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The Correlation between Neck Pain and Disability, Forward Head Posture and Hyperkyphosis with Opium Smoking in the Most Prevalent Opium Smoking Persian Gulf Country; a Cross-Sectional Study from Iran

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Abstract: Opium smoking for long hours and over many years is common in Iran, and the Covid-19 pandemic and false beliefs about the protective effects of that opium against COVID-19 infection has caused the increasing of opium smoking during the pandemic. The aim of this study was to investigate the relationship between non-ergonomic positions of traditional opium smoking in Iran with the occurrence of neck pain and disability, forward head posture and hyperkyphosis. In this cross-sectional and correlation study 120 people who smoke opium were selected based on the inclusion criteria and were interviewed about their addiction profile and evaluated for the presence of pain and disability in the neck by Maudsley Addiction Profile, Leeds Dependence Questionnaire, the Visual Analog Scale and Neck Disability Index. Also, they were evaluated about forward head posture (FHP) through side view photography and hyperkyphosis (HK) through flexible ruler. Data were analyzed by correlation coefficient tests and stepwise linear regression. There was a significant relation between homelessness, the duration of lifetime opium smoking (months), the duration of daily opium smoking (minutes) and drug dependence severity with the severity of neck pain, neck disability, forward head posture and hyperkyphosis. Homelessness is the strongest predictive variable of the possibility of neck pain and disability, FHP and HK, followed by ''the number of months of opium smoking'' and ''the number of minutes of opium smoking in one day'' respectively. Increasing the duration of sitting in non-ergonomic positions can lead to neck pain and disability, FHP and HK due to their non-neutral posture in opium smokers.

Keywords: opiates; opium smoking; neck pain; neck disability; forward head posture; hyperkyphosis; drug use disorder; Iran

1. Introduction

Most researchers and scientists believe that addiction is a brain disease, and although they may not agree on specific neurological symptoms, they all agree that addiction has a neurobiological basis, and in addition to substance dependence, it also leads to addictive behaviors. In other words, in addition to dependence on the consumption of a substance, a person may also become dependent on the method of consumption of that substance and the tools of its consumption in the form of

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behavioral addiction (1, 2). Iran is one of the countries that faces the most problems in the field of addiction. Iran has seized more opium, morphine, and heroin than any other country in the world, based on 2022 world drug report. 98% of the opium seized in the world comes from Iran, because in addition to the international transit route, many people there have a long history and culture of opium smoking, and it is tied to the geopolitics of the region (3, 4). More than 2000,000 people are using drug daily in Iran and more than 70% of them are opiates users (5). Many addictive behaviors have shown pathogenesis in the same neurocircuitry of substance use disorder (6), and it seems that opium smokers have a combination of addictive behavior and substance dependence. In fact, using opium through smoking is an addictive behavior that is added to their dependence on opium. Opium smoking is very common due to its historical background and the special geographical conditions of Iran, and unfortunately following the outbreak of the Covid-19 pandemic and the false beliefs that opium smoking stops the spread of the Coronavirus, opium smoking increased further (7) and more than 90% of drug use in Iran is through smoking (5). In the ranking of health problems that are the cause of the most disabilities in Iran, drug use disorders are in the fourth place, and among the factors that cause death and disability, it ranks eighth (8). Drug dependents for various reasons [non-ergonomic position when using (smoking or inhalation), lack of movement and inactivity (9), malnutrition (10) and heavy smoking (11)], seem to be more prone to some of the musculoskeletal disorders. Opium dependents when smoke opium, they use three special types of tools called 'Vafour', 'Gholgholi', and 'Sikh-o-sang' in uncomfortable positions where their head tilts forward more than normal. It also can cause in their spine, making them curved over and sometimes leaning to one side (12, 13). If opium smoking in this way, which is common, continues for several hours a day and for many years, the risk of neck musculoskeletal disorder will be high, like many work-related musculoskeletal disorder caused by non-ergonomic position (14, 15).

On the other hand, musculoskeletal disorders are one of the most common health concerns in the world and in the classification of disabling health problems in 2017, musculoskeletal disorders are among the most common causes of disability and reduction of life years without disability, and lower back and neck pains are in the fourth category of these problems (16, 17). Also, in the similar report from 2020, it was announced that spinal problems and headaches are among the top ten causes of disability in the age groups between 10 to 24 years and 25 to 49 years old (18). Musculoskeletal disorders are often acquired and caused by work or non-ergonomic positions (19). Various physical and mechanical risk factors such as: long-term repetitive work (especially in non-ergonomic position), continuous lifting or lifting a heavy load, pushing, pulling or carrying heavy loads, can cause or aggravate these disorders. There is a close relationship between these disorders and improper use of body mechanics (20, 21). Bending forward and turning the neck, incorrect sitting and standing positions, and also doing repetitive manual activities are the most important factors for neck musculoskeletal disorders and there is a positive relationship between neck pain and incorrect sitting or standing position. Neck and shoulder's muscles and joints problems are also significantly related to poor postures (15, 22). Neck pain and disability is one of the most common work-related musculoskeletal disorders (23). Neck pain and disability are common in many occupations and daily and repetitive activities of life and even sports, where the upper body and upper limbs are in uncomfortable positions or a position in which the upper limb is repeatedly held forward and up (24, 25). While smoking opium, people keep their upper limbs and hands up and forward, and this position is repeated several hours a day. In the same category of jobs and daily activities and sports mentioned above, forward head posture (FHP) and hyperkyphosis (HK) are also very common, and for example, office workers and industrial brokers and even some sports such as cyclists show a higher rate of forward head posture and kyphosis (26-30). Tilting of the head and neck forward and creating a kyphotic hump in the spine can also be seen in opium smokers when they sit and smoke opium. Taking into consideration that the incidence of physical disorders has increased in today's urban life, it is very important to document the incidence and prevalence of these disorders and the factors that underlie them, in different age groups, gender, occupation, etc.,. Since very few and incomplete researches have been done in this field on people with drug use disorder, both in Iran and in other countries, and in the field of addiction, most of the researches have been from the

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psychiatric, psychological and social aspects, the purpose of this study is to investigate the relationship between opium smoking and the incidence of neck pain and disability, forward head posture and kyphosis in opium smokers in Tehran.

2. Materials and Methods

2.1. Participants

This cross-sectional and correlation study was done in 2022 in Tehran. 120 people who use opiates were selected from the clients of outpatient treatment centers in Tehran based on the necessary criteria and were evaluated for the presence of pain and disability in the neck. The main inclusion criteria include the diagnosis of substance use disorder and dependence according to the ICD-11 criteria (31), also, their main used drug was opium and their predominant method of consumption was smoking, as well as the ability to stand, age between 25 and 50 years, and Body Mass Index (BMI) below 27.5 (because in this age range and BMI, the probability of skeletal-muscular disorders is less), and the exclusion criteria also include a history of neuromuscular or skeletal disease, a past history of surgery in the spine and shoulder girdle, history of championship or regular exercise, any imbalance caused by a specific disease, any clear postural deformity or anatomical disorder and using of smartphones and tablets more than half to an hour (0.5-1 h) a day (32). The sample size was estimated by using G*Power software and based on the number of variables in cross-sectional correlation studies, statistical power 80% and significance level 0.05 (105 people).

2.1. Tools and data gathering

Data gathering was done by, demographic questionnaire, The Maudsley Addiction Profile (33), the Persian version of the Leeds Dependence Questionnaire (34), the Visual Analog Scale, and Neck Disability Index (35). Also, the practical measurements of this study were done through photography and curved ruler, both of which are valid and reliable methods for evaluating forward head posture and hyperkyphosis (36, 37).

In order to evaluate the forward head posture in this study, the craniovertebral angle was measured. To measure the craniovertebral angle, photography was used from the side view. In this way, using a Canon digital camera, made in Japan (Canon PowerShot G11 10MP, Japan), the person was photographed from a distance of 265 cm. The person was standing sideways next to the wall and the camera was placed at a height in line with his shoulder and completely perpendicular to the sagittal plane of his body. The photos were transferred to the AUTOCAD-2013 software and the craniovertebral angle was measured.

The examination of the spine curvature in the thoracic region and the measurement of the thoracic kyphosis angle were performed as follows: the person was standing in a normal and relaxed position and after moving the head, neck and upper limbs several times (in order to relax the muscles from any stress and contraction), they stood up straight in a upright posture and motionless with the spine in a completely neutral straightened position. A flexible ruler (brand name: Staedtler Mars 24-inch, Germany) is placed completely tangentially on the thoracic spine from T2 to T12, then the ruler is transferred to a sheet of A3 paper while keeping the same curve completely, and the curved line on The paper was drawn. The kyphosis angle was measured using this equation: α=4arctan(2h/l)

2.1. Data analysis

Statistical analysis was done by SPSS software version 23 through Shapiro-Wilk test, correlation coefficient tests (Goodman and Kruskal's lambda, Pearson and Spearman) and stepwise linear regression.

2.1. Ethical consideration

The study design and research method has been approved by the ethics committee of the University of Social Welfare and Rehabilitation Sciences with the code of IR.USWR.REC.1398.120. We

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obtained informed consent from all participants. This article is extracted from the doctoral thesis of the first author.

3. Results

3.1.1. Basic variables

The demographic characteristics of the samples and their substance use profile are presented in Table 1.

Table 1. Demographic characteristics and opium use profile of participants.

Variables	Mean	SD
Age	39.30	5.05
Weight	72.70	6.48
Height	1.73	6.13
BMI	24.29	2.12
Age of first drug use (any kind of drug)	19.35	6.45
Age of occasional drug use (any kind of drug)	21.05	5.15
Age of occasional opium smoking	23.45	5.85
Age of continues opium smoking	28.20	6.15
Duration of opium smoking during life (months)	110.45	31.70
Duration of daily opium smoking (minutes)	212.35	48.45
Dependence severity score	25.20	4.35

3.1.2. Main variables

There was a significant relation between the age of continues opium smoking, homelessness, the duration of lifetime opium smoking (in months) and the duration of daily opium smoking (in minutes) with the severity of neck pain, but age of occasional opium smoking, BMI, job, drug use duration, opium smoking method and drug dependence severity had no significant relationship with neck pain (Table 2). Also, neck disability showed significant correlation with homelessness, the duration of lifetime opium smoking (months), the duration of daily opium smoking (minutes) and drug dependence severity; but there was no significant relationship between BMI, age of occasional or continues opium smoking and drug use duration with neck disability (Table 3).

Table 2. Correlation between neck pain and predictor variables of study.

Variables		Correlation Coefficient	P-value
Predictor Variable	Criterion Variable		
Age of occasional opium smoking	VAS	-0.19	0.112
Age of continues opium smoking	VAS	-0.23	0.040
BMI	VAS	0.29	0.077
Job	VAS	0.22	0.096
Homelessness	VAS	0.61	<0.001
Opium smoking method (based smoking tool)	VAS	0.24	0.135
Drug use duration	VAS	0.36	0.080
Duration of opium smoking during life (months)	VAS	0.53	<0.001
Duration of daily opium smoking (minutes)	VAS	0.59	0.022
Drug dependence severity	VAS	0.39	0.072

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Table 3. Correlation between neck disability and predictor variables of study.

Variables		Correlation Coefficient	P-value
Predictor Variable	Criterion Variable		
Age of occasional opium smoking	NDI	-0.29	0.090
Age of continues opium smoking	NDI	-0.46	0.065
BMI	NDI	0.25	0.089
Job	NDI	0.38	0.113
Homelessness	NDI	0.69	<0.001
Opium smoking method (based smoking tool)	NDI	0.41	0.045
Drug use duration	NDI	0.38	0.105
Duration of opium smoking during life (months)	NDI	0.61	0.007
Duration of daily opium smoking (minutes)	NDI	0.68	0.005
Drug dependence severity	NDI	0.48	0.04

Neck disability and disorders were almost twice as correlated with opium smoking through a 'Wafour' (a type of vape that is a traditional tool of opium smoking in the Middle East and Persian Gulf countries), compared to opium smoking through a hookah (a small opium smoking hookah called ''Gholgholi'' in Iran) or through spoke & pin (Sikh-o-Sang). But neck pain was not different between different methods of opium smoking.

In order to investigate the correlation between forward head posture and hyperkyphosis with independent variables, the correlation coefficient between them was calculated. As the results are available in Table 4, forward head posture and hyperkyphosis have significant and moderate reverse correlation with age of continues opium smoking. Homelessness had the strongest significant correlation with forward head posture and hyperkyphosis. Also Opium smoking duration (month) and Daily opium smoking time (minutes) were significantly and strongly correlated with forward head posture and hyperkyphosis and drug dependence severity showed significant moderate correlation with FHP and HK.

Table 4. Correlation between forward head posture and hyperkyphosis with predictor variables of study.

Variables		Correlation Coefficient	P-value
Predictor Variable	Criterion Variable		
Age of occasional opium smoking	FHP	-0.29	0.079
	HKP	-0.26	0.82
Age of continues opium smoking	FHP	-0.56	0.045
	HKP	-0.49	0.022
BMI	FHP	0.35	0.069
	HKP	0.33	0.061
Job	FHP	0.29	0.081
	HKP	0.31	0.105
Homelessness	FHP	0.71	<0.001
	HKP	0.77	<0.001
Opium smoking method (based smoking tool)	FHP	0.37	0.115
	HKP	0.49	0.066
Drug use duration	FHP	0.38	0.105
	HKP	0.59	0.033

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Duration of opium smoking during life (months)	FHP	0.66	0.005
	HKP	0.71	<0.001
Duration of daily opium smoking (minutes)	FHP	0.65	0.002
	HKP	0.74	<0.001
Drug dependence severity	FHP	0.51	0.03
	HKP	0.59	0.007

FHP: Forward Head Posture HKP: Hyperkyphosis.

In order to investigate the effect of independent variables in predicting the occurrence of neck problems and disability, forward head posture and hyperkyphosis stepwise regression analysis was used. As presented in Tables 5–7 homelessness is the strongest predictive variable for the possibility of neck musculoskeletal disorders and disability, FHP and HK. Also, the number of months of opium smoking and the number of minutes of smoking in one day are other variables that increase the coefficient of determination (R^2 and adjusted R^2) in the regression analysis for predicting neck disability and hyperkyphosis, but about the forward head posture, the daily duration of opium smoking entered the regression table ahead of the number of months of opium smoking in the lifetime. (Tables 5–7).

Table 5. Stepwise regression analysis for neck disability (criterion variable) based on predictor variables.

Step	Predictor variable	R	R^2	Adjusted R^2	β	t	P-value
1	Homelessness	0.605	0.367	0.309	0.521	4.254	<0.001
2	Duration of opium smoking during life (months)	0.675	0.456	0.407	0.401	3.140	0.004
3	Duration of daily opium smoking (minutes)	0.711	0.505	0.460	0.345	2.405	0.011

Table 6. Stepwise regression analysis for forward head posture (criterion variable) based on predictor variables.

Step	Predictor variable	R	R^2	Adjusted R^2	β	t	P-value
1	Homelessness	0.676	0.457	0.443	0.539	4.414	<0.001
2	Duration of daily opium smoking (minutes)	0.710	0.504	0.492	0.411	3.338	0.015
3	Duration of opium smoking during life (months)	0.739	0.546	0.534	0.382	2.720	0.022

Table 7. Stepwise regression analysis for hyperkyphosis (criterion variable) based on predictor variables.

Step	Predictor variable	R	R^2	Adjusted R^2	β	t	P-value
1	Homelessness	0.690	0.476	0.463	0.572	4.705	<0.001
2	Duration of opium smoking during life (months)	0.727	0.528	0.516	0.433	3.60	0.002
3	Duration of daily opium smoking (minutes)	0.755	0.570	0.559	0.386	2.925	0.004

4. Discussion

The current study was aimed to investigate the relationship between drug dependence and its severity, as well as its smoking use with neck pain and disabilities. The findings of this study showed that increasing the opium smoking can have negative effects on some functions of the neck and cause pain and limitations in its ability.

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Sedentary life style in today's modern societies is the source of many health concerns (38), and Iran has a special position compared to other countries in the world due to the reasons stated earlier.

In Iran, it is common for opium addicts to smoke opium (or residue of smoked opium) for several years and for long hours a day with various tools such as 'Wafour' (or Vafour), 'Hookah', etc. in non-ergonomic positions (12) and it can be a major potential risk factor for the occurrence of postural disorders and skeletal problems of the upper body, beside of shorter smoking time period of heroin and cannabis which are more common in other countries (3). Therefore, this issue may not be as important as Iran in other countries. There are still no similar studies from other countries in this field so that we can compare their results with the results of this study. Only the impact of homelessness on the occurrence of health problems is a proven fact in previous researches. For instance, in the study of Sun et al., the existence of a direct and significant correlation between homelessness and more pain and musculoskeletal disorders has been shown (39). This relationship has been proven in other studies (40).

Iran is the second country in terms of severe opioid addiction and has the highest rate of heroin and opium addiction per capita in the world. So among the population aged 15 to 60, one out of every five people has non-permanent drug abuse and one out of every 17 people is a permanent user (3). The non-ergonomic and harmful position that drug users give to their spine during opium smoking is the cause of pain and disability in the cervical vertebrae. Moreover, the results of this study also report a significant relationship between the occurrence of neck pain and the younger age of continuous drug use, the method of use, the number of months of opium smoking and daily opium smoking duration in minutes. There was no similar study to compare these results in other countries. Only Daneshmandi et al. in their study showed that spine disorders and postures deformities are more prevalent in prison addicts of Iran (41). In explaining the occurrence of pain, it can be said that: repetitive work in an incorrect and non-neutral position leads to postural pressure, fatigue and pain (42). It has also been proven that according to their work habits or work needs, people are placed in wrong and non-standard body positions, which after a while causes them various pains, which are postural pains (43). Similar to what was found about opium smokers in this study, it was also found in previous studies for dentists that working for several hours a day in harmful positions causes many kinds of neck musculoskeletal disorders (44, 45).

Forward head posture showed a high significant correlation with the number of months of opium smoking during life and the daily duration of opium smoking, while it was not correlated with the total duration of drug use (i.e. of any type of substance and any method of use). These results make the relation and alignment of opium smoking with forward head posture more important and increase the possibility of a causal relationship between them. Although there are no similar studies in this field, we can refer to other studies that are somewhat similar to these studies. The prevalence of forward head posture in office workers who work on a desktop, or gamers who often put their head and neck forward and non-neutral position for long hours, are similar examples of opium smoking positions (46, 47).

Also, hyperkyphosis showed a high positive and significant correlation with the number of months of opium smoking during life and the number of daily minutes of opium smoking. This correlation should also be investigated more and more precisely in future studies in terms of the existence of a causal relationship between them. If it has been proven that dentists and farmers have similar positions during work, the risk of hyperkyphosis increases in them in the long run (48, 49). Neck disability, which was significantly correlated with opiate smoking, was similarly more common in office workers who experienced similar non-ergonomic positions (50).

As the results of regression analysis showed, homelessness is the strongest predictor of musculoskeletal neck disorders. Although there is no similar research to emphasize the significant relationship obtained in this study; however in explaining this relationship, we can point to other secondary causes, which are caused by homelessness. Lack of movement, insufficient and unhealthy nutrition, sitting and sleeping in non-ergonomic positions and heavy smoking are the consequences of homelessness that can aggravate the occurrence of skeletal disorders. Previous studies have also shown a positive relationship between neck pain and neck musculoskeletal disorders with incorrect

sitting or standing and sleeping positions (22, 49, 51). Previous studies have also indicated the effect of malnutrition on muscle weakness, especially in the axial muscles (which can cause disability and spinal deviation) (52). Also, the occurrence of musculoskeletal pain due to tissue malnutrition caused by smoking has been emphasized in people who lift heavy loads for their jobs (53), and the occurrence of pain and musculoskeletal disorders caused by hypovitaminosis D due to malnutrition has also been proven before (54).

There were some limitations in this study that should be considered. First and the main limitation of this topic (no this study) was the lack of similar studies; both in Iran and in other countries. In fact, after paying attention to the possibility of this problem (incidence of complications of non-ergonomic positions in opium smokers in Iran), in the next step and literatures review, no reports of similar studies were found. It seems that this issue is not so important in other countries (perhaps due to the shorter smoking time, considering the nature of the types of consumable drugs) and it has not been discussed in Iran yet. Therefore, it was necessary to design research using more basic methods and prove the existence of correlation. It is recommended to use research methods such as case-control and even prospective studies in order to stronger establishing of achieved correlations in this study. The second limitation of the study was that unfortunately, the female samples refused to participate in the study and we had to settle for the results of the men.

5. Conclusions

Non-ergonomic positions due to opium smoking have strong relationship with neck pain and disability, and posture deformities such as forward head posture and hyper-kyphosis. Opium smoking in different methods for long hours a day, which continues for years can lead to neck pain, neck musculoskeletal disorders, decreasing in craniovertebral angle (forward head posture) and increasing in thoracic kyphosis angle (hyper-kyphosis).

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Institutional Review Board Statement: The study design and research method has been approved by the ethics committee of the University of Social Welfare and Rehabilitation Sciences with the code of IR.USWR.REC.1398.120.

Informed Consent Statement: We obtained informed consent from all participants.

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Conflicts of Interest: The authors declare no personal, organizational and financial conflict of interest.

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