

Original Article

Epidemiologic Study of Opium Use in Pars Cohort Study: A Study of 9000 Adults in a Rural Southern Area of Iran

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Abstract

Background: Opium is one of the most common substances used worldwide with variable epidemiologic features in different regions. This study was performed in southern Iran, to find the epidemiology of opium use and its association with different factors and diseases.

Methods: This cross-sectional study was performed on baseline data extracted from Pars Cohort Study performed in Valashahr, a rural area in southern Iran. For any subject, information was collected about demographic factors, some common diseases including heart disease, stroke and hypertension and the state of using opium, other substances and cigarettes.

Results: There were 4276 males and 4988 females, with a mean age of 52.6 ± 9.7 years of whom 8.4% reported opium use (17.3% of males and 0.7% of females). In men, the history of stroke and heart disease were significantly more common in opium users (12.6% vs. 8.8%, $P = 0.001$ and 2.8% vs. 1.5%, $P = 0.01$, respectively) while the history of hypertension was significantly more common in non-opium users (7.8% vs. 10.3%, $P = 0.04$). Younger age, male gender, being non-married and positive history of joint pain, cigarette smoking and alcohol consumption were the factors associated with opium use.

Conclusion: Opium use is common in non-married men who have a positive history of cigarette smoking and alcohol consumption in the rural population of southern Iran. It is associated with increased risk of heart disease and stroke and decreased risk of hypertension in males. Global interventional and preventive measures are required to control this complicated social problem.

Keywords: Epidemiology, Iran, opium, risk factors, rural population

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Introduction

Opium is a substance extracted from the opium poppy¹ and its derivatives are used in medical practice, especially for analgesia.² According to World Drug Report 2015, about 16.5 million people, 0.4% of the world's adult population, use opiates such as heroin and opium.³ Based on the same report in 2013, an 18% rise has been observed in the number of illicit drug users since 2008, most importantly due to easy access and population growth.⁴ Apart from being a social problem that could impose persistent and harmful effects on the total population, opium addiction is considered a personal risk. Opium intake and dependence are detrimental to health and can result in obesity, injury and poor quality of life.^{5,6} Current evidence suggests that opium consumption is associated with increased risk of laryngeal, lung,⁷ bladder⁸ and upper gastrointestinal cancers.⁹

In addition to being a worldwide problem, opium is traditionally used in many south-central Asian countries, especially Iran,

Pakistan, Afghanistan and India.¹⁰ Considering the long border between Iran and Afghanistan (a country with large opium production), opium is readily available in Iran.^{9,11} In fact, in 2012 and 2013, Iran had the first rank regarding the quantity of opium seized.³ Opium consumption is more common in northern and southern parts of Iran.⁹ In a study on substance users in Drop in Centers in Shiraz, a major city in southern Iran, opiates were the most common substances used.¹² The opiate compounds used by Iranian people were reported to be opium, followed by *shireh* (opium residue), heroin and hashish.¹³

Recent evidence suggests that socio-demographic factors such as age, sex and occupation play an important role in opium consumption.⁵ Opiate use is more prevalent in males, people who are younger than 30 years of age, married, employed and populations with lower levels of education in Iran.¹³ The association of such factors with opium use may be different in different parts of the country and in rural areas compared with urban regions. Therefore, in this study, we evaluated the population of Pars Cohort Study, a prospective study established in southern Iran, regarding epidemiology of opium use and its association with different factors and diseases.

Materials and Methods

The Pars Cohort Study was started in fall 2012 in Valashahr district, a rural area consisting of Valashahr city and 93 villages located in Fars province in southern Iran. The total 40,000

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inhabitants of this region consist of a variety of ethnicities, mainly Fars and Turk. In this cohort study, 9721 residents aged 40–75 years were invited and 9264 (95%) of them were recruited from fall 2012 to 2014. People who were unwilling to participate in this study or were temporary residents were excluded. Further details about Pars Cohort Study have been discussed elsewhere.¹⁴

The present study is a cross-sectional study performed on baseline data of Pars Cohort Study. This research was reviewed and approved by Ethics Committee at Shiraz University of Medical Sciences and was performed in accordance with Declaration of Helsinki. All the participants gave informed written consent before their enrollment in the study.

For any subject included, a trained interviewer collected the required information through a general questionnaire.¹⁴ Our questionnaire included questions on demographic factors including age, sex, marital status, ethnicity, educational level and medical history and queries on opium use (see below), cigarette smoking, other forms of tobacco use and alcohol drinking with self-report responses. We measured height, weight and calculated body mass index (BMI) as weight divided by height squared (kg/m^2) for each participant. Blood pressure (BP) of each subject was measured by the same investigator using a mercury sphygmomanometer in a sitting position after 5 minutes of rest; two BP measurements with a ten-minute interval were done for each arm and averaged for the BP record. We also drew 5 mL-blood samples to measure fasting blood sugar (FBS), total cholesterol, low-density lipoprotein cholesterol (LDL-C) and high-density lipoprotein cholesterol (HDL-C) for each participant.

Detailed data on opium use included types of the opiates commonly used including *teriak*, heroin, *sukhteh* and *shireh*, age of start and duration of its use, routes of opium administration, typical amount of use in *nokhods* (the local unit for opium use, equivalent to 0.195 g) and frequency of use (how many days in a week if weekly or more). We calculated cumulative opium

use (*nokhod-year*) by multiplying daily amount of opium use in *nokhods* by the number of years the subject used opium. For subjects who used multiple opiate types, data for each type were recorded separately. Participants were also asked about using opium in their childhood.

Teriak, or raw opium, is a dark sticky or crumbly mass extracted from the ripening capsule of opium poppy, *Papaver somniferum*. It can be smoked or consumed orally. If opium is smoked, the remaining dross is named *sukhteh* which can be ingested. *Shireh* is produced by boiling *sukhte*, with or without adding *teriak*, in water and filtering it multiple times. Similar to *teriak*, *shireh* can be smoked or taken orally.¹⁵

We performed the statistical analyses using SPSS 21 (SPSS Inc, www.ibm.com/software/analytics/spss/products/statistics) statistical software package. Results for quantitative variables are shown as mean and standard deviation and results for categorical variables are shown in frequencies and percentages. Independent samples *t*-test and Mann-Whitney *U* test were used to compare quantitative variables with normal and non-normal distribution between opium users and non-opium users. Categorical data between these two groups were compared using χ^2 test. Logistic regression was used for assessment of factors associated with opium use. Variables with likelihood ratio test *P*-values of less than 0.1 were retained in the multivariate logistic regression model. $P < 0.05$ was considered to be statistically significant.

Results

There were 4276 males and 4988 females, with a mean age of 52.6 ± 9.7 years. Most of the subjects (88.6%) were married and 78.5% of them had ≤ 5 years of education or no education. The prevalence of opium use was 8.4% ($n = 774$) in the study population (17.3% in males and 0.7% in females). Demographic factors of the participants are listed in Table 1.

Table 1. Summary statistics for demographic characteristics of participants in Pars Cohort Study, Fars province, Iran, 2014.

Demographic characteristics	Men ($n = 4276$)		<i>P</i> [†]	Women ($n = 4988$)		<i>P</i> [†]
	Opium users ($n = 740$)	Non-opium users ($n = 3536$)		Opium users ($n = 34$)	Non-opium users ($n = 4954$)	
Age (mean yr \pm SD)	51.1 \pm 8.9	53.1 \pm 10.1	< 0.001*	56.0 \pm 12.3	52.5 \pm 9.5	0.130*
Marital status –N (%)						
Married	720 (97.3)	3453 (97.7)	0.682**	23 (67.6)	4016 (81.1)	0.047**
Non-married	20 (2.7)	83 (2.3)		11 (32.4)	938 (18.9)	
Educational level –N (%)						
Illiterate	208 (28.1)	1128 (31.9)	0.004**	23 (67.6)	3180 (64.2)	0.968***
≤ 5 years	217 (29.3)	973 (27.5)		10 (29.4)	1533 (30.9)	
6-8 years	151 (20.4)	661 (18.7)		1 (3.0)	163 (3.3)	
High school	135 (18.3)	540 (15.3)		0 (0)	60 (1.2)	
University	29 (3.9)	234 (6.6)		0 (0)	18 (0.4)	
Ethnicity –N (%)						
Fars	366 (49.5)	2003 (56.7)	< 0.001**	20 (58.8)	2829 (57.1)	0.416**
Turk	323 (43.6)	1373 (38.8)		14 (41.2)	1884 (38.0)	
Others	51 (6.9)	160 (4.5)		0 (0)	241 (4.9)	

[†]*P* calculated by: * by Mann-Whitney *U* test, ** by χ^2 test and *** by fisher exact test.

Table 2. Characteristics and pattern of opium use of the opium users in Pars Cohort Study, Fars province, Iran, 2014.

Type of opiate used –N (%)*	(n = 774)
<i>Teriak</i>	742 (95.9)
Heroin	8 (1)
<i>Sukhteh</i>	3 (0.4)
<i>Shireh</i>	25 (3.2)
Starting age of using opium (mean yr ± SD)	36.7 ± 12.3 (range 3–75)
Duration of using opium (mean yr ± SD)	11.3 ± 9.0 (range 0–56)
Administration route of opium –N (%)*	(n = 774)
Smoking	744 (96.1)
Oral	46 (5.9)
Intravenous	1 (0.1)
Amount of daily used opium (mean <i>nokhod</i> ± SD)	5.04 ± 5.68
Cumulative use of opium (mean <i>nokhod</i>-year ± SD)	58.9 ± 100.7
Days of opium use in a week (mean day ± SD)	5.9 ± 2.1
*Some people use different opiate types or different routes for opium administration; therefore, the cumulative percent is more than 100.	

Table 3. Past medical history, blood pressure and laboratory parameters, anthropometric indices and other associated characteristics of the participants in Pars Cohort Study, Fars province, Iran, 2014.

Variables	Men (n = 4276)		P†	Women (n = 4988)		P†
	Opium users (n = 740)	Non-opium users (n = 3536)		Opium users (n = 34)	Non-opium users (n = 4954)	
Heart Disease (Angina, myocardial infarction or heart failure) –N (%)	93 (12.6)	311 (8.8)	0.001*	5 (14.7)	552 (11.1)	0.422**
Mean age of diagnosis of heart disease (mean yr ± SD)	50.4 ± 10.2	54.1 ± 10.4	0.003***	56.0 ± 12.0	53.8 ± 10.3	0.635***
Stroke –N (%)	21 (2.8)	54 (1.5)	0.014*	0 (0)	91 (1.8)	0.999**
Hypertension history –N (%)	58 (7.8)	365 (10.3)	0.039*	10 (29.4)	1080 (21.8)	0.285*
Anxiety –N (%)	183 (24.7)	609 (17.2)	< 0.001*	15 (44.1)	1936 (39.1)	0.549*
Back Pain –N (%)	293 (39.6)	1258 (35.6)	0.039*	24 (70.6)	3029 (61.1)	0.261*
High systolic BP‡ –N (%)	46 (6.2)	306 (8.7)	0.028*	5 (14.7)	546 (11.0)	0.417**
High diastolic BP –N (%)	65 (8.8)	443 (12.5)	0.004*	7 (20.6)	642 (13.0)	0.197**
Systolic BP (mean mmHg ± SD)	107.8 ± 17.7	112.4 ± 17.9	< 0.001***	116.4 ± 21.0	112.3 ± 19.9	0.232***
Diastolic BP (mean mmHg ± SD)	70.9 ± 11.8	74.3 ± 11.5	< 0.001***	74.3 ± 13.2	73.2 ± 11.9	0.617***
Fasting blood sugar (mean mg/dL ± SD)	101.6 ± 30.9	103.5 ± 31.8	0.134***	112.4 ± 49.0	107.6 ± 40.4	0.500***
Total cholesterol (mean mg/dL ± SD)	184.3 ± 41.9	188.0 ± 39.3	0.021***	218.2 ± 34.8	202.8 ± 42.6	0.036***
Low-density lipoprotein cholesterol (mean mg/dL ± SD)	101.1 ± 32.8	102.6 ± 32.1	0.238***	122.0 ± 28.2	111.2 ± 35.1	0.073***
High-density lipoprotein cholesterol (mean mg/dL ± SD)	52.0 ± 10.9	54.8 ± 11.9	< 0.001***	59.6 ± 10.5	60.7 ± 13.4	0.630***
Body mass index (mean ± SD)	23.3 ± 4.2	24.6 ± 4.0	< 0.001***	27.2 ± 4.8	27.1 ± 4.8	0.897***
History of opium use in childhood –N (%)	132 (17.8)	244 (6.9)	< 0.001*	8 (23.5)	239 (4.8)	< 0.001**

†P calculated by: * by χ^2 test, ** by fisher exact test and *** by Independent samples *t*-test. ‡BP = Blood pressure.

In opium users, the most common opiate used by the participants was *teriak* (95.9%) and the most popular method of using opium was smoking (96.1%). Characteristics and pattern of opium use for these subjects are shown in Table 2.

According to Table 3, the history of heart diseases including myocardial infarction, angina and heart failure was significantly more common and occurred in younger ages in male opium users

compared to male non-opium users. Also, the history of stroke was significantly more prevalent in male opium users than male non-opium users while the history of hypertension was significantly more common in male non-opium users compared with male opium users. Considering the lipid profile and FBS, male opium users had significantly lower total cholesterol and HDL-C than male non-opium users and female opium users had significantly

Table 4. Logistic regression analysis of factors associated with opium use in Pars Cohort Study, Fars province, Iran, 2014*.

Variables	Opium users (n = 774)	Non-opium users (n = 8490)	Odds ratio (95% CI)	
			Unadjusted	Adjusted [†]
Age (mean yr ± SD)	51.3 ± 9.1	52.8 ± 9.7	0.983 (0.975 to 0.991)	0.966 (0.941 to 0.992)
Gender –N (%)				
Female	34 (4.4)	4954 (58.3)	Reference	
Male	740 (95.6)	3536 (41.7)	30.50 (21.57 to 43.12)	23.47 (7.10 to 77.60)
Marital status –N (%)				
Married	743 (96)	7468 (88)	Reference	
Non-married	31 (4)	1022 (12)	0.31 (0.21 to 0.44)	4.34 (1.10 to 17.12)
History of hypertension –N (%)				
Yes	68 (8.8)	1446 (17)	Reference	
No	706 (91.2)	7044 (83)	2.17 (1.67 to 2.86)	1.66 (0.95 to 2.93)
History of joint pain –N (%)				
No	404 (52.2)	3831 (45.1)	Reference	
Yes	370 (47.8)	4659 (54.9)	0.75 (0.65 to 0.87)	1.77 (1.05 to 2.96)
History of smoking cigarettes –N (%)				
Non-cigarette smokers	187 (24.1)	7157 (84.3)	Reference	
Cigarette smokers	587 (75.8)	1333 (15.7)	16.87 (14.17 to 20.10)	4.04 (2.34 to 6.97)
History of alcohol consumption –N (%)				
Non-alcohol consumers	683 (88.2)	8383 (98.7)	Reference	
Alcohol consumers	91 (11.8)	107 (1.3)	10.64 (7.95 to 14.23)	5.02 (1.66 to 15.20)
History of opium use in childhood –N (%)				
Non-opium users in childhood	634 (81.9)	8006 (94.3)	Reference	
Opium users in childhood	140 (18.1)	484 (5.7)	3.66 (2.98 to 4.49)	2.03 (0.99 to 4.17)

*Variables with likelihood ratio test *P*-values of less than 0.1 were retained in the logistic regression model.
[†]Adjusted for variables including age, gender, marital status, history of hypertension, history of joint pain, cigarette smoking, alcohol consumption and opium use in childhood, except if each of them is considered as stratifying variable.

higher total cholesterol than female non-opium users. However, there was no significant difference between the two groups regarding LDL-C and FBS in either gender. Male opium users had significantly lower BMI than male non-opium users while there was no significant difference regarding BMI between opium users and non-opium users in females. The proportion of subjects who were given opium in their childhood was also significantly increased in opium users than non-opium users in both genders. More details on disease history, BP, laboratory, clinical and other associated characteristics of the subjects are provided in Table 3.

According to Table 4, younger age, male gender, being non-married, negative history of hypertension and positive history of joint pain, cigarette smoking, alcohol consumption and opium use in childhood were the factors associated with opium use in opium users in multiple analysis. Other variables included in this analysis were ethnicity, educational level, history of heart disease and its mean age of diagnosis, history of stroke, anxiety and back pain and history of using tobacco other than cigarettes.

Discussion

Our results confirm that prevalence of opium addiction is considerable in the district of Valashahr, a rural area in southern Iran compared with worldwide opiate use. The most important factors associated with opium use in this area include male gender, being non-married and positive history of cigarette smoking and alcohol consumption.

The substance use pattern in rural areas is different from that in urban areas.¹⁶ Opioid use is more prevalent among the rural population, whereas other substances such as alcohol and cannabis are expected to be more prevalent among urban people.¹⁷ Similarly, opium use in this rural area in southern Iran had a high prevalence and in almost all cases, it was in the form of *teriak*.

In 2008, about 13–22 million people worldwide used opium or its derivatives as illicit drugs: about half of them were in Asia and the other half were in Europe, America, Africa and Oceania in decreasing frequency.¹⁸ Opiates are also commonly used in different parts of Iran.^{19,20} In our study in southern Iran, the prevalence of opium addiction was lower compared to a report from Golestan cohort study in northern Iran (8.4% vs. 17%)¹⁵; however, it was similar to another study performed in Babol province, a rural area in northern Iran (8.4% vs. 8.9%).¹¹ The high prevalence of addiction seen in Golestan cohort study compared to the present report might be due to presence of Turkmen people with different ethnicity in Golestan province.¹⁵ In accordance with our results, in both of the aforementioned reports, *teriak* was the most common opiate used and smoking was the most popular method of using opium.^{11,15}

According to a report from rural areas of Kerman province in eastern Iran, a substantial increase was observed in substance use over a 12-year period (from 2000 to 2012).¹⁶ The Kerman report, Golestan cohort study and Babol study were in concordance with our study regarding male predominance in opium users.^{11,15,16} Also, our study was similar to Golestan cohort study regarding the starting age (36.7 ± 12.3 vs. 39.7 ± 9.2) of using opium and

duration of using opium (11.3 ± 9.0 vs. 12.7 ± 11.1). This finding may be explained in part by similar age range of the participants in both studies.¹⁵

Opium has been shown to be an independent risk factor for coronary artery disease²¹⁻²³ and stroke.²⁴ Likewise, heart diseases including myocardial infarction and stroke were significantly increased in male opium users in the present study. We also found out that male opium users developed heart disease at an earlier age. This finding is in concordance with a study on patients with acute myocardial infarction that showed opium dependence decreased the recurrence age of the event by about 3.6 years.²⁵ These results can be contributed to the possible aggravating effects of opium on atherosclerosis formation²⁶ by increasing plasma fibrinogen²⁷. On the other hand, these finding might be due to reverse causality; i.e., patients with myocardial infarction and stroke start using opium probably because they falsely believe that opium use can be protective against these events.

Few studies have focused on the effect of opium on BP and the results are variable. Some have stated that opium users have lower risk of hypertension²⁸ while others have concluded that opium consumption does not have any considerable effect on BP or it may increase the systolic BP.²⁹ In the present study, opium use was shown to reduce both systolic and diastolic BP and decreased the prevalence of hypertension significantly in men.

Opium has been used as a tranquilizer for many years and it has been well known for its hypnotic and analgesic effects.³⁰ This fact could justify the higher prevalence of anxiety and back pain in opium users compared to non-opium users in this study; i.e., subjects with anxiety and back pain tend to use opium to relieve these conditions.

There are some controversies about opium effect on lipid profile in humans and animals: some studies have suggested that opium use has no effect on total cholesterol, LDL-C or HDL-C,^{31,32} some stated that it increases total cholesterol and LDL-C²⁶ while others have shown that it decreases total cholesterol³³ or HDL-C.³⁴ Our results indicated decreased total cholesterol and HDL-C in male opium users compared to male non-opium users and increased total cholesterol in female opium users compared to female non-opium users. Similarly, considering the opium impact on FBS, different results have been reported including significant decline,³³ increase³⁵ or no change³¹. In this study, we found no significant change in FBS in opium users compared to non-opium users in either gender.

Najafpour *et al.* reported that opium use was associated with low physical activity.³⁶ However, some reports declared that opium users had significantly lower BMI compared to non-opium users.^{32,37} Similarly, our findings showed that male opium users had significantly lower BMI than male non-opium users. Although it is not easy to identify the main cause for these findings, some possible explanations are as follows: the fact that opium users have to spend considerable amount of their income on opiates makes their dietary regimen different from that of non-opium users.³² Loss of appetite induced by opium use and drowsiness caused by insufficient intake of opium can result in weight loss.³²

The present study is one of the few studies investigating the correlated factors for opium use in a large population. Our results showed that younger age, male gender and positive history of cigarette smoking were among the factors correlated with opium use. Similarly, in a study from India, it was found that socio-demographic factors, such as age, sex, ethnicity, religion

and occupation had close association with opium use.⁵ Also, in a report from a rural area in northern Iran, opium use had a statistically significant relationship with male sex, unemployment and cigarette smoking.¹¹

In a study from China, being divorced/widowed/separated, having been encouraged by friends/others to use drugs, smoking cigarettes, belonging to the Fingpo ethnic group, and having a family member who used drugs were declared as risk factors for drug use.³⁸ In concordance with this report, we found that being non-married and positive history of cigarette smoking and opium use in childhood were correlated with opium use.

Rounsaville *et al.* suggested that most participants with alcohol use disorder in their study had alcohol problems before seeking treatment for opiate use.³⁹ Likewise, alcohol consumption was among the factors correlated with opium use in our study. In another investigation in southern Iran, Jafari *et al.* illustrated that treatment of general medical problems was one of the factors promoting the start of drug use.¹³ However, to our knowledge, the present study is the first to report negative history of hypertension and positive history of joint pain as factors correlated with opium use.

Some variables were not included in the regression model: high systolic BP, high diastolic BP, systolic BP and diastolic BP because they had significant collinearity with the variable history of hypertension, and total cholesterol, HDL-C and BMI because they were clinically considered as outcomes of opium use rather than factors associated with opium use.

Opium use is considered a social problem with harmful effects on health of individuals.⁴⁰ In countries with high prevalence of opium use, the need for early intervention, especially for at-risk population as a major public health problem, is mandatory. According to reports from Iran, finding young drug users is not only important but also helpful for policy makers to develop intervention and prevention programs more effectively.^{16,19}

The strengths of this study include large sample size and incorporation of a great variety of parameters. The main limitation to our study is its observational design which makes the study vulnerable to potential residual confounding variables. Also, because the data is collected through self-report method, the study is vulnerable to self-report response bias. Additionally, the small number of female opium users might be the reason why no significant difference was found in most of the analyses performed on females in this study. In future phases of Pars Cohort Study, other factors related to opium such as mortality and incidence of cancers associated with opium use will be investigated.

In conclusion, opium use is prevalent in the district of Valashahr, a rural area in southern Iran. The most important factors correlated with opium use are male sex, being non-married and history of cigarette smoking and alcohol consumption of the participants. Opium use is associated with increased risk of heart disease and stroke while it is reversely associated with the risk of hypertension. Global interventional and preventive measures are required to control this complicated social problem.

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