Investigating Changes in Serum Biochemical Parameters in Opium Addicts Before and During Addiction Treatment

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Original Article

Abstract

Background: Iran is one of the major consumers of opium and opiate substances in the world. Addiction has become a very important issue in the 21st century and an urgent one in Iran. The consumption of this substance leaves a variety of impacts on the human body. The goal of this study is to investigate the changes of the biochemical parameters derived from opiate substances in addicts during their treatment.

Methods: This is a cross-sectional research that focused on 40 individuals dependent on the consumption of opium. Their blood samples were taken before and during treatment, and their fasting blood sugar (FBS), sodium, calcium, phosphorus, creatinine, urea, uric acid, total protein, triglycerides, low-density lipoprotein (LDL), high-density lipoprotein (HDL), and total cholesterol were measured. Data were analyzed by SPSS using paired t-test.

Findings: The results showed that serum uric acid, LDL, cholesterol, and the total protein levels significantly decreased during the treatment in comparison with the time before the treatment ($P < 0.050$). Yet, the serum fasting glucose, urea, creatinine, HDL, triglycerides, calcium, phosphorous, sodium, and potassium showed no significant change the time prior and during the treatment.

Conclusion: Given the findings of the analysis, opium addiction has a number of destructive impacts on the lipid profile and uric acid. In addition, the level of total protein decreased during the treatment.

Keywords: Dependence on opium; Blood biochemical parameters; Addiction treatment; Opium

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Introduction

Drug abuse is one of the most important social crises which are also closely related to economic and cultural aspects of society. Drug dependence is known as a serious health threat and a major issue in different societies. Our country has been ranked to be the first in terms of opium consumption in the world. The consumption of opium and its derivatives is a potential and exponential threat for the youth.[1] Due to being rich in 20 types of alkaloids and 70 other compounds,[2] opium has a variety of pharmacologic and pathologic impacts, the understanding of which is of prime importance. Exposure to opioids could lead to physiologic and structural changes in the human body and affect organs such as kidney, liver, heart, nervous system, and endocrine.[3,4] These substances could cause changes in urine output and sodium excretion via multiple neural and hormonal mechanisms in peripheral organs, central nervous system, and kidneys.[2] Morphine could also affect hormones such as adrenaline, noradrenaline, cortisol, glucagon and adiponectin, which as a consequence, leads to metabolic impacts on consumers.[4-6] Several other studies on addiction to such substances have revealed that they have caused fundamental changes in the level of electrolytes, blood sugar, blood fat, blood pressure,[7,8] and even on the mental and oral health.[9] A study by Asgary et al.[10] showed, however, that there is no significant difference between most biochemical factors in the blood of addicts and those in the blood of healthy individuals.

Given our search, so far no comprehensive research has compared biochemical parameters in homogeneous addicted and under treatment groups. This study attempts to make a comparison between these parameters in homogenous groups and to analyze the changes in these parameters to establish a ground for future research in this regards especially studies pertinent to the prevention, etiology, and treatment of addiction.

Methods

This is a cross-sectional and population-based study, focusing on 40 individuals between 25 and 65 years with opium addiction, who attended an addiction rehabilitation center for a 3-month period to receive treatment. According to the criteria of Diagnostic and Statistical Manual of Mental Disorders-4th edition (DSM-IV), those who had three of the following symptoms during a 12-month period were identified as opium dependent:

1. Developed tolerance to opium consumption
2. Opium withdrawal syndrome in case opium is not consumed
3. Need to increase the dose of the opium over time
4. Emergence of a permanent desire to reduce or quit opium consumption
5. Spending a lot of time to prepare or get rid of opium and its effects
6. Leaving social, occupational, or recreational activities
7. Continuing opium consumption despite being aware of psychological or physical problems caused by the consumed substance.

The criteria for participating in the study also included using opium consecutively for more than 2 years (via eating or smoking) and issuing an informed consent to take part in the study. Those who did not meet the DSM-IV criteria or those substance abusers who used the drug for the purpose of recreation or as trial were not admitted in the study. In addition, those who previously suffered from syphilis, hepatitis and acquired immune deficiency syndrome (AIDS) or any infectious disease with clear clinical signs (e.g., skin diseases), consumed several narcotic substances simultaneously and did not give their informed consent were removed from the study.

Then, a checklist of information including age, drug type, date of the last consumption, and duration of addiction was provided from the opium dependent participants. To make sure of the sustainable use of opiates, the participants' urine samples were tested. First, a screening test and rapid situation assessment (RSA) (immunochromatography) test were performed on the samples. Then, a solid-liquid column chromatography test and a thin layer chromatography test (Akon and Baharafshan, Tehran, Iran) were performed on the positive cases of screening test to ensure the consumption of opium in the participants. The blood samples of the participants were collected anonymously to measure the biochemical parameters in the blood

serum as explained in the following:

About 5 ml of fresh venous blood was collected and centrifuged for 5 °C 30 minutes in 800 g to separate the blood serum. The serum was kept in -20 °C temperature up to the medical diagnostic tests and until the day of the experiment. Then, all of the following parameters in the serum of the individuals were evaluated:

- Fasting blood sugar (FBS): enzymatic photometric method [glycerol-3-phosphate oxidase phenol aminophenazone (GOP-PAP)] (Pars Azmoon Company Kit, Tehran, Iran)
- Sodium (Na^+) and potassium (K^+): flame photometric method, the standard flame photometer
- Calcium (Ca^{2+}): Cresolphthalein complexone, (Darman Kav Company Kit, Tehran, Iran)
- Phosphor (P): endpoint colorimetric method (Biochemical Company Kit, Tehran, Iran)
- Creatinine: Jaffe method (Pars Azmoon Kit)
- Urea, urease-Berthelot method (Biochemical Company Kit)
- Uric acid: Phosphate tungstate method (Biochemical Company Kit)
- Total protein (blood serum total protein) and albumin: endpoint colorimetric method (Biochemical Company Kit)
- Triglyceride: Photometric method (GOP-PAP) (Pars Azmoon Company Kit)
- Cholesterol: Photometric method [cholesterol oxidase (CHOD)-PAP] (Pars Azmoon Company Kit)
- Low-density lipoprotein (LDL) and high-density lipoprotein (HDL): Enzymatic method (CHOD-PAP) (Pars Azmoon Company Kit).

After 1 month of the treatment, RSA test (rapid immunochromatography, opioid compound diagnosis) was carried out, and if the result were negative, the same biochemical parameters of the serum would be repeated. Then, the whole data were given to SPSS (version 21, IBM Corporation, Armonk, NY) to perform a statistical analysis using paired-t-test (significant level = 0.05).

Results

A total of 40 patients with mean age of 38.4 years and the standard variation of 10.1 entered the study. Six participants (15%) were female and 34 were male (85%). The route of consumption was smoking in 20 individuals (70%) and enteral (oral) in 12 (30%) others.

Serum uric acid levels in the participants reduced significantly from 4.2 ± 1.0 mg/dl before the treatment to 3.7 ± 0.9 mg/dl during the treatment ($P < 0.001$). Serum LDL levels also significantly decreased from 105.0 ± 36.4 mg/dl before the treatment to 94.7 ± 39.7 mg/dl during the treatment ($P = 0.008$). Serum cholesterol levels significantly decreased from 176 ± 41.6 mg/dl before the treatment to 166.0 ± 45.2 mg/dl during the treatment ($P = 0.020$). Serum total protein levels significantly decreased from 7.00 ± 0.54 mg/dl before the treatment to 6.7 ± 0.36 mg/dl during the treatment ($P = 0.003$).

On the contrary, serum fasting glucose, urea, creatinine, HDL, triglyceride, calcium, phosphorous, sodium, and potassium levels showed no significant difference between before and during the treatment ($P > 0.050$). The serum levels of all parameters are listed in table 1.

Discussion

This study focused on blood biochemical parameters in individuals who were dependent on opium consumption before and during addiction treatment. It was found that during the treatment serum uric acid in these people significantly decreased in comparison with the time before the treatment. Another study showed that the increase of morphine led to the increase of uric acid.[11] In this study, quitting the consumption of opium (morphine) in the addicts decreased the level of uric acid, which is in line with the findings of the study mentioned above. The findings of Afarinesh et al.[12] also confirm those of our study. They focused on the comparison of opium dependent individuals and a control group, and they showed that the level of uric acid in the opium dependent individuals was significantly higher. Likewise, another study by Divsalar et al.[13] showed that serum uric acid in the opium dependent participants was higher than that of the control group; yet, there was no significant difference between the level of serum uric acid in individuals who had quitted opium consumption for 1 month and the opium dependent participants. The major difference between our study and the previous two studies is that their control group was comprised of healthy people with no background of addiction while in this study, the comparison focused on a homogeneous group (dependent on and quitting

opium consumption), thus the intervening factors between the two groups were removed and the study was more reliable.

Table 1. Serum level of the parameters in this study

Serum parameter	Mean ± SD	P*
FBS (mg/dl)		
Before treatment	93.3 ± 31.0	0.417
During treatment	98.0 ± 36.2	
Urea (mg/dl)		
Before treatment	31.7 ± 9.9	0.640
During treatment	32.4 ± 8.3	
Creatinine (mg/dl)		
Before treatment	0.96 ± 0.20	0.942
During treatment	0.96 ± 0.20	
Uric acid (mg/dl)		
Before treatment	4.2 ± 1.0	< 0.001
During treatment	3.7 ± 0.9	
Cholesterol (mg/dl)		
Before treatment	176.0 ± 41.6	0.020
During treatment	166.0 ± 45.2	
HDL (mg/dl)		
Before treatment	46.2 ± 9.5	0.508
During treatment	45.3 ± 9.6	
LDL (mg/dl)		
Before treatment	105.1 ± 36.4	0.008
During treatment	94.7 ± 39.7	
Triglyceride (mg/dl)		
Before treatment	140.2 ± 123.1	0.488
During treatment	129.6 ± 83.1	
Calcium (mg/dl)		
Before treatment	9.6 ± 0.6	0.143
During treatment	9.5 ± 0.5	
Phosphorous (mg/dl)		
Before treatment	4.2 ± 0.7	0.282
During treatment	4.0 ± 0.6	
Sodium (mEq/l)		
Before treatment	140.8 ± 2.5	0.177
During treatment	140.0 ± 2.6	
Potassium (mEq/l)		
Before treatment	4.2 ± 0.4	> 0.999
During treatment	4.2 ± 0.4	
Total protein (mg/dl)		
Before treatment	7.0 ± 0.5	0.003
During treatment	6.7 ± 0.4	

*Significance was estimated by using paired t-test.
FBS: Fasting blood sugar; LDL: Low-density lipoprotein; HDL: High-density lipoprotein; SD: Standard deviation

In comparison with the participants who consumed opium (before the treatment), the serum LDL and cholesterol levels during the treatment were significantly reduced. Serum triglyceride also decreased during the treatment, yet this was not significant. In a study carried out on rats in 1987, it was found that morphine had an impact on the increase of total cholesterol, LDL and very LDL, and the decrease of plasma HDL.[14] This study also shows that the decrease of morphine level in the blood after treatment could significantly decrease the serum cholesterol and LDL levels. Afarinesh et al.[12] found that the cholesterol in the control group was higher than that of the opium addicts, but this difference was not significant. The cholesterol level in those who had quitted addiction for 1 month (heterogeneous treatment group) was almost the same as that of the control group and higher than the opium addicts, which was not significant. Serum triglyceride level in the opium addicts in the same study was the same as that of the control group; yet, it was significantly increased in the heterogeneous participants who had recently quitted opium, which is contrary to our findings. Shahryari et al.[15] focused on golden hamsters and showed that in hamsters that were addicted to alcohol, and alcohol and opium, lipid profiles including triglyceride increased significantly, but in those addicted only to opium, the increase of serum triglyceride level in comparison with the control group was not significant. Divsalar et al.[13] found that cholesterol level in the opium addicts was significantly lower compared to the control group. However, there was no significant difference between triglyceride levels in the two groups. It seems that many factors including socioeconomic issues could affect the level of serum lipid profiles; yet, this study attempted to minimize these factors by homogenizing the groups and thus increasing the research reliability.

There was no significant statistical difference between the serum electrolyte levels in the participants before and during the treatment. The previous studies have reported various serum sodium, potassium, and calcium levels. For instance, Elnimr et al.[16] showed that the density of several electrolytes such as calcium and potassium ion, magnesium, zinc, Fe, and chloride decreased in the heroin addicts. Laso et al.[17] also reported that K^+ in the blood serum of the opium addicts was significantly lower compared with the control group. Divsalar et al.[13] and Afarinesh et al.[12] demonstrated that serum potassium level decreased significantly in the opium and heroin addicts compared to the control group, yet there was no significant difference between the serum

level of sodium and calcium ions. The increase of serum epinephrine compared to control groups has been introduced as a cause of hypokalemia in opioid addicts.[18]

Fasting sugar in the participants was not significantly different before and during the treatment. However, there are a number of opinions on blood sugar level of opium addict.[19] Several studies have shown that blood glucose level increases in opium addicts.[5,20,21] However, some studies have reported that the increase of morphine leads to the decrease of blood glucose level.[22,23] Azod et al.[23] and Karam et al.[24] also showed that glucose level of blood decreases even in opium dependent diabetes patients; however, it was not significant. A study done by Gozashti et al.[25] showed that there was no significant difference between the serum glucose levels in the opium dependent and the control group. Divsalar et al.[26] showed that in comparison with the control group and heroin addicts, blood sugar significantly decreased in those who had quitted heroin recently. Increase in the use of glucose and decrease of hepatic gluconeogenesis by stimulating peripheral receptors are among mechanisms that can decrease blood sugar in opium addicts.[4,7]

Total protein level in the participants was significantly reduced during the treatment. Divsalar et al.[27] compared opium and heroin addicts with a control group and showed that, contrary to our findings, there was no significant difference in serum albumin, alpha 1 and 2 globin in opium and heroin addicts compared with the control group. However, serum gamma globin level in the addicts decreased significantly compared to the control group. This decrease of serum gamma globin level could lead to the increase of infection in such addicts. Another study also confirmed the findings of this study and showed that serum total protein in the heroin addicts during the treatment was lower during the treatment in comparison with the control group or heroin addicts before the treatment, yet this difference was not significant.[26] Afarinesh et al.[12] showed that serum total protein levels in the opium dependent participants were lower compared to the control group and opium addicts during the treatment; however, this difference was not significant.

Conclusion

Given the results of the present research, serum uric acid, cholesterol, LDL, and the total level of protein significantly decreased during the treatment. As this research used a homogenous group before and during the treatment, the existing environmental and genetic factors were minimized, and the final data were considerably more reliable in comparison with those studies in which the same parameters are measured in a control group (healthy) or in heterogeneous treatment groups.

Conflict of Interests

The Authors have no conflict of interest.

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بررسی تغییرات شاخص‌های بیوشیمیایی سرم خون در افراد وابسته به مصرف تریاک قبل و در حین ترک اعتیاد

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مقاله پژوهشی

چکیده

مقدمه: ایران یکی از مصرف کننده‌های بزرگ تریاک و مواد اپیوئیدی در دنیا است و اعتیاد یکی از مهم‌ترین مسایل مربوط به قرن ۲۱ و یک موضوع ضروری در کشورمان محسوب می‌شود. مصرف این مواد تأثیرات گوناگونی را بر بدن انسان دارد. هدف از انجام مطالعه حاضر، بررسی تغییرات شاخص‌های بیوشیمیایی ناشی از این مواد در افراد معتاد در حین ترک بود.

روش‌ها: این مطالعه مقطعی بر روی ۴۰ فرد وابسته به تریاک انجام شد. نمونه خون این افراد قبل و در حین ترک تهیه و مواردی شامل، قند خون ناشتا (Fasting blood sugar یا FBS)، سدیم، کلسیم، فسفر، کراتینین، اوره، اسید اوریک، پروتئین توتال، تری‌گلیسرید، Low-density lipoprotein (LDL)، High-density lipoprotein (HDL) و کلسترول اندازه‌گیری گردید. داده‌ها با استفاده از آزمون Paired t در نرم‌افزار SPSS مورد تجزیه و تحلیل قرار گرفت.

یافته‌ها: سطح سرمی اسید اوریک، LDL، کلسترول و پروتئین توتال در نمونه‌های مورد مطالعه حین ترک نسبت به قبل از ترک به طور معنی‌داری کاهش یافت ($P < ۰/۰۵$)، اما در سطوح سرمی FBS، اوره، کراتینین، HDL، تری‌گلیسرید، کلسیم، فسفر، سدیم و پتاسیم تفاوت معنی‌داری قبل و در حین ترک مشاهده نشد ($P > ۰/۰۵$).

نتیجه‌گیری: با توجه به داده‌های به دست آمده، اعتیاد به تریاک تأثیرات زیانباری بر پروفایل‌های چربی و اسید اوریک دارد. علاوه بر این، سطح توتال پروتئین در حین ترک کاهش می‌یابد.

واژگان کلیدی: وابستگی به مواد مخدر، شاخص‌های بیوشیمیایی خون، ترک اعتیاد، تریاک

ارجاع: برزه‌کار صدیقه، گذشتی محمد حسین، دیوسالار کورس، مشروطه مهدیه، درویشی لاری امیر حسین. **بررسی تغییرات شاخص‌های بیوشیمیایی سرم خون در افراد وابسته به مصرف تریاک قبل و در حین ترک اعتیاد.** مجله اعتیاد و سلامت ۱۳۹۵؛ ۸ (۴): ۲۱۷-۲۱۱.

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