Ethanol induces a number of deleterious metabolic changes in the liver. Its excessive use for a long-time leads to development of steatosis, alcoholic hepatitis and cirrhosis resulting in weight and volume changes. At least 80% of heavy drinkers had been reported to develop steatosis, 10-35% alcoholic hepatitis, and approximately 10% liver cirrhosis. Recent studies in animal models suggest that liver injury in chronic alcoholics is due to oxidative stress that leads to fibrosis and impaired liver functions and increased apoptosis. The present study describes the hepatotoxic effects of ethanol in albino rats.

This study was an experimental randomized control trial (RCT). Twelve male albino rats 6-8 weeks old having 150-200 gm of body weight were used. The animals were fed on standard rat chow, provided water ad libitum, and randomly divided into two groups of 6 rats each. Group A served as control and each rat was given an additional 2 ml/100 gm/day distilled water. The experimental Group B was given 2 ml (0.5 g)/100 gm body weight per day of 30% v/v of aqueous solution of ethanol for 8 weeks. The body weight of each animal was recorded twice weekly and at the end of the experimental period.

At the end of experiment, serum alanine aminotransferase (ALT) and gamma glutamyl-transferase (GGT) were measured by using kits (Human Company, Germany). The liver of each animal was removed, weighed, in 10% formalin and processed for routine paraffin embedding. Five micron thick sections were stained with H&E and PAS stains. The data was analyzed using SPSS version 15.0. Independent sample “t” test and Fisher’s exact test were applied. Differences between groups were considered to be statistically significant, if p-value was ≤ 0.05.

All animals of group A were healthy and active; however, group B exhibited slight degree of drowsiness. In group A, mean body weight of the animals at the start and the end of experiment was 168.33±4.40 and 208.16 ±5.84 gram respectively; whereas, in group B, values were 165.66±4.46 and 182.66±3.5 gram respectively, showing that the group B rats had significantly lower (p < 0.05) body weights.

After 8 weeks of the experiment, group A values for serum ALT and GGT were 28.16±7.13 and 27.33 ±3.05 U/L respectively; whereas group B values for these enzymes were 82.33±10.89 and 79.33±4.37 U/L respectively (p < 0.05). Liver from group A showed no gross and/or histological abnormalities. The mean weight and volume of liver in this group were 10.78 ±0.39 g and 10.33 ±0.42 ml respectively; these parameters (13.23±0.50 g and 13.23±0.38 ml) were statistically higher (p < 0.05) in the experimental group. The histological sections of group A showed normal hepatic histological picture (Figures 1 and 2). Each hepatocyte (21.24±0.38 µm) contained a vesicular nucleus (7.51±0.12 µm) with 1-2 nucleoli. The mean diameter of central vein in this group was 78.50 ±0.99 µm. The bile duct was lined by low cuboidal epithelium (Figure 2a).

In group B, no change in the hepatic cords radiating from central vein toward the periphery was seen (Figure 1b). The mean size of hepatocytes and their nuclei were 26.23 ±0.54 and 7.51 ± 0.12 µm respectively. The mean diameter of central vein in this group was 78.50 ±0.99 µm. The bile duct was lined by low cuboidal epithelium (Figure 2a).

ABSTRACT

Twelve male albino rats of 6-8 weeks old, weighing 150-200 gm each were divided into two groups of 6 rats each. Group A was used as control while Group B was given ethanol at a dose of 0.6 ml (0.5 gm)/100 gm/day for 8 weeks. Serum enzymes and liver histology was determined in both groups. Statistically significant increase in the mean enzyme levels, liver weight and volume were observed in the ethanol treated group compared to the controls. Histologically, hepatocytes contained large number of cytoplasmic vacuoles, pyknotic nuclei, and lymphocytic infiltration in treated animals. Ethanol appeared to be hepatotoxic in albino rats.

Key words: Ethanol. Hepatotoxicity. Pyknotic nuclei. Hepatocytes.
of central vein was observed (p > 0.05). The cytoplasm of the cells contained large number of micro- and macro-vacuoles involving entire of the hepatic lobule. Nuclei of hepatocytes of this group appeared vesicular with a distinct nuclear envelope containing one or two prominent nucleoli and scattered chromatin. Some hepatocytes contained two nuclei. Pyknotic nuclei were also observed. The portal area showed lymphocytic infiltration, the bile duct was lined with cuboidal cells and appeared normal (Figure 2b). Fisher’s exact test showed statistically significant difference between groups A and B regarding percentage of hepatocytes containing cytoplasmic vacuoles (p=0.002). Similarly, differences in pyknotic nuclei (p=0.006) and portal area showing lymphocytic infiltration between groups A and B were statistically significant (p=0.005).

The changes (p < 0.05) reported above in the liver ALT and GGT in group B rats were probably due to production of reactive oxygen species, inducing protein oxidation and lipid peroxidation which resulted in hepatocyte injury. The increase (p < 0.05) in liver weight of the alcohol-treated rats can be due to the accumulation of fats and water causing hepatocytic hypertrophy. Ethanol induced apoptosis characterized by dark pyknotic nuclei had also been reported earlier due to the alcohol toxicity. Similarly, lymphocytic infiltration around the bile duct called periporal inflammation seen in the present study had also been reported earlier.

Ethanol treatment to albino rats for 8 weeks induced a fair degree of derangement of liver structure and function.

REFERENCES


Figure 1: Section from the liver of the experimental group B. H and E stain. X200. central vein (C); endothelial cells (Ec); hepatocytes (H); hepatic sinusoids (S); Kupffer cells (K); cytoplasmic vacuoles (V).

Figure 2: Photomicrograph of a section from the liver of the experimental group B. PAS stain. X400. portal vein (V); hepatic artery (A); bile duct (B); glycogen granules (G); cytoplasmic vacuoles (Vc); nuclei (N); nucleoli (Nu); lymphocyte infiltration (L); pyknotic nuclei (Pn).