

Prevalence and Comorbidities of Adult Attention-deficit/hyperactivity Disorder in a Community Sample from Korea

Young Sup Woo¹, Jung Wan Hong², Se-Hoon Shim³, Hyung Mo Sung⁴, Jeong Seok Seo⁵, Sung-Yong Park⁶, Jung Goo Lee⁷, Bo-Hyun Yoon⁸, Won-Myong Bahk¹

¹Department of Psychiatry, College of Medicine, The Catholic University of Korea, Seoul, Korea

²Department of Psychiatry, Iksan Hospital, Iksan, Korea

³Department of Psychiatry, Soonchunhyang University Cheonan Hospital, College of Medicine, Soonchunhyang University, Cheonan, Korea

⁴Department of Psychiatry, Soonchunhyang University Gumi Hospital, College of Medicine, Soonchunhyang University, Gumi, Korea

⁵Department of Psychiatry, College of Medicine, Chung-Ang University, Seoul, Korea

⁶Department of Psychiatry, Keyo Hospital, Uiwang, Korea

⁷Department of Psychiatry, Haeundae Paik Hospital, College of Medicine, Inje University, Busan, Korea

⁸Department of Psychiatry, Naju National Hospital, Naju, Korea

Objective: Attention-deficit/hyperactivity disorder (ADHD) is prevalent in adults, and psychiatric comorbidities are common in adults with ADHD. We aimed to examine the prevalence of adult ADHD with several common psychiatric conditions in a community sample in Korea and the association between adult ADHD and risk of psychiatric comorbidities.

Methods: This study used a cross-sectional survey design. We provided supplementary and optional self-report questionnaires, including the Korean version of the World Health Organization Adult ADHD Self-Report Scale (ASRS) short screening scale, Patient Health Questionnaire-9 for screening for depression, Alcohol Use Disorders Identification Test alcohol consumption questions, and the Korean version of the Mood Disorders Questionnaire, to Korean adults who visited one of six centers of a large private healthcare company for the National General Health Examination.

Results: A total of 17,799 subjects included in this study, and 430 (2.4%) were positive on the ASRS screen. ADHD was significantly associated with the 19–30-year-old age group (odds ratio [OR] = 3.938), lower income (OR = 1.298), depression (OR = 11.563), and bipolar disorder (OR = 3.162).

Conclusion: Adult ADHD was highly associated with depression and bipolar disorder, suggesting that clinicians should carefully evaluate and treat such psychiatric disorders in adults with ADHD symptoms.

KEY WORDS: ADHD; Adult; Comorbidity; Depression; Alcohol use disorder; Bipolar disorder.

INTRODUCTION

Attention-deficit/hyperactivity disorder (ADHD) is a psychiatric disorder defined by persistence of inattention, hyperactivity, and impulsivity that interferes with functioning or development [1]. The International Classification of Mental and Behavioral Disorders 10th revision re-

ported a prevalence rate in children of 1–2%, whereas the less stringent Diagnostic and Statistical Manual of Mental Disorders 4th edition (DSM-IV) [2] presents a 3.0% prevalence rate in children. Although ADHD is most prevalent among children and adolescents and can resolve during adolescence, there is substantial evidence that ADHD persists into adulthood in 50–65% of cases [3,4] and is associated with problems in personal, social, and occupational areas [5]. Moreover, the comorbidity rate among ADHD patients is higher in adults than in children, and as many as 80% of adults with ADHD are reported to have at least one comorbid psychiatric disorder, most commonly substance use disorder, mood disorder, anxiety disorder or antisocial personality disorder [6-11].

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Address for correspondence: Won-Myong Bahk
Department of Psychiatry, Yeouido St. Mary's Hospital, College of Medicine, The Catholic University of Korea, 10 63-ro, Yeongdeungpo-gu, Seoul 07345, Korea
E-mail: wmbahk@catholic.ac.kr
ORCID: <https://orcid.org/0000-0002-0156-2510>

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For example, Kessler *et al.* [11] reported a comorbid prevalence rate of 38.3% for mood disorders, 47.1% for anxiety disorders, and 15.2% for substance disorders in a US community sample of adults with ADHD. Moreover, German patients with ADHD exhibited a psychiatric lifetime comorbidity prevalence of 77.1% [6]. Likewise, in a recent study utilizing data from the Korea Health Insurance Review and Assessment Service, it was found that among Korean adult ADHD patients, 78.72% presented with at least one psychiatric comorbidity [7].

Because these psychiatric comorbidities may contribute to under-diagnosis of adult ADHD due to symptom overlap and could have further long-term negative effects on outcomes, psychiatric comorbidities are of great importance in clinical practice [12,13]. Although there are some epidemiological data specific to adult ADHD in the general population in Korea [7,14,15], methodological drawbacks limited the generalizability of the results; Park *et al.* [14] conducted a study in a Korean community ($n = 6,081$) using data from the National Epidemiological Survey of Psychiatric Disorders in Korea conducted in 2006. They reported an estimated 6-month prevalence of adult ADHD symptoms to be 1.1%. Additionally, the study findings indicated lifetime prevalence rates of alcohol abuse/dependence at 30.4%, major depressive disorder at 17.4%, bipolar disorder at 8.6%, and anxiety disorder at 25.7% in subjects with ADHD symptoms. However, it should be noted that the researchers utilized an invalidated Korean version of the World Health Organization (WHO) Adult Attention-Deficit/Hyperactivity Disorder Self-Report Scale (ASRS) due to the lack of validation for the Korean version until 2013 [16]. Yeom *et al.* [15] conducted a study and reported the prevalence of ADHD to be 2.8%. Among ASRS positive subjects, they observed a prevalence of 52.1% for depression, 49.5% for social anxiety, 43.2% for generalized anxiety, and 10.4% for alcohol problems. The main limitation of their study was the restricted sample, as it solely included Korean servicemen who were males in their 20's, identified as healthy and eligible for military service based on a physical examination for draft criteria conducted by the Military Manpower Administration. This narrow participant pool may impact the generalizability of the study findings to broader populations. Furthermore, Seo *et al.* [7] reported a prevalence of 78.7% for any psychiatric disorders in adult ADHD patients in their study, which utilized data

from the Korea Health Insurance Review and Assessment Service. However, as administrative claims data were utilized, the potential for referral bias could not be entirely eliminated.

In Korea, 97% of the population is obliged to enroll in the National Health Insurance (NHI) program according to the Framework Act on Health Examinations, National Health Insurance Act, and Enforcement Decree of the National Health Insurance Act. Insured employees or self-employed individuals and their dependents (aged 20 years or younger) and medical aid beneficiaries (aged 19–64 years) are provided a National General Health Examination (NGHE) biennially [17]. The exam is performed by the government's assigned health screening centers. Participants for NGHE had the liberty to select any certified medical institution, such as private clinics, hospitals, or healthcare institution and public health centers, for their screening examinations.

In light of these considerations, we investigated the prevalence of ADHD symptoms and other comorbid psychiatric conditions in a large community adult sample in Korea.

METHODS

Participants and Procedure

This study used a cross-sectional survey design. We provided supplementary and optional self-report questionnaires to Korean adults (aged 19 years or older) who visited one of six centers (three centers in Seoul, one center in Gwangju, one center in Daegu, one center in Busan) of a large private healthcare institution, Korean Medical Institute, for the NGHE. Data were collected from individuals who provided informed consent and completed the questionnaire voluntarily.

Assessment

Sociodemographic data of sex, age, employment status, personal income, and educational level were collected. Age was categorized into 10-year groups, and personal income was categorized into two groups (lower 50% and higher 50%) using 2021 National Statistics (https://www.index.go.kr/unity/potal/main/EachDtIPageDetail.do?idx_cd=2762).

The self-report questionnaire included the Korean version of the WHO ASRS short screening scale (ASRS screen,

six questions) [16,18]. The ASRS symptom checklist is a self-report 18-item scale that contains questions based on the 18 category A symptoms from the DSM-IV and is meant to identify patients who may be at risk for ADHD, and a shorter 6-item self-report ASRS screening scale was developed for screening [19]. The screening scale employs a 5-point Likert-type scale to assess the frequency of ADHD symptoms experienced over the past 6 months, ranging from 0 (never) to 4 (very often) [12]. Psychometric factor analyses of diagnostic interviews from individuals with and without ADHD in the NCS-R population informed the design of the screener's items. The ASRS screening scale effectively distinguishes between individuals with and without ADHD, making it a valuable tool for various purposes, including conducting epidemiological surveys and evaluating patients in clinical settings [20]. Furthermore, its brevity and user-friendly nature enhance its practicality. In the context of Korean adults, the Korean version of ASRS screening demonstrated a sensitivity of 0.627, specificity of 0.804 and false positive rate of 0.196 [16]. The results from the ASRS screen were classified as positive at a cutoff score of four as the sum of the dichotomous responses for the six questions [18,19].

For depression screening, we utilized the Korean version of the Patient Health Questionnaire-9 (PHQ-9), a validated and reliable instrument [21]. The PHQ-9 is a self-administered questionnaire comprising nine items designed to assess depressive symptoms. Each item is rated on a scale from 0 to 3, with higher scores indicating more severe symptoms. The total PHQ-9 score ranges from 0 to 27, and specific cutoff points of 5, 10, and 15 represent mild, moderate, and severe levels of depressive symptoms, respectively [22]. In this study, depression is defined as a total score of 10 or higher [23].

In this study, alcohol-related problems were screened using the Alcohol Use Disorders Identification Test (AUDIT), specifically the AUDIT-C, which comprises the first three questions of the AUDIT [24]. Developed by the WHO in 1989 [25], the AUDIT is a self-report questionnaire consisting of 10 items, each scored on a scale of four, yielding a total score range of 0 to 40. The AUDIT-C, on the other hand, is a shortened version derived from the original AUDIT and serves as a brief 3-item screening test to detect risky drinking behaviors at early stages. AUDIT-C offers a more efficient alternative for administration and scoring, as it significantly reduces the efforts required. To

compute the AUDIT-C score, the scores of the first three items of the AUDIT are summed, addressing aspects of drinking frequency, average drinking quantity, and binge drinking frequency. The maximum total score of the AUDIT-C is 12 [26]. A cutoff score of five or more for males and four or more for females was used to identify individuals with positive alcohol-related screening results [27-29].

And the Korean version of the Mood Disorders Questionnaire (K-MDQ) [30] was used to screen for bipolar disorder. The MDQ was developed as a screening tool by Hirschfeld *et al.* [31] with the aim of improving the identification of bipolar spectrum disorder. The original MDQ criteria for a positive screen encompass three essential elements: endorsement of 7 or more symptoms (Part 1), co-occurrence of these symptoms (Part 2), and experiencing moderate to severe functional impairment (Part 3). However, Jon *et al.* [30] validated the K-MDQ in a clinical sample, and they found acceptable levels of sensitivity (0.75) and specificity (0.69) against unstructured clinical diagnoses when parts 2 and 3 were eliminated. Accordingly, in the current study, a positive result for K-MDQ was determined by the presence of at least seven "yes" answers in Part 1 of the K-MDQ [30].

Statistical Analyses

Descriptive characteristics were presented as frequencies and percentages for quantitative variables. The chi-square test was performed to test for differences between the ASRS positive (ADHD) and negative (non-ADHD) groups. Binary logistic regression analyses were performed to assess the relationships between each mental health condition (alcohol-related problems, depression, and bipolar disorder) and ADHD. All models were adjusted for age group, educational level, employment status, and personal income. All reported *p* values are two-tailed and considered statistically significant at $p < 0.05$. All statistical analyses were performed using SPSS for Windows, version 18.0 (SPSS Inc.).

Ethics

The Institutional Review Board (IRB) of Yeouido St. Mary's Hospital in Seoul, Korea (SC21QISI042) reviewed and approved the protocol, and the study was conducted in accordance with good clinical practices and the Helsinki Declaration. The IRB waived patient-specific in-

formed consent for this survey and anonymous reporting of aggregate data.

RESULTS

Sociodemographic Characteristics

A total of 22,732 individuals responded to the survey, and 4,933 (21.9%) respondents were excluded for missing responses. Among all included subjects ($n = 17,799$), 430 (2.4%) were positive on the ASRS screen (ADHD group). The sociodemographic characteristics of ADHD and non-ADHD groups are presented in Table 1. ADHD was identified in 1.9% ($n = 234$) of males and 3.5% ($n = 196$) of females ($p < 0.001$), and the proportion of females was significantly higher in the ADHD group (45.6%) compared to the non-ADHD group (30.9%, $p < 0.001$). Age group distributions were significantly different between the two groups ($p < 0.001$), and income in the lower 50% was more prevalent in the ADHD group (26.3%) than in the non-ADHD group (15.6%, $p < 0.001$).

Prevalence of Psychiatric Comorbidities

Table 2 shows the prevalence of comorbid psychiatric conditions in the full sample set and in the ADHD and non-ADHD groups. The prevalence of depression and bipolar disorder was significantly different between the

ADHD and non-ADHD groups among the total samples set and among male subjects. Among female subjects, all three comorbid conditions were significantly more prevalent in the ADHD group than in the non-ADHD group. One comorbid condition was found in 34.2% of subjects in the ADHD group and in 41.3% of the non-ADHD group. The presence of two and three comorbid psychiatric conditions was observed in 184 (42.8%) and 68 (15.8%) subjects, respectively, in the ADHD group and in 1,902 (11.0%) and 377 (2.2%) subjects in the non-ADHD group (Table 3).

In logistic regression analysis (Table 4), ADHD was significantly associated with the 19–30-year age group (odds ratio [OR] = 3.938, 95% confidence interval [CI] = 2.111–7.347, $p < 0.001$, compared to age group 60 years or older), lower income (OR = 1.298, 95% CI = 1.019–1.652, $p = 0.035$), depression (OR = 11.563, 95% CI = 8.945–14.946, $p < 0.001$), and bipolar disorder (OR = 3.162, 95% CI = 2.544–3.929, $p < 0.001$).

When the results were divided by sex (Table 4), ADHD was significantly associated with the 19–30-year-old group (OR = 4.337, 95% CI = 1.619–11.617, $p = 0.004$), depression (OR = 11.433, 95% CI = 7.467–17.505, $p < 0.001$), and bipolar disorder (OR = 2.617, 95% CI = 1.868–3.667, $p < 0.001$) in females. In males, ADHD also was significantly associated with the 19–30-year-old age

Table 1. Sociodemographic characteristics of subjects

Variable	Total (n = 17,799)	Non-ADHD (n = 17,369)	ADHD (n = 430)	<i>p</i> value
Female	5,567 (31.3)	5,371 (30.9)	196 (45.6)	< 0.001
Age (yr)				
19–30	1,868 (10.5)	1,724 (9.9)	144 (33.5)	< 0.001
30–40	5,243 (29.5)	5,083 (29.3)	160 (37.2)	
40–50	5,672 (31.9)	5,595 (32.2)	77 (17.9)	
50–60	3,930 (22.1)	3,893 (22.4)	37 (8.6)	
60 or older	1,086 (6.1)	1,074 (6.2)	12 (2.8)	
Employment status				
Unemployed	296 (1.7)	289 (1.7)	7 (1.6)	0.932
Student, housework	1,666 (9.4)	1,629 (9.4)	37 (8.6)	
Employed (part time)	1,715 (9.6)	1,671 (9.6)	44 (10.2)	
Employed (full time)	14,122 (79.3)	13,780 (79.3)	342 (79.5)	
Education				
High school or lower	5,562 (31.2)	5,435 (31.3)	117 (27.2)	0.071
College or higher	12,247 (68.8)	11,934 (68.7)	313 (72.8)	
Income				
Lower 50 percent (< 36 million KRW/yr)	2,829 (15.9)	2,716 (15.6)	113 (26.3)	< 0.001
Higher 50 percent (≥ 36 million KRW/yr)	14,969 (84.1)	14,652 (84.4)	317 (73.7)	

Values are presented as number (%).

ADHD, attention-deficit/hyperactivity disorder; KRW, South Korean Won.

Table 2. Prevalence of comorbid psychiatric conditions

Total sample	Total (n = 17,799)	Non-ADHD (n = 17,369)	ADHD (n = 430)	<i>p</i> value
Alcohol related problem (AUDIT-C positive)	7,399 (41.6)	7,203 (41.5)	196 (45.6)	0.088
Depression (PHQ-9 positive)	3,774 (21.2)	3,424 (19.7)	350 (81.4)	< 0.001
Bipolar disorder (K-MDQ positive)	1,654 (9.3)	1,481 (8.5)	173 (40.2)	< 0.001
Male	n = 12,232	n = 11,998	n = 234	
Alcohol related problem (AUDIT-C positive)	6,131 (50.1)	6,004 (50.0)	127 (54.3)	0.200
Depression (PHQ-9 positive)	2,233 (18.3)	2,052 (17.1)	181 (77.4)	< 0.001
Bipolar disorder (K-MDQ positive)	1,180 (9.6)	1,079 (9.0)	101 (43.2)	< 0.001
Female	n = 5,567	n = 5,371	n = 196	
Alcohol related problem (AUDIT-C positive)	1,268 (22.8)	1,199 (22.3)	69 (35.2)	< 0.001
Depression (PHQ-9 positive)	1,541 (27.7)	1,372 (25.5)	169 (86.2)	< 0.001
Bipolar disorder (K-MDQ positive)	474 (8.5)	402 (7.5)	72 (36.7)	< 0.001

Values are presented as number (%).

ADHD, attention-deficit/hyperactivity disorder; AUDIT-C, Alcohol Use Disorders Identification Test-alcohol consumption questions; K-MDQ, Korean version of Mood Disorders Questionnaire; PHQ-9, Patient Health Questionnaire-9 for screening for depression.

Table 3. Number of comorbid conditions

Total sample	Total (n = 17,799)	Non-ADHD (n = 17,369)	ADHD (n = 430)	<i>p</i> value
0	7,948 (44.7)	7,917 (45.6)	31 (7.2)	< 0.001
1	7,320 (41.1)	7,173 (41.3)	147 (34.2)	
2	2,086 (11.7)	1,902 (11.0)	184 (42.8)	
3	445 (2.5)	377 (2.2)	68 (15.8)	
Male	n = 12,232	n = 11,998	n = 234	
0	4,825 (39.4)	4,808 (40.1)	17 (7.3)	< 0.001
1	5,582 (45.6)	5,515 (46.0)	67 (28.6)	
2	1,513 (12.4)	1,405 (11.7)	108 (46.2)	
3	312 (2.6)	270 (2.3)	42 (17.9)	
Female	n = 5,567	n = 5,371	n = 196	
0	3,123 (56.1)	3,109 (57.9)	14 (7.1)	< 0.001
1	1,738 (31.2)	1,658 (30.9)	80 (40.8)	
2	573 (10.3)	497 (9.3)	76 (38.8)	
3	133 (2.4)	107 (2.0)	26 (13.3)	

Values are presented as number (%).

ADHD, attention-deficit/hyperactivity disorder.

group (OR = 3.494, 95% CI = 1.457–8.381, $p = 0.005$), depression (OR = 11.471, 95% CI = 8.311–15.832, $p < 0.001$) and bipolar disorder (OR = 3.614, 95% CI = 2.717–4.807, $p < 0.001$). ADHD was associated with increased risk of lower income in females (OR = 1.380), but the association was not statistically significant (95% CI = 0.970–1.962, $p = 0.073$).

DISCUSSION

In this large, community-based survey, adult ADHD

symptom prevalence was 2.4%. This result was consistent with the results from a meta-analysis that reported a pooled prevalence of 2.5% for adult ADHD [32]. In the present study, the univariate analysis indicated significantly higher prevalence of ADHD symptoms in females (3.5%) than in males (1.9%). However, sex was not a significant predictor of ADHD in multivariate analysis because the proportion of young people (age 19–30 years), a significant predictor of ASRS positivity in multivariate analysis, was significantly higher in females (13.0%) than males (9.4%, $p < 0.001$). The higher preva-

Table 4. Risk factors for ASRS positive in binary logistic regression analysis

Total sample	Odds ratio	Confidence interval (95%)		Significance
Female	1.231	0.996	1.523	0.055
Age (compared to 60 or older) (yr)				
19–30	3.938	2.111	7.347	< 0.001
30–40	1.821	0.978	3.39	0.059
40–50	1.147	0.603	2.182	0.675
50–60	0.973	0.494	1.916	0.938
Education (college or higher)	0.869	0.687	1.1	0.243
Lower income	1.298	1.019	1.652	0.035
AUDIT-C positive	0.891	0.721	1.101	0.284
PHQ-9 positive	11.563	8.945	14.946	< 0.001
K-MDQ positive	3.162	2.544	3.929	< 0.001
Male				
Age (compared to 60 or older) (yr)				
19–30	3.494	1.457	8.381	0.005
30–40	1.711	0.719	4.073	0.225
40–50	1.181	0.486	2.870	0.714
50–60	0.982	0.390	2.472	0.970
Education (college or higher)	0.838	0.609	1.154	0.280
Lower income	1.229	0.873	1.732	0.237
AUDIT-C positive	0.882	0.669	1.162	0.371
PHQ-9 positive	11.471	8.311	15.832	< 0.001
K-MDQ positive	3.614	2.717	4.807	< 0.001
Female				
Age (compared to 60 or older) (yr)				
19–30	4.337	1.619	11.617	0.004
30–40	1.930	0.722	5.160	0.190
40–50	1.001	0.358	2.800	0.999
50–60	0.892	0.301	2.646	0.837
Education (college or higher)	0.953	0.668	1.359	0.789
Lower income	1.380	0.970	1.962	0.073
AUDIT-C positive	0.854	0.609	1.197	0.359
PHQ-9 positive	11.433	7.467	17.505	< 0.001
K-MDQ positive	2.617	1.868	3.667	< 0.001

ASRS, Adult attention-deficit/hyperactivity disorder Self-Report Scale; AUDIT-C, Alcohol Use Disorders Identification Test-alcohol consumption questions; K-MDQ, Korean version of Mood Disorders Questionnaire; PHQ-9, Patient Health Questionnaire-9 for screening for depression.

lence of ADHD in females in this study was discordant with results from a recent systematic review, which indicated that ADHD was more prevalent in males [33]. The results of this study, showing a higher risk of ADHD in females, can be explained as follows. According to previous research [33], females tend to be more impaired than males in various aspects of ADHD, including social functioning. Therefore, this higher functional impairment in females might have led to an increased rate of voluntary survey participation, potentially overestimating the prevalence of ADHD in females. Moreover, recent reports indicate a significant rise in adult ADHD diagnoses, particularly among females compared to males. According to a

press release from the National Health Insurance Service in Korea [34], the number of adult ADHD patients has notably increased in 2021 compared to 2017, with a more than five-fold increase in male ADHD patients (from 1,055 to 5,542) and a more than nine-fold increase in female ADHD patients (from 439 to 4,072) in their 30s. Thus, the results of this study may reflect the increasing awareness of adult ADHD, especially in females, in recent times.

In previous studies performed in Korea using data from the 2009–2011 Korean National Health and Nutrition Examination Survey (KNHANES) [35], the prevalence of intermediate- or high-risk alcohol drinking [29] was 39.5%,

the prevalence of depression was 6.1% in the analysis of 2014–2016 KNHANES data [36], and the prevalence of bipolar spectrum disorder in the general population was 4.3% [37]. Moreover, in a recent systematic review [38], the prevalence of depressive disorder in the general population was estimated at 1.2–12.5% in the non-ADHD group compared to 8.6–55.0% in the ADHD group. The prevalence of bipolar disorder in the non-ADHD group was 0.2–3.6% compared to 4.5–35.3% in the ADHD group, and the prevalence of any substance use disorder in the non-ADHD group was 0–16.6% compared to 2.3–41.2% in the ADHD group.

The prevalence reported in this study for all three comorbid conditions (Table 2) was much higher than the results from previous studies of the general population, except the prevalence of alcohol-related problems. This prevalence was 41.6% in the present study, in accordance with the results from KNHANES data (39.5%). The higher prevalence of depression and bipolar disorder in this study (21.2% for depression and 9.3% for bipolar disorder in the total sample and 81.4% for depression and 40.2% for bipolar disorder in the ADHD group) would be interpreted as reflecting characteristics of participants in this study. There is a possibility that a larger number of individuals exhibiting cognitive impairment akin to ADHD, such as those diagnosed with bipolar disorder or depression, participated in the survey, although a precise comparison is arduous owing to disparities in the diagnostic instruments utilized.

Moreover, in multivariate analyses conducted on all subjects, as well as those stratified by sex, the association between alcohol-related problems and ADHD was not significant. However, both depression and bipolar disorder exhibited a significant association with ADHD. The findings suggest that adult ADHD is often comorbid with depression or bipolar disorder, as reported in a recent meta-analysis that showed that a prevalence of ADHD of 17% in adult bipolar patients and of 7% in adult major depression patients [39]. These results also could imply that the ASRS may not effectively differentiate between adult ADHD and cognitive deficits that may co-occur with depression or bipolar disorder. As noted by Bond *et al.* [40], the frequent comorbidity of mood disorders and ADHD could be explained in three ways: artifactual misdiagnosis when clinicians misattribute mood symptoms to ADHD, subtypes of mood disorders characterized by ADHD-like

prodrome with symptoms persisting between mood episodes, and true comorbidity. Although the misattribution theory seems unlikely because most patients continued to meet criteria for both, even when overlapping symptoms were discounted, concerns remain about ADHD being over-diagnosed in adults [41,42], especially when diagnoses rely solely on screening tools. The false positive rate of the ASRS screen was about 20% in a study of Korean subjects [18], and depressive symptoms could affect subjective ADHD symptoms [43]. Hence, symptom checklists alone cannot provide sufficient screening, and diagnosis of adult ADHD warrants careful consideration of multiple sources of information including self-reporting, clinical interviews, collateral information, childhood history, and neuropsychological testing [41].

The lack of association between alcohol-related problems and adult ADHD in this study was discordant with previous studies reporting bidirectional relationships of the two diseases [44,45]. Interestingly, the prevalence of alcohol-related problems in the ADHD group in this study (45.6%) was similar with the result from the Netherlands Mental Health Survey (43%), although the prevalence in the non-ADHD group was much higher in our study (41.5%) than in the Netherlands study (18.2%) [46]. Additionally, as reviewed by Weiss *et al.* [47], there is mounting evidence of a close interrelationship between ADHD, bipolar disorder, and alcohol use disorder, not only from a psychopathological perspective, but also in terms of their underlying neurobiological substrates. Hence, the potential association between ADHD and alcohol-related problems in this study may have been obscured by the considerable prevalence of alcohol-related problems within the non-ADHD group. According to nationally representative surveys conducted from 2009 to 2011, the prevalence of problematic drinking in the Korean general population was 57.5% for males and 16.6% for females [35]. The existence of a tolerant and permissive drinking culture, coupled with a high AUDIT positive rate in the general population in Korea, could complicate the interpretation of the association between alcohol use disorder, evaluated using AUDIT-C, and adult ADHD. Additionally, it is worth noting the high prevalence of depression and bipolar disorder within the ADHD group, which may be linked to an elevated risk of alcohol use problems.

Regarding the risk and age-relatedness of ADHD, the results of multivariate analysis showed that the younger

age group (19–30 years old) had a significantly higher risk of showing ASRS positive compared to the group aged 60 years and above (OR = 3.938, 95% CI = 2.111–7.347, Table 4). This could be related to neurobiological factors since the biological development of the frontal brain region, which is associated with ADHD, can continue until the mid-20s [48].

The present study had limitations that should be considered when interpreting the results. Symptoms of ADHD and other comorbidities were assessed through self-reporting, and the results may not be as accurate as for those using structured interviews. Despite the nationwide scope of the survey conducted by multiple centers, encompassing participants of various ages and occupations, generalization of the findings is challenging due to the predominant inclusion of employed individuals and the reliance on voluntary survey completion. The restricted participant pool, comprising only volunteers, raises significant concerns that necessitate careful consideration. It is plausible that the prevalence of ADHD and other comorbid conditions might be overestimated due to the possibility that individuals with mental health issues resembling ADHD, such as cognitive impairment, impulsivity, and affective instability, were more inclined to participate in the survey willingly. This potential bias could impact the accuracy and generalizability of the survey's findings. Moreover, anxiety disorder, which is commonly comorbid with ADHD, was not evaluated. Because response burden (e.g., questionnaire length) is negatively associated with response rate [49], screening tools for anxiety were excluded from the study to reduce the number of questionnaire items. Despite these limitations, the strengths of this study lie in our use of a broad and large community-based data set from Korea.

With this study, our goal was to examine the prevalence of ADHD symptoms and other comorbid psychiatric conditions in a substantial population-based sample of adults residing in Korea. The results presented herein show that the prevalence of ADHD in the Korean adult community sample is comparable with the global average. Our results also revealed that ADHD is highly associated with psychiatric comorbidities, lower income, and younger age, as expected. Therefore, careful consideration should be given to the likelihood of coexistence of ADHD as a comorbidity when dealing with mood disorders of young adult patients.

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■ Conflicts of Interest

No potential conflict of interest relevant to this article was reported.

■ Author Contributions

Conceptualization: Bo-Hyun Yoon, Won-Myong Bahk. Data acquisition: Jung Wan Hong, Se-Hoon Shim, Hyung Mo Sung, Jeong Seok Seo, Sung-Yong Park. Formal analysis: Young Sup Woo. Funding: Won-Myong Bahk. Supervision: Bo-Hyun Yoon. Writing—original draft: Young Sup Woo. Writing—review & editing: Jung Goo Lee, Young Sup Woo, Won-Myong Bahk.

■ ORCID

Young Sup Woo	https://orcid.org/0000-0002-0961-838X
Jung Wan Hong	https://orcid.org/0000-0003-0458-6750
Se-Hoon Shim	https://orcid.org/0000-0002-3137-6591
Hyung Mo Sung	https://orcid.org/0000-0002-2396-3358
Jeong Seok Seo	https://orcid.org/0000-0002-4880-3684
Sung-Yong Park	https://orcid.org/0000-0002-8685-620X
Jung Goo Lee	https://orcid.org/0000-0003-3393-2667
Bo-Hyun Yoon	https://orcid.org/0000-0002-3882-7930
Won-Myong Bahk	https://orcid.org/0000-0002-0156-2510

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