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REVIEW ARTICLE

The prevalence of current water pipe use among Iranian male population: a systematic review and meta-analysis

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Abstract: **Introduction:** Waterpipe as a traditional method of tobacco consumption is a public health challenge. Considering the growing trend of waterpipe (hookah) use in Iran, this systematic review aimed to measure the pooled prevalence of waterpipe current use among Iranian men. **Materials and Methods:** The present systematic review was conducted on the published cross-sectional studies during 2009-2019 aiming at estimating the prevalence of waterpipe current use among Iranian men. Current use of waterpipe was defined as using waterpipe within the preceding 30 days. Random Effect model was used to estimate the pooled prevalence by STATA v.14. **Result:** Ten cross-sectional epidemiologic studies with a total sample size of of 6,263 were included in the meta-analysis. The pooled prevalence of waterpipe current use among Iranian men was estimated at 25% (95% Confidence Interval: 30-20%). **Conclusion:** There are a variety of definitions for current use of waterpipe across studies. The results of this study suggest a high prevalence of current use of waterpipe among Iranian men during 2009-2019. Increased use of waterpipe in communities should be considered as a public health concern and a matter of priority by health policymakers. Preventive programs should take into account the acceptability and appealing nature of waterpipe among Iranian population and consider them as important modifiable factors.

Keywords: Waterpipe; Systematic review; Men; Iran

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1. Introduction

Waterpipe smokes tobacco by ignition through a water basin and pipe and was emerged nearly 400 years ago in Iran, India, Turkey, and North Africa. It is now considerably popular across the mentioned countries, especially Iran (1). Tobacco smoking is reported to start usually in age group of 13-20 years in Iran while younger adults tend to increase its spread (2). One session of waterpipe use usually takes 20-80 minutes and provides a higher amount of nicotine, carbon monoxide, and other harmful substances. The results of the meta-analysis in 2015 on global literature suggested that the amount of bodily absorption of nicotine following one session of waterpipe equals to smoking 10 cigarettes a day. Thus, regular waterpipe users are at high risk of nicotine addiction(3).

Previous studies have shown that waterpipe use increases the risk of lung cancer, chronic respiratory disease, low birth weight, and periodontal diseases (4, 5). It also causes a decrease in quality of life, especially in forms of physical functions, body pain, general health, mental health, and social functions (6). There are huge differences in waterpipe prevalence among communities worldwide. Various studies consistently report that compared to women, men start smoking cigarette and wate pipe at younger ages. The results of a meta-analysis in Iran estimated that a reasonable proportion of men use waterpipe for more than 5 years. The same study estimated a pooled prevalence of joint smoking (both cigarette and waterpipe) as 16% among Iranian men (2). The

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growing trend of waterpipe use and its considerable popularity among men necessitates addressing this type of tobacco use in Iranian males. Nevertheless, evidence on the prevalence of waterpipe use and its modifiable risk factors among Iranians males is limited.

From another perspective, equal health risks of waterpipe as cigarette has been notified constantly by the international health organizations such as World Health Organization (7). These alerts have been accompanied by encouragements of scientific societies to conduct more accurate studies to better understand the health effects of waterpipe. The aim of the present study was to review epidemiologic evidence reporting the prevalence of waterpipe use among Iranian men during 2009-2019.

2. Materials and Methods

This systematic review was a part of a project entitled:"Delineation of Men's Health Status in Iran during 2009-2019" which has been granted and supervised by the Men's Health & Reproductive Health Research Center. The present review addressed current use of water pipe among Iranian male population during 2009-2019. Inclusion criteria was defined as all cross-sectional studies reporting prevalence of current use of water pipe in Iran general population or any particular population of males published between 2009 and 2019. No language restriction was applied to the studies, since the studies presumably would publish either in English or Farsi.

International scientific databases such as MedLib, Scopus, Web of Science, and national databases including SID and Iran Medex were searched with the following keywords: Smoking, Tobacco smoking, Water pipe, Hookah, Shisha, Hubble-Bubble, Substance abuse, Iran/Iranian, men/male. To find further related articles, references of extracted studies were also reviewed.

Duplication removal was performed by two independent researchers while any disaggrement was resolved by the third party. Finally, 10 articles with the same definition for current use of waterpipe included in the meta-analysis.

The extracted data included author information, publication year, sample size, and the estimated prevalence of current use of waterpipe among men. The study outcome was determined as current waterpipe smoking and was defined as "using waterpipe as much as one session during the past 30 days". To calculate standard error for prevalence estimates, the exact method and binary distribution were used. Heterogenous Cochrane test (Q) was used to assess the heterogeneity between studies. The results of this test suggested that the Random Effect model is a perfect strategy for estimating the pooled prevalence of current use of waterpipe ($P<0.001$). Forest plot was depicted on the prevalence estimation and 95% confidence intervals (CIs) so that the size of the squares indicate the specified weight based on the sample size and vertical lines indicate 95%CI in the estimated prevalence in each study and the estimated pooled prevalence. Data was analyzed using Stata v.14 4 (Stata Corp., College Station, TX, USA).

3. Results

In total, 113 articles were screened, of those 100 were assessed by either abstract or full-text (depending on accessibility of full-text) to check for eligibility criteria for the study. At the exclusion phase, following reasons applied to exclude 90 articles from the article pool: studies on adolescent population (n=25), Knolwledge-Attitude-Practice (KAP) studies (n=10), economic analysis on the health effects and tax issues of tobacco (n=6), health effects of water pipe on diseases/disorders (n=12), environmental pollutants, hazardous substances following waterpipe smoking (n=8), review/letter to editor/ editorials (n=11), Experimental designs(n=7), and other (n=11). (Figure 1)

Ten cross-sectional epidemiological studies with a total sample size of 6263 were included in the meta-analysis. Table 1 summarizes the description of the included studies. Ghafouri et al. using a self-administered checklist reported a 51% of current use of waterpipe among 358 freshmen university students. The prevalence of current use of waterpipe was slightly higher among male students (52%)(8). In a population-based cross-sectional study, Abdollah pour recruited 1057 Iranian adults between 2013 and 2015, in Tehran city. The prevalence of water-pipe smoking estimated as 20.25% (95% CI: 18–23%)) in adults in Tehran. The authors reported that total current waterpipe use was reported from 175 subjects (prevalence: 16.60%, 95%CI: 15-19%) in the study population. Among male subsample, 127 (24.80%) reported current use of waterpipe (9). Sabahy et al, on a random sample of 1024 university students at two major universities in South Iran administered a three-part questionnaire. The authors estimated the prevalence of current waterpipe smoking in the respondent (within the last 30 days) as 18.7%. Current waterpipe use further estimated as 28% among male respondents (10).

In another cross-sectional stuy in Kerman, Danaei et al, recruited 1090 adult participants using multistage sampling in 2016. The prevalence of current waterpipe smoking were 28.8% (men: 36.9%, women: 20.6%) ($P<0.001$). Men initiated to use waterpipe in more early ages than women ($P<0.001$) and used waterpipe 2.8 times more frequently than women (11). On a national survey done by Keshavarz et al, among Iranian dental students. All 4th-year students of 8 randomly selected dental schools were surveyed anonymously in December 2010 (n=325). Of participants, 50.8% had used water-

Table 1: General description of the included study

Author(year of publication)	Study Location	Sample size*	Estimated prevalence	95%CI	Weight
Ghafouri (2011) (8)	Nationwide	296	0.29	0.24, 0.35	9.61
Keshavarz (2013) (12)	Nationwide	111	0.29	0.21, 0.38	8.21
Safiri (2016) (15)	Tabriz	704	0.21	0.18, 0.25	10.31
Kabir (2016)(16)	Karaj	658	0.14	0.12, 0.17	10.40
Abbasi-Ghahramanlou (2016)(14)	Tehran	614	0.16	0.13, 0.19	10.34
Sabahy (2011)(10)	Kerman	507	0.28	0.24, 0.32	10.05
Hesami (2017) (13)	Tehran	883	0.24	0.21, 0.27	10.36
Abdollahpour (2019)(9)	Tehran	513	0.17	0.13, 0.20	10.26
Sharifi (2009) (17)	Tehran	1426	0.32	0.30, 0.35	10.45
Danaei (2017)(11)	Kerman	551	0.37	0.33, 0.41	10.02
Overall	6263	0.25	0.20	0.30	100.00
		Heterogeneity statistic	Degrees of freedom	p-value	I^2
Test of heterogeneity		200.33	9	<0.001	95.51%

*only in male population.

pipes, which was 62.7% among male students (12).

In a cross-sectional study, Hessami et al, recuited 1830 residents over the age of 15 from Tehran city during 2013-14. The prevalence of current waterpipe tobacco smoking was 17.6%. Waterpipe use was significantly more in men than women (24.2% vs. 11.3%) (13). In another study on 1992 randomly selected sample of students of Tehran University of Medical Sciences during 2012 – 2013, last month prevalence rates of waterpipe smoking was 8.9% (95% CI: 7.7 - 10.2). More specifically, prevalence of waterpipe use within the last 30 days was estimated as 15.8% in male subjects (14). Safiri et al, conducted an anonymous cross-sectional study in October 2015 and November 2015 on 1,777 students from Tabriz University of Medical Sciences. The prevalence of waterpipe use (>1 time/month) was estimated as 11.6% (95% CI: 10.0,13.1). The prevalence of water pipe use among male students was further estimated as 21.3% (95%CI:18.2–24.3%)(15).

Kabir et al, in a study on 1959 Karaj university students used a self-administered questionnaire to measure current use of water pipe. The prevalence of water pipe use within the last 30 days was estimated as 3.4% (95%CI:2.7, 4.3%) , which was 4.9% among male students(16).

Sharifi et al, in a cross- sectional study among a random population of 2053 residents in the main squares of Tehran city reported that 17.9% of the respondents reported using waterpipe at least once a month. They further reported than among male smokers, 8.5% consumed water pipe once a week, and 14% consumed once a month (17). In order to check for publication bias, funnel plot of the study-specific prevalences was depicted over their standard errors. The results of the funnel plot showed that there is a random variability across included studies. Publication bias, however; was unlikely to affect study results (Figure 2). The pooled prevalence of current smoking of waterpipe among Iranian men was estimated at 25% (95% CI= 20-30%) (Figure 3).

4. Discussion

A total of 31 cross-sectional studies were conducted aiming at measuring the prevalence of current use of waterpipe during 2009-2019. The results of our search showed that the time bound to define current use of waterpipe varied vastly across different studies. The time bound was as narrow as daily use, to wider periods such as the past 6 months, last year, and lifetime use. To unify the definition of waterpipe use, those studies using "waterpipe use during the past 30 days" were included in the meta-analysis.

Waterpipe use is considered one of the current growing problems especially in Eastern Mediterranean countries such as Arabic countries, Iran, and Turkey. The results of the present study suggested that on average, nearly one-quarter of Iranian men have smoked water pipe during the preceding 30 days.

The observed high prevalence might be due to the incorrect beliefs and attitudes regarding harmlessness of waterpipe and its social acceptance compared to other forms of tobacco smoking(18). Waterpipe smoking is an acceptable way of smoking in Iranian society while most of the households do not take its harms seriously (14, 19). Today, increased media advertisements and marketing fruit-flavored tobacco substances have increasingly grown the waterpipe use among the youth, which has a direct impact on social acceptability of water pipe(20). Thus, increasing the community's knowledge are associated with substantial decrease in waterpipe use. The study by Ghafouri et al, found that the majority of waterpipe users had initially experienced it with their friends or families. More than one-third of users had another waterpipe user in their families/friends. The entertain-

ing and social aspects of waterpipe were the main reasons for continuing waterpipe use (21). The results of other studies such as Danaei further confirm that finding, which underlies two additional inferences. First, there is a high prevalence of waterpipe use family circle. Second, there is an attitude in favor of water pipe compared to other Tobacco and non-tobacco sunbstances. These inferences highlight the importance of designing and implementing preventive programs with focus on the primary level prevention in communities, especially in the younger age groups and their family members. On the other hand, target-oriented strategies such as delivering the lifeskills to say no to temptations (rejection) and increasing self-confidence and self-reliance skills against the pressures from friends are amongst effective approaches to control water pipe epidemic from a behavioral perspective(22).

According to Taremian et al., positive attitude to waterpipe use, defeating stress, and a sense of calmness are the main reasons for using waterpipe among Iranian students(23). Therefore, unawareness can not necessarily be the only factor of a tendency to use waterpipe and other determinant factors such as attitude, social norms, perceived social pressures, cultural components, and other related factors must be taken into account. In the majority of the studies, male gender was considered as one of the risk factors of waterpipe use. Lower consumption of water pipe among women might be partially due to the fact that water pipe is a less social behavior for women in Iran while they tend to consider it as an entertainment rather than a pattern of behavior(24). Hence, it is suggested that the health system should focuse on men population as the main target for preventive programs. The present systematic review and meta-analysis was conducted to determin the prevalence of current waterpipe use among Iranian men in a 10-year period. the stregths of the study was a homogenous sample of cross-sectional studies, which yielded results with similar level of accuracy. The study limitation stemmed from various and inconsistent definitions and measurement tools for waterpipe use in Iran.

5. Conclusion

The results of the present study suggested that despite the high prevalence of waterpipe use, it seems programs on controlling tobacco smoking should focus on the water pipe as a method of tobacco smoking which is more acceptable in Iranian society especially among men.

Furthermore, considering an increase in the water pipe in the society and its prevalence among younger age groups, national health authorities must address this issue as a priority and urgency and make a plan to provide proper and accessible entertainment for the young people, decrease social stressors, train the life skills to struggle against stress, regulations to ban waterpipe smoking in public as well as educatethe community ofhealth consequences of waterpipe.

6. Appendix

6.1. Acknowledgements

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6.2. Authors Contributions

All the authors have shared the same workload and thereby are entitled to equal acknowledgement.

6.3. Funding Support

None.

6.4. Conflict of Interest

The authors declare no conflict of interest.

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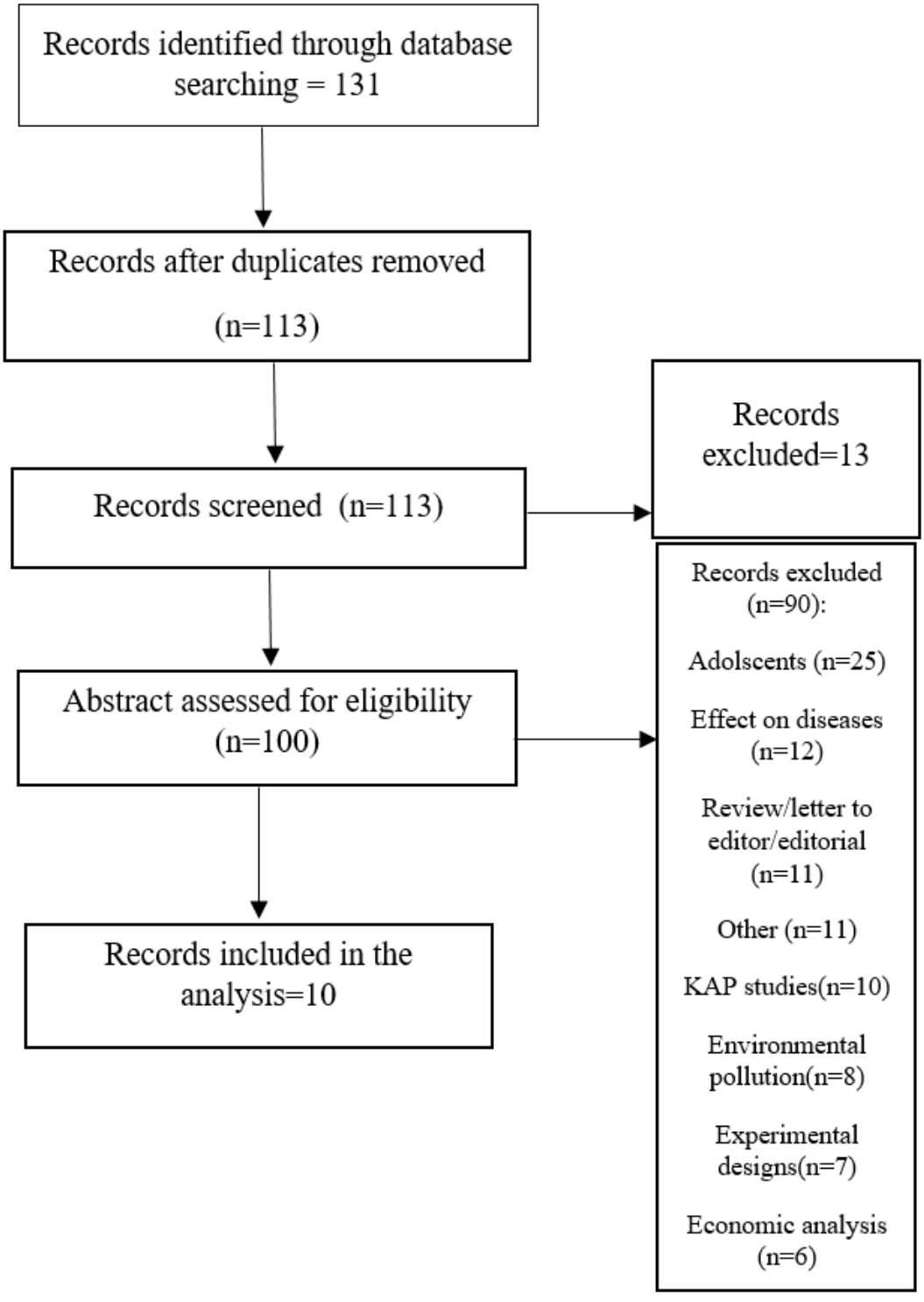

Figure 1: PRISMA flow diagram for study selection.

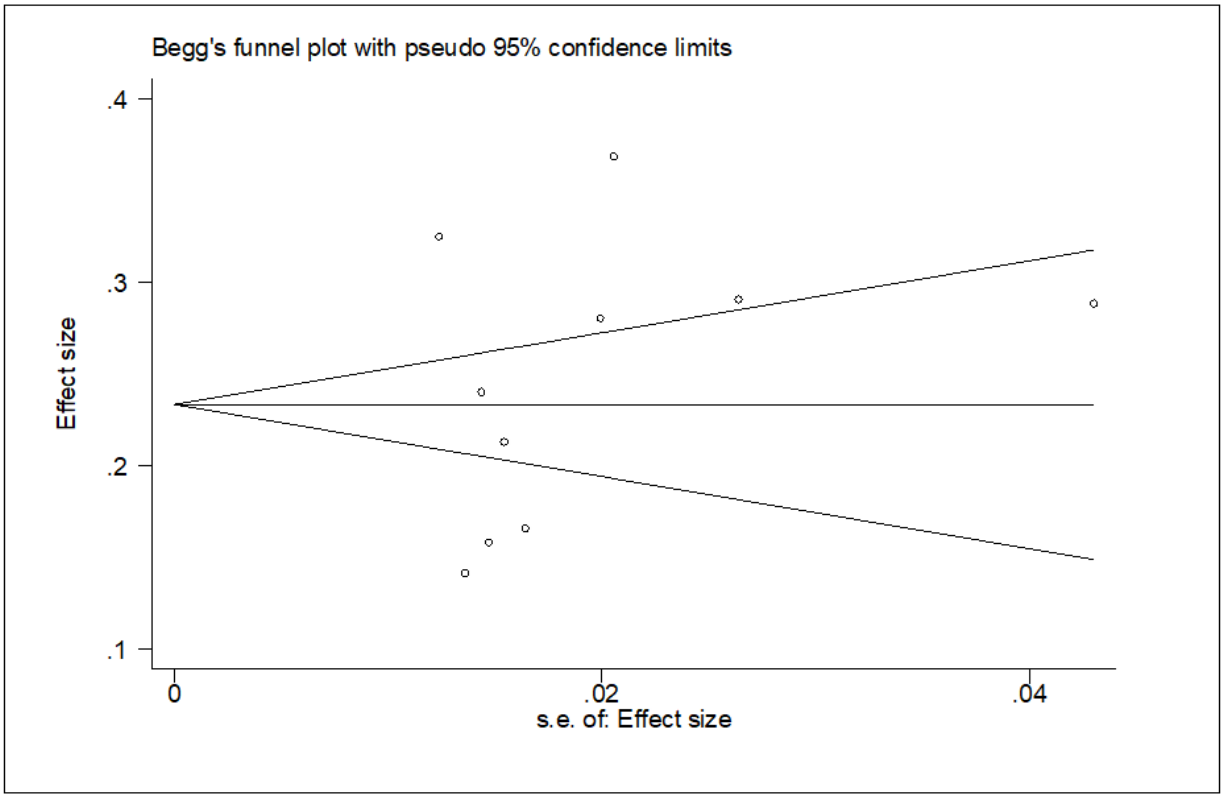

Figure 2: Begg's funnel plot for assessing risk of publication bias for included studies.

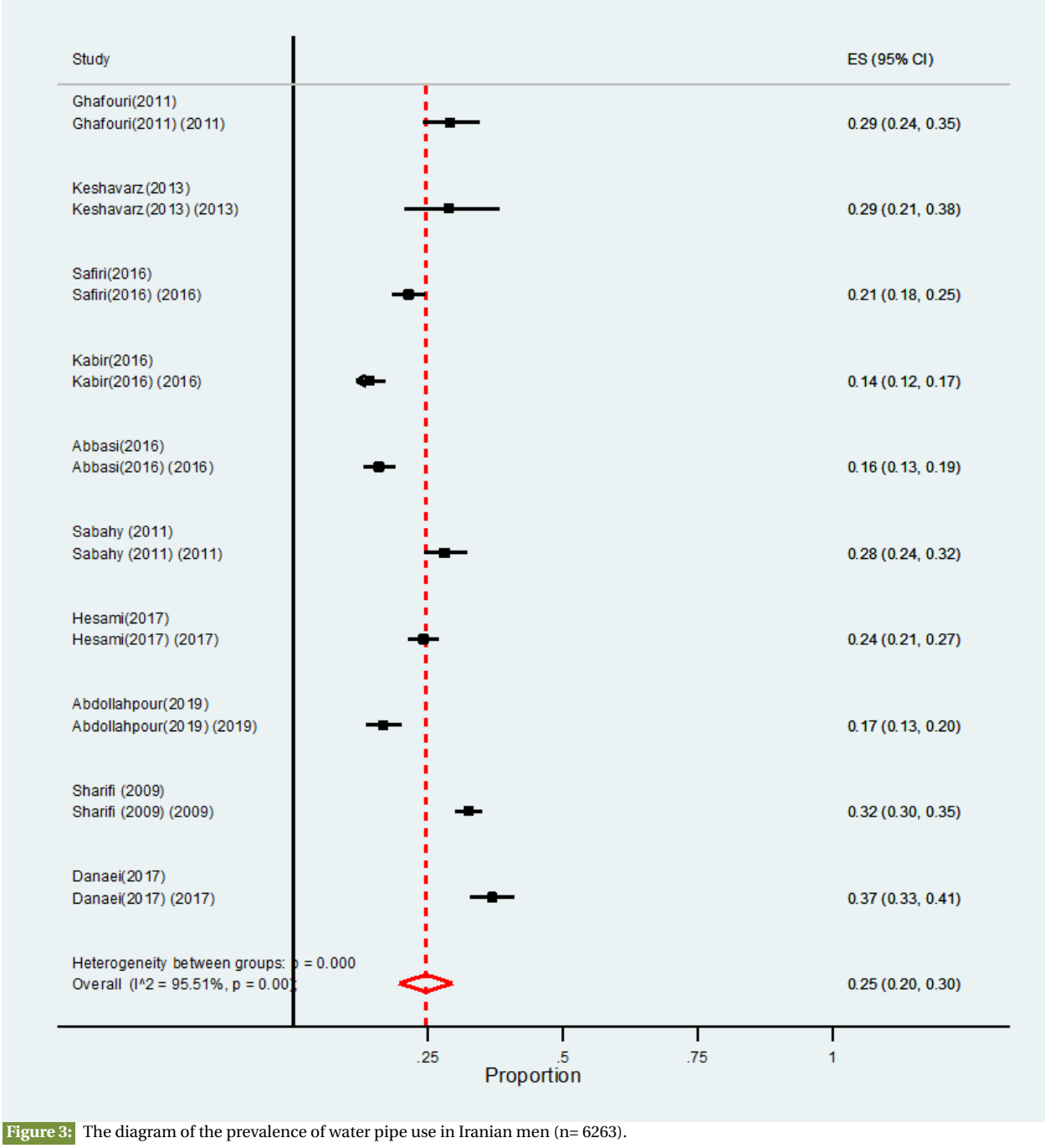

Figure 3: The diagram of the prevalence of water pipe use in Iranian men (n= 6263).