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ORIGINAL ARTICLE

Counter effects of Vitamin E against Outcomes of Alcohol Toxicity in Pancreatic Acini: Histomorphometric Study

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ABSTRACT

Aim: To evaluate the effects of alcohol on the microscopic morphology of the exocrine pancreas and blood serum amylase and to explored that if vitamin E has a protective role against alcohol-induced damage in the pancreas of rabbits.
Study design: Analytical experimental study
Place and duration of study: Departments of Anatomy, Pathology and Pharmacology in Peshawar Medical College Pakistan from 1st January 2019 to 30th June 2019.
Methodology: Eighteen healthy adult male domestic rabbits weighing 1-1.5 kg were chosen (oryctolaguscuniculus). The control group A received proper food and normal saline as drinking water, experimental group B received proper diet and 30 percent ethanol solution (30ml/kg/day) orally daily with normal saline, and experimental group C received proper diet, 30 percent ethanol solution (30ml/kg/day), vitamin E (50mg/kg/day) orally daily with normal saline. Each rabbit's blood was taken for serum amylase. Morphology of acinar cells included: 1) number of cells, (10 acini/field, 2) size of acini, 3) size of acinar cells, and 4) size of acinar nuclei.
Results: Normal value of serum amylase in rabbits was found. The difference in serum amylase levels between the control and experimental groups for both E4 and E8 animals was not statistically significant. There was no significant difference in the number of pancreatic acinar cells, size of pancreatic acini, the pancreatic acinar cell size, and pancreatic acinar cells nuclear size in the control and experimental groups for both E4 and E8 animals.
Conclusion: Alcohol consumption had no influence on the histomorphology of the rabbits' pancreatic acini in a short period (4-8 weeks). No significant variation was noted in the pancreatic acinar cells count & size, pancreatic acinar cells nuclear count and size, and pancreatic acini size. Therefore, protective role of vitamin E was not usefully identified.
Keywords: Alcohol, Pancreas, Histomorphology, Vitamin E, Serum amylase

INTRODUCTION

Alcohol abuse induces a variety of tissue injuries in our body which leads to different pathological conditions including alcoholic liver disease, pancreatitis, cardiomyopathy, neurotoxicity, muscle loss, impaired immune functions, hormonal imbalance, fetal abnormalities, and osteoporosis[1]. Another important target organ of alcohol in the human body is the pancreas. Regular alcohol intake for long-duration causes irreversible pancreatic damage. This damage is due to recurrent acute attacks of pancreatitis.[2] Alcohol metabolism results in hazardous metabolites in our bodies, which cause oxidative stress and damage in many bodily tissues. Vitamin E is an antioxidant that acts as a peroxyl radical scavenger and prevents free radical action in tissues.[3-5] Alcohol metabolism produces a variety of chemicals in various body tissues. The breakdown of these molecules produces reactive oxygen species, also known as free radicals, in tissues[6]. Alcohol also increases the activity of an enzyme called cytochrome P450s, which is a key component in the generation of reactive oxygen species[6]. Ethanol-stimulated cytochrome P4502E1 (CYP2E1) activity is one fundamental route for causing alcoholic damage in human tissues via reactive oxygen species that cause oxidative stress in cells.[7] Ethanol increases gut permeability, allowing endotoxins generated by the gut bacteria to enter[8].

Even though alcohol causes serious pancreatic damage, the mechanisms or pathways by which alcohol initiates pancreatic tissue damage are not completely clear.[9] Acetaldehyde, which is one of the most toxic metabolites produced by alcohol metabolism, alters the integrity of pancreatic acinar cells, the production and activity of oxygen-derived free radicals on pancreatic acinar cells. These free radicals, generated from alcohol metabolism act on the lipid bilayer of the cell membrane leading to peroxidation of the lipid bilayer. This alteration in the lipid bilayer disturbs the cell membrane integrity. Chronic alcohol consumption decreases bicarbonate concentration and fluid volume in pancreatic secretions. This decrease in bicarbonates and fluid volume leads to the precipitation of protein and calcium crystals within the pancreatic ducts, which finally cause ducts obstruction. This destroys pancreatic acini leading to pancreatitis due to ductal hypertension.[10] Pancreatitis is mainly related to the destruction of acinar cells[11].

Alcohol is now recognized to cause a variety of toxicity in acinar cells. Acinar cells have been found to metabolize alcohol (ethanol) by both oxidative and nonoxidative mechanisms. Many researchers have looked at whether differences in ethanol-metabolizing enzymes may be a cause of chronic pancreatitis, but no definitive link has been found. The metabolites and byproducts (oxygen radicals) produced have a toxic impact on the pancreas, causing acute and chronic alterations, although the vulnerability factor that causes overt illness is yet unknown.[12] Micronutrient antioxidant therapy offers a novel therapeutic option for recurring (non-gallstone) pancreatitis and/or pancreatic discomfort.[13-14]

MATERIALS AND METHODS

This analytical experimental study was conducted at Peshawar Medical College's Department of Anatomy, Pathology, and Pharmacology in Peshawar, Pakistan from 1st January 2019 to 30th June 2019. A total of 18 healthy adult male domestic rabbits weighing 1-1.5 kg were chosen. Female rabbits were excluded owing to breeding concerns since they are induced ovulators.[15] Rabbits that were too young (less than 6 months old) or too elderly (greater than 2 years old) were not chosen. The animals were housed in specially built iron cages with natural earth bases and fed a standardized laboratory diet and water. Rabbits were divided into 3 main groups.

Control Group A consisted of six rabbits that were fed a regular diet plus saline. For identifying purposes, permanent green color labels were applied to number these rabbits. The capital letter "A" was used to identify rabbits in this group. Based on the length of the trial, this group was further split into two subgroups. **Subgroup A-I**: For the entire 8 weeks, three rabbits were fed a conventional diet and normal saline as drinking water. **Subgroup A-II**: For the

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entire four weeks, three rabbits were provided a suitable diet and regular saline as drinking water.

Experimental Group B: The rabbits in this group were fed a conventional meal, 30% ethanol solution (30 ml/kg/day) orally daily [16-17], and normal saline. For identifying purposes, permanent red color labels were applied to number these rabbits. The capital letter "B" was used to identify rabbits in this group. Based on the length of the trial, this group was further split into two subgroups. **Subgroup B-I:** Description made up of three rabbits who are fed a normal diet. For the whole 8 weeks, they were given a 30 percent ethanol solution (30ml/kg/day) orally everyday [16-17] and normal saline as drinking water. **Subgroup B-II**: The rabbits are fed a normal diet and are made up of three rabbits. They were given a 30 percent ethanol solution (30ml/kg/day) orally every day for four weeks, as well as regular saline as drinking water.

Experimental Group C: Six rabbits were administered a routine meal, 30 percent ethanol solution (30ml/kg/day), vitamin E (50mg/kg/day) orally daily 13-15, and normal saline in this group. For identifying purposes, permanent blue color labels were applied to number these rabbits. The capital letter "C" was used to identify rabbits in this group. Based on the length of the trial, this group was further split into two subgroups. **Subgroup C-I**: The rabbits are fed a normal diet and are made up of three rabbits. For the whole 8 weeks, they were given a 30 percent ethanol solution (30ml/kg/day), vitamin E (50mg/kg/day) orally each [16-17], and normal saline as drinking water. **Subgroup C-II:** Description made up of three rabbits who are fed a normal diet. For the whole 4 weeks, they were given a 30 percent ethanol solution (30ml/kg/day), vitamin E (50mg/kg/day mixed with 2ml distilled water) orally daily[16-17], and normal saline as drinking water.

Based on experimental duration, the above-mentioned subgroups were divided into two main categories. **Category E4 animals:** This category includes control subgroup A-II, experimental subgroup B-II, and experimental subgroup C-II animals who had an experimental period of 4 weeks.

Category E8 animals: This category includes control subgroup A-I, experimental subgroup B-I, and experimental subgroup C-I animals with an experimental period of 8 weeks.

Pure (99.9% produced by BDH labs, England) ethanol was obtained from a licensed chemical dealer in Peshawar, Pakistan, and a 30 percent solution was prepared in distilled water as needed. Abbott Pharmaceuticals in Karachi, Pakistan, provided us with vitamin E in powder form.

Each group of rabbits was housed in its iron cage with a natural dirt substrate. Each cage was 6 by 8 feet in size. Rabbits were given regular saline to drink through inverted bottles placed in their cages. Food was given in the form of a variety of fresh fruits and vegetables. Bread made up of dry whole grain, dry milk, and sugar was also supplied regularly in addition to fruits and vegetables.

Each rabbit's blood was taken for biochemical examination (serum amylase in U/L) to see if any biochemical abnormalities might be linked to morphological changes produced by alcohol poisoning. Ketarol (ketamine HCL) 1 ml/ IM/kg body weight 16, a general anesthetic, was used to anesthetize rabbits before slaughter. Following anesthesia, a superficial neck incision was performed to expose the external jugular vein, and blood samples were taken from it. Blood samples were taken in heparinized tubes and submitted to a laboratory for biochemical analysis right away.

Proper abdominal dissection was performed on the dissecting board. The viscera of the abdomen were identified, and the left lobe of the pancreas was removed carefully. Left lobe of pancreas was taken for study because the main body and bulk of rabbit pancreas is in left lobe of pancreas and the right lobe is disseminated and its study is not possible.[18] The left lobe of pancreas was inspected for color and any gross abnormalities, as well as the weight and size of each specimen.

After 4 weeks, Category E4 animals, which included subgroups "A-II" of the control group, subgroups "B-II" and "C-II" of the experimental groups, were slaughtered to see if there were any morphological changes in the pancreas due to alcohol toxicity and to see if vitamin E played a protective role in protecting it from alcohol toxicity.

After 8 weeks, Category E8 animals in the control group's subgroup "A-I," as well as the experimental groups' subgroups "B-I" and "C-I," were slaughtered to see if there were any morphological changes in the pancreas due to alcohol toxicity, as well as the protective role of vitamin E in protecting it from alcohol toxicity.

Fixation: For 24 hours, specimens were preserved in 10% neutral buffered formalin. The fixative was changed after 24 hours, and the specimens were transferred to newly produced 10% neutral buffered formalin. Individual rabbit specimens were placed in their containers, which were labeled properly.

Amount of Fixative: To guarantee adequate preservation, a sufficient amount of fixative (almost 5 times the mass of specimens) was placed in containers.

Temperature: Fixed tissues were kept at room temperature till the processing of these issues. Tissues were processed and then carefully embedded for sectioning.

Molds: For producing paraffin blocks to implant tissues, Leichardt's molds (L-shaped pieces of metal sitting on a flat metal surface/plate) were employed.

Sectioning: After preparing the blocks, they were refrigerated for 1 hour before being sectioned. 5 m thin tissue sections were made by microtome (American Optical rotating microtome, model # 820/ Serial # 67026- the USA).

Staining: Hematoxylin and Eosin for normal microscopy.

Mounting of sections: Sections were stained, then mounted with DPX solution and carefully coated with glass cover slips for easier handling, storage and preservation.

Histological examination*:* For microscopy, two slides of pancreas per rabbit were made in each group and each slide was examined under five fields. Following observations were made in pancreatic sections under the light microscope.

Changes in Exocrine Pancreas: Morphology of acinar cells included: 1) number of cells, (10 acini/field, 2) size of acini, 3) size of acinar cells, and 4) size of acinar nuclei.

The SPSS version 25 was used for statistical analysis. When using the one-way ANOVA test to look for a link between two continuous variables, a P-value of 0.05 was considered statistically significant. For each variable, an independent t-test was used to determine the significance of the differences between groups of animals.

RESULTS

Category E4 animals: Control group A-II had a mean serum amylase of 314.33±25.42 U/L, experimental group B-II had a mean serum amylase of 311.67±17.24 U/L, and experimental group C-II had a mean serum amylase of 314.67±15.82 U/L. The difference in serum amylase levels between the control and experimental groups was not statistically significant (P=0.980).

Category E8 animals: Control group A-I had a mean serum amylase of 302.33+20.84 U/L, experimental group B-I had a mean serum amylase of 303.67±15.94 U/L, and experimental group C-I had a mean serum amylase of 309.00±19.07 U/L. There was no significant difference in serum amylase levels between the control and experimental groups (P-value = 0.901). Pancreatic acinar cells were counted in 10 pancreatic acini in 5 sites per specimen in a stained section at 40X magnification.

Category E4 Animals: Control group A-II had a count of 65.60± 0.60 pancreatic acinar cells, experimental group B-II had a count of 69.20±0.40 pancreatic acinar cells, and experimental group C-II had a count of 68.13±2.30 pancreatic acinar cells. There was no significant difference in the number of pancreatic acinar cells in the control and experimental groups (P-value = 0.051).

Category E8 Animals: Control group A-I had a mean pancreatic acinar cell count of 67.26± 0.70, experimental group B-I had a mean pancreatic acinar cell count of 65.80±1.40, and experimental

group C-I had a mean pancreatic acinar cell count of 66.66±1.02. There was no significant difference in the number of pancreatic acinar cells in the control and experimental groups (P-value = 0.318).

Category E4 Animals: Mean size of pancreatic acini in control group A-II was 20.52±0.72 µm, experimental group B-II was 23.56±1.02 µm and experimental group C-II was 25.68± 0.86 µm. The difference in the size of pancreatic acini in the control and experimental groups showed no significance (P-value = 0.053).

Category E8 Animals: Mean size of pancreatic acini in control group A-I was 24.65±1.30 µm, experimental group B-I was 23.88±1.02 µm and experimental group C-I was 23.28± 0.78 µm. The difference in the size of pancreatic acini in the control and experimental groups showed no significance (P value = 0.348).

Category E4 animals: Mean pancreatic acinar cell size in control group A-II was 9.02±1.09 µm, experimental group B-II was 9.44±0.13 µm and experimental group C-II was 9.43±0.61 µm. Difference in the pancreatic acinar cell size in control and experimental groups showed no significance (P value = 0.733).

Category E8 animals: Mean pancreatic acinar cell size in control group A-I was 10.04±0.25 µm, experimental group B-I was 8.64±1.09 µm and experimental group C-I was 10.17± 0.28 µm. Difference in the pancreatic acinar cell size in control and experimental groups showed no significance (P value = 0.057).

Category E4 animals: Mean pancreatic acinar cells nuclear size in control group A-II was 4.36±0.08 µm, experimental group B-II was 4.08±0.24 µm and experimental group C-II was 4.16±0.36 µm. Difference in the pancreatic acinar cells nuclear size in control and experimental groups showed no significance (P value = 0.440).

Category E8 animals: Mean pancreatic acinar cells nuclear size in control group A-I was 4.24±0.13 µm, experimental group B-I was 3.94±0.12 µm and experimental group C-I was 4.62±0.62 µm. Difference in the pancreatic acinar cells nuclear size in control group and experimental groups showed no significance (P value = 0.160).

Table 1: Serum Amylase of animals at the end of experiment

Category	Group	Mean±SD
E4 Animals	Control Group A-II	314.33±25.42
	Experimental Group B-II	311.67±17.24
	Experimental Group C-II	314.67±15.82
E8 Animals	Control Group A-I	302.33±20.84
	Experimental Group B-I	303.67±15.94
	Experimental Group C-I	309.0±19.07

Table 2: Serum Amylase of animals at the end of experiment (One way ANOVA test)

Category	Groups	Sum of Squares	Df	Mean Square	F	Sig.
E4 animals	Between	16.222	2	8.111	0.020	.980
	Within	2388.000	6	398.000		
	Total	2404.222	8			
E8 animals	Between	74.667	2	37.333	0.106	.901
	Within	2105.333	6	350.889		
	Total	2180.000	8			

Table 3: Pancreatic acinar cells count/10 pancreatic acini

Category	Group	Mean±SD
E4 Animals	Control Group A-II	65.60±.060
	Experimental Group B-II	69.20±0.40
	Experimental Group C-II	68.13±2.30
E8 Animals	Control Group A-I	67.26±0.70
	Experimental Group B-I	65.80±1.40
	Experimental Group C-I	66.66±1.02

Table 4: Pancreatic acinar cells count / 10 pancreatic acini (One way ANOVA test)

Category	Groups	Sum of Squares	Df	Mean Square	F	Sig.
E4 animals	Between	20.516	2	10.258	5.257	.051
	Within	11.707	6	1.951		
	Total	32.222	8			
E8 animals	Between	3.262	2	1.631	1.397	.318
	Within	7.013	6	1.169		
	Total	10.276	8			

Table 5: Size of pancreatic acini/HPF

Category	Group	Mean±SD
E4 Animals	Control Group A-II	20.52±0.72
	Experimental Group B-II	23.56±1.02
	Experimental Group C-II	25.68±0.86
E8 Animals	Control Group A-I	24.65±1.30
	Experimental Group B-I	23.88±1.02
	Experimental Group C-I	23.28±0.78

Table 6: Size of pancreatic acini/HPF (One way ANOVA test)

Category	Groups	Sum of Squares	Df	Mean Square	F	Sig.
E4 animals	Between	40.362	2	20.181	26.191	.053
	Within	4.623	6	.771		
	Total	44.985	8			
E8 animals	Between	2.844	2	1.422	1.267	.348
	Within	6.746	6	1.124		
	Total	9.590	8			

Table 7: Pancreatic acinar cells size/HPF

Category	Group	Mean±SD
E4 Animals	Control Group A-II	9.02±1.09
	Experimental Group B-II	9.44±0.13
	Experimental Group C-II	9.43±0.61
E8 Animals	Control Group A-I	10.04±0.25
	Experimental Group B-I	8.64±1.09
	Experimental Group C-I	10.17±0.28

Table 8: Pancreatic acinar cells size/HPF (One way ANOVA test)

Category	Groups	Sum of Squares	Df	Mean Square	F	Sig.
E4 animals	Between	.347	2	.174	.327	.733
	Within	3.182	6	.530		
	Total	3.529	8			
E8 animals	Between	4.346	2	2.173	4.805	.057
	Within	2.713	6	.452		
	Total	7.059	8			

Table 9: Pancreatic acinar cells nuclear size/HPF

Category	Group	Mean±SD
E4 Animals	Control Group A-II	4.360±0.08
	Experimental Group B-II	4.08±0.24
	Experimental Group C-II	4.16±0.36
E8 Animals	Control Group A-I	4.24±0.13
	Experimental Group B-I	3.94±0.12
	Experimental Group C-I	4.62±0.62

Table 10: Pancreatic acinar cells nuclear size/ HPF (One way ANOVA tests)

Category	Groups	Sum of Squares	Df	Mean Square	F	Sig.
E4 animals	Between	.125	2	.062	.944	.440
	Within	.397	6	.066		
	Total	.522	8			
E8 animals	Between	.711	2	.356	2.524	.160
	Within	.845	6	.141		
	Total	1.556	8			

Fig. 1: Photomicrograph of 5µm thick H&E stained section of a control group rabbit pancreas showing normal lobulated appearance of pancreas

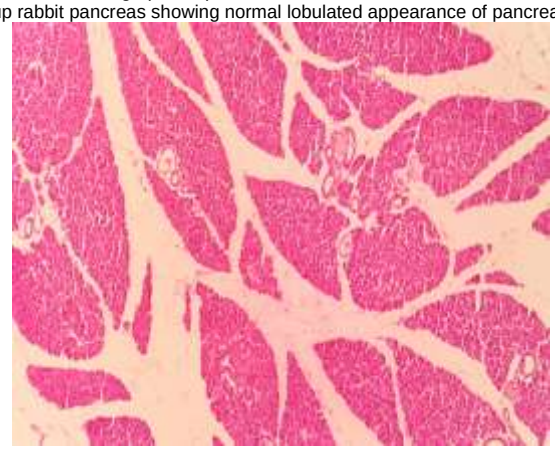


Fig. 2: Photomicrograph of 5µm thick H&E stained section of an experimental group B-I, category B rabbit pancreas showing. A. Normal pancreatic accini

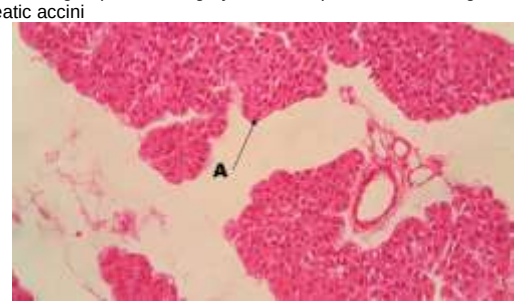
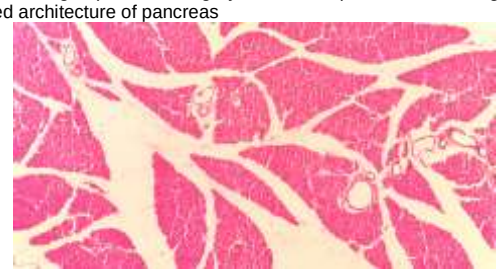


Fig. 3: Photomicrograph of 5µm thick H&E stained section of an experimental group C-I, category B rabbit pancreas showing normal lobulated architecture of pancreas



DISCUSSION

Alcohol has been related to a range of morphological alterations in the pancreas. Alcoholic pancreatitis is a common side effect of binge drinking. However, only a small percentage of drinkers acquire the illness, indicating that another trigger may be necessary to cause clinically visible pancreatic damage. Alcohol is now well known to be processed by the pancreas through both oxidative and non-oxidative metabolites. For some years, researchers have been trying to find clinically significant variables that might explain why some drinkers are prone to pancreatitis. Although endotoxin has been demonstrated to cause overt pancreatic damage and increase disease development in alcohol-fed animals in the experimental environment, clinical investigations have yet to find a clear, functionally defined link. While the biochemical effects of alcohol on the pancreas have become more clear in recent years, identifying predisposing or triggering variables remains difficult.[19] The current study looked that if alcohol can alter the exocrine pancreas' microscopic morphology as well as blood serum amylase levels. We investigated if vitamin E has a role in preventing alcohol-induced damage to the pancreas of rabbits. We found that the intake of alcohol use did not affect the histomorphology of the rabbits' pancreas after 4-8 weeks. Rabbits in all experimental groups were sleepy and unable to walk for a few hours after being given alcohol at the start of the study. They gradually became used to drinking, and their level of activity increased. All of the experimental groups experienced mood shifts. Rabbits in experimental groups were increasingly violent and aggressive, to the point that they began fighting with one another, with the strongest constantly attempting to control the weaker. Some rabbits were severely hurt as a result of the fighting. Stevenson et al[20] reported similar changed motor activity and behaviors in mice after 8 weeks of alcohol administration. In both category E4 and E8 animals, mean body weights were compared across all three subgroups in each category, and there was no statistically significant difference in weights between control and experimental subgroups. The body weights of all rabbits in both groups increased at about the same rate. Our findings on the effect of alcohol on body weight are in line with those of Tsukamoto et al[21], who found no significant differences in body weights of control and experimental group animals after sixteen weeks of alcohol treatment to mice. Our findings align with the conclusion by Devgun and Dunbar[22], which demonstrated that alcohol does not induce weight gain even when used for a long period, such as 5 years.

The most common cause of chronic pancreatic inflammation is alcohol consumption (chronic pancreatitis). Although it has long been assumed that alcoholic pancreatitis is a chronic illness from the start, evidence is mounting that recurrent bouts of acute tissue inflammation and death can lead to chronic damage in the pancreas (necroinflammation). Initially, ductular and sphincteric anomalies were linked to the aetiology of alcoholic pancreatitis. The kind of pancreatic cell that generates digestive juices has gotten a lot of attention in recent years (acinar cell).[12] The production of toxic metabolites and alcohol metabolism by acinar and other pancreatic cells are considered to have a role in the formation of alcohol-related acute and chronic pancreatic damage. According to research using cultured pancreatic acinar cells and isolated pancreatic acini, the pancreas can metabolize ethanol via both oxidative and non-oxidative mechanisms. Recently, it was shown that pancreatic stellate cells, which are involved in pancreatic fibrogenesis, contain ADH activity, suggesting that the pancreas' ability to metabolize ethanol may be found not just in parenchymal (acinar) cells but also nonparenchymal cells. Individual vulnerability to alcoholic pancreatitis has been investigated using polymorphisms and mutations of ethanol metabolizing enzymes[23].

We observed that there was no statistically significant difference in the serum amylase of rabbits among all groups in both categories. This observation concludes that short-term alcohol intake does not damage pancreatic acini and their secretary function remains normal. However, Maruyama et al[24] found that serum amylase was found high in chronic alcoholics who were admitted to hospital for some reason. The reason for this dissimilarity in the results might be the difference in the duration of alcohol intake. To check any histological changes in the exocrine pancreas due to alcohol toxicity, we selected and analyzed some parameters including the number of cells/acinus/10 acini, size of acini/HPF, size of acinar cells/HPF, and size of acinar cells nuclei/HPF. For all parameters, the differences between control and experimental groups in both category E4 and E8 animals showed no significance. This suggests that an alcohol intake on daily basis for a short duration has no toxic effects on pancreatic acini. Sarles et al[25] also reported no morphological change in pancreatic acini after 4-8 weeks' administration of alcohol to rats. However, Tsukamoto et al[26] reported degenerative changes in the pancreatic acini and acinar cells after alcohol administration in rats. The difference in the results may be due to the difference in duration of the alcohol administration, the kind of animal used in the experiment, and the high-fat diet given to rats.

We found that in 4-8 weeks, alcohol consumption did not influence the histomorphology of the rabbits' pancreas. As a result, vitamin E does not appear to have a function in a rabbit's alcohol-exposed pancreas. Gómez et al[27] reasoned that vitamin E may prevent or minimize the negative effects of CsA on pancreatic regeneration and collagen deposition following Cr pancreatitis based on the findings above. Gomez observed how vitamin E affected collagen deposition in rats with Cerulein (Cr) pancreatitis that was caused by Cyclosporin A (CsA) treatment. In vitamin E-treated rats, morphology revealed an improvement in fibrosis score and a decrease in the number of myofibroblasts. In the treatment of chronic pancreatitis, antioxidant therapy may be beneficial. For some years, researchers have been trying to find clinically significant variables that might explain why some drinkers are prone to pancreatitis. Although endotoxin has been demonstrated to cause overt pancreatic damage and increase disease development in alcohol-fed animals in the experimental environment, clinical investigations have yet to find a clear, functionally defined link. While the biochemical effects of alcohol on the pancreas have become more clear in recent years, identifying predisposing or triggering variables remains difficult.

Pancreatic amylase and lipase performed better in the diagnosis of pancreatitis than total amylase[28].

CONCLUSION

No significant variation was noted in the pancreatic acinar cells count & size, pancreatic acinar cells nuclear count and size, and pancreatic acini size. In 4-8 weeks, it was discovered that alcohol consumption did not influence the histomorphology of the rabbits' pancreas. Therefore, vitamin E does not seem to have any potential role for an alcohol-exposed pancreas of rabbits. There are mixed results concerning pancreatic damage from alcoholism. Therefore, more research into the oxidative and nonoxidative mechanisms of ethanol metabolism by pancreatic cells is needed.
Conflict of interest: Nil

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