

The Impact of Using *Ammi Visnaga* On the Recovery of Induced Liver Injury by Waterpipe Smoking

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Abstract

The main objectives of this study were to explore the impacts of waterpipe smoking on liver injury as indicated by liver function tests ALT, AST, and LDH from one side, and to investigate the potential use of *Ammi visnaga* to remedy the liver induced injury. The methodology involved establishing animal smoking model, in which rats were chronically exposed to waterpipe smoking by digital smoking machine. Animals were randomly assigned into 3 groups: control group (N=8), waterpipe smoking group (N=8), and waterpipe smoking and *Ammi visnaga* group (N=8). One-month recovery was applied after the experiment had finished, it is a cessation period of waterpipe smoking for one month. Liver injury was assessed by carrying out liver function tests ALT, AST, and LDH. Study findings showed that waterpipe smoking significantly increased the levels of ALT from 51 ± 3.2 U/L in control group to 76 ± 1.8 U/L in waterpipe smoking group ($p=0.000$), AST (from 222 ± 7.5 U/L in control group to 314 ± 9.3 U/L in smoking group, $p=0.000$), and the level of LDH significantly increased in waterpipe smoking group (186 ± 1.2 U/L in control group to 498 ± 17.4 U/L in smoking group, $p=0.000$). On the other hand, the use of *Ammi visnaga* significantly reduced the levels of AST (184 ± 6.8 U/L, $p=0.03$), ALT (40 ± 3.8 U/L, $p=0.04$), and LDH (247 ± 4.2 U/L, $p=0.00$). Recovery period was partially associated with reversing induced liver injury. Taken together, waterpipe smoking induced liver injury that could be reversed using *Ammi visnaga*.

Keywords: Waterpipe, Smoking, *Ammi Visnaga*, Liver, Injury, ALT, AST, LDH

Introduction

Water pipe smoking is very common in poor nations, particularly in the Eastern Mediterranean. According to studies, more than 100 million individuals smoke water pipes. Furthermore, tobacco use is one of the most significant behavioral variables linked to an elevated risk of cancer, the world's leading cause of death [1].

Liver function tests (LFTs) are useful clinical tools for evaluating liver disease, tracking treatment responses, and predicting the prognosis of patients with liver disease. LFT is made up of several assays, including aspartate amino transferase (AST), alanine aminotransferase (ALT), and lactate dehydrogenase (LDH) [2]. However, because LFTs can be influenced by a variety of personal and environmental factors, such as age, gender, and body mass index (BMI), the interpretation of these tests should be comprehensive and thorough [3, 4].

Liver function tests (ALT and AST) were assessed in a sample of waterpipe smokers and were found significantly elevated compared with the control group ($p<0.05$) [2]. The level of LDH was significantly increased in mice exposed to waterpipe smoking compared with control group [5].

Ammi visnaga L. is a Mediterranean short annual or biennial herb native to North Africa, Asia, and Europe [6]. The plant is abundantly dispersed in Egypt's Delta region, which borders the Nile River, particularly in the governorates of Assiut and Minia [7]. Many people and companies cultivate it in order to utilize its extracts or active components in the pharmaceutical sector. At heights of 380–460 meters above sea level, it was recently discovered and added to the flora of Croatia [8]. North America (North Carolina, Pennsylvania, Oregon, Alabama, California, Florida, and Texas), the Atlantic islands, Argentina, Mexico, and Chile are also home to the plant. Iraq, Iran, and other western and southern Asian coun-

tries are home to the plant. The plant, particularly its fruit, has a wide range of traditional and modern medical benefits. Despite the plant's medical relevance and usage, no extensive literature assessment of *A. visnaga* and its chemical contents has been conducted. Renal colic, moderate anginal symptoms, and abdominal cramps have all been treated with the decoction and/or powdered plant in the past. It is also used as a supportive treatment for moderate obstruction of the respiratory system in asthma or spastic bronchitis, as well as surgical treatment of urinary calculi-related diseases [6]. The plant and its extracts are also utilized as a lithotriptic drug in the treatment of vitiligo and psoriasis. It is commonly used to widen bronchial, urinary, and blood arteries without causing blood pressure to rise. Internally, it is used as an emmenagogue to control menstruation, as a diuretic, and to treat vertigo, diabetes, and kidney stones [9]. Aerial components infusions have also been utilized to alleviate headaches [10]. Up to the best knowledge of the authors, this study may be the first to describe the impact of using *Ammi visnaga* in ameliorating the impacts of waterpipe smoking.

Study Objectives: The main objectives of the present study were to investigate the impacts of waterpipe smoking on liver function tests, and how the use of *Ammi visnaga* helps in reversing the induced liver injury.

Methods and Materials
Waterpipe Animal Smoking Model

A digital smoking machine was created and used in our studies. It has a special smoking topography, suitable for the exposure of rats

to waterpipe smoke [11]. As shown in the diagram, the smoking machine is made up of the following components. Five rats weighing 100-150 grams can be housed in an inhalation chamber made of Plexiglas (8 mm thick) with dimensions of 30 cm length, 22.5 cm width, and 10.5 cm height.

Each smoking run cycle lasted 90 seconds and included the following three steps:

- a. 30 seconds of continuous waterpipe smoke withdrawal
- b. Using fresh air to wash off the smoke for 30 seconds.
- c. Finally, the rats were given 30 seconds to breathe typical fresh air.

Following the recovery period from the last exposure to waterpipe smoking (overnight) animals were sacrificed by ether inhalation and blood samples were withdrawn and collected in blood tubes for assessment of AST, ALT, and LDH.

Results

Effect of Waterpipe Smoking on ALT Level in Albino Rats.

As shown in table (1), the level of ALT was 51 ± 3.2 U/L in the control group, and significantly increased in waterpipe smoking group (76 ± 1.8 U/L, $p=0.000$). Using *Ammi visnaga* significantly reduced the levels of ALT (40 ± 3.8 U/L, $p=0.04$). After cessation, the level of ALT was significantly reduced (24 ± 2.2 , $p=0.000$). Cessation of waterpipe smoking with continuous using *Ammi visnaga* increase insignificantly the level of ALT (58 ± 2.6 , $p=0.13$).

Table 1: Effect of Waterpipe Smoking on ALT Level in Albino Rat

Animal groups	After exposure U/L	P- values	After cessation U/L	P-values
Control (Fresh air)	51 ± 3.2	1.0	51 ± 3.2	1.0
Waterpipe	76 ± 1.8	0.00	24 ± 2.2	0.00
Waterpipe + <i>Ammi visnaga</i> seeds	40 ± 3.8	0.04	58 ± 2.6	0.13

Effect of Waterpipe Smoking on AST Level in Albino Rats

The level of AST in in control group was 222 ± 7.5 U/L. Waterpipe smoking significantly increased the level of AST (314 ± 9.3 U/L, $p=0.000$). The use of *Ammi visnaga* significantly decreased the

level of AST (184 ± 6.8 U/L, $p=0.03$). The recovery period significantly lowered the level of AST (264 ± 17 U/L, $p=0.05$). The use of *Ammi visnaga* significantly decreased the level of AST (181 ± 5.7 U/L, $p=0.03$).

Table 2: Effect of Waterpipe Smoking on AST Level in Albino Rats

Animal groups	After exposure U/L	P- values	After cessation U/L	P-values
Control (Fresh air)	222 ± 7.5	1.0	222 ± 7.5	1.0
Waterpipe	314 ± 9.3	0.00	264 ± 17	0.05
Waterpipe + <i>Ammi visnaga</i> seeds	184 ± 6.8	0.03	181 ± 5.7	0.03

Effect of Waterpipe Smoke on LDH Level in Albino Rats

As seen in table (3), the level of LDH in control group was 186 ± 1.2 U/L, and this level of LDH significantly increased in waterpipe smoking group (498 ± 17.4 U/L, $p=0.000$). The use of *Ammi visnaga* seeds significantly decreased the level of LDH (247 ± 4.2 ,

$p=0.000$). After cessation, the level of LDH in *Ammi visnaga* group significantly decreased (105 ± 2.3 U/L, $p=0.04$). on the other hand, cessation period in waterpipe smoking group significantly decreased the level of LDH (477 ± 13 U/L, $p=0.000$).

Table 3: Effect of Waterpipe Smoke on LDH Level in Albino Rats

Animal groups	After exposure U/L	P- values	After cessation U/L	P-values
Control (Fresh air)	186± 1.2	1.0	186± 1.2	1.0
Waterpipe	498± 17.4	0.00	477 ±13	0.00
Waterpipe + <i>Ammi visnaga</i> seeds	247 ± 4.2	0.00	105 ± 2.3	0.04

Discussion

Waterpipe smoking significantly elevated the level of ALT ($p=0.000$). Treatment with *Ammi visnaga* seeds lowered the level of ALT significantly ($p=0.04$), but the level of ALT was insignificantly increased with cessation waterpipe smoking and continuous treatment with *Ammi visnaga* seeds ($p=0.13$). Waterpipe smoking significantly increased the level of AST ($p=0.000$). The treatment with *Ammi visnaga* seeds lowered the level of AST significantly ($p<0.05$). Quitting waterpipe smoking with or without treatment significantly lowered the level of AST ($p<0.05$). These findings suggested that waterpipe smoking induces oxidative damage in the liver [12]. Several studies have reported the pathologic effects of smoking in general on liver enzymes [13]. The findings of the present study help in setting up the impacts of smoking models on liver and other study parameters.

Waterpipe smoking significantly increased the level of LDH ($p=0.000$), and treatment with *Ammi visnaga* seeds significantly lowered the level of LDH. Cessation of waterpipe smoking significantly reduced the level of LDH ($p=0.000$).

Conclusions

The present study showed that waterpipe smoking can induce liver injury, which can be reversed using *Ammi visnaga*.

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