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## INTRODUCTION

Diet is the total amount of nutrients and energy a person consumes through eating and drinking. Our diet is compounded mainly of Carbohydrates, Proteins, and Fats, along with other nutrients such as mineral salts. A balanced diet is a combination of all the essential nutrients necessary for the optimum growth of an individual, starting from birth and throughout life. The general population must have a balanced, as a healthy diet facilitates providing energy and nutrition necessary to survive and live a healthy life.<sup>1</sup> Similarly, if a person does not take proper nutrition or does not have a balanced diet, they may be termed as undernourished or malnourished. Furthermore, those taking or consuming a diet in excessive amounts may suffer from obesity or overweight. Globally, the United Nations states that 36 million people die annually due to malnourishment,

## Pre and postnatal assessment of gross parameters after utilization of high fat diet in rats.

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**ABSTRACT... Objective:** To assess the gross parameters of maternal weight and abdominal circumference upon utilization of high fat diet. **Study Design:** Experimental study. **Setting:** Al-Tibri Medical College and Hospital. **Period:** October 2019 to March 2020. **Material & Methods:** After taken an ethical approval total 16 female albino rats were selected and divided into two groups through randomized sampling and 2 male rats were introduced in each group for the purpose of mating, group A given a normal diet (control) and group B given a composition of high fat diet throughout the gestational period. The weights of the pregnant rats and the abdominal circumference were measured on day 1<sup>st</sup> and 21<sup>st</sup> of gestation. The data were analyzed through SPSS version 21.0, in the form of Mean  $\pm$  standard deviation, and for the evaluation of level of significance independent “t” test was applied and considered value of significant was  $P < 0.05$ . **Results:** There was no significant difference in the weight or abdominal circumference of maternal rats in both groups. **Conclusion:** High fat diet having no significant effects on maternal weight and abdominal circumference as compared to normal diet. We need to assess other histomorphological parameters to assess the relative effects.

**Key words:** High Fat Diet, Maternal, Pre and Postnatal, Weight.

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whereas 2.8 million people die each year as a result of being overweight or obese.<sup>2,3</sup> A balanced diet is also crucial during pregnancy; as this critical period where the significant influence of maternal nutrition, hormones, and environmental factors will go on to define fetal development.<sup>4,5,6</sup> Alternatively, if there is inadequate nutrition delivered during fetal life, developmental failures will result in various organs of humans and animals.<sup>7,8</sup> This means that women must have a balanced and routine diet that an individual may easily consume during pregnancy. Different types of diets that are high in one particular nutrient such as carbohydrates or proteins have been used in pregnancy but have not been beneficial resulting in premature birth, lower birth weight, reduced BMI, impairment in physical and neuronal activity, and alterations in sex.<sup>9,10</sup> In contrast, a standard routine diet with probiotics and vitamins has

shown to be beneficial, leading to better gestation outcomes, better lactation, and a well-developed offspring.<sup>11</sup> There are not still many studies that assess the gross parameters of maternal women during pregnancy upon different dietary intake. Therefore, a study was conducted to assess the prenatal and postnatal gross parameters of High Fat Diet maternal rats.

## MATERIAL & METHODS

After taking the ethical approval from committees (IERC/ATMC/19/51), an experimental study was conducted in the department of anatomy at Al-Tibri Medical College, Isra University Karachi Campus. The duration of the study was for six month from October 2019 to March 2020.

Normal healthy female albino rats aged between 60-90 days and weight between 150 to 220gms were taken from the animal house of Al-Tibri Medical College based on a random sampling technique. Healthy rats below the age of 60 days or greater than 90 days were selected. 16 female rats then housed under a circadian rhythm of 12 hours of light and darkness with different kinds of food and water ad libitum. After one week, the albino female rats were divided into two groups in which each group contained eight female rats and two male rats. Each group was given a particular diet in the form of cake prepared from a bakery with different dietary compositions formulated by veterinary specialist. The dietary composition for each group was as follows:

**Group A:** The Control Group was given a normal animal diet (NAD), comprising of 54% Carbohydrate, 26% Fat, and 20% Protein

**Group B:** was maintained on a High Fat Diet (HFD) for two weeks before pregnancy and during pregnancy. HFD comprised of 58% Fat, 22% Carbohydrate, and 20% Protein.

At the commencement of the study, all female rats were weighed, tagged, and kept in a plastic cage. A male rat was introduced for mating in each group. Confirmation of Pregnancy was around the 4<sup>th</sup> and 5<sup>th</sup> days. The pregnancy confirmation was done using a vaginal swab of female rats,

after which the swabs were dipped in normal saline and studied on a microscope to detect the presence of sperms, thereby confirming pregnancy. On the confirmation of pregnancy, the day was counted as Day Zero.

Once pregnancy was confirmed, the male rats were separated. The maternal rats' weight (in grams) measured using an electronic weight scale and abdominal circumference (measured in cm) were measured using measuring tape on the 1<sup>st</sup> and 21<sup>st</sup> day, with each mother being given a diet of 20-30 grams daily.

The data was analyzed using SPSS version 21.0. The continuous variables in our study were reported as Mean  $\pm$  standard deviation (SD). Independent "t" test was applied to see the statistical significance, with a P-value of < 0.05 being considered significant.

## RESULTS

Figure-1 Shows comparison of Mean maternal weight (gm.) of Albino Rats on the 1<sup>st</sup> and 21<sup>st</sup> day in different groups.

Figure-2 Shows a comparison of Mean Maternal Abdominal Circumference (cm) of Albino Rats on 1<sup>st</sup> and 21<sup>st</sup> day in different groups.

Table-I Shows Pre and Postnatal differences of weight (gm) among the different groups.

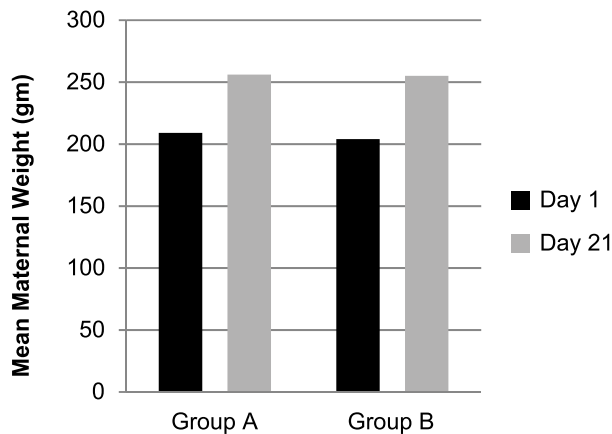
Table-II Shows pre and postnatal differences in abdominal circumference (cm) among the different groups.

Maternal Weight	Day 1	Day 21
Group A vs A	<0.001	
Group B vs B	<0.001	
Group A vs B	0.074	

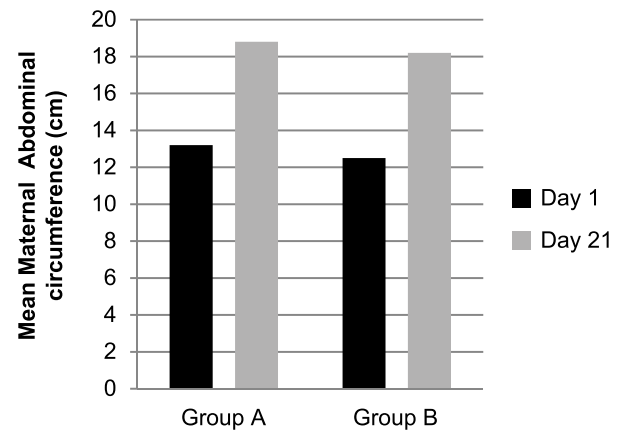
**Table-I. Shows Pre and Postnatal differences of weight (gm) among the different groups. Independent "t" test applied. P=<0.05**

Abdominal Circumference	Day 1	Day 21
Group A vs A	<0.001	
Group B vs B	<0.001	
Group A vs B	0.238	

**Table-II. Shows pre and postnatal differences in abdominal circumference (cm) among the different groups. Independent "t" test applied. P=<0.05**



**Figure-1. Shows comparison of Mean maternal weight (gm.) of Albino Rats on the 1<sup>st</sup> and 21<sup>st</sup> day in different groups.**



**Figure-1. Shows a comparison of Mean Maternal Abdominal Circumference (cm) of Albino Rats on 1<sup>st</sup> and 21<sup>st</sup> day in different groups.**

## DISCUSSION

Weight is an essential tool in determining the health status of any individual. The same can be said during pregnancy when nutrition is not just required for the mother but its future offspring so that it is born healthy without any abnormalities that might risk impairment and reduce life expectancy in the offspring. We gave a normal and a High Fat Diet to the maternal albino rats and observed no significant difference (P-value <0.05) in either of the groups when it came to their weights on the 1<sup>st</sup> and 21<sup>st</sup> days of pregnancy with all of them gaining weight reasonably steadily during the course. Similarly, there was no significant difference (P-value <0.05) observed in the maternal albino rats' and abdominal circumference either on both days of measuring. A similar study conducted on rats showed that diet restriction during the catabolic phase of gestation could increase maternal weight loss. In contrast, restriction during the anabolic phase leads to a decrease in maternal weight gain, emphasizing the importance of proper diet throughout gestation.<sup>12</sup> Although the results show no significant difference, they must not be considered an adequate benchmark for assessing the health of the female during the time of pregnancy, as weight and abdominal circumference are easily available benchmarks that may not accurately depict the overall systemic health of the women or the development of the offspring. This shows that emphasis should

be put on studying other parameters that may provide a more detailed depiction of women's health status during the time of pregnancy if they are on a specific dietary composition.

The group consuming a High Fat diet also did not show any significant difference, however, another study conducted on rats demonstrated that High Fat diet could lead to elevated levels of body fat during pregnancy and at the end of lactation in the maternal rats, leading to maternal obesity that also affected the adiposity and the average body weight of the offspring.<sup>13</sup> Our study, however, showed no significant increase in the group consuming High Fat diet when it came to obesity or weight, however, we did not study the effect of these different dietary compositions on the offspring's either. Alternatively another study conducted showed that the impact of High Fat Diet showed significant difference between the female rats consuming High Fat diet and those consuming control diet after some time and remained so during mating, birth, and weaning period.<sup>14</sup> Rats consuming a high fat diet have shown to become significantly heavier in another study as well, thereby contradiction with our results.<sup>15</sup> This indicates more studies and assessment of other parameters concerning fat diet and its pathological manifestations need to be addressed. A normal diet also displayed the same results, that a normal diet is the same as other diets when it comes to maternal weight and

abdominal circumference. It must be noted that these effects, although may or may not determine pregnancy outcome.

Further research is requiring assessing the effects of high fat diet on maternal rats; histomorphological parameters can be helpful to assess the dietary effects.

## CONCLUSION






There was no significant difference were observed in the maternal weight and abdominal circumference in the provision of high fat diet and regular diet in maternal rats. This does not necessarily mean that diet may not influence pregnancy and pregnancy outcomes. The issue of the behavior of different diets during pregnancy remains a subject without any consensus. More studies are needed to further assess other parameters during pregnancy and in the offspring to evaluate the effect of not just fats, but of different dietary compositions.

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## REFERENCES

- Price S. **Understanding the importance to health of a balanced diet.** Nursing times. 2005 Jan 1; 101(1):30-1.
- Ziegler J. **Economic, social and cultural rights: The right to food. Report by the special rapporteur on the right to food, Mr. Jean Ziegler, submitted in accordance with Commission on Human Rights Resolution 2001/25:** United Nations General Assembly, 58th Session. 2002.
- World Health Organization. **World health statistics: A snapshot of global health.** Ginebra: Organización Mundial de la Salud; 2012.
- Grieger JA, Clifton VL. **A review of the impact of dietary intakes in human pregnancy on infant birth weight.** Nutrients. 2015 Jan; 7(1):153-78.
- Walsh JM, McAuliffe FM. **Impact of maternal nutrition on pregnancy outcome—Does it matter what pregnant women eat?.** Best Practice & Research Clinical Obstetrics & Gynaecology. 2015 Jan 1; 29(1):63-78.
- Gresham E, Byles JE, Bisquera A, Hure AJ. **Effects of dietary interventions on neonatal and infant outcomes: A systematic review and meta-analysis.** The American journal of clinical nutrition. 2014 Nov 1; 100(5):1298-321.
- Chan KA, Tsoulis MW, Sloboda DM. **Early-life nutritional effects on the female reproductive system.** Journal of Endocrinology. 2015 Feb 1; 224(2):45- 62.
- Hanson MA, Gluckman PD. **Early developmental conditioning of later health and disease: physiology or pathophysiology?.** Physiological reviews. 2014 Oct; 94(4):1027-76.
- Nel K, Rimbach R, Pillay N. **Dietary protein influences the life history characteristics across generations in the African striped mouse Rhabdomys.** Journal of Experimental Zoology Part A: Ecological Genetics and Physiology. 2015 Feb; 323(2):97-108.
- Oso AO, Idowu OM, Haastrup AS, Ajibade AJ, Olowonefa KO, Aluko AO, et al. **Growth performance, apparent nutrient digestibility, caecal fermentation, ileal morphology and caecal microflora of growing rabbits fed diets containing probiotics and prebiotics.** Livestock Science. 2013 Oct 1; 157(1):184-90.
- Arrish J, Yeatman H, Williamson M. **Midwives and nutrition education during Pregnancy: A literature review.** Women and Birth. 2014 Mar 1; 27(1):2-8.
- Anderson GD, Ahokas RA, Lipshitz J, Dilts Jr PV. **Effect of maternal dietary restriction during pregnancy on maternal weight gain and fetal birth weight in the rat.** The Journal of Nutrition. 1980 May 1; 110(5):883-90.
- Desai M, Jellyman JK, Han G, Beall M, Lane RH, Ross MG. **Maternal obesity and high-fat diet program offspring metabolic syndrome.** American journal of obstetrics and gynecology. 2014 Sep 1; 211(3):237-e1.
- Férézou-Viala J, Roy AF, Sérougne C, Gripois D, Parquet M, Bailleux V, Gertler A, Delplanque B, Djiane J, Riottot M, Taouis M. **Long-term consequences of maternal high-fat feeding on hypothalamic leptin sensitivity and diet-induced obesity in the offspring.** American Journal of Physiology-Regulatory, Integrative and Comparative Physiology. 2007 Sep; 293(3):R1056-62.
- Kirk SL, Samuelsson AM, Argenton M, Dhonye H, Kalamatianos T, Poston L, Taylor PD, Coen CW. **Maternal obesity induced by diet in rats permanently influences central processes regulating food intake in offspring.** PloS one. 2009 Jun 11; 4(6):e5870.

**AUTHORSHIP AND CONTRIBUTION DECLARATION**

Sr. #	Author(s) Full Name	Contribution to the paper	Author(s) Signature
1	Shahid Maqbool Korai	Experimental Study conduction.	
2	Hina Khan	COncceptualization and manuscript writing.	
3	Shahid Hussain Soomro	Critical review.	
4	Muhammad Rafique	Data analysis.	
5	Raja Faisal	Study conduction.	
6	Mazhar-ul-Haque	Manuscript writing.	