Original article Casp. J. Vet. Sci., 2026; 3(1): 1-5

Amol University of Special Modern Technologies

Caspian Journal of Veterinary Sciences

doi: 10.22034/cjvs.2026.559598.1051

Journal homepage: https://Cjvs.ausmt.ac.ir/

Morphological and embryonic development in different stages under side effect of barbican beverage in white mice *Mus musculus*

Arwa Adress Ahmed[1*]

[1]Department of Biology, College of Education for Pure Science, Mosul University, Mosul, Iraq.

(*) Corresponding Author: arwabio2020@uomosul.edu.iq

Article Info

Article history:

Submit Date: 13 November 2025

Accept Date: 5 January 2026

Online Date: 17 June 2026

Keywords:

Barbican

Fetuses

Mus musculus

Pregnant

Abstract

Barbican is a barley drink that is widely consumed among people. Pregnant mice were given this ready-made drink three times a day, which is a high concentration equivalent to three 330 ml cans, from the first day of pregnancy until (D18) of dissection. Our study revealed numerous effects, including uterine horn deformities, a high rate of foetal death, a significant increase in the weight of fetuses and pregnant mothers, the appearance of a number of morphological deformities, including flatulence, spina bifida, hemorrhage, cleft palate and a number of pathological and histological changes in the spleen of pregnant mice from it dilatation, congestion, and hemosiderosis. Barbican is not safe and its effects at high concentrations.

Introduction

Barley drink is one of the most popular beverages (El-Naggar *et al*., 2012) whose consumption has increased significantly and has replaced milk among adolescents and even adults. This increase in consumption is not surprising as its manufacturers have spent billions of dollars on advertising to attract consumers and increase their numbers, which in turn leads to increased consumption of their products (Muhammed *et al*., 2015). It is very popular and widespread in many countries (Ahmed *et al*., 2006). The non-alcoholic beverage industry is a common industry all over the world and has become a dietary habit in most countries and in both urban and rural areas (David *et al*., 2006). It contains fructans, a type of fermentable fiber made up of short-chain carbohydrates that can cause bloating in people with irritable bowel syndrome (IBS) (Cardona *et al*., 2013; Ye *et al*., 2020). It reduces blood sugar, so it must be carefully monitored when taken with diabetes medications (Gupta *et al*., 2017; So *et al*., 2018). It can also help with weight loss if taken with a diet, as it has high fiber content (Andersson *et al*., 2013; Wang *et al*., 2016). Despite all the benefits of these drinks, excessive consumption of them causes fatigue, lethargy, and many problems (Abdullah *et al*., 2015) due to the presence of artificial flavors and colors (Xu *et al*., 2021). The barley drink industry began in ancient Iraq in the Sumerian civilization, and after that, the Babylonians and then the Egyptians in the third millennium BC, and then this industry reached Europe after that (Shafi *et al*., 2009). The incidence of malformations varies during pregnancy depending on the stage of foetal development, ranging from fertilization, early implantation, organogenesis, and the foetal period, due to the influence of factors on foetal growth and development (Semih, 2021). The study was conducted on pregnant rats and their fetuses to determine the potential effects of this type of beverage on causing birth defects and pathological and histological changes.

Materials and Methods

Animals

In this study, female Swiss white mice (*Mus musculus*) were used. They were obtained from the Animal House of the College of Veterinary Medicine, University of Mosul. They were in good health and were placed in the designated cages for the study. They were given the water and foods allocated to them and were kept under equal periods of light and darkness and at appropriate temperatures. They were sterilized periodically. The mating process was carried out with (20) female mice (weight 23 ± 2 gr) by placing two females with one male (10 male). The day of fertilization was considered day zero of pregnancy and the following day were considered day 1 of pregnancy."

Material used in the study

Saudi Barbican syrup was used, which was obtained from local markets and given to pregnant mice as is without dilution or change. The concentration given to pregnant mice was (0.9 mg/kg of body weight) (Pandy, 2020) three times daily from the first day of pregnancy to D18, which is the day on which the dissection was performed. The mice were divided into two groups, the first was given distilled water and the second was given Barbican syrup.

Experimental design

Pregnant mice were divided into two groups. The first group (5 pregnant females) was given distilled water, while the second group (15 pregnant females) was given Barbican beverage according to the previously determined dosage.

Dissection and extraction of embryos and organs

Dissection was performed on (D18) using the traditional method and embryos were obtained to study morphological abnormalities and obtain a spleen for the pregnant mothers to perform the necessary procedures according to Al-Hajj (2010).

Statistical analysis

The results were analyzed statistically using SPSS program and ANOVA test, and LSD was adopted to calculate the significant difference at a significance level of $p < 0.05$ (Al-Aqili *et al*.,1998).

Results

1- Uterine horns

Barbican caused few effects in the experimental group, including hemorrhage (H), fat

(F), and irregular uterine horns (double arrow) (Fig. 1).

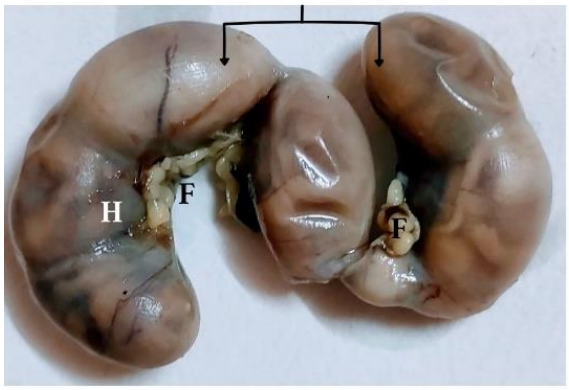

Fig. 1. Malformation in uterine horns.

2- Foetal death

A higher incidence (43%) of fetal death was observed at the dose used compared to the control group (Fig. 2).

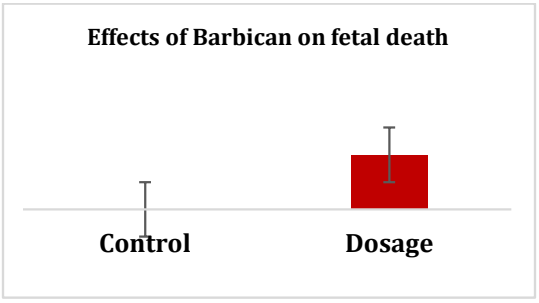

Fig. 2. Rate of death in foetal. Significant in death of fetus compared to control group increase ** $p < 0.05$ in D18. As mean ± STD , n=20.

3- Embryo weight

There was a significant increase in the weight (0.53 ± 0.82 gr) of the fetus compared to the weight of the embryos in the control group (0.3 ± 0.5 gr) (Fig. 3).

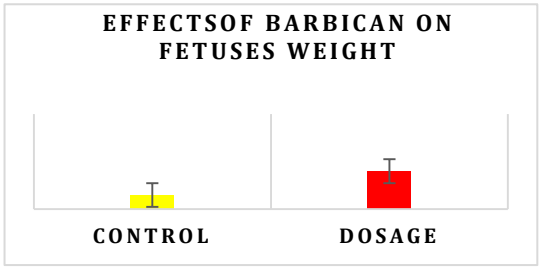

Fig. 3. The rate of weight in foetal. Significant in death of fetus compared to control group increase *** $p < 0.05$ in D18. as mean ± STD , n=20.

4- Weight of pregnant mice

There was also an increase in the weight of pregnant mice compared to control group (Fig. 4).

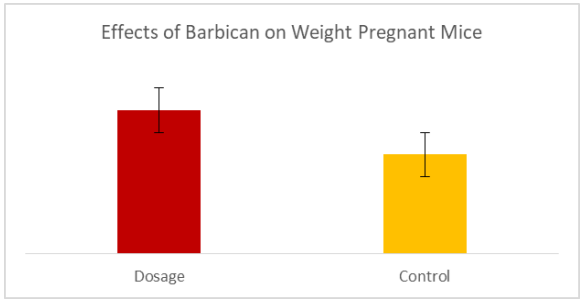

Fig. 4. Risk of Barbican on weight of pregnant mice. *$p < 0.05$. in D18. as mean ± STD , n=20.

5- Morphological changes in fetuses D18

Numerous morphological abnormalities were observed, including short forelimbs, adactyly, spine bifida, hemorrhage, flatulence (Fig. 2), cutis pendula, hypostasis, adactyly (Fig. 3), pinna out of place cutis pendula, hypostasis (Fig. 4) exophthalmia, meningocele, cleft palate (Fig. 5), spine bifida, hemorrhage, celectome in Rromb encephalon (Fig. 6) compared to control group (Fig. 1).

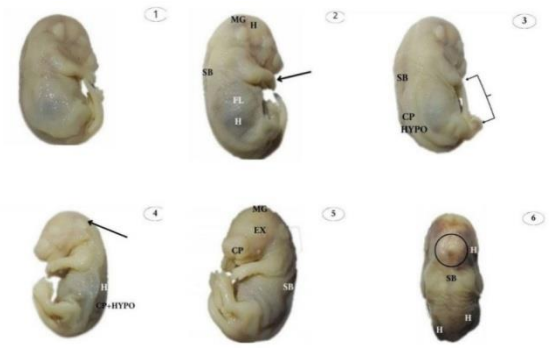

Fig. 5. View the congenital malformation in fetuses in (D18), spin bifida (SB), flatulence (FL), hemorrhage (H), megalencephaly (MG), micromelia and a dactyl (arrow) (Fig. 2), cutis pendula (CP) + hypostasis (HYPO), (AD) (arrows) (Fig. 3), pinna in the abnormal place (arrow), (CP+HYPO) (Fig. 4), exophthalmia (EX), cleft palate (CP), (SB),(MG) (Fig. 5), notencephalocele (circle), (H), (SB) (Fig. 6), all that compare to control (Fig. 1).

6- Histopathological changes in the spleen

A number of histopathological changes were observed in the spleens of pregnant mice

compared to the control group (Fig. 1), these changes were dilation and congestion of spleen blood vessels (Fig. 2), increased the white pulp areas with hyperplasia of splenic lymphoid follicles (Fig. 3), The splenic red pulp area with massive hemosiderosis (Fig. 4), infiltration of marked macrophages (Fig. 5).

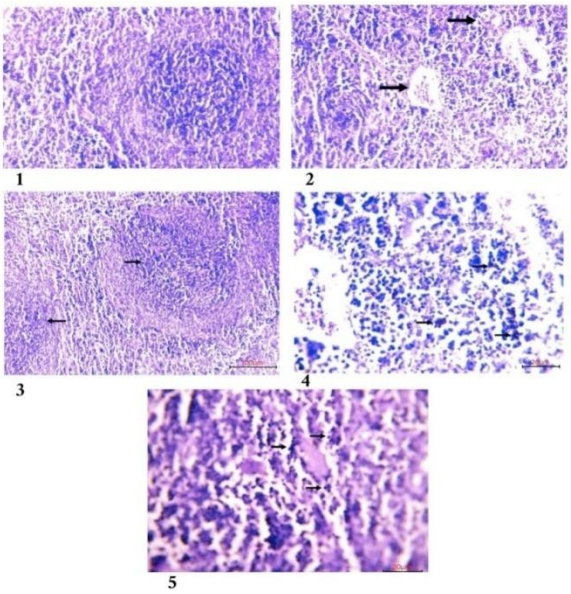

Fig. 6. Spleen section from mice exposed to control group (P:1), dilatation and congestion of splenic blood vessels (black arrows). (100 µm H&E) (P:2), increased the white pulp areas with hyperplasia of splenic lymphoid follicles (black arrows), (100 µm H&E) (P:3), the splenic red pulp area with massive hemosiderosis (black arrows), (100 µm H&E) (P:4), infiltration of marked macrophages (black arrows), (20 µm H&E) (P:5).

Discussion

The current study was conducted on pregnant female mice that were dosed with ready-made Barbican syrup, which was obtained from local markets. The study found no significant differences in the occurrence of uterine horns between the experimental and control groups. It also found a percentage of foetal death and an increase in the weights of pregnant mice and foetuses, in addition to congenital malformation in foetal and histopathological in spleen of pregnant mice (Abdullah *et al*., 2015). We also did not find any research that indicates the side effects of Barbican on mice or pregnant mice, as there are not many studies that directly evaluate the safety of non-alcoholic drinks during pregnancy. However, studies indicate that such drinks contain higher than expected quantities, such as ethanol (Adiong *et al*., 2014). Barley is one of the main ingredients of alcoholic beverages (Trius-Soler *et al*., 2020). Studies have shown that after consuming a large amount of ethyl alcohol, acetaldehyde will be produced, which disrupts the trichloroacetic acid cycle, which affects the process of fat metabolism (Ma *et al*., 2015). An increase in the concentration of ethyl alcohol in the body leads to an increase in the formation of fats in the blood (Landnann *et al*., 2017). The results of our study were not consistent with many studies, as our results indicated that the effects caused by Barbican may be due to oxidative stress caused by drinking Barbican in high doses and concentrations, while other studies indicate that it reduces oxidative damage, as it contains antioxidants that activate enzymes that reduce oxidative damage (Zhang *et al*., 2021). Al-Khatib and Khalifa (2023) found an increase in the number of white blood cells in male mice that were given a barley drink, which indicates the occurrence of inflammation. Studies indicate that the spleen is affected by this type of drink, which affects the immune cells in the surrounding lymphoid tissues and stimulates it to release cellular mediators, including TNFα and IL-1. As a result of such inflammatory activity, it may affect the structure of the spleen and result in tissue changes in it. Some studies indicate that these drinks containing barley cause weight loss, not obesity, and this is not consistent with our study (Thatiparthi *et al*., 2019).

The results we have shown may indicate that this drink has side effects at high concentrations, an average of 3 cans (330 ml) when taken among pregnant mice. Although our study did not agree with most studies, the results that appeared indicate that pregnant women should avoid taking it and take a safe position until the end of pregnancy. The study recommends the need to conduct more research at other concentrations and also follow up on the lactation stage.

Conflict of Interest

No

References

Abdullah, MM; Jones, PJ and Eck, PK (2015). Nutrigenetics of cholesterol metabolism: observational and dietary intervention studies in the postgenomic era. Nutr. Rev., 73: 523–543.

Adiong, JP; Kim, E; Koren, G and Bozzo, P (2014). Consuming non-alcoholic beer and other beverages

during pregnancy and breastfeeding. Can. Family Physician, 60: 724–725.

Al-Aqili, SI and Al-Shaib, SM (1998). Statistical analysis using the ready-made statistical analysis program SPSS, Dar Al-Sharq for Publishing and Distribution, Amman, Jordan.

Al-Hajj A (2010). Optical laboratory preparation. 1st ed. Jordan: Dar AlMassera, PP: 40-44.

Al-khateeb SA and Khalefa SHJ (2023). Study the effect of barely drinks on some haematological variables on male rats, Samarra. J. Pure Appl. Sci., 5: 128-142.

Andersson, KE; Axling, U; Xu, J; Swärd, K; Ahrné, S; Molin, G; Holm, C and Hellstrand, P (2013). Diverse effects of oats on cholesterol metabolism in C57BL/6 mice correlate with expression of hepatic bile acid-producing enzymes. Eur. J. Nutr., 52: 1755–1769.

Cardona, F; Andrés-Lacueva, C; Tulipani, S; Tinahones, FJ and Queipo-Ortuño, MI (2013). Benefits of polyphenols on gut microbiota and implications in human health. J. Nutr. Biochem., 24: 1415–1422.

Gupta, VK; Paul, S and Dutta, C (2017). Geography, ethnicity or subsistence-specific variations in human microbiome composition and diversity. Front. Microbiol., 8: 1162.

Koren, G; Nulman, I; Chudley, AE and Loocke, C (2003). Fetal alcohol spectrum disorder. Can. Med. Assoc. J., 169: 1181–1185.

Landmann, M; Sellmann, C; Engstler, AJ; Ziegenhardt, D; Jung, F; Brombach, C and Bergheim, I (2017). Hops (*Humulus lupulus*) content in beer modulates effects of beer on the liver after acute ingestion in female mice. Alcohol Alcoholism, 52: 48-55.

Ma, T; Sun, X; Tian, C; Zheng, Y; Zheng, C and Zhan, J (2015). Chemical composition and hepatoprotective effects of polyphenols extracted from the stems and leaves of Sphallerocarpusgracilis. J. Func. Foods, 18: 673-683.

Pandy, V (2020). A simple method for animal dose calculation in preclinical research. EC Pharmacol Toxicol., 8: 1-2.

Semih, DM (2021). The pathogenesis of congenital anomalies: roles of teratogens and infections. Intech Open,

So, D; Whelan, K; Rossi, M; Morrison, M; Holtmann, G; Kelly, JT; Shanahan, ER; Staudacher, HM and Campbell, KL (2018). Dietary fiber intervention on gut microbiota composition in healthy adults: a systematic review and meta-analysis. Am. J. Clin. Nutr., 107: 965–983.

Thatiparthi, J; Dodoala, S; Koganti, B and Prasad, K (2019). Barley grass juice (*Hordeum vulgare* L.) inhibits obesity and improves lipid profile in high fat diet-induced rat model. J. Ethnopharmacol., 238: 111843..

Trius-Soler, M; Vilas-Franquesa, A; Tresserra-Rimbau, A; Sasot, G; Storniolo, CE; Estruch, R and Lamuela-Raventós, RM (2020). Effects of the non-alcoholic fraction of beer on abdominal fat, osteoporosis, and body hydration in women. Molecules, 25: 3910.

Wang, Y; Ames, NP; Tun, HM; Tosh, SM; Jones, PJ and Khafipour, E (2016). High molecular weight barley β-glucan alters gut microbiota toward reduced cardiovascular disease risk. Front. Microbiol., 7: 129.

Xu, D; Wang, S; Feng, M; Shete, V; Chu, Y; Kamil, A; Yang, C; Liu, H; Xia, H; Wang, X; Sun, G and Yang, Y (2021). Serum metabolomics reveals underlying mechanisms of cholesterol-lowering effects of oat consumption: A randomized controlled trial in a mildly hypercholesterolemic population. Mol. Nutr. Food Res., 65: e2001059.

Ye, M; Sun, J; Chen, Y; Ren, Q; Zhao, Y; Pan, Y and Xue, H (2020). Response of serum LDL cholesterol to oatmeal consumption depends on CYP7A1_rs3808607 genotype in Chinese. Asia Pacific J. Clin. Nutr., 29: 423–433.

Zhang, L; Liu, C; Jiang, Q and Yin, Y (2021). Butyrate in energy metabolism: there is still more to learn. Trends Endocrinol. Metabolism, 32: 159–169.