

Risk Assessment of Repeated Suicide Attempts Among Youth in Saudi Arabia

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Introduction: Although the incidence of suicide attempts continues to increase among youth in Saudi Arabia, no risk assessment tool has been established for suicide attempt repetition in the country's youth population. The objective of the study was to develop risk assessment of suicide attempt repetition among youth in Saudi Arabia.

Methods: This is a retrospective study of youth (10–24 years) with intentional suicide attempt(s) who presented to the emergency departments (ED) at King Abdullah Specialist Children's Hospital (KASCH) and King Abdulaziz Medical City-Riyadh (KAMC-R), Saudi Arabia between 1 January 2015 and 31 December 2017. We excluded youth having unintentional suicide attempts. Data were retrieved for the 157 eligible as having attempted suicide.

Results: Forty-one of 157 (26.1%) had repeated suicide attempts (95% confidence limits: 19.433–37.7%). Four independent factors were identified that were associated with an increased risk of repeated suicide attempts: age (adjusted odds ratio [aOR] = 1.147, 95% confidence interval (CI) = 1.015–1.297, P=0.028), family problems (aOR = 4.218, 95% CI = 1.690–10.528, P=0.002), psychiatric disorders (aOR = 3.497, 95% CI = 1.519–8.051, P=0.003), and hospitalization (aOR = 5.143, 95% CI = 1.421–18.610, P=0.013). This risk model showed adequate utility with an area under the receiver operating characteristic (ROC) curve (AUC): 77.9%, 95% CI: 69.486–86.3% with optimism-corrected AUC = 71.8%. Youden index defined a probability of ≥ 0.38 to predict a high risk of repeated suicide attempts.

Conclusion: The risk of repeated suicide attempts among Saudi youth was high, compatible with what has been reported among youth in England and in France. Age, family problems, psychiatric disorders, and hospitalization are risk factors for repeated suicide attempts. A prevention program for suicide attempts in youth may take into account family problems, screening for psychiatric disorders, and suicidal behavior.

Keywords: repeated suicide attempts, psychiatric disorders, family problems, youth

Introduction

High rates of suicide have been reported in Saudi Arabia, particularly among the youth population.¹ The increasing rates of suicide during the youth years highlight the vital need for understanding factors and causes associated with suicide and suicide attempts.^{2–5} We recognized the importance of addressing youth health risks in order to prevent youth suicide attempts and improve health strategies for this group.

A suicide attempt is a strong predictor for subsequent attempts among the youth population.⁶ The subsequent attempts or repeated suicide attempts were common in the younger age groups, 12% among adolescents in the USA,⁷ nearly 15% among

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adolescents aged under 15 years in France,⁸ and 27.3% among children and adolescents aged 10–18 years in England.⁹ The rate of suicide attempts has not been studied in youth or adult populations in Saudi Arabia.

In international studies, the risk of repeated suicide attempts increases with age,⁹ family functioning,⁷ and psychiatric disorders.^{7–13} A study from Korea reported additional factors associated with the high risk of suicide attempts such as experience of violence, sleep duration, alcohol drinking, and cigarette smoking.¹⁴

The available assessment tools for measuring suicidal behavior and risk of suicide may not be adequate in predicting repeated suicide attempts in populations influenced by society and culture factors.¹ In a large cross-country study of university students, Saudi Arabia has one of the world's lowest scores of social acceptance for a suicidal friend.⁵

The suicide risk screening could be useful in clinical and academic settings, as it can identify individuals at risk for future suicides and implement intervention programs. Data establishing risk assessments of repeated suicide attempts among youth with the first suicide attempt are urgently needed because they can help stratify youth who are at high risk of future suicidal behavior. Findings would be useful to reduce and prevent repeat suicidal behavior by providing early supportive care.

The authors used a retrospective design to address research questions regarding the association between demographic data, family problems, work or school problems, hospital admission, family history of suicide, substance abuse, physical or sexual abuse, psychiatric disorder, methods of self-harm, chronic disease, and the risk of repeated suicide attempts among youth in Saudi Arabia.

This study purpose was to develop risk assessment of suicide attempt repetition among the youth population who presented to the emergency departments (ED) at King Abdullah Specialist Children Hospital (KASCH) and King Abdulaziz Medical City-Riyadh (KAMC-R), Saudi Arabia.

Methods

A retrospective study was made on all emergency department (ED) visits of patients who had made suicide attempt (s) and who presented to two ED centers at KASCH and KAMC-R between 1 January 2015 and 31 December 2017. Both emergency departments (EDs) assessed all medical emergencies of children and adults of the

Ministry of National Guard Health Affairs (MNG-HA) population. Ethical approval was obtained by the Research Ethics Committee with MNG-HA approval #RC18/019/R. The committee granted exemption of informed consent and publication consent due to the study design nature. Patient privacy and protection regulations were followed, in accordance with the Declaration of Helsinki.

The study population has been defined as youth of ages between 10 and 24 years with at least one suicide attempt who were treated at the MNG-HA. A suicide attempt has been defined as self-harming behavior with clearly intentional suicide.¹¹ The authors excluded unintentional self-poisoning or self-harm such as food poisoning and accidental self-injury.

The authors retrieved data from electronic medical records. The MNG-HA had implemented a new electronic medical system in 2015.¹⁵ Data included gender, age, marital status, hospitalization, family history of suicide, comorbidity, and methods of self-harm (self-poisoning or violence). Self-poisoning methods include medication and its dose, and chemicals such as Clorox. Violent methods include hanging, jumping from heights, and gunshot injuries. Data is gathered for each cause of suicide attempt, such as family problems, work or school problems, physical or sexual abuse, substance abuse, and psychiatric disorders.

The medical record of each suicide attempter was reviewed for repetition for a minimum period of one year after presentation with the suicide attempt. The outcome of this study was the number of suicide attempts (1, 2, 3, etc.). For the purpose of modeling, we reclassified the outcome into a single suicide attempt (# reattempts = 1, encoded as “0”) and repeated suicide attempts (# reattempts ≥ 2 , encoded as “1”).

Statistical Analysis

Analyses were performed using Stata 12 software (StataCorp, College Station, TX, USA). Unavailable data are treated as missing data in all of the analyses. Sample characteristics of patients with suicide attempts are presented in Table 1 using count and percent. The mean and standard deviation (\pm SD) were used to analyze the ages of those who attempted suicide. The prevalence of acetaminophen toxicity was calculated and reported with 95% confidence limits. The study used the criteria of the United States Food and Drug Administration to define the risk of acetaminophen

Table 1 Characteristics of Patients with Attempted Suicide (N=157)

Characteristics	Levels	n	%
Female	No	37	23.6
	Yes	120	76.4
Married	No	26	16.7
	Yes	130	83.3
Family problems	No	77	49.0
	Yes	80	51.0
Work or school problems	No	142	90.4
	Yes	15	9.6
Hospital admission	No	143	91.1
	Yes	14	8.9
Family history of suicide	No	151	96.2
	Yes	6	3.8
Substance abuse	No	147	93.6
	Yes	10	6.4
Physical or sexual abuse	No	139	88.5
	Yes	18	11.5
Psychiatric disorder	No	110	70.1
	Yes	47	29.9
Methods of self-harm	Violent	10	6.4
	Self-poisoning	147	93.6
Chronic disease	No	136	86.6
	Yes	21	13.4
Repeat suicide attempt	No	116	73.9
	Yes	41	26.1

toxicity, in which the daily therapeutic dose exceeded 4000 milligrams.¹⁶ Simple binary logistic models were used to examine the unadjusted effect of patients' characteristics on repeat suicide attempts (Table 2). A stepwise multivariate binary logistic model ($\alpha=0.05$) was used to identify the significant adjusted effect of patients' characteristics on repeated suicide attempts (Table 3). The goodness of fit was evaluated by the Hosmer and Lemeshow test. The predictive accuracy of the model was summarized by the area under the curve (AUC), specificity, and sensitivity. The risk assessment tool was internally validated in 200 samples "with replacement" using a bootstrapping technique, and summarized with optimism-corrected AUC.^{17,18} Youden's J index algorithm was applied to define optimal cutoff probability.^{18,19,20}

Results

We analyzed 157 patients with suicide attempts whose mean age was 17.84 ± 3.71 years (10–24 years), of which 75.4% were females. Family problems (51.0%) were a common cause of suicide attempts in our sample, and 11.5% cited physical or sexual abuse. Non-violent methods of attempted suicide were common in this population, accounting for 93.6% (Table 1). Violent suicide attempts were found in 10 cases in which 3 were hanging, 3 jumping, and 4 cutting skin. Alcohol use was found in 2 cases. No deaths were reported in our sample. The frequency of repeat suicide attempts was 41/157 (26.1%) with 95% CI (19.433.7%). Of the sample, 47 patients with suicide attempts had a psychiatric disorder, and of these, 30 (63.8%) had depression, 5 (10.6%) had schizophrenia, 3 (6.4%) had a generalized anxiety disorder, and 2 (4.3%) were bipolar.

The most frequent drugs involved in overdose suicide attempts were: acetaminophen 63 (43.8%), ibuprofen 12 (8.3%), oral hypoglycemic agents 7 (4.8%), metformin 6 (4.2%), and citalopram 6 (4.1%). Of 63 acetaminophen overdose cases, 56 had the available therapeutic dose (minimum = 1000 and maximum = 20,000 milligrams per day) of which 12 cases were non-toxic with doses of ≤ 4000 mg. The prevalence of acetaminophen toxicity (doses exceeded 4000 milligrams per day) was 44/56 (78.6%) with 95% CI (65.688.4%).

A bivariate analysis (Table 2) assessed the unadjusted effect of patient characteristics on repeated suicide attempts. Hospital admission to manage suicide attempts (odds ratio [OR] = 6.244, 95% CI: 1.954–19.953, $P=0.002$), family problems (OR = 2.651, 95% CI: 1.249–5.627, $P=0.011$), and psychiatric disorders (OR = 4.215, 95% CI: 1.978–8.983, $P=0.001$) were associated with higher odds of repeat suicide attempts.

A stepwise multivariable binary logistic model (Table 3) calculates the adjusted odds [aOR] of repeat suicide attempts. The risk of repeat suicide attempts increases with age (aOR = 1.147, 95% CI = 1.1015–1.297, $P=0.028$). Patients with suicide attempts who had inpatient services to manage suicide attempts had greater adjusted odds of repeat suicide attempts (aOR = 5.143, 95% CI = 1.421–18.610, $P=0.013$). Family problems were associated with significantly higher adjusted odds of repeat suicide attempts (aOR = 4.218, 95% CI = 1.690–10.528, $P=0.002$). Psychiatric disorders were associated with a

Table 2 Bivariate Analysis: Factors Associated with Increased Risk of Repeat Suicide Attempts (N=157)

Factor	B	SE	z	P	OR	95% CI	
						LCL	UCL
Age	0.098	0.051	1.920	0.055	1.103	0.998	1.220
Female	0.123	0.435	0.280	0.777	1.131	0.482	2.655
Single	-0.691	0.453	-1.530	0.127	0.501	0.206	1.216
Family problems	0.975	0.384	2.540	0.011*	2.651	1.249	5.627
Work or school problems	0.387	0.581	0.670	0.505	1.472	0.472	4.595
Hospital admission	1.832	0.593	3.090	0.002*	6.244	1.954	19.953
Family history of suicide	0.362	0.886	0.410	0.683	1.436	0.253	8.149
Substance abuse	0.206	0.715	0.290	0.773	1.229	0.303	4.995
Physical or sexual abuse	0.944	0.515	1.830	0.067	2.570	0.937	7.044
Psychiatric disorder	1.439	0.386	3.730	0.001*	4.215	1.978	8.983
Methods of self-harm - Self-poisoning	-0.684	0.673	-1.020	0.309	0.505	0.135	1.887
Chronic disease	-0.141	0.548	-0.260	0.796	0.868	0.297	2.541

Note: *Significant at $\alpha = 0.05$.

Table 3 Stepwise Analysis: Independent Factors Associated with Increased Risk of Repeat Suicide Attempt (N=157)

	B	SE	Z	P	aOR	95% CI	
						LCL	UCL
Age	0.137	0.063	2.190	0.028*	1.147	1.015	1.297
Hospital admission	1.638	0.656	2.500	0.013*	5.143	1.421	18.610
Family problems	1.439	0.467	3.080	0.002*	4.218	1.690	10.528
Psychiatric disorder	1.252	0.426	2.940	0.003*	3.497	1.519	8.051
Constant	-5.001	1.318	-3.800	0.001*	0.007	0.001	0.089

Note: *Significant at $\alpha = 0.05$.

greater adjusted odds of repeat suicide attempts (aOR = 3.497, 95% CI = 1.519–8.051, P=0.003).

The model achieved high accuracy (AUC 77.9%, 95% CI: 69.486.3%) compared to the accuracy of the individual factors (Figure 1). The model fit was acceptable, Hosmer

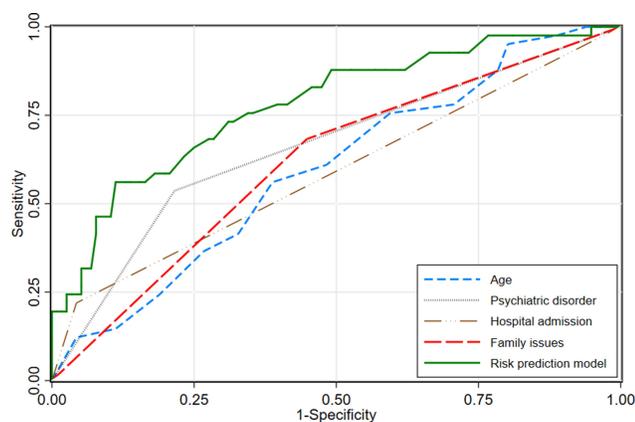


Figure 1 The risk prediction model achieved high accuracy (AUC 77.9%, 95% CI: 69.486.3%) compared to the accuracy of the individual factors.

and Lemeshow P=0.898. In 200 bootstrap resamples, the AUC was 76.1% with mean optimism of 0.96% and SD 4.3%. The corrected estimate of discriminatory power was 76.14.3% = 71.8%. Youden index identified an optimal probability of 0.38 as a cutoff to classify the risk of repeated suicide attempts, which produced a specificity of 88.8% and sensitivity of 56.1%.

Discussion

The primary purpose of the study was to assess the repetition of suicide attempts among youth in Saudi Arabia with ages between 10 and 24 years. Studies estimating the rate of repeated suicide attempts and defining its factors among youth with this specific age group are limited worldwide. The investigation found that repeat suicide attempts are common among youth in Saudi Arabia, 26.1% of 157 had repeated suicide attempts during our review period. This is compatible with what has been reported at 27.3% among youth aged 10–18 years in England and 30% in France.^{9,21} There is a need for the MNG-HA to apply strategies such

as monitoring youth with suicide attempts to manage suicidal behaviors and future self-harm thoughts. Those handling the first efforts of prevention may consider identifying high-risk youth with establishing risk assessment for repetition of suicide attempts, because a history of suicide attempts is a strong predictor of suicide and subsequent suicide attempts.^{22,23}

According to our risk assessment, four factors were identified as being associated with greater odds of repeated suicide attempts among youth. Unlike Vajda et al,²⁴ findings are consistent with Hawton et al,⁹ and our study revealed that the risk of suicide attempt repetition increases with each youth's age.

In accordance with international literature,⁷⁻⁹ youth with psychiatric disorders are at greater risk for repeat suicide attempts. The study population reported a high prevalence of psychiatric disorders, where depression was the most frequent condition. Screening for psychiatric disorders in youth with suicide attempts must be a priority to reduce the risk of subsequent attempts.

Youth with family problems are at greater risk of repeat suicide attempts. This is in line with a previous study that reported family functioning as a risk factor for suicide attempts in children and adolescent populations.⁷ Adequate management of the causes of suicide attempts (such as family problems), and using counseling and education, could play a role in preventing repetition of suicide attempts. We found that hospital admission was a risk factor for repetition of suicide attempts in youth with suicide attempts. This could be due to the seriousness of the attempt which may require medical hospitalization.²⁵ Patients admitted to a hospital due to suicide attempts may require assessment of future suicidal behaviours and counseling during admission and after discharge from the hospital to reduce the risk of repeated suicide attempts.

In agreement with two studies,^{26,27} the present investigation showed acetaminophen is one of the most widely utilized drugs among youth for self-poisoning. This could be due to the availability of acetaminophen in most homes, and availability without prescription. A prevention strategy of repeated suicide attempts may consider raising awareness to understand possible usage of acetaminophen as a self-poisoning agent.

There are very few earlier studies on repetition of suicide attempts and its risk assessment worldwide. The risk assessment takes into account consistent risk factors for repetition of suicide attempts.⁷⁻⁹ It may help emergency departments at the MNG-HA to strategize if youth have an increased risk of repeated suicide attempts.

Limitations

Several issues may limit our findings: The sample was based on retrospective data from a single center in which findings cannot be generalized and associations do not indicate causation. Data on valuable clinical presentations such as vomiting, abdominal pain, etc. were not collected. The study revealed a high percentage of toxicity, but unfortunately, clinical outcomes such as liver damage due to paracetamol poisoning were not gathered. The three-year study is limited by the small sample size of those who attempted suicide. External validation is needed in a prospective cohort of patients with suicide attempts.

Conclusion

The risk of repeated suicide attempts among Saudi youth was high, compatible with what has been reported among youth in England and in France. Older youth, family problems, psychiatric disorders, and hospitalization are risk factors for repeated suicide attempts. A prevention program for suicide attempts in youth may take into account family problems, screening for psychiatric disorders, and suicidal behavior. Studies are needed to address the impact of early screening for suicide in this age group on youth wellbeing.

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Disclosure

The authors declare that they have no competing interests for this work.

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