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Latent Subtypes and Characteristics of Suicide Risk Among Korean Adults

Jin Young Choi[1,2] and Subin Park[3] ✉

[1]Division of Research Planning, Mental Health Research Institute, National Center for Mental Health, Seoul, Republic of Korea
[2]Department of Social Welfare, Sungkyunkwan University, Seoul, Republic of Korea
[3]Mental Health Research Institute, National Center for Mental Health, Seoul, Republic of Korea

Objective We aimed to identify subgroups of suicide risk and their characteristics among Korean adults.

Methods We used data from the National Mental Health Survey of Korea 2021. Participants were 5,511 adults aged 18–79 years. Latent class analysis was conducted to identify patterns of suicide risk using suicidal thoughts, plans, attempts, and self-harm. Sociodemographic and health-related characteristics according to the subtype of suicide risk were compared.

Results Suicide risk was classified into three latent classes: low suicide risk (89.5%, Class 3 [C3]), high suicidal ideation and low suicidal behavior (8.7%, Class 2 [C2]), and high suicidal thoughts and behavior (1.8%, Class 1 [C1]). Risk factors associated with C1 and C2 were the absence of a spouse, low educational and economic status, and unstable occupational status. C1 and C2 had more physical and psychological problems than did C3. Prevalence of mental disorders and mental health service use were higher in C1 than in C2.

Conclusion Suicide risk types have different demographic, physical health-related, and mental health-related characteristics. Therefore, a focused and individualized suicide preventive strategy should be implemented. **Psychiatry Investig 2024;21(11):1251-1259**

Keywords Suicide risk; Suicidal ideation; Suicidal behavior; Mental health; National Mental Health Survey of Korea.

INTRODUCTION

Suicide is a serious mental health problem worldwide. The suicide rate of South Korean adults is highest among Organization for Economic Cooperation and Development countries.[1] Identifying the suicide risk pattern of South Korean adults is necessary to develop interventions for suicide prevention. Moreover, identifying and characterizing suicide risk patterns using population-based data is important.[2] Doing so will help establish policies and services for suicide prevention. However, first, suicide risk must be defined. Although defining when an individual is at risk of suicide is difficult, it is generally considered to be the stage before death by suicide.[3] An assessment of the risk of committing suicide implies identifying mental aspects related to thinking about or planning suicide and behavioral aspects such as actual suicide attempts or self-harm. In their systematic review and meta-analysis, Angelakis and Gooding[4] evaluated studies on non-suicidal, self-injurious behavior without suicidal ideation. Recent studies consider Non-Suicidal Self-Injury (NSSI), without the intention to die, separately from self-harm with the intention to die. Although there is no suicidal intention, research on NSSI, such as pain avoidance to relieve unstable emotions, is essential.[5] However, because our study aimed to identify as many potential groups at risk for suicide as possible, we did not limit self-harm to cases with suicidal intent. Additionally, self-harm has long been considered a behavior related to suicide. It is necessary to include self-harm as a suicide risk indicator, along with suicide attempts and suicidal thoughts. In clinical practice, self-harm is not a life-threatening behavior, but viewing it as a predictor of suicide risk is known to be effective in preventing suicide.[6]

Suicide research must include suicide risk sub-factors and the possibility of their co-occurrence. This is expressed in the concept of suicidality, which emphasizes viewing overall suicide risk rather than considering suicidal ideation, plans, and attempts and self-harm individually.[7] Clinically, suicidal ideation is associated with suicide attempts and self-harm. There-

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✉ **Correspondence:** Subin Park, MD, PhD
Mental Health Research Institute, National Center for Mental Health, 127 Yongmasan-ro, Gwangjin-gu, Seoul 04933, Republic of Korea
Tel: +82-2-2204-0103, **Fax:** +82-2-2204-0362, **E-mail:** subin-21@hanmail.net

fore, studies on suicide risk should be designed to explain the complex phenomenon of suicide rather than to solely report high and low levels of each sub-factor.

Several studies have attempted to identify patterns associated with suicide risk.[7-10] Recent studies emphasize person-centered rather than variable-centered approaches and latent growth models when investigating suicidality because it is useful in explaining suicide risk's complex nature.[11-14] Moreover, ascertaining whether there are demographic or health-related differences among people grouped according to suicide risk patterns is necessary. This will help identify and eliminate the current suicide risk factors within suicide risk subtypes. Identifying and recognizing subtypes would be clinically useful for providing focused services, such as differentiated suicide prevention and treatment, according to differences between latent groups.

However, few studies have identified the latent patterns of suicide risk considering suicidality.[12,13] Some have included psychological symptoms rather than factors associated with suicide risk, such as suicide plans or self-harm. Other studies have focused on suicide-related variables that predict suicidal behavior in clinical samples.[15,16] Therefore, this study aimed to identify latent groups of suicide risk in South Korean adults using the National Mental Health Survey of Korea (NMHSK). Additionally, differences in demographic, health, and service use characteristics between suicide risk groups were examined.

METHODS

We used data from the NMHSK 2021. Pursuant to Article 10 of the Act on the Improvement of Mental Health and Support for Welfare Services for Mental Patients, the NMHSK has been conducted every 5 years since 2001.[17] This study was approved by the National Center for Mental Health Institutional Review Board, South Korea (IRB no. 116271-2022-23). This data informed respondents about the objectives and method of the survey before the survey, and all respondents signed an informed consent form on a tablet.

Participants

The NMHSK 2021 was conducted from June 19 to August 31, 2021. We selected the data of 5,511 South Korean adults aged 18−79 years from the survey data. This survey's sampling frame covered the entire South Korean adult population, and data were collected according to a complex sample design for representative sampling.[18] Stratification variables in the composite sample design included state (si)/province (do), neighborhoods (dong)/towns (eup)/townships (myeon), and household type. The primary sampling and enumeration units were sampled on the probability proportional to size. Households were selected as secondary sampling units through systematic random sampling.

Measurement

Suicide risk indicators (lifetime prevalence)

Suicide risk included four indicators. Suicidal ideation, suicide plan, and suicide attempt were determined using the "S. Suicidality" part of the Korean version of the Composite International Diagnostic Interview (K-CIDI)[19]: "Have you ever seriously thought about committing suicide?" "Have you ever made a specific plan to commit suicide?" and "Have you ever attempted suicide?" For self-harm, NMHSK researchers used the Self-Harm Inventory developed by Gratz[20]: "Have you ever harmed yourself?" All items had binary response options.

Sociodemographic characteristics

We used self-reported data for sociodemographic factors, including sex, age, geographic area, marital status, education level, income level, and job status.

Physical health

Health status satisfaction was assessed using 1 item from the World Health Organization (WHO) Quality of Life scale,[21] which was adapted for use in Korea by Min et al[22]: "How satisfied are you with your health?" (very dissatisfied=1 to very satisfied=5). Chronic diseases were assessed by modifying the Severity of Chronic Pain scale, developed by Von Korff et al.[23] Chronic diseases include hypertension, hyperlipidemia, stroke, myocardial infarction, angina pectoris, diabetes, or cancer (diagnosis=1, non-diagnosis=0). The WHO International Physical Activity Questionnaire was used to evaluate physical activity: inactive, minimal activity, and health-enhancing physical activity.[24,25] The score was obtained by calculating the metabolic equivalent of task min per week for each activity considering each activity's unit.

Psychological health

Life satisfaction was assessed using 1 item from the Social Integration Survey.[26] Items were responded to using a 10-point scale: "When considering your life as a whole, how satisfied are you with your current life?" (very dissatisfied=0 to very satisfied=10). Items from the EuroQol 5 Dimension (EQ-5D) were used to evaluate anxiety and depression.[27] EQ-5D was developed by the EuroQol Group to measure health status related to quality of life. Items were responded to using a 3-point scale. Loneliness and social isolation were assessed using the Loneliness and Social Isolation Scale developed by Hwang et al.[28] The 6 items on a 4-point scale were used. Campbell-Sills and Stein's version of the Connor-Davidson Resilience Scale was

used to assess resilience.[29,30] The scale comprises 10 items scored on a 5-point scale.

Mental disorder (lifetime prevalence)

Lifetime prevalence rates of the four major mental disorders were used: alcohol use disorder (AUD), nicotine use disorder (NUD), depressive disorder, and anxiety disorder. The disorders were assessed using the K-CIDI ver. 2.1.[19] The CIDI is a structured diagnostic interview for adults, based on the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, and used internationally for epidemiological investigations.[31]

Mental health service utilization (lifetime)

Mental health service utilization refers to receiving counseling or help from a mental health professional (e.g., psychiatrist, social worker, psychologist, mental health nurse) for mental health problems. Response options were not used (0) and used (1). Psychiatrist utilization was assessed separately as having visited a psychiatric clinic for a mental health problem. Response options were not used (0) and used (1).

Statistical analysis

We conducted descriptive analysis considering three important variables in complex sample analysis: stratification, clustering, and weight. Two main analysis processes were followed. First, latent class analysis (LCA) confirmed the suicide risk patterns using Mplus 7.4 (https://www.statmodel.com). To identify the ideal number of subtypes in the samples, several information indexes were used.[32] Second, analysis of variance and chi-square tests were performed using SPSS v.2.0 (IBM Corp., Armonk, NY, USA), and paired comparisons were made through the Bonferroni-Dunn's post-hoc test.

RESULTS

Explicating subtypes

The model fit indices for the LCA are provided in Table 1. Based on the Lo-Mendell-Rubin adjusted likelihood ratio test and bootstrap likelihood ratio test, two and three subtypes were statistically significant. The two or three subtypes were closest to 1 in entropy, showing high classification accuracy. However, the Bayesian information criterion (BIC) and sample size-adjusted BIC values indicated that three subtypes showed a better fit than two subtypes. Although the fit of the Akaike information criterion was high for four and five subtypes, a small number of cases with less than 1% in classification were reported. The model fit was comprehensively considered, and three subtypes were selected based on the study's purpose.

Table 1. Fit indices for latent class analysis subtypes (N=5,511)

Subtypes	AIC	BIC	ssaBIC	Entropy	LMR-LRT p	BLRT p	N (%)				
							1	2	3	4	5
2	5036.161	5095.691	5067.092	0.979	<0.0001	<0.0001	162 (2.9)	5,349 (97.1)			
3	5026.797	5119.400	5074.912	0.966	0.0002	<0.0001	99 (1.8)	477 (8.7)	4,935 (89.5)		
4	5053.869	5161.545	5101.169	0.948	0.0115	0.6667	64 (1.2)	23 (0.4)	5,348 (97.0)	76 (1.4)	
5	5045.869	5204.617	5128.353	0.570	0.9519	>0.9999	9 (0.2)	27 (0.5)	419 (7.6)	126 (2.3)	4,930 (89.5)

AIC, Akaike information criterion; BIC, Bayesian information criterion; ssaBIC, sample size adjusted BIC; LMR-LRT, Lo-Mendell-Rubin adjusted likelihood ratio test; BLRT, bootstrap likelihood ratio test

Suicide risk latent subtypes

We named the three subtypes of suicide risk as follows: Class 1 (C1: 1.8%)="High level of suicidal thoughts and behavior"; Class 2 (C2: 8.7%)="High suicidal ideation, low behavior"; Class 3 (C3: 89.5%)="Low suicide risk" (Figure 1).

C1 was defined as the suicidal crisis group, as it was considered high in overall suicide-related thoughts and behaviors. C1 had a similar level of suicidal ideation to C2 but a higher level of suicide plans and attempts than the other groups. Suicidal ideation in C2 was as high as in C1. However, the levels of suicide planning and attempts and self-harm were lower than in C1. This group had a low risk of suicidal behavior but high suicidal ideation. In C3, indicators of suicide risk showed a low overall risk. This group had the largest percentage of the sample population with little or no suicidal thoughts or behavior.

Suicide risk subtype characteristics

Five characteristics of the suicide risk subtypes differed: sociodemographics, physical health, psychological health, mental disorders, and service utilization (Table 2).

Sociodemographic characteristics

The proportion of women was the highest in C2 (55.6%). The mean age of the sample was 47.10 years; the highest mean age was in C1 (49.17), followed by C2 (48.82) and C3 (46.88). As for the area of residence, C3 (19.5%) had the highest proportion of people living in eup/myeon areas. Compared to C2 (14.5%), C1 (16.8%), a high-risk group for suicide, lived more in eup/myeon areas than in dong areas. Regarding marital status, the proportion of divorced, separated, or widowed in C1 (21.6%) was approximately double that of C2 (12.1%) and C3 (9.5%). Regarding education level, C1 (26.1%) had a much lower percentage of those with college education and above compared to C2 (41.3%) and C3 (45.0%). The proportion of middle school education or lower was highest in C1 (16.1%). The proportion of low-income levels was the highest in C1 (53.1%), followed by C3 (43.4%) and C2 (41.6%). Additionally, regarding income levels, compared to C3 (56.6%), which had the lowest level of suicide risk, C2 (58.5%) had a higher proportion of people with a high income. Regarding job status, C3 (52.6%) had the highest proportion of permanent jobs, followed by C2 (48.8%) and C1 (36.4%). Meanwhile, C1 (39.1%) had the highest ratio of students/housewives, followed by C2 (32.6%) and C3 (28.9%). These results showed that job instability was the highest in C1, as was income level.

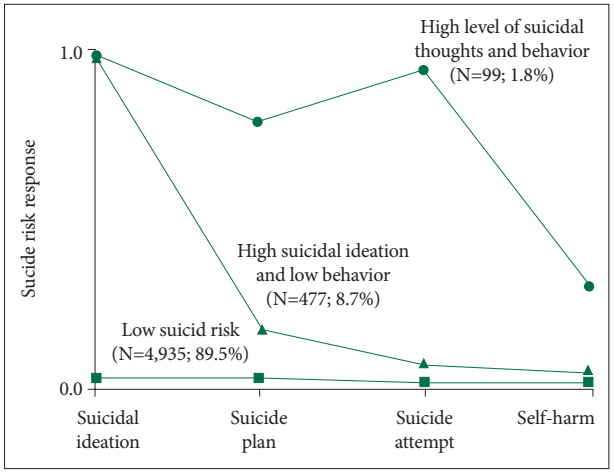

Figure 1. Suicide risk latent profile.

Physical health

Health status satisfaction was the highest in C3 (mean=3.71), followed by C2 (mean=3.37) and C1 (mean=3.27); the post-hoc test was statistically significant. The rate of being diagnosed with chronic disease was the highest in C1 (33.2%), followed by C2 (29.1%) and C3 (23.9%). Physical activity did not show any difference according to the subtypes.

Psychological health

Mean life satisfaction was the highest in C3, followed by C2 and C1. Mean resilience showed a similar pattern—highest in C3, followed by C2 and C1—and the post-hoc test result was statistically significant. Mean anxiety and depression were the highest in C1, followed by C2 and C3. Loneliness was significantly higher in C1 than in C2 and C3.

Mental disorders

Regarding mental disorders, similar trends were observed according to the subgroups of suicide risk regardless of the diagnosis. Participants with any mental disorder the most common in C1 (74.0%), which was approximately 3 times higher than that in C3 (24.3%). Any mental disorder, except for AUD or NUD, was the most common in C1 (64.3%), followed by C2 (41.5%) and C3 (10.7%), with a more pronounced difference. AUD was higher in C1 (24.2%) and C2 (26.2%) than in C3 (10.0%). Anxiety disorder was higher in C1 (27.6%) and C2 (21.6%) than in C3 (7.8%). Specifically, Depressive disorder and NUD were more than 1.5 times higher in C1 than in C2.

Service utilization

Mental health service utilization rate was the highest in C1 (31.5%), then infollowed by C2 (15.4%) and C3 (2.9%). The experience of visiting a psychiatrist was most common in C1 (28.8%), followed by C2 (12.4%) and C3 (2.4%), suggesting that the rate of use of mental health services was high in latent classes with a high level of suicide risk.

Table 2. Comparison of correlates by latent group

Variable	Total sample	Class 1 high level of suicidal thoughts and behavior	Class 2 high suicidal ideation and low behavior	Class 3 low suicide risk	F/χ^2	Significant differences ($p<0.05$)
Sample size	5,511 (100.0)	99 (1.8)	477 (8.7)	4,935 (89.5)		
Weighted†	42,039,186 (100.0)	731,359 (1.7)	3,779,052 (9.0)	37,528,775 (89.3)		
Sociodemographic						
Sex					35484.283***	2>1>3
Male	50.4	44.6	44.4	51.1		
Female	49.6	55.4	55.6	48.9		
Age (yr)	47.10±15.96	49.17±14.64	48.82±15.50	46.88±16.01	31614.978***/6.104	1>2>3
18–39	34.4	28.9	30.7	34.9		
40–59	39.9	42.2	40.5	39.8		
60–79	25.6	28.9	28.9	25.2		
Area					29400.980***	
Dong	81.0	83.2	85.5	80.5		3>1>2
Eup/myeon	19.0	16.8	14.5	19.5		
Marital status					17.946**	
Married	63.0	54.7	61.8	63.3		
Div/Sep/Wid	10.0	21.6	12.1	9.5		
Unmarried	27.0	23.7	26.1	27.2		
Education					21.288**	
Middle school or lower	14.5	16.1	12.4	14.7		
High school	41.1	57.8	46.3	40.2		
College or above	44.4	26.1	41.3	45.0		
Income level					16499.080***	2>3>1
Low	43.4	53.1	41.6	43.4		
High	56.6	46.9	58.5	56.6		
Job status					12.9817*	
Permanent	52.0	36.4	48.8	52.6		
Contract	18.6	24.5	18.5	18.5		
Student/housewife	29.4	39.1	32.6	28.9		

Table 2. Comparison of correlates by latent group (continued)

Variable	Total sample	Class 1 high level of suicidal thoughts and behavior	Class 2 high suicidal ideation and low behavior	Class 3 low suicide risk	F/χ^2	Significant differences ($p<0.05$)
Physical health						
Health status satisfaction	3.68±0.69	3.27±0.88	3.37±0.81	3.71±0.66	561679.926***	3>2>1
Chronic disease	24.5	33.2	29.1	23.9	41076.430***	1>2>3
Physical activity					8.673	
Inactive	30.2	30.4	27.0	30.5		
Minimally active	48.8	39.8	52.7	48.6		
Health-enhancing activity	21.0	29.8	20.4	20.9		
Psychological health						
Life satisfaction	6.89±1.44	5.49±2.01	6.05±1.75	7.00±1.35	1157320.554***	3>2>1
Anxiety/depression	1.11±0.34	1.38±0.55	1.29±0.52	1.09±0.30	895877.694***	1>2>3
Loneliness/social isolation	5.79±2.87	8.71±3.63	7.18±3.29	5.59±2.74	950116.388***	1>2>3
Resilience	25.19±7.16	21.23±6.15	22.40±7.14	25.55±7.10	455377.154***	3>2>1
Mental disorders						
AUD	11.7	24.2	26.2	10.0	452694.835***	1, 2>3
NUD	9.2	23.2	12.8	8.6	135725.573***	1>2>3
Depressive disorder	7.7	54.8	32.1	4.4	3495941.331***	1>2>3
Anxiety disorder	9.3	27.6	21.6	7.8	544817.537***	1>2>3
Any disorder	27.8	74.0	53.7	24.3	1196094.412***	1>2>3
Any disorder except AUD+NUD	14.4	64.3	41.5	10.7	2299932.943***	1>2>3
Service utilization						
Mental health service	4.5	31.5	15.4	2.9	1345744.821***	1>2>3
Psychiatrist	3.7	28.8	12.4	2.4	1200036.099***	1>2>3

Values are presented as number (%), mean±standard deviation, or percentage only unless otherwise indicated. *p<0.05; **p<0.01; ***p<0.001; †weighted by the city/province, age, and sex of the general population in Korea. The total proportion may not add up to 100% owing to missing data; Dong, neighborhoods; Eup/myeon, towns/townships; Div/sep/wid, divorced, separated, or widowed; AUD, alcohol use disorder; NUD, nicotine use disorder

DISCUSSION

We identified three potential patterns of suicide risk among Korean adults. These results are similar to the high-, medium-, and low-risk groups identified in Park et al.'s study.[10] C3, which accounted for the largest distribution, is the general population without serious mental health problems. C1 requires clinical treatment and crisis intervention. C2 does not have a prominent behavioral component as in C1; nevertheless, it should be considered an intermediate-risk group with a potential for subsequent suicidal behavior.

We decided that it would aid the clinical approach to name the sub-characteristics rather than merely indicating a high or low suicide risk level. For example, C3 may be an "emotionally healthy group" identified in prior studies.[7] However, to identify more latent individuals, it is more appropriate to name the group "low suicide risk" rather than suggesting there is no suicide risk. This is because a slight risk of suicidal ideation cannot be eliminated, and broadly outlining the potential of suicide risk is more effective for suicide prevention. Additionally, although C2 is not a high-risk group theoretically, it shares similar risk factors with C1. Thus, the difference in the classes' characteristics is crucial.

The higher proportion of women in C2 than in C1 aligns with the results of a previous study showing that suicidal thoughts are more prevalent in women and suicidal behaviors are more common in men.[9] Moreover, this study is similar to Park et al.[10] study in that the high-risk attempter w older than the moderate or low-risk attempters. These results are related connected to the correlation between suicide high-risk groups and mental disorders. The prevalence of mood disorders such as depression is highly related to the risk of suicide, and appears to with age.[33,34] South Korea has a very high suicide rate among the elderly, which may be related to their physical, emotional and economic vulnerability.[35]

Additionally, C1 was more vulnerable than C2 owing to living in a non-urban environment, the absence of a spouse, a low education level, and irregular employment, suggesting that the intervention urgency is the highest in C1. C2 was less vulnerable to income effects, meaning that solving economic problems may not be a priority for intervention.

C1 participants reported poorer health status satisfaction and chronic disease, and it was difficult to identify differences in physical activity between groups. The lack of satisfaction also indicates that they perceive their health status negatively due to their suicide risk status. Self-reported health status assessment in groups at high risk for suicide can help motivate treatment and provide further insights into mental health symptoms. A higher risk of suicide may be associated with serious physical problems, such as a diagnosed chronic disease; however, it may not be closely associated with daily physical activity. These findings suggest that when conducting interventions for high-risk groups, identifying and treating physical illness may be more effective than increasing daily physical activity.

Each variable of psychological health has different characteristics in suicide risk groups. Suicide risk is closely related to negative life satisfaction. This confirms that suicide risk is a serious mental health problem that can harm an individual's overall health and well-being and their ability to recognize it in themselves. Anxiety and depression are psychological symptoms that are highly correlated with suicidal thoughts or actions. This is the primary symptom that requires priority intervention to reduce the risk of suicide. Loneliness and social isolation indicate that negative thoughts, such as wanting to die, commonly occur when a person is alone or has no resources to seek help. We emphasize that environmental interventions for preventing emotional and environmental isolation are effective in reducing suicide risk. Resilience can be an important emotional resource that can help reduce the risk of recurring suicide attempts. Suicide attempters can easily weaken their resilience by continuously putting themselves at risk of suicide; therefore, promoting resilience is essential for prevention.

The presence of mental disorders and mental health service utilization were the most prevalent in C1, followed by C2 and C3. These results make it clear that potential suicide risk groups are differentiated according to their level of suicide risk (low, medium, or high). This is because the higher the need for mental health services, the more likely it is that mental health problems will become alarming. The difference between C2 and C1 is twofold, indicating that even if there are suicidal thoughts, the service utilization rate may be different due to suicidal behavior. The psychiatric visit rate by potential suicide risk groups is similar to the mental health service utilization rate. Among the various types of mental health services, psychiatric visits are crucial in the treatment of groups at high risk of suicide. High psychiatric visit rates in high-risk groups may indicate a high preference for psychiatric treatment. Therefore, it is crucial to establish a mental health service plan focusing on psychiatric treatment when intervening in suicide risk groups.

Depressive disorders and anxiety disorders are known to frequently co-occur with suicide risk. It is noteworthy that the prevalence of depressive disorders is more than 10 times higher in the high-risk group for suicide compared with the normal group. This is significant because for anxiety, alcohol, and nicotine disorders, the prevalence in the high-risk group is only 2 to 4 times higher than in the normal group. This means that reducing depressive symptoms should be the primary treatment goal for suicide risk groups.

Notably, only AUD was most prevalent in the C2 group. Heavy drinking is associated with decreased cognitive and coping abilities, and people with AUD may repeatedly think of death as the only solution for their difficulties.[36] Their suicidal thoughts are chronic and routine, and suicide attempts are impulsive while drinking.[37] Drunken suicidal ideation can be dangerous, even if no clear history of previous suicidal behavior or a current suicide plan exists. Therefore, establishing an intervention strategy is necessary by considering suicide risk according to the disorder type.

This study has several limitations. First, indicators of NSSI were not investigated. However, as there are clinical cases in which self-harm behavior occurs even in the absence of clear suicidal ideation, further research considering this as a spectrum of suicide risk is necessary. Second, ascertaining a causal relationship between the classes of suicide risk and related characteristics is difficult owing to the use of cross-sectional data. Future research using longitudinal data is needed to confirm our results.

In conclusion, this study examined Korean adults' suicide risk patterns and found differences in risk factors depending on suicide risk group. The results suggest the need to establish focused and individualized suicide prevention strategies according to suicide risk types.

Availability of Data and Material

The datasets generated or analyzed during the current study are available in the Mental Health Survey of Korea repository, https://mhs.ncmh.go.kr/.

Conflicts of Interest

Subin Park, a contributing editor of the *Psychiatry Investigation*, was not involved in the editorial evaluation or decision to publish this article. All remaining authors have declared no conflicts of interest.

Author Contributions

Conceptualization: Subin Park, Jin Young Choi. Data curation: Subin Park, Jin Young Choi. Formal analysis: Jin Young Choi. Funding acquisition: Subin Park. Methodology: Jin Young Choi, Subin Park. Supervision: Subin Park. Visualization: Jin Young Choi. Writing—original draft: Jin Young Choi. Writing—review & editing: Subin Park, Jin Young Choi.

ORCID iDs

Jin Young Choi https://orcid.org/0009-0004-5962-9302
Subin Park https://orcid.org/0000-0002-4623-9899

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