International Journal of Engineering & Technology, 7(4.16) (2018) 318-320

International Journal of Engineering & Technology

Website: www.sciencepubco.com/index.php/IJET

Research paper

Suicide Risk Assessment and Prevention: A Literature Review

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Abstract

Suicide is the act of taking own life purposefully. Suicide trail aims at harming oneself with mortal intention. The behavior of the people committing suicide can be analyzed over a range of activities like thinking, setting up and committing suicide. Global study says that the second major cause for deaths today is suicide. Nearly, 71% of the deaths in women and 50% of the deaths in men these days are because of suicides. In some countries, the highest suicide rate found among the people aged above 70 years and in some countries it is more among the teenagers aged between 15 and 29.Suicidal behavior indicates deep unhappiness and sometimes mental disorder. Both factors are not necessarily dependent on each other. The objective of this study is to present the literature review on suicidal risk assessment and prevention mechanisms proposed by different researchers using data mining and machine learning techniques to minimize the suicidal rate.

Keywords: *Suicide, Risk, Assessment, Prevention, Review, Data Mining..*

1. Introduction

In India, the biggest crisis towards personal, family, and societal is Suicide. With respect to the survey report issued by WHO, 8 lakh people are dying by suicide every year which is one person for every 40 seconds. The objective of the research done was to prevent youth suicide through developing diversified programs on mental health promotion to improve positive thinking in them [1]. Huge collaboration and coordination among public as well as private sectors along with non-health sectors like agriculture, labor, education, defense, business, justice, politics, media and law is required to deal with a complex problem like suicide. A single approach may not be sufficient to handle such a composite problem. So, integrated and comprehensive techniques are required to grip the issue [6]. As mentioned in WHO's Mental Health Gap Action Programme, the basic approach to prevent suicides is assessing and managing the mental disorders. This technique requires recognizing the individual stress levels of people about to commit suicide and ways to assess and manage their mental stability [29].

Depression, hopelessness and anxiety are the three main reasons we found in almost 90% of the suicide cases. People thinking about suicides might be seeking for support and help and usually go with suicide when they feel that there is no other option for them [28] [30]. It is almost impossible to gather the quality data about suicidal behavior as many countries are stigmatizing suicides.To assess and predict the people about to commit suicide, to study the suicidal behavior and to implement various programs to prevent suicides quality data is very important. So, the quality of the data needs to be maximized to achieve accurate results [17].

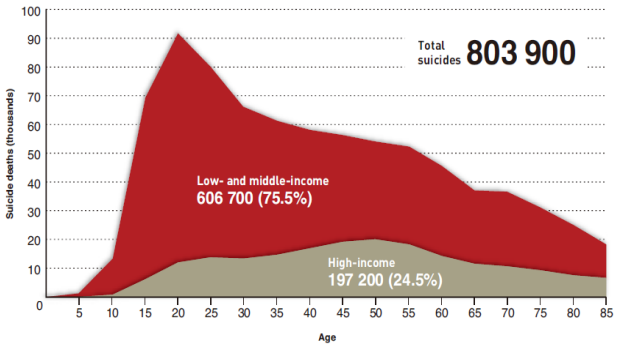

Figure 1: Global suicides by age and level of income as per 2012 census

It is clear that the suicide rate is high in males compared to females. Globally, the results proved that suicide is the second major cause for deaths among the people aged amid 15 and 29 years[17] and the suicide rate among teenagers is 8.5% of all deaths.It accounts for 4.1% of all deaths among adults aged 30−49 years. Rate of suicide accounts for 17.6% and 16.6% among young adults aged amid 15 and 29 years with respect to income [5][7].

1.1. Individual risk factors

The risk factors that lead a person to develop suicidal behavior in them may vary from person to person. Irrespective of the person mental condition, the most common risk indicator is their former suicide attempts. Once a person attempts suicide, the risk of committing suicide and self harm will be very high [15]. In addition to suicide attempt, excess use of alcohol, mental disorders,Hopelessness, Job loss, financial status, illness, biological

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factors and genetic disorders [11] are some of the risk factors that lead a person to commit suicide.
An individual's suicide tendency also increases with disaster, experiencing abuse, discrimination, conflict and violence. According to global surveys,It is assessed that pesticides was used by 30% of the people to take their lives. This was identified mostly in rural areas in in low and middleincome countries [19]. Firearms and hanging are some of the common methods to commit suicides. So, suicides can be prevented by recognizing such high-risk individuals and by supporting them with proper care [23].

1.2. Prevention strategy

Huge collaboration and coordination among public as well as private sectors along with non-health sectors like agriculture, labor, education, defense, business, justice, politics, media and law is required to deal with a complex problem like suicide. A single approach may not be sufficient to handle such a composite problem [13].
Today, 28 countries introduced many new policiesto prevent suicides. International Association for Suicide Prevention declared September 10 as World Suicide Prevention Day and organized many events on that day as an initial step to reduce suicide tendency in individuals [14][22].

Suicides can be prevented to some extent by identifying and targetingsusceptible groups [9];by increasing awareness among public through campaigning and education; by assessing and managing the accurate suicidal behavior; bypromoting individual protective factors;by improving societal beliefs and by minimizingdisgrace towards people with mental disorders or who exhibit suicidal behaviors[18] ;by reducing the free access to firearms and pesticides;by supporting the right individuals at right time by assessing and realizing their suicidal intentions through behavioral or verbal signs;by conducting proper counseling sessions to the needy people [4].

Data-centric approach such as knowledge discovery or data mining is one of popular method which has gained a lot of attention in many areas. Data mining applies mathematical, statistical, machine learning and artificial intelligence techniques to extract hidden patterns from large databases. The following section reports the research works done on how the data mining techniques can be successfully applied in assessing the risk of suicidal factors and preventing them [26].

2. Literature Survey

According to WHO, Mental Health Action Plan initiated various suicide prevention techniques with an objective of minimizing the suicide rate to 10% by 2020 [14]. Research on predicting suicide with some traditional methods in the international wide are reported in the literature. Few of the works related to study summarized below:
SuselGóngora Alonso et al., proposed that Data mining techniques can be applied to improvise the quality of patients life who are fighting against diseases like depression, schizophrenia and dementia [1]. Bachmann et al., proposed a method to distinguish multiple single-channel measures (Electro Encephalo Graphic) to detect depression levels in individuals. The study proved that single measures alone are not sufficient to assess the depression levels. So, a technique was introduced to combine multiple measures thus forming the multichannel EEG analysis to generate accurate depression levels [2]. Hollingsworth et al., presented a novel risk factor that is leading the young students to take their lives. The young students taking unnecessary burden in managing studies and societal relationships and treating suicide is the only option for them to avoid the issues. Prevention methods are very much necessary to minimize suicide tendency among these teens [3]. Bisson, K. H et al., gathered student information such as GPA, depression as well as anxiety indications, GPA and social support. The data thus collected was analyzed and it was found that the sample mean on both anxiety and depression was betweenthe normal and mild range. In the case of social support, the results proved that 9.7%, 32.2%, 58.1% students had low, moderate and high support respectively. To establish the relation amid dependent,independent, and moderating variables a linear regression was utilized. A considerable connection was foundbetween GPA, social support and depression [8].
Franco De Crescenzo et al., proposed a new technique to use BD and MDD to diagnose suicide tendency among children and teenagers. The technique was applied on 2,303 people aged amid 3 and 18 years from South Korea and US and it was identified that most of these children are suffering from mood disorders. Studies conducted on suicide ideation and attempts were compared and analyzed and found that diagnosis will appreciably help in minimizing suicide rates [10]. Amini. P. et.al., proposed various classification techniques like DT, SVM, LR and ANN to predict the major factors that are influencing the people in committing suicides. The author compared all these four method and recommended SVM as the best classifier technique. SVM enables the policy makers to assess suicide risk factors accurately.The experiment results also proved that SVM yields accurate results compared to LR, k-nearest, DT, c4.5 [14].

Cook et al., proposed an alternative technique to data monitoring systems which uses traditional techniques in resource gathering. The author presented a low cost technique which comprises NLP(Natural Language Processing) with machine learning prediction methods to forecast suicide risks. NLPtechnology helps in identifying the people with suicide intentions and thus it supports in preventing the suicide risk by supporting and counseling the persons about to commit suicide at right time [16]. Acharya U.R. et al., implemented an automated EEG-based diagnosis system using nonlinear methods to assess the depression rates. This approach uses EEG recordings to compute DDI(Depression Diagnosis Index) automatically. Applying this technique the depression levels can be calculated utilizing a single numeric value.Nonlinear techniques are used to generate the values which are further graded using t value and sent as input to Support Vector Machine classifier. The experimental results proved that SVM classifiersucceeded in yielding 98%, 97%, 98.5%results with respect to accuracy, sensitivity and specificity correspondingly [20].

James M Bolton et. al., discussed various mental disorders. This paper presented how the advancements in science help in assessing and preventing suicide risks. It also covered how the people with different mental disorders can be clinically treated [21]. Bernert et.al., presented a survey report conducted on various clinical practices available to identify and assess suicide risks as well as the techniques to prevent these risks [24]. Chakraborty, R et al., offered a study stating that long time is required to treat Schizophrenia patients with SUDs.Added depressive symptoms are found in these patients and at least a follow up of six weeks is required to treat these patients [25].
Dr. HameedaShaheen et al., presented a novel technique in which all the students are categorized in to two groups. One group of students who prefer to be lonely and another group of students who are well being. 90 students aged amid 13 and 17 years were considered from these groups and a sample survey was conducted. The results revealed that the students who prefer to be alone are mostly suffering from negative impacts compared to students who are well being. So, identifying such students at an early step helps in reducing suicide risks [27]. BehshadHosseinifard et al., implemented a novel technique to discriminate normal subjects from depressed patients by utilizing nonlinearanalysisofEEG.This technique enables the psychiatrists to diagnose the depressed patients [31].

3. Conclusion

With timely and evidence-based interventions suicides are avoidable.Restricting the access to the most frequent means like pesticides, some medicines and firearms is one of the important strategies to prevent suicides. Globally, excess usage of alcohol and mental disorders found to be the major reasons behind most of the suicides today. So the suicides can be prevented to certain extent by prior identification of factors related with suicidal behavior and by supporting the people with utmost care they need. Individuals also require social support to fight with mental disorders and depression [31].Suicides can also be averted by improving surveillance and by monitoring the suicide indications as well as attempts.Awareness campaigns should be periodically conducted to promote mental health.Research studies showed that the relationshipamid cultural, biological, social, psychological and environmental factors is very important in assessing suicidal behaviors [12].

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