

# Prevalence and Psychiatric Comorbidities of Internet Addiction in a Nationwide Sample of Korean Adults

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The goal of the study was to examine the prevalence and psychiatric comorbidities of Internet addiction in a nationwide sample of Korean adults. Among a total of 6,022 participants involved in Korean Epidemiological Catchment Area study in 2011, 3,723 Internet users were assessed for their Internet addiction using Young's 8-item Diagnostic Questionnaire. The results showed that of the 3,723 Internet users, 39 (1.0%) had Internet addiction. Addicted Internet users were younger, more likely to be males and unemployed compared to non-addicted Internet users. Internet addiction was associated with alcohol and nicotine use disorders, depressive disorders, and anxiety disorder after controlling for age, gender, and occupational status. Internet addiction was associated with suicidal plans even after controlling for psychiatric disorders and socio-demographic factors. This study showed that Internet addiction is highly associated with a variety of different psychiatric disorders and suicidal plans. Therefore, clinicians should carefully evaluate them when treating addicted Internet users.

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**Key Words** Internet addiction, Mental disorders, Suicide, Korea.

## INTRODUCTION

Internet addiction (IA) is characterized by inability to control Internet use which interferes with one's daily life.<sup>1</sup> IA is not listed in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5). However, Internet Gaming Disorder is listed in Section III as a condition warranting more scientific research and clinical experience before it might be considered as a formal disorder.<sup>2</sup> IA broadly includes other types of addictive internet use (i.e., addictive use of social networking sites, addictive online shopping, and excessive internet information retrieval) and internet gaming.<sup>3</sup>

The prevalence of IA varies among populations. It ranges from 0.3%<sup>4</sup> to 37%.<sup>5</sup> This variability across studies might have

resulted from variations in Internet accessibility in different countries, definitions of IA, assessment tools, and age ranges of different population.<sup>6</sup> Significant association between IA and psychiatric comorbidity has been documented in numerous studies (for a review<sup>3,5,7</sup>). However, most studies have been focused on groups of students or adolescents in school-based studies or Internet users in online surveys. Ho et al.<sup>3</sup> have conducted a meta-analysis of the literature and determined the association between IA and psychiatric comorbidity including 8 studies comprising 1,641 patients with IA and 11,210 controls. Positive associations between IA and alcohol abuse, attention-deficit hyperactivity disorder, depression, and anxiety have been found, with pooled prevalence rates ranging from 13.5% for alcohol abuse to 26.3% for depression.<sup>3</sup> To the best of our knowledge, there are only two published studies on the prevalence and comorbidities of IA in a random sample of the general population. Aboujaoude et al.<sup>4</sup> have reported a prevalence of problematic Internet use of 0.3% in a general population of the United States ( $\geq 18$  years of age,  $n=2,513$ ). Bakken et al.<sup>8</sup> have reported a prevalence of IA of 1.0% in the general Norwegian population (16–74 years,  $n=3,399$ ) with a linear relationship between the prevalence of self-reported mental health problems and increasing Internet-related problems.

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Given the paucity of using general population of random adults sample to study IA, we investigated the prevalence and psychiatric comorbidities of IA in a nationally representative sample of adults aged 18–70 years in South Korea.

## METHODS

### Sample

We examined data from the Korean Epidemiologic Catchment Area (KECA) study conducted in 2011.<sup>9</sup> The objective of KECA was to evaluate the lifetime and 12-month prevalence, demographic and socioeconomic factors, and comorbidities of psychiatric disorders for the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) of Korean adults.<sup>9–11</sup> KECA selected subjects using a stratified, multi-stage, and clustered sample design in reference to a population census conducted by community registry offices in 2010.<sup>9</sup> The individual whose birthday was the earliest was chosen for every selected household based on the day of the birth month. After excluding 1,628 individuals who refused to participate, 6,022 subjects completed the diagnostic interview.<sup>9</sup> For these participants, Internet use was initially assessed using the following dichotomous question: “Have you ever used Internet in the past 1 month?” A total of 3,723 respondents who did use Internet in the past 1 month were assessed for IA using Young’s Diagnostic Questionnaire (DQ). All procedures of the study protocol were approved by the Institutional Review Board of Seoul National University College of Medicine (IRB No. C-1104-092-359). All participants were fully informed of the study objectives and written consent was obtained from all participants.

### Measurement

IA was assessed with Young’s 8-item Diagnostic Questionnaire (DQ).<sup>12</sup> In the DQ, respondents who answered “yes” to five or more criteria out of eight were classified as addicted Internet users. The others were classified as usual Internet users. Participants were also asked to choose from additional choices of social media, Internet gaming, Internet retrieval, use of e-mail, videos, pornography, online shopping, and others as main area of Internet use. Psychiatric disorders were measured with the Korean version of the Composite International Diagnostic Interview (K-CIDI),<sup>12,13</sup> a fully structured diagnostic modality designed to determine psychiatric diagnoses based on DSM-IV.<sup>14</sup> The inter-rater reliability, test/retest reliability, and validity of the K-CIDI ranged from 0.86–1.00, 0.42–0.89, and 0.50–1.00 in kappa value, respectively.

### Statistical analysis

Weighted values for each respondent were applied to esti-

mate the national population in respect of age and gender for each catchment area using the 2010 Korean National Statistical Office census.<sup>9</sup> First, we performed Pearson’s chi-square test to compare gender, age group, economic and occupational status, residential region, and comorbid psychiatric disorders between usual groups. We also performed multivariate logistic regression analyses to estimate the odds ratios (ORs) and 95% confidence intervals (CIs) of lifetime psychiatric disorders after controlling for socio-demographic variables. SPSS (version 21.0; IBM Corp., Armonk, NY, USA) was used for all statistical analyses. Statistical significance was considered when *p*-value was less than 0.05.

## RESULTS

Of the total of 3,723 participants, 39 (1.0%, 95% CI: 0.7–1.3%) were classified as addicted Internet users. Regarding the main area of Internet use, addictive Internet users were more likely to use social media (20.5% vs. 8.8%,  $\chi^2=4.89$ , *p*=0.027) and Internet game (33.3% vs. 12.2%,  $\chi^2=15.81$ , *p*<0.001) compared to usual Internet users. They were less likely to use Internet for information retrieval (34.2% vs. 56.2%,  $\chi^2=7.41$ , *p*=0.006) compared to usual Internet users.

Addictive Internet users were younger (*p*=0.009) than usual Internet users. They were more likely to be male (*p*=0.027) and unemployed (*p*=0.006) compared to usual Internet users. Educational status and economic status were not significantly different between the two groups. A total of 74.4% of addicted Internet users and 29.1% of usual Internet users had at least one DSM-IV psychiatric disorder (Table 1).

IA was positively associated with a wide range of psychiatric comorbidities, including alcohol [adjusted odd ratio (AOR)=2.10, 95% CI=1.02–4.29, *p*=0.043] and nicotine use disorders (AOR=3.98, 95% CI=1.82–8.69, *p*=0.001), depressive disorders (AOR=9.67, 95% CI=4.86–19.23, *p*<0.001), anxiety disorder (AOR=8.17, 95% CI=4.14–16.09, *p*<0.001), and any DSM-IV psychiatric disorder (AOR=6.94, 95% CI=3.32–14.55, *p*<0.001) after controlling for age, gender, and occupational status. When anxiety disorder was classified into several more specific types, IA was significantly and positively associated with generalized anxiety disorder (AOR=15.39, 95% CI=6.16–38.43, *p*<0.001), specific phobia (AOR=2.76, 95% CI=1.03–7.36, *p*=0.043), social phobia (AOR=7.02, 95% CI=1.34–36.88, *p*=0.021), and post-traumatic stress disorder (AOR=8.32, 95% CI=2.37–29.25, *p*=0.001).

## DISCUSSION

The present study provided the first representative estimated prevalence of IA in a general population of Korean adults. Our

**Table 1.** Socio-demographic and clinical characteristics of addicted Internet users and usual Internet users

	Usual Internet users (N=3686)	Addicted Internet users (N=39)	$\chi^2$	P
	%	%		
Age (years)			9.48	0.009
18-34	47.2	71.8		
35-54	45.7	23.1		
55 or older	7.1	5.1		
Gender			4.89	0.027
Male	54.1	71.8		
Female	45.9	28.2		
Education			0.19	0.664
Less than high school	40.2	43.6		
High school or more	59.8	56.4		
Occupation			7.61	0.006
Employed	56.5	34.2		
Unemployed	43.5	65.8		
Residence			0.001	0.977
Urban	81.8	81.6		
Rural	18.2	18.4		
Family income			0.69	0.407
≤1000\$	27.3	34.6		
>1000\$	72.7	65.4		
Psychiatric disorders				
Alcohol use disorder	15.5	28.9	5.11	0.024
Nicotine use disorder	7.6	25.6	17.50	<0.001
Depressive disorder	6.2	36.8	58.44	<0.001
Any anxiety disorder	8.3	39.5	46.02	<0.001
Generalized anxiety disorder	1.5	18.4	65.32	<0.001
Specific phobia	5.5	13.5	4.48	0.034
Social phobia	0.5	5.1	13.74	<0.001
Obsessive-compulsive disorder	0.7	7.7	23.37	0.004
Post-traumatic stress disorder	1.3	7.7	12.00	0.015
Any DSM-IV psychiatric disorder	29.1	74.4	37.92	<0.001

DSM-IV: Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition

results revealed significant association between IA and other psychiatric disorders such as alcohol and nicotine use disorder, depressive disorder, and anxiety disorder.

Our findings of a 1.0% prevalence rate of IA among Korean internet users was similar to prevalence rate reported by a previous study conducted in Norway (1.0%), but higher than that estimated in a previous study conducted in the United States (0.3%). While more percentage of usual users used Internet retrieval to get useful information, addictive users were more likely to use social media and Internet gaming, consistent with the finding of Bakken et al.<sup>8</sup> Addictive nature of Internet gaming has been previously recognized. In fact, Inter-

net gaming disorder has been listed in DSM-5 as a condition for further research.<sup>2</sup> In addition, addictive qualities of social networking sites have been recently addressed.<sup>15,16</sup> They also require clinical attention.

Consistent with prior findings,<sup>8</sup> addicted Internet users were more likely to be younger adults than usual users. This might be attributed to the fact that younger adults have easier access to technology. The finding of higher prevalence of IA in males is similar to that reported in prior studies.<sup>7,17,18</sup> In addition, addicted Internet users were more likely to be unemployed, compatible with a positive association between IA and unsatisfactory financial status reported in a previous study.<sup>8</sup> Exces-

sive Internet use might provide a psychological escape from personal difficult situations such as unemployment. However, it might may further impede their social functioning as well.<sup>19</sup>

Our findings support the well-established associations between Internet addiction problem and a wide range of psychiatric disorders.<sup>3,5,7,8</sup> As found in prior studies among clinical sample and adolescents as well as young adult population, IA was associated with increased prevalence of substance use disorder,<sup>5,8,18</sup> depressive disorder,<sup>3,7,8,17,20</sup> various types of anxiety disorder,<sup>3,7</sup> and obsessive-compulsive disorder.<sup>5,7,8</sup>

This cross-sectional study has several limitations. First, it cannot determine the causal relationship between IA and comorbid psychiatric disorders. In addition, IA was assessed via participants' self-reporting. Thus, further prospective studies using more structured clinical assessments for IA are needed to classify IA as a predictive factor or consequence of other psychiatric disorders. Despite such limitations, our results indicated that IA was closely linked with diverse psychiatric disorders in a general adult population in Korea.

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