



Diagnostic Distribution of Psychiatric Disorders among Korean Young Adults

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Objectives: The prevalence of psychiatric disorders among young adults is different from that among younger or older age groups because of biological and environmental changes. The purpose of this study was to analyze the diagnostic distribution of psychiatric disorders in 19–30-year-old Koreans based on their age and gender using data from the Korean National Health Insurance Service (NHIS).

Methods: From the 2011 medical claims sample data of NHIS of 1,375,842 people, we extracted the data of 221,038 people aged 19–30 years, including 106,232 (48.1%) men and 114,806 (51.9%) women. We evaluated the overall changes in the diagnostic distribution of psychiatric disorders over a 3-year period.

Results: The diagnostic frequency in women was 13,627 (59.0%), which was significantly higher than that in men. “Other anxiety disorders” was the most common psychiatric disorder in both genders, followed by depressive episodes, somatoform disorders, “other neurotic disorders,” and nonorganic sleep disorders. In men, attention-deficit/hyperactivity disorder or intellectual disabilities were not among the top 10 disorders. In women, no significant changes in major psychiatric disorders were seen over the 3-year period.

Conclusion: These results reveal the trends of diagnostic distribution of mental illnesses depending on the development, particularly in young adulthood. It is necessary to identify whether such trends are due to biological or environmental factors, aging processes, or complex influences.

Key Words: Prevalence; Psychiatric disorder; Nationwide; Young adulthood.

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INTRODUCTION

Young adulthood is a period marking the end of adolescence and beginning of adulthood, during which individuals independently set the direction of their lives [1]. Although it has increasingly delayed because of industrialization, young adulthood may involve an expansion of individual problems to those affecting families and social organizations, such as marriage- and work-related issues [1]. Therefore, it is a period in which individuals are exposed to a new environment, and consequently, mental health problems may differ from those in previous stages of life. Structural maturation of the brain and hormones induce changes in the subcortical and cortical activities throughout childhood, adolescence, and adulthood. Further, as people grow out of childhood, when motor symptoms were the most prevalent, and pass through ado-

lescence, psychiatric symptoms come to prevail in adulthood [2]. A study using a dual system model of brain development in adolescence, including young adulthood, suggested that this period may be marked by higher sensory seeking and lower impulse control compared to other periods [3].

Although adolescence and young adulthood are continuous phases, it is highly likely that adolescents fall into a so-called “twilight zone” [4], in which there is a great possibility of important treatments being stopped because of changes in the healthcare system, lifestyle, and environment, consequently changing the distribution of mental disorders. Nevertheless, studies investigating the distribution of mental disorders throughout one’s life are rare. In surveys on the prevalence of mental disorders among adolescents aged 13–17 years using the National Comorbidity Survey (NCS) Replication Adolescent Supplement [5] and prevalence of mental disorders in the general population above the age of 18 years using the NCS Replication (NCS-R) [6], anxiety and behavioral disorders were the most prevalent mental disorders until adoles-

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cence, yet the prevalence of depressive disorders exceeded that of behavioral disorders in adulthood. Similar to these surveys conducted in the United States, a nationwide mental disorder survey has been conducted every 5 years since 2001 in Korea. This survey reported alcohol abuse (9.2%), alcohol dependence (7.0%), major depressive disorder (5.6%), specific phobia (3.8%), and generalized anxiety disorder (1.6%) to be the most common mental disorders [7]. However, it included the general population aged 18–64 years.

Our previous study revealed interesting changes in the diagnostic distribution of mental disorders among children and adolescents under the age of 19 years based on gender and age [8]. Attention-deficit/hyperactivity disorder (ADHD) was the most prevalent mental disorder among boys aged 4–15 years and girls aged 7–12 years. In late adolescence, anxiety disorder was the most prevalent mental disorder among both boys and girls, and girls also showed a marked increase in the prevalence of depressive disorder. In a previous study, we emphasized on the need to examine changes that occur during transition from adolescence to adulthood [8]. Therefore, the aim of this study was to analyze the diagnostic distribution of psychiatric disorders in young adulthood using the nationally representative health insurance sample data.

PARTICIPANTS AND METHODS

Participants

This study utilized the 2011 Health Insurance Review and Assessment Service-National Patient Sample (HIRA-NPS-2011-0082) based on the medical claims data. The HIRA-NPS data includes 3% of the total Korean population, i.e., 1,375,842 people. The HIRA-NPS data are statistically sampled secondary data without personal identifiers, containing medical claims over a 1-year period.

We extracted the HIRA-NPS data of individuals aged 19–30 years for two reasons. First, we have analyzed the diagnostic distribution of psychiatric disorders in children and adolescents aged below 19 years in a previous study [8] and have also attempted to examine changes in people aged 19 years or older in a continuum. Second, as the incidence of physical diseases begins to increase after the age of 30 years [9], distinguishing the influence of physical-mental comorbidity becomes difficult [10]. In the NPS data, 221,038 people were aged 19–30 years, including 106,232 (48.1%) men and 114,806 (51.9%) women. Among them, we included those who received an outpatient or inpatient treatment at a primary, secondary, or tertiary medical institution for mental disorders with an F (F00–F99) code per the Korean standard classification of diseases [11], which was developed based on the International Classification of Diseases (ICD) [12]. We included all codes

for psychiatric disorders per person. A total of 16,297 people, including 6,417 (39.4%) men and 9,880 (60.6%) women, had one major diagnosis with an F code. When F codes for an individual were counted separately and the same F code was counted only once, the total number of accumulated patients were 23,102, including 9,475 (41.0%) men and 13,627 (59.0%) women (Fig. 1).

Methods

In the first preliminary analysis, we examined the distribution over a 1-year period. We performed another analysis over a 3-year period to examine the overall trend and found no marked differences in the results between the two analyses. Subsequently, we compared changes over a 3-year period for 23,102 people with an F-code diagnosis based on their gender. The following diagnoses had been made at a frequency of 1% or more in the preliminary analyses, and therefore, their distributions were analyzed separately from other diagnoses: mental and behavioral disorders due to alcohol use (F10), schizophrenia (F20), bipolar affective disorder (F31), depressive episode (F32), recurrent depressive disorder (F33), persistent mood disorder (F34), phobia (F40), other anxiety disorders (F41), obsessive-compulsive disorder (F42), reaction to severe stress and adjustment disorder (F43), somatoform disorders (F45), other neurotic disorders (F48), and non-organic sleep disorders (F51). Mental retardation codes (F70, F71, F72, F73, F78, and F79) were processed as a single code (F70–79). Other mood disorders (F38) and nonspecific mood disorders (F39) were also considered similar and therefore processed as a single code. The remaining disorders were classified as “others.” Therefore, 15 single diagnostic codes and one “others” code were analyzed. This study protocol was approved by the institutional review board of the Kyung Hee University Hospital (KMC IRB 1605-10).

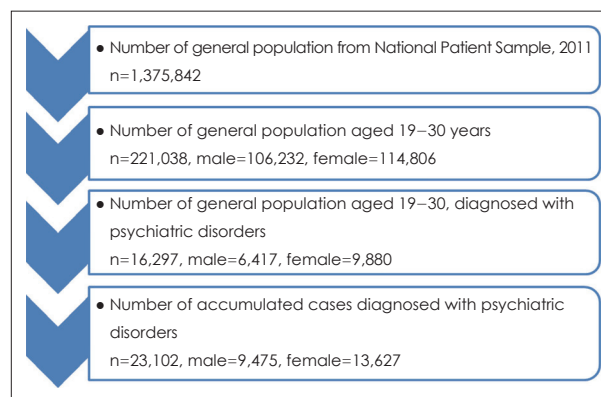


Fig. 1. Flow of the study patients and cases in analysis of distribution about psychiatric disorders.

Data analysis

Data were analyzed with SAS 9.3 (SAS Institute Inc. Cary, NC, USA), and the distribution of mental disorders among young adults aged 19–30 years by age and gender were analyzed with the frequency analysis. A p-value less than 0.05 was deemed statistically significant.

RESULTS

Number of diagnosis per subject

The number of F-code diagnoses for each individual ranged from one to ten (Table 1).

Most common diagnoses in the overall study population

In the overall study population aged 19–30 years, the most common diagnosis was “other anxiety disorders” (F41, 24.80%), followed by depressive episodes (F32, 14.82%), somatoform disorders (F45, 11.31%), “other neurotic disorders” (F48, 9.26%), and nonorganic sleep disorders (F51, 9.19%) (Table 2). Among the disorders included in the “others” category, the most common diagnosis was specific personality disorder (F60, n=172), followed by eating disorders (F50, n=159), and unspecified nonorganic psychosis (F29, n=154) (Table 3).

Distribution by age in men

The most common diagnosis was “other anxiety disorders” (F41), followed by depressive episodes (F32), somatoform disorders (F45), “other neurotic disorders” (F48), and nonorganic sleep disorder (F51) in both age groups of 19–21 and 22–24 years, showing the same distribution as the top six disorders (Fig. 2). The order of the most common diagnosis in the age group of 25–27 years began to change after the top three disorders, “other anxiety disorders” (F41), depressive episodes (F32), and nonorganic sleep disorder (F51), but distributions of the top five disorders in the age groups of 28–30 and 19–

24 years were the same. ADHD (F90), which was the most common diagnosis in children and adolescents, was ranked 10th in the age group of 19–21 years and further down in older age groups. Mental retardation (F70–79), which was among the top 10 disorders until 27 years of age, ranked markedly down after the age of 27 years. In the age group of 28–30 years, the order of the top 10 disorders changed, but no new disorders other than mental and behavioral disorders due to alcohol use (F10) were added.

Distribution by age in women

In women, the age groups of 19–21, 22–24, and 25–27 years showed the same order in the top nine disorders: “other anxiety disorders” (F41), followed by depressive episodes (F32), somatoform disorders (F45), “other neurotic disorders” (F48), nonorganic sleep disorder (F51), reaction to severe stress and adjustment disorder (F43), other, unspecified mood disorders (F38–39), bipolar affective disorder (F31), and schizophrenia (F20) (Fig. 3). Mental retardation (F70–79), which was ranked 10th in the age group of 19–21 years, was replaced by persistent mood disorder (F34) in older age groups. The age groups of 28–30 and 19–27 years showed the same order in the top

Table 1. Number of psychiatric diagnoses per patient

Number of diagnoses	Number of Patient (%)	Cumulative frequency (%)
1	12,185 (74.77)	12,185 (74.77)
2	2,519 (15.46)	14,704 (90.23)
3	931 (5.71)	15,635 (95.94)
4	401 (2.46)	16,036 (98.40)
5	150 (0.92)	16,186 (99.32)
6	69 (0.42)	16,255 (99.74)
7	25 (0.15)	16,280 (99.90)
8	12 (0.07)	16,292 (99.97)
9	3 (0.02)	16,295 (99.99)
10	2 (0.01)	16,297 (100.00)

Table 2. Distribution of psychiatric diagnoses among population aged 19–30 (%)

Psychiatric diagnosis	Number of case*		
	Male	Female	Total
F41	2,154 (22.73)	3,576 (26.24)	5,730 (24.80)*
F32	1,348 (14.23)	2,075 (15.23)	3,423 (14.82)*
F45	856 (9.03)	1,757 (12.89)	2,613 (11.31)*
F48	784 (8.27)	1,355 (9.94)	2,139 (9.26)*
F51	787 (8.31)	1,337 (9.81)	2,124 (9.19)*
F43	415 (4.38)	624 (4.58)	1,039 (4.50)
F20	409 (4.32)	321 (2.36)	730 (3.16)
F38–39	299 (3.16)	430 (3.16)	729 (3.16)
F31	290 (3.06)	322 (2.36)	612 (2.65)
F70–79	313 (3.30)	174 (1.28)	487 (2.11)
F34	145 (1.53)	216 (1.59)	361 (1.56)
F40	182 (1.92)	157 (1.15)	339 (1.47)
F42	185 (1.95)	132 (0.97)	317 (1.37)
F10	162 (1.71)	142 (1.04)	304 (1.32)
F33	92 (0.97)	176 (1.29)	268 (1.16)
Others	1,054 (11.12)	833 (6.11)	1,887 (8.17)
Total	9,475 (100.0)	13,627 (100.0)	23,102 (100.0)

*p<0.05. F10: mental and behavioural disorder due to use of alcohol, F20: schizophrenia, F31: bipolar affective disorder, F32: depressive episode, F33: recurrent depressive disorder, F34: persistent mood disorder, F38–39: other (F38), unspecified (F39) mood disorder, F40: phobic anxiety disorder, F41: other anxiety disorder, F42: obsessive-compulsive disorder, F43: reaction to severe stress and adjustment disorder, F45: somatoform disorder, F48: other neurotic disorder, F51: nonorganic sleep disorder, F70–79: mental retardation

Table 3. Distribution of diagnoses included in 'others'

Psychiatric diagnosis	Number of case*		
	Male	Female	Total
F00	1	0	1
F01	13	9	22
F02	1	0	1
F03	5	1	6
F05	8	4	12
F06	67	64	131
F07	44	33	77
F09	8	1	9
F11	2	1	3
F13	3	12	15
F17	7	8	15
F18	3	0	3
F19	7	19	26
F21	19	16	35
F22	18	17	35
F23	33	26	59
F25	43	55	98
F28	34	19	53
F29	100	54	154*
F30	17	17	34
F44	16	6	22
F50	20	139	159*
F52	20	3	23
F53	0	8	8
F54	40	98	138
F55	0	3	3
F59	0	16	16
F60	104	68	172*
F61	2	1	3
F62	1	2	3
F63	42	11	53
F64	12	2	14
F65	1	0	1
F66	1	0	1
F68	2	2	4
F69	3	2	5
F80	9	2	11
F81	4	2	6
F83	1	2	3
F84	102	18	120
F88	1	0	1
F89	2	0	2
F90	100	42	142
F91	17	5	22
F92	10	10	20
F93	8	7	15
F95	62	10	72

Table 3. Distribution of diagnoses included in 'others' (continued)

Psychiatric diagnosis	Number of case*		
	Male	Female	Total
F98	14	9	23
F99	27	9	36
Total	1,054	833	1,887

*p < 0.05. F00: dementia in Alzheimer's disease, F01: vascular dementia, F02: dementia in other diseases classified elsewhere, F03: unspecified dementia, F05: delirium, not induced by alcohol and other psychoactive substances, F06: other mental disorders due to brain damage and dysfunction and to physical disease, F07: personality and behavioural disorders due to brain disease, damage and dysfunction, F09: unspecified organic or symptomatic mental disorder, F11: mental and behavioural disorders due to use of opioids, F13: mental and behavioural disorders due to use of sedatives or hypnotics, F17: mental and behavioural disorders due to use of tobacco, F18: mental and behavioural disorders due to use of volatile solvents, F19: mental and behavioural disorders due to multiple drug use and use of other psychoactive substances, F21: schizotypal disorder, F22: persistent delusional disorders, F23: acute and transient psychotic disorders, F25: schizoaffective disorders, F28: other nonorganic psychotic disorders, F29: unspecified nonorganic psychosis, F30: manic episode, F44: dissociative disorders, F50: eating disorders, F52: sexual dysfunction, not caused by organic disorder or disease, F53: mental and behavioural disorders associated with the puerperium, NEC, F54: psychological and behavioural factors associated with disorders or diseases classified elsewhere, F55: abuse of non-dependence-producing substances, F59: unspecified behavioural syndromes associated with physiological disturbances and physical factors, F60: specific personality disorders, F61: mixed and other personality disorders, F62: enduring personality changes, not attributable to brain damage and disease, F63: habit and impulse disorders, F64: gender identity disorders, F65: disorders of sexual preference, F66: psychological and behavioural disorders associated with sexual development and orientation, F68: other disorders of adult personality and behavior, F69: unspecified disorder of adult personality and behavior, F80: specific developmental disorders of speech and language, F81: specific developmental disorders of scholastic skills, F83: mixed specific developmental disorders, F84: pervasive developmental disorders, F88: other disorders of psychological development, F89: unspecified disorder of psychological development, F90: hyperkinetic disorders, F91: conduct disorders, F92: mixed disorders of conduct and emotions, F93: emotional disorders with onset specific to childhood, F95: tic disorders, F98: other behavioural and emotional disorders with onset usually occurring in childhood and adolescence, F99: unspecified mental disorder

three disorders but different orders in the remaining disorders of the top 10 list, without the addition of any new diagnosis. For example, schizophrenia (F20) ranked higher while other, unspecified mood disorders (F38–39) ranked lower.

DISCUSSION

In this analysis, the most notable characteristic of mental disorders in young adulthood was the reversal of the male-to-female ratio among detected patients: more diagnoses in men than in women during childhood and adolescence and more diagnoses in women than in men during young adult-

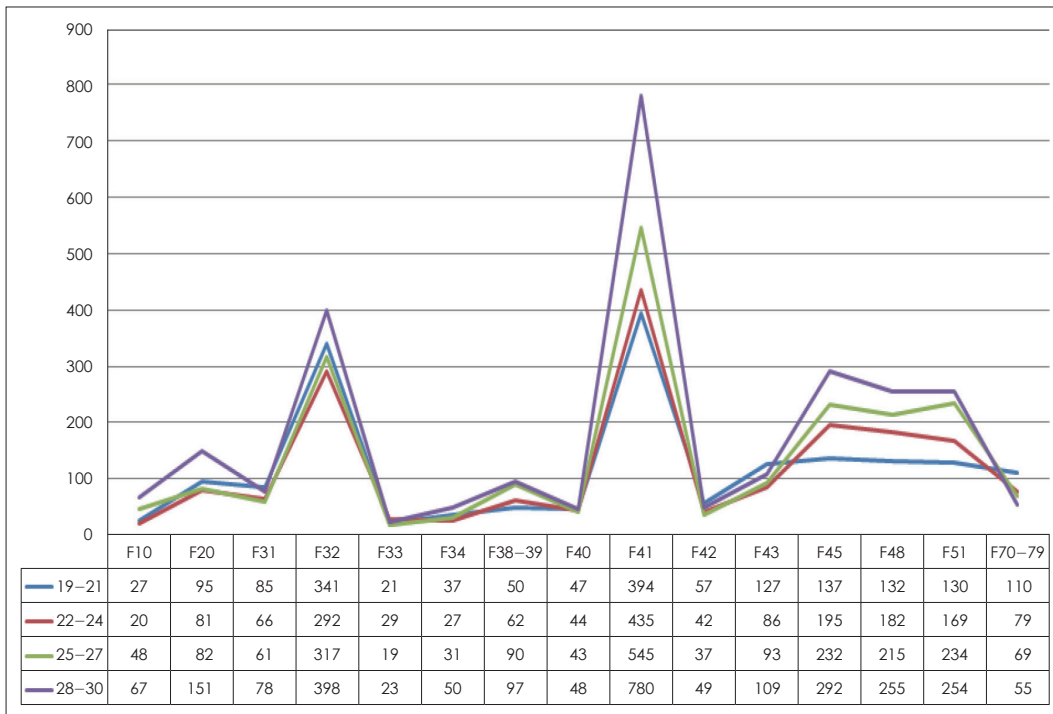


Fig. 2. Diagnostic distribution according to age (male). F10: mental and behavioural disorder due to use of alcohol, F20: schizophrenia, F31: bipolar affective disorder, F32: depressive episode, F33: recurrent depressive disorder, F34: persistent mood disorder, F38-39: other (F38), unspecified (F39) mood disorder, F40: phobic anxiety disorder, F41: other anxiety disorder, F42: obsessive-compulsive disorder, F43: reaction to severe stress and adjustment disorder, F45: somatoform disorder, F48: other neurotic disorder, F51: nonorganic sleep disorder, F70-79: mental retardation.

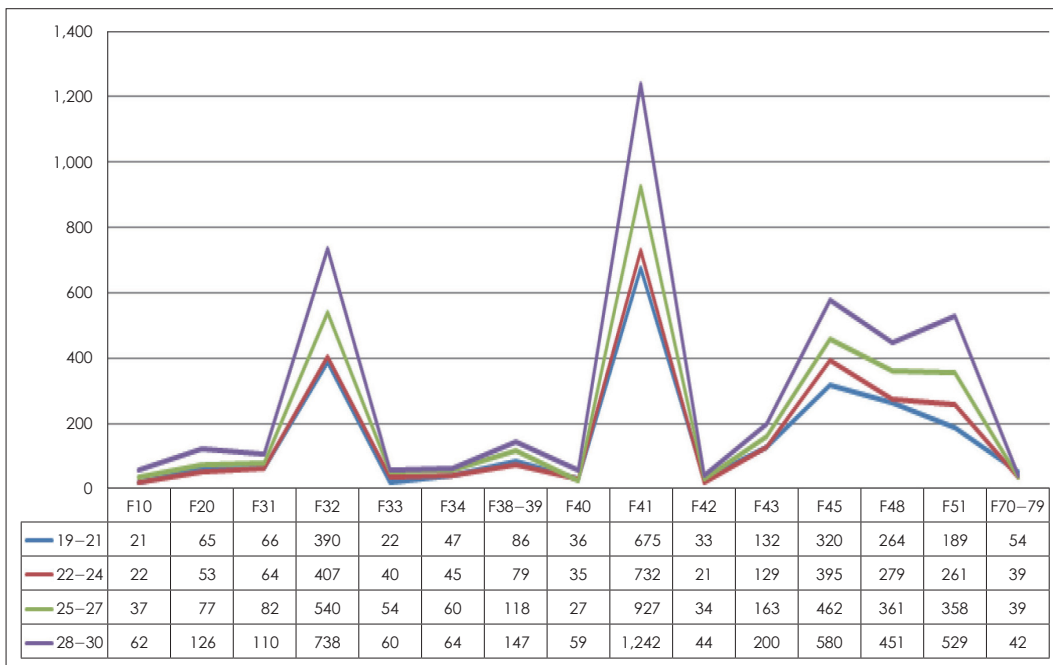


Fig. 3. Diagnostic distribution according to age (female). F10: mental and behavioural disorder due to use of alcohol, F20: schizophrenia, F31: bipolar affective disorder, F32: depressive episode, F33: recurrent depressive disorder, F34: persistent mood disorder, F38-39: other (F38), unspecified (F39) mood disorder, F40: phobic anxiety disorder, F41: other anxiety disorder, F42: obsessive-compulsive disorder, F43: reaction to severe stress and adjustment disorder, F45: somatoform disorder, F48: other neurotic disorder, F51: nonorganic sleep disorder, F70-79: mental retardation.

hood. A cross-national meta-analysis of mental disorders also revealed that the prevalence of mental disorders is 1.1 times higher in women than in men [13].

The prevalence of mental disorders in young adulthood differs with the gender, age group, and type of disorder. In a meta-analysis, the prevalence of major depressive disorder was high among women while that of externalizing disorder was high among men [13]. While the prevalence of mental disorders was markedly higher in men than in women before the age of 19 years in our previous analysis of psychiatric disorders during childhood and adolescence, primarily due to the high ADHD prevalence among boys [8], the present study revealed that the number of women with depressive and anxiety disorders increased substantially and exceeded the number of men. The number of patients with depressive and anxiety disorders also increased with increasing age from 19 to 30 years. The increase in number of adults with anxiety and depression begins around the age of 13 years and continues into adulthood [8]. This strongly suggests that the high prevalence of anxiety and mood disorders in young adulthood in our study reflects the diagnostic continuity of mental disorders from adolescence to young adulthood. This is an issue that must be adequately addressed in studies on the prevalence of psychiatric disorders in adulthood and relevant policymaking.

A 2011 epidemiological study in Korea that utilized the Diagnostic and Statistical Manual of Mental Disorders (DSM; 4th Edition) [14] found a high prevalence of anxiety and mood disorders among women, similar to our results, but nicotine and alcohol use disorders were highly prevalent among men and younger age groups [15]. Similarly, the NCS-R that utilized DSM-IV also revealed that the annual prevalence of anxiety and mood disorders was the highest while that of substance use disorder was the second highest in the young adult population aged 18–29 years [16]. In our study, among men, both the number and percentage of cases of bipolar affective disorder (F31), depressive episodes (F32), compulsive disorder (F42), and response to severe stress and adjustment disorder (F43) dropped in the interval between 19–21 and 22–24 years but began to rise again towards old age. We speculate that this is a transient decline caused by failure to present to a hospital because of mandatory military duty among Korean men in this period, as opposed to a decline in the actual occurrence of these disorders. The difference may also be attributable to the fact that the two aforementioned studies examined the general population while we used measurements from people who presented at a hospital. In other words, resulting from a cultural lenience towards smoking and drinking, people do not recognize them as an illnesses and therefore do not present to a hospital, which increases the possibility

of underestimation in the medical claims data of NHIS. The fact that both the United States NCS-R [6] and Korean epidemiological study [7] used DSM-IV [14] as reference while we used ICD-10 [12] may also have contributed to such differences.

In our previous study [8], 68.8% of children and adolescents had been diagnosed with a single disorder, but in the present study, 74.8% of adults received a single diagnosis. This suggests that there were more patients with multiple diagnoses in childhood and adolescents than in adulthood. In consideration of previous reports that 66–76.2% of patients with ADHD have one or more comorbidities [17,18], it is possible that a second diagnosis of a comorbidity accompanying ADHD, which was the most prevalent mental disorder in childhood and adolescence, might have been added. The prevalence of ADHD (F90) was notably low. In this study, the reason that the occurrence of ADHD rapidly declined in adulthood may be partly because ADHD medications are not covered by Korea's national health insurance system for people aged 19 years or older, which might have contributed to diminished treatment adherence because of the burden of treatment costs [19]. However, in 2016, this problem was resolved by expanding the coverage for adults, and as the combined prescription of ADHD medications has been permitted in December 2019, the number of ADHD diagnoses may increase in the coming years [19].

In this study, diagnostic frequencies of somatoform disorders, "other neurotic disorders," and nonorganic sleep disorder were high. Somatoform disorders and nonorganic sleep disorder are two independent disorders with different diagnostic codes, but somatoform symptoms and insomnia might be common major complaints in other mental disorders. Considering that Korean patients with depression were highly concerned with digestive symptoms and health [20], we cannot eliminate the possibility that depressive disorder may have been diagnosed as a somatoform disorder. Although insomnia was not included as a major mental disorder in a 2006 epidemiological study on sleep disorders, the prevalence of insomnia, when a broad definition was used, was high, with 22.7% in the age group of 18–24 years and 20.8% in the age group of 25–34 years [21]. As sleep disorders are commonly accompanied by other illnesses [22], they might have been entered as a sub-diagnosis in addition to other diagnoses as opposed to being entered as a single disorder. Neurotic disorders, encompassing depression, anxiety, fear, hysteria, hypochondria, and somatoform disorders [23], are not included in the current DSM system [14] but remain in ICD-10 [12]. A study that extracted 1% of the Taiwanese population diagnosed based on ICD-9 and analyzed the health insurance data revealed a high prevalence of neurotic disorders, including "other neurotic disorders" (2.44%), similar to our study [24].

However, results should be interpreted with caution, as ICD-9 and ICD-10 adopt a different concept of neurotic disorders.

This study had a few limitations. First, we only analyzed data spanning 1 year, so we could not compare the changes in the diagnostic distribution by year. Therefore, it would be necessary to utilize long-term accumulated data to examine whether mental disorders are replaced by “others” in the overall population or not and whether mental disorders change in the same person with age or not. Second, although our data were sampled from the entire population, groups of people for whom medical claims were not made were not included in the data, and diagnoses of mental disorders were analyzed only for 3% of the population, which limited the generalizability of the study results for the entire general population. Third, we could not examine the socioeconomic factors and other confounding factors that may impact treatment because of the personal information protection policy governing the NHIS data.

Nevertheless, using nationwide health insurance sample data to overcome the limitations of previous studies, using data that contains actual diagnoses made by psychiatrists and other doctors in clinical practice, and comprehensively investigating all mental disorders are strengths of this study. This study makes a significant contribution by revealing the trends of major psychiatric disorders in the transitional stage from adolescence to young adulthood.

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Conflicts of Interest

The authors have no potential conflicts of interest to disclose.

Author Contributions

Conceptualization: Geon Ho Bahn, Ram Hwangbo. Data curation: Hyejung Chang. Investigation: Geon Ho Bahn. Methodology: Geon Ho Bahn, Hyejung Chang. Writing—statistics: Hyejung Chang. Writing—original draft: Ram Hwangbo. Writing—review & editing: Geon Ho Bahn.

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