Review Article

Problematic Internet Use Among School-Going Adolescents in India: A Systematic Review and Meta-Analysis

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Abstract

Background: Problematic internet use (PIU) among school going adolescents constitutes a major area of concern. However, no comprehensive reports are available to determine the magnitude of the problem. This study aimed to estimate the pooled prevalence of PIU among school going adolescents in India. **Methods:** We conducted a systematic review and meta analysis of 15 studies conducted in various parts of India. **Results:** The prevalence of moderate and severe PIU among Indian school going adolescents was 21.5% (95% CI: 17.0%–26.8%) and 2.6% (95% CI: 1.6%–4.2%) based on the Young Internet Addiction Test (Y IAT) cutoff points of 50 and 80, respectively. In subgroup analysis, it was found that the year of publication, gender, sampling method, and severity of addiction had a significant effect on the prevalence estimates. **Conclusions:** Currently, the use of the internet is rampant in India and our findings reflect nationally representative data on the magnitude of PIU among school going adolescents. About one fifth of school going adolescents are at risk of PIU in this setting. There is a need for further research in the reconsideration of cut off points of the Y IAT among Indian adolescents.

Keywords: Adolescents, India, problematic internet use, school

Introduction

The global network offered by the internet is widely used as a medium for interpersonal communication and entertainment by people across the world. Over a few decades, it has become an indispensable part of life.[1] Adolescence is a transition period from childhood to adulthood, comprising of a wide range of 10–24 years and covering a broader portion of the life course.[2] Children and adolescents are extremely fragile and sensitive and may be fascinated by the internet as a means of escape where they feel a sense of acceptance. They are mainly attracted to various social networking sites such as Facebook, WhatsApp, YouTube, and online games. Despite the numerous advantages bestowed by the internet, it poses perils for adolescents who have unlimited and unrestricted access to it.[3] Eventually, this can lead to problematic internet use (PIU) or internet addiction (IA) necessitating treatment. A high concordance is seen in the manifestations expressed in PIU and traditional substance addiction such as salience, mood modification, tolerance, withdrawal, conflict, and relapse.[4] Social network dependence among adolescents is often related to low self-esteem and a sense of social inadequacy among them.[5] Furthermore, PIU results in significant impairment and distress, and is also associated with psychiatric disorders in adolescents.[6] On the other hand, PIU or IA has not been included in neither the International Classification of Diseases, Eleventh Revision (ICD-11) nor the Diagnostic and Statistical

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Manual, Fifth Revision (DSM-5) due to poor consensus on conceptualizing it as a disorder.[7] PIU is characterized by excessive or poorly controlled preoccupations, urges, or behaviors regarding computer use and Internet access that lead to impairment or distress.[8] Multiple scales, questionnaires, and instruments are developed over time to measure PIU or IA. But the most commonly used reliable scale is the Young Internet Addiction Test (Y IAT) developed by Young.[9] The Y-IAT was developed based on the criteria for pathological gambling diagnosis in DSM-IV. The scale consists of 20 items rated on a 5-point Likert scale yielding a total score categorizing addictive behavior into four categories: no addiction (0–30), mild signs of addiction (31–49), moderate signs of addiction (50–79), and severe addictive behavior (80–100).[9]

Studies conducted in South Asian countries have reported alarming prevalence rates of internet usage among adolescents.[10] Multiple studies conducted across various parts of the India have highlighted the magnitude of PIU at large, and several other studies have reported modest values for the same. A wide discrepancy, as reported in several studies, may be due to the inconsistent cutoff score used, use of diverse scales, cultural and social fabric existing across various regions, variable sample sizes, and survey approaches.[11] Henceforth, the current systematic review and meta analysis were undertaken to identify the lacunae in the paucity of data on the national prevalence of PIU among adolescents justifying for increased investment in their health; or else the predominant programs for maternal and child health in our country becomes futile when we are not able to save the future generation of our country. Similarly, the psychological effects of PIU can hamper the productivity and scholastic performance of active minds, so a meticulous exploration of the issue can help avert the ill effects.[12] Accordingly, this meta-analysis aims to estimate the pooled prevalence of PIU among school-going adolescents in India.

Methods

Study selection

This systematic review is reported following the PRISMA checklist.[13] We searched the following electronic bibliographic databases: PubMed, Web of Science, Scopus, EMBASE, and Google Scholar for articles published during the years 2010 to 2020. Besides, archives of relevant Indian journals were reviewed for maximum inclusion of available studies. The cross-references of the identified studies were explored for additional studies. We have used a combination of Medical Subject Headings (MeSH) and keywords to identify the various studies. The following MeSH terms were used: prevalence; epidemiology; internet addiction disorders; internet use; internet; adolescent; schools; students; India. The keywords used were the following: problematic internet use; internet addiction; smartphone addiction; internet gaming disorder; social media addictions; India; South-East Asia; low- and middle-income countries. For details on the search strategy and example in PubMed.

Inclusion and exclusion criteria

School-based prevalence studies conducted in the Indian setting that estimated PIU using the Y-IAT and published in the English language during the years 2010 to 2020 were included. In this study, the definition of PIU should be understood as a measured outcome variable based on the Y-IAT cutoff point of 50 and above. Studies with varying Y-IAT cutoff scores (Y-IAT 40 and above or cutoff points not mentioned) or different screening tools of PIU used were excluded.

Data extraction

Two researchers independently carried out the internet searches and selected potentially relevant articles from the search outputs by reading the study titles and abstracts. Additional two investigators independently appraised the full texts of appropriated records to reach a common consensus regarding the inclusion and exclusion of individual studies. No attempts were made to acquire grey/unpublished literature considering the inherent conflict of interest which might increase the risk of bias. All the eligible studies were further screened and data extraction was carried out based on the following study characteristics: author (year of publication), study setting (state/population), and sample size and sampling method, age, and prevalence as per the severity of PIU and as per gender. Any disagreement about inclusion criteria and scoring of the methodological quality of the included studies were resolved through mutual discussion and by reaching a consensus.

Quality assessment

The methodological quality of included studies was assessed by two independent reviewers employing the JBI Critical Appraisal Checklist for Studies Reporting Prevalence Data.[14] This checklist contains nine criteria with a total quality score ranging from 1 to 9. We classified scores as having high (0–3), moderate (4–6), and low (7–9) risk of bias. The score of the included studies was not considered for the study selection criterion. Discrepancies in the quality scoring of two reviewers were addressed by a third reviewer.

Statistical analysis

Meta-Analyst software was used to perform the meta-analysis. The statistical heterogeneity was addressed using Cochran's Q and I^2 statistics. The value was interpreted in the following ways in our study: 0%, 25%, 50%, and 75% as zero, low, medium, and high heterogeneity, respectively. The fixed-effect model was used to estimate the pooled prevalence in our meta-analysis due to medium heterogeneity among studies (I^2 = 49.1% and Cochran's Q = 99.7, $P < 0.001$).[15] The funnel plot was used to assess potential publication bias.

Results

Description of study characteristics

Of the 544 screened, 14 eligible articles were identified and included in the meta-analysis [Figure 1. The characteristics

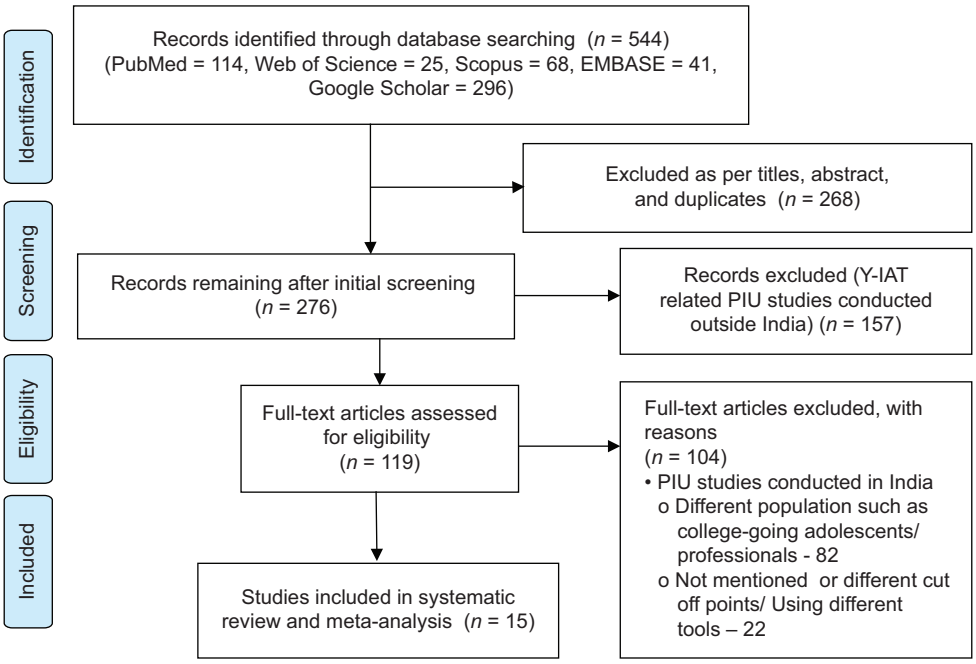

Figure 1: PRISMA flow diagram for selection

of the included studies are summarized in Table 1.[16–30] The geographical heterogeneity across the diverse country was addressed by incorporating studies from different areas: two studies from South India,[23,29] six from North India,[16,18,25,31,32] one from the northeast part of India,[20] two from the central part of India; [22,27] and four from the western part of India. [17,28,30,33] The study population comprised of school-going adolescents from classes 8 to 12 within an age group ranging from 13 to 19 years. Besides, the majority of the studies focused on adolescents from class 11 to 12 (11 studies) and a small number of studies assessed students from class 8 to 10 with an overall sample size of 7,946, with the sample size in each study ranging from 150 to 1,312. Most of the studies utilized non-probability sampling methods (convenience-09), while a few of the studies (n = 06) employed probability sampling methods. A wide variation in the prevalence of moderate addiction has been reported in studies with a modest value of 6%[23] to the highest value of 32.9%.[29] Furthermore, a study from Gujarat reported a prevalence of 13.7% had the largest sample size among the included studies (n = 1312).[17] Meager values were reported for severe addiction in almost all of the studies. Gender difference in prevalence of IA has also been brought out in the review. The majority of the studies indicated a higher prevalence of IA among males, but a study from central India reported a higher prevalence among females than males.[27]

Prevalence of PIU among school-going adolescents in India

The estimated effect of interest for this study was the pooled prevalence of PIU (Y-IAT ≥50). We used the DerSimonian and Laird method of fixed-effects models to calculate the pooled prevalence of IA, as the magnitude of observed heterogeneity was statistically significant (I^2 = 49.1% and Cochran's Q = 99.7, P < 0.001). The overall pooled estimate of the prevalence of PIU was 21.5% (95% CI: 17.0%–26.8%) and 2.6% (95% CI: 1.6%–4.2%) based on the Y-IAT cutoff point of 50 and 80, respectively [Figure 2].

Nine studies were classified as having a low risk of bias and the remaining six as having a moderate risk of bias. The quality score ranged from 4 to 9 with a median value of 7 and a mean of 6.4. The overall quality of evidence was rated as "moderate" based on the following criteria under GRADE assessment:

(a) Risk of bias was evaluated based on Joanna Briggs Institute (JBI) critical appraisal checklist for studies reporting prevalence data. The median and mean score was 7 and 6.4, respectively, in which the total score ranged from 1 to 9. Therefore, no serious risk of bias was identified.
(b) Inconsistency: No serious inconsistency in results was noted as the I^2 value was less than 50%.
(c) Indirectness: Approximately 60% of the studies had an adequate sample frame to address the target population. Therefore, no serious indirectness in the outcome measure was identified.
(d) Imprecision: There was a wide CI around the pooled prevalence estimates.
(e) Publication bias: The visual examination of the funnel plot was performed to assess the publication bias[31] and it was found to be symmetrical.

Subgroup analysis

In subgroup analysis, the year of publication, gender, sampling method, and severity of addiction had a significant effect on the prevalence estimates [Table 2]. The pooled prevalence of PIU

Table 1: Characteristics of studies regarding the prevalence of internet addiction among school-going adolescents in India

Author/ Year of publication	State/ Population	Sample Size/ Sampling Method	Age (Years)	Moderate Addiction (Y- IAT 50-79) Prevalence (%)	Severe Addiction (Y- IAT 80 100) Prevalence (%)	Prevalence as per gender (Y- IAT≥50)	Quality Scoring
Grover D, *et al*., 2020[16]	Haryana/Class 9-10 Students	400/ Convenience	14-16	22.2% (89/400)	4.2% (17/400)	Male: 22.5% (90/400) Female: 4% (16/400)	07
Vadher BS, *et al.,* 2019[17]	Gujarat/Class 10-12 Students	1312/ Convenience	15.9 (Mean Age)	13.7% (180/1312)	3% (39/1312)	Male: 17.7% (161/909) Female: 14.6% (59/403)	07
Kumar N, *et al*., 2019[18]	New Delhi/ Class 11 and 12 Students	426/ Convenience	NM	30.28% (129/426)	1.41% (6/426)	Male: 1.61% (4/248) Female: 1.12% (2/178)	07
Saikia AM, *et al*., 2019[19]	Assam/Class11 and 12 Students	416/Random Sampling	16-19	13.46% (56/416)	1.9% (8/416)	Male: 19.1% (58/304) Female: 5.4% (6/112)	09
Goswami A, *et al*., 2018[20]	Madhya Pradesh/Class 11 and 12 Students	502/ Convenience	NM	16.3% (82/502)	0.4% (2/502)	NM	04
Kayastha B, *et al*., 2018[21]	Karnataka/Class 8-10 students	200/ Multistage Random	12-16	6% (12/200)	0.5% (1/200)	Male: 6.6% (7/105) Female: 6.31% (6/95)	07
Arthanari S, *et al*., 2017[22]	Uttar Pradesh/ Class 9 and 12 Students	963/ Multistage Random	14-19	35.6% (343/963)[$]		Male: 40.5% (196/483) Female: 30.6% (147/480)	09
Sharma DK, *et al.*, 2016[23]	Rajasthan/ Class11 and 12 Students	700/ Convenient sampling	14-19	21.71% (152/700)	6.86% (48/700)	NA	06
Bhatia M, *et al.*, 2016[24]	Madhya Pradesh/Class 9-10 Students	300/Simple Random	13-18	24% (72/300)	06.33% (19/300)	Male: 29.26% (48/164) Female: 31.6% (43/136)	06
Prabhakaran *et al*., 2016[25]	Gujarat/Class 8-11 Students	724/ Convenience	14.5 (Mean Age)	8.7% (63/724)[$]		Male: 11.2% (46/411) Female: 17/313 (5.4%)	08
Kumar PB S, *et al*., 2015[26]	Kerala/Class11 and 12 Students	803/ Convenience	16-19	32.9% (264/803)	1.2% (10/803)	NM	05
Mali KH, *et al*., 2015[27]	Maharashtra/ Class 11 and 12 Students	150/NM	15-17	18% (27/150)	2% (3/150)	NM	04
Anwar E, 2014[28]	Uttar Pradesh/ Class 9 and 10 Students	300/Stratified Random	NM	26.66% (80/300)	10% (30/300)	NM	05
Yadav, *et al*., 2013[29]	Gujarat/Class 11 and 12 Students	552/ Convenience	NM	11.8% (65/552)[$]		NM	08
Meena PS, *et al*., 2012[30]	Rajasthan/ Class 11 and 12 Students	198/ Convenience	NM	24.74% (49/198)	2.02% (2/198)	Male: 31.30% (40/115) Female: 15.6% (13/83)	05

Abbreviations: NM - Not mentioned; Y-IAT – Young Internet Addiction Test; [$] Y-IAT score of >50 indicates possible internet addiction

among studies published during 2010–2015 was 23.1% (95% CI: 21.5%–24.7%) and 2016–2020 was 17.0% (95% CI: 13%–23.0%). The aggregate estimate of the prevalence of PIU was higher among males than females (19.4%; 95% CI: 18.0%–20.8% vs 12.9%; 95% CI: 11.5%–14.4%). The estimates for studies conducted through convenience sampling was 16.8% (95% CI: 15.6%–18.1%) and for random sampling was 26.9% (95% CI: 24.9%–29.0%). The prevalence of moderate addiction was significantly higher when compared to severe addiction (20.1%; 95% CI: 16%–24.8% vs 2.6%; 95% CI: 1.6%–4.2%). However, no statistically significant difference in prevalence was observed based on year of schooling ($P = 0.07$).

Sensitivity analysis

A leave one-out sensitivity analysis was carried out to address the potential influence of any single study on the overall pooled effect. There was no significant impact of any particular study on the overall pooled effect for PIU among school-going adolescents (21.5%) and the values ranged between 20.6% (16.2%–25.9%) and 22.4% (17.8%–27.8%).

Discussion

The major findings of the review are the estimation of a pooled prevalence of PIU in Indian school-going adolescents. The overall prevalence of moderate PIU was 21.5% (95% CI:

Table 2: Subgroup analysis of PIU based on the fixed-effect model

Subgroup	Category	No. of studies	Event/*n*	Pooled Prevalence (95% CI)	I2 –Heterogeneity across studies (*P*)	*P* in between categorical subgroup
Year of publication	2010-2015	5	632/2740	23.1 (21.5%-24.7%)	49.2% (<0.001)	X^2=409.47
	2016-2020	10	434/2469	17.0 (13%-23.0%)	49.4% (<0.001)	*P*<0.001
Gender	Male	09	584/3011	19.4 (18.0%-20.8%)	49.1% (<0.001)	X^2=25.84
	Female	09	262/2028	12.9 (11.5%-14.4%)	48.8% <0.001)	*P*<0.001
Sampling	Convenience	10	560/3330	16.8 (15.6%-18.1%)	49.0% (<0.001)	X^2=48.28
	Random	04	506/1879	26.9 (24.9%-29.0%)	49.0% (<0.001)	*P*<0.001
Class	9-10	4	320/1200	23.2 (14.8%-34.4%)	48.4% (<0.001)	X^2=3.2
	11-12	8	903/3747	22.2 (16.7%-28.8%)	48.7% (<0.001)	*P*=0.07
Severity of addiction	Moderate (50-79)	12	1192/5707	20.1 (16%-24.8%)	48.4 (<0.001)	X^2=837.8
	Severe (80-100)	12	185/5707	2.6 (1.6%-4.2%)	46.9 (<0.001)	*P*<0.0001

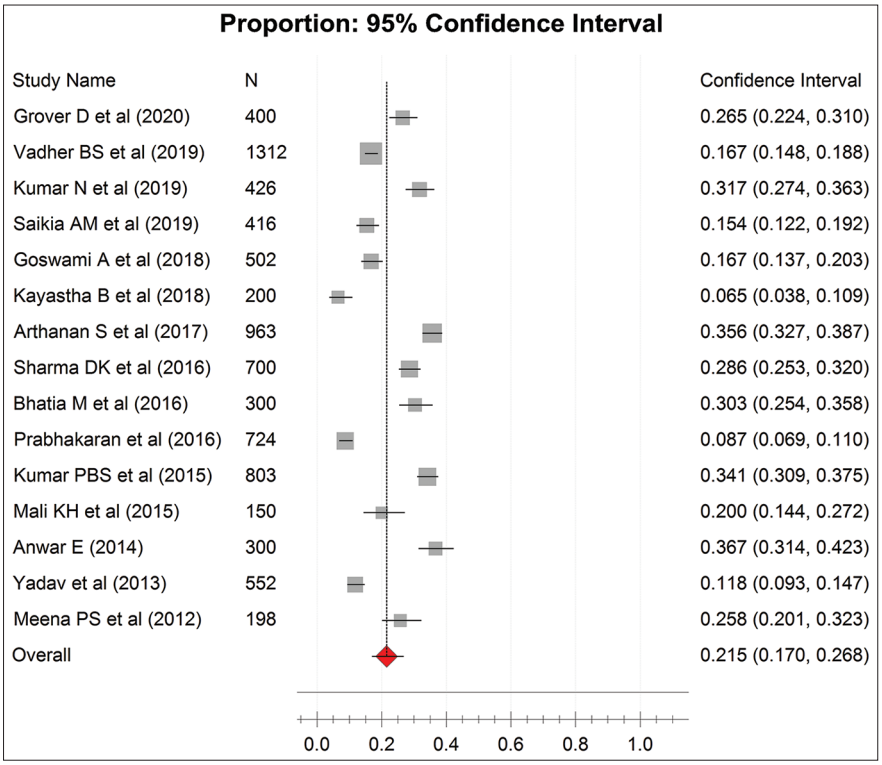

Figure 2: Pooled prevalence of PIU among school-going adolescents in India (Y-IAT ≥50)

17.0%–26.8%) based on the Y-IAT cutoff score of 50. This pooled estimate of PIU in Indian adolescents is comparable to the magnitude reported in studies from Hong Kong (17%–26.8%),[33,34] China (26.5%),[32] Taiwan (24%),[35] Iran (21%)[36] but slightly higher than those reported from Turkey (15%).[37] The overall estimates of 2.6% of severe PIU in this study are found to be similar to the figure in Croatia (3.4%; Y-IAT ≥70),[38] Egypt (2.6%; Y-IAT ≥80),[39] and Iran (3.7%; Y-IAT ≥80).[40] However, these comparisons should be interpreted with caution due to the discrepancies in screening instruments, criteria, and study context. It is important to note that our study reflects the exact magnitude of PIU among Indian school students based on the measurement of a single screening instrument: the Y-IAT. Many previous studies investigating the severity of PIU used different Y-IAT cutoff points such as 40, 50, 70, and 80. We found aggregate estimates of moderate and severe PIU as 21.5% and 2.6% based on the Y-IAT cut-off points of 50 and 80 respectively. Referring to some previous studies, there are conflicting results regarding the Y-IAT detection rate of PIU/IA across the world. The magnitude of PIU based on studies conducted in the Indian college studies using a Y-IAT cutoff point of 40 ranged from 20% to 33%.[41–44] Furthermore, two school-based cohort studies using the Y-IAT (cutoff score of 50) of a large number of school-going adolescents yielded a wide variation in the prevalence rate of PIU/IA in China (12.2% vs 23.7%).[45,46] All of these results suggest the need for further research in the reconsideration of cutoff points of the Y-IAT among Indian adolescents.

Currently, the use of the internet is rampant in India, and the findings of this meta-analysis reflect national-level data on the magnitude of PIU among school-going adolescents. The level of heterogeneity was moderate ($I^2 = 49.1\%$) and most of the included studies had a low risk of bias in terms of methodological quality. We detected a higher prevalence in male students (19.4%) than in female students (12.9%) in this setting, which is similar to studies conducted abroad.[47] It may be explained by the fact that males are more attracted to the wider utility of the internet such as online games than females.[48] After subgroup analyses based on the year of publication and sampling, we found that the prevalence rate ranged from 17.0% to 26.9%. Taken together, we identified that nearly one-fifth of the Indian school students were at risk of PIU, which is similar to other studies conducted among college students in India[49] but different from those conducted in China.[50] Our findings also reflect that compared with other screening instruments, the Y-IAT detection rate of PIU among adolescents in India was higher than in Turkey (15.1%),[37] China (8.8%),[51] Korea (4.3%),[52] and Japan (7.9%).[53]

Strength and limitations

To the best of our knowledge, this is the first meta-analysis that evaluated the pooled prevalence rate of PIU among Indian school-going adolescents. Most of the included studies were rated as moderate quality and the studies covered in this meta-analysis were conducted in different geographic areas of India, which makes the sample representative of Indian school-going adolescents. However, there are some limitations. Although the assessment of PIU was based on the Y-IAT tool, the diagnosis was not confirmed in any of the studies. Factors that may influence the prevalence of PIU were not examined due to the paucity of such data. Furthermore, the purpose and context of internet use has changed due to the COVID-19 pandemic. Hence, comparing studies from 2010 to 2020 might not reflect the exact magnitude of the problem. Considering the moderate heterogeneity among studies, the overall prevalence estimate needs to be treated with caution.

Conclusion

Currently, the use of the internet is rampant in India and our findings reflect nationally representative data on the magnitude of PIU among school going adolescents. About one-fifth of school-going adolescents are at risk for PIU in this setting. There is a need for further research in the reconsideration of cutoff points of the Y-IAT among Indian adolescents.

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Conflicts of interest

There are no conflicts of interest.

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