Kesmas

Volume 19
Issue 4 *November 2024*

Article 1

11-29-2024

Early Detection of Risk Factor for Suicidal Ideation Among Senior High School Students in Jakarta: Updated Measurement

Nova R. Yusuf
National Center for Mental Health Indonesia, Marzoeki Mahdi Hospital, Bogor,
noriyu.psychiatrist@gmail.com

Sabarinah Prasetyo
Universitas Indonesia, Depok, sabarinahprasetyo@gmail.com

Byron J. Good
Harvard Medical School, Boston, byron_good@hms.harvard.edu

Recommended Citation

Yusuf NR , Prasetyo S , Good BJ , et al. Early Detection of Risk Factor for Suicidal Ideation Among Senior High School Students in Jakarta: Updated Measurement. *Kesmas*. 2024; 19(4): 223-232
DOI: 10.21109/kesmas.v19i4.1089
Available at: https://scholarhub.ui.ac.id/kesmas/vol19/iss4/1

Yusuf *et al. Kesmas: Jurnal Kesehatan Masyarakat Nasional (National Public Health Journal)*. 2024; 19 (4): 223-232
DOI: 10.21109/kesmas.v19i4.1089

Kesmas: Jurnal Kesehatan Masyarakat Nasional (National Public Health Journal)

Early Detection of Risk Factor for Suicidal Ideation Among Senior High School Students in Jakarta: Updated Measurement

Nova Riyanti Yusuf[1], Sabarinah Prasetyo[2*], Byron J. Good[3]

[1]National Center for Mental Health Indonesia, Marzoeki Mahdi Hospital, Bogor, Indonesia
[2]Department of Biostatistics and Population Studies, Faculty of Public Health, Universitas Indonesia, Depok, Indonesia
[3]Harvard Medical School, Boston, USA

Abstract

The key strategy to address suicide in adolescents is school-based suicidal prevention by adapting a screening instrument to the local culture and policymakers' perception of suicide. This study aimed to develop an instrument for the early detection of risk for suicidal ideation and identify influential risk factors for suicidal ideation among high school students in Jakarta, Indonesia. This study was conducted in 2018 with a mixed-method design (quantitative and qualitative approaches). It was found that 5% of students had suicidal ideation in July–November 2018, and 13.8% had a high-risk factor for suicidal ideation. The instrument developed in this study consisted of 16 items and had been proven valid and reliable for screening. Students with depression and those screened positive utilizing the developed instrument had 4.41 and 5.39 times the risk of developing suicidal ideation. A recommendation to the counseling teacher associations is to reduce suicidal stigma, encourage students to be open to talking about mental health issues, and prioritize adolescents at risk of suicide for further assessment.

Keywords: early detection, high school students, instrument, suicidal ideation

Introduction

Adolescents are the youth aged 10-19 years, while "youth" is defined as those aged 10 to 24 years. During adolescence, changes in physical maturity occur, particularly in the reproductive organs, followed by mental and social conditions changes.[1] According to the United Nations Children's Fund (UNICEF) in 2016, adolescent mortality slightly decreased from 126 deaths per 100,000 population in 2000 to 111 per 100,000 population in 2012.[2] World Health Organization (WHO) in 2017 noted that the top causes of death in male adolescents aged 15–19 years were traffic accidents, interpersonal violence, and self-harm; while, in female adolescents, the causes were maternal conditions and self-harm.[3]

According to the 2017 WHO Global Health Estimates, the highest global death rate from suicide in low and middle-income countries is at the age of 20. However, the WHO points out that many countries fail to make accurate counts of suicides, including Indonesia. Based on WHO Suicide Mortality Rate data, the reported suicide rate in Indonesia is only 3.4 suicide cases per 100,000 population, which is clearly an underreported figure.[4] A study by the Global School-based Student Health Survey (GSHS) in 2015 involving 10,837 junior and senior high school students resulted in 5.2% having suicidal ideation, 5.5% having a suicide plan, and 3.9% having attempted suicide.[5] A preliminary study with the Indonesian Ministry of Health purposively collected data from 1,014 adolescent respondents in the 10th and 11th grades in Jakarta who were frequently involved in trouble, such as brawls.

Screening using the Children's Depression Inventory (CDI) instrument showed that 30% of adolescents had potential depressive disorders, with 19% contemplating suicide but not committing it, and 1% committing suicide.[6] Another study

***Correspondence**:* *Sabarinah Prasetyo, Department of Biostatistics and Population Studies, Faculty of Public Health, Universitas Indonesia, Depok, Indonesia.*
Email: sabarinahprasetyo@gmail.com, Phone: +62 816-953-885

Received : February 8, 2024
Accepted : July 15, 2024
Published: November 29, 2024

identified that adolescents in urban areas were 1.66 times more likely to have suicidal ideation than those in rural areas.[7] A-accredited schools have a more positive and protective climate as a "safety net" that helps at-risk students from developing physical and mental health problems. On the other hand, A-accredited schools can serve as a protective net for adolescents at risk of suicidal ideation.[8]

Suicide can be prevented by reducing risk factors and increasing factors strengthening resilience or coping skills.[9] One of the key strategies to address suicide in adolescents is a school-based suicide prevention and intervention program. Screening instruments should be adapted to the local culture and policymakers' perception of suicide.[10] In 2015, the Indonesian Ministry of Health developed the Evaluation of Mental Health Case Services/*Evaluasi Pelayanan Kasus Kesehatan Jiwa* (EPK2J) instrument to measure adult suicidal tendencies. However, various literature shows that there are differences in risk factors for suicide between adolescents and adults.

A previous study was conducted to develop an instrument for adolescent's early detection of risk factors for suicidal ideation, but further study is needed to generate better validity and reliability levels.[11] Therefore, this study was a follow-up study to develop the instrument for early detection of risk factors for suicidal ideation adapted for adolescents. This instrument is expected to be utilized by the provincial government of Jakarta for early prevention of suicidal ideation through a screening process and various recommendations for stakeholders. Apart from that, this study aimed to determine risk factors for suicidal ideation among adolescents in high schools in Jakarta.

Method

This study applied step-wise qualitative and quantitative or mixed methods with a cross-sectional approach. The population in this study was all high school students in Jakarta by 2018, while the sample consisted of A-accredited high school students in Jakarta from 2013 to 2018. The inclusion criteria for this study were the A-accredited high school students aged 14-19 years in Jakarta. This study obtained 910 respondents from five public senior high schools and five public vocational high schools that were selected by stratified random sampling.

This study used a three-stage approach. The first stage was a qualitative approach in the form of a document study (to explore the risk factors for suicidal ideation of secondary school-aged adolescents), focus group discussion I (FGD I), and instrument drafting. The FGD I was managed by a group of experts in the process of modifying the EPK2J instrument into a derivative instrument that could be utilized in a self-report manner for adolescents. There were two validation processes: content validity to obtain input from subject field experts and face validity to obtain input from target experts.

The second stage was a quantitative study with instrument testing to produce a validated instrument for early detection of risk for suicidal ideation with the number of samples depending on the item numbers. Furthermore, construct validity with a factor analysis and reliability tests were also carried out to produce a simple, valid, and reliable instrument for early detection of risk factors for suicidal ideation in adolescents. This study used Exploratory Factor Analysis (EFA) to explore the relationship between several variables without determining the number of factors to be formed. The next phase was Confirmatory Analysis (CFA), with results illustrating theoretical constructs' convergence and discrimination validity.

Measure of Sampling Adequacy (MSA) and Kaiser-Meyer-Olkin (KMO) tests were conducted to determine the sample's adequacy for factor analysis. The KMO test tests sample adequacy and correlation by excluding collinear variables. The KMO value ranges from 0-1, and factor analysis is feasible if in the range of 0.5-1.0. The correlation strength test in factor analysis is determined from Barlett's test. It can also be seen from the Anti-image Correlation table if no MSA value is found.

After selecting several variables, they were extracted as one or several factors. Variables could be included in a factor if the factor loading >0.5 in the communalities table, explaining the proportion of variance of each variable in the factor to be formed. Then, it continued with the rotation stage when the factors formed did not describe differences between existing factors. Criterion validity was also tested by conducting a Receiver Operating Characteristic (ROC) analysis that describes the relationship between the observed and the predicted class through a curve or Area Under Curve (AUC) with a limit value of 0.5. The instrument is considered reliable if the Cronbach's Alpha value is >0.70.

In the quantitative approach, descriptive, bivariate, and multivariate analyses were also conducted using Poisson regression. The Patient Health Questionnaire-9 (PHQ-9) instrument was used to determine the severity of a student's depression. The research data results are presented in tables and figures to compare the validity and reliability values between the questionnaires with 27 and 16 items. In addition, the analysis of risk factors for suicidal ideation is also

presented in the form of tables containing the frequencies, percentages, and OR generated.

The qualitative method was applied again in the third stage through an FGD II with a group of cross-sector and cross-program informants to explore policies related to the potential utilization of early detection instruments of risk factors for suicidal ideation at the school level. The purpose of this FGD II was to make recommendations for the implementation of instruments for early identification of factors placing adolescents at high risk for suicidal ideation at the school level.

Results

Instrument Development Using a Qualitative Approach

FGDs were conducted in two stages. The FGD I conducted with three child and adolescent psychiatry consultants, one clinical psychologist, two psychiatrists, one methodological expert, three psychologists, and one activist. Meanwhile, FGD II was conducted with 12 cross-sector (government and non-governmental organizations) participants. The FGD I was conducted by focusing on the content and face validity of the instrument to be developed. The modified EPK2J instrument was reduced from 28 items to 27 items (19 unfavorable and 8 favorable statements). The FGD I also decided on the utilization of the PHQ-9-Adolescent instrument to be translated and validated as an instrument to assess the severity of depression among adolescents. A simple questionnaire on Psychosocial Stressors was also collaboratively developed to be used and validated during data collection.

Instrument Development with a Quantitative Approach

After the process focused on content and face validity through FGD I, the construct validity process was carried out and presented in Table 1.

Table 1. Example of the Table Construct Validity Test Using Factor Analysis and Reliability Test on Early Detection for Suicidal Ideation Risk Factors Instruments

Indicator	27 Items (KMO & Barlett's test = 0.927)				16 Items (KMO & Barlett's test = 0.931)			
	Factor Analysis			Reliability	Factor Analysis			Reliability
	Anti-Image	Communalities	Loading Factor	α-Cronbach If Item Deleted	Anti-Image	Communalities	Loading Factor	α-Cronbach If Item Deleted
C1	0.933	0.658	0.653	0.904	0.927	0.730	0.786	0.902
C2	0.927	0.689	0.696	0.903	0.918	0.749	0.766	0.900
C3	0.941	0.610	0.689	0.904	0.936	0.731	0.772	0.901
C4	0.946	0.505	0.622	0.905	0.944	0.614	0.549	0.903
C5	0.953	0.594	0.689	0.903	0.947	0.622	0.567	0.901
C6f	0.905	0.489	0.474	0.907	0.862	0.681	0.588	0.909
C7f	0.904	0.554	0.498	0.907	0.925	0.779	0.815	0.908
C8f	0.912	0.458	0.508	0.908	0.879	0.758	0.846	0.910
C9	0.934	0.579	0.583	0.905				
C10	0.918	0.485	0.555	0.906				
C11f	0.882	0.460	0.442	0.907				
C12f	0.877	0.399	0.493	0.909				
C13	0.732	0.723	0.532	0.910				
C14f	0.881	0.392	0.514	0.909				
C15f	0.751	0.721	0.687	0.909				
C16	0.911	0.571	0.577	0.905				
C17f	0.916	0.279	0.399	0.909				
C18	0.965	0.558	0.722	0.902	0.949	0.626	0.659	0.901
C19	0.952	0.525	0.679	0.904	0.957	0.625	0.726	0.902
C20	0.963	0.555	0.717	0.903	0.949	0.638	0.611	0.901
C21f	0.802	0.335	0.328	0.912				
C22	0.956	0.512	0.674	0.904	0.949	0.669	0.753	0.902
C23	0.944	0.536	0.646	0.904	0.940	0.631	0.606	0.902
C24	0.919	0.588	0.623	0.905	0.906	0.728	0.794	0.904
C25	0.919	0.655	0.671	0.904	0.903	0.771	0.808	0.902
C26	0.949	0.633	0.678	0.904	0.935	0.676	0.715	0.902
C27	0.946	0.410	0.457	0.908				

Notes: KMO = Kaiser–Meyer–Olkin, α-Cronbach= 0.909

KMO, MSA, Communalities, and Loading Factor values are eligible if the value is >0.5. The table shows that the KMO & Barlett's test in both models produces a value of 0.927 for the 27-item model and 0.931 for the 16-item model. All indicators in both models also generated a value of >0.5. Communalities and Loading Factor values on all 16-item model

indicators met the requirements with a value range of 0.61–0.779. In contrast, in the 27-item model, the Communalities value on eight indicators and the Loading Factor value on two indicators are still worth <0.5. Cronbach's Alpha value, if items are deleted, shows a value of >0.9 on all indicators of both models (Table 1).

Criterion validity was assessed using ROC. The ROC classification accuracy was done by calculating the AUC. In Figure 1, the AUC value of the 27-item model is 0.837 and 0.826 for the 16-item. AUC values in the good category were generated in both models.

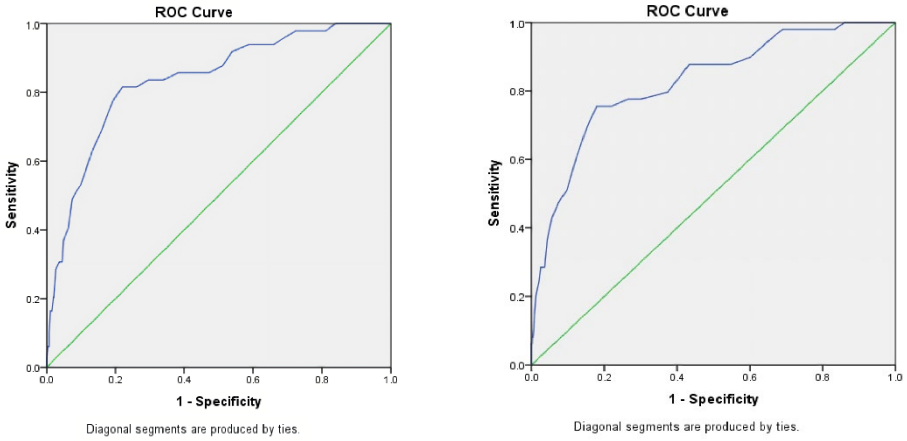

Figure 1. Receiver Operating Characteristic Curve of Early Detection for Suicidal Ideation Risk Factors Instruments to Suicidal Ideation

Table 2. Grouping of Item Components for Early Detection of Suicide Ideation Risk Factors Instrument

Indicator	27-Item Model's Component					16-Item Model's Component				
	1	2	3	4	5	1	2	3	4	5
C1	0.779	0.166	0.076	0.091	0.098	0.786	0.084	0.199	0.199	0.160
C2	0.796	0.101	0.055	0.141	0.157	0.766	0.011	0.211	0.298	0.170
C3	0.716	0.157	0.041	0.117	0.245	0.772	0.147	0.047	0.188	0.274
C4	0.611	-0.049	0.010	0.244	0.258	0.549	0.196	-0.206	0.449	0.172
C5	0.681	0.011	0.114	0.184	0.289	0.507	-0.026	0.096	0.567	0.185
C6f	0.236	0.574	0.077	0.313	-0.004	0.100	0.588	0.541	0.113	0.142
C7f	0.421	0.575	0.175	0.000	0.079	0.197	0.146	0.815	0.164	0.163
C8f	0.143	0.517	0.025	0.417	-0.026	0.093	0.846	0.102	0.144	0.053
C9	0.167	0.157	0.008	0.699	0.191					
C10	0.252	0.043	0.132	0.625	0.124					
C11f	0.122	0.261	0.223	0.570	-0.049					
C12f	-0.071	0.507	-0.051	0.335	0.160					
C13	0.073	-0.183	0.802	0.119	0.167					
C14f	0.131	0.382	0.384	-0.154	0.242					
C15f	0.056	0.193	0.816	0.071	0.106					
C16	0.156	0.183	-0.102	0.666	0.247					
C17f	0.055	0.434	0.010	0.280	0.055					
C18	0.435	0.155	0.006	0.483	0.333	0.244	0.309	0.056	0.659	0.182
C19	0.496	-0.021	0.027	0.412	0.322	0.206	0.145	0.096	0.726	0.162
C20	0.439	0.114	-0.032	0.425	0.411	0.252	0.338	-0.044	0.611	0.293
C21f	-0.089	0.538	-0.041	-0.042	0.173					
C22	0.494	0.005	0.015	0.403	0.327	0.201	0.015	0.176	0.753	0.172
C23	0.412	-0.034	0.155	0.187	0.553	0.157	-0.119	0.173	0.606	0.442
C24	0.207	0.198	0.150	0.141	0.679	0.127	0.035	0.178	0.221	0.794
C25	0.297	0.181	0.146	0.097	0.705	0.262	0.071	0.090	0.187	0.808
C26	0.297	0.174	0.105	0.152	0.694	0.239	0.165	0.007	0.284	0.715
C27	0.130	0.037	0.033	0.109	0.615					

Notes: 1 = Burdensomeness, 2 = Belongingness, 3 = Impulsiveness, 4 = Loneliness, 5 = Hopelessness

Based on the ROC results, the cut-off point of the early detection instrument for suicidal ideation risk factor was 33.5 with a sensitivity of 0.776 (77.6%) and specificity of 0.736 (73.6%). Furthermore, the final result of the 16-item instrument had a cut-off score of 33.5 from a range of 16 to 64. If the score is ≥34, it can be stated that to have a risk of suicidal ideation. This study also conducted CFA on the early detection instrument of risk factors for adolescent suicidal ideation. The grouping of items can be seen in Table 2.

According to Table 2, the Impulsiveness dimension (items C13, C14, and C15) previously in the 27-item model is missing in the 16-item model. However, item C7, with the statement "*I feel I am part of something useful,*" belonging to the Belongingness Dimension, was even stronger in the Impulsiveness Dimension.

Final Model of 16-Item Instrument

Table 3 shows that the 16-item model results in Average Variance Extract (AVE) values within the range of 0.39–0.54, while the CR is within the range of 0.64–0.85. The Construct Reliability (CR) range in the 16-item model was better than the 27-item model, with an AVE range of 0.30–0.54 and a CR range of 0.21–0.85.

Table 3. 16-Item Model of Early Detection for Suicide Ideation Risk Factors Instrument

Components	λ	AVE	CR
Burdensomeness		0.5398	0.8532
C1	0.7693		
C2	0.8173		
C3	0.7662		
C4	0.6237		
C5	0.6804		
Belongingness		0.3859	0.6440
C6	0.7852		
C7	0.5219		
C8	0.5185		
Loneliness		0.5301	0.8184
C18	0.7571		
C19	0.7123		
C20	0.7414		
C22	0.7000		
Hopelessness		0.5319	0.8181
C23	0.6068		
C24	0.7574		
C25	0.8149		
C26	0.7222		

Notes: AVE = Average Variance Extract, CR = Construct Reliability

Suicidal Ideation

Based on the PHQ-9-Youth questionnaire filled out by the respondents, the number of respondents with suicidal ideation in July–November 2018 was 5% of the total 910 respondents. Table 4 presents an overview of respondents according to risk factors for suicidal ideation at senior high schools in Jakarta.

Table 4. Description of Respondents Suicidal Ideation Risk Factors Among Adolescents in Senior High School/Equivalent in Jakarta 2018 (n=910)

Variable	Category	Frequency		Y1			
		N	%	%Y1	p-value	OR	95% OR
Parent's Divorce Status	Divorced	66	7.6	7.6	0.616	1.46	0.56–3.83
	Not Divorced	830	92.6	5.3			
Father Existence	Dead	55	6.1	3.6	0.767	0.64	0.152–2.72
	Alive	849	93.9	5.5			
Mother Existence	Dead	34	3.8	5.9	1	1.09	0.26–4.71
	Alive	870	96.2	5.4			
Depression	Very Severe	11	1.2	72.7	<0.01	338.7	49.52–2316
	Severe	49	5.4	22.4	<0.01	36.8	7.84–172.3
	Medium	161	17.7	5.0	0.018	6.6	1.39–31.68
	Mild	396	43.6	4.3	0.021	5.7	1.30–24.87
	Minimal/None	258	28.4	0.8	1		
Risk Factor	Risky	125	13.8	22.4	<0.01	10.4	5.69–19.06
	Not at Risk	779	86.2	2.7			
Stressor	High	340	39.2	7,6	<0.05	2.1	1.15–3.82
	Low	527	60.8	3.8			

Notes: OR = odds ratio, Y1 = dependent variable (suicidal ideation)

There are 11 respondents (1.2%) with very severe depression, 49 respondents (5.4%) with severe depression, 161 respondents (17.7%) with moderate depression, 396 respondents (43.6%) with mild depression, and 258 respondents (28.4%) with minimal/none depression. Respondents with high-risk factors for suicidal ideation were 125 respondents (13.8%), and 779 respondents (86.2%) were not at risk. Based on the cut-off point score of 4.5, respondents with high psychosocial stressors (>4.5) were 340 respondents (39.2%), and low (<4.5) were 527 respondents (60.8%). In bivariate

analysis, the influential variables to suicidal ideation were very severe depression, severe depression, detected risk factors for suicidal ideation, and high stressors, while other variables were not correlated with suicidal ideation.

Table 5 presents the results of multivariable analysis with Poisson regression analysis and shows that the instrument developed in this study can detect the risk of suicidal ideation. Of all the factors examined in this study, only the presence of depression and students detected to be at risk of suicide showed significant results after controlling the confounding variable. Students with depression were 4.41 times (p-value 0.048) more likely to have suicidal ideation than students without depression. Students detected to be at risk of suicide, compared to the students not detected, were 5.39 times (p-value <0.01) more likely to have suicidal ideation.

Table 5. Factors Associated with Suicidal Ideation (Y) of Adolescents in Senior High School/Equivalent in Jakarta (n=910)

Variable	Category	Y1		
		AOR	95% OR	p-value
Age	<17 years old	1.42	0.72–2.78	0.310
	>17 years old			
Sex	Male	1.12	0.55–2.29	0.759
	Female			
Education	SHS	1.67	0.85–3.28	0.139
	JHS			
Father's Education Level	High (>JHS)	1.04	0.44–2.47	0.923
	Low (<SHS)			
Father's Occupational Status	Employed	0.75	0.26–2.15	0.590
	Unemployed			
Mother's Education Level	High (>JHS)	1.49	0.67–3.29	0.327
	Low (<SHS)			
Mother's Occupational Status	Employed	1.63	0.81–3.30	0.171
	Unemployed			
Ethnicity	Betawi	0.63	0.28–1.41	0.261
	Other			
Religious Belief	Low	0.98	0.48–2.01	0.960
	High			
Parental Divorce Status	Divorced	0.84	0.29–2.43	0.743
	Not Divorced			
Father Existence	Dead	0.86	0.20–3.68	0.839
	Alive			
Depression	Yes	4.41	1.01–19.14	0.048
	No			
Risk Factor	Risky	5.39	2.76–10.51	<0.01
	Not at Risk			
Stressor	High	1.14	0.59–2.22	0.693
	Low			
Constant		0.01		<0.01

Notes: AOR = adjusted odds ratio, OR = odds ratio, JHS = Junior High School, SHS = Senior High School

Discussion

Instrument Development

The results of this study, using qualitative and quantitative methods to test construct validity, showed that the 16-item model was the optimal instrument model as it could fulfill the adequacy of factor analysis and reliability. The Cronbach's Alpha value in the previous study[11] was 88.2%, while this study produced a higher value of 90.9%. The previous study set the cut-off score at ≥31 with a sensitivity of 77.6% and specificity of 77.1%.[6] In contrast, in this study, the cut-off score ≥34 was set with a sensitivity of 77.6% and a higher specificity of 73.6%. Updated measurement of the developed instrument shows a better specificity value with fewer question items (16 items). In this study, the results of KMO, MSA, Communalities, Loading Factor, and Cronbach's Alpha if item deleted values also showed that the 16-item model met the requirements or value limits. Furthermore, criterion validity was carried out using ROC to evaluate the accuracy of sensitivity and specificity of the instrument for early detection of suicidal ideation risk factors visualized by using the ROC curve, the technique to visualize, organize, and classify a set of variables based on their performance.[12]

The 16-item model did not include an impulsiveness dimension. However, modeling was possible even without the impulsiveness dimension. Stress factor often precedes suicidal ideation. Rapid and sudden action in adolescents can occur with a short intervention time between the stressors and the time of the suicide attempt.[13] The Chinese study also sought to highlight the relationship between impulsivity and suicide. A person with dysfunctional impulsivity has a 14-fold higher risk of suicide than a person with low dysfunctional impulsivity, while functional impulsivity and education serve as protective factors.[14]

Impulsivity was measured with a 23-item scale called Dickman Impulsivity Inventory (DII), measuring functional and dysfunctional impulsivity as two distinct components. According to Dickman,[14] functional impulsivity is fast and performs inaccurately in optimal response situations; dysfunctional impulsivity is quick and performs inaccurately in non-optimal response situations. The two impulsivities have a low correlation to each other. Functional impulsivity is strongly associated with enthusiasm, high activity levels, and adventure, while dysfunctional impulsivity is related to mental disorders or health problems, such as making decisions without considering reality and worsening the problems caused by their actions. A study in South Korea showed that 48% of participants were driven by sudden tendencies to attempt suicide.[14]

Risk Factors of Suicidal Ideation

Variables of depression and adolescents detected at risk of suicide produced significant results for efforts to identify levels of suicidal ideation among adolescents. Suicide in adolescents is closely related to mental disorders such as depression.[15] A study by Baiden and Tadeo found that depressed adolescents have a 10.54 times (p-value <0.001) higher risk of suicidal ideation.[16] About 30% of adolescents experiencing suicidal ideation or suicide attempts meet the criteria for a major depression diagnosis that can also affect adolescents' ability to manage emotions and focus on the negative aspects of life.[17]

Im *et al.*[18] found similar results, with depressed adolescents having 5.7 times more likely to have suicidal ideation (p-value = 0.001). In a transitional period with unstable psychological development, adolescents are vulnerable to suffering from stress that can lead to depression or even suicidal ideation.[6] The higher the level of hope, the lower the suicidal ideation will be, and the higher the level of hopelessness, the higher the likelihood of suicidal ideation will be.[18,19] Therefore, strategic interventions need to be considered to prevent or reduce acute academic stress and help adolescents manage it.[19]

Yusuf found that emotional problems in female adolescents tend to be three times higher than in male adolescents.[6] In the "Multi-Factor Model of Suicide," individual biological factors such as genetics and sex can influence a person to have suicidal ideation or make suicide attempts.[20] Some of the independent variables of the multi-factor model of suicide boil down to parental factors as the respondents' social resources. In the bivariate analysis of this study, the independent risk factors influencing suicidal ideation were the father's education level and the mother's occupational status. Other variables were not correlated with suicidal ideation.

Students with fathers attaining higher education had a 2.38-fold risk for suicidal ideation compared to students with fathers attaining high school degrees.[21] Fathers who are absent from home, either for work or their role as single parents, also have an impact on physical and psychological problems in adolescents when compared to intact parents.[22] Students with employed mothers also have a higher risk (3.05 times) of having suicidal ideation when compared to students with unemployed or housewife mothers. Regardless of the type of mother's occupation, the parents' parenting strongly influences their children. Authoritative and rejecting-neglecting parents put children at risk of suicide.[23] Students having divorced parents had a 2.48 times higher risk of attempting suicide. Obeid *et al.*[24] found that parental divorce is associated with social fear and avoidance, higher depression, and suicidal ideation. Communication problems often occur in a period prior to divorce and can create an atmosphere of stress. This can lead to uncontrollable outbursts of anger and affect mental health, such as depression.[24]

In the stressor variable, students experiencing high stressors had a 2.1 times risk of having suicidal ideation when compared to students experiencing low stressors. However, on multivariate analysis, stressors were not significantly associated with suicidal ideation. Psychosocial stressors take a variety of forms, but there are psychosocial stressors prevalent in adolescents, such as pathological internet use associated with the development of suicidal thoughts. It has been reported that video games and internet use for more than five hours a day result in high levels of depression and suicidal tendencies among adolescents.[25]

Governmental Program Implications

The periodic utilization of early detection instruments for suicidal ideation risk factors could be considered at higher academic pressures. The instrument utilization might be employed as part of the "Report of My Health/*Rapor Kesehatanku* Program" by School Health Enterprises. In addition, the early detection of risk factors for adolescents' suicidal ideation can also be done simultaneously using another instrument named the Strengths and Difficulties Questionnaire. The only difference is that there is no input of the instrument score into *Rapor Kesehatanku* since it

contains the identity of the book owner. Consideration for inclusion in *Rapor Kesehatanku* is needed if there is a further study concerning stigma on suicide and the utilization of early detection instruments of risk factors for adolescents' suicidal ideation as individual assessment instruments. For Jakarta, further study should also be carried out to include the instrument in the e-Jiwa application. This is in accordance with the demands of the era of digital mental health developed by WHO to overcome the treatment gap in low- and middle-income countries.[26]

Knowledge Implications

The results of this study are expected to be a reference for further studies, specifically on the further development and utilization of instruments for early detection of risk factors for suicidal ideation in urban areas broadly, rural areas, junior high school students, the development of online instruments; on the association of impulsivity with adolescent suicide; and on how stigma affects suicide. The instrument can also be used for further study on approaches that are effective but do not worsen stigma for adolescents detected as potentially having suicidal ideation. Suicide and mental illness are still burdened by negative societal attitudes that can only be addressed by a change in the public perception of these issues. Follow-up of screening results may have particular risks if literacy about suicide is low and stigma towards suicide is high. This is related to a person's reluctance to seek help due to their risky condition. Mass media interventions can reduce the stigma of mental illness and play an essential role in suicide prevention.[27]

Strength and Limitations

This study combined quantitative and qualitative approaches, thus serving comprehensive and implementable results by implementing the existing central and local government policies and programs. The advantage of early detection of risk factors for suicidal ideation in adolescents is self-reporting so that adolescents' concerns about denying their condition can be overcome by the absence of eye contact with the assessor. In addition to being valid and reliable, the instrument for early detection of risk factors for suicidal ideation in adolescents is also relatively short, with a total of 16 items that are suitable for the short attention span of adolescents.

This instrument was pilot-tested only on a group of adolescents in the A-accredited senior high schools in Jakarta, an urban area of Indonesia that may have different risks from problematic schools. There has been no evidence of using the instrument for rural areas, often thought to have a lower risk for suicidal ideation. Therefore, risk factors essential for predicting suicidal ideation should be based on norms for rural and urban populations, as well as those linked to sex.[28] Besides, people's tendency to show a good self-image is called Socially Desirable Responding (SDR), which might create false or obscuring relationships between variables due to response bias.[29]

Conclusion

The 16-item model instrument for early detection of risk factors for suicidal ideation has a significant value of Cronbach's Alpha reliability and criterion validity to determine the magnitude of the problem to be followed up by the school in the form of aggregate data. Adolescent suicide can be prevented by incorporating screening of adolescent suicidal ideation with the utilization of the instrument developed in this study into school programs. Counseling teachers should reduce stigma towards suicide, encourage students to be open to talk about mental health issues, including depression and suicide, and prioritize adolescents at risk of suicide for further assessment. Future studies are suggested to explore the development of the instrument for rural areas.

Abbreviations

WHO: World Health Organization; EPK2J: *Evaluation of Mental Health Case Services/Evaluasi Pelayanan Kasus Kesehatan Jiwa*; FGD: focus group discussion; MSA: Measure of Sampling Adequacy; KMO: Kaiser–Meyer–Olkin; ROC: Receiver Operating Characteristic; AUC: Area Under Curve; PHQ-19: Patient Health Questionnaire; AVE: Average Variance Extract; CR: Construct Reliability; OR: odds ratio; AOR: adjusted odds ratio.

Ethics Approval and Consent to Participate

This study has been approved by the Commission for Research Ethics and Public Health Service, Faculty of Public Health, Universitas Indonesia Number: 134/UN2.F10/PPM.00.02/2018

Competing Interest

There are no significant competing personal, professional, or financial interests that may have influenced the performance or presentation of the work described in this manuscript.

Availability of Data and Materials

The data that supports the findings of this research is provided by the author and obtained directly from research informants and respondents.

Authors' Contribution

SP was involved in the research methodology, BJG directed the development of risk factors, and NRY was involved in the design study, analyzing data, developing instruments, and compiling the script.

Acknowledgment

This research is supported by the advice and input given by Prof. dr. Hasbullah Thabrany, MPH Dr.PH., Dr. dr. Suzy Yusna Dewi, SpKJ (K)., Dr. dra. Rita Damayanti, MSPH., Dr. dra. Dumilah Ayuningtyas, MARS., Prof. dr. Sasanto Wibisono, SpKJ (K)., and Dr. dr. Fidiansjah, SpKJ, MPH, as the research advisor, and Regita Septiani, SKM who has helped compile this manuscript.

References

1. World Health Organization. Adolescent health and development. Geneva: World Health Organization; 2020.
2. United Nations International Children's Emergency Fund (UNICEF). Adolescent mortality. New York: United Nations International Children's Emergency Fund; 2016.
3. World Health Organization. Depressive disorder (depression). Geneva: World Health Organization; 2023.
4. Bridge JA, Greenhouse JB, Ruch D, et al. Association between the release of Netflix's 13 Reasons Why and suicide rates in the United States: An interrupted time series analysis. J Am Acad Child Adolesc Psychiatry. 2020; 59 (2): 1–14. DOI: 10.1016/j.jaac.2019.04.020.
5. Badan Litbang Kesehatan. Global school-based student health survey: Indonesia 2015 fact sheet. Jakarta: World Health Organization; 2019.
6. Yusuf N, Prasetyo S. Assessing self-rated instrument to detect suicidal thought among high school students in Jakarta. KnE Life Sci. 2019; 4 (10): 415–421. DOI: 10.18502/kls.v4i10.3813.
7. Nahrin R, Al-Mamun F, Kaggwa MM, et al. Prevalence and factors associated with suicidal ideation among students taking university entrance tests: Revisited and a study based on Geographic Information System data. BJPsych Open. 2023; 9 (4): e129. DOI: 10.1192/bjo.2023.526.
8. Lester L, Cross D. The relationship between school climate and mental and emotional wellbeing over the transition from Primary to Secondary School. Psycho Well Being. 2015; 5 (1): 9. DOI: 10.1186/s13612-015-0037-8.
9. Centers for Disease Control and Prevention. Suicide was the tenth leading cause of death in the United States. Atlanta: Centers for Disease Control and Prevention; 2019.
10. World Health Organization. Preventing suicide: A community engagement toolkit. Geneva: World Health Organization; 2018.
11. Yusuf NR, Sabarinah, Thabrany H. Development of a risk-factors questionnaire to assess suicidal ideation among high school students of DKI Jakarta Province, Indonesia. Indian J Public Heal Res Dev. 2019; 10 (8): 2147–2151. DOI: 10.5958/0976-5506.2019.02174.0.
12. Nahm FS. Receiver operating characteristic curve: overview and practical use for clinicians. Korean J Anesthesiol. 2022; 75 (1): 25–36. DOI: 10.4097/kja.21209.
13. Polanco-Roman L, Gomez J, Miranda R, et al. Stress-Related Symptoms and Suicidal Ideation: The Roles of Rumination and Depressive Symptoms Vary by Gender. Cognit Ther Res. 2016; 40 (5): 606-616. DOI: 10.1007/s10608-016-9782-0.
14. Lim M, Lee S, Park JI. Differences between impulsive and non-impulsive suicide attempts among individuals treated in emergency rooms of South Korea. Psychiatry Investig. 2016; 13 (4): 389–396. DOI: 10.4306/pi.2016.13.4.389.
15. Bilsen J. Suicide and youth: Risk factors. Front Psychiatry. 2018; 9: 540. DOI: 10.3389/fpsyt.2018.00540.
16. Baiden P, Tadeo SK. Investigating the association between bullying victimization and suicidal ideation among adolescents: Evidence from the 2017 Youth Risk Behavior Survey. Child Abuse Negl. 2020; 102: 104417. DOI: 10.1016/j.chiabu.2020.104417.
17. Baiden P, Stewart SL, Fallon B. The mediating effect of depressive symptoms on the relationship between bullying victimization and non-suicidal self-injury among adolescents: Findings from community and inpatient mental health settings in Ontario, Canada. Psychiatry Res. 2017; 255: 238–247. DOI: 10.1016/j.psychres.2017.05.018.
18. Im Y, Oh W-O, Suk M. Risk factors for suicide ideation among adolescents: Five-year national data analysis. Arch Psychiatr Nurs. 2017; 31 (3): 282–286. DOI: 10.1016/j.apnu.2017.01.001.
19. Aulia N, Yulastri Y, Sasmita H. Psychological factors as the main risk of suicidal ideation in adolescents in Rengat City, Indragiri Hulu Regency. J Penelit Kesehat Suara Forikes. 2020; 11: 48–52. DOI: 10.33846/sf11nk110.
20. Balaji M, Vijayakumar L, Phillips M, et al. The young lives matters. Wellcome Open Res. 2020; 5: 262. DOI: 10.12688/wellcomeopenres.16364.1.
21. Gordon M, Melvin G. Risk assessment and initial management of suicidal adolescents. Aust Fam Physician. 2014; 43 (6): 367–372.
22. Jiang Y, Xiao H, Yang F. Accompanying your children: Living without parents at different stages of pre-adulthood and individual physical and mental health in adulthood. Front Public Health. 2023; 11: 992539. DOI: 10.3389/fpubh.2023.992539.
23. Donath C, Graessel E, Baier D, et al. Is parenting style a predictor of suicide attempts in a representative sample of adolescents? BMC Pediatr. 2014; 14 :113. DOI: 10.1186/1471-2431-14-113.
24. Obeid S, Al Karaki G, Haddad C, et al. Association between parental divorce and mental health outcomes among Lebanese adolescents: Results of a national study. BMC Pediatr. 2021; 21: 455. DOI: 10.1186/s12887-021-02926-3.
25. Shain B. Teen suicide: A closer look at three key factors. Itasca, IL: American Academy of Pediatrics; 2016.
26. Carswell K, Harper-Shehadeh M, Watts S, et al. Step-by-step: A new WHO digital mental health intervention for depression. mHealth. 2018; 4: 34. DOI: 10.21037/mhealth.2018.08.01.

27. Carpiniello B, Pinna F. The reciprocal relationship between suicidality and stigma. Front Psychiatry. 2017; 8: 35. DOI: 10.3389/fpsyt.2017.00035.
28. Liu J, Yang L, Zheng Y, et al. Rural-urban differences in prevalence and correlates of suicidal ideation in adolescent patients with depression in a large sample of Chinese. J Affect Disord. 2023; 322: 118-124. DOI: 10.1016/j.jad.2022.11.032.
29. Hart CM, Ritchie TD, Hepper EG, et al. The balanced inventory of desirable responding short form (BIDR-16). SAGE Open. 2015; 5 (4). DOI: 10.1177/2158244015621113.