



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

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ABSTRACT

Background: The Korean Cohort for the Model Predicting a Suicide and Suicide-related Behavior (K-COMPASS) study is a prospective, naturalistic, observational cohort study, aiming to identify predictors of suicide attempt and suicide characteristics in the Korean suicidal population. The findings intend to contribute to a thorough understanding of suicidal phenomena and development of suicide prevention guidelines. The present cross-section study examines the study rationale, methodology, and baseline characteristics of the participants.

Methods: Participants were enrolled via the hospital and community gateways, establishing the hospital-based cohort (HC) and community-based cohort (CC), respectively. Baseline assessment was conducted on sociodemographic, clinical, diagnostic, and psychopathological aspects. The Columbia-Suicide Severity Rating Scale was used to investigate suicidality.

Results: A total of 800 suicidal people aged 15 years or older were enrolled from 8 university hospitals and 8 community mental health welfare centers (CMHWCs), among whom 480 (60%) were suicidal ideators and 320 (40%) were attempters. The ideators comprised 207 CC and 273 HC participants, whereas the attempters, 34 CC and 286 HC participants. Despite their lower severity in some measures, including suicidal ideation, compared with their HC counterparts, the CC participants within each group of ideators or attempters presented clinically significant psychopathology. Moreover, alcohol use problems and past suicide attempt were more likely to be found in CC participants. Only 11.1% to 21.6% of the participants in each of the four groups (defined by the cohorts and the ideators/attempters) were on any type of psychiatric treatment.

Abbreviations: K-COMPASS, Korean Cohort for the Model Predicting a Suicide and Suicide-related Behavior Study; HC, Hospital-based cohort; CC, Community-based cohort; CMHWCs, Community mental health welfare centers; OECD, Organisation for Economic Co-operation and Development; K-MINI, The Korean version of the Mini International Neuropsychiatric Interview; PHQ-9, The Patient Health Questionnaire-9; BAI, Beck Anxiety Inventory; AUDIT, Alcohol Use Disorders Identification Test; BIS-11, Barratt Impulsiveness Scale-11; ETISR-SF, Early Trauma Inventory Self Report-Short Form; SRS, Social Relationships Scale.

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Conclusions: Suicidal visitors to CMHWCs need to be as closely monitored as suicidal patients in university hospitals, especially considering their association with problem drinking and past suicide attempt. A cautious assumption is that the high suicide rate in Korea might be partly attributable to the low proportion of patients receiving psychiatric services.

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1. Introduction

Suicide is a leading cause of death worldwide, claiming close to 800,000 lives every year [1]. Since 2003 the Republic of Korea (hereafter, Korea) has continued to show the highest suicide rate among countries in the Organisation for Economic Co-operation and Development (OECD) [2]. In 2016, the annual suicide rate (number of deaths by suicide per 100,000 individuals) in Korea was 25.6 [3], which was almost twice that of the OECD, 12.1 [2]. This phenomenon has led many investigators to examine the characteristics of the high suicide rate and risk factors for suicidal behavior in Korea [4–6].

In Korean society, characterized by excessive competition and division by class, the paucity of social support programs to help people in despair might aggravate their negative feelings, which, in turn, may result in suicidal ideation as a solution [7]. In addition, the societal perception of suicide as an individual choice presents another hurdle in allocating financial resources to promote mental health and educate health professionals [6]. A study on attitudes toward suicide reported that Korean college students, compared with American college students, have a greater tendency to believe that people do not have the right to prevent suicide, believing that such an intervention is unethical; this belief relates to an endorsement of suicide as an individual decision and discourages concerted suicide prevention attempts [8].

Another issue is so-called problem drinking, which is greatly prevalent in Korea. According to a 2011 nationally representative survey, alcohol use disorders were the most prevalent (13.4%) in individuals reporting “lifetime” use and second most (4.4%) in those reporting “during the last 12 months” [9]. In addition, the custom of giving alcohol to depressed people to improve their mood is common, despite that alcohol may trigger suicide attempts by increasing depression in suicidal ideators, in turn damaging problem-solving skills, and provoking impulsiveness [6]. In a large-scale study, women showed a positive correlation between depressive symptoms and moderate- and high-risk drinking [10].

As suicidal behavior is complicated and multifaceted, the biopsychosocial aspects surrounding Koreans should be comprehensively investigated [11]. However, most studies have been descriptive [12,13], or, when risk factors were presented, only cross-sectional [14–17], and findings have tended to show an intrinsic limitation of reverse causality. To offer stronger evidence, risk factors with temporal causality need to be identified, for which a prospective cohort study is warranted. In other countries, a number of such studies have been conducted [18]. However, they also share their own common limitation: many recruited suicidal patients from emergency departments [19,20] or psychiatric wards [21,22], both of which were very unlikely to operate primary clinics. Most of the participants were likely to have been patients with severe psychopathology visiting large, research-oriented mental health facilities, such as university hospitals. Moreover, many suicidal community-dwellers who either remain untreated or attend different types of hospitals (e.g., not necessarily tertiary hospitals) are likely to be neglected in cohort studies led by research-oriented hospitals. Thus, the utility of cohort studies on only hospital visitors is limited in that they are unlikely to represent the entire suicidal population. The same goes for community cohort studies [23], which are relatively rare. Therefore, a well-designed prospective cohort study covering community-dwellers as well as hospital visitors and reflecting the suicidal nature of Koreans is necessary.

The Korean Cohort for the Model Predicting a Suicide and Suicide-related Behavior (K-COMPASS) research began in 2015 as a long-term, large-scale, multi-center, prospective, naturalistic, observational cohort study. It is the first prospective cohort study in suicidology ever conducted in Korea. It features the operation of two concurrent cohorts, namely, the community-based cohort (CC) and hospital-based cohort (HC). The CC participants were enrolled through community mental health welfare centers (CMHWCs), working as the community gateway, whereas the HC participants were enrolled through university hospitals, functioning as the hospital gateway. The purpose of operating the dual gateway system was to minimize selection bias by enrolling suicidal people with different severities receiving different levels of care to form a more comprehensive understanding of suicide. To our knowledge, there has been no study using multiple cohorts from different gateways in suicide research.

The primary aim of the K-COMPASS study is to identify suicide attempt risk factors and suicide characteristics of the Korean population along the trajectory of suicidal ideators and attempters to establish Korean-specific assessment tools for predicting suicidal events and develop clinical practice guidelines. The secondary aim is to examine any differences between the CC and HC in terms of the relationship between changes in psychiatric symptoms and occurrence of suicidal events. A previous study from our research team presented tailored management strategies for cohort participants from the first half of suicidal ideators in enrollment order [24]. By extending our research to the entire baseline sample and applied measures, the present study intends to provide a study rationale and a methodological overview of the K-COMPASS study and descriptive analyses of the baseline characteristics of the participants, focusing on the differences between the cohorts within each group of suicidal ideator or attempter. This comparison format is justified for the following reasons. First, there are few studies with this type of design despite probable differences between the two groups (suicidal community-dwellers and hospital visitors) which may have many potential clinical implications. Beyond a presumption that hospital visitors may suffer from more severe psychiatric problems, we aim to present results in a quantitative manner. The Diagnostic and Statistical Manual of Mental Disorders, 4th Edition, text revision does not specify the relationship between suicidal ideation or suicide attempt and mental disorders other than their association with major depressive episode and borderline personality disorder [25]. However, previous studies have shown that a broad range of psychiatric disorders increases the risk of experiencing suicidal ideation, and several psychiatric disorders characterized by anxiety, agitation or impaired impulse-control may even predict suicide attempts among those experiencing suicidal ideation [26,27]. In light of this it is important to further investigate whether potential differences in diagnoses and psychopathologies other than depression exist between the two groups. Second, the current study lays the groundwork for future research. A good grasp of their characteristic differences at baseline will help to develop in-depth understanding of future findings from longitudinal, between-cohort, and follow-up data. Subsequent studies will be performed on the primary and secondary outcome measures with longitudinal data.

2. Methods

2.1. Study population and recruitment of participants

The K-COMPASS study set a goal of recruiting 800 individuals overall. The planned sample size was based on the recruiting capacities of

the participating researchers; a formal power analysis for calculating a sample size was not performed. Each participant was classified into either a suicidal ideator or a suicide attempter group. Suicide attempt was defined as life-threatening behavior intended to kill oneself. If participants attempted suicide within one month from an enrollment day, they were grouped as suicidal attempters. If they reported current, serious suicidal ideation without any life-threatening behavior, they were categorized as suicidal ideators, with the level of seriousness determined with a scale after enrollment. Only those aged 15 years or older were included. The exclusion criteria were as follows: 1) history of intellectual disability or organic mental disorder, and 2) incapability of reading and communicating in the Korean language.

The participants were recruited through eight tertiary university hospitals and eight CMHWCs, affiliated with each hospital. The hospitals chosen were distributed nationwide to closely represent the population of each province although statistical sampling methods were not used. The HC cohort was established with patients visiting the participating hospitals. Through all available routes, namely, outpatient clinics, inpatient wards, and emergency rooms, potential HC participants determined to meet study eligibility by board-certified psychiatrists were informed about the study. Meanwhile, the CC cohort was built from the CMHWCs, where the study was introduced by mental health professionals (mental health nurses and social welfare workers) to active members or new enrollees referred from public service agencies or detected during mental illness screening visits to social welfare facilities. No target numbers for suicidal ideators and attempters or for the HC and CC were predetermined for the purpose of constructing cohorts reflecting as realistic proportions between the groups as possible.

This study protocol was approved by the Seoul National University Hospital Institutional Review Board (H-1505-050-671) and Institutional Review Boards of all other participating study sites. The participants or their legal guardians, in case of adolescents under 19 years, gave written informed consent.

2.2. Study design

The K-COMPASS study is an ongoing prospective, naturalistic, observational cohort study. It began on September 1, 2015 and will be completed on June 30, 2019. The study consists of two preset assessments, namely, baseline and follow-up, and of two alternative assessments, namely, emergency and telephone. The baseline assessment of the CC participants was conducted on the enrollment day. Meanwhile, the HC participants were permitted to finish it within a week depending on their medical condition. For the follow-up assessment, all participants were scheduled to visit the hospital or the CMHWC, according to their cohort, at 1, 3, 6, 9, 12, 18, 24, 30, 36, 42, and 48 months after the baseline assessment. In case a suicide attempt occurs between scheduled assessments, the emergency assessment will be performed instead of the scheduled follow-up assessment. If participants do not show up, they are contacted for the telephone assessment by raters twice a day until two days after the scheduled day. Dropout was defined as missing all telephone assessments and not returning for one month. Rejoining the study after dropout was allowed.

2.3. Systematic interview

At the baseline assessment, systematic interview with participants was conducted by raters. Sociodemographic (age, sex, marital and living status, education level, monthly household income, employment status, and health security status) and clinical information (medical and psychiatric illness, psychiatric treatment and admission, family history, and past suicide attempt) was obtained based on self-report. Psychiatric treatment was defined as any type of pharmacological or psychotherapeutic treatment offered by psychiatrists.

2.4. Instrumental measures

The instrumental evaluation at baseline assessment included diagnostic and psychopathological assessments. The Korean version of the Mini International Neuropsychiatric Interview (K-MINI), which showed adequate validity, was adopted to confirm psychiatric diagnosis [28]. Its overall diagnostic concordance assessed using Cohen's kappa, sensitivity, specificity, positive predictive value, and negative predictive value was higher than that of the original English version of the MINI [28,29]. Only 13 selected diagnoses considered prevalent in suicidal people by the research team were used, which included various mood episodes, posttraumatic stress disorder, alcohol use, and psychotic features (Cohen's kappa 0.66–0.93) [28]. The Suicidality module in the K-MINI consists of five items asking about suicidality during the past month ("Did you think that you would be better off dead or wish you were dead?" [1 point], "Did you want to harm yourself or to hurt or to injure yourself?" [2 points], "Did you think about suicide?" [6 points], "Did you have a suicide plan?" [10 points], and "Did you attempt suicide?" [10 points]) and one item during lifetime ("Did you ever make a suicide attempt?" [4 points]). Answering "yes" to at least one item indicates the presence of current suicide risk. As written in the footnote of Table 3, current suicide risk was classified into three levels as follows: low (1–5 points), moderate (6–9 points), and high (≥ 10 points). According to a 2-year prospective study with older Korean people in the community, the presence of suicidality by the module was associated with increased risk of suicide attempts [14]. In another prospective study about its predictive validity, the module also predicted suicidal behavior at 12 months after discharge from a psychiatric ward; however, the validity for risk screening was limited owing to its high false negative rates [30], which would classify many patients as low risk [31]. Only mental health professionals participated as raters, and, before administration, they all attended mandatory, formal, off-line training and consensus meetings for the proper use of the rater-administered tools. They also attended K-MINI workshops aiming at accurate application of the K-MINI, led by researcher HJJ or CHK.

Psychopathological assessment included both self- and rater-administered measures. The self-administered instruments included the following: Patient Health Questionnaire-9 (PHQ-9), for measuring the severity of depression; Beck Anxiety Inventory (BAI), for assessing the intensity of anxiety; Alcohol Use Disorders Identification Test (AUDIT), for identifying those with problem drinking; Barratt Impulsiveness Scale-11 (BIS-11), for measuring the intensity of trait impulsivity; Early Trauma Inventory Self Report-Short Form (ETISR-SF), for identifying early trauma and classifying its type; Social Relationships Scale (SRS) [32], for evaluating the level of stress due to social relationships; and Stress Questionnaire for Korean National Health and Nutrition Examination Survey-Short Form (SQ for KNHANES-SF), for assessing the degree of stress and indicating the most stressful source.

The rater-administered instrument included the Columbia-Suicide Severity Rating Scale (C-SSRS), one of the most widely used tools for assessing suicidal ideation and behavior. Since all of the study subjects voluntarily participated in the study, the potential of under-reporting their suicidal symptoms was believed to be low. To further minimize under-reporting of severity of suicidal ideation and attempt, first, all raters were trained for the proper use of the C-SSRS. For example, according to its guideline [33], even if a participant denies suicidal ideation or intent, raters are expected to clinically infer suicidal intent from the action or circumstances when assessing suicidal behavior. Second, it was made clear to the participants that all the assessments were for the purpose of research, not clinical intervention. Third, the raters were different from the clinicians regularly seeing the participants. For the HC only, three rater-administered scales were applied for additional assessment: Montgomery-Åsberg Depression Rating Scale (MADRS), for the intensity of depressive symptoms; Young Mania Rating Scale (YMRS), for the severity of manic symptoms; and Brief Psychiatric Rating Scale (BPRS), for the severity of common psychopathology in

psychotic and severe affective disorders [34]. Only the Suicide Intent Scale (SIS), measuring suicidal intent at the time of suicide attempt, contained both self- and rater-administered parts. For English scales, Korean versions, whose validity and reliability had been previously demonstrated, were used [35–40].

The variables were the strongest and most consistently reported risk factors for suicide and suicidal behavior, which could be categorized as several groups [41]: 1) sociodemographic (sex, age, education level, marriage status, employment status, etc.) and 2) biological factors (family history), for evaluating which systematic interview was performed, 3) psychiatric (depression, alcohol use, and impulsivity) and 4) psychological factors (impulsivity), for assessing which of the psychopathology scales (PHQ-9, AUDIT, and BIS-11) were used, and 5) stressful life events (stress and early trauma), for evaluating which stress-related measurements (SRS, SQ for KHANES-SF, and ETI) were used. For in-depth understanding of individual suicidal ideation and attempt, C-SSRS and SIS were applied. We included as many as possible well-established risk factors in the analyses for several reasons. First, the K-COMPASS study is the first Korean prospective cohort study on suicidology that aims to identify the truly significant risk factors specific to the Korean population among the established factors as well as to assess the strength of association for each of these risk factors. Second, since the purpose of the study is to identify the Korean-specific suicide characteristics, including the risk factors, comparing our findings with existing results from other nations is important, and, to do this, the exploration of well-established and widely studied risk factors from the literature of suicidology (conducted on many other populations) was necessary. Third, according to 2013 Korea

National Suicide Survey, interpersonal stress was the second most subjectively reported reason (31.2%) for suicide attempts after the presence of psychiatric symptoms (37.9%) [42]; thus, we utilized the SRS to further characterize stress to evaluate this association. Because characteristics of tertiary hospital visitors with suicidality would be different from those of suicidal community-dwellers, who would be visiting various types of hospitals, differences are expected between the two groups, which makes the current study design plausible and meaningful.

The C-SSRS, PHQ-9, BAI, MADRS, YMRS, and BPRS will be administered at every follow-up visit; the K-MINI, AUDIT, SRS, and SQ for KNHANES, every year; and the SIS at the emergency assessment.

2.5. Statistical analyses

Baseline sociodemographic and clinical factors, diagnoses, and psychopathological measures were compared across the cohorts within each group of suicidal ideators and suicide attempters. A Student's *t*-test for continuous variables and a Pearson's χ^2 test or a Fisher's exact-test, in which numbers in cells were <5, were used for categorical variables to obtain two-tailed *P* values. In addition, diagnoses and clinical rating scores were compared between the cohorts using multivariate logistic regression and analysis of covariance to adjust for age and sex. The three scales measured only on the HC participants, namely, MADRS, YMRS, and BPRS, were excluded from the current analyses because of lack of counterparts in the CC. All statistical analyses were performed using SPSS version 21.0 for Windows (SPSS, Inc., Chicago, IL, USA). A *P* value <0.05 was considered statistically significant.

Table 1

Comparisons of sociodemographic factors between the CC and HC in each group of suicidal ideators and attempters.^a

Variables	Suicidal ideators		<i>P</i> value ^b	OR ^c	Suicide attempters		<i>P</i> value	OR
	CC (n = 207)	HC (n = 273)			CC (n = 34)	HC (n = 286)		
Age, years	56.37 ± 19.26	38.62 ± 16.31	<0.001	–	39.50 ± 17.97	38.59 ± 15.76	0.780	–
Age group, years			<0.001	–			0.605	–
15–19	3 (1.4)	22 (8.1)			4 (11.8)	29 (10.1)		
20–39	43 (20.8)	132 (48.4)			14 (41.2)	125 (43.7)		
40–59	67 (32.4)	78 (28.6)			10 (29.4)	102 (35.7)		
60–79	78 (37.7)	39 (14.3)			6 (17.6)	30 (10.5)		
≥80	16 (7.7)	2 (0.7)			0 (0.0)	0 (0.0)		
Sex			0.168	1.293			0.266	0.667
Female	123 (59.4)	145 (53.1)			15 (44.1)	155 (54.2)		
Male	84 (40.6)	128 (46.9)			19 (55.9)	131 (45.8)		
Marital status			<0.001	–			0.024	–
Never married	68 (32.9)	134 (49.1)			16 (47.1)	126 (44.1)		
Currently married	43 (20.8)	79 (28.9)			4 (11.8)	102 (35.7)		
Cohabiting	4 (1.9)	2 (0.7)			1 (2.9)	5 (1.7)		
Separated or divorced	53 (25.6)	48 (17.6)			11 (32.4)	45 (15.7)		
Widowed	39 (18.8)	10 (3.7)			2 (5.9)	8 (2.8)		
Living status			<0.001	–			0.017	–
With family	96 (46.4)	205 (75.1)			16 (47.1)	203 (71.0)		
With nonfamily or institutionalized	11 (5.3)	12 (4.4)			5 (14.7)	21 (7.3)		
Alone	100 (48.3)	56 (20.5)			13 (38.2)	62 (21.7)		
Education level			<0.001	–			0.474	–
Less than primary school	44 (21.3)	7 (2.6)			0 (0.0)	5 (1.7)		
Primary school	36 (17.4)	14 (5.1)			4 (11.8)	29 (10.1)		
Middle school	33 (15.9)	40 (14.7)			10 (29.4)	50 (17.5)		
High school	68 (32.9)	148 (54.2)			14 (41.2)	150 (52.4)		
College or higher	26 (12.6)	64 (23.4)			6 (17.6)	52 (18.2)		
Monthly household income, thousand KRW ^d			<0.001	–			0.186	–
≤ 1000	148 (71.5)	86 (31.5)			15 (44.1)	77 (26.9)		
1001–2000	34 (16.4)	76 (27.8)			8 (23.5)	93 (32.5)		
2,001–3000	13 (6.3)	51 (18.7)			7 (20.6)	61 (21.3)		
3001–4000	3 (1.4)	21 (7.7)			0 (0.0)	19 (6.6)		
≥4001	9 (4.3)	39 (14.3)			4 (11.8)	36 (12.6)		
Employment status			0.003	0.569			0.905	0.956
Employed	79 (38.2)	142 (52.0)			22 (64.7)	188 (65.7)		
Unemployed	128 (61.8)	131 (48.0)			12 (35.3)	98 (34.3)		

Values are presented as number (%) or mean ± SD; CC, Community-based Cohort; HC, Hospital-based Cohort; OR, odds ratio; KRW, Korean Won; SD, standard deviation.

^a Numbers may not agree with the number of total subjects due to missing data.

^b Student's *t*-test for continuous variable and Pearson's χ^2 test or Fisher's exact test for categorized variables. Significant findings at *P* < 0.05 are in bold.

^c Relative to the CC.

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

3. Results

3.1. Comparisons of sociodemographic factors

A total of 800 participants enrolled from December 22, 2015 to March 8, 2018. Table 1 presents the sociodemographic factors of the participants. Notably, the CC suicidal ideators tended to be older and have higher proportions of having been previously married and living alone compared with the HC ideators. The CC suicidal ideators were also associated with lower socioeconomic status. The CC suicide attempters showed higher proportions of any previous marriage and living alone compared with the HC attempters; other than these, there were no statistical differences between CC and HC attempters.

3.2. Comparisons of clinical factors between cohorts in each group

In the suicidal ideators group, the CC participants were more likely to have present or past medical comorbidity and to be currently under psychiatric treatment (Table 2). The HC participants were over twice

as likely to have a familial history of psychiatric treatment. Suicidal-related factors did not differ in the participants and their families.

In the suicide attempters, only past suicide attempts differed between the two cohorts; a greater proportion of the community-dweller participants experienced past suicide attempts.

3.3. Comparisons of diagnoses between cohorts in each group

Among the suicidal ideators, the HC participants were more likely to be diagnosed with selected mood episodes, such as current and recurrent major depressive episode, whereas the CC participants were more likely to be diagnosed with current major depressive episode with melancholic features and past hypomanic episode (Table 3). The latter two were not significantly different after adjustment for age and sex. The HC participants had a greater proportion and severity of current suicide risk.

In both suicidal ideators and suicide attempters, current alcohol abuse and dependence differed between the two cohorts (after adjustment for age and sex in the ideators); both were found to be higher among the community dwellers. Notably, in the attempters, as in

Table 2
Comparisons of medical-, psychiatric-, familial-, and suicidal-related factors between the CC and HC in each group of suicidal ideators and attempters.^a

Variables	Suicidal ideators		P value ^b	OR ^c	Suicidal attempters		P value	OR
	CC (n = 207)	HC (n = 273)			CC (n = 34)	HC (n = 286)		
Medical- and psychiatric-related								
Present or past medical illness ^d			<0.001	0.313			0.710	0.868
No	61 (30.0)	155 (57.8)			22 (64.7)	188 (67.9)		
Yes	142 (70.0)	113 (42.2)			12 (35.3)	89 (32.1)		
Present or past psychiatric illness ^e			0.103	1.469			0.414	1.350
No	45 (21.8)	43 (16.0)			16 (48.5)	115 (41.1)		
Yes	161 (78.2)	226 (84.0)			17 (51.5)	165 (58.9)		
Psychiatric treatment			<0.001	–			1.000	–
Never	10 (6.2)	2 (0.9)			0 (0.0)	5 (3.0)		
Past	117 (72.2)	199 (88.1)			15 (83.3)	132 (78.6)		
Present	35 (21.6)	25 (11.1)			3 (16.7)	31 (18.5)		
Present or past psychiatric admission			0.716	1.081			0.277	0.585
No	104 (64.2)	141 (62.4)			9 (50.0)	106 (63.1)		
Yes	58 (35.8)	85 (37.6)			9 (50.0)	62 (36.9)		
Familial-related								
Psychiatric treatment			0.003	2.034			0.796	1.141
No	176 (85.0)	201 (73.6)			29 (85.3)	239 (83.6)		
Yes	31 (15.0)	72 (26.4)			5 (14.7)	47 (16.4)		
Suicide attempt			0.285	1.280			0.732	0.857
No	169 (81.6)	212 (77.7)			27 (79.4)	234 (81.8)		
Yes	38 (18.4)	61 (22.3)			7 (20.6)	52 (18.2)		
Suicide completion			0.184	0.551			0.664	1.850
No	10 (26.3)	24 (39.3)			3 (42.9)	15 (28.8)		
Yes	28 (73.7)	37 (60.7)			4 (57.1)	37 (71.2)		
Suicidal-related, past								
Past suicide attempt			0.973	0.994			0.004	0.281
No	85 (41.3)	111 (41.4)			6 (17.6)	122 (43.3)		
Yes	121 (58.7)	157 (58.6)			28 (82.4)	160 (56.7)		
Suicidal-related, current								
Disclosure of suicidal intent			–	–			1.000	0.771
No	–	–			1 (4.0)	14 (5.1)		
Yes	–	–			24 (96.0)	259 (94.9)		
Suicide place			–	–			0.054	–
Home	–	–			17 (65.4)	209 (75.5)		
Hotel/motel	–	–			4 (15.4)	12 (4.3)		
Other places	–	–			5 (19.2)	56 (20.2)		
Lethality ^f of suicide methods			–	–			0.183	2.270
Low	–	–			23 (88.5)	206 (77.2)		
High	–	–			3 (11.5)	61 (22.8)		

Values are presented as number (%); CC, Community-based Cohort; HC, Hospital-based Cohort; OR, odds ratio; SD, standard deviation.

^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 $P < 0.05$ are in bold.

^c Relative to the CC.

^d Includes hypertension, diabetes mellitus, cancer, stroke, Parkinson's disease, cardiac disease, pulmonary disease, renal disease, ophthalmic disease, otologic disease, etc.

^e 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.

^f Low lethal suicide methods include drug/chemical overdose and use of a sharp object; high lethal suicide methods are all the other methods.

Table 3
Comparisons of diagnoses between the CC and HC in each group of suicidal ideators and attempters.^a

Variables	Suicidal ideators						Suicidal attempters					
	CC (n = 207)	HC (n = 273)	Unadjusted		Adjusted ^b		CC (n = 34)	HC (n = 286)	Unadjusted		Adjusted	
			P value ^c	OR ^d	P value	OR			P value	OR	P value	OR
Major depressive episode, current												
No	99 (50.5)	78 (29.3)	<0.001	2.460	0.003	1.904	12 (38.7)	80 (28.4)	0.230	1.595	0.243	1.580
Yes	97 (49.5)	188 (70.7)					19 (61.3)	202 (71.6)				
Major depressive episode, recurrent												
No	132 (67.3)	77 (28.9)	<0.001	5.063	<0.001	2.256	9 (29.0)	118 (41.8)	0.168	0.569	0.144	0.737
Yes	64 (32.7)	189 (71.1)					22 (71.0)	164 (58.2)				
Major depressive episode with melancholic features, current												
No	164 (83.7)	240 (90.2)	0.036	0.555	0.091	0.588	30 (96.8)	258 (91.5)	0.489	2.791	0.320	2.816
Yes	32 (16.3)	26 (9.8)					1 (3.2)	24 (8.5)				
Suicide risk, current												
No ^e	47 (24.0)	21 (7.9)	<0.001	3.680	<0.001	3.071	8 (25.8)	51 (18.1)	0.297	1.575	0.324	1.544
Yes ^f	149 (76.0)	245 (92.1)					23 (74.2)	231 (81.9)				
Suicide risk, current ^g												
Low	52 (34.9)	20 (8.2)	<0.001	–	<0.001	–	2 (8.7)	19 (8.2)	0.925	–	0.953	–
Moderate	39 (26.2)	62 (25.3)					3 (13.0)	28 (12.1)				
High	58 (38.9)	163 (66.5)					18 (78.3)	184 (79.7)				
Manic episode, current												
No	193 (98.5)	256 (96.2)	0.152	2.513	0.470	1.674	29 (93.5)	273 (96.8)	0.298	0.478	0.348	0.468
Yes	3 (1.5)	10 (3.8)					2 (6.5)	9 (3.2)				
Manic episode, past												
No	187 (95.4)	242 (91.0)	0.068	2.061	0.263	1.270	31 (100.0)	270 (95.7)	0.617	0.897	–	–
Yes	9 (4.6)	24 (9.0)					0 (0.0)	12 (4.3)				
Hypomanic episode, current												
No	192 (98.0)	252 (94.7)	0.077	2.667	0.632	1.331	30 (96.8)	274 (97.2)	1.000	0.876	0.920	0.896
Yes	4 (2.0)	14 (5.3)					1 (3.2)	8 (2.8)				
Hypomanic episode, past												
No	187 (95.4)	240 (90.2)	0.037	2.251	0.586	1.125	31 (100.0)	261 (92.6)	0.245	0.894	–	–
Yes	9 (4.6)	26 (9.8)					0 (0.0)	21 (7.4)				
Posttraumatic stress disorder, current												
No	190 (96.9)	254 (95.5)	0.426	1.496	0.956	0.970	31 (100.0)	270 (95.7)	0.617	0.897	–	–
Yes	6 (3.1)	12 (4.5)					0 (0.0)	12 (4.3)				
Alcohol dependence, current												
No	165 (84.2)	239 (89.8)	0.069	0.601	0.005	0.418	23 (74.2)	249 (88.3)	0.044	0.381	0.026	0.363
Yes	31 (15.8)	27 (10.2)					8 (25.8)	33 (11.7)				
Alcohol abuse, current												
No	178 (90.8)	248 (93.2)	0.338	0.718	0.031	0.446	24 (77.4)	260 (92.2)	0.015	0.290	0.008	0.275
Yes	18 (9.2)	18 (6.8)					7 (22.6)	22 (7.8)				
Mood disorder with psychotic features												
No	191 (97.4)	235 (88.3)	<0.001	5.039	0.122	2.205	30 (96.8)	262 (92.9)	0.706	2.290	0.433	2.265
Yes	5 (2.6)	31 (11.7)					1 (3.2)	20 (7.1)				

Values are presented as number (%); K-MINI, Korean version of the Mini International Neuropsychiatric Interview; CC, Community-based Cohort; HC, Hospital-based Cohort; OR, odds ratio.

^a Numbers may not agree with the number of total subjects due to missing data.

^b Adjusted for age and sex.

^c Pearson's χ^2 test or Fisher's exact test. Significant findings at $P < 0.050$ are in bold.

^d Relative to the CC.

^e 0 point in the K-MINI current suicide risk.

^f ≥ 1 point in the K-MINI current suicide risk.

^g 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.

sociodemographic and clinical factors, there were hardly any differences in diagnoses between the two groups.

3.4. Comparisons of clinical rating scores between cohorts in each group

The HC suicidal ideators had higher mean scores in psychopathological symptoms: severity and intensity of suicidal ideation, depression, and anxiety (Table 4). According to the cutoff of each scale [43–45], the levels of depression were found to be moderately severe in both CC and the HC ideators; moderate-to-severe anxiety was observed in CC ideators, and severe anxiety and problem drinking in HC ideators. HC ideators also had a greater level of perceived stress. The sources of relational stress differed in the cohorts: the HC participants experienced more stress from close family, whereas the CC participants, from a close friend.

Likewise, the HC suicide attempters had higher scores in suicidal ideation. Suicide attempters without any ideation occupied a minor portion in each cohort; there were 17 (5.31%) out of all attempters; 6 (17.64%) among 34 CC attempters; and 11 (3.84%) of 286 HC attempters. Despite

the absence of differences in suicidal behavior and suicidal intention, among actual attempters, a higher proportion of the hospital visitors underwent more lethal physical damage. Psychopathological severity other than suicidal ideation and lethality did not differ in the cohorts, but both attempters showed moderately severe depression, moderate-to-severe anxiety, and problem drinking.

4. Discussion

In the current paper, we presented the methodological highlights of the K-COMPASS study and the baseline characteristics of the 800 participants, focusing on differences between the CC and HC in each group of suicidal ideators and attempters. Overall, the participants came from the hospital gateway more than twice as often as from the community gateway. Presumably, and expectedly, many were seen in university hospitals for their grave danger of suicidality. Especially, most suicide attempters were enrolled from the hospital gateway and, in light of our enrollment criterion, within one month of attempt. The possibility of their visiting

Table 4
Comparisons of clinical rating scores between the CC and HC in each group of suicidal ideators and attempters.

Variables	Suicidal ideators				Suicidal attempters			
	CC (n = 207)	HC (n = 273)	P value ^a		CC (n = 34)	HC (n = 286)	P value	
			Unadjusted	Adjusted ^b			Unadjusted	Adjusted
C-SSRS (ideation)								
Severity subscale	2.28 (1.70)	3.11 (1.43)	<0.001	<0.001	2.42 (1.94)	3.54 (1.48)	0.003	<0.001
Intensity subscale	12.17 (6.50)	14.43 (4.34)	<0.001	0.003	11.09 (6.14)	14.53 (5.08)	<0.001	<0.001
PHQ-9	14.50 (7.51)	19.23 (6.29)	<0.001	<0.001	16.15 (6.78)	18.22 (6.44)	0.083	0.116
BAI	23.74 (15.93)	32.00 (14.74)	<0.001	<0.001	24.24 (15.13)	27.91 (15.42)	0.196	0.283
AUDIT	7.17 (10.88)	8.81 (10.80)	0.104	0.447	14.21 (13.81)	11.47 (11.25)	0.197	0.213
BIS-11	67.71 (10.88)	70.58 (13.51)	0.011	0.783	69.12 (8.44)	70.05 (14.15)	0.587	0.744
ETISR-SF ^c								
No	118 (74.7)	162 (63.8)	0.021	0.623	19 (65.5)	171 (62.9)	0.779	0.823
Yes	40 (25.3)	92 (36.2)			10 (34.5)	101 (37.1)		
SQ for KNHANES-SF								
Total score ^d	27.87 (10.27)	34.09 (8.58)	<0.001	<0.001	31.00 (10.60)	32.76 (9.24)	0.308	0.422
Stress cause			<0.001	0.015			0.530	0.642
Work, job or school	15 (7.3)	46 (17.3)			3 (9.1)	32 (11.3)		
Interpersonal relationships ^e	55 (26.7)	99 (37.2)			13 (39.4)	130 (46.1)		
Changes in relationships ^f	7 (3.4)	9 (3.4)			4 (12.1)	15 (5.3)		
Illness or injury to oneself or others	56 (27.2)	58 (21.8)			2 (6.1)	26 (9.2)		
Financial problems	71 (34.5)	42 (15.8)			11 (33.3)	71 (25.2)		
Unusual events ^g	2 (1.0)	12 (4.5)			0 (0.0)	8 (2.8)		
SRS ^h (stress from)								
Close family	2.32 (1.27)	1.92 (1.09)	<0.001	0.023	1.94 (1.22)	1.98 (1.19)	0.858	0.695
Lover or boyfriend/girlfriend	3.35 (1.09)	3.29 (1.09)	0.554	0.193	3.18 (1.19)	3.26 (1.16)	0.706	0.612
Close friend	3.09 (1.15)	3.18 (1.09)	0.394	0.018	3.09 (1.21)	3.29 (1.11)	0.340	0.319
Colleague or boss	3.43 (1.06)	3.23 (1.15)	0.052	0.840	3.21 (1.17)	3.19 (1.16)	0.923	0.860
C-SSRS (behavior)								
Suicidal behavior			-	-			0.057	-
Actual attempt	-	-			21 (84.0)	242 (95.7)		
Interrupted attempt					0 (0.0)	1 (0.4)		
Aborted attempt					3 (12.0)	7 (2.8)		
Preparatory acts or behavior					1 (4.0)	3 (1.2)		
Actual lethality/medical damage (physical damage)			-	-			0.043	-
No or very minor	-	-			4 (20.0)	39 (16.4)		
Minor					4 (20.0)	43 (18.1)		
Moderate					10 (50.0)	59 (24.8)		
Moderately severe					2 (10.0)	64 (26.9)		
Severe					0 (0.0)	33 (13.9)		
SIS	-	-	-	-	12.93 (6.47)	14.22 (6.32)	0.313	0.235

Values are presented as number (%); CC, Community-based Cohort; HC, Hospital-based Cohort; C-SSRS, Columbia-Suicide Severity Rating Scale; PHQ-9, Patient Health Questionnaire-9; BAI, Beck Anxiety Inventory; AUDIT, Alcohol Use Disorders Identification Test; BIS-11, Barratt Impulsiveness Scale-11; ETISR-SF, Early Trauma Inventory Self Report-Short Form; SRS, Social Relationships Scale; SQ for KNHANES-SF, Stress Questionnaire for Korea National Health and Nutrition Examination Survey-Short Form; SIS, Suicide Intent Scale.

^a Student's *t* test for continuous variable and Pearson's χ^2 test or Fisher's exact test for categorized variables. Significant findings at $P < 0.05$ are in bold.

^b Adjusted for age and sex.

^c Unadjusted and adjusted odds ratios (relative to the CC) = 1.675 and 1.127 for the suicidal ideators, respectively, and 1.122 and 1.099 for the suicide attempters, respectively.

^d The total score ranges from 0 to 36.

^e Relationships with family or other significant people.

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

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

^h For each relationship, the total score ranges from 1 to 4, with a lower score corresponding to higher stress.

the CMHWCs for any psychosocial support was presumed to have been extremely low when acute medical or psychiatric stabilization was required. Nevertheless, about a third of the total was enrolled from the community gateway. If the community gateway had not been included, these participants would have been excluded from the study. We suggest that, established from the two concurrent gateways, our cohorts may accurately and more comprehensively describe the Korean suicidal population.

The suicidal ideators in this work showed distinct between-group differences in sociodemographic factors. Characteristically, the CC participants were more likely to be old, leading a solitary life, and of a lower socioeconomic status, whereas the HC participants had more diagnostic proportions of major depressive episodes and greater suicide risk, but not alcohol use problems. The results are consistent with those of our previous paper [24], suggesting the importance of socioeconomic assistance for suicidal community-dwellers and clinically directed aid for suicidal hospital visitors.

For psychopathology measured with clinical scales, both cohorts revealed meaningful degrees of severity, although the HC participants

showed greater severity except for alcohol use. Notably, in case of the C-SSRS severity subscale, the CC suicidal ideators reported a mean score over 2 (2.28 ± 1.70), corresponding to active suicidal ideation, if not specific. Moreover, according to the literature, the severity subscale is a significant predictor of subsequent suicide attempt among psychiatric emergency patients with the odds ratio [OR] of 1.30 [46] and of planned suicide attempt with OR of 1.578 [47]. Similarly, the intensity subscale significantly predicted future suicide attempt among suicidal ideators (OR of 1.15) [46] and planned suicide attempt (OR of 1.228) [47]. Considering the presence of non-specific active suicidal ideation, at least, and the subscales' potential role as predictors of future suicide attempt, together with the noticeable psychopathology, both cohorts deserve clinical attention even though the CC's sub-scores were lower than those of the HC participants.

The results of stress evaluations presented implications for management. In both ideator cohorts, interpersonal relationships occupied a portion that could not be overlooked among possible stressors; interpersonal psychotherapy would be of help in addressing such relational

conflicts [48]. However, the types of stressful interpersonal relationships were different: CC ideators experienced greater stress from a close friend (after adjustment), whereas their HC counterparts from close family, which makes a tailored approach more desirable. Contrary to most psychopathology, no difference was found in the alcohol-related risk level. However, alcohol use was diagnosed more frequently in CC ideators (after adjustment), and, considering that their score was close to the cutoff of hazardous drinking, at 8 points [43], presumably a proportion of the CC participants would have alcohol-related problems. Evidence-based strategies would be particularly relevant to this group with excessive alcohol use. Motivational interviewing, a brief, patient-centered, directive method for promoting inherent motivation to change through exploration and resolution of ambivalence, has demonstrated efficacy in reducing alcohol consumption among problem drinkers [49], including those under treatment for depression [50]. Cognitive-behavioral therapy (CBT) aims to identify cognitive, affective, and situational triggers for alcohol use and deliver skills to develop alternative strategies [51]. CBT's effectiveness on alcohol use disorder is well-documented with group CBT as effective as individual CBT [51].

In contrast to many disparities between the CC and HC suicidal ideators, the suicide attempters presented considerable similarities between the two cohorts. Nevertheless, certain characteristics of the CC attempters necessitate similar clinical attention as in the CC suicidal ideators. First, the CC attempters tended to live without family and had more marital problems. Lack of familial support was associated with increased non-adherence to psychiatric drugs [52], which might result in insufficient improvement of symptoms. In addition, single-person households have a positive association with elevated suicide rates [53]. Second, the proportion of past suicide attempt was greater in the CC than in the HC attempters. Suicide attempters were possibly being followed up by primary clinic psychiatrists or primary care physicians after acute medical or psychiatric stabilization offered from tertiary medical facilities; or first-in-lifetime attempters may have preferred to visit university hospitals for thorough evaluations. Past suicide attempt is a well-established, strong predictor of subsequent suicide attempt and death by suicide [54–56]. Third, as in suicidal ideators, a higher proportion of current alcohol use disorders was found in the CC attempters than in the HC attempters. The relationship between alcohol use and suicide attempt or suicide has been addressed in various studies, many of which reported a high prevalence of suicide among alcohol addicts [57]. According to a meta-analysis of cohort studies, alcohol use disorder is strongly associated with suicide [58]. Alcohol addiction may be the most potent, single predictor of a death by suicide [54] in the future among suicide attempters [22,59]. Fourth, both the CC and the HC participants had the appropriate psychopathological severity to justify clinical attention without significant differences. In addition, perceived stress (which could contribute to suicidal ideation as well as mood and anxiety symptoms [60]), as well as its main cause, and even suicide intent (which is reported to have a positive association with future suicide [61]), were not significantly different. Differences were only found in the C-SSRS severity and intensity sub-scores, in both of which the HC attempters presented higher severity. Given the cross-sectional design, we could only postulate that those with more severe suicidal ideation already had been treated in the university hospitals before the attempt or those who experienced it after the attempt decided to visit, or were involuntarily admitted to, tertiary hospitals. However, considering their mean severity sub-score (2.42 ± 1.94), even the CC attempters were found to have active, if not specific, suicidal thoughts, at least. The implication of this finding for justifying clinical intervention was already explained in detail with the suicidal ideators. In summary, with limited familial support, a higher association with past suicide attempt, current alcohol use disorders, psychopathology severity (at least moderate) similar to that of the hospital visitors, and suicidal ideation significant enough to deserve clinical attention, suicide attempters referred to or visiting CMHWCs should be as alertly monitored as hospital visitors.

Finally, the status of psychiatric treatment merits discussion. In all groups, only around 10% to 20% of the participants were receiving any type of psychiatric treatment. Compared with Western countries, in Asian countries, stigma and prejudice regarding psychiatric disorders are reported to more greatly act as obstacles to psychiatric diagnosis and treatment [62]. In addition, Koreans are less able than other Asians and Britons to recognize mental illness [63]. The limited use of psychiatric services in Korea has been addressed in many studies. According to a Korean nationwide survey, only 6.1% among psychiatric patients received any kind of mental health service during the last year [64]. These proportions are remarkably lower than those in Western countries: 32.9% of Americans, 34.1% of Asian Americans, 35% of Australians, and 46.5% of Canadians. Especially in elderly Koreans, their own stigma on mental disorders discourages them from utilizing mental health services [65]. A study explained this barrier to psychiatric treatment with social stigmatization in Korean culture [64], which had long been influenced by Confucianism, leading to a disregard for psychiatric illness and a negative attitude toward mental care [66]. Korean immigrants that have resided for a long time in the United States, probably ridding themselves of the tradition, are more likely to use psychiatric health services [67], suggesting that cultural aspects may affect psychiatric service use. However, as the K-COMPASS study is not a population-based national survey and has limited comparability with other national survey findings, we only speculate cautiously that this underutilization of psychiatric service might be associated with the high suicide rate in Korea. In our results, underlying psychiatric illness, a well-known risk factor of suicide [68], was self-reported in a large number of the participants (about 80% of the ideators and over 50% of the attempters). Nevertheless, for the ideators, the finding that those visiting CMHWCs were more likely to be already receiving psychiatric care than their HC counterparts is inspiring: at least some of them might have joined CMHWCs not to avoid or replace pharmacotherapy, which is a usual practice in psychiatric clinics and hospitals in Korea [69], but to benefit from adjunctive psychosocial treatment, leading to a synergistic effect on many illnesses.

The current study has several limitations. First, as a baseline analysis of an ongoing prospective cohort study, causality could not be established owing to its cross-sectional design. Second, a nationally representative sample was not employed, and thus, the findings from the study may not reflect accurately the characteristics of the Korean suicidal population. To minimize selection bias that is due to regional factors, we chose the participating study sites based on nationwide distribution. Third, as the information on the number of potential subjects in each study site was unavailable, institutional bias could not be excluded. Fourth, compared with the hospital gateway, the community gateway comprised relatively more diverse recruitment routes; a choice of one over another depended on the CMHWC, which may have led to a selection bias that influenced the composition of the participants.

5. Conclusions

The K-COMPASS study is the first long-term, large-scale, multi-center, prospective, observational, naturalistic cohort study on suicidal ideators and attempters in Korea. The participants are being followed up based on their regular assessment schedule. In the present cross-sectional, descriptive study, we presented the K-COMPASS study rationale, methodology, and baseline sample characteristics. The findings suggest that CMHWC visitors with suicidality need to be as closely monitored as suicidal patients going to university hospitals. In addition, under the limitations of comparability, we speculate with caution that the high suicide rate of the country might be partly attributable to the low proportion of patients receiving psychiatric services. They might account for some characteristics of the Korean suicidal population. Further analyses of longitudinal data will be performed to establish causal relationships between potential risk factors and future suicidal events. The results will contribute to in-depth understanding of suicidal

phenomena characteristics among Koreans and the subsequent development of suicide prevention strategies specific to Koreans.

Conflicts of interest

None.

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Wonkwang University Hospital and Iksan Community Mental Health Welfare Center, Iksan; Inje University Busan Paik Hospital and Busanjin-gu Community Mental Health Welfare Center, Busan; Soonchunhyang University Cheonan Hospital and Cheonan Community Mental Health Welfare Center, Cheonan; Seoul National University Hospital and Jongno-gu Community Mental Health Welfare Center, Seoul; Gachon University Gil Medical Center and Incheon Community Mental Health Welfare Center, Incheon; Soonchunhyang University Bucheon Hospital and Bucheon Community Mental Health Welfare Center, Bucheon; Kyung Hee University Hospital and Dongdaemun-gu Community Mental Health Welfare Center, Seoul; Wonju Severance Christian Hospital and Wonju Community Mental Health Welfare Center, Wonju.

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