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Article

Is Opium Smoking A Cause of Sway Back Posture and Spinal Musculoskeletal Disorders? What Is the Relation?

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Abstract: Opioid use disorder has increased in the world in recent years and Iran ranks first in terms of opium smoking in the world. In fact, opium smoking by traditional methods, in addition to dependence on morphine, is a behavioral addiction in Iran. The body position during opium smoking is usually non-standard and non-ergonomic. Over time, changes in muscle tissue, tendons and ligaments, and the connective tissue go from elasticity to neuromuscular plasticity. This study aims to compare sway back posture and musculoskeletal problems between opium smokers and non-drug users. In this comparative and cross-sectional study, 80 opium smokers were compared with 74 non-drug users in terms of sway angle (sway back posture), and musculoskeletal complaints (NORDIC questionnaire) and the association of possible risk factors was investigated. Data were analyzed by Kolmogorov-Smirnov, Correlation Coefficient and paired-*t* tests using SPSS version 23. There were significant differences between two groups in terms of sway back posture (P=0.007), and neck (<0.001), upper back (<0.001) and lower back (0.006) musculoskeletal complaints. Homelessness, the lifetime duration of opium smoking (in months), and the duration of daily opium smoking (in minutes) had significant correlation with sway back posture and musculoskeletal complaints. Homelessness was the strongest predictor and had strongest correlation. Overall, an increase in the duration of sitting in non-ergonomic positions could lead to increase in sway angle and sway back posture and increase in musculoskeletal complaints of neck, upper back and lower back due to the non-neutral posture of opium smoking. It seems that plasticity and structural and functional adaptations of the posture occurs due to opium smoking and further studies are recommended.

Keywords: opioids; opium smoking; substance use disorder; behavioral addiction; drug use disorder; sway back posture; musculoskeletal disorders; Nordic; Iran

1. Introduction

Opium use disorder has increased in the world due to the increase in poppy cultivation in countries such as Myanmar and Afghanistan in recent years (1, 2). This problem is especially serious in Asia and has become a permanent crisis in the neighboring countries of opium producers. Iran is a country that shares many common borders with Afghanistan and is a suitable route for opium transit and smuggling to Europe and America (3). For this reason, it endures many problems from opium cultivation. The highest number of opium discoveries in the world is from Iran. Iran ranks second in the ranking of opium consumption in the world and ranks first in terms of smoking opium

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consumption (1). In fact, one of the main health concerns in Iran is the high prevalence of opioid use and dependence. Because opium smoking has long been common in parts of Asia, especially Iran. Even in many regions of Iran, the use of opium is not only not condemned, but it is known to be useful and treat many pains and diseases. In some cities of Iran, they provide opium and smoking tools (Wafour) for better reception of guests (4).

On the other hand, drug use disorder as a nervous system disease has many neuropathological consequences (5). A large part of the neurocognitive and neurobehavioral complications of opioid dependence is caused by the irregularity of neurotransmitter settings and also the increase of reward caused by dopamine (6, 7). In Iran, the habit and dependence on opium is associated with another addictive behavior. This addictive behavior is the same as smoking opium. In fact, in addition to dependence on morphine contained in opium, they are also dependent on smoking opium as an addictive behavior. To the extent that they do not accept the oral consumption of opium and smoke opium even in impossible conditions. Since ancient times in Iran, there has been a strong interest in opium smoking with Wafour (Vafour) or hookah, and it is usually done for long minutes a day (3, 4, 8). The body position during opium smoking is usually non-standard and non-ergonomic.

According to the Posture Committee of the Academy of Orthopedic Surgeons, posture is the relative arrangement of different parts of the body in relation to each other and musculoskeletal balance along with proper alignment of different segments of the body is considered a good posture. In this posture, the minimum amount of energy is required to maintain the posture. The advantage of good posture is that it causes minimal stress on body tissues (9, 10). Posture deformity is any change in the relative arrangement of different parts of the body that is associated with excessive tension or pressure on body tissues and structures (9). According to the musculoskeletal chain system and the posture of the body, any change and deformity in a part will cause a compensatory change in the shape and function of the adjacent muscles and joints. The neuromuscular system shows anatomical and physiological adaptation following fundamental changes in its activity pattern (11). In case of continuation and repetition of placement in abnormal positions, the postural abnormalities of the spine will increase quantitatively and qualitatively. For example, Lin et al. reported in a research that people with hyperkyphosis of the spine use the hip or ankle joint more to control balance than healthy people (12). Therefore, knowing and preventing them at any stage can have health and even economic (cost-benefit) justification.

Sway back posture is one of the most common deformities of the spine, which has been reported to be very high (between 10 and 62%) in research (13, 14). The prevalence of this abnormality is high in some athletes and it is also related to some musculoskeletal disorders and diseases (15-18). Many drug users are not normal in terms of physical condition (posture) and at first glance, kyphotic or sway back posture is evident in them (19, 20). In the sway back posture, the pelvis is moved forward and the hip is pulled inside. The upper part of the back is moved back and the shoulders are in the position of elevation. In fact, the general view includes forward head posture and increased kyphosis of the back, elevated shoulders and forward leaning hips (9).

Opium is the most smoked substance in Iran. More than 75% of the substances used in Iran are opiates, of which opium and Shireh (another form of opium used in Iran, which is obtained by dissolving the residue of smoked opium or low morphine type of raw opium in water and heating it to produce a thick concentrate that has more morphine than raw opium) comprise more than two-thirds. On the other hand, more than 95% of drug consumption in Iran is through smoking (4, 21). From these statistics, it is easy to understand how many Iranians smoke opium. As mentioned, opium smoking by traditional methods has been customary in Iran for centuries. This method of substance abuse is a slow and time-consuming process, usually taking 1-3 hours a day (3, 8). Since the body position is not neutral during opium smoking, there is a possibility of postural deformity after years of opium smoking. Or those who inhale or inject heroin, immediately after consumption, experience a sharp and sudden loss of consciousness and fall asleep for long minutes (in an non-ergonomic, kyphotic, head-down position) (22, 23).

Considering the high prevalence of opium smoking in Iran, which unfortunately increased after the Covid-19 pandemic (24, 25), the need to pay attention to the possible consequences of this issue

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is a health priority, and the sooner it is fixed, the less expensive it will be. It seems that due to the high prevalence of marijuana, cocaine, and heroin consumption in Europe and America, the duration of their smoking is short, the non-ergonomic state of the body while smoking is not a priority for health and rehabilitation. But this problem exists in Iran with very wide dimensions. Various studies have shown that some postural deformities are more common in workers who work several hours a day or in athletes who train for hours in a non-neutral position (26-30). So there is a possibility that in people who smoke opium for 10-15 years and are in a non-standard position for several hours a day, the unbalanced position of the spine causes more stretching in some parts of the musculoskeletal system and more pressure in some other parts. The review of the literature testifies that the study of musculoskeletal disorders and postural deformities in people who smoke opium has received little attention. Considering the high prevalence of opium smoking in Iran, this study was conducted with the aim of comparing sway back posture and musculoskeletal problems between those who smoke opium and normal people and investigating the factors affecting it.

2. Materials and Methods

2.1. Participants

This comparative cross-sectional study was conducted in 2022 in Tehran. The statistical population of patient group in this research was people with opioid use disorder in Tehran. In order to select study samples, 4 centers from different areas of Tehran were selected as sampling heads. Then, among the clients to these centers, the first and main samples were selected and the selection of other samples was done by snowball method. In this way, 80 people with opioid use disorder were selected according to the study criteria. Also, 74 healthy people from friends and relatives of the first group were included in the study by matching method. In order to have the greatest similarity between the samples of the two groups, the main branches of each cluster were chosen randomly. Then we asked each of these people to introduce two people to us. One of his friends or colleagues or relatives who uses drugs and one who does not use drugs, and so on, the introduction of the next examples continued.

The following criteria were considered to select the samples of the drug user group: Diagnosis of substance use disorder (opioid dependence) according to ICD-11 criteria (31). Opium is the main substance used in the samples and the main method of consumption is smoking. Ability to stand. Age between 25 and 50 years and body mass index below 27.5 (because with this age range and BMI range, musculoskeletal disorders are not caused by the aging process or obesity) (32-35).

Exclusion criteria were: history of neuromuscular or musculoskeletal disease, history of surgery in spine and shoulder girdle areas, history of championship or regular sports, any balance control disorder caused by a specific disease, obvious postural deformities and anatomical disorder, and using smartphones and tablets for more than half an hour a day (36).

2.2. Tools and Data Gathering

Data collection was done using a demographic questionnaire, drug use section of ASI (Addiction Severity Index), and Persian version of the Leeds Dependence Questionnaire (LDQ) (37, 38).

The sway angle measurement was done on a digital photo that was photographed from a sagittal view. The swing angle is formed by the vertical line that connects the spinous process of the acromion to the middle point of the greater trochanter of the femur and the line that connects the greater trochanter of the femur to the tip of the external ankle connects. The intersection of these two lines is the swing angle. Usually, people who have a greater or equal swing angle with 10 degrees, they are classified as people with a sway back posture (39).

We evaluated pain, disability and musculoskeletal injuries in different areas of the body, including the neck, shoulders, upper back, lower back, lumbar, and upper and lower limbs using the Nordic questionnaire. This questionnaire collects information about musculoskeletal symptoms and disorders from 9 anatomical areas of the body, which are related to the last seven days and last twelve months (40).

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The reliability of the measurement method was confirmed by a primary test-retest. Ten participants were rated in an extra 4 testing sessions of the sway back posture test in 2 weeks.

2.3. Data Analysis

The resulting data were analyzed by Kolmogorov-Smirnov test, correlation coefficient tests (Pearson's correlation coefficient and Spearman's correlation), and Paired-*t*-test using SPSS version 23 at a significance level of <0.05.

2.4. Ethical Consideration

The ethics committee of the University of Social Welfare and Rehabilitation Sciences has approved the study method. The university's ethics approval code is: IR.USWR.REC.1398.120. This article is extracted from the doctoral thesis of the first author.

3. Results

3.1. Basic Variables

Inter-rater and intra-rater reliability tests were done to confirm reliability of sway angle measurement. For inter-rater reliability, the intraclass correlation coefficient (ICC) was 0.67 (CI, 0.19-0.91) (P = 0.42) and intra-rater reliability, ICC was 0.63 (CI, 0.22-0.89) (P = 0.39).

The average age in the group of drug users was 38.20±6.55 years and in the non-user group was 37.80±5.88 years. Also, the average B.M.I. It was 24.05±2.05 in the drug user group and 23.67±1.98 in the non-user group. There was no significant difference between the two groups in terms of age and BMI. There were 5 women (6.25%) in the opium smoker group and 4 women (5.4%) in the non-user group.

3.2. Main Variables

The sway angle was 9.4±1.41 in the drug use group and 6.62±1.35 in non-users group. There was significant difference between two group in term of sway back posture (P=0.007).

Correlation tests were used in order to investigate the possible relationship between the independent variables of opium smoking and the increase in the sway angle in the drug users group.

Table 1. Correlation between sway angle and independent (predictor) variables (drug use profile).

Criterion variable	Predictor variable	Correlation coefficient	*P*-value
Sway angle	Dependence severity (LDQ)	-0.37	0.04*
	Total duration of using any kind of drug	-0.29	0.079
	Duration of opium smoking (month)	-0.68	0.004**
	Average daily time of opium smoking (minute)	-0.49	0.032*
	Age of starting drug use	0.23	0.073
	Homelessness	-0.73	<0.001**

As seen in Table 1, dependence severity, the number of months of opium smoking, the daily duration of opium smoking (minutes) and homelessness have a significant relationship with the sway angle. As it is clear, homelessness has the strongest correlation and significance. In addition, among the number of months of opium smoking during life and the daily duration of opium smoking (minutes), the number of months of opium smoking showed a stronger correlation with sway back posture.

In order to compare the musculoskeletal problems between the two groups, we used the Nordic questionnaire. As you can see in Table 2, opium smokers had significantly more problems in the neck as well as the upper and lower of the back.

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Table 2. Comparison of musculoskeletal problems between opium smokers and non-drug users.

Body area	Group			χ^2-score	P-value
	Opium smoker (n=123)	Non-drug user (n=122)	Total (n=245)		
Neck	64 (52%)	15 (12%)	79 (32%)	18.28	<0.001**
Shoulder	25 (20%)	17 (14%)	42 (17%)	3.65	0.319
Elbow	24 (20%)	22 (18%)	46 (19%)	3.41	0.487
Wrist	17 (14%)	13 (11%)	30 (12%)	2.43	0.281
Upper back	44 (36%)	14 (11%)	58 (24%)	14.48	<0.001**
Lower back	59 (48%)	34 (28%)	93 (38%)	16.14	0.006*
Gluteal & Thigh	34 (28%)	31 (25%)	65 (27%)	6.52	0.117
Knee	32 (26%)	24 (20%)	56 (23%)	0.69	0.712
Ankle	11 (9%)	13 (11%)	24 (10%)	0.44	0.885

Considering the significant difference between the two groups in neck and upper and lower back problems, the correlation of musculoskeletal problems in these three body areas and independent variables (drug use profile) was investigated in order to identify more related factors.

The correlation results of neck and upper and lower back musculoskeletal problems with independent variables (drug use profile) are presented in Table 3. As you can see in the table3, there is a significant correlation between the numbers of months of opium smoking during life, the duration of daily minutes of opium smoking and homelessness with neck, and upper and lower back musculoskeletal problems and like the sway angle, musculoskeletal problems in these three body areas have the strongest correlation with homelessness. The dependence severity has a significant correlation only with lower back musculoskeletal problems.

Table 3. The correlation of musculoskeletal problems of neck, upper back and lower back with independent (predictor) variables (drug use profile).

Predictor variable	Criterion Variable					
	Neck disorders		Upper back disorders		Lower back disorders	
	R	*P*-value	R	*P*-value	R	*P*-value
Dependence severity (LDQ)	0.29	0.073	0.25	0.083	0.19	0.044*
Duration of any kind of drug using	0.23	0.119	0.17	0.233	0.23	0.069
Opium smoking duration (month)	0.58	0.036*	0.49	<0.001**	0.38	0.012*
Daily opium smoking duration (minute)	0.31	0.042*	0.47	0.004**	0.40	0.05*
Age of first drug use	-0.14	0.105	-0.18	0.178	-0.09	0.235
Homelessness	0.62	0.044*	0.59	0.003**	0.55	0.022*

4. Discussion

This study was conducted with the aim of comparing musculoskeletal problems between opium smokers and non-drug users and investigating the possible association between musculoskeletal disorders and postural deformities with independent variables of drug use profile. Although the transmission of infectious diseases among drug addicts in Iran was greatly reduced and almost controlled, following the national opioid addiction treatment program with agonist drugs; But opioids abuse is still very common in Iran, especially opium smoking and this problem has increased after the COVID-19 pandemic. In a country like Iran, attention should also be paid to the harms caused by opium smoking, in addition to the problems and harms of morphine addiction. Because opium smoking by traditional methods and with its special tools in Iran causes a large volume of

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smoke to enter the lungs for several hours a day. Also, they sit in a non-neutral position for several hours a day, and the possibility of musculoskeletal complications due to being in such a position for many years is very high. These problems have been shown in various industries, office jobs and even some sports. For example, hyperkyphosis is very common in professional cyclists. Because they practice for hours a day in a bent and non-ergonomic position and after a few years they suffer from postural deformity (16). Also, forward head posture, kyphosis and lordosis are more prevalent in ping pong and Wushu athletes than general population, because these athletes train for hours in positions that lead to postural deformity after years (26, 29). Musculoskeletal disorders and postural deformity are more common in many occupations that require long hours of work in a non-neutral posture, or those who perform repetitive movements with their hands up and head forward, or people who sit for several hours in a static position inactively (28, 41-44).

Although the effect of opium smoking on people's posture has not been investigated in past studies, the non-neutral position of the body during opium smoking and several hours of immobility is similar to many occupations and work-related posture deformity and musculoskeletal disorders. For example, the Rosecrance study showed that 50% of musculoskeletal disorders in construction industry workers are due to non-neutral body positions during work and long-term static positions (45). Also, studies have shown that among the variables investigated in construction, the duration of standing and sitting during work has a significant relationship with back disorders (46, 47), in the group of jobs that work with machines and are usually done sitting, the harmful position of sitting on a chair, bending and Alternating rotations of the person to the sides (for better control of the work) lead to an increase in the disorder in the lumbar region (48).

Being in certain positions and repeating them daily for several hours causes changes in posture. As previous studies have shown that professional gymnasts and cyclists have a more sway back posture. Although the exact reason for the higher prevalence of sway back posture in cyclists and gymnasts is not known, many studies have proven a higher prevalence (17, 49). In this study, sway back posture was more in opium smokers. The higher prevalence of a postural deformity in a certain group suggests the possibility of correlation with their occupational position, or sports status or their daily habits. For this reason, the higher prevalence of bent posture in opium smokers is probably caused by their posture while smoking opium.

In this study, based on the results of the Nordic questionnaire, musculoskeletal disorders of the neck, upper back and lower back were more common in opium smokers and were correlated with long sitting in a non-neutral position (both lifetime opium smoking duration in months and daily opium smoking duration in minutes). Similar to this situation, neck pain and problems in dentists were reported in Rahmani's study (50). Musculoskeletal problems of the neck in dentists were correlated with their long-term sitting on the dental unit, poor posture, and repetitive occupational movements (51, 52). Working in non-ergonomic positions has been reported as a risk factor for neck pain and musculoskeletal problems in employees who work with computers and their keyboards are in an inappropriate position (53, 54). Musculoskeletal problems of upper and lower back are also more common in many jobs. Because they have to work several hours a day in a non-neutral position (sitting or standing) (55-57). The association of non-neutral body posture and harmful position with neck, shoulder and back disorders in dam construction workers has also been reported. Their posture during sitting activities during work, standing or sitting static positions is the main cause of back disorders (58, 59).

The high prevalence of hyperkyphosis in people with sway back posture has been shown in previous studies (60, 61). A higher prevalence of hyperkyphosis has also been shown in people who smoke opium (19, 20), and in this study, they also had a more sway back posture. Also, forward head posture is more prevalent in people with sway back posture, which is in line with Posture's findings in opium smokers (9).

More than half of musculoskeletal disorders are caused by long-term stretching and pressure on the body (62, 63). It has also been shown that increasing the average duration of work and long-term activities may increase the probability of suffering from musculoskeletal disorders by 1.38 times (64).

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Although longitudinal and prospective causal studies have not been conducted in opium smokers regarding the definitive effect of body posture during opium smoking on musculoskeletal disorders and posture deformity, many studies have proven the association between improper body posture and musculoskeletal disorders. Therefore, with the high probability of the existence of a causal relationship between the non-ergonomic position of opium smoking and postural deformity and musculoskeletal disorders, it is suggested to conduct other studies to confirm this relationship.

The limitations of this study that should be addressed are:

First, there are few similar studies in this field. Both in Iran and in the world. Therefore, literature review gives the researcher few experiences and comparative analysis of data with similar data is not possible. Another limitation of the study was the non-participation of women, so the data were not analyzed and compared by gender, because there were very few women. Another limitation of this study is the possibility of less accurate answers, underestimation, and even denial in some answers. Therefore, it is better to pay attention to these issues in future studies.

5. Conclusion

Non-ergonomic positions due to opium smoking have a strong relationship with musculoskeletal problems such as pain and dysfunction in neck, upper back and lower back and sway back posture. Opium smoking through different methods for long hours a day, which continues for years, can lead to neck, and upper and lower back musculoskeletal disorders, and an increase in sway angle (sway back posture). It seems that plasticity and structural and functional adaptations of the posture occurs due to opium smoking and further studies are recommended.

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Institutional Review Board Statement: The study design and research method have 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.

Data Availability Statement: The raw data supporting the conclusions of this article will be made available by the authors without undue reservation.

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