

Frequency of Methylphenidate (Ritalin) Consumption and its Associated Factors in Medical Students

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Abstract

Background: Methylphenidate or Ritalin is an amphetamine derivative and a central nervous system (CNS) stimulant that is chemically similar to cocaine. A lot of reports have been made on Ritalin abuse.

Objectives: This study aimed to determine the relative frequency of Ritalin consumption and its associated factors among medical students in different steps at Mashhad University of Medical Sciences.

Methods: Using stratified random sampling, this descriptive analytical study was conducted on medical students in different steps at Mashhad University of Medical Sciences in 2015. The checklist included the subjects' background information, and also the questions associated with the frequency of Ritalin consumption and its underlying causes. Independent sample t-test was used to analyze the quantitative variables with normal distribution, and Chi-square test or Fisher's exact test to analyze the qualitative variables. However, Kruskal-Wallis and Mann-Whitney were applied as non-parametric tests to analyze the quantitative variables with non-normal distributions.

Results: This study was conducted on 340 medical students in different steps, and the response rate was reported as 91%. The frequency of Ritalin consumption among students was 17.3%. The excessive consumption of Ritalin by medical students was observed within the exams period (83%); smoking cigarette was reported in 75.5% of Ritalin user students and drug addiction in 20.8%. There was a significant difference in Ritalin consumption between the students living on-campus or off-campus and those living with their spouse or parents [OR (95% CI) = 0.5 (0.27-0.93)]; however, the higher consumption of Ritalin was reported in the first group. Moreover, a significant difference was revealed in Ritalin consumption between non-smoking students and smoking ones [OR (95% CI) = 40.34 (18.34-88.72)].

Conclusion: Regarding the prevalence of Ritalin consumption along with smoking cigarette and addiction to drugs among the students living on-campus, immediate preventive interventions are required for the people in the same age group who are living together in social environment as well as students at risk of more damages due to the abuse of such medications.

Keywords: Iran, Mashad, Medical student, Ritalin

1. Background

Methylphenidate or Ritalin is an amphetamine derivative and a central nervous system (CNS) stimulant that is chemically similar to cocaine (1). Despite the therapeutic effects of Ritalin, numerous reports have been released on its abuse that has caused some concern. A case of schizophrenia has been reported following a single dose of Ritalin (2). According to the previous studies, improving academic performance, alertness and attention, increasing concentration, losing weight and feeling of pleasure and euphoria are considered as the common causes for high prevalence of Ritalin consumption among students (3, 9). Those who use amphetamines are at increased risk of experiencing adverse effects on cardiovascular system, kidneys, digestive system, mental health problems and even decrease in learning and memory power. Great psychological dependence is also caused by consumption of these dangerous drugs (10-14).

According to a Web-based survey, during the last year, 4.34% of the people over 18-25 years had consumed non-prescription drugs in order to treat attention deficit disorder as well as hyperactivity

(15). However, it seems that this rate is higher among the students (16).

There is no detailed statistics for Ritalin abuse in Iran. Nonofficial reports in recent years suggest that Ritalin abuse is increasing among medical students, physicians who prepare themselves for Medical Residency Entry Examination and physician assistants (17).

Non-medical dosage of Ritalin in students studying different fields of Medical Sciences has not been evaluated by any researchers in Iran or other countries. In Ataee's et al. study, the mean age of the students was about 23. Ritalin abuse had been experienced by 6.6% of the students; however, success in examinations was mentioned as the main cause of consumption by the majority of the students (13). In the study by Khademi and Shariat, the frequency of Ritalin consumption in physician assistants of Tehran University of Medical Sciences during their lifetime, the last year and last month was reported 23, 48 and 6.6% respectively; and it was higher in men comparing to women (14). Although the average frequency of Ritalin consumption has been reported from 1.5 to 31% in various studies, the reasonable estimate of this frequency in the student

population is 4% (7).

In the study by Valipour et al., it was revealed 8% of the students had consumed Tramadol and Ritalin; however, pleasure and temptation by friends were mentioned as the causes of drugs consumption by 50% of the students (18). The prevalence of Ritalin consumption among the students has been reported from 3.4 to 8.7% by other studies; and most of the students associated this with their academic activities (19-24).

Due to more accessibility of the physicians to the drugs, especially Ritalin, possibility of Ritalin abuse, and the side effects of arbitrary consumption, it is of great importance to evaluate the abuse potential of this drug among physicians. Studies have shown that training is a known method for preventing abuse of banned drugs in the society. However, a prerequisite for any kind of educational planning is situational awareness and understanding of the situation. Experts, in this regard, believe that epidemiological studies are regarded as the first step in designing prevention programs (22).

2. Objectives

Regarding the importance of understanding factors influencing the behavior of Ritalin abuse in order to adopt and implement the prevention programs, this study aimed to determine the relative frequency of Ritalin abuse and its associated factors among medical students of Mashhad University of Medical Sciences.

3. Methods

Regarding the similar studies and considering the sample size for prevalence according to previous studies (14), and by considering 10 percent attrition, the sample size was calculated as 340. This descriptive analytical research was conducted on 340 medical students in different steps at Mashhad University of Medical Sciences in 2015, and 85 students were selected from each step using stratified random sampling (Each academic steps in medical course was defined as strata). The basis of calculation in the study included frequency and estimating a quality variable.

Inclusion and exclusion criteria

The students participated in the study after informed consent was obtained from all of them,

and they were fully informed of the research project and ensured that confidentiality of the information will be maintained. Those who were taking Ritalin on prescription excluded from the study.

Data collection

Data collection tool was a checklist with two parts: part I consisted of the questions on the subjects' background information including age, sex, academic step, marital status, housing status, number of siblings, household income, and if he is smoking cigarette, using hookah, drinking alcohol or using drugs, and the frequency of using in a week; and part II consisted of the questions on Ritalin consumption including frequency and dosage, and also the underlying causes.

SPSS (version 16) was used to analyze data statistically. Quantitative variables were reported as Mean \pm SD and qualitative variables as percent. Moreover, nonparametric Kolmogorov-Smirnov test was considered to analyze normal distribution of quantitative variables. Independent sample t-test was used to analyze the quantitative variables with normal distribution and Kruskal-Wallis and Mann-Whitney were applied as non-parametric tests to analyze the quantitative variables with non-normal distributions, and the Chi-square test or Fisher's exact test was used to analyze the qualitative variables. Finally, Logistic regression was also used to determine predictor variables on Ritalin consumption. $P < 0.05$ was considered as the significance level.

4. Results

In the current study, 309 of 340 medical students in different academic steps completed the checklist, showing the response rate as 91%.

Demographic characteristics of the quantitative and qualitative variables are shown in tables 1 and 2 respectively.

Medical students were divided into four groups in terms of academic step: 78 persons (25.4%) at basic sciences, 86 persons (28%) at physiopathology, 83 persons (27%) at externship and 60 persons (19.5%) at internship. Using non-parametric Kruskal-Wallis test, a statistically significant difference was observed between the mean of age and household income level in different academic steps of the students ($P < 0.001$, $P = 0.011$ respectively). But no significant difference

Table 1. Descriptive statistics for demographic characteristics of quantitative variables

Quantitative variable	Number (person)	Mean	SD	Minimum	Maximum
Age (year)	301	22.19	2.411	18	32
Number of siblings (person)	300	2.95	1.344	1	9
Frequency of smoking cigarette (per week)	45	3.8	3.853	1	18
Dosage of Ritalin (every time)	51	1.79	1.49	0.3	8
household income (million)	195	4.33	7.80	0.1	100

Table 2. Descriptive statistics for demographic characteristics of qualitative variables

Qualitative variable		Number	percent	Qualitative variable		Number	percent	
Sex	Male	92	30	Ritalin consumption	No	254	82.7	
	Female	215	70		Yes	53	17.3	
	total	307	100		total	307	100	
Marital status	single	245	79.3	Exam periods	No	260	84.1	
	married	63	20.4		Yes	49	15.9	
	widowed	1	0.3		total	309	100	
	total	309	100	Family stress	No	293	94.8	
Academic step	basic sciences	78	25.4		Yes	16	5.2	
	Physiopathology	86	28		total	309	100	
	externship	83	27	Causes of Ritalin Consumption	No	300	97.1	
	internship	60	19.5		Stress at work	Yes	9	2.9
	total	307	100		total	309	100	
Housing status	on- campus	145	47.1		pleasure	No	303	98.1
	with parents	116	37.7			Yes	6	1.9
	with spouse	30	9.7	total		309	100	
	total	308	100	temptation by friends	No	302	97.7	
Smoking cigarette	No	249	81.1		Yes	7	2.3	
	Yes	58	18.9		total	309	100	
	total	307	100	Others	No	308	99.7	
Addiction to drugs	No	296	96.4		Yes	1	0.3	
	Yes	11	3.6		total	309	100	
	total	307	100					

revealed between the mean of number of siblings ($P = 0.26$), frequency of smoking cigarette per week ($P = 0.08$) and dosage of Ritalin, 10 mg at every time ($P = 0.08$), in different academic steps.

58 students (18.9%) were smoking cigarette at least once to usual maximum 18 times a week; and 11 students (3.6%) who were addicted to drugs, were smoking cigarette 1-2 times a week. Due to the small number of medical students smoking cigarette, addicted to drugs as well as those consuming Ritalin, it was impossible to make comparison and perform statistical analysis in all subjects.

Moreover, the frequency of Ritalin 10mg consumption in 53 medical students (17.3%) was reported at least once to maximum 20 times a week, and the dosage at least 1/4 to maximum 8 tablets at every time.

Of 53 students who were consuming Ritalin, 28 persons (52.8%) were men and 25 (47.2%) were women; 39 persons (73.6%) were single and 14 (26.4%) were married. In addition, 40 subjects (75.5%) were smoking cigarette and 11 (20.8%) were addicted to drugs. Meanwhile, 9.6% of the mentioned students were at physiopathology, 61.5% at externship and 28.8% at internship steps; however, none of the students at basic sciences step reported Ritalin consumption.

No significant difference was statistically observed in the mean of frequency of Ritalin consumption ($P = 0.8$), number of siblings ($P = 0.42$), frequency of smoking cigarette in a week ($P = 0.07$), dosage of Ritalin ($P = 0.08$) as well as household income level ($P = 0.15$) at different academic steps.

None of the students at basic sciences step reported Ritalin consumption, but it was reported in 5 students (6%) at physiopathology step, 32 ones

(38.6%) at externship and 15 ones (25%) at internship. The most common frequency of Ritalin 10 mg consumption at every time was reported to be 3, 8 and 3 at physiopathology, externship and internship respectively.

A univariate analysis revealed that there was a significant difference between Ritalin consumption and the students' housing status ($P < 0.001$), so that a significant difference was observed between those living on-campus or off-campus and those living with their spouse or parents [OR(95%CI)=0.5(0.27-0.93)]. Meanwhile, a significant difference in Ritalin consumption was observed between non-smoking students and smoking ones [OR (95% CI) = 40.34 (18.34-88.72)].

Although a significant difference in Ritalin consumption was reported between male and female students [OR (95%CI) = 0.3 (0.16-0.54)], no significant difference in drug consumption was seen between single and married students ($P=0.24$).

Logistic Regression model was used to determine the predictor variables (sex, academic step, smoking cigarette and addiction to drugs) in Ritalin consumption; therefore, about 37 to 63% of the consumption could be predicted by this model. Goodness of fit for the logistic regression model was also confirmed by Hosmer & Lemeshow test (p -value = 0.87).

According to the model, Ritalin consumption in male students was 3.05 times more than females (OR=3.05, 95%CI OR=1.10-8.45), and in smoking students it was reported 13.88 times more than non-smoking ones (OR=13.88 , 95%CI OR=5.52-34.88) (Table 3).

Various reasons for Ritalin consumption is shown in Diagram 1. Total percentage has been used due to

Table 3. Evaluation of the predictor variables on Ritalin consumption in medical students based on the Logistic Regression

		Variables in the Equation					95% C.I. for EXP(B)		
		B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Step 1 ^a	Female) Sex(Ref:	1.117	.520	4.619	1	.032	3.054	1.103	8.455
	Education(Ref:Bsic)			11.126	3	.011			
	Education(1)	17.422	4429.301	.000	1	.997	36822418.141	.000	.
	Education(2)	19.557	4429.301	.000	1	.996	311429149.113	.000	.
	Education(3)	19.752	4429.301	.000	1	.996	378785370.448	.000	.
	Smoking(Ref:no)	2.631	.470	31.293	1	.000	13.881	5.523	34.888
	Constant	-21.823	4429.301	.000	1	.996	.000		

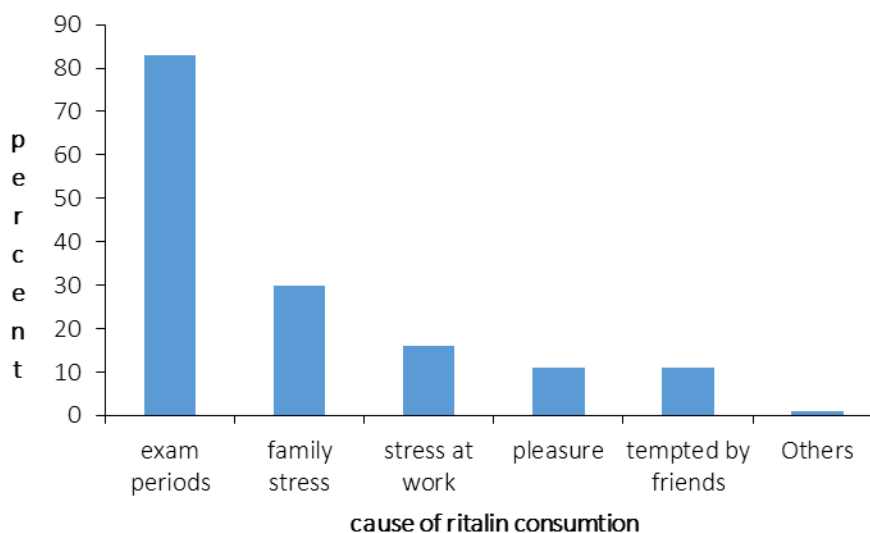


Figure 1. cause of Ritalin consumption

selection of the combined items higher than one hundred percent. Consumption of Ritalin is highly increased during the exam periods (83%) (Figure 1).

5. Discussion

In this study that was conducted on 340 medical students studying in different steps, the response rate was 91%, whereas in other studies, the lowest rate was reported to be 20% (5) and the highest rate 91.2% (19).

The prevalence of Ritalin consumption in this study was 17.3%; however, various results were obtained through evaluation of this prevalence in other studies. Prevalence of Ritalin consumption in students of Tehran, Kermanshah, Isfahan and Tabriz Universities of Medical Sciences was 5% (23), 5.4% (18), 6.6% (19) and 8.7% (17) respectively, and in a systematic study carried out on medical students, it was reported 16% (25). These differences could be caused by changes in educational environment, changes resulted from the passage of time and also different fields of study.

The prevalence of illegal consumption of Ritalin in students in the 8th, 10th and 12th grades in USA, 2001 was reported to be 2.7, 4.6 and 5% respectively;

however, the prevalence of unadjusted consumption of the drug for all samples was 4% (26) during the last year.

Non-prescription use of Ritalin had been reported in about 3% of the undergraduate students studying Bachelor's degree programs at Michigan College during the last year (6). Moreover, the rate of illegal consumption of Ritalin in the whole population of America was increased from 1.2% in 2000 to 2% in 2006; and in young people aged 18 to 21, it was also increased from 3.6% in 2000 to 5.4% in 2006 (7).

In another study, self-reports of 8.5% of the students showed non-prescription use of Ritalin during their lifetime (27). However, in the study conducted in Iran in 2013, the prevalence of Ritalin consumption among men and women was 3.3% (2.16- 5.09) and 3.5% (2.33- 5.3) respectively, and totally it was reported 3.4% (2.53- 4.59) (28).

In the current study, it was revealed that consumption of Ritalin was highly increased during the exam periods (83%) since the students intended to have better concentration and improve their academic achievements. Students of Isfahan University of Medical Sciences pointed out to the questions on structures of behavioral intention as the main reason for Ritalin consumption during the

exam periods (13). Being prepared for Medical Residency Entry Examination was also mentioned as the main cause of Ritalin consumption by the students of Tehran university of Medical Sciences (14). Meanwhile, of the total students studying in one of the medical fields at Azad University of Borujerd, 8% who had used Tramadol and Ritalin referred to pleasure and temptation by friends as the causes of consumption by 50% (18).

Increasing concentration (41.7%) was mentioned by the students of Tabriz University of Medical Sciences as the most common motivation for consuming Ritalin between the years 2000 and 2007. In addition, staying awake (17.3%), curiosity (16.7%), boosting energy level (8.8%), boosting confidence (6.1%), temptation by friends (5%) as well as losing weight (4.4%) were recounted by these students as other reasons for consuming Ritalin (17).

The primary motivation of the students of Kermanshah (24) and Isfahan Universities of Medical Sciences for consuming Ritalin (16.13%) was improving the academic performance (19).

Evaluation of the studies carried out on the prevalence of illegal consumption of Ritalin among American students from 1976 to 2006 revealed that most of the students had mainly consumed the drug in order to improve their academic performance (7).

In a systematic study conducted on medical students, those who had started consuming Ritalin after entering the university referred to increasing concentration and improving the study levels as the main reasons, while losing weight and curiosity was mentioned as the main reasons by the students who had started it before entering the university (24).

According to a Web-based survey on American medical students in 2005, increasing concentration (65.2%), improving the study levels (59.8%), raising consciousness (47.5%), feel euphoria (31%) and curiosity (29.9%) were reported as the major reasons for illegal consumption of stimulants such as Ritalin (29).

However, some high-risk behaviors have been reported following the abuse of Ritalin and other drugs. In the current study, 75.5% of the students suffering Ritalin abuse were also smoking cigarette, and 20.8% of them were addicted to drugs. According to the study conducted on the students of Isfahan University of Medical Sciences in 2013, smoking cigarette was reported in 21.2% of the students, consuming alcohol in 14.9%, opium 3.7% and Methamphetamine in 1.7%; meanwhile, 15.7% of the smoking students and 22.2% of alcoholic ones were consuming Ritalin (19).

Another study on the students of Kermanshah University of Medical Sciences showed the history of smoking cigarette, consuming alcohol, opium and Methamphetamine in 14.5, 15.2, 2.5 and 0.6 % of the students respectively (24).

Of the undergraduate students studying Bachelor's

degree programmes at Michigan College and were illegally consuming Ritalin during the past year, 100% had tried marijuana and 58% Ecstasy. Moreover, drinking alcohol was reported in 98% of them within the past two weeks (6).

In the current study, a significant difference was observed in Ritalin consumption between the students living on-campus or off-campus and those living with their spouse or parents. In Tabriz University of Medical Sciences, 66.6% of the students consuming Ritalin were living on-campus, 7.4% off-campus and 26% with their family (17). And in Isfahan University of Medical Sciences, 68.75% of the students were living on-campus (19). Accordingly, it seems that living on-campus among those in the same age group may affect the pattern of Ritalin consumption.

The main limitation of this study was that the results was based on the self response. It is suggested to do this research with more accurate methods.

6. Conclusion

The prevalence of Ritalin consumption in students of Mashhad university of Medical Sciences was 17.3%, and family stress and success in examinations were reported as the major reasons for consumption. Meanwhile, the frequency of Ritalin consumption is increased in externship and internship steps, and in those who are living in-campus or off-campus, which confirm the relationship between the aforementioned factors and Ritalin consumption.

High prevalence of Ritalin consumption in the students smoking cigarette and addicted to drugs shows the consequences of high-risk behaviors following drug abuse.

Therefore, it seems that providing training during academic years, especially the early years, for medical students who are living on-campus, acquainting them with the side effects of Ritalin and other drugs abuse, and modifying high-risk behaviors play an important role in preventing and reducing consequences of the drugs abuse.

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Conflicts of interest

None

References

1. Brunton L, Lazo J, Parker K. Goodman and Gilman are the pharmacological basis of therapeutics. 11th ed. New York: The

- McGraw-Hill Companies; 2006.
2. Ghaffarinejad A, Kheradmand A. Reporting a case of injecting methylphenidate (ritalin) tablets, intensified symptoms of schizophr-enia or induce separate mental disorder? *Addict Health*. 2009;1(2):111-4. [PubMed: 24494093].
 3. Morton AW, Stockton GG. Methylphenidate abuse and psychiatric side effects. *Prim Care Companion J Clin Psychiatry*. 2000;2(5):159-64. [PubMed: 15014637].
 4. Low KG, Gendaszek AE. Illicit use of psycho stimulants among college students: a preliminary study. *Psychol Health Med*. 2002;7(3):283-7. doi: 10.1080/13548500220139386.
 5. Babcock BA, Byrne T. Student perceptions of methylphenidate abuse at a public liberal arts college. *J Am Coll Health*. 2000;49(3):143-5. doi: 10.1080/07448480009596296. [PubMed: 11125642].
 6. Teter CJ, McCabe SE, Boyd CJ, Guthrie SK. Illicit methylphenidate use in an undergraduate student sample: prevalence and risk factors. *Pharmacotherapy*. 2003; 23(5):609-17. [PubMed: 12741435].
 7. Bogle KE, Smith BH. Illicit methylphenidate use: a review of prevalence, availability, pharmacology, and consequences. *Curr Drug Abuse Rev*. 2009;2(2):157-76. [PubMed: 19630746].
 8. Barrett S, Darredeau C, Bordy LE, Pihl RO. Characteristics of methylphenidate misuse in a university student sample. *Can J Psychiatry*. 2005;50(8):457-61. doi: 10.1177/07067437050500805. [PubMed: 16127963].
 9. Fatemi N, Khoshnavaye Foomani F, Behbahani N, Hosseini F. Assertiveness skill and use of Ecstasy among Iranian adolescents. *Quart J Fundam Mental Health*. 2007;10(40):265-72. [Persian]
 10. Kaplan H, Sadock B, James B. Summary of psychiatry. Trans: Pourafkari N. Tehran: L. Shahr-e-Ab; 2003. P. 534-88.
 11. Gouzoulis-Mayfrank E, Daumann J, Tuchtenhagen F, Pelz S, Becker S, Kunert HJ, et al. Impaired cognitive performance in drug free users of recreational ecstasy (MDMA). *J Neurol Neurosurg psychiatry*. 2000;68(6):719-25. [PubMed: 10811694].
 12. Solowij N, Hall W, Lee N. Recreational MDMA use in Sydney; a profile of ecstasy user and their experiences with the drug. *Br J Addict*. 1992;87(8):1161-72. [PubMed: 1354992].
 13. Ataei M, Hosseini N, Ahmadi JT, Jalilian F, Mirzaei AM, Eslami AA, et al. Application of prototype/willingness model in describe ritalin abuse behavior among college students. *Health Syst Res*. 2014;10(2):335-44.
 14. Khademi L, Shariat SV. Prevalence of nonmedical use of methylphenidate (Ritalin) in residents of Tehran university of medical sciences and their attitude toward methylphenidate use. *Iran J Psychiatry Clin Psychol*. 2013;19(1):20-7.
 15. Novak SP, Kroutil LA, Williams RL, Van Brunt DL. The nonmedical use of prescription ADHD medications: Results from a national internet panel. *Subst Abuse Treat Prev Policy*. 2007;2:32. doi: 10.1186/1747-597X-2-32. [PubMed: 17974020].
 16. Arria AM, Wish ED. Nonmedical use of prescription stimulants among students. *Pediatr Ann*. 2006;35(8):565-71. [PubMed: 16986451].
 17. Habibzadeh A, Alizadeh M, Malek A, Maghbooli L, Shoja MM, Ghabili K. Illicit methylphenidate use among iranian medical students: prevalence and knowledge. *Drug Des Dev Ther*. 2011;5:71-6. doi: 10.2147/DDDT.S13818. [PubMed: 21340040].
 18. Valipour M, Zivdar M, Amin M, Bazvand S, Saki M, Omidifard Z. Prevalence and predisposing factors for substance abuse among students. *Aflak*. 2011;5(14-15):63-7. [Persian]
 19. Eslami AA, Jalilian F, Ataei M, Alavijeh MM, Mahboubi M, Afsar A, et al. Intention and willingness in understanding Ritalin misuse among Iranian medical college student: A cross-sectional study. *Glob J Health Sci*. 2014;6(6):43-53. doi: 10.5539/gjhs.v6n6p43. [PubMed: 25363098].
 20. Habibzadeh A, Alizadeh M, Malek A, Maghbooli L, Shoja MM, Ghabili K. Illicit methylphenidate use among iranian medical students: prevalence and knowledge. *Drug Des Dev Ther*. 2011;5:71-6. doi: 10.2147/DDDT.S13818. [PubMed: 21340040].
 21. Reza Hosseini O, Rpphbakhsh A, Tavakolian V, Assar S. Drug abuse among university students of Rafsanjan, Iran. *Iran J Psychiatry Behav Sci*. 2014;8(2):81-5. [PubMed: 25053961].
 22. Barati M, Allahverdi-pour H, Jalilian F. Prevalence and predictive factors of psychoactive and hallucinogenic substance abuse among college students. *J Fundam Mental Health*. 2012;13(4):374-83. [Persian]
 23. Taremiyan F, Bolhari J, Pairavi H, Ghazi Tabatabaeii M. The prevalence of drug abuse among university students in Tehran. *Iran J Psychiatry Clin Psychol*. 2008;13(4):335-42. [Persian]
 24. Jalilian F, Karami-Matin B, Mirzaei Alavijeh M, Ataei M, Mahboubi M, Motlagh F, et al. Prevalence and factor related to ritalin abuse among Iranian medical college student: an application of theory of planned behavior. *Terapevticheskie Arkhiv*. 2013;85(4s):22-7.
 25. Finger G, Silva ER, Falavigna A. Use of methylphenidate among medical students: a systematic review. *Rev Assoc Med Bras*. 2013;59(3):285-9. doi: 10.1016/j.ramb.2012.10.007.
 26. McCabe SE, Teter CJ, Boyd CJ, Guthrie SK. Prevalence and correlates of illicit methylphenidate use among 8th, 10th, and 12th grade students in the United States, 2001. *J Adolesc Health*. 2004;35(6):501-4. doi: 10.1016/j.jadohealth.2004.02.004.
 27. Moore DR, Burgard DA, Larson RG, Ferm M. Psychostimulant use among college students during periods of high and low stress: An interdisciplinary approach utilizing both self-report and unobtrusive chemical sample data. *Addict Behav*. 2014;39(5):987-93. doi: 10.1016/j.addbeh.2014.01.021. [PubMed: 24561016].
 28. Ansari-Moghaddam A, Rakhshani F, Shahraki-Sanavi F, Mohammadi M, Miri-Bonjar M, Bakhshani NM. Prevalence and patterns of tobacco, alcohol, and drug use among Iranian adolescents: a meta-analysis of 58 studies. *Children Youth Serv Rev*. 2016;60:68-79. doi: 10.1016/j.chilyouth.2015.11.018.
 29. Teter CJ, McCabe SE, LaGrange K, Cranford JA, Boyd CJ. Illicit use of specific prescription stimulants among college students: prevalence, motives, and routes of administration. *Pharmacotherapy*. 2006;26(10):1501-10. doi: 10.1592/phco.26.10.1501. [PubMed: 16999660].