



Characteristics of the “young-old” and “old-old” community-dwelling suicidal ideators: A longitudinal 6-month follow-up study

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ABSTRACT

Background: Despite heterogeneity of older people in suicidal behavior, research identifying characteristics by age groups is scarce. We examined baseline features of older community-dwelling suicidal ideators by dichotomized age groups and the 6-month trajectory of their suicidal ideation along with its related psychopathology. Predictors of suicidal ideation within each group were investigated.

Methods: Older community-dwelling suicidal ideators enrolled in the Korean Cohort for the Model Predicting a Suicide and Suicide-related Behavior study were subdivided into the “young-old (65–74 years)” and “old-old (≥75 years)” group. Baseline, 1-, and 6-month assessments were compared. Within each group, multiple regression analysis using rating scales (Patient Health Questionnaire-9, Beck Anxiety Inventory, Alcohol Use Disorders Identification Test, Stress Questionnaire for Korean National Health and Nutrition Examination Survey-Short Form, and Social Relationships Scale) was conducted to identify predictors of suicidal ideation measured with the intensity subscale of the Columbia-Suicide Severity Rating Scale. Two-way repeated-measures analysis of variance (RM-ANOVA) was used to compare changes in suicidal ideation, depression, anxiety between age groups over time, and one-way RM-ANOVA to examine changes within each age group.

Results: Among 29 “young-old” and 53 “old-old” ideators, the latter were less likely to be receiving psychiatric treatment (odds ratio [OR] = 4.065) and make suicide attempts (OR = 2.874), whereas the former revealed greater levels of anxiety and stress. Baseline depression and stress in the “young-old” group and the “old-old” group, respectively, predicted the intensity of suicidal ideation at both baseline and 1-month assessments. No significant age group x time interactions on suicidal ideation and depression were found. However, within each age group, both suicidal ideation and depression significantly decreased only during the first month with no further improvement. **Conclusion:** We speculate cautiously that more attention may need to be paid to the “old-old” ideators in the evaluation of psychiatric issues and for referral to psychiatrists. To decrease suicidal ideation, tailored approaches involving proactive, timely management of depression in the “young-old” and interventions focusing on stress reduction in the “old-old,” would be helpful.

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1. Introduction

Suicide is a leading cause of death worldwide; close to 800,000 lives are lost every year [1]. The suicide rates in the Republic of Korea (hereafter, Korea) have been the highest among its member nations of the Organisation for Economic Co-operation and Development (OECD) since 2003 [2]. According to the most recent statistics from the OECD, the annual suicide rate, defined as number of deaths by suicide per 100,000 persons, in Korea was 25.6 in 2016 [3], which was more than twice than the OECD average, 11.6 [2]. Among different age groups, suicide rates in older people are particularly the highest in almost all nations [4]. In Korea, the suicide rates for those aged 70–79 years and 80 years or older reached 54.0 and 78.1, respectively, in 2016 [5]. Given the high vulnerability of the elderly to suicide owing to underlying physical illness and socioeconomic changes such as retirement and their strong resolution toward suicide completion, which is reflected by a much lower suicide attempt rate compared to younger people [1,4], the rapidly increasing suicide rates in Korea have been partly attributed to the unprecedentedly fast aging of the society [6]. Additionally, insomnia, the prevalence of which increases with age [7] such that it is very common among the elderly [8], may contribute to the increased vulnerability of older people to suicide; suicide attempters with insomnia were reported to more frequently employ a violent suicide method, compared with those without insomnia [9]. Considering these ongoing issues, developing tailored strategies to prevent suicide in this age group is urgently required.

Numerous studies have addressed the characteristics of geriatric suicidal behavior, and evidence continues to accumulate indicating that this population is heterogeneous in suicidal behavior [4]. As suicidal behavior is a complex and multifaceted phenomenon, it has to be comprehensively approached through biopsychosocial aspects, which do not remain constant. With advancing age, the elderly, biologically, experience declinations of their physical abilities, psychologically, have to face and accept their spouse' or own death at some point, and socially, retire and may have economic difficulties. The heterogeneity within older people is partly reflected by increasing suicide rates with aging [10].

More specifically, previous studies have demonstrated different characteristics between the “young-old (65–74 years of age)” and the “old-old (≥ 75 years of age)” suicide attempters or completers, with most studies focusing on the latter. Sociodemographically, “old-old” suicide completers were positively associated with being bereaved and living alone compared with their “young-old” counterparts [11]. Clinically, they were more likely to have medical problems and history of psychiatric illness, and less likely to have experienced psychiatric hospitalization [4]. A similar study that subdivided the elderly suicide completers by the age of 80 showed significant between-group differences in marital and living status as well as stress sources [12,13]. Only one study was performed on geriatric suicide attempters with a similar methodology; the “young-old” age group had a higher proportion of individuals who attributed their suicide attempt to mental pain [14].

Suicide does not happen suddenly. It entails a long development process called the suicidal process; suicidality goes through stages. The process refers to an intra-personal course occurring in response to an individual's surroundings; it begins with the emotion of hopelessness, then transient suicidal ideation, and advances through more concrete suicidal plans and suicide attempts; these are often recurrent and may involve growing degrees of suicidal intent and lethality of suicide methods employed, such that the individual reaches completion [15]. The concept of the suicidal process has important implications for treatment and prevention because each stage has several non-overlapping risk factors and thus requires different approaches [16,17]. In addition, to prevent the process from further proceeding and resulting in catastrophic sequelae related to repetitive attempts,

the implementation of timely intervention is strongly recommended from the very beginning (i.e., the stage of suicidal thoughts); thus, a clear understanding of the characteristics of this population of older suicidal ideators is required. However, in contrast to the studies on suicide attempters or completers, no study has examined older people with current suicidal ideation by subdividing them based on age groups or adopting a dichotomic approach (the “young-old” versus the “old-old”). Moreover, most reports on suicide attempters or completers are only comparison analyses, and studies identifying predictors of the degree of suicidality such as lethality within each group are scarce, and no prospective studies have been conducted on this topic. Besides, all samples on suicide attempters and completers in the present studies are European or Canadian.

The purpose of the present study was to test the hypothesis that characteristics of suicidal ideation and its predictors differ between the “young-old” and “old-old” current suicidal ideators in the community. Specifically, using a dataset from the Korean Cohort for the Model Predicting a Suicide and Suicide-related Behavior (K-COMPASS) study and performing cross-sectional analysis, the primary aim was to determine characteristic differences in baseline sociodemographic and clinical factors, psychiatric diagnoses, and psychometric scores between the two age groups and to investigate the abilities of clinical rating scales to serve as potential predictors for greater suicidal ideation within each age group. The secondary aim was, to examine characteristics of the course of suicidal ideation between the age groups during a 6-month naturalistic follow-up period by longitudinal analysis. Identification of characteristics in each group and predictive factors for higher suicidal ideation will lead to the development of tailored interventional strategies for specific age groups.

2. Methods

2.1. Subjects

This work was a secondary analysis of the ongoing K-COMPASS study, which is a long-term, large-scale, multi-center, prospective, naturalistic, observational cohort study modeling the biopsychosocial trajectory of suicidal ideators and attempters. The K-COMPASS study consists of two concurrent cohorts with a goal of enrolling 800 participants overall: the community-based cohort ($n = 241$) and the hospital-based cohort ($n = 559$). Each cohort is composed of suicidal ideators and suicide attempters. The sample size was determined on the basis of the recruiting capacities of the researchers in the participating institutions, without a formal power analysis. The study began on September 1, 2015 and will be finished on June 30, 2019.

The community-based cohort was established with the participants recruited via eight community mental health welfare centers (CMHWCs), affiliated with the participating hospitals distributed nationwide in Korea. Current and new members of the CMHWCs and subjects encountered during community mental health screening visits to disadvantaged areas or social welfare facilities including nursing homes, or referred from other public community services were screened and enrolled in the study. Suicidal ideators were defined as those who reported current, serious suicidal ideation without history of suicide attempts within 1 month from study enrollment; the quantification of suicidal ideation was conducted after enrollment. Those with 1) history of intellectual disability or organic brain damage, either self-reported or presented by a family member or a guardian, or 2) inability to comprehend the Korean language, as judged by an interviewer, were excluded from the study. Because of its naturalistic, observational design, the K-COMPASS study participants did not receive any additional intervention from the study beyond psychiatric treatment they already had been receiving, if any; this arrangement was permitted regardless of whether their current treatment was psychopharmacological or psychosocial, and they were allowed to

continue or discontinue such treatment as needed. More details regarding the methods of data collection [1,18] and the overall baseline sample characteristics [18] have been previously published. For the current study, we analyzed the subgroup of older suicidal ideators (≥ 65 years of age) in the community-based cohort. The present study protocol was reviewed and approved by the Seoul National University Hospital Institutional Review Board (H-1505-050-671) and Institutional Review Boards of all other participating study sites. Informed consent was submitted by all participants when they were enrolled.

2.2. Measurements

At the baseline assessment, a systematic interview was performed by trained mental health professionals. Sociodemographic and clinical information (medical-, psychiatric-, familial-, suicidal-related factors) was obtained. The Korean version of the Mini International Neuropsychiatric Interview (K-MINI), based on the Diagnostic and Statistical Manual of Mental Disorder, Fourth Edition (DSM-IV) [1], was used to obtain psychiatric diagnoses for study participants. We selectively used 13 modules regarded as prevalent in a suicidal population. To assess suicidal ideation, the intensity subscale of the Columbia-Suicide Severity Rating Scale (C-SSRS) was employed. The subscale ranges from 0 to 25, with a higher score indicating greater suicidal ideation.

Next, the following self-rating scales were applied. The intensity of depression was measured using the Patient Health Questionnaire-9 (PHQ-9). Its score ranges from 0 to 27; 5, 10, 15, and 20 are the respective lower boundaries of mild, moderate, moderately severe, and severe depression [19]. The severity of anxiety was measured with the Beck Anxiety Inventory (BAI), with a total score ranging from 0 to 63; 10, 19, and 30 represent the respective lower limits of mild-to-moderate, moderate-to-severe, and severe anxiety [20]. The Alcohol Use Disorders Identification Test (AUDIT) was applied to identify participants with alcohol-related problems in the past 1 year. Its total score ranges from 0 to 40, and a score of 7 indicates a cut-off for problematic drinking for the elderly [21]. The overall stress level was assessed with the Stress Questionnaire for Korean National Health and Nutrition Examination Survey-Short Form (SQ for KNHANES-SF), a 9-item instrument, and its total score ranges from 0 to 36 with a higher score indicating greater stress; in addition to the degree of stress, participants were required to indicate the most important stress source among six categories: 1) interpersonal relationships (relationships with family or other significant people); 2) changes in relationships (e.g., death, birth, divorce, or marriage); 3) illness or injury to oneself or others; 4) work, job, or school; 5) financial problems; and 6) unusual events (e.g., crime, natural disaster, accident, or moving) [22]. Further, for more detailed evaluations of interpersonal stress, the Social Relationships Scale (SRS) was administered; this was developed for the Korean General Society Survey [23]. To assess stress from specific relationships, the following questions were asked: "I have a lot of stress because of close family like a spouse, children, or parents," "I have a lot of stress because of a lover or a boyfriend/girlfriend," "I have a lot of stress because of a close friend," and "I have a lot of stress because of a colleague or a boss in the workplace." For each relationship, the total score ranges from 1 ("Strongly agree") to 4 ("Strongly disagree"), with a higher score corresponding to lower stress. All scales except the AUDIT asked the participants about symptoms experienced during the past month.

At the 1- and 6-month follow-up visits, only the C-SSRS, PHQ-9, and BAI were administered.

2.3. Statistical analysis

As cross-sectional analysis, baseline sociodemographic and clinical factors as well as diagnoses were compared across the "young-old"

and the "old-old" age groups. For continuous variables, a Student's *t*-test or Mann-Whitney *U* test was used to obtain two-tailed *P* values, and, for categorical variables, a Pearson's χ^2 test or a Fischer's exact test were used. Next, we performed comparisons of suicidal ideation and psychopathological and stress evaluations between the age groups using the same statistical methods at each assessment time. Further, to predict the intensity of suicidal ideation based on clinical rating scores for each age group at baseline, multiple regression analysis with the stepwise method was performed using all clinical rating scores as independent variables and the C-SSRS intensity subscale as a dependent variable within each group. As longitudinal analysis, the effect of age group over assessment time on the change in suicidal ideation, depression, and anxiety scores each was examined by performing two-way repeated-measures analysis of variance (RM-ANOVA). Within each age group, the changes in each of suicidal ideation, depression, and anxiety score from baseline to endpoint were analyzed with one-way RM-ANOVA using post-hoc tests with Bonferroni correction for multiple comparisons across three different assessment times. In case of significant results with Mauchly's test of sphericity, the Greenhouse-Geisser method was employed. All statistical analyses were conducted using SPSS version 21.0 for Windows (SPSS, Inc., Chicago, IL, USA). A *P* value < 0.050 was considered statistically significant.

3. Results

3.1. Comparisons of sociodemographic factors between the "young-old" and the "old-old" group

Among the total 82 older community-dwelling suicidal ideators, 29 were "young-old" (35.4%), and 53 "old-old" (64.6%) (Table 1). Except for age, no statistical differences in sociodemographic variables between the two groups were found.

3.2. Comparisons of medical-, psychiatric-, familial-, and suicidal-related factors and diagnoses between the "young-old" and the "old-old" group

The "old-old" were less likely to receive current psychiatric treatment (odds ratio [OR], 4.065, the reciprocal of 0.246) and have history of suicide attempts (OR, 2.874, the reciprocal of 0.348) (Table 2). Medical- and familial-related variables and the selected DSM-IV diagnoses did differ between the two groups. Only the diagnoses related to major depressive episodes, alcohol use, and suicide risk are listed in Table 2. The remaining diagnoses are presented in Table S1.

3.3. Comparisons of clinical rating scores between the "young-old" and the "old-old" group

Both the C-SSRS intensity subscore and PHQ scores did not significantly differ between the age groups at baseline and follow-up assessments (Table 3). The "young-old" group showed significantly higher scores in the BAI at each assessment time (moderate-to-severe and mild-to-moderate anxiety for the "young-old" and the "old-old" group, respectively) and in the SQ for KHANES-SF. On the basis of PHQ-9, there were no significant between-group differences with both presenting moderate depression. The AUDIT scores indicated no alcohol intake or low risk drinking. While a greater degree of baseline overall stress in the "young-old" group was observed, the proportions of types of stress sources and levels according to specific relationships did not differ.

3.4. Multiple regression analysis of clinical rating scores predictive of suicidal ideation within each "young-old" and "old-old" group

In the "young-old" group, only one independent variable, the PHQ-9 score, significantly predicted the intensity of suicidal ideation with the

Table 1
Comparisons of sociodemographic factors between the “young-old” and the “old-old” group.

Variables	“Young-old” (n = 29)	“Old-old” (n = 53)	P-value ^a	OR ^b	95% CI
Age, yr	69.66 ± 2.69	78.89 ± 4.10	<0.001	–	
Sex			0.447	1.467	0.546–3.944
Female	21 (72.4)	34 (64.2)			
Male	8 (27.6)	19 (35.8)			
Marital status			0.256	–	
Never married	2 (6.9)	4 (7.5)			
Currently married or cohabitating	8 (27.6)	10 (18.9)			
Separated or divorced	11 (37.9)	13 (24.5)			
Widowed	8 (27.6)	26 (49.1)			
Living status			0.621	1.263	0.499–3.195
With family or nonfamily	12 (41.4)	19 (35.8)			
Alone	17 (58.6)	34 (64.2)			
Education level			0.624	–	
Less than primary school	10 (34.5)	25 (47.2)			
Primary school	7 (24.1)	11 (20.8)			
Middle school	5 (17.2)	5 (9.4)			
High school or higher	7 (24.1)	12 (22.6)			
Monthly household income, thousand KRW ^c	682.76 ± 54.58	531.51 ± 38.51	0.191	–	
≤1000	24 (82.8)	50 (94.3)	0.124	0.288	0.064–1.306
>1000	5 (17.2)	3 (5.7)			
Employment status			0.660	0.805	0.306–2.117
Employed	9 (31.0)	19 (35.8)			
Unemployed	20 (69.0)	34 (64.2)			

Values are presented as number (%) or mean ± SD.

OR = odds ratio; CI = confidence interval; KRW = Korean Won; SD = standard deviation.

^a Mann-Whitney U test for continuous variable and Pearson's χ^2 test or Fisher's exact test for categorized variables. Significant findings at $P < .050$ are in bold fonts.

^b Relative to the “old-old.”

^c Average exchange rate 1207.7 KRW = 1 USD in 2017 (Ministry of Strategy and Finance, Republic of Korea).

variable accounting for 25.9% of the variance (left portion of Table 4). A greater severity of depression was associated with higher intensity of suicidal ideation ($\beta = 0.509$, $P = .005$).

The “old-old” group also showed that only one independent variable, the SQ for KHANES-SF, had significant predictive effects on the intensity of suicidal ideation with the factor accounting for 43.9% of the variance (right portion of Table 4). A higher level of overall stress reflected higher intensity of suicidal ideation ($\beta = 0.663$, $P < .001$).

3.5. Two-way RM-ANOVA analysis for the effects of age group on the C-SSRS intensity subscale, PHQ-9, and BAI

All 73 participants completed the 6-month follow-up assessment, among which 27 were “young-old” (37.0%), and 46 “old-old” (63.0%) (Table 3). The interactions of age group and assessment time with the scores of the C-SSRS intensity subscale ($F = 0.740$, $P = .464$, $\eta^2 = 0.010$), PHQ-9 ($F = 0.365$, $P = .672$, $\eta^2 = 0.005$), and BAI ($F = 0.175$, $P = .839$, $\eta^2 = 0.002$) were not significantly different; namely, the trends of the two age groups were similar across time. They are illustrated in Figs. 1, 2, and 3, respectively.

3.6. One-way RM-ANOVA analysis for the baseline-to-endpoint score changes in C-SSRS intensity subscale, PHQ-9, and BAI

In the “young-old” group, RM-ANOVA conducted on each scale showed a significant time effect on the C-SSRS intensity subscale and PHQ-9, but not BAI (Table 5). Post-hoc tests for the former two revealed that there were significant differences in the scores between baseline and 1-month assessment for both scales, whereas a difference in the scores was observed between baseline and 6-month assessment only with the intensity subscale. In the “old-old” group, RM-ANOVA was performed on the three scales, which revealed a significant time effect for each (Table 5). Post-hoc tests showed that the scores significantly differed between the baseline and 1-month assessment for each scale, while those between baseline and 6-month assessment did only for the intensity subscale and PHQ-9, but not BAI. No difference was found in any scale of any age group between the 1- and 6-month

assessments. The results are summarized in Table 5 and depicted in Figs. 1, 2, and 3.

4. Discussion

This is the first study demonstrating the cross-sectional and longitudinal characteristics of “young-old” and “old-old” suicidal ideators in the community, and reveals the predictors of suicidal ideation within each age group to suggest tailored prevention strategies. Overall, the “old-old” were less likely to be currently under psychiatric treatment and have a history of suicide attempts. Although the intensity of suicidal ideation did not significantly differ, the “young-old” had higher levels of anxiety and overall stress with the former remaining more severe at the follow-up assessments as well. In the “young-old”, only greater depression and, in the “old-old”, only higher stress predicted the higher intensity of suicidal ideation at baseline. During the 6-month follow-up, the two age groups showed no statistically different courses of suicidal ideation, depression, and anxiety; however, within each group, the former two significantly improved during the first month with no further improvement.

At baseline, the proportion of individuals currently on psychiatric treatment was significantly lower in the “old-old” group, despite no between-group differences in self-reported history of psychiatric illness and psychiatric diagnosis, as well as most clinical rating scores. The disparity, first, may be stemming from an age-related difference in stigma about mental disorders. Many studies have shown that older people have a greater stigma on mental illness. Increasing age among Koreans is associated with a higher, discriminatory stigma in patients suffering from suicide attempts and depression [24], and the perception of elderly Koreans of psychiatric illness as a stigma resulted in an infrequent utilization of mental health services [25]. An American survey reported that older people were more skeptical about the competence of those with psychiatric problems in dealing with tasks of importance [26]. As an explanation for the higher rate of stigmatization in the elderly, certain encounters with mental illness or psychiatric patients, especially negative enough to draw public attention, may be stereotyped by them [25]. Second, we speculate with caution that referral

Table 2
Comparisons of medical-, psychiatric-, familial-, and suicidal-related factors and selected diagnoses between the “young-old” and the “old-old” group^a.

Variables	“Young-old” (n = 29)	“Old-old” (n = 53)	P-value ^b	OR	95% CI
Medical-related					
Present or past medical illness ^c			1.000	0.711	0.129–3.917
No	2 (6.9)	5 (9.4)			
Yes	27 (93.1)	48 (90.6)			
Body Mass Index			0.796	–	–
Underweight	1 (3.6)	1 (1.9)			
Normal	15 (53.6)	28 (53.8)			
Overweight	5 (17.9)	13 (25.0)			
Obese	7 (25.0)	10 (19.2)			
Subjective distress due to physical illness			1.000		
No	2 (7.4)	3 (6.3)			
Mild	6 (22.2)	12 (25.0)			
Moderate	12 (44.4)	22 (45.8)			
Severe	7 (25.9)	11 (22.9)			
Psychiatric-related					
Psychiatric illness ^d			0.204	0.547	0.214–1.394
No	10 (34.5)	26 (49.1)			
Yes	19 (65.5)	27 (50.9)			
Current psychiatric treatment			0.027	0.246	0.068–0.881
No	5 (26.3)	16 (59.3)			
Yes	14 (73.7)	11 (40.7)			
Psychiatric admission			0.133	0.271	0.058–1.265
No	13 (68.4)	24 (88.9)			
Yes	6 (31.6)	3 (11.1)			
Family-related					
Psychiatric treatment			1.000	1.680	0.167–16.925
No	28 (96.6)	50 (94.3)			
Yes	1 (3.4)	3 (5.7)			
Suicide attempt			0.184	0.399	0.110–1.446
No	23 (79.3)	48 (90.6)			
Yes	6 (20.7)	5 (9.4)			
Suicide completion			1.000	1.500	0.136–16.542
No	3 (50.0)	2 (40.0)			
Yes	3 (50.0)	3 (60.0)			
Suicide-related					
Past suicidal ideation			0.962	1.023	0.394–2.656
No	10 (34.5)	18 (34.0)			
Yes	19 (65.5)	35 (66.0)			
Past suicide plan			0.199	2.076	0.672–6.412
No	24 (82.8)	37 (69.8)			
Yes	5 (17.2)	16 (30.2)			
Past suicide attempt			0.029	0.348	0.133–0.910
No	15 (51.7)	40 (75.5)			
Yes	14 (48.3)	13 (24.5)			
DSM-IV diagnosis					
Major depressive episode, current			0.438	1.467	0.555–3.873
No	18 (66.7)	30 (57.7)			
Yes	9 (33.3)	22 (42.3)			
Major depressive episode, recurrent			0.065	0.390	0.141–1.078
No	16 (59.3)	41 (78.8)			
Yes	11 (40.7)	11 (21.2)			
Major depressive episode with melancholic features, current			0.538	0.636	0.196–2.069
No	21 (77.8)	44 (84.6)			
Yes	6 (22.2)	8 (15.4)			
Alcohol dependence, current			1.000	1.592	0.158–16.078
No	26 (96.3)	49 (94.2)			
Yes	1 (3.7)	3 (5.8)			
Alcohol abuse, current			1.000	0.510	0.031–8.483
No	26 (96.3)	51 (98.1)			
Yes	1 (3.7)	1 (1.9)			
Suicide risk, current			0.164	2.100	0.730–6.039
No	9 (33.3)	10 (19.2)			
Yes	18 (66.7)	42 (80.0)			
Suicide risk, current ^e			0.406	–	–
Low	6 (33.3)	21 (50.0)			
Moderate	7 (38.9)	10 (23.8)			
High	5 (27.8)	11 (26.2)			

Values are presented as number (%).

OR = odds ratio; CI = confidence interval; DSM-IV = Diagnostic and Statistical Manual of Mental Disorder, Fourth Edition.

^a Numbers may not agree with the number of total subjects due to missing data.^b Pearson's χ^2 test or Fisher's exact test. Significant findings at $P < .050$ are in bold fonts.^c Includes hypertension, diabetes mellitus, cancer, stroke, Parkinson's disease, cardiac disease, pulmonary disease, renal disease, ophthalmic disease, otologic disease, etc.^d Includes dementia, psychotic disorder, bipolar disorder, depressive disorder, anxiety disorder, somatoform disorder, adjustment disorder, substance-related disorder, intellectual disability, learning disorder, developmental disorder, and etc.^e Low, moderate, and high risk for 1–5, 6–9, and ≥ 10 points, respectively, out of the total 33 points in the K-MINI current suicide risk.

Table 3
Comparisons of clinical rating scores between the “young-old” and the “old-old” groups.

Variables	Baseline			1-Month			6-Month		
	“Young-old” (n = 29)	“Old-old” (n = 53)	P-value ^a	“Young-old” (n = 28)	“Old-old” (n = 51)	P-value	“Young-old” (n = 27)	“Old-old” (n = 46)	P-value
C-SSRS Intensity subscale	11.69 (6.62)	11.04 (7.18)	0.811	7.54 (7.56)	6.25 (6.91)	0.336	5.52 (7.05)	5.63 (7.59)	0.865
PHQ-9	14.48 (7.86)	12.57 (7.24)	0.270	10.89 (7.70)	9.92 (6.75)	0.630	10.93 (6.22)	8.72 (6.30)	0.117
BAI	26.10 (17.36)	16.92 (12.35)	0.018	23.04 (19.12)	12.45 (11.80)	0.018	20.04 (14.58)	11.76 (11.65)	0.010
AUDIT	3.03 (7.17)	1.60 (4.38)	0.273						
SQ for KNHANES-SF									
Total score	27.90 (10.91)	22.70 (8.58)	0.032						
Stress cause									
Interpersonal relationships ^b /Changes in relationships ^c	7 (24.1)	11 (20.8)	0.917						
Illness or injury to oneself or others	13 (44.8)	26 (49.1)							
Work, job or school/Financial problems/Unusual events ^d	9 (31.0)	16 (30.2)							
SRS (stress from)									
Close family	2.41 (1.35)	2.57 (1.28)	0.503						
Lover or boyfriend/girlfriend	3.41 (1.09)	3.68 (0.83)	0.176						
Close friend	3.21 (1.08)	3.42 (1.03)	0.289						
Colleague or boss	3.55 (0.95)	3.60 (0.99)	0.399						

Values are presented as number (%).

C-SSRS = Columbia-Suicide Severity Rating Scale; PHQ-9 = Patient Health Questionnaire-9; BAI = Beck Anxiety Inventory; AUDIT = Alcohol Use Disorders Identification Test; SQ for KNHANES-SF = Stress Questionnaire for Korea National Health and Nutrition Examination Survey-Short Form; SRS = Social Relationships Scale.

^a Student's *t* test or Mann-Whitney U test for continuous variables and Pearson's χ^2 test for a categorized variable. Significant findings at $P < .050$ are in bold fonts.

^b Relationships with family or other significant people.

^c Death, birth, divorce, marriage, etc.

^d Crime, natural disaster, accident, moving, etc.

rates to psychiatric services might have been different between the two groups. Considering stigma discouraging the elderly from utilizing psychiatric services, referrals from their primary care physicians or non-psychiatric specialists to psychiatrists may be an important route for entering mental health services. Given no differences in history of medical illness, body mass index, and subjective distress from physical illness in our results, the proportion of individuals visiting medical clinics between the two groups might have been similar, and thus, their referral rate may have differed with a relatively higher proportion of the “young-old” being referred to mental health providers. This inference is in line with a previous study [27] reporting that the “old-old” depressed patients visiting primary care clinics receive insufficient attention as the “young-old” are over four times more likely to be evaluated about suicide risk than the “old-old”, and the “old-old” are 1.5 times less likely to be referred to mental health specialists than the “young-old.” Another study showed that most of the elderly suicide completers had seen a physician during 1 month before their lethal attempt, also implying under attention on mental illness among non-psychiatrists [28]. Our findings highlight the importance of developing strategies to involve the “old-old” in mental health services, perhaps based on the literature review, by focusing on lowering stigma and encouraging their referrals to psychiatrists.

The lower proportion of past suicide attempts in the “old-old” may be attributable, in part, to suicide completion occurring during the “young-old” age band. Past suicide attempt is a well-known, strong predictor of suicide completion [29]. In particular, older suicide attempters are known to show higher suicide rates [4] because of their prevalent use of suicide methods with high lethality [30] along with their physical vulnerability due to advanced age [31]. Thus, once again, this finding implies the importance of proactive interventions such as active referral to a psychiatrist to prevent suicide attempts in the elderly.

There were no differences in current suicide risk by the K-MINI and the C-SSRS intensity of suicidal ideation. First, these findings indicate that older community-dwellers with current suicidal ideation, irrespective of their age group, deserve equal, psychiatric attention. However, as comparison was precluded owing to a lack of previous studies, further studies are recommended to confirm this finding. Second, the results appear to imply a greater risk of suicidal ideation among the “old-old” when interpreted together with different suicide rates by age group. A previous study using cross-national data reported higher suicide rates in the “old-old” age group compared with the “young-old” [32]. Similarly, a recent study with international data showed that suicide rates increased consistently with advancing five-year age intervals from 65 to 70 years through to 85–89 years [10]. According to the

Table 4
Multiple regression analysis of baseline clinical rating scores predictive of suicidal ideation in each group of the “young-old” and the “old-old” groups.

Dependent variables	Independent variables	“Young-old” (n = 29)					“Old-old” (n = 53)				
		R ^{2a}	B ^b	β^c	<i>t</i>	P-value ^d	R ²	B	β	<i>t</i>	P-value
C-SSRS Intensity subscale (Baseline)	PHQ-9 SQ for KHANES-SF	0.259	0.429	0.509	3.073	0.005	0.439	0.555	0.663	6.321	<0.001
C-SSRS Intensity subscale (1-Month)	PHQ-9 SQ for KHANES-SF SRS (Stress from close family)	0.146	0.371	0.383	2.112	0.044	0.358	0.383	0.481	4.029	<0.001
							−1.392	−0.256	−2.143	0.037	

C-SSRS = Columbia-Suicide Severity Rating Scale; PHQ-9 = Patient Health Questionnaire-9; SQ for KHANES-SF = Stress Questionnaire for Korea National Health and Nutrition Examination Survey-Short Form; SRS = Stress Relationships Scale.

^a Coefficient of determination.

^b Unstandardized regression coefficient.

^c Standardized regression coefficient.

^d Multiple regression analysis with stepwise method. Significant findings at $P < .050$ are in bold fonts.

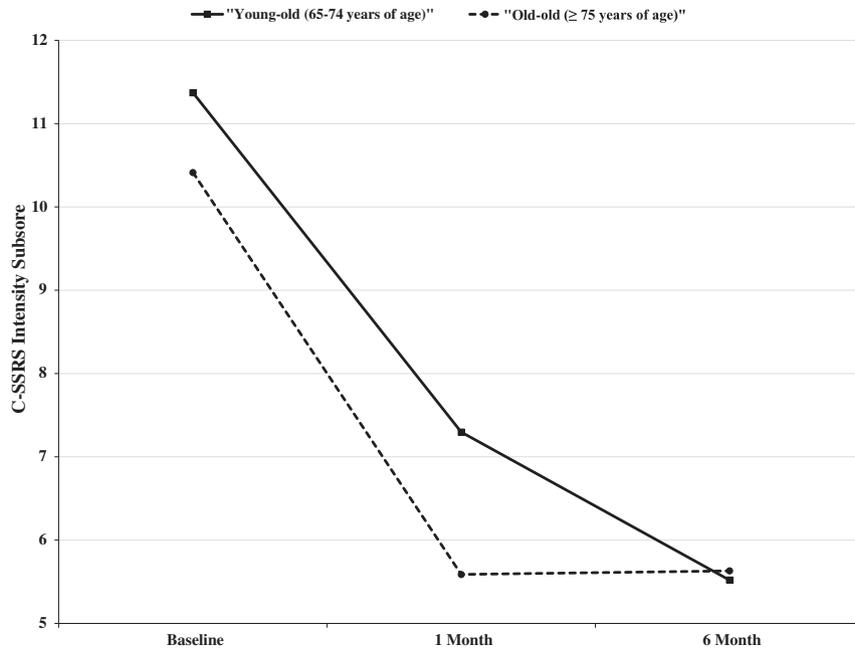


Fig. 1. Baseline to endpoint changes in the C-SSRS intensity subscale by age group. C-SSRS = Columbia-Suicide Severity Rating Scale.

concept of suicidal process, suicidal ideation develops into suicide completion via formation of a suicidal plan followed by attempt [15]; given their prominently higher suicide rate, along with no significant differences in the intensity of suicidal ideation, the “old-old” suicidal ideators should receive particularly more careful attention to prevent the progress of suicidal ideation to the next stage.

We found significant group differences between the average scores on the BAI and the SQ for KNHANES-SF, which indicate that the “young-old” tend to suffer from higher anxiety and stress than the “old-old.” These results are in close agreement with those of previous studies reporting that aging is associated with a natural decrease in vulnerability to anxiety [33], and prevalence rates of anxiety disorders decrease with advancing age in the elderly [34]. We performed additional analysis with data from the question asking a participant whether

they attribute the incidence of current suicidal ideation to anxiety symptoms, and no less than 31.0% and 32.1% of the “young-old” and “old-old,” respectively, answered yes to the question (data not shown). Moreover, although, currently it is not a well-established risk factor for all-cause mortality [35], anxiety in older men, was associated with an increased hazard ratio of mortality in a large-scale study [36] and was a risk factor for suicidal ideation in the Korean elderly [37] and for suicide attempts [38]. Several mechanisms have been proposed to explain how anxiety may influence suicidal behavior [38]; first, as a direct effect, distress from anxiety symptoms might possibly contribute to suicidal behavior, independent of other factors. Second, as an indirect effect, anxiety disorders may lead to suicidal behavior by elevating the possibility of pathologic conditions, such as depressive disorder [39,40] or substance use [41,42], which may result in the onset of such

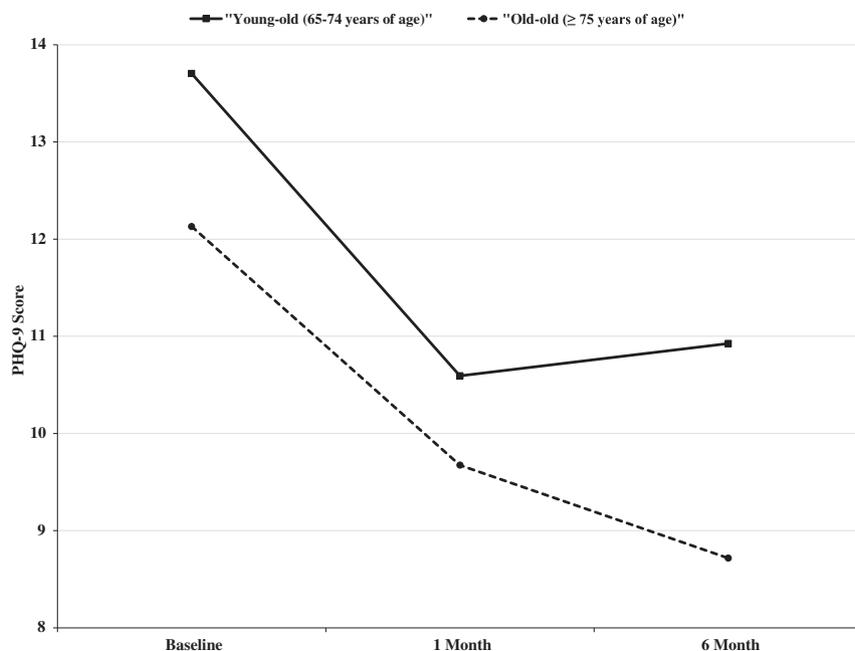


Fig. 2. Baseline to endpoint changes in the PHQ-9 intensity subscale by age group. PHQ-9 = Patient Health Questionnaire-9.

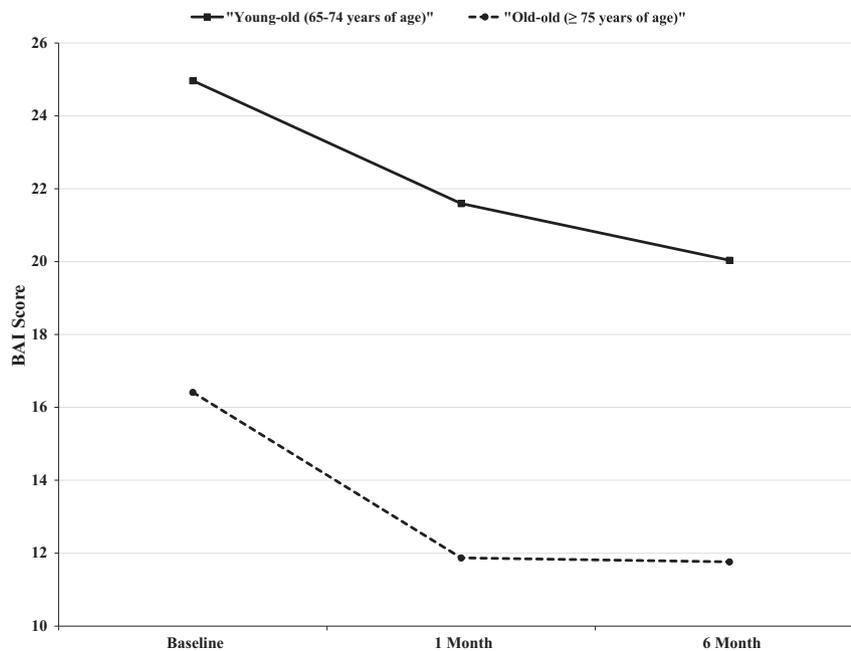


Fig. 3. Baseline to endpoint changes in the BAI intensity subscale by age group. BAI = Beck Anxiety Inventory.

behavior. Third, anxiety disorders and suicidal behavior may share genetic or environmental components. Moreover, in our longitudinal analysis, anxiety, in the “young-old” group, did not significantly decrease over a 6-month follow-up and, in the “old-old” group, was still present at a mild-to-moderate level at the endpoint despite the initial reduction at 1-month assessment (Table 5). The persistence of a higher level of anxiety in the former over the follow-up period suggests that the aforementioned inverse pattern between age and vulnerability to anxiety [33] continued during the study. The subjective psychological suffering with little improvement in the symptom severity, based on our results, and a possible association with increased mortality highlight the importance of active management efforts on anxiety, especially in the “young-old” suicidal ideators. Although pharmacotherapy was reported to be more effective than cognitive-behavioral therapy, the most extensively studied psychosocial modality of treatment [43], psychotherapeutic approaches would occupy an important position because geriatric patients are more susceptible to medication-induced side effects. Recently, mindfulness-based therapies for the elderly have shown promising results in effectively reducing both anxiety and depressive symptoms [44] as well as worry [45]. Specifically, by exercising mindfulness, individuals learn to concentrate on their present state of mind, such as thinking and feeling with nonjudgmental self-acceptance. Accordingly, they become more aware of habitual patterns that may have resulted

in depression or anxiety, and begin to perceive negative reflections and emotions only as transient events. Eventually, through overcoming past automatic and ruminant responses, participants will notice alarm signals and opt to react in more considerate and sophisticated ways [44].

We propose tailored approaches to reduce current suicidal ideation according to age groups among the elderly. The fact that different factors, i.e., depression and stress, are associated with the intensity of suicidal ideation in different age groups is in line with the findings from a previous study that involved Korean adult age groups [46]. Depression was the only predictor that intensified present suicidal ideation in the “young-old” suicidal ideators. These findings correspond with the results of numerous studies [47]; a significant and highly positive correlation was previously observed between depression and suicidal ideation among the elderly [48] and, in another large-scale prospective study performed on older Korean community-dwellers, depressive symptoms increased independent risks of prevalent, incident, and persistent suicidal ideation [47]. The well-established association of depression with suicidal ideation, along with reports showing that depression is the most prevalent mental disorder among the elderly at a prevalence rate of 4.8–13.7% in the community sample [49], and suicidal ideation as a major indicator of suicidal behavior [48], necessitate timely prevention and treatment efforts for geriatric depression. Unfortunately, alarming the current practice, it has been reported that

Table 5
One-way RM-ANOVA for baseline-to-endpoint score changes on each scale.

Dependent variables	F	P-value ^a	Partial η^2 ^b	Post-hoc Bonferroni ^c		
				Baseline vs 1-month	Baseline vs 6-month	1-month vs 6-month
“Young-old”						
C-SSRS Intensity subscale	11.544	<0.001	0.307	0.011	0.001	0.345
PHQ-9	3.836	0.028	0.129	0.014	0.145	1.000
BAI	2.373	0.103	0.084	–	–	–
“Old-old”						
C-SSRS Intensity subscale	19.406	<0.001	0.301	<0.001	<0.001	1.000
PHQ-9	7.620	0.001	0.145	0.006	0.005	0.894
BAI	6.653	0.004	0.129	0.005	0.032	1.000

RM-ANOVA = Repeated-measures analysis of variance; C-SSRS = Columbia-Suicide Severity Rating Scale; PHQ-9 = Patient Health Questionnaire-9; BAI = Beck Anxiety Index.

^a One-way RM-ANOVA. Significant findings at $P < .050$ are in bold fonts.

^b Magnitude of the effect size.

^c Significant findings at $P < .025$ (0.050/2) are in bold fonts.

older depressed people both with clinical significance [50] and at a subsyndromal level [51] are undertreated. We believe that a special physician educational program to promote the awareness of depression among primary care physicians or non-psychiatric specialists may be required. A previous study showed that such a program could be an effective way of improving care of depressed patients by providing more proactive intervention [52]. According to literature [53], in this age group, either pharmacotherapy or psychotherapy can be considered as a first-line treatment. Aforementioned mindfulness-based intervention may be another option [44].

Higher stress was associated with the greater intensity of current suicidal ideation in the “old-old” suicidal ideators. These findings are consistent with those of earlier studies suggesting that stressful life events or psychological distress independently predict prevalent and persistent suicidal ideation in Koreans using a longitudinal study [47], and their association has been reported in several cross-sectional studies as well [54]. With advancing age, people suffer from many stressful life events - bereavement, financial difficulties after retirement, reduced social support due to diminished interpersonal relationships, and a burden of medical illness; moreover, they might experience difficulties and subsequent frustration in managing adverse life events because of cognitive impairment. When these issues remain unsolved or unmanaged, they may turn into greater psychosocial stress, ultimately contributing to suicidal ideation [47]. It is well-documented that stressful life events can contribute to suicidal behavior; however, information regarding mechanisms behind this phenomenon is scarce [55]. Similar to anxiety, stress has been shown to lead to suicidal ideation through both direct and indirect effects, such as depression [55]. For example, early trauma, a personal stressor and major public health problem, as well as an established risk factor for suicidal ideation in adulthood, is known to increase such risk independent of psychiatric comorbidities; additionally, it may also indirectly elevate the possibility of suicidal ideation by increasing the risks of other psychiatric disorders, such as bipolar disorder, major depressive disorders, anxiety disorders, and substance use [56]. No studies have specifically addressed the consequence of reducing psychological distress on suicidal ideation in the elderly. Based on the current literature, the following psychosocial approaches appear to be effective for this age group. First, as a psychological approach, mindfulness-based stress reduction (MBSR), one of the aforementioned mindfulness-based therapies, appears promising. Considering the potential deterioration of cognitive abilities in old age, therapeutic interventions with cognitive restructuring may be taxing [43]. Therefore, MBSR, which lacks the component of cognitive therapy, might be more realistic, particularly for this “old-old” population, in that it combines mindfulness solely with stress education, coping skills, and assertive communication. Practically, when one's self-image is threatened, the use of mindfulness can diminish psychological distress, whether the distress is real or perceived [57]. The elderly, especially the “old-old” as in our case, experience aging and death of themselves or companions as actual events; some may develop negative perceptions of themselves as less valued, due to retirement and change in financial status [58]. Studies have shown that MBSR is helpful in stress reduction among the elderly [45], and that it improves depression, anxiety, and even suicidal ideation [59]. Second, as a social approach, different strategies need to be implemented to effectively address one's particular cause of stress [1]. For example, for those who suffer from loneliness or financial difficulties, provision of group programs such as MBSR to build new social relationships in CMHWCs or provide job opportunities, respectively, might be helpful.

Because they might be misleading, the findings that the AUDIT score for alcohol screening did not predict the intensity of suicidal ideation in both “young-old” and “old-old” groups are worthy of additional explanations. Alcohol misuse is a well-established risk factor for suicidal ideation in older people [60], whereas adequate alcohol consumption is not. Considering that the average scores for each group, 3.03 and 1.60, respectively, were greatly under the score of 7, a cut-off for

hazardous alcohol use (and an indicator of a medium or high level of alcohol problems), the possibility of alcohol misuse in our study population was thought to be very low. Most of the participants, 82.75% for the “young-old” group and 90.57% for the “old-old” group, were under the cut-off; thus, they could be regarded as light to moderate drinkers. The characteristics of the current study sample may have resulted in the non-predictability of the alcohol screening score with respect to the intensity of suicidal ideation.

The 6-month follow-up showed several novel findings about characteristics of older suicidal ideators. First, the “young-old” and the “old-old” suicidal ideators followed a similar course over the entire follow-up period in each of the C-SSRS intensity subscale, PHQ-9, and BAI without significant differences (Table 5); in contrast, within each age group, the scores across assessment times differed significantly (Figs. 1, 2, and 3, respectively). Second, significant decreases in the intensity of suicidal ideation over assessment times, for both age groups, occurred only during the first month, and no further reduction was found at the 6-month assessment with only a minimal degree of ideation [61] remaining in the end. These unique trends of suicidal ideation over time may be related to changes in the depression severity; it is noteworthy that the course of depression revealed a strikingly similar direction to that of suicidal ideation - a rapid, significant improvement at 1-month followed by maintenance of the status quo without a further decrease. In our study sample, 73.7% of the “young-old” and 40.7% of the “old-old” participants were receiving psychiatric treatment (Table 2). Besides, given that depression is a well-established risk factor for suicidal ideation in the elderly [47–49], and in our “young-old” group, a higher level of depression was associated with greater suicidal ideation, these temporal findings may imply the importance, and possibly the effectiveness of earlier intervention on depression to prevent suicide [62], even at the subsyndromal level [63]. On the other hand, from the baseline analysis, only higher stress, but not depression, was a predictor of more severe suicidal ideation in the “old-old” ideators, and thus, we speculate cautiously that stress reduction might have partly, in an adjunctive manner, contributed to the improvement of suicidal ideation in this group.

Because there was no further improvement in suicidal ideation beyond the 1-month assessment, the research team decided to further scrutinize this point by performing additional, multiple regression analyses with the clinical rating scores from the baseline assessment as independent variables and the C-SSRS intensity subscale at the 1-month assessment as a dependent variable. Similar results to those from the baseline using cross-sectional analysis were obtained (Table 4); in the “young-old” group, only the baseline PHQ-9 ($\beta = 0.383, P = .044$) predicted the intensity of suicidal ideation at the 1-month assessment and, in the “old-old” group, only the baseline stress-related scales - the SQ for KHANES-SF ($\beta = 0.481, P = 4.029$) and one item of the SRS (stress from close family) ($\beta = -0.256, P = .037$) did. With greater depression and stress predicting more severe suicidal ideation at not only the baseline but also the 1-month follow-up, once again, these findings highlight the utmost necessity of proactive management of depression in the “young-old” suicidal ideators and the importance of stress reduction in “old-old” ideators.

Lastly, at the initial assessment, 44.8% of the “young-old” group and 18.9% of the “old-old” group ($P = .012$) were using psychiatric medication (44.8% and 13.2%, respectively, if only antidepressants and antipsychotics were considered; $P = .001$). At the 6-month assessment, 30.8% and 9.1% in each group ($P = .045$) were taking psychiatric medication (26.9% and 6.8%, respectively, if only antidepressants and antipsychotics were considered; $P = .032$). The findings that a significantly lower proportion of the “old-old” group received psychopharmacological intervention, as aforementioned, may reflect a greater stigma of mental illness and lower referral rate or, inversely, refer to greater anxiety of the “young-old” group. In both groups, the proportion using psychiatric medications decreased over the 6-month follow-up period, possibly due to improvement in psychiatric symptoms. Detailed information

on the types of psychiatric medications is presented in Supplementary Table S2.

The current study has several limitations. First, there is a limitation stemming from its small sample size. Second, the follow-up period was relatively short. As depression can occur recurrently, a long-term follow-up will be required to examine its association with suicidal ideation. Third, the study sample had a low economic status. The national average monthly household income is 3888.32 thousand KRW for the average family members of 2.48, and, even for a single person household, it is 1684.58 thousand KRW [64], almost three times of that of our entire study sample (585.00 ± 451.11 thousand KRW). It is unclear whether our findings can be generalized to a population with middle or high economic status. Fourth, the study sample consisted of ethnic Koreans only, and therefore, generalization of the results to other ethnic groups should be conducted cautiously. Fifth, only self-rating scales were used to measure psychopathology and stress; in psychiatric evaluations, interviewer-rated scales are known to include unique information not obtained through self-reporting [65,66], and to be more sensitive to changes in symptoms [67]. Furthermore, if self-reporting were used, there might have been a potential for under-reporting of psychiatric symptoms [68], possibly due to the stigma associated with mental illness, prevalent among the Korean elderly population [25]. However, considering that all study subjects voluntarily participated in the study, this possibility was thought to be very low. Sixth, some medications, including antidepressants [69,70] as well as psychotherapy [71], may affect the risk of suicidal ideation; however, the effects of non-psychiatric pharmacotherapy or any concomitant psychotherapy could not be considered for analysis because this information was not obtained. In spite of these limitations, the current study presents several strengths that warrant more detailed comments. First, this study is the first prospective cohort study characterizing geriatric suicidal ideators and investigating older Asians by dichotomized age groups. Second, this work employed clinical rating scales whereas, most similar studies on suicide attempters or completers were retrospective chart reviews.

5. Conclusions

In conclusion, this prospective cohort study is the first to investigate characteristics of the “young-old” and the “old-old” community-dwelling suicidal ideators and identify distinguishing, cross-sectional and longitudinal predictors of greater suicidal ideation within each age group. Non-psychiatric health practitioners need to pay more attention to the assessments of depression and suicidal ideation among the “old-old” suicidal ideators and consider active referral to psychiatrists. To reduce suicidal ideation, proactive, timely management of depression and psychotherapeutic interventions focusing on stress reduction would be helpful among the “young-old” and “old-old” groups, respectively. Further studies with a large sample size and a long-term follow-up period are required to confirm these characteristics and to examine the effects of reducing depression and stress on suicidal ideation in each age group.

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.comppsy.2018.12.002>.

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Conflicts of interest

None.

References

- [1] Park CHK, Lee JW, Lee SY, Moon J, Shim S-H, Paik J-W, et al. Comparison of baseline characteristics between community-based and hospital-based suicidal ideators and its implications for tailoring strategies for suicide prevention: Korean cohort for the model predicting a suicide and suicide-related behavior. *J Korean Med Sci* 2017;32: 1522–33. <https://doi.org/10.3346/jkms.2017.32.9.1522>.
- [2] Organisation for Economic Co-operation. OECD Health Statistics 2018. <https://www.oecd.org/els/health-systems/OECD-Health-Statistics-2018-Frequently-Requested-Data.xls>; 2018. [accessed 11 August 2018].
- [3] Statistics Korea. Korean Statistical Information Service: annual report on the cause of death statistics 2016. http://kosis.kr/eng/statisticsList/statisticsList_01List.jsp?vwcd=MT_ETITLE&parmTabld=M_01_01#SubCont; 2016. [accessed 11 August 2018].
- [4] Paraschakis A, Douzenis A, Michopoulos I, Christodoulou C, Vassilopoulou K, Koutsaftis F, et al. Late onset suicide: distinction between “young-old” vs. “old-old” suicide victims. How different populations are they? *Arch Gerontol Geriatr* 2012; 54:136–9. <https://doi.org/10.1016/j.archger.2011.02.011>.
- [5] Statistics Korea. Korean statistical information service: statistics for causes of mortality 2016. http://kostat.go.kr/portal/korea/kor_nw/2/6/2/index.board?bmode=download&Seq=&aSeq=363268&ord=5; 2016. [accessed 11 August 2018].
- [6] Oh DJ, Park JY, Oh M, Kim K, Hong J, Kim T, et al. Suicidality-based prediction of suicide attempts in a community-dwelling elderly population: results from the Osan Mental Health Survey. *J Affect Disord* 2015;184:286–92. <https://doi.org/10.1016/j.jad.2015.06.010>.
- [7] Bhaskar S, Hemavathy D, Prasad S. Prevalence of chronic insomnia in adult patients and its correlation with medical comorbidities. *J Family Med Prim Care* 2016;5: 780–4. <https://doi.org/10.4103/2249-4863.201153>.
- [8] Jaussent I, Dauvilliers Y, Ancelin ML, Dartigues JF, Tavernier B, Touchon J, et al. Insomnia symptoms in older adults: associated factors and gender differences. *Am J Geriatr Psychiatry* 2011;19:88–97. <https://doi.org/10.1097/JGP.0b013e3181e049b6>.
- [9] Pompili M, Innamorati M, Forte A, Longo L, Mazzetta C, Erbuoto D, et al. Insomnia as a predictor of high-lethality suicide attempts. *Int J Clin Pract* 2013;67:1311–6. <https://doi.org/10.1111/ijcp.12211>.
- [10] Shah A, Bhat R, Zarate-Escudero S, Deleo D, Erlangsen A. Suicide rates in five-year age-bands after the age of 60 years: the international landscape. *Aging Ment Health* 2016;20:131–8. <https://doi.org/10.1080/13607863.2015.1055552>.
- [11] Innamorati M, Pompili M, Di Vittorio C, Baratta S, Masotti V, Badaracco A, et al. Suicide in the old elderly: results from one Italian county. *Am J Geriatr Psychiatry* 2014;22:1158–67. <https://doi.org/10.1016/j.jagp.2013.03.003>.
- [12] Sinyor M, Tan LPL, Schaffer A, Gallagher D, Shulman K. Suicide in the oldest old: an observational study and cluster analysis. *Int J Geriatr Psychiatry* 2016;31:33–40. <https://doi.org/10.1002/gps.4286>.
- [13] Erlangsen A, Bille-Brahe U, Jeune B. Differences in suicide between the old and the oldest old. *J Gerontol B Psychol Sci Soc Sci* 2003;58:S314–22.
- [14] Wiktorsson S, Berg AI, Wilhelmson K, Mellqvist Fässberg M, Van Orden K, Duberstein P, et al. Assessing the role of physical illness in young old and older old suicide attempters. *Int J Geriatr Psychiatry* 2016;31:771–4. <https://doi.org/10.1002/gps.4390>.
- [15] Van Heeringen K, Hawton K, Williams JMG, Van Heeringen K. Pathways to suicide: An integrative approach. In: Hawton K, editor. *The international handbook of suicide and attempted suicide*. New Jersey: John Wiley & Sons Inc.; 2000. p. 223–34.
- [16] Stack S. Differentiating suicide ideators from attempters: violence – a research note. *Suicide Life Threat Behav* 2014;44:46–57. <https://doi.org/10.1111/sltb.12054>.
- [17] Van Orden KA, Witte TK, Gordon KH, Bender TW, Joiner Jr TE. Suicidal desire and the capability for suicide: tests of the interpersonal-psychological theory of suicidal behavior among adults. *J Consult Clin Psychol* 2008;76:72–83. <https://doi.org/10.1037/0022-006X.76.1.72>.
- [18] Park CHK, Lee JW, Lee SY, Moon J-J, Jeon D-W, Shim S-H, et al. The Korean Cohort for the Model Predicting a Suicide and Suicide-related Behavior: study rationale, methodology, and baseline sample characteristics of a long-term, large-scale, multi-center, prospective, naturalistic, observational cohort study. *Compr Psychiatry* 2019;88:29–38. <https://doi.org/10.1016/j.comppsy.2018.11.003>.
- [19] Kroenke K, Spitzer RL, Williams JB. The PHQ-9: validity of a brief depression severity measure. *J Gen Intern Med* 2001;16:606–13.
- [20] Julian LJ. Measures of anxiety: State-Trait Anxiety Inventory (STAI), Beck Anxiety Inventory (BAI), and Hospital Anxiety and Depression Scale-Anxiety (HADS-A). *Arthritis Care Res* 2011;63:S467–72. <https://doi.org/10.1002/acr.20561>.
- [21] Babor TF, Higgins-Biddle JC, Saunders JB, Monteiro MG. AUDIT: the alcohol use disorders identification test: guidelines for use in primary health care. 2nd ed. Geneva: World Health Organization; 2001.
- [22] National Digital Science Library. Development of the Stress Questionnaire for KHNANES. <http://www.ndsl.kr/ndsl/search/detail/report/reportSearchResultDetail.do?cn=TRKO20130000362>; 2013. [accessed 14 November 2018].
- [23] Lee M-A, Kim S-H, Park J-H, Sim E-J. Factors of suicidal ideation and behavior: social relationships and family. *Korea J Popul Stud* 2010;33:61–84.
- [24] Park S, Kim M-J, Cho MJ, Lee J-Y. Factors affecting stigma toward suicide and depression: a Korean nationwide study. *Int J Soc Psychiatry* 2015;61:811–7. <https://doi.org/10.1177/0020764015597015>.
- [25] Park JE, Cho S-J, Lee J-Y, Sohn JH, Seong SJ, Suk HW, et al. Impact of stigma on use of mental health services by elderly Koreans. *Soc Psychiatry Psychiatr Epidemiol* 2015; 50:757–66. <https://doi.org/10.1007/s00127-014-0991-0>.
- [26] Pescosolido BA, Monahan J, Link BG, Stueve A, Kikuzawa S. The public's view of the competence, dangerousness, and need for legal coercion of persons with mental health problems. *Am J Public Health* 1999;89:1339–45.
- [27] Fischer LR, Wei F, Solberg LI, Rush WA, Heinrich RL. Treatment of elderly and other adult patients for depression in primary care. *J Am Geriatr Soc* 2003;51:1554–62.

- [28] Koenig HG, Blazer DG. Epidemiology of geriatric affective disorders. *Clin Geriatr Med* 1992;8:235–51.
- [29] Bostwick JM, Pabbati C, Geske JR, McKean AJ. Suicide attempt as a risk factor for completed suicide: even more lethal than we knew. *Am J Psychiatry* 2016;173:1094–100. <https://doi.org/10.1176/appi.ajp.2016.15070854>.
- [30] Pérez Barrero SA. Suicide risk factors among the elderly. *Cien Saude Colet* 2012;17:2011–6.
- [31] Park CHK, Yoo SH, Lee J, Cho SJ, Shin M-S, Kim EY, et al. Impact of acute alcohol consumption on lethality of suicide methods. *Compr Psychiatry* 2017;75:27–34. <https://doi.org/10.1016/j.comppsy.2017.02.012>.
- [32] Shah A, Bhat R, McKenzie S, Koen C. Elderly suicide rates: cross-national comparisons and association with sex and elderly age-bands. *Med Sci Law* 2007;47:244–52. <https://doi.org/10.1258/rsmmsl.47.3.244>.
- [33] Jorm AF. Does old age reduce the risk of anxiety and depression? A review of epidemiological studies across the adult life span. *Psychol Med* 2000;30:11–22.
- [34] Schaub RT, Linden M. Anxiety and anxiety disorders in the old and very old - results from the Berlin Aging Study (BASE). *Compr Psychiatry* 2000;41:48–54.
- [35] Miloyan B, Bulley A, Bandeen-Roche K, Eaton WW, Gonçalves-Bradley DC. Anxiety disorders and all-cause mortality: systematic review and meta-analysis. *Soc Psychiatry Psychiatr Epidemiol* 2016;51:1467–75. <https://doi.org/10.1007/s00127-016-1284-6>.
- [36] Van Hout HP, Beekman AT, De Beurs E, Comijs H, Van Marwijk H, De Haan M, et al. Anxiety and the risk of death in older men and women. *Br J Psychiatry* 2004;185:399–404. <https://doi.org/10.1192/bjp.185.5.399>.
- [37] Shin KM, Cho S-M, Hong CH, Park KS, Shin YM, Lim KY, et al. Suicide among the elderly and associated factors in South Korea. *Aging Ment Health* 2013;17:109–14. <https://doi.org/10.1080/13607863.2012.702732>.
- [38] Bolton JM, Cox BJ, TOS Afifi, Enns MW, Bienvenu OJ, Sareen J. Anxiety disorders and risk for suicide attempts: findings from the Baltimore Epidemiologic Catchment area follow-up study. *Depress Anxiety* 2008;25:477–81. <https://doi.org/10.1002/da.20314>.
- [39] Stein MB, Fuetsch M, Muller N, Hoefler M, Lieb R, Wittchen H-U. Social anxiety disorder and the risk for depression: a prospective community study of adolescents and young adults. *Arch Gen Psychiatry* 2001;58:251–6.
- [40] Goodwin RD. Anxiety disorders and the onset of depression among adults in the community. *Psychol Med* 2002;32:1121–4.
- [41] Kushner MG, Abrams K, Borchardt C. The relationship between anxiety disorders and alcohol use disorders: a review of major perspectives and findings. *Clin Psychol Rev* 2000;20:149–71.
- [42] Sareen J, Chartier M, Paulus MP, Stein MB. Illicit drug use and anxiety disorders: findings from two community surveys. *Psychiatry Res* 2006;142:11–7. <https://doi.org/10.1016/j.psychres.2006.01.009>.
- [43] Andreescu C, Varon D. New research on anxiety disorders in the elderly and an update on evidence-based treatments. *Curr Psychiatry Rep* 2015;17:53–9. <https://doi.org/10.1007/s11920-015-0595-8>.
- [44] Foulk MA, Ingersoll-Dayton B, Kavanagh J, Robinson E, Kales HC. Mindfulness-based cognitive therapy with older adults: an exploratory study. *J Gerontol Soc Work* 2014;57:498–520. <https://doi.org/10.1080/01634372.2013.869787>.
- [45] Lenze EJ, Hickman S, Hershey T, Wendleton L, Ly K, Dixon D, et al. Mindfulness-based stress reduction for older adults with worry symptoms and co-occurring cognitive dysfunction. *Int J Geriatr Psychiatry* 2014;29:991–1000. <https://doi.org/10.1002/gps.4086>.
- [46] Park E-O, Lee HY. Factors influencing suicidal ideation among Korean adults by age: results of the 2010–2011 Korean health and nutrition examination survey. *Community Ment Health J* 2015;51:987–93. <https://doi.org/10.1007/s10597-015-9863-7>.
- [47] Kang H-J, Stewart R, Jeong B-O, Kim S-Y, Bae K-Y, Kim S-W, et al. Suicidal ideation in elderly Korean population: a two-year longitudinal study. *Int Psychogeriatr* 2014;26:59–67. <https://doi.org/10.1017/S1041610213001634>.
- [48] Ponte C, Almeida V, Fernandes L. Suicidal ideation, depression and quality of life in the elderly: study in a gerontopsychiatric consultation. *Span J Psychol* 2014;17:1–10. <https://doi.org/10.1017/sjp.2014.15>.
- [49] Forlani C, Morri M, Ferrari B, Dalmonte E, Menchetti M, De Ronchi D, et al. Prevalence and gender differences in late-life depression: a population-based study. *Am J Geriatr Psychiatry* 2014;22:370–80. <https://doi.org/10.1016/j.jagp.2012.08.015>.
- [50] Barry LC, Abou JJ, Simen AA, Gill TM. Under-treatment of depression in older persons. *J Affect Disord* 2012;136:789–96. <https://doi.org/10.1016/j.jad.2011.09.038>.
- [51] Vanitallie TB. Subsyndromal depression in the elderly: underdiagnosed and undertreated. *Metabolism* 2005;54:39–44. <https://doi.org/10.1016/j.metabol.2005.01.012>.
- [52] Gerrity MS, Cole SA, Dietrich AJ, Barrett JE. Improving the recognition and management of depression: is there a role for physician education? *J Fam Pract* 1999;48:949–57.
- [53] Taylor WD. Depression in the elderly. *N Engl J Med* 2014;371:1228–36. <https://doi.org/10.1056/NEJMcp1402180>.
- [54] Handley TE, Hiles SA, Inder KJ, Kay-Lambkin FJ, Kelly BJ, Lewin TJ, et al. Predictors of suicidal ideation in older people: a decision tree analysis. *Am J Geriatr Psychiatry* 2014;22:1325–35. <https://doi.org/10.1016/j.jagp.2013.05.009>.
- [55] Polanco-Roman L, Gomez J, Miranda R, Jeglic E. Stress-related symptoms and suicidal ideation: the roles of rumination and depressive symptoms vary by gender. *Cognit Ther Res* 2016;40:606–16. <https://doi.org/10.1007/s10608-016-9782-0>.
- [56] Perroud N. Childhood maltreatment. In: Courtet P, editor. *Understanding suicide: from diagnosis to personalized treatment*, Switzerland. Springer; 2016. p. 360–70.
- [57] Marchand WR. Mindfulness-based stress reduction, mindfulness-based cognitive therapy, and Zen meditation for depression, anxiety, pain, and psychological distress. *J Psychiatr Pract* 2012;18:233–52. <https://doi.org/10.1097/01.pra.0000416014.53215.86>.
- [58] Roberts LR, Schuh H, Sherzai D, Belliard JC, Montgomery SB. Exploring experiences and perceptions of aging and cognitive decline across diverse racial and ethnic groups. *Gerontol Geriatr Med* 2015. <https://doi.org/10.1177/2333721415596101>.
- [59] Serpa JG, Taylor SL, Tillisch K. Mindfulness-based stress reduction (MBSR) reduces anxiety, depression, and suicidal ideation in veterans. *Med Care* 2014;52:S19–24. <https://doi.org/10.1097/MLR.0000000000000202>.
- [60] M1 Pompili, Serafini G, Innamorati M, Dominici G, Ferracuti S, Kotzalidis GD, et al. Suicidal behavior and alcohol abuse. *Int J Environ Res Public Health* 2010;7:1392–431. <https://doi.org/10.3390/ijerph7041392>.
- [61] The Columbia Lighthouse Project. The Columbia Suicide Severity Rating Scale (C-SSRS): Saving lives, improving high risk identification and triage and redirecting scarce resources. <http://hsacc.org/2017/PPT.Thurs%20%231%20.CSSRS.and.SPI%20.Training.Adam.Lesser.pdf>; 2017. [accessed 11 August 2018].
- [62] Barry DL. Depression in late life. *Dialogues Clin Neurosci* 1999;1:57–65.
- [63] Park M, Unützer J. Geriatric depression in primary care. *Psychiatr Clin North Am* 2011;34:469–87. <https://doi.org/10.1016/j.psc.2011.02.009>.
- [64] Statistics Korea. Korean Statistical Information Service: monthly average household income during the first quarter of 2018. http://kosis.kr/statHtml/statHtml.do?orgId=101&tblId=DT_119E028; 2018. [accessed 11 August 2018].
- [65] Uher R, Perlis RH, Placentino A, Dernovšek MZ, Henigsberg N, Mors O, et al. Self-report and clinician-rated measures of depression severity: can one replace the other? *Depress Anxiety* 2012;29:1043–9. <https://doi.org/10.1002/da.21993>.
- [66] Clements KM, Murphy JM, Eisen SV, Normand SL. Comparison of self-report and clinician-rated measures of psychiatric symptoms and functioning in predicting 1-year hospital readmission. *Admin Pol Ment Health* 2006;33:568–77. <https://doi.org/10.1016/j.psc.2011.02.009>.
- [67] Cuijpers P, Li J, Hofmann SG, Andersson G. Self-reported versus clinician-rated symptoms of depression as outcome measures in psychotherapy research on depression: a meta-analysis. *Clin Psychol Rev* 2010;30:768–78. <https://doi.org/10.1016/j.cpr.2010.06.001>.
- [68] Hunt M, Auriemma J, Cashaw AC. Self-report bias and underreporting of depression in the BDI-II. *J Pers Assess* 2003;80:26–30. https://doi.org/10.1007/10.1207/S15327752JPA8001_10.
- [69] Courtet P, Lopez-Castroman J. Antidepressants and suicide risk in depression. *World Psychiatry* 2017;16:317–8. <https://doi.org/10.1002/wps.20460>.
- [70] Robertson HT, Allison DB. Drugs associated with more suicidal ideations are also associated with more suicide attempts. *PLoS One* 2009;4:e7312. <https://doi.org/10.1371/journal.pone.0007312>.
- [71] Alexopoulos GS, Reynolds 3rd CF, Bruce ML, Katz IR, Raue PJ, Mulsant BH, et al. Reducing suicidal ideation and depression in older primary care patients: 24-month outcomes of the PROSPECT study. *Am J Psychiatry* 2009;166:882–90. <https://doi.org/10.1176/appi.ajp.2009.08121779>.