Determination of opium abuse prevalence in Iranian young people: a systematic review and meta-analysis

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Abstract

The Islamic Republic of Iran located on the largest transit routes for opiates smuggled in the world and opium is the most common drug of choice in this country. A meta-analysis study was conducted to estimate the opium abuse prevalence for Iranian young people. The meta-analysis was designed according to MOOSE guideline for review of observational studies. Factors related to heterogeneity of prevalence in national level was assessed using meta-regression multivariate model. The PubMed/Medline, ISI/Web of Science, and Scopus/Elsevier databases and reference lists of eligible articles were searched. A total of 52,173 samples were included in analysis (32,116 college students and 20,057 high school students). The pooled prevalence of opium abuse in male, female, and mixed was 6.0% (95% CI = 5.0–7.0%), 2.0% (95% CI = 1.0–2.0%), and 4.0% (95% CI = 3.0–5.0%), respectively. Meta-regression model found that prevalence was significantly higher in older students, and in studies with multistage sampling, and was lower in newer conducted studies. The prevalence of opium abuse in Iranian youth students is higher than for other countries as well as sampling methods, and the level of education and age is in association with variation in prevalence across provinces. Declining prevalence among male students during past 30 years is notable.

Introduction

Opium is structurally a narcotic analgesic with its analgesic effects identified as a pain receptors agonist in nervous system. Opium milky juice originated from the green capsules of the poppy plant (Papaver somniferum) which is dried to make a brown doughy shape product. The opium addiction has been demonstrated to contribute to incidence for many diseases. Previous studies showed that opium consumption causes cardiometabolic diseases (Masoukarbik et al., 2013) and ototoxic effects (Rawool & Dluhy, 2011) and increases the risk of several cancers (Kamangar, Shakeri, Malekzadeh, & Islami, 2014). In addition, literatures showed a strong association between opium abuse and esophageal cancers in Iranian population (Ribeiro Pinto & Swann, 1997).

Opium is the most common drug of choice for abuse in Iran that has been a historical root in Iranian culture. The Islamic Republic of Iran located on the largest transit rout for opiates smuggled in the world,and the United Nations Office on Drugs and Crime (UNODC) reported that prevalence of opiates abuse is about 3% in Iranian adults (International Narcotics Control Strategy Report, 2004). Cross-sectional studies have reported heterogeneous prevalence among different provinces. In the west (Nazarzadeh et al., 2014a), northwest (Mohammadpoorasl et al., 2007), east (Talaei et al., 2008), north (Siyam, 2006), and south of the country (Mardani et al., 2012), a lifetime prevalence of 2.8, 0.4, 1.6, 4.8, and 6.6% had been reported, respectively. The patterns of this heterogeneity can be discovered through a meta-analysis study.

The most critical times for preventing drug addiction is adolescence and early youth. According to behavioral studies, the adolescents are at high risk to begin drug abuse when they were under 20 years old (Lyoo et al., 2015). This may be because of either different functionality of brain in this age or environmental factors such as dealing with high levels of puberty stress and wide availability of different types of drugs. Consequently, the precise estimation of prevalence of drug abuse in these age groups is critical to decision-making in public health.

No meta-analysis studies have been reported in Iran to estimate a pooled prevalence of opium abuse in young people and assess the cause of heterogeneity in estimated prevalence across provinces. As such, the aims of this study were to estimate a pooled opium abuse prevalence in high school and college students of Iran and model the methodological and other variables related to changes in opium prevalence across provinces using meta-regression.
Methods

Search strategy and methods

The electronic search was conducted for each type of descriptive studies which were published since 1979 (after Iran’s Islamic Revolution). The domestic scientific databases including Iranmedex, Scientific Information Database (SID), Magiran, Irandoc, Medlib, and IranPsych, as well as international databases, including PubMed/Medline, ISI/Web of Science, and Scopus/Elsevier, reference lists of eligible papers, and review articles were searched up to February 2015. Communication with corresponding authors and Iranian experts in addiction field was done for any additional information or unpublished studies, if necessary.

The search was restricted to the Persian and/or English language. For search in the databases, the combinations of keywords relating to opium abuse were employed: “Opium,” “Substance Abuse, Intravenous,” “Substance-Related Disorders,” “morphine,” “codeine,” “Papaveretum,” “Omnopon,” “Pantopon,” “substance,” “drug,” “illicit drug,” “Adolescent,” “Students,” “Iran,” “Adolescent,” “Youth,” “School students,” “Students,” “college student,” “prevalence,” “cross-sectional,” and “abuse.” The details of search string in databases are exhibited in supplementary Table S1. The EndNote X7 (Thomson Reuters) was used to manage citations, review the articles, and find duplication.

The systematic review was conducted according to the MOOSE reporting guidelines. Two expert researchers in systematic review and addiction (MN and ZB) independently check out the titles and selected relevant articles for further evaluation. Then, abstracts were independently assessed by researchers, and the full text was retrieved when the abstract met inclusion criteria. In the case of disagreement, research team members acted as a mediator and a decision was made based on consensus.

Inclusion and exclusion criteria

The criteria for exclusion are: (a) interventional study such as clinical trials; (b) case–control studies without population-based sampling methods; (c) case series or case report articles; (d) inadequate reporting, that is, studies not reporting prevalence proportion for opium abuse; (e) meta-analyses, review articles, letters, editorial, comments, historical articles; (f) relevant study in counties except Iran; (g) sample size less than 50; (h) response rate less than 50%; (i) articles that were conducted before 1979.

For inclusion into the meta-analysis, the articles had to meet the following inclusion criteria: (a) having objective definition of opium abuse (standardized diagnostic criteria for drug abuse/use include: the International Classification of Diseases, Classification of Mental and Behavioral Disorders, or Diagnostic and Statistical Manual of Mental Disorders, or direct question in questionnaire and interview); (c) having prevalence proportion or number of case patients for opium abuse; (d) place of study should be in Iran; (e) descriptive studies such as cross-sectional studies, survey design, baseline cohort data, and population-based case–control studies; and (f) having least information required for meta-analysis (prevalence proportion and sample size).

Variables and measures

A self-designed data extraction form was developed and piloted in five studies. The form included: first author’s name, date of conduction, province, age, level of education, sampling method, sample size, measurement tool, validity and reliability of questionnaire, response rate and opium abuse prevalence including: lifetime, one month later, one week later, and current abuse.

Categorization of continuous variables for subgroup analysis was done. Age groups defined as >18 versus <18 years; level of education: high school and college students; gender categories: male, female, and mixed; sampling methods: multistage, census or stratified or random and not mentioned; date: <2000, 2000–2005, >2005 year; and sample size: <1000, >1000.

Statistical analysis

Standard error of prevalence was calculated based on binomial distribution formula and weight for each study calculated using inverse variance method. The presence of potential between-study heterogeneity was inspected using Cochran’s Q statistic (with significant level p < 0.1), alongside I² statistic percent for estimates of inconsistency within the studies (I² = 0% indicates no observed heterogeneity while 100% indicates substantial heterogeneity). In the presence of significant heterogeneity, the pooled prevalence was calculated using the random-effect model, with detailed information exhibited in a forest plot.

The association between heterogeneity and presumption factors was investigated through subgroup analyses and meta-regression model. In the meta-regression model, variables were assessed in the adjusted model at a significance level of <0.2 and maximum likelihood method was employed for the estimation of regression coefficient. Because of the difference in nature of the addictive behavior between the two genders, the meta-regression models were built for each gender separately. To prevent the instability in the model, the variables with a significant level <0.2 were entered in the adjusted model 2.

Potential publication bias was assessed through the Egger’s test. The influence of individual studies (sensitivity analysis) on the results was assessed by random-effect model after removal of each study and plotting the result. All analyses were conducted using Stata SE version 13 (Stata CorpLP, College Station, TX, USA) with a Stata package for meta-analysis and meta-regression.

Results

Literature search and study characteristics

A total of 1076 citations were retrieved of which 23 studies met the inclusion criteria and were included in the meta-analysis (Agahi & Spencer, 1982; Ahmadi et al., 2008, 2001, 2006, 2009, 2004, 2003; Ahmadi & Hasani, 2003; Ahmadi & Sharifi, 2003; Attari et al., 2012; Ghanizadeh, 2001; Goreishi & Shajari, 2013; Jodati et al., 2007; Mohammadpoorasl et al., 2007, 2012; Mohtasham-Amiri et al., 2011; Najafi et al., 2009; Nakhaee et al., 2009;
Nazarzadeh et al., 2014a; Sahraian et al., 2010; Shamsipour et al., 2014; Talaei et al., 2008; Zarrabi et al., 2009). The flowchart exhibiting the details related to the systematic review process is shown in Figure S1. The general characteristics of eligible studies are exhibited in Table 1 (only men), Table 2 (only women), and Table 3 (studies in which men and women were not separated). In overall, a total of 52,173 samples were included in the pooled analysis (32,116 college students and 20,057 high school students). Twenty-four studies were conducted on men (n = 18,251), seventeen investigated female (n = 13,960), and twelve included mixed samples (n = 19,962). The mean age of men, women, and mixed samples was 19.87, 21.34, and 21.46 year, respectively.

Pooled prevalence in male
Substantial between-study heterogeneity was detected (Q = 838.86, p < 0.001, I² = 97.3%) and consequently the random-effect model was used for the pooled estimation. The prevalence of opium abuse in male students was reported in 24 cross-sectional studies with a pooled prevalence of 6.0% (95% CI = 5.0–7.0%; Figure 1). No statistically significant differences were observed in subgroup analyses based on sampling methods, year of study, and sample size. But, subgroup analyses based on level of education and age groups showed higher prevalence in college students and also students aged 18 and over (Figures S2–S5). The Egger’s bias plot do not show significant publication bias (Figure S6). Significant differences were not observed followed by excluding each study one by one and reassessing the pooled prevalence based on the remaining studies (Figure S7).

In model 1 of the meta-regression analyses, only the date of publication was statistically significant—newer studies had lower prevalence of opium abuse. Model 2 (variables with p < 0.2 from model 1) has identified that the prevalence is significantly higher in older students, and in studies with multistage sampling, and is lower in newer studies.

Pooled prevalence in female and mixed
Sixteen papers reported prevalence of opium abuse in female students. The random-effect model was used because of significant between-study heterogeneity (Q = 260.09, p < 0.001, I² = 94.2%). The pooled prevalence of opium abuse in female students was 2.0% (95% CI = 1.0–2.0%) (Figure 2). The pooled prevalence in the high school students was higher than for college students. No differences were seen for subgroup analyses based on sampling methods, age, and sample size. But, the prevalence was greater in studies conducted after 2005 than studies before this date (Figures S8–S11). The publication bias test was significant; however sensitivity analysis did not show any significant difference by excluding any single study (Figures S12 and 13). As shown in Table S2, meta-regression analysis found a significant linear association between the increase in age and the increase in prevalence of opium abuse in female.

Forest plot of studies in which men and women were not separated was shown in Figure 3. Among the 12 included studies, the heterogeneity was significant and pooled prevalence was 4.0% (95% CI = 3.0–5.0%). The prevalence in the colleges was observably higher than for high schools (Figure 3). The subgroup analysis was not significant except for age categories (Figures S14–S17). The Egger’s bias test and sensitivity analysis did not show any significant results.

Discussion
This descriptive meta-analysis of opium abuse prevalence in Iranian youth identified 23 surveys including 52,173 subjects. There were five important findings: (a) pooled prevalence of opium abuse in young Iranian male, female, and overall was 6.0%, 2.0%, and 4.0%, respectively; (b) higher prevalence in male compared with female; (c) higher prevalence in male college students compared with male high school students; (d) lower prevalence in female college students compared with female high school students; and (e) decreasing prevalence in male during past 30 years.

Based on a thorough literature search, we did not find any meta-analysis with the aims of assessing opium abuse prevalence in a country level. The net prevalence of opium abuse has been little studied, and most researchers have reported opiate and opioid prevalence. The 2012 United Nations Office on Drugs and Crime (UNODC) had reported that prevalence of opiates and opioids among the population aged 15–64 in the world was 0.5% and 0.8%, respectively. The prevalences were highest in the Eastern Europe and South-Eastern Europe (1.2–1.3%), Oceania (2.3–3.4%), and North America (3.8–4.2%). It is important to note, however, that these prevalences are not only opium use and a large percent of it is heroin and prescription opioids (UNODC, 2012). Compared with these global reports which includes all type of opiates and opioids, the pooled prevalence of lifetime opium abuse was considerably high in Iran. This may be because of the historical root of opium and its derivatives use in Iran, which may lead to increase in prevalence of opium abuse compared to other illicit drugs such as cannabis and methamphetamines (Nazarzadeh et al., 2014b; Siassi & Fozouni, 1980). On the other hand, it should be noted that all of the included studies in the present meta-analyses identified abuser people using questionnaires and direct questions. Consequently, false-negative answers to questionnaires may lead to underestimation of prevalence.

This meta-analysis study provides a comprehensive knowledge about opium abuse status in Iranian high schools and colleges and calculated the best estimate of prevalence based on existing information. But, a number of limitations should be considered when interpreting the results of the current meta-analysis: (a) significant heterogeneity in all pooled and subgroup analysis, (b) incomplete information about response rate and questionnaires validity and reliability (these variables may be important source of heterogeneity), and (c) no coverage for gray literature such as unpublished works. Based on the present meta-analysis results, the authors suggest the conduction of a descriptive meta-analysis in international level for the determination of opium abuse status in young people worldwide.

In conclusion, the results of this meta-analysis indicate that prevalence of opium abuse in Iranian high school and college students is higher than for other countries as well as sampling methods, and level of education and age are in association with variation in prevalence across provinces. Meanwhile, a decrease in prevalence in male students during past 30 years is notable.
Table 1. Characteristics of included studies in pooled analysis (only men).

| First author | Date | Province | Age (years) (mean or range) | Student’s grade | Sampling method | Sample size | Measurement tool | Validity percent or DSM use | Reliability percent | Response rate | Current n (%) | 1 week n (%) | 1 month n (%) | Lifetime n (%) |
|--------------|------|----------|-----------------------------|----------------|----------------|-------------|----------------|-----------------------------|--------------------|--------------|---------------|---------------|----------------|----------------|----------------|
| Ahmadi J     | 2001 | Fars     | 13.5                        | High school    | Multistage     | 470         | Questionnaire  | DSM-IV                     | NM                 | NM           | 0             | –             | –             | 3 (0.64)       |
| Ahmadi J     | 2000 | Fars     | 17.2                        | High school    | Multistage     | 197         | Questionnaire  | DSM-IV                     | NM                 | 94.5%        | 3 (1.5)       | –             | –             | 13 (6.6)       |
| Ahmadi J     | 2000 | Fars     | 22.8                        | College students | Multistage     | 59          | Questionnaire  | DSM-IV                     | NM                 | 93%          | 3 (5.1)       | 6 (10.2)      | 17 (28.8)      |
| Ahmadi J     | 2000 | Fars     | 24.3                        | College students | Multistage     | 329         | Questionnaire  | DSM-IV                     | NM                 | 90.1%        | 29 (8.8)      | –             | –             | 98 (29.8)      |
| Jodati AR    | 2001 | Tabriz   | 21.3                        | College students | NM            | 173         | Questionnaire  | NM                       | NM                 | 79%          | –             | –             | –             | 11 (6)         |
| Mohamadi N   | 2008 | Hamadan  | 20                          | College students | Census        | 430         | Questionnaire  | NM                       | 95%                | 86%          | –             | –             | –             | 32 (7.5)       |
| Poorasli A   | 2005 | Tabriz   | 16.3                        | High school    | Multistage     | 1785        | Questionnaire  | NM                       | NM                 | NM           | –             | –             | –             | 6 (0.4)        |
| Mohammadkhani Sh | 2012 | Survey include 10 province | 15.5            | High school    | Multistage     | 1283        | Questionnaire  | 0.87                     | NM                 | 95%          | –             | –             | (0.5)         | (2.5)         |
| Mortazavi, G | 2003 | Birjand  | 20–24                       | College students | Random       | 361         | Questionnaire  | NM                       | NM                 | 87%          | –             | –             | –             | 2 (0.55)       |
| Najafi K     | 2005 | Guilan   | 15–20                       | High school    | Random        | 1041        | Questionnaire  | NM                       | 66%                | 98.8%        | –             | –             | –             | 34 (3.3)       |
| Nakhaee N    | 2005 | Kerman   | NM                          | High school    | Stratified    | 256         | Questionnaire  | NM                       | NM                 | NM           | –             | –             | –             | 8 (3.2)        |
| Zardkhanesh S | 2011 | Survey include 5 province | 18–35           | College students | Stratified    | 3372        | Questionnaire  | 0.74–0.90                 | NM                 | NM           | –             | –             | –             | 175 (5.2)      |
| Ziaddini H   | 2001 | Kerman   | NM                          | High school    | Census        | 1945        | Questionnaire  | NM                       | NM                 | 94.8%        | (25.1)        | (11.9)        | (9.3)         | (13.2)        |
| Nazarzadeh M | 2012 | Ilam     | 17.2                        | High school    | Multistage     | 937         | Questionnaire  | NM                       | NM                 | 93.7%        | –             | –             | –             | (2.8)         |
| Ahmadi J     | 2008 | Fars     | 23.03                       | College students | Multistage    | 150         | Questionnaire  | DSM-IV                     | NM                 | 78.8%        | 3 (2.0)       | –             | –             | 26 (17.3)      |
| Siyam Sh     | 2005 | Guilan   | NM                          | College students | Multistage    | 800         | Questionnaire  | NM                       | NM                 | 100%         | –             | –             | –             | 39 (4.87)      |
| Shamsalizadeh N | 2007 | Kurdistan | NM                          | College students | Census        | 427         | Questionnaire  | NM                       | 0.82              | 89.20%       | –             | –             | –             | 35 (8.2)       |
| Alaee R      | 2011 | Alborz   | 16.5                        | High school    | Multistage     | 208         | Questionnaire  | Youth Risk Behavior Surveillance System (YRBSS) | 0.87              | 100%         | –             | –             | –             | 4 (2.1)        |
| Talaei A     | 2007 | Khorasan | 18–35                       | College students | NM            | 485         | Questionnaire  | NM                       | NM                 | NM           | –             | –             | –             | 8 (1.64)       |
| Mardani H    | 2010 | Hormozgan | 18–35                       | College students | Stratified Random | 150         | Questionnaire  | NM                       | NM                 | 88.57%       | –             | –             | –             | 10.0 (6.67)    |
| Agahi C      | 1982 | Esfahan  | 14–18                       | High school    | Random        | 712         | Questionnaire  | NM                       | NM                 | NM           | –             | –             | –             | 85 (12.0)      |
| Ahmadi J     | 2003 | Fars     | 23.78                       | College students | Multistage    | 1126        | Questionnaire  | DSM-IV                     | NM                 | 96.9%        | 16 (1.4)      | –             | –             | 102 (9.1)      |
| Ahmadi J     | 2003 | Fars     | 11.15                       | College students | Multistage    | 1034        | Questionnaire  | DSM-IV                     | NM                 | 98.48%       | 1 (0.1)       | 2 (0.2)       | 6 (0.6)        |
| Shamsipour M | 2010 | Tehran   | NM                          | College students | NM            | 521         | Questionnaire  | NM                       | NM                 | 95.03%       | –             | –             | –             | (2.4)         |

NM: not mentioned.
| First author  | Date | Province | Age (years (mean or range)) | Student’s grade | Sampling method | Sample size | Measurement tool | Validity percent or DSM use | Reliability percent | Response rate | Current n (%) | 1 week n (%) | 1 month n (%) | Lifetime n (%) |
|--------------|------|----------|-----------------------------|-----------------|----------------|-------------|------------------|----------------------------|-------------------|---------------|--------------|--------------|--------------|--------------|----------------|
| Ahmadi J     | 2000 | Fars     | 15.85 High school students  | Multistage      | 200            | Questionnaire | DSM-IV          | NM                     | 94.5%             | 0             | –            | –            | 1 (0.5)      |              |
| Ahmadi J     | 2000 | Fars     | 20.33 College students      | Multistage      | 341            | Questionnaire | DSM-IV          | NM                     | 93%               | 0             | –            | 11 (3.2)    | 17 (5.0)     |              |
| Ahmadi J     | 2000 | Fars     | 22.13 College students      | Multistage      | 172            | Questionnaire | DSM-IV          | NM                     | 90.1%             | 2 (1.2)       | –            | –            | 8 (4.7)      |              |
| Mortazavi, G | 2003 | Birjand  | 20–24 College students      | Random          | 509            | Questionnaire | NM              | NM                     | 66%               | –             | –            | –            |              |              |
| Najafi K     | 2005 | Guilan   | 15–20 College students      | Random          | 886            | Questionnaire | NM              | NM                     | 66%               | –             | –            | –            | 13 (1.5)     |              |
| Nakhaee N    | 2005 | Kerman   | NM High school students     | Stratified      | 396            | Questionnaire | NM              | NM                     | 87%               | –             | –            | –            | 26 (6.6)     |              |
| Zardkhanesh  | 2011 | Survey include 5 province    | 18–35 College students | Stratified      | 4980           | Questionnaire | 0.74–0.90       | NM                     | 94.8%             | (34.3)        | (3.4)        | (12.9)       | (12.9)       |              |
| Ziaadini H   | 2001 | Kerman   | NM High school students     | Census          | 1373           | Questionnaire | NM              | NM                     | 94.8%             | (34.3)        | (3.4)        | (12.9)       | (12.9)       |              |
| Ahmadi J     | 2008 | Fars     | 23 College students         | Multistage      | 150            | Questionnaire | DSM-IV          | NM                     | 78.8%             | 1 (1.2)       | –            | –            | 2 (1.3)      |              |
| Mohammadkhani Sh | 2012 | Survey include 10 province Kurdistan | 15.5 High school students | Multistage      | 1255           | Questionnaire | 0.87            | NM                     | 95%               | –             | –            | (0.1)        | (0.2)        |              |
| Shamsalizadeh N | 2007 | NM College students          | Census          | 614            | Questionnaire | NM              | 0.82            | 89.20%                  | –                 | –             | –            | 13 (2.1)     |              |
| Alaee R      | 2011 | Alborz   | 16.5 High school students  | Multistage      | 239            | Questionnaire | Youth Risk Behavior Surveillance System | 0.87 | 100%     | –             | –            | 5 (2.1)      |              |
| Talaei A     | 2007 | Khorasan  | 18–35 College students      | NM              | 358            | Questionnaire | NM              | NM                     | 88.57%            | –             | –            | –            | 2 (1.25)     |              |
| Mardani H    | 2010 | Hormozgan | 18–35 College students      | Stratified Random | 160           | Questionnaire | NM              | NM                     | 96.9%             | 3 (0.2)       | –            | –            | 8 (0.6)      |              |
| Ahmadi J     | 2003 | Fars     | 23.78 College students      | Multistage      | 1393           | Questionnaire | DSM-IV          | NM                     | 95.03%            | –             | –            | –            | (0.3)        |              |
| Shamsipour M | 2010 | Tehran   | NM College students         | NM              | 1047           | Questionnaire | NM              | NM                     | 95.03%            | –             | –            | –            | (0.3)        |              |

NM: not mentioned.
Table 3. Characteristics of included studies in pooled analysis (studies in which men and women were not separated).

| First author         | Data   | Province  | Age (years) | Student’s grade | Sampling method | Sample size | Measurement tool | Questionnaire | Validity percent or DSM use | Reliability percent | Response rate | Current n (%) | 1 week n (%) | 1 month n (%) | Lifetime n (%) |
|----------------------|--------|-----------|-------------|----------------|-----------------|-------------|-----------------|---------------|-----------------------------|---------------------|---------------|----------------|--------------|---------------|----------------|
| Ahmadi J             | 2000   | Fars      | 24.03       | College students | Multistage      | 346         | Questionnaire   | DSM-IV        | NM                          | 73%                 | 5(1.4)        | (29.8)        |              |               |               |
| Ghavidel N           | 2008   | Alborz    | 17.3        | High school   | Multistage      | 400         | Questionnaire   | NM            | 72%                         | 93%                 | –             | –             | (0.8)        | (2)           |               |
| Mohtasham-Amiri, Z   | 2005   | Guilan    | 22.2        | College students | Multistage | 1800       | Questionnaire   | NM            | Monitoring the future | 93.5%               | –             | –             | –             | (2.7)         |               |
| Shamvandizadeh N     | 2007   | Kurdistan | NM          | College students | Census      | 1056       | Questionnaire   | NM            | 0.82                        | 89.20%              | 1(0.1)        | 4(0.4)        | 51 (4.8)     |               |               |
| Dehghani Kh          | 2009   | Yazd      | 22          | College students | Multistage | 534        | Questionnaire   | NM            | 86%                         | 98.8%               | –             | –             | –             | 15 (2.8)      |               |
| Taromian F           | 2006   | Tehran    | NM          | College students | Multistage | 2999       | Questionnaire   | NM            | NM                          | 99.73%              | –             | –             | –             | (2.3)         |               |
| Zarrabi H            | 2006   | Guilan    | 22.12       | College students | representative sample | 827       | Questionnaire   | NM            | NM                          | 97.86               | –             | –             | 11(1.3)      | 32 (3.86)     |               |
| Alaei R              | 2011   | Alborz    | 16.5        | High school   | Multistage      | 447         | Questionnaire   | Youth Risk Behavior Surveillance System | 0.87               | 100%          | –             | –             | 9 (2.0)       |               |
| Attari MA            | 2006   | Esfahan   | 17.19       | High school   | Multistage      | 537         | Questionnaire   | NM            | –                           | –                   | –             | –             | (2.2)         |               |               |
| Mortazavi, G         | 2003   | Birjand   | 20–24       | College students | Random      | 870         | Questionnaire   | NM            | NM                          | 87%                 | –             | –             | –             | 3 (0.3)       |               |
| Goreishi A           | 2010   | Zanjan    | 21.3        | College students | Stratified Random | 1200       | Questionnaire   | DSM-IV        | 0.89                        | 0.90                | (0.1)        | –             | (0.5)        | (20.0)        |               |
| Talaei A             | 2007   | Khorasan  | 18–35       | College students | Random      | 843         | Questionnaire   | NM            | NM                          | –                   | –             | (15.1)        | –             |               |               |
| Sahraian A           | 2009   | Fars      | 22.15       | College students | Random      | 971         | Questionnaire   | DSM-IV        | NM                          | 97.1%               | (0.1)        | –             | –             | 2 (0.2)       |               |
| Sarajzadeh H         | 2003   | Survey include 15 province Tabriz | 21.3 | College students | Multistage | 5231       | Questionnaire   | NM            | NM                          | –                   | 476 (9)      | –             | –             | (1)           |               |
| Poorasl A            | 2010   | Tabriz    | 15.7        | High school   | Multistage | 4903       | Questionnaire   | NM            | NM                          | 96.02%              | –             | –             | –             | 28 (0.6)      |               |
| Najafi K             | 2005   | Guilan    | 15–20       | High school   | Random        | 1927       | Questionnaire   | NM            | 66%                         | 98.8%               | 3 (0.15)     | 1 (0.05)      | 4 (0.2)      | 47 (2.4)      |               |
| Ahmadi J             | 2001   | Fars      | 25.5        | College students | Multistage    | 184        | Questionnaire   | NM            | NM                          | –                   | –             | –             | –             | (4.9)         |               |
| Ghanizadeh A         | 1999   | Fars      | 18–31       | College students | Random      | 216        | Questionnaire   | NM            | NM                          | 98.18%              | –             | –             | –             | 45 (21)       |               |
| Momtazi S            | 2009   | Zanjan    | NM          | College students | High school Cluster sampling | 537       | Questionnaire   | NM            | NM                          | 89.5%               | –             | –             | –             | (1.9)         |               |
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Declaration of interest
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