression, while in the case of the logistic model we use the (log likelihood ratio), that of the distribution of (Chi-square-X^2) follows, according to the following equation:

$$\mathbf{X^2} = 2 (\text{Log}_e L_0 - \text{Log}_e L1)$$

Calculate the value of X^2, it is shown in Table (5):

Table 5: Omnibus tests of model coefficients

		Chi square	df	Sig.
Step 1	Step	14,237	6	***0.027***
	Block	14,237	6	***0.027***
	Model	14,237	6	***0.027***

From Table (5) we find the value of X2 (14.237) with (Sig.= 0.027) which is statistically significant. By calculating the value of X2, the contingency table was calculated as shown in Table (6).

Table 6: Contingency table for Hosmer-Lemeshow test

Occurrence of bullying in high schools						
		No = 0		Yes = 1		In total
		Observed	Expected	Observed	Expected	
Step 1	1	2	2,000	0	0.000	2
	2	3	3,000	0	0.000	3
	3	1	1,575	1	0.425	2
	4	2	0.850	0	1,150	2
	5	0	0.575	2	1,425	2
	6	0	0.000	2	2,000	2
	7	0	0.000	2	2,000	2

From the intersection of the sums of the binary dependent variables (y) with the sums of the estimated probabilities. A table was created showing the intersection of the sums of the dependent variables with the sums of the estimated probabilities by the Hosmer-Lemeshow test in Table (7).

Table 7: Hosmer-Lemeshow test

Step	Chi Square	df	Sig.
1	4,502	5	0.480 *

We note from the previous table that the value is (H-statistic = 4.502) with (Sig.=0.480) and this indicates the quality of fit for the entire model and that the model fits the data well, and this shows the presence of an overall significance for the model parameters, confirming the results presented in the previous Table (7), for the occurrence or non-occurrence of bullying at school, since the values were very close between the actual and the estimated values, whether or not occurred.

In order to determine the percentage of representation of the resulting model in the current study, the following table was found for the study data:

Table 8: Classification table

	Observed		Predicted		
			Y: Occurrence of bullying in high schools		Percentage correct
			No=0	Yes=1	
Step 1	Y: Occurrence of bullying in high schools	No=0	6	2	75.0
		Yes=1	1	6	85.7
	Total percentage				80.0

a. The cutoff value is.500

From the previous table we find (total percentage = 0.80), that is, only 3 observations were misclassified, and the

overall error probability (0.20), which is a good percentage, indicates that the model represents the data well.

11. Research Recommendations

Based on the results of this study and the studies reviewed in this study, the researcher recommends the following points:

1. Using logistic regression models to study and explain other school phenomena.
2. Use of other binary regression models in future studies of school bullying.
3. Generalization of the idea of using the logistics model in the social, economic and educational fields and in bullying, rather than focusing only on the medical field as in the past.
4. Building models that take into account the interaction that exists between the explanatory variables of school bullying.

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