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ORIGINAL ARTICLE

Ajwa Date Fruit Extract Ameliorates the Effects of Alcohol on Weight of Liver in Male Albino Rats

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ABSTRACT

Background: Liver injuries induced by different toxic substances have been recognized as one of the great toxicological problem for years. However, there are a lot of herbal medicines existing to compensate these disorders.Alcohols are one of the most important organic compounds in different areas of our daily lives. The health benefits of Ajwa Date Fruit Extract are well documented in literature.

Objective: To determine the effect of alcohol on weight of liver and possible protective role of Ajwa date fruit extract (ADFE) in adult male albino rats.

Study Design: Experimental Study

Place and Duration of Study: Department of Anatomy, Postgraduate Medical Institute, Lahore from 1st October 2018 to 31st March 2019.

Methodology: Twenty four adult male albino rats were used in this research and divided into the 4 groups A, B, C and D having 6 rats in each group. Group A was designated as control group;group B received ethanol 3g/kg/day of 40% v/v prepared in distilled water; group C received ethanol and ADFE1g/kg/day and group D received ethanol and ADFE 2g/kg/day by oral gavage once daily for 28 days.The 100% pure alcohol was dissolved in distilled water for preparation of 40% alcohol. Dates palm (*Phoenix dactylifera L*.) fruits washed with tap water and removed the seeds. The extract of the date fruits made by adding distilled water to date fruit (3:1) and leaving for 48 hours in refrigerator (4°C).

Results: The increase in mean weight of liver in group B on 29th day of experiment were statistically significant (p=0.001) in comparison with the control. The mean weight of liver was decreased significantly after 28 days of experiment in experimental groups C and D.

Conclusions: Alcohol administration in the male albino rats significantly increase their weight of liver which was improved by the use of ADFE.

Key words: Alcohol, Ajwa date fruit extract, Rats

INTRODUCTION

In recent decades, global alcohol consumption has increased specially in developing countries leading to the fifth most deadly factor in the world.[1] Chronic and severe alcohol consumption increases the possibility of death directly or indirectly, for example, alcohol is a factor leading to the violent death or self-harm in the form of suicide.[2,3] Every year in the United States, about 100,000 people die from alcohol abuse, which plays an important role in the country's economic downturn and causes enormous economic losses.[4]

Ethanol is a key component of anaesthetic ethers.[5] The molecular formula of ethanol is CH_2H_5OH and its structural formula is CH_3-CH_2-OH.[6] The main way of alcohol metabolism occurs through the process of oxidation in which the ADH enzyme converts alcohol to acetaldehyde. Acetaldehyde alters β-oxidation of fatty acids by mitochondria and promotes the formation of oxygen-free radicals, responsible for the peroxidation of membrane lipids, resulting in damage to cell membranes.[7] Ethanol and acetaldehyde cause cell injury and necrosis by increasing the production of reactive oxygen species (ROS) through a process known as lipid peroxidation.[8]

Phoenix dactylifera L. is a perennial woody plant belongs to the family Arecaceae, comprising 3,000 species and 200 genera.[9]The species name dactylifera "bearing date" comes from two Greek words dáktulos which signify "Date" and the Greek verb ferō's stem date. It is one of the oldest plants to grow on earth and can be used as an alternate of food for about 6,000 years.[10]

Among the varieties of many dates, ajwa dates have unique medicinal properties, which are particularly cultivated in holy city of Al-Madina. The ajwa date plays an important role in religion because Muslims usually break their fasting by eating ajwa dates. Ajwa date fruit consumption may be beneficial for non diabetic due to its low glycemic index.[11]

Ajwa dates are a source of energy rich in sugar, dietary fiber, fat, protein, minerals and vitamins. The fruit of ajwa date (*Phoenix dactylifera L. Arecaceae*) includes high proportion of carbohydrates, dietary fiber, lipids and proteins along with minerals and vitamins like A, B1, B2, B3, β-carotene and C.[12] It also contains a number of fatty acids including palmitoleic acid, oleic acid, linoleic acid and linolenic acid[13] and various phytochemicals such as sterols, polyphenols, flavonoids and glycosides.[14]

MATERIALS AND METHODS

This study was carried out at Department of Anatomy, Postgraduate Medical Institute Lahore from 1st October 2018 to 31st March 2019. Twentyfour adult male albino wistar rats, 6-8 weeks old and weighing (140–160 g) were

procured from University of Health sciences, Lahore. Equal numbers of rats were divided into four groups by using random number generator. Group A served ascontrol group were given distilled water in equivalent volume by oral gavage once daily for 28 consecutive days.Group Bwere given ethanol 3g/kg/day of 40% v/v prepared in distilled water by oral gavage once daily.Group Canimals weregiven ethanol 3g/kg/day of 40% v/v and ADFE 1g/kg/day by oral gavage once daily for 28 days. Group Dweregiven ethanol 3g/kg/day of 40%v/v and ADFE 2g/kg/day by oral gavage once daily for 28 days.They were individually housed in a climate-controlled environment and provided with food and water *ad libitum*. They were kept in well ventilated room at ambient temperature of 25.0±2.0ºC and humidity (60±10%) under 12 hrs light/dark cycles.

The alcohol being used in this research was a product of Merck. The 100% pure alcohol was dissolved in distilled water for preparation of 40% alcohol.The dose of alcohol in each group and duration of administration was chosen according to the protocol.[15]

Ajwa date fruit were procured from Saudi Arabia through Islamic Shed Centre. Ajwa date fruit extract was prepared manually. Dates palm (*Phoenix dactylifera L*.) fruits washed with tap water and removed the seeds. The extract of the date fruits made by adding distilled water to date fruit (3:1) and leaving for 48 hours in refrigerator (4°C). The whole solution was grinded and then centrifuged at 4° for 20 min at 4000 rmp. The supernatant was collected and stored in refrigerator.[16]

Animals were given the extract at a dose of 1g/kg/day by gastric gavage which is equivalent to 7 dates per person per day[17] for group C, while a dose of 2g/kg/day were given to group D.

The data was investigated using SPSS-25. One way ANOVA followed by Post Hoc Tukey`s test was applied to observe differences of the mean between groups. The P value ≤ 0.05 was considered as statistically significant.

RESULTS

Weight of liver during experiment ranged between 6.20-6.92, 7.46-7.73, 6.65-7.02 and 6.01-6.52 in groups A, B, C and D respectively. The mean weight of liver was 6.56±0.32, 7.63±0.10, 6.79±0.17 and 6.31±0.17in groups A, B, C and D respectively. One way ANOVA showed statistically significant difference in the mean weight of liver on 29th of experiment when compared between control and experimental groups (p=0.001) [Table 1, Fig. 1].For multiple comparisons, post hoc Tukey test was used which showed that mean weight of liver in groups B was significantly higher as compared to remaining all groups. However, there is nostatistically significant difference in the mean weight of liver in groups A, C and D (Table 2).

Table 1: One way ANOVA showing the mean and standard deviation of mean weight of liver among groups

Variable	Group A	Group B	Group C	Group D	p-value
Mean weight of liver (g)	6.56±0.32	7.63±0.10	6.79±0.17	6.31±0.17	0.001*

*P value ≤ 0.05 is statistically significant

Table 2: Pair-wise comparison of mean weight of liveramong groups

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.
A	B	-1.06833*	.12093	.001*
	C	-.22333	.12093	.282
	D	.25667	.12093	.180
B	C	.84500*	.12093	.001*
	D	1.32500*	.12093	.001*
C	D	.48000*	.12093	.004

*P value ≤ 0.05 is statistically significant

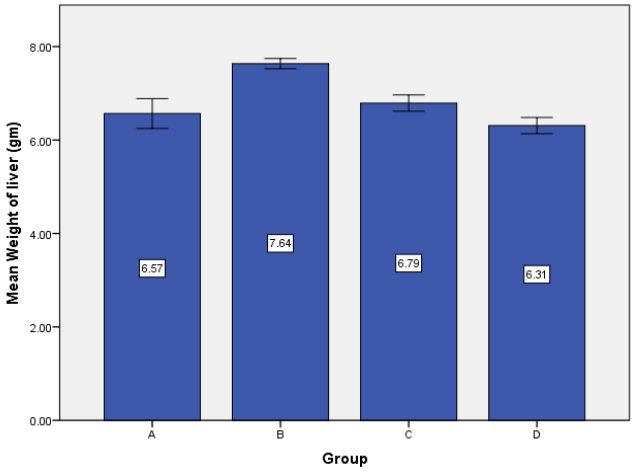

Fig. 1: Mean weight of liver among groups

DISCUSSION

All rats of control group remain healthy. However, animals in rest of the groups showed varying degree of agitation, drowsiness and lethargy.The statistical of the present study showed weight and volume of liver in group B treated with ethanol were significantly increased compared to the control group and other groups treated with ADFE and ethanol. The increase in weight of liver may be due to the fact that alcohol causes hepatomegaly and hypertrophy of liver. This is attributed to the accumulation of lipids and proteins in hepatocytes due to chronic alcohol consumption and damage to proteins secreted by hepatocytes.[18,19] The water remains in the cytoplasm leading to hypertrophy of hepatocytes and as a result an increase in the total mass and volume of the liver.[20]

This alcohol induced increase in total liver weight was prevented by treatment with ADFE. In groups C and D, treatment with ADFE prevented the increase in total liver weight. In group D, the weight of liver was reduced as compared to the C group, which showed that effect of ADFE with dose of 2g/kg(body weight) was more effective. The average weight gain of the liver treated with alcohol corresponds to the rosmarinic acid attenuates the hepatotoxicity induced by ethanol in rats by giving alcohol 3g/kg body weight.[21] Vipulet al[22] *and* Saravanan & Nalini[23] supported our results by documenting that ethanol induced hepatotoxicity causes weight in liver of rats and they used *Hemidesmus indicus* as an antioxidant to ameliorate the effect.Padmanabhan and Jangle[24] reported that hepatoprotective activity of herbal preparation (hp-4) against alcohol induced hepatotoxicity in mice also corresponds to our present study in which weight of liver

increases in mice also after chronic alcohol administration.Our results are consistent with Lodhi et al[25] who reported that green tea extract causes decrease of weight of liver in alcohol induced hepatotoxicity. The present study also corresponds with Kapur et al[26] who observed the increase weight of liver in ethanol induced hepatotoxicity and reversal changes in weight occur by use of *Sidaveronicaefolia*.

CONCLUSION

Ajwa date fruit extract has significant protective effect against ethanol induced hepatotoxicity. This may be due to high antioxidants and rich vitamin contents of ADFE.

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