The Effect of High Fat or High Carbohydrate Exposure During Gestation and Lactation Periods on Hypothalamic and Cerebellar Oxidative Stress Markers in Offspring Sprague Dawley Rats

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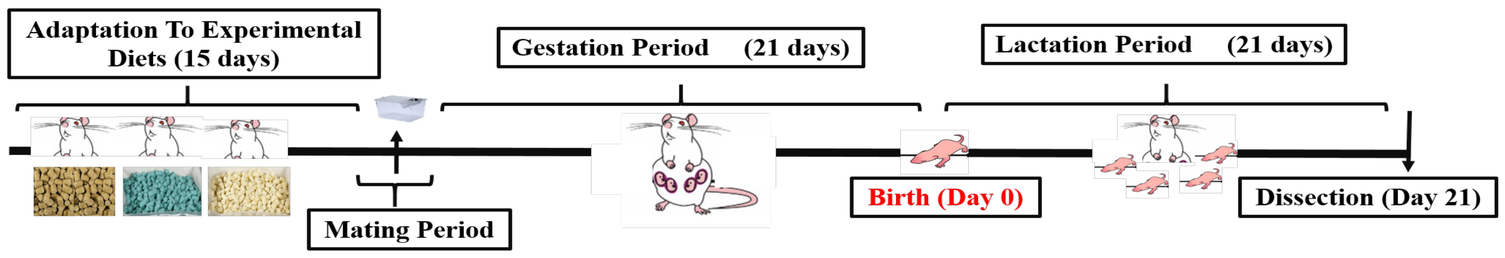
INTRODUCTION

Fetal brain significantly develops during prenatal periods as structures and connections form, providing the base for all aspects of future development. The fetal environment influences the modulation of the early neural processes.[1,2] A critical role in pathology of metabolic, cognitive and neuroendocrinologic disorders is also ascribed to oxidative stress.[3] This study aimed to determine the possible effects of high carbohydrate and high-fat exposure during the maternal period on the oxidant and antioxidant parameters in the male offspring rat brain parts, such as hypothalamus and cerebellum.

METHODS



At the end of the maternal period, a total of 18 male offspring rats were sacrificed, cerebellum and hypothalamus parts were isolated. Enzymatic activities of SOD and GST and levels of GSH and MDA were measured. The experimental protocol was in accordance with National Institutes of Health Guidelines for the Care and Use of Laboratory Animals, and with the Animal Research Ethics Committee of Yeditepe University (Istanbul, Turkey, Decision Number: 2020-820). Statistical analyses were performed by Kruskal Wallis and Man Whitney U Test. p values lower than 0.05 were accepted as statistically significant.

RESULTS

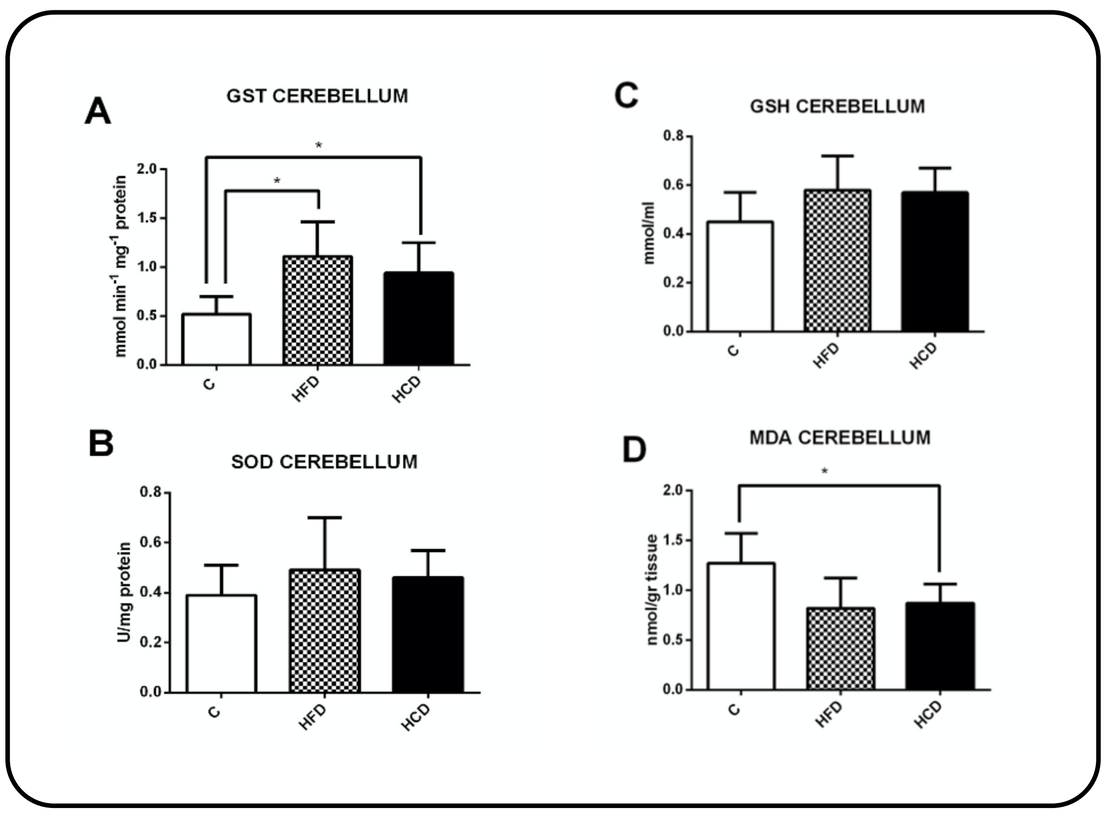


Figure 1 (A-D). Activity of SOD and GST and levels of GSH and MDA in cerebellum. *All data are given as mean of ± SD. * p<0.05.*

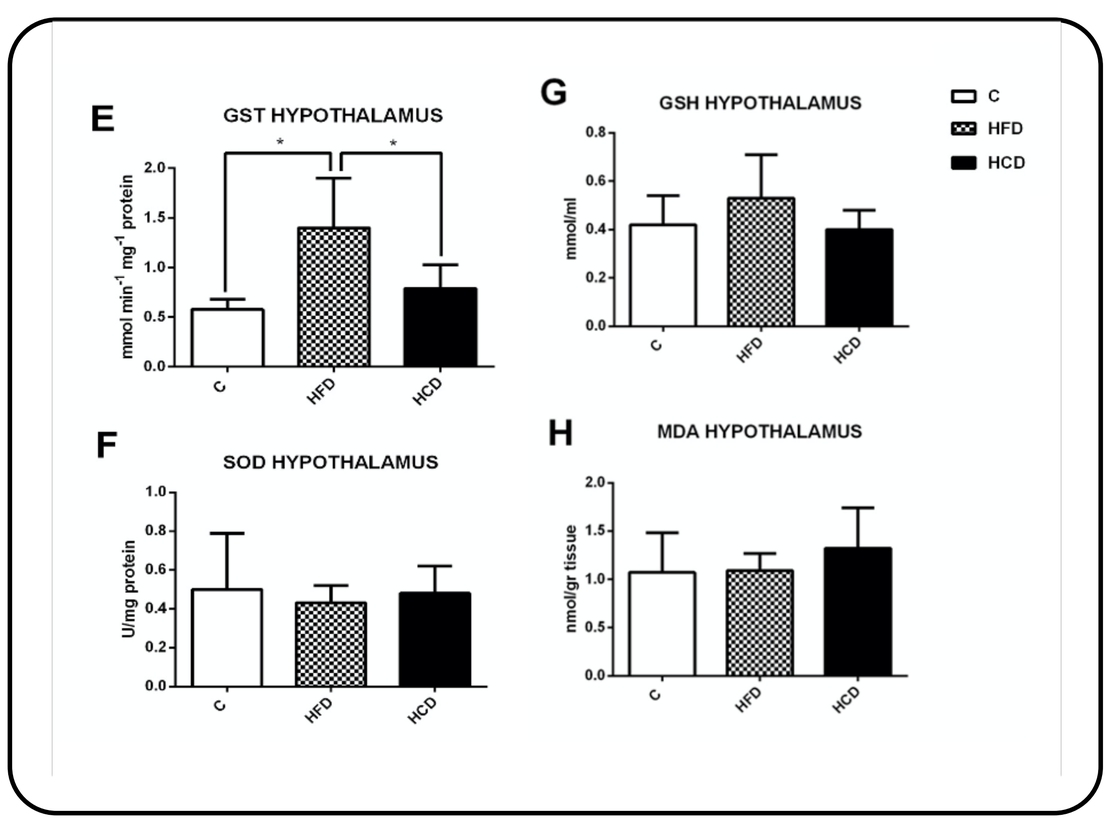


Figure 1 (E-H). Activity of SOD and GST and levels of GSH and MDA in hypothalamus. *All data are given as mean of ± SD. * p<0.05.*

The enzymatic activity of GST was significantly higher in cerebellum HFD-exposed and HCD-exposed offsprings when compared to C-exposed offsprings ($p<0.05$). In addition, the enzymatic activity of GST was significantly higher in hypothalamus of HFD-exposed offsprings when compared to C-exposed and HCD-exposed offsprings ($p<0.05$). On the other hand, MDA level was significantly lower in cerebellum of HCD exposed offsprings rats ($p<0.05$). In addition, MDA levels in HCD exposed rats hypothalmus was increased but not statistically significant.

CONCLUSION

Excessive carbohydrate and fat exposure during the maternal period have an effect on the oxidative stress status of hypothalamus and cerebellum of the brain. These findings indicate that increased GST activity through excessive fat exposure during G-L periods may be an adaptive brain response. However, further molecular researches are needed to clarify the related mechanisms underlying the oxidative stress markers in response to high fat or carbonhydrate exposure.

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