

Improving the Screening Instrument of Bipolar Spectrum Disorders: Weighted Korean Version of the Mood Disorder Questionnaire

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Objective: It is not easy to diagnose bipolar disorders accurately in the clinical setting. Although Korean version of the Mood Disorder Questionnaire (K-MDQ) is easily administered, it still has weakness regarding case finding. In this study, we suggest a new weighted version of the K-MDQ to increase its screening power.

Methods: Ninety-five patients with bipolar disorders and 346 controls (patients with schizophrenia, patients with depressive disorders, patients with anxiety disorders, and subjects without any psychiatric disease) were enrolled in this study. The subjects received brief information on the K-MDQ, and then independently completed the questionnaire.

Results: Using odds ratios, we constructed a new weighted K-MDQ (W-K-MDQ). Item 1 (feel so good or hyper) was weighted 7 times and item 4 (less sleep) 3.5 times. Item 7 (easily distracted) and item 11 (more interested in sex) were excluded. Part 2 (simultaneity) and 3 (functional impairment) were also excluded as in the original K-MDQ. The sensitivity of the W-K-MDQ with a cutoff value of 10 was enhanced to 0.789. The area under the receiver operating characteristic curve was increased to 0.837.

Conclusion: We suggested a new formula for K-MDQ using 11 of its items. The W-K-MDQ can be easily applied with good sensitivity to screen for bipolar disorders in clinical settings in Korea. Further evaluations with larger samples are needed to establish the usefulness of the W-K-MDQ.

KEY WORDS: Bipolar disorder; Differential diagnosis; Sensitivity.

INTRODUCTION

Bipolar disorder is a recurrent disease entity involving functional impairment and high suicidality. It is relatively common and causes considerable economic burden. The 12-month prevalence of bipolar I disorder varies from 0.0% to 0.6%.¹⁻³⁾

In the Diagnostic and Statistical Manual of Mental Disorders, 5th edition (DSM-5), 'bipolar and related disorders' are listed separately from depressive disorders and placed between schizophrenia spectrum and other psy-

chotic disorders and depressive disorders.³⁾ Although the evidence supports that bipolar disorders should be separated from depressive disorders, there is difficulty in accurately diagnosing bipolar disorders in the clinical setting.⁴⁻⁶⁾ The patients with bipolar disorders experience symptoms of depression and anxiety more often than manic or hypomanic symptoms.⁷⁾ Also as bipolar and related disorders are placed between schizophrenia spectrum and depressive disorders in the DSM-5, numerous symptoms associated with manic episodes overlap with symptoms of schizophrenia spectrum disorder and depressive disorders.³⁾

Similar to other psychiatric disorders, bipolar disorder is a progressive condition. It is widely known that inadequate treatment can cause repeated mood episodes, functional impairment, and persistent subthreshold symptoms.⁸⁾ Therefore, early detection and appropriate treatment are imperative for patients with bipolar disorders.⁹⁾

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Several screening instruments have been developed to assist with the diagnosis of bipolar disorders.^{5,10-12)} The Mood Disorder Questionnaire (MDQ) was developed by Hirschfeld *et al.*⁵⁾ to screen for bipolar disorders in the clinical setting. It is a self-reported, single-page inventory with relatively good sensitivity. It is one of the most frequently studied bipolar disorder screening inventories world widely.¹³⁻¹⁹⁾ However, many studies have criticized MDQ's usefulness and its discriminatory power for bipolar disorder.^{7,20-24)} Additionally, some studies have suggested adjusting the cutoff value to enhance the instrument's sensitivity.^{25,26)}

In Korea, the MDQ was validated as the Korean version of the Mood Disorder Questionnaire (K-MDQ) in 2009.¹⁶⁾ Modified criteria were suggested for the K-MDQ, which excluded part 2; simultaneity of symptoms and part 3; severity of functional impairment. With a cutoff value of 7, it has good sensitivity (0.75) and specificity (0.69).

Although the K-MDQ is easy to use in clinical settings, it still has weakness regarding case finding. Also each item of the K-MDQ has different discriminating power for bipolar disorder. More than adjusting the cutoff value, weighting some items in K-MDQ may improve the screening instrument more powerfully. In this study, we suggest a new modified version of the K-MDQ in which we weighted some of the items to increase its screening power.

METHODS

Subjects

Ninety-five patients with bipolar disorders and 346 controls were enrolled in this study. The control group was composed of four sub-groups: patients with schizophrenia, patients with depressive disorders, patients with anxiety disorders, and subjects without any psychiatric disease. The characteristics of each group can be found in a previous study.²⁷⁾ The subjects were enrolled from four university hospitals and one psychiatric hospital. All the subjects were treated in outpatient clinic with stable state during enrollment and assessment, and they had had the same diagnosis for more than 2 years. Illiterate subjects were excluded, so that all subjects could complete the K-MDQ, which is in paper-and-pencil format, independently. Healthy subjects without any psychiatric disease were enrolled from regular health check-up and health education

settings.

This study was approved by the institutional review board of each hospital, and all subjects provided their written informed consent.

Instruments and Assessment Procedure

At least two psychiatrists with more than 10 years of clinical experience as a certified psychiatrist diagnosed the patients based on Diagnostic and Statistical Manual of Mental Disorders, 4th edition, text revision (DSM-IV-TR).²⁸⁾ The healthy subjects were examined based on the Mini International Neuropsychiatric Interview (MINI)²⁹⁾ and it was confirmed that they had no psychiatric disease.

The subjects received brief information on the K-MDQ, and then independently completed the questionnaire. Although it has been suggested that only the first part of the K-MDQ should be used for screening, the subjects were instructed to complete all three parts of the K-MDQ.

The first part of the K-MDQ comprises 13 items pertaining to manic/hypomanic symptoms and related behaviors. Part 2 asks whether several manic or hypomanic symptoms or behaviors have been experienced during the same period, and part 3 assesses the severity of functional impairment due to illness. The items of part 1 and 2 constitute 'yes' or 'no' questions. The part 3 is answered on a 4-point system; no problem, minor problems, moderate problems, and serious problems.¹⁶⁾

Statistical Analysis

Statistical analyses were performed using independent *t* test, Pearson's chi-squared test and logistic regression. We used the odds ratio (OR) of each item to select the weighted variables. Receiver operating characteristic (ROC) curves were drawn to confirm changes in the screening power of the K-MDQ. We used the Statistical Package for the Social Sciences Statistics ver. 24 (IBM Co., Armonk, NY, USA) for analyses and we set the significance at $p < 0.05$ (2-sided).

RESULTS

There were more female subjects in the bipolar disorder group than in the control group, and the patients with bipolar disorder were younger than the subjects in the control group (Table 1).

The total scores of the K-MDQ were higher and part 2

Table 1. Demographic and clinical characteristics of patients

Characteristic	Bipolar disorder (n=95)	Control* (n=346)	p value
Sex (male/female)	27/68 (28.4/71.6)	154/192 (44.5/55.5)	0.005
Age (yr)	37.03±10.32	40.57±11.41	0.007
Education (yr)	12.79±2.88	13.14±3.22	0.347
K-MDQ			
Total score	8.73±3.51	4.79±3.28	<0.001
≥7/<7	74/21 (77.9/22.1)	105/241 (30.3/69.7)	<0.001
Simultaneity of symptoms (yes/no) [†]	71/23 (75.5/24.5)	139/205 (40.4/59.6)	<0.001
Severity of functional impairment [†]			<0.001
No	11 (11.7)	186 (54.1)	
Minor	30 (31.9)	88 (25.0)	
Moderate	24 (25.5)	37 (10.8)	
Serious	29 (30.9)	33 (9.6)	

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

K-MDQ, Korean version of the Mood Disorder Questionnaire.

*Control group was composed of four sub-groups: patients with schizophrenia, patients with depressive disorders, patients with anxiety disorders, and subjects without any psychiatric disease.

[†]One subject of bipolar disorder group and two subjects of control group did not answer the last 2 parts.

“simultaneity of symptoms” and part 3 “severity of functional impairment” were also more frequent in the bipolar disorder group than in the control group. In the multivariate stepwise logistic regression, item 1 (feel so good or hyper) had the highest OR (7.128; $p < 0.001$, 95% confidence interval [CI]=3.376-15.051). Only two items, item 1 (feel so good or hyper) and item 4 (less sleep) (OR, 3.588; $p < 0.001$, 95% CI=1.842-6.989) had statistically significant ORs. The ORs for item 7 (easily distracted; OR, 0.519; $p = 0.043$, 95% CI=0.275-0.978) and item 11 (more interested in sex; OR, 0.389; $p = 0.008$, 95% CI=0.193-0.782) were below 1 (Fig. 1). The ORs for part 2 ($p = 0.712$) and part 3 ($p = 0.839$) were not significant.

Using these ORs, we constructed a new weighted formula for the K-MDQ. Item 1 (feel so good or hyper) was weighted 7 times and item 4 (less sleep) 3.5 times. Item 7 (easily distracted) and item 11 (more interested in sex) were excluded. Part 2 (simultaneity) and 3 (functional impairment) were also excluded as in the original K-MDQ.

Weighted Korean version of the Mood Disorder Questionnaire (W-K-MDQ)

$$= 7 \times \text{item 1} + \text{item 2} + \text{item 3} + 3.5 \times \text{item 4} + \text{item 5} + \text{item 6} + \text{item 8} + \text{item 9} + \text{item 10} + \text{item 12} + \text{item 13}$$

As the formula for W-K-MDQ, the range of total score is

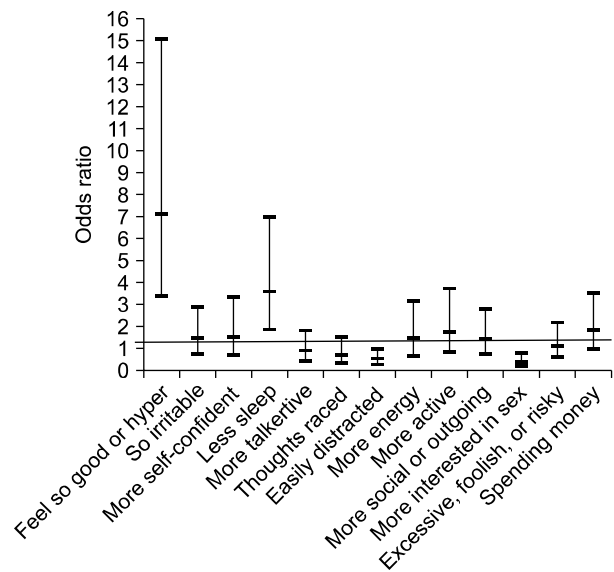


Fig. 1. The odds ratio for each item of the Korean version of the Mood Disorder Questionnaire.

from 0 to 19.5.

The area under the ROC curve (AUC) of the original K-MDQ was 0.793 ($p < 0.001$). The AUC of the W-K-MDQ increased to 0.837 ($p < 0.001$) (Fig. 2).

The sensitivity and specificity of the W-K-MDQ were higher than the sensitivity and specificity of the original K-MDQ. We suggest a cutoff point of 10 with sensitivity of

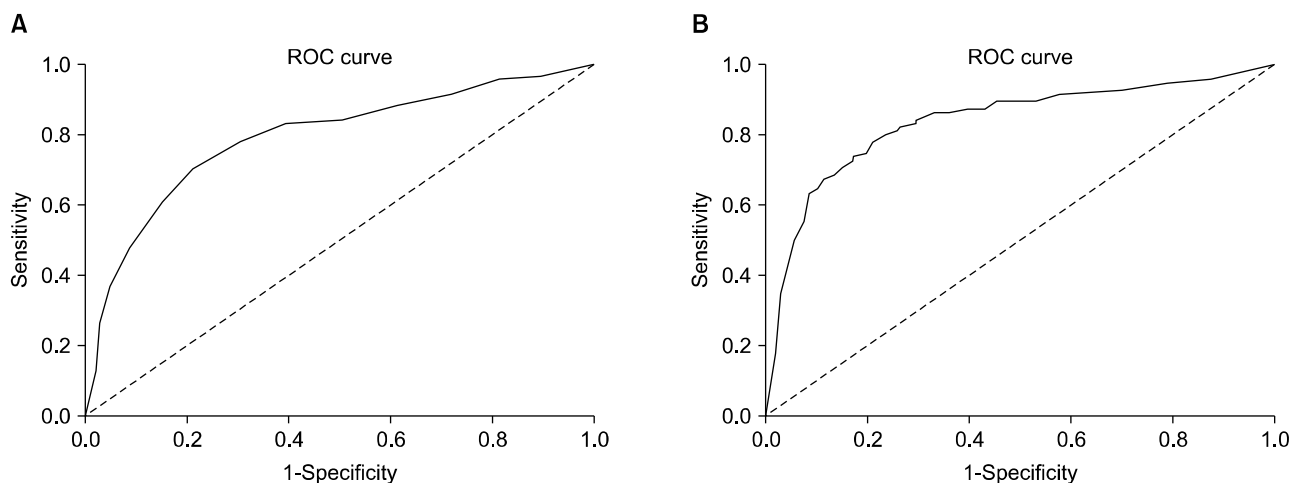


Fig. 2. Receiver operating characteristic (ROC) curve. (A) The original Korean version of the Mood Disorder Questionnaire (K-MDQ). Area under the ROC curve (AUC), 0.793 ($p < 0.001$). (B) The weighted K-MDQ. AUC, 0.837 ($p < 0.001$).

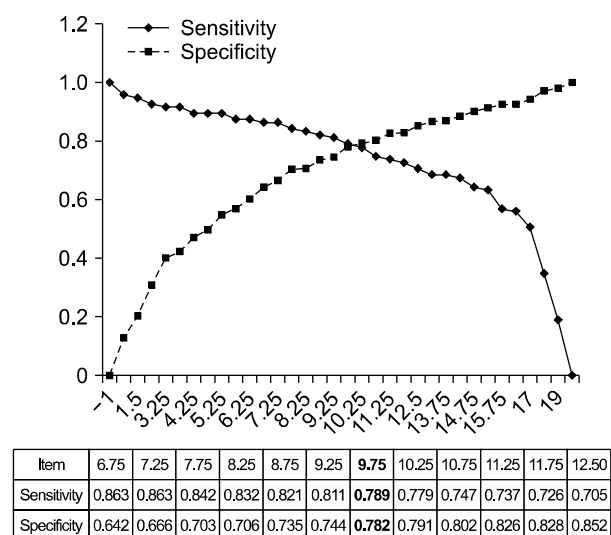


Fig. 3. Sensitivity and specificity of the weighted Korean version of the Mood Disorder Questionnaire at various cutoffs values.

0.789 and specificity of 0.782 (Fig. 3). Cutoff point 10 and cutoff point 9.75 had same sensitivity and specificity.

DISCUSSION

Bipolar disorder has attracted increasing attention and it is considered as a separate spectrum from that of depressive disorder or schizophrenia. As it has been separated from depressive disorder, the differential diagnosis of bipolar disorder from depressive disorder has become more important.³⁾

The MDQ is a widely used screening instrument for bi-

polar disorder. Although it has been translated to many languages and is in global use, there still remain several concerns regarding its clinical usefulness and the appropriateness of its cutoff value.^{22,26)} Certainly, the K-MDQ is easily administered to patients in clinical settings; it is a self-rated questionnaire in paper-and-pencil format, and the time for its completion is relatively short. If a more sensitive formula for the K-MDQ can be developed, it will improve its use in psychiatric practice and other screening settings.

In this study, we suggested a modified formula for K-MDQ to enhance its screening sensitivity for bipolar disorder. We developed the W-K-MDQ using 11 items of the K-MDQ.

Item 1 (feel so good or hyper) is a core and essential symptom of bipolar disorder. The OR of item 1 robustly distinguished bipolar disorder. In this study, the control group was composed of four subgroups, including patients with schizophrenia, depressive disorders, and anxiety disorders and healthy controls. Irritability and other behavioral problems could not distinguish bipolar disorders because they may also be present in other psychiatric diseases. Numerous studies have reported that psychiatric diseases may have different features in East Asian countries, including Korea. Hypersexuality may not be fully expressed by patients in the Korean Confucian culture. In contrast, somatic symptoms such as sleep problems may be emphasized, as has been found by studies on depressive disorders.^{30,31)}

Therefore, we excluded distractibility and hyper-

sexuality from the screening formula. We weighted the core and distinguishing symptoms, pertaining to mood and sleep, to enhance the sensitivity of the instrument to screen for bipolar disorders.

The lack of sensitivity of part 2 (simultaneity of symptoms) and part 3 (severity of functional impairment) of the K-MDQ had been suggested since the instrument's development. Jon *et al.*¹⁶⁾ explained that functional impairment is minimal in patients with bipolar II disorder and a low level of insight affected the response pattern in patients with bipolar I disorder. In this study population, the OR of parts 2 and 3 were also insufficient to screen for bipolar disorders. As was performed in the validation study of the original K-MDQ, we excluded the last two parts of the K-MDQ.

The W-K-MDQ showed higher screening power than the original K-MDQ. The sensitivity of the MDQ in previous meta-analyses was 0.62²⁶⁾ and 0.66,¹³⁾ and the sensitivity and specificity of the K-MDQ was 0.75 and 0.69 in the validation study.¹⁶⁾ The sensitivity and specificity of the K-MDQ in our study population with a cutoff value of 7 was 0.779 and 0.697. The sensitivity and specificity of the W-K-MDQ with a cutoff value of 10 was enhanced to 0.789 and 0.782. The AUC was increased to 0.837 in the W-K-MDQ from 0.793 in the K-MDQ.

The main strength of this study was the composition of the control group. Besides healthy controls, patients with other psychiatric diseases, especially with schizophrenia and depressive disorders, should be differentially diagnosed from bipolar disorder with a screening instrument in clinical settings. Therefore, including these four subgroups in the control group may have played an important role in this study. Furthermore, the confirmed diagnoses by two experienced psychiatrists and 2-years of diagnostic stability confirmed subject distribution.

A limitation of this study was the differences in the demographic characteristics. The specific characteristics of each of the four disease entities could have affected the observed differences. Future studies with larger populations and a stratified analysis could overcome this limitation.

We suggested a new formula for K-MDQ using 11 of its items. The W-K-MDQ can be easily applied with good sensitivity to screen for bipolar disorders in clinical settings in Korea. Further evaluations with larger samples are needed to establish the usefulness of the W-K-MDQ.

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