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Internet addiction among Iranian medical students: a systematic review

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Today, Internet addiction is considered one of the most important challenges of the young generation worldwide, such that determining its intensity and magnitude has become recognized as an important prerequisite for better management of this phenomenon. This study has been conducted with the aim of investigating the prevalence of Internet addiction among Iranian students. In this meta-analysis and systematic review study, national and international databanks were searched with the keywords of "Internet addiction", "students", and "Iran". In the final stage, 30 studies which had been conducted on 9161 students were introduced into the meta-analysis. The results suggested that the total prevalence of Internet addiction at moderate level is 25.32% and at severe level is 4.67%. Considering this high prevalence especially at the moderate level, it is suggested that screening tests are conducted nationally in a more purposeful way, and presentation of the necessary education for preventing and reducing Internet addiction seems to be essential.

BACKGROUND

Today, addiction to the cyberspace has become a major challenge in development of technology. According to the latest statistics of the international Association of telecommunication, in September 2017, over 3.5 billion people have access to the Internet. The ratio of using the Internet is calculated as the number of Internet users in every 100 individuals. Accordingly, the ratio of Internet users has increased from 12 per every 100 individuals in 2005 to over 48 per every 100 people in 2017, suggesting a four-fold increase of Internet users worldwide. The statistics among the youth indicate that more than 803 million people (70%) of Internet users consist of the youth between 18 and 24 years of age, and more than 70% of them live in Asian developing countries such as Islamic Republic of Iran. Furthermore, men use the Internet twice more often than women (1). Although it has not been introduced in the international classification of psychological disorders, addiction to the cyberspace which is mostly called Internet addiction in common literature has been defined as follows by the scholars: "any behavior dependent on online media which causes disorder in normal life and creation of stress in the family and job". Among the most important dimensions of defining Internet addiction are its numerous effects on various aspects of quality of life and development of disorder in routine activities (2), (Beard, 2005). According to the latest definition by American Society of addiction medicine, Internet addiction is not considered a group of abusing mass communication; rather it has been defined as a chronic mental disease (3). Cyberspace addiction causes psychological symptoms: overusing the Internet, sense of guilt, stress, depression, anxiety, inability in scheduling, improper perception of time, extreme propensity to loneliness, and using the Internet as a way for escaping problems, as well as physical problems including carpal tunnel syndrome, headache, weight loss, and sleep disorders (4, 5). Cyberspace addiction is considered one of the current challenges in information technology arena, where its users are progressively increasing, and since it is important it can have irrecoverable effects on different sociocultural aspects of the future makers of any country. This becomes further important knowing that over 80% of Internet users are composed of the youth (1). Studies suggest that in Asian countries, the cyberspace programs are developed with the aim of impressing teenagers. Due to the highly competitive and stressful educational system of these countries, teenagers have a higher level of the stress and to escape this stress, they enter the cyberspace through these games in an addictive fashion causing negative performance in their academic progress. Furthermore, use of these games results in increased aggression, diminished social relations, and reduced belief to the values and culture of these individuals (6, 7). Based on meta-analysis studies, the total prevalence of Internet in the world, in national studies across 32 countries, has been 6% (8). On the other hand, national studies in Asian countries indicate that Internet addiction ranges from 41 to 84% in countries such as China, South Korea, and Malaysia (7) The studies that have been conducted in Iran have mostly been individual and concentrated on one center. Nevertheless, among the sparse studies conducted nationally and only on teenagers across 13 provinces, it has been shown that the total Internet addiction in teenagers is 22.2% (9). In other individual studies, Internet addiction has been reported as 19% (10) and 26.95% (11). It seems that in the today's world, the main competition among countries is in the arena of information technology

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and data, where information technology is one of the main tools of soft war due to its publicity and high speed in information transmission, which can be used by advanced countries against developing countries. Considering the importance of paying attention to different dimensions of information technology, although it can be a major solution for profiting and promoting countries such as developed countries, if the necessities of proper management of IT-associated processes are neglected and scientific use of this instrument and its major applications in the society are overlooked, it can result in development of irrecoverable damages especially in developing countries such as Islamic Republic of Iran, which is less experienced in this regard. Moreover, most technological products especially in the arena of cyberspace are imported, which are controlled by other countries and have targeted the public. In recent years, various studies have been conducted with the aim of managing the signs of information technology as well as the processes and approaches in its consumption, and given its national importance, in information technology in 20-year document of future perspective in horizon 1404 as one of the major axes of development with the relevant title of "Iran in 1404: a developed country with the first rank in the information technology" announcing it to the three powers. It has been of interest to authorities such that one of the main areas of information technology in 20-year document of future is needs assessment and problem orientation or pathology of information technology in the country, where the extent of use of cyberspace and patterns of using the cyberspace are investigated for basing fundamental information for scientific and better decision-making in this area (13) Further, cyberspace is one of the main programs propounded in the national plan for IT network development which is known as the main plan for preventing the damages resulting from use of the cyberspace (14). Due to the extensiveness of the issues related to the cyberspace, NGOs and governmental organizations have an undeniable effect in this regard.

Given the increasing importance of cyberspace management in scientific, cultural, and economic promotion of the country, One of the most important dimensions of the document of future perspective is needs assessment and problem orientation which plays a very important role in determining the current trend, IT challenges including pathology in cyberspace, predicting the challenges resulting from IT and paying attention to its essential role on the design of large scale plans with an emphasis on Islamic Iranian culture and use of latest scientific experiences. Further, the unknown real general prevalence and addiction to the internet across different populations in the country and the importance of knowing its accurate level for real strategic planning based on previous studies, determining the current status of cyberspace addiction, determining the challenges and harms of cyberspace in Iran, determining the solutions and international experiences used in management of cyberspace addiction.

MATERIALS AND METHODS

Eligibility criteria

The methods adopted for this systematic review have been developed in accordance with the guidelines detailed on the PRISMA. Observational studies were included in present study. Case series, case reports, clinical trials, and reviews (systematic review and narrative reviews) were excluded. The target populations were woman. We included all studies which conducted on undergraduate and postgraduate medical students in universities. Outcome: The main objectives were determining the prevalence of internet addiction severity. Internet addiction in present study defined as any online-related, compulsive behavior which interferes with normal living and causes severe stress on family, friends, loved ones, and one's work environment (15). Studies included in final stage that the severity of IA was measured by a validated questionnaire, and prevalence of IA was the primary outcome of the study population. Outcome collected as reported. Sampling methods and sample size: All observational studies with any Sampling and census designs included in present SR. Minimum required sample size is ≥ 25 patients.

Search strategy and databases

Literature review was done using the medical subject headings (MeSH) and key words related to internet addiction in Iran. We explored the electronic databases including international databases (MEDLINE (PubMed interface), Google scholar and ISI Web of science (web of science interface)) and national databases (scientific information database (SID) and MAGIRAN), for relevant studies. No settings and language limits were imposed on the search. The specific search strategies were created by a Health Sciences Librarian with expertise in systematic review searching. PRESS standard used for creating the search strategy (McGowan et al., 2016). The MEDLINE search strategy was adapted to search in another database. Moreover, PROSPERO searched for the ongoing or recently completed systematic reviews. The Mesh terms and keywords were used for this study included: "compulsive Internet use", "excessive internet use", or "problematic Internet use", "internet addiction", Prevalence, Survey, Epidemiology, Frequency, "medical students", and medical undergraduates that were combined with Boolean operators included AND, OR, and NOT.

Participants	Prevalence	Outcomes
"medical students" "Students" "medical under graduates"	Survey Epidemiology Frequency	"internet addiction" "compuls* Internet use" "excessive internet use" "problematic Internet use

Study selection

Literature review results were uploaded by the Endnote Software. The team developed the test screening questions and forms for level 1 and 2 assessments based on the inclusion and exclusion criteria. Citation abstracts and full text articles were uploaded with screening questions to the Endnote. Prior to the formal screening process, a calibration exercise was undertaken to pilot and refine the screening questions. Formal screening process of titles and abstracts were conducted by two researchers according the eligibility criteria and consensus method was used for solving controversies among the two researchers. The full text obtained for all titles that meet the inclusion criteria. Additional information retrieved from the study authors in order to resolve queries regarding the eligibility criteria. We recorded the reasons for the exclusion criteria. Neither of the review authors was blinded to the journal titles or to the study authors or institutions.

Data Extraction, Quality assessment and Data synthesis

Extracted data items included general information (First Author, Year of publication and Province), study characteristics (study design, (Sampling method, Mean of data collection, Setting, Sample size, Brief title, Questioner characteristics and Psychometric characteristics), participant characteristics (demographics, sample size), and outcome measures (IA). Hoy et al., tool used for assessing the quality of studies (Hoy et al., 2012). These decisions were made independently by two review authors based on the criteria for judging the risk of bias, in case of any disagreement, using the consensus method to resolve any controversies. Studies were tabulated in chronological order in tables.

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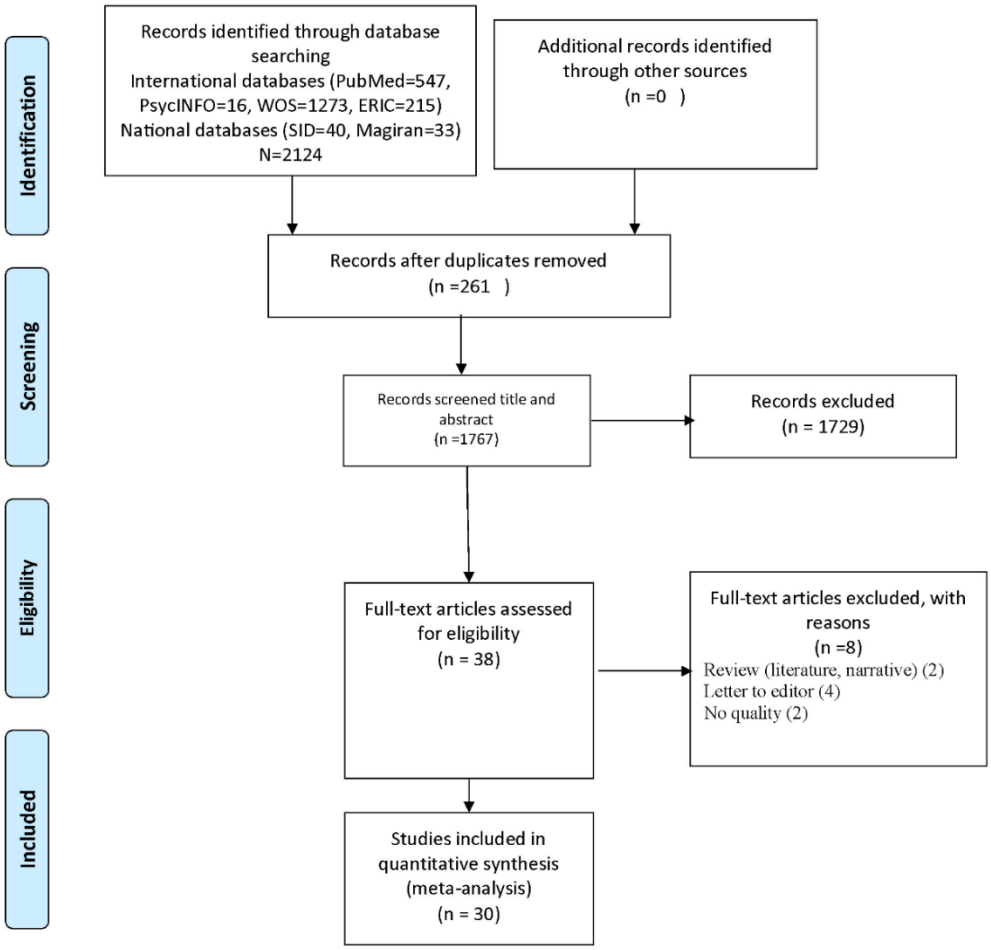
RESULTS

Figure 1. PRISMA 2009 Flow Diagram



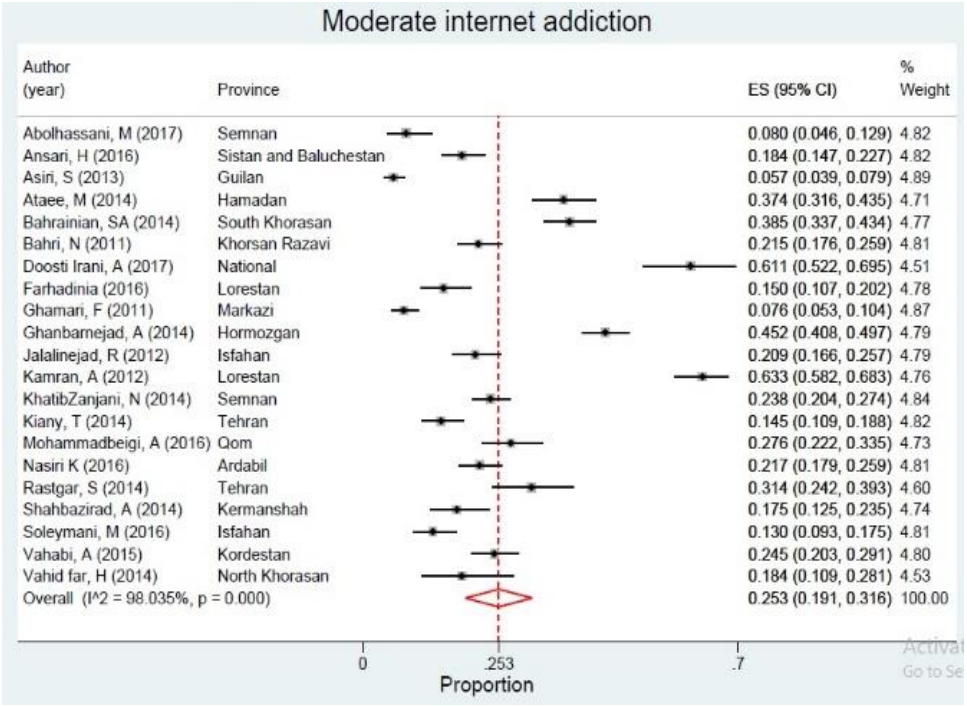


Figure 2 Overall Prevalence of Moderate Internet Addiction

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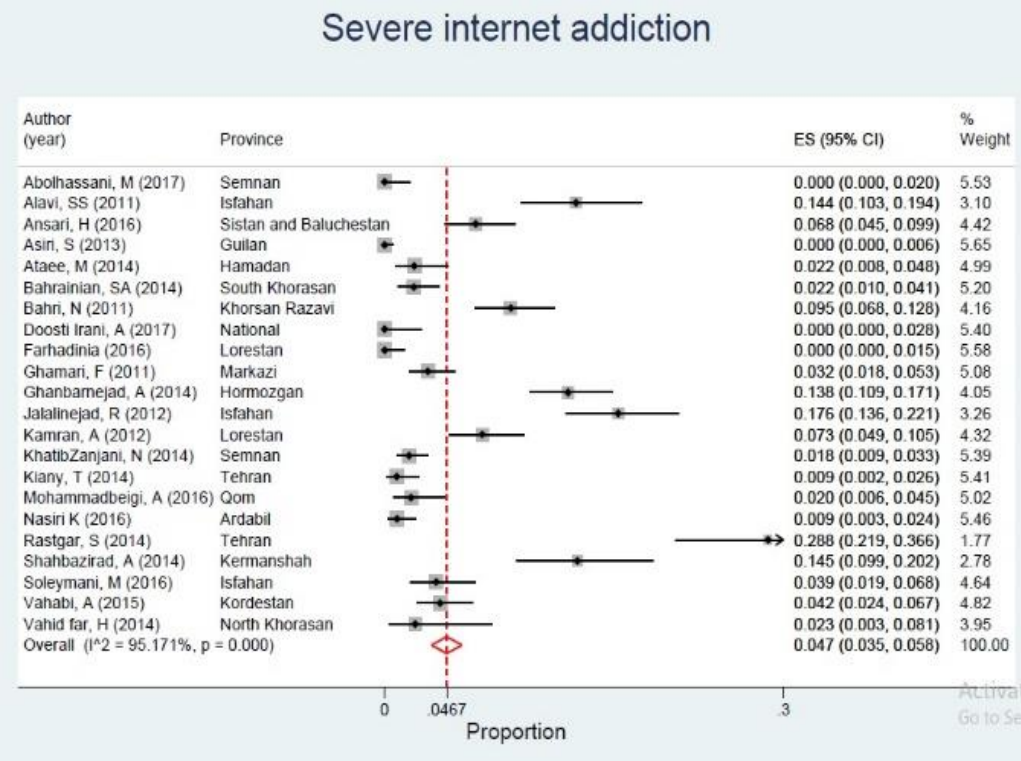

Figure 3 Overall Prevalence of Severe Internet Addiction

Table 1 Prevalence of IA based on type of filed in Student (Medical and non-medical)

	Addiction in total (IAT≥50)			Addiction in male (IAT≥50)			Addiction in female (IAT≥50)		
First author	**ES**	**95% CI for ES**	**% Wight**	**ES**	**95% CI for ES**	**% Wight**	**ES**	**95% CI for ES**	**% Wight**
Medical Student									
Abolhassani, M (2017) (16)	8.02	4.56, 12.88	3.37	4.81	2.22, 8.94	5.20	3.21	1.19, 6.85	5.20
Ansari, H (2016) (17)	25.26	20.97, 29.95	3.36	12.89	9.69, 16.69	5.15	12.37	9.23, 16.11	5.11
Asiri, S (2013) (18)	5.66	3.93, 7.86	3.40	3.43	2.11, 5.25	5.42	2.23	1.19, 3.78	5.30
Ataee, M (2014) (19)	39.63	33.75, 45.74	3.32	13.70	9.84, 18.39	5.00	25.93	20.80, 31.59	4.81
Bahrainian, SA (2014) (20)	40.69	35.88, 45.63	3.35						
Bahri, N (2011) (21)	31.00	26.50, 35.79	3.35						
Charkhat Gorgich, EA	27.58	23.34, 32.14	3.36	6.47	4.31, 9.28	5.32	6.95	4.71, 9.84	5.21
Doosti Irani, A (2017) (11)	61.07	52.16, 69.46	3.23						
Farhadinia (2016)	15.00	10.73, 20.16	3.35						
Fatehi, F (2016) (22)	16.09	10.97, 22.41	3.33						
Ghamari, F (2011) (23)	10.82	8.14, 14.02	3.39	6.28	4.24, 8.89	5.34	4.55	2.84, 6.86	5.26
Ghanbarnejad, A (2014) (24)	59.00	54.55, 63.35	3.36	22.60	19.01, 26.52	5.09	36.40	32.17, 40.79	4.98
Kamran, A (2012) (25)	70.65	65.71, 75.26	3.35						
Kiany, T (2014) (26)	15.45	11.73, 19.81	3.37	9.09	6.22, 12.72	5.20	6.36	3.98, 9.56	5.19
Lashgarara, B (2012) (27)	33.62	27.54, 40.14	3.31	16.59	12.02, 22.06	4.83	17.03	12.40, 22.54	4.88
Mohammadbeigi, A (2016) (28)	29.53	23.99, 35.55	3.32	23.23	18.18, 28.92	4.74	6.30	3.64, 10.03	5.15
Nasiri K (2016) (29)	22.66	18.78, 26.93	3.37						
Pirzadeh, A (2012) (30)	19.51	12.92, 27.63	3.28	4.07	1.33, 9.23	5.12	15.45	9.56, 23.07	4.59
Salehi, M (2014) (31)	6.07	3.27, 10.16	3.38						
Shahbazirad, A (2014) (32)	32.00	25.60, 38.95	3.30	12.00	7.84, 17.33	4.91	20.00	14.69, 26.22	4.76
Soleymani, M (2016) (33)	16.90	12.73, 21.78	3.36	11.62	8.13, 15.93	5.08	5.28	2.99, 8.56	5.19
Vahabi, A (2015) (34)	28.65	24.17, 33.45	3.35						
Vahidi far, H (2014) (35)	20.69	12.75, 30.71	3.22	12.64	6.48, 21.50	4.27	8.05	3.30, 15.88	4.72
Sub-group random pooled ES	**27.55**	**20.35, 34.74**	**76.76**	**11.14**	**8.01, 14.28**	**70.66**	**11.87**	**7.84, 15.89**	**70.36**
Non-medical student									
Jalalinejad, R (2012)	38.48	33.21, 43.97	3.33	26.67	21.97, 31.79	4.85	11.82	8.54, 15.80	5.09
Kajbaf, Mb (2014)	44.67	36.55, 52.99	3.24	22.00	15.65, 29.49	4.37	22.67	16.24, 30.21	4.53
KhatibZanjani, N (20	25.63	22.17, 29.33	3.37	8.38	6.28, 10.89	5.33	17.25	14.31, 20.53	5.15
Nastizai, N (2009)	33.07	28.32, 38.08	3.35	14.93	11.48, 18.95	5.10	18.13	14.37, 22.41	5.03
Rastgar, S (2014)	60.26	52.12, 67.99	3.26						
Sub-group random pooled ES	**40.05**	**29.54, 50.55**	**16.55**	**17.74**	**9.33, 26.15**	**19.65**	**16.91**	**13.07, 20.75**	**19.80**
Medical and non-medical student									
Alavi, SS (2011)	14.40	10.29, 19.37	3.36	8.80	5.60, 13.02	5.12	5.60	3.10, 9.22	5.17
Salahian, A (2015)	71.20	65.16, 76.73	3.32	34.40	28.53, 40.65	4.57	36.80	30.81, 43.11	4.67
Sub-group random pooled ES	**35.72**	**32.29, 39.16**	**6.68**	**15.52**	**12.50, 18.53**	**9.69**	**11.38**	**8.81, 13.95**	**9.84**
Overall random pooled ES	**30.67**	**24.11, 37.23**	**100.00**	**13.40**	**10.33, 16.47**	**100.00**	**13.82**	**10.15, 17.49**	**100.00**

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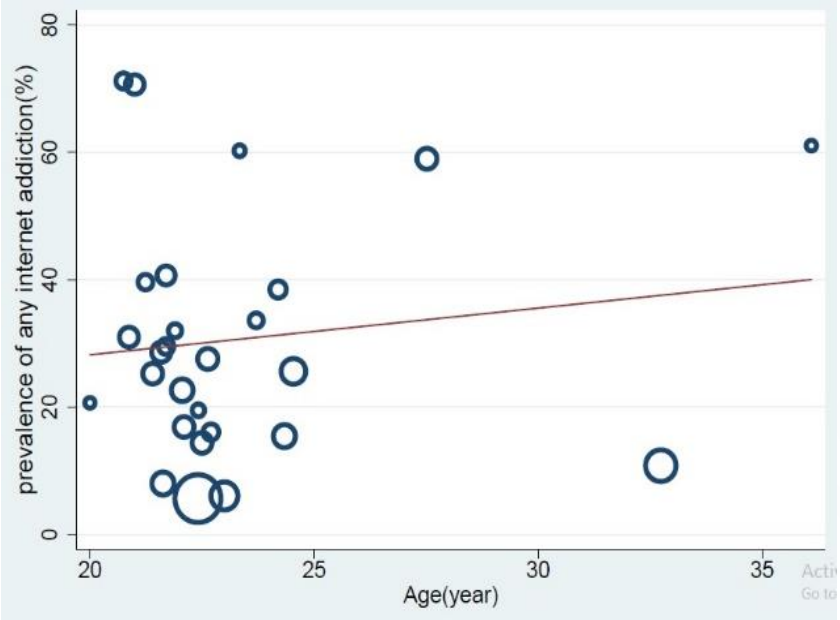

Figure 4 Univariate Meta-Regression Analyses Based on Participant's Mean Age

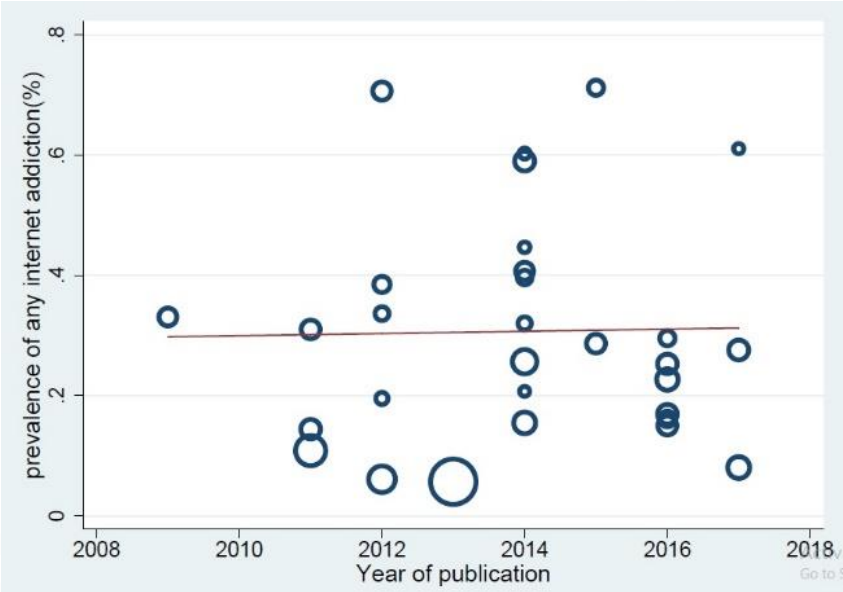

Figure 5 Univariate Meta-Regression Analyses Based on articles year of publication

Initially, based on the search in different databanks, 2124 papers were found, out of which 1729 were excluded due to their irrelevancy to the main subject of the research. Finally, 30 papers out of the remaining 38 papers were introduced into the final stage for analysis (Figure 1).

Meta-analysis prevalence of internet addiction in Iranian university student

Thirty studies with 9161 students from across Iran were entered into meta-analysis. Based on the results of random effect method, the overall prevalence of moderate internet addiction (IAT=50-79) and severe internet addiction (IAT≥80) were 25.32% (95% CI: 19.08, 31.55; I^2=98.03%) and 4.67% (95% CI: 3.53, 5.81; I^2=95.17%), (Figure 2, 3).

The prevalence of any internet addiction (IAT≥50) was 30.67% (95% CI: 24.11, 37.23; I^2=98.52%) and prevalence in male and female not had different (13.40 VS. 13.82); although not all article reports of gender-based prevalence, especially those with high prevalence rates, had caused the gender-specific prevalence to be less than half the total prevalence. Sub-group analysis done for kind of field of students (Medical and non-medical). Total prevalence of any internet addiction (IAT≥50) in non-medical student was almost 1.5 times higher than in medical students (Table 1).

Meta-regression

The results of univariate meta-regression analyses, participant's mean age, and year of publication variable not significantly contributed to heterogeneity of prevalence of any internet addiction (P-Value>0.05) (Figure 4, 5).

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DISCUSSION

This systematic review and meta-analysis has been conducted with the aim of investigating the prevalence of different types of internet addiction among Iranian students up to 2017. In the final stage, 30 papers which had been conducted in different provinces and universities entered the meta-analysis. The results of 30 papers which had been done on 9161 students indicated that the moderate prevalence of internet addiction was 25.23 and the prevalence of severe internet addiction was 4.67%. The prevalence of each type (mild, moderate, and severe) of internet addiction was 30.67%, which is larger than the global mean during the recent meta-analysis study, which has been reported as 30.65% (36). Similarly, in another study, the extent of internet addiction has been stated as 0.8-26% (37). The reason of this difference can be due to the methodological differences of the studies including sample size of the studied population, and the utilized instruments. Internet addiction did not differ significantly among men and women. Internet addiction was 1.5 times more frequent among non-medical students than their medical counterparts.

Limitations and strengths

The most important limitations of the present research which had complicated the data analysis were as follows: the prevalence of internet addiction was not stated based on level (mild, moderate, and severe) in all studies; The information associated with internet addiction had not been mentioned based on gender in all studies; in some studies, in spite of standard scoring of the questionnaire, researcher-made scoring had been used for analysis. The most important advantage of this study has been use of PRISMA systematic method.

CONCLUSION

The results of the present research which show high levels of internet addiction suggest the importance of greater care for proper management of the cyberspace and internet addiction across the society especially among the youth, who are the most important capitals of any society.

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