



Electronic Assessment Of Depression And Suicide Risk Among Youth In Tungurahua, Ecuador.

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Abstract. El The present investigative work arises from the existing problem in the province of Tungurahua (Ecuador) and that has to do with a high rate of youth suicides, at national level. Numerically it is in the third place of Ecuador but percentage-wise it occupies the first place at national level of youth suicides. This also implies that young people in the province will have high levels of anxiety and depression. The problem can be formulated with the following question: How to help reduce the rates of anxiety, depression and youth suicide risk in Tungurahua? The general objective of the research was: To develop web applications with 4.0 technology to improve the prevention of anxiety, depression and youth suicide risk in Tungurahua. The research was carried out in 50 educational institutions, with the participation of directors and directors of the DECE. It was evidenced that normally these educational entities do not carry out evaluations related to these mental health difficulties, because there are many students and the tabulation is delayed, on the other hand it is stated that training is conducted for prevention purposes but nothing more. The project generated 3 web applications, the first one automated the Hamilton questionnaire for the respective evaluations, the second one was predictive through facial recognition of emotions and the third one was a virtual psychologist based on artificial intelligence. A test of the use of the software was carried out with 500 students of the Instituto España and unfortunately the results obtained instantly showed that 8% have a high suicidal risk and 16% have a high level of depression. Finally, it was concluded that a quick evaluation helps in prevention.

Keywords: web applications, anxiety, depression, suicidal risk, mental health, mental health

1 Introduction

For the World Health Organization [1] mental well-being is: “a fundamental component of the definition of health. Good mental health enables people to realize their potential, overcome normal life stresses, work productively, and contribute to their community.” Mental health is a state of physical, mental and social well-being, but unfortunately this can be affected by a series of socioeconomic factors that produce certain changes in the way of thinking and acting of the human being, generally this affection has a direct impact on all the activities of the person. [2].

For the World Health Organization [1], the determinants of mental health and mental disorders include: “not only individual characteristics such as the ability to manage our thoughts, emotions, behaviors and interactions with others, but also social, cultural, economic, political and environmental factors such as national policies, social protection, and working conditions”.

One of the most common diseases of our time is depression, which directly affects children, adolescents and adults. Depression is a psychic illness that affects the whole body of a person. It produces somatization in the whole body. For this reason, it is called a “totalizing disease”. Depression can be described as feeling sad, melancholy, unhappy, dejected or down. Most of us feel this way from time to time for short periods of time. Clinical depression is a mood disorder in which feelings of sadness, loss, anger or frustration interfere with daily life for a period of 2 weeks or more. [3].

For the National Institute of Mental Health [4] depression is: “Depression is an illness that can interfere with the ability to do daily activities, such as sleeping, eating, or managing schoolwork.”

Depression is common, but that does not mean it is serious. Treatment may be needed to make a person feel better. Depression can occur at any age, but symptoms often begin in teens or 20s or 30s. It can occur along with other mental problems, substance abuse, and other health problems. [4].

Two of the common types of depression are: Major depression, which involves depressive symptomatology most of the time for at least 15 days. These symptoms interfere with the ability to work, sleep, study and eat. Persistent depressive disorder (dysthymia), which generally incorporates less severe depressive symptoms but lasts much longer, usually lasting more than 2 years.

In the North American health portal associated with the National Library of Health Medline plus [5] the usual symptoms of depression are exposed; thus, we have:

- Persistent feelings of sadness, anxiety or “emptiness”.

- Feelings of hopelessness or pessimism.
- Feelings of irritability, frustration or uneasiness.
- Feelings of guilt, worthlessness or helplessness.
- Loss of interest or pleasure in activities and hobbies.
- Fatigue, decreased energy or feeling slowed down.
- Difficulty concentrating, remembering or making decisions.
- Difficulty sleeping, waking up early in the morning, or sleeping too much.
- Unplanned changes in appetite or weight.
- Aches and pains, headaches, cramps or digestive problems with no apparent physical cause, or that are not relieved even with treatment.
- Suicide attempts or thoughts about death or suicide.

Adolescence can be difficult; there are changes in the body and brain that can affect the way you learn, think and behave. And if you face difficult or stressful situations, it is normal to have emotional ups and downs. Teenage depression, also known as adolescent depression, is an illness that can interfere with a young person's ability to carry out daily activities. It manifests itself through symptoms such as sadness, changes in appetite, sleep disturbances, feelings of worthlessness and thoughts of death. Depression in adolescents is a significant problem, and it has been observed that young people can present depressive episodes from an early age. In addition, genetic, hereditary, and environmental factors may influence the development of depression at this stage of life [6].

For the American Academy of Child and Adolescent Psychiatry, [7], "youth suicide has recently been on the rise across the nation, with thousands of adolescents committing suicide in the United States each year. Suicide is the third most frequent cause of death for young people aged 15 to 24 years."

Adolescents experience strong feelings of stress, confusion, self-doubt, pressure to succeed, financial uncertainty, and other fears as they grow older. For some adolescents, divorce, forming a new family with stepparents and stepsiblings, or moving to new communities can be upsetting and intensify self-doubt. For some adolescents, apparent suicide will be a solution to their problems and stress. Depression and suicidal tendencies are treatable mental disorders. The presence of these conditions in both children and adolescents should be recognized and diagnosed and an appropriate treatment plan developed. When there is parental doubt that the child or young person may have a serious problem, a psychiatric examination can be helpful. [8].

In Ecuador, according to the National Institute of Statistics and Census in Ecuador [9], there were 1143 officially registered suicides this year, of which 892 were men and 251 were women. Suicide comprises one of the most important public health problems in Ecuador, as it was responsible for 13,024 deaths between 2001 to 2015, Suicides represent 1.7% of deaths occurring in the country annually. Self-inflicted death between 2015 and 2018 exceeds the figures of death by interpersonal aggression and most of its victims were between 15 to 40 years old [9].

Alarming is suicide in children between 10 and 14 years, which has increased by 322% (girls) to 480% (boys) between 1990 and 2017 making Ecuador one of the 10 countries with the highest suicide rates worldwide in this age group. In this sense, the care of people with suicidal intent and/or attempt is increasingly frequent in health facilities, so it is essential to have a guideline on the detection, care and follow-up of these cases. [10].

In Ecuador, the suicide mortality rate varies greatly depending on the provinces and natural regions. Thus, it can be observed that in the provinces that correspond to the Sierra and the Amazon, the rates are the highest, especially in the urban area, where Bolívar, Pastaza and Tungurahua have rates of 18 per 100,000 inhabitants and more. In rural areas, the highest rate corresponds to Orellana and Cañar with 12 and 11 per 100,000 inhabitants, respectively. [10]

Table 1. Suicides by province

Province	City		Rural	
	Number	Rate per 100 thousand population	Number	Rate per 100 thousand population.
Bolívar	17	26,1	6	4,2
Tungurahua	41	18,1	28	8
Cotopaxi	24	15,4	11	3,4
Cañar	16	12,5	16	11,1
Chimborazo	27	12,4	24	8,1
Pichincha	198	9,9	59	5,3
Azuay	45	9,6	50	13
Carchi	9	9,3	4	4,6
Loja	28	8,7	10	5,3
Imbabura	14	5,5	13	6,2
Los Ríos	51	10,1	16	4,1
Manabí	91	9,9	23	3,7

Source: INEC

The province of Tungurahua is in the central region of Ecuador, currently has about 600,000 inhabitants, has approximately 80 public and private secondary schools. In this province, the incidence of suicides has generated interest both for the authorities related to public health and internal security; likewise, there is concern for the families affected by its occurrence. According to the above, it is understandable that this phenomenon, far from decreasing over time, has increased at an accelerated pace; this practice is commonly carried out in adolescence, a stage of human development considered quite conflictive and risky, due to the influence they receive from the environment in which they develop, which affects the behavior and health status of the person; once the suicide has been consummated, it affects the family and social environment of the victim [11]. On the other hand, the criteria of the newspaper "Primicias" [12], which states that according to data from the Ministry of Health, medical appointments for mental health problems, such as anxiety and depression, increase year after year in Ecuador.

From the consultations carried out by the Ministry of Health it has been possible to determine that the 5 most frequent mental health problems are: Mixed depression and anxiety disorder, mild depressive episode, autism, generalized anxiety and mental retardation. According to the report, depression and anxiety are two of the most frequent problems because "they are present in everyday life, that is, they develop due to family, work, economic and love problems, regardless of people's age". In addition, the main age range of people who come to the consultation is between 20 and 39 years. [12]. Something else that complements the problem and that is stated by the Ministry of Public Health [10] is the lack of psychologists in the public service, it is considered that in Tungurahua there is a lack of at least 800 professionals in this branch, it should also be mentioned that the time of attention in the public sector is only 30 minutes while internationally it should be at least 45 minutes, it is also recommended that the attention should be weekly but in our country it is one month and in the best case scenario in 15 days. This means that the public sector in Ecuador has not given much importance to the mental health of people and especially the vulnerable group of adolescents and young people in the province.

In short, it is possible to point out that the mental health problem in Tungurahua is latent and continues to deepen, there is also a direct relationship between depression and youth suicide, this is a social problem that affects the whole society and that demands urgent preventive actions. Several research works have been reviewed as background, among which the following can be pointed out: That of Medellín, E. et. a [13], which deals with: "Depression and Suicidal Risk in High School Students" from the city of Nuevo León in Mexico, there almost 300 high school students aged between 12 and 19 years are investigated, and the following results are obtained: 8.3% of adolescents present severe depression, 12.3% mild depression and 68.7% minimal depression. They manifest feelings of failure (4.8%), guilt (2.8%) and punishment (2.8%), as well as suicidal thoughts or ideation where 26.2% answered the option "I have had thoughts of killing myself, but I would not do it" and 2.8% "I would kill myself if I had the opportunity to do it". Regarding the desire to die on the part of high school students, it is observed that 11.10% have an intense desire, 40% have a moderate desire and 48.90% have a minimal desire to die. Where the reasons for dying outweigh those for living (4.4%), having an acceptable attitude towards thoughts of suicide (8.9%). Women have the highest risk of intense suicide with 16.1%. Regarding the relationship between depression and suicidal ideation, a positive and significant correlation was observed ($r_s = 0.696$, $p < .01$), indicating that: those with greater depression present greater suicidal ideation.

The work of Mayorga, M & Mayorga, M [14] was also analyzed with its theme: "Relationship between depression and suicidal risk in adolescents of Tungurahua" in which 336 adolescents from various schools were investigated with the following results: those investigated presented levels of mild depression (13.7%), moderate (14.3%), and severe (8.9%), as well as suicidal risk in 24.7%. Likewise, it was found that there was a high positive correlation, statistically significant, between depression and suicidal risk in the evaluated sample $r = .753$ ($p < 0.01$). Finally, the analysis of covariance reveals that depression predicts up to 54.2 % the presence of suicidal risk in the examined population. These data point to the examinees as a vulnerable age group. From the analysis of these studies, it can be deduced that there is a direct relationship between depression and suicidal risk in adolescents in high school; therefore, they are a vulnerable group that requires preferential attention.

2 Methodology

The research adopted a qualitative-quantitative approach. The qualitative dimension is based on observation and interviews with authorities in various educational centers in the city of Ambato. On the other hand, the quantitative dimension is based on the application of surveys within this area of education in Ambato.

The population involved in the problem is made up of 50 educational units in the city of Ambato. For the study, surveys were applied to students, teachers and members of the Student Counseling Department (DECE) of these institutions. Since the number of participants is specific and manageable, it is not necessary to perform a sample calculation.

The types of research to be applied are described below:

Bibliographic: This methodology is based on the collection of information from books, journals and online sources, with the purpose of deepening the study of anxiety, depression and suicidal risk in adolescents. In addition, it seeks to scientifically support the aspects related to the assessment instruments used to detect these problems, ensuring a rigorous approach in their analysis and application.

Field: This research will be carried out directly in the environments where the problem manifests itself, that is, in various educational units of the city of Ambato. We will inquire about the emotional state of adolescents, evaluating the levels of anxiety, depression and suicidal risk. In addition, it was analyzed if the institutions have professionals specialized in mental health and if they have implemented strategies for the identification and prevention of these problems.

Regarding the research methods that were applied, we have:

Analytical-Synthetic: It facilitated the detailed evaluation of the bibliographic information collected, allowing then its synthesis for the construction of the state of the art.

Inductive-Deductive: This research method will be applied to derive a specific solution from the analysis of cases and, subsequently, to establish a general solution.

3 Results

The results obtained from the research carried out are as follows:

Research for Teachers.

Question No. 1. Do you know if the institution performs evaluations related to anxiety and depression to students?

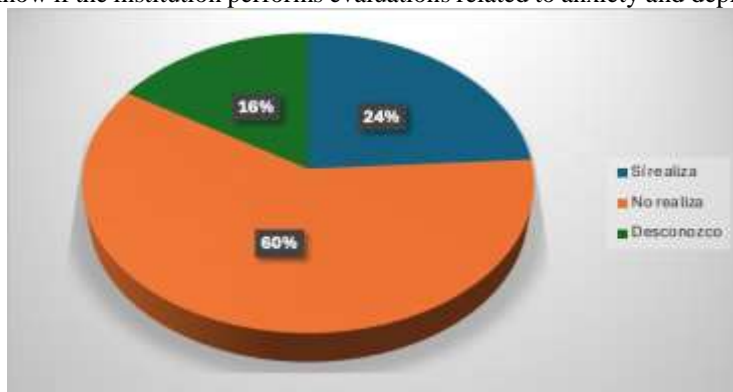


Figure 1. Statistical results of question 1 Teachers' Survey

Research in the DECE of each school

Question No. 1. Do you consider that the tabulation of the results of the evaluations that are related to anxiety and depression of the many students in your educational institution can become a process with many errors?

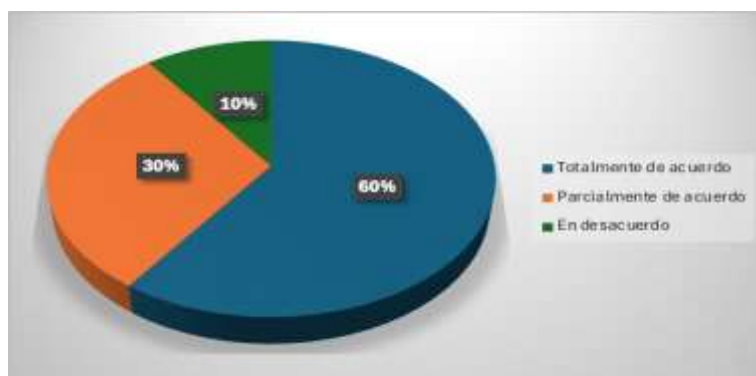


Figure 2. Statistical result of question 1 DECE Survey

Question No. 2. Do you know the number of cases of anxiety and juvenile depression that exist in school?

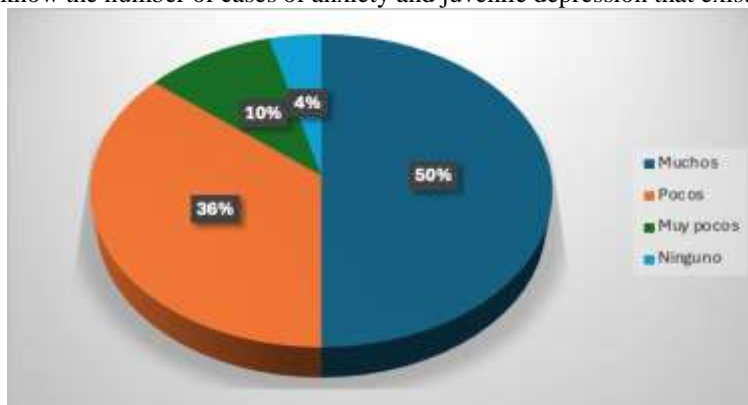


Figure 3. Statistical results of question 2 DECE Survey

Interview with the director of Colegio Bolívar.

1. Are you aware of the existing problem in Tungurahua in relation to the high rate of youth suicides?

Yes, I am aware of this serious problem. It is worrying that the number of youth suicides in our province has increased, especially in recent years. It is an issue that cannot be neglected.

2. What does the Institution in your charge do for the prevention of mental pathologies such as anxiety, depression and the risk of juvenile suicide?

We have a Student Counseling Department (DECE) that offers informative seminars and preventive workshops for both parents and students. However, I understand that it is not always enough because a more in-depth and continuous approach is needed.

3. In your educational institution have there been cases of attempted suicide by a student?

Unfortunately, yes. Although there have not been many, we have encountered difficult situations that have required immediate intervention and support from DECE.

4. Have students at your Institution been assessed for these mental pathologies in relation to anxiety, depression and suicidal risk?

Not systematically. We have conducted several exploration surveys, but not complete and continuous assessments.

5. If they have not been conducted, why?

The main cause is the lack of adequate tools and trained personnel to perform specialized assessments. In addition, there are restrictions on the use of these tools.

6. Would you agree with an electronic assessment, which automatically and quickly tabulates the results of the assessment of youth anxiety and depression?

I completely agree. It would be a creative and useful tool that would help identify cases in real time and take immediate action.

Response Analysis

The rector demonstrates a clear understanding of the problem of youth suicide in Tungurahua, recognizing its seriousness and the need for an immediate response. Although the institution has a DECE to carry out preventive activities, he recognizes that these actions are insufficient due to lack of resources and specialized personnel. It also highlights that depression and anxiety evaluations are not carried out systematically, which limits the early detection of cases. The willingness to use an automated system reflects a proactive approach to using technological solutions to facilitate diagnosis and case management. This approach highlights the need to strengthen the institutional system with tools that support prevention and comprehensive care:

Development of web applications

Firstly, a web application was implemented to evaluate the level of anxiety and depression based on the web automation of the Hamilton questionnaire, the application is linked to the web portal <https://isteinvestigaciondaw-dam.net/acerca-de>. The tools used for the development of the applications are PHP as programming language, MySQL as database, Apache as web server, Laravel was also used as development environment. The application allows user registration, makes the assessment and internally determines the level of anxiety and depression.



Figure 4. Tool main menu

Link: <https://isteinvestigaciondaw-dam.net/cuestionarios/public/dashboard>

We also developed a second web application fully supported by artificial intelligence which is based on facial recognition of emotions that incorporated a complementary algorithm to predict the level of anxiety and depression based on the results obtained in several tests.



Figure 5. Tool main menu

Link: <https://isteinvestigaciondaw-dam.net/cuestionarios/public/recono>

A third web application generated was called ISTE GPT which functions as a virtual psychologist, for which a GPT API was imported and fed with more than 30 books related to youth anxiety and depression.

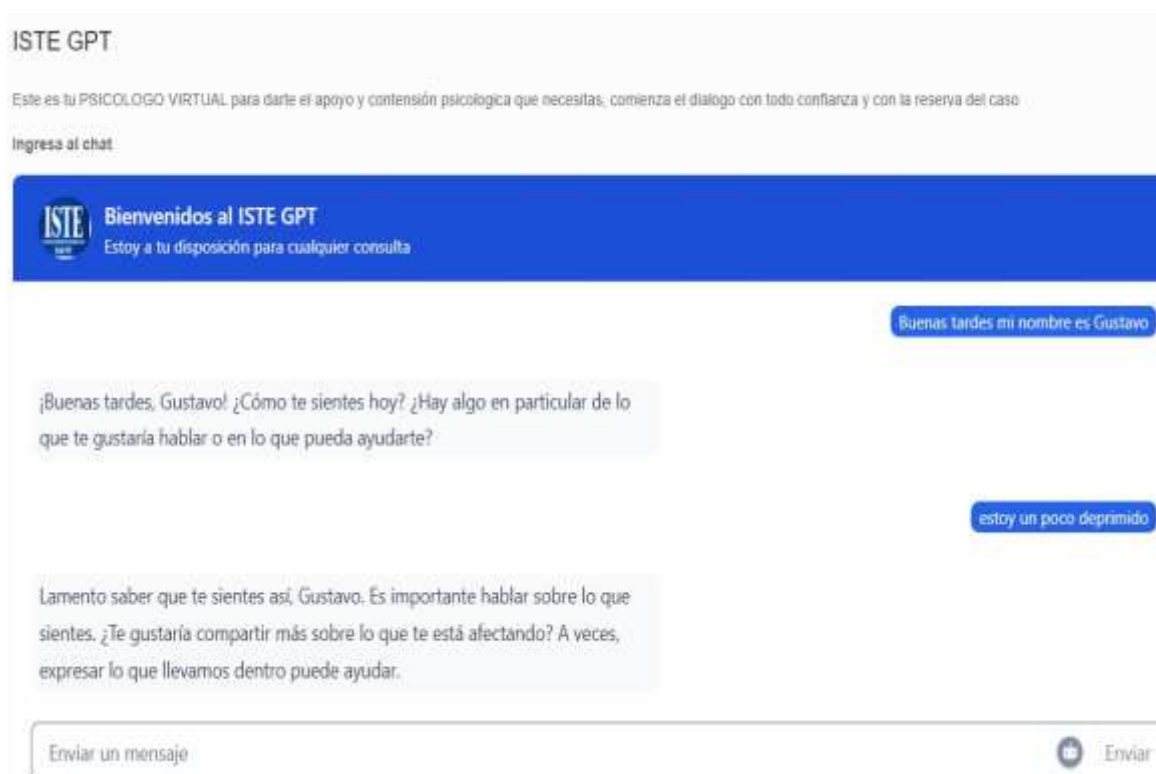


Figure 6. Virtual psychologist <https://isteinvestigaciondaw-dam.net/iste-gpt/>

Pilot test

A pilot test was conducted with the web application to assess the level of anxiety, depression and suicidal risk, with the collaboration of the Instituto España of the city of Ambato, with the participation of about 120 students with an average age between 18 and 25 years old, the results obtained in the test are as follows:

INFORME DE EVALUACIONES REALIZADAS

INS. EDUCATIVA: Instituto Superior Tecnológico España

ESCALA DE HAMILTON PARA LA DEPRESIÓN

Escala de Hamilton. Versión de JA Ramos-Brieva y A Cordero-Villafáfila

Cédula	1003665070
Nombre Completo	Gabriela Alejandra Cisneros Alvarez
Total Puntos	29
Resultado	DEPRESION MAYOR: Buscar ayuda profesional OBLIGATORIAMENTE y URGENTE y cambiar estilo de vida: Haciendo ejercicio regularmente, Dormir lo suficiente, Evitar el alcohol y las drogas Comer una dieta saludable, Pasar tiempo con seres queridos, Hacer actividades que disfrutes, Hacer técnicas de relajación, Unirse a grupos de apoyo, pensar en terapia y en medicación PERMANENTE
Cédula	1723692388
Nombre Completo	Yerry Josue Vines Moya
Total Puntos	20
Resultado	DEPRESION MAYOR: Buscar ayuda profesional OBLIGATORIAMENTE y URGENTE y cambiar estilo de vida: Haciendo ejercicio regularmente, Dormir lo suficiente, Evitar el alcohol y las drogas Comer una dieta saludable, Pasar tiempo con seres queridos, Hacer actividades que disfrutes, Hacer técnicas de relajación, Unirse a grupos de apoyo, pensar en terapia y en medicación PERMANENTE

Figure 7. Report on the Pilot Test

INFORME ESTADÍSTICO DE EVALUACIONES REALIZADAS

INS. EDUCATIVA: Instituto Superior Tecnológico España

Cantidad de personas	115
Cantidad de cuestionarios	3
Cantidad de evaluaciones realizadas	301

ESCALA DE HAMILTON PARA LA ANSIEDAD

Total evaluaciones: 100

SIN ANSIEDAD. Felicitaciones, no posees ansiedad.	43
ANSIEDAD LEVE Recomendación: Practica técnicas de relajación. Cuida tu salud física: Asegúrate de dormir lo suficiente, comer una dieta saludable y hacer ejercicio regularmente. Estos hábitos pueden ayudarte a mejorar tu estado de ánimo y reducir los niveles de ansiedad. Evita la cafeína y el alcohol	30
ANSIEDAD MODERADA Recomendación: Busca ayuda profesional, hasta tanto haz lo siguiente: Practicar técnicas de relajación, Realizar ejercicio físico de manera regular, Mantener una dieta saludable, Dormir lo suficiente, Evitar el consumo de sustancias, Cultivar relaciones sociales positivas, Aprender a manejar el estrés, Establecer límites saludables, Practicar la atención plena	11
ANSIEDAD SEVERA O GRAVE. Recomendación: URGENTE ACUDE A LA CONSULTA CON UN PROFESIONAL DE LA SALUD MENTAL	16

Figure 8. Report on the Pilot Test

4 Conclusions.

Most educational institutions in Ambato do not conduct regular assessments on anxiety, depression and suicidal risk in adolescents, which hinders early detection and timely intervention. Teachers, students and DECE staff consider that it is essential to implement preventive policies to address mental health problems in educational institutions.

Both teachers and students perceive that there are a significant number of cases of anxiety and depression in their institutions, evidencing the need for effective intervention strategies.

The lack of technological tools and specialized personnel impedes the efficient application of evaluations, which highlights the importance of implementing automated diagnostic systems.

There is a high level of acceptance towards the implementation of an automated electronic assessment system, suggesting that technology can facilitate the detection and management of these mental health problems.

Web applications are a great ally in prevention processes of these mental health problems, because early assessment can allow authorities to make timely decisions and better channel the help of psychological containment.

Web applications are a great ally in the prevention of these mental health problems, as an early assessment can allow authorities to make timely decisions and better channel psychological support.

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