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Global prevalence of internet addiction in university students: a systematic review and meta-analysis

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ADMINISTRATIVE INFORMATION

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 27 November 2024 and was last updated on 27 November 2024.

INTRODUCTION

Review question / Objective The object of this review is to evaluate the global prevalence of internet addiction (IA) in university students diagnosed by the IAT-20 and identify potential moderators. The PICO framwork is as follow, Participants (P): undergraduate university students; intervention (I): not applicable; control (C): not applicable; outcomes (O): the prevalence of internet addiction (IA) in college students measured by the Yang Internet Addiction Test (IAT)-20 scale with cutoff values, the most widely used standard scales on IA; study design (S): cross-sectional study or cohort studies (only baseline data of cohort studies were extracted).

Rationale Given the rising concern over internet addiction (IA), extensive studies have examined its prevalence among university students worldwide, but a global meta-analysis has yet to be conducted. Assessing the global prevalence of IA and identifying corresponding moderators could help develop preventive and intervention strategies, as well as allocate appropriate health services to address the problem of IA.

Condition being studied With the widespread expansion of internet usage over the past few decades, the internet has become an indispensable part of everyday life, making internet addiction (IA) a prominent research topic. The concept of IA, first introduced in the late 1990s by psychologist Kimberly S. Young, is characterized by excessive and problematic internet use (Young, 1998). However, there is an ongoing debate regarding the psychopathology of IA. Young initially conceptualized internet addiction as a generalized impulse control disorder (Young, 1996), while others have argued that IA should be classified as

a behavioral addiction (Beard, 2005; Griffiths, 1996). Regardless, the negative health effects of IA, both physically and psychologically, have become a significant public health concern. IA has been linked to various mental health outcomes, including depression, anxiety, loneliness, decreased subjective well-being, and poor sleep quality (Alimoradi et al., 2019; Cai et al., 2023b).

Age is a key determinant of IA, with young adults and adolescents being particularly vulnerable (Hassan et al., 2020; Lozano-Blasco et al., 2022). University students, encompassing both young adults and adolescents, are among the most active internet users, making them a critical population for IA research. As such, IA in university students has been extensively studied, with prevalence reported worldwide. Several meta-analyses have also examined the prevalence of IA among university students across different countries and regions (Atalay, 2024; Duc et al., 2024; Joseph et al., 2021; Li et al., 2018). The highest pooled prevalence was 43.42% (95% CI: 28.54, 58.31), reported by the meta-analysis of the prevalence among university students in Ethiopia including 11 studies with 6,501 students (Atalay, 2024). While the lowest pooled prevalence was 11.3% (95% CI: 10.1%–12.5%), reported by the meta-analysis of the prevalence among university students in China including 70 studies with 122,454 university students(Li et al., 2018). The large range of the pooled prevalence indicates significant variability which suggests the influence of geographic and socioeconomic factors as well as other demographic and health-related factors may influence IA prevalence among university students.

METHODS

Search strategy Major international databases (PubMed, Web of Science, Embase, and PsycINFO) were systematically searched by two researchers (XL and ZC) independently from their inception to April 17, 2024. The search terms were as follow:

#1: "Internet Addiction Disorder" OR "Addiction Disorder, Internet" OR "Addiction Disorders, Internet" OR "Disorder, Internet Addiction" OR "Disorders, Internet Addiction" OR "Internet Addiction Disorders" OR "Internet Addiction" OR "Addiction, Internet" OR "Addictions, Internet" OR "Internet Addictions" OR "Social Media Addiction" OR "Addiction, Social Media" OR "Addictions, Social Media" OR "Media Addiction, Social" OR "Media Addictions, Social" OR "Social Media Addictions" OR "Smartphone Addiction" OR "Addiction, Smartphone" OR "Addictions, Smartphone" OR "Smartphone Addictions" OR "Internet Gaming Disorder" OR "Disorder, Internet Gaming" OR "Disorders, Internet Gaming" OR "Gaming Disorder, Internet" OR "Gaming Disorders, Internet" OR "Internet Gaming Disorders" OR "Internet addiction" ;

#2: "Prevalence" OR "prevalence" or "epidemiology";

#3: "College student" OR "university student" OR "undergraduate student" OR "Medical Students" OR "Student, Medical" OR "Medical Student" OR "nursing students" OR "Pupil Nurses" OR "Student, Nursing" OR "Nurses, Pupil" OR "Nurse, Pupil" OR "Pupil Nurse" OR "Nursing Student" OR "Adolescents" OR "Adolescent" OR "Adolescence" OR "Teens" OR "Teen" OR "Teenager" OR "Youth";

Search strategy: #1 AND #2 AND #3.

Participant or population Undergraduate university students.

Intervention Not applicable.

Comparator Not applicable.

Study designs to be included Cross-sectional study or cohort studies (only baseline data of cohort studies were extracted).

Eligibility criteria Included studties reported the prevalence of internet addiction (IA) in college students measured by the Yang Internet Addiction Test (IAT)-20 scale with cutoff values, the most widely used standard scales on IA. The exclusion criteria were as follow: 1) studies published in non-English languages; 2) studies without a description of sampling method.

Information sources PubMed, Web of Science, Embase, PsycINFO.

Main outcome(s) Among the 101 included studies, the prevalence rates of IA ranged from 6.9% to 98.3% and the pooled prevalence of IA was 41.84% (95% CI: 36.89-48.02%, I2=100%) in university students.

Additional outcome(s) There were significant differences in the pooled prevalence of IA across income levels (p=0.007), with the highest prevalence in low-income countries. Similarly, there were significant regional differences (p<0.001). The pooled prevalence of IA was significantly higher after the COVID-19 pandemic (p=0.027), with prevalence rates of 37.6% (95%CI: 30.2-45.7%; n=55; I2=99.5%) and 54.4% (95%CI: 41.8-66.4%; n=21; I2=99.6%) before and after the pandemic, respectively. There were significant differences in the prevalence of IA among studies using different IAT-20 cut-off values (p<0.001). In

contrast, no significant difference was found between studies with different sampling methods (p=0.206), gender (p=0.178) and study quality (p=0.058).
In meta-regression analyses, sample size was negatively associated with the prevalence of IA (β=-0.0001, z=-2.2781, p=0.023), while depression prevalence was positively associated with the IA prevalence (β=0.0283, z=4.3366, p<0.001). No significant associations were found between age, gender, urban residency, smoking, drinking, sleeping problems, anxiety, or study quality and the prevalence of IA.
There were 56 studies reported the prevalence of IA in both male and female participants, including 25,258 male participants and 37,280 female participants. Male university students had a significant higher risk to have IA compared to their female companion, with a pooled OR of 1.29 (95% CI: 1.15–1.44).

Quality assessment / Risk of bias analysis Three researchers independently extracted data from eligible studies using a standardized extraction form. Study characteristics (e.g., the title, first author, publication year, journal, survey time, sampling method, country, study design and sample size) and participant characteristics (e.g., gender, residency, smoking habit, drinking habit, and related mental health condition (i.e., depression, sleeping problems, and anxiety) were extracted. IA assessment data were also extracted, including IAT-20 cut-off values, number of participants with IA and mean IAT-20 total score.
An 8-item assessment instrument for epidemiological studies was used to assess the study quality (Boyle, 1998; Loney et al., 1998), described in Table S2. The total score ranged from 0 to 8 and were classified as low (0-3 points), moderated (4-6 points) and high (7-8 points) quality. Consensus or a discussion with the senior author was required in cases of disagreement.
Publication bias was assessed using funnel plots and egger's test.

Strategy of data synthesis All data analyses were conducted with R (version 4.3.1, The R Foundation, Vienna, Austria), using the meta package (version 4.3.3). Prevalence data were logit transformed or log transformed when appropriate. The pooled prevalence of IA and its 95% confidence intervals (CIs) were calculated by random-effects model. Heterogeneity among studies were evaluated using the I2 statistic with a value above 50% indicating high heterogeneity (Higgins et al., 2003).
To explore the sources of heterogeneity, subgroup analyses and meta-regression were conducted for categorical variables and continuous variables, respectively. The subgroup analyses focused on categorical variables: income level (i.e., high income, upper middle income, low middle income, and low income)(The World Bank Group), region (i.e., East Asia & Pacific, Europe & Central Asia, Latin America & Caribbean, Middle East & North Africa, South Asia, and Sub-Saharan Africa), Corona Virus Disease 2019 (COVID-19) pandemic (i.e., after and before), sampling method (i.e., probability sampling and non-probability sampling), gender (i.e., male and female) and cut-off value (i.e., ≥20, >30, ≥40, ≥50, and >50). Meta-regression analyses were conducted based on the following continuous variables: sample size, mean age, total study quality assessment score and the proportion of male, urban residency, smoking, drinking, depression, sleeping problem and anxiety.
Publication bias was assessed using funnel plots and egger's test. The stability of the results was tested using the sensitivity analysis through the "leave-one-out method", where individual studies were removed sequentially. P < 0.05 was considered statistically significant (two-tailed).

Subgroup analysis To explore the sources of heterogeneity, subgroup analyses and meta-regression were conducted for categorical variables and continuous variables, respectively. The subgroup analyses focused on categorical variables: income level (i.e., high income, upper middle income, low middle income, and low income)(The World Bank Group), region (i.e., East Asia & Pacific, Europe & Central Asia, Latin America & Caribbean, Middle East & North Africa, South Asia, and Sub-Saharan Africa), Corona Virus Disease 2019 (COVID-19) pandemic (i.e., after and before), sampling method (i.e., probability sampling and non-probability sampling), gender (i.e., male and female) and cut-off value (i.e., ≥20, >30, ≥40, ≥50, and >50). Meta-regression analyses were conducted based on the following continuous variables: sample size, mean age, total study quality assessment score and the proportion of male, urban residency, smoking, drinking, depression, sleeping problem and anxiety.

Sensitivity analysis The stability of the results was tested using the sensitivity analysis through the "leave-one-out method", where individual studies were removed sequentially. P < 0.05 was considered statistically significant (two-tailed).

Language restriction English only.

Country(ies) involved China.

Keywords Internet addiction; university students; prevalence; meta-analysis.

Contributions of each author

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