

ORIGINAL ARTICLE

EFFECT OF HIGH FAT AND CAGED CHICKEN DIET ON OVARIAN HISTOMORPHOLOGY IN FEMALE ALBINO RATS

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Background: Consumption of high fat diet, caged chicken meat and sedentary lifestyle have seriously increased the risks of hyperlipidemia that leads to increased ovarian weight as well as ovarian stromal changes associated with difficulties in reproduction. This study is designed to compare the effects of high fat and caged chicken diet on histomorphology of ovaries of female albino rats. **Methods:** This study was conducted in collaboration with National Institute of Health and Anatomy Department of Islamic International Medical College, Islamabad after approval from Ethics Review Committee. The study duration was 12 months from Sep 2021 to Sep 2022, and was performed on 30 albino rats. Control group A was given standard rat diet. Experimental group B was given High Fat Diet (HFD) of 60% fat. Experimental group C was given cubes of caged chicken meat in the raw form. At the end of experiment, animals' ovaries were collected and weighed. The samples were processed, sectioned in 5 μ m thickness, stained with H&E and observed under light microscope for stromal vascular changes and congestion. **Results:** The ovarian weight and stromal vascularity significantly increased in caged chicken diet group C compared to control group A and experimental group B. **Conclusion:** Caged chicken diet is more harmful than HFD in causing ovarian weight gain and ovarian stromal hypervascularity.

Keywords: Caged chicken, High fat diet, Ovary, Histomorphology, Stroma, Stromal hypervascularity, Polycystic ovaries, Steroid sex hormones, Hyperlipidemia

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INTRODUCTION

Human ovaries are paired organs, oval shaped, that lie bilaterally in ovarian fossa. Grossly human ovaries are attached with the uterus at its inferior pole by means of ovarian ligament. Each ovary is attached to the posterior surface of the broad ligament by a peritoneal fold that is known as mesovarium.^{1,2} Ovaries has two important functions, i.e., gametogenesis and steroidogenesis (the production of oestrogen and progesterone). At puberty under the influence of hormones, folliculogenesis occurs during various phases of ovarian cycle.³

Factors like sedentary lifestyle and diet influence the ovarian folliculogenesis. Diet plays a major role in the health of an individual. Food containing excess of oils and fats trigger the emergence of excessive deposition of adipose tissue leads to weight gain in ovaries.^{5,6}

With the change in the eating habits, intake of chicken meat has markedly increased now a days. Chicken meat is rich in cholesterol and fats.⁶ The increased cholesterol consumed through meat is absorbed in the intestine, where it is packaged as triacylglycerol-rich particles known as chylomicrons.⁷ The deleterious effects of high fat diet and caged chicken meat consumption is leading to changes in ovarian weight.⁸

The present study was designed to compare weight changes and microscopic ovarian stromal vascular congestion in ovaries of female albino rats fed on High Fat Diet (HFD) and caged chicken meat.

MATERIAL AND METHODS

This randomized control trial was conducted in collaboration with National Institute of Health (NIH) and Anatomy Department of Islamic International Medical College, Islamabad after approval from Ethics Review Committee (Appl #Riphah/IRC/20/242). The duration of the study was 12 months from Sep 2021 to Sep 2022.

Thirty (30) albino Sprague Dawley adult female rats were included in the study. The animals were divided into 3 equal groups randomly after allotting animal numbers to all. Group A was given standard pellet animal diet for rats (20 gm per rat). Group B was given 60% High Fat Diet (12-gram *ghee* mixed with standard rat diet per rat). Group C was given caged chicken cubes 20 gm per rat as diet replacement.

After completion of 9 weeks, all animals were sacrificed and dissected. Removed right ovaries were cleaned from fatty tissues and washed with normal saline. Tissue paper was used to remove the excess fluid and weighed using a digital scale with precision of 0.001 gm.

Data was entered and analysed using SPSS-21. Mean and standard error of mean were calculated for quantitative variables. One-way analysis of variance (ANOVA) was applied for the mean comparison of quantitative variables. The results were expressed as Mean \pm SD. Post hoc Tukey's test was applied for the multiple comparisons among groups.

RESULTS

Mean weight of ovary was 0.05 gm in control group A, and it was 0.07 and 0.08 gm in group B and group C respectively. A significant increase in ovary weight was found in experimental group C compared to group B and A ($p=0.000$) (Table-1, 2).

Control group A showed normal stroma in 100% of rats. Fifty (50%) of rats in experimental group B showed severe (grade 4) vascular congestion and 40% of rats showed moderate (grade3) vascular congestion, and 10% showed a minimum degree of vascular congestion. In experimental group C 60% of rats showed severe (grade 4) vascular congestion, and 40% showed moderate (grade 3) vascular congestion. Severe degree of stromal vascular congestion was

found around the follicles in experimental group C compared to groups B and A (Table-3, Figure-1).

Table-1: Comparison of mean weight (gm) of ovary in control and experimental groups

Groups	A (Control)	B (HFD)	C (Caged chicken diet)
Mean	0.05	0.07	0.08
SEM	0.0013	0.0014	0.0010
<i>p</i>	0.000*		

*Significant

Table-2: Post hoc Tukey's test for mean differences in ovarian weight (gm) among study groups

Groups	Mean difference	<i>p</i>
A vs B	0.018	0.000*
A vs C	0.028	0.000*
B vs A	0.010	0.000*

*Significant

Table-3: Group-wise distribution of stromal vascular congestion in ovarian cortex among control and experimental groups of Sprague Dawley rats (N=30)

Groups	Negligible (Grade 0)	Minimal (Grade 1)	Mild (Grade 2)	Moderate (Grade 3)	Severe (Grade 4)	<i>p</i>
A (Control)	10 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0.000*
B (HFD)	0 (0%)	0 (0%)	2 (20%)	4 (40%)	4 (40%)	
C (Caged chicken diet)	0 (0%)	0 (0%)	0 (0%)	4 (40%)	6 (60%)	

*Significant

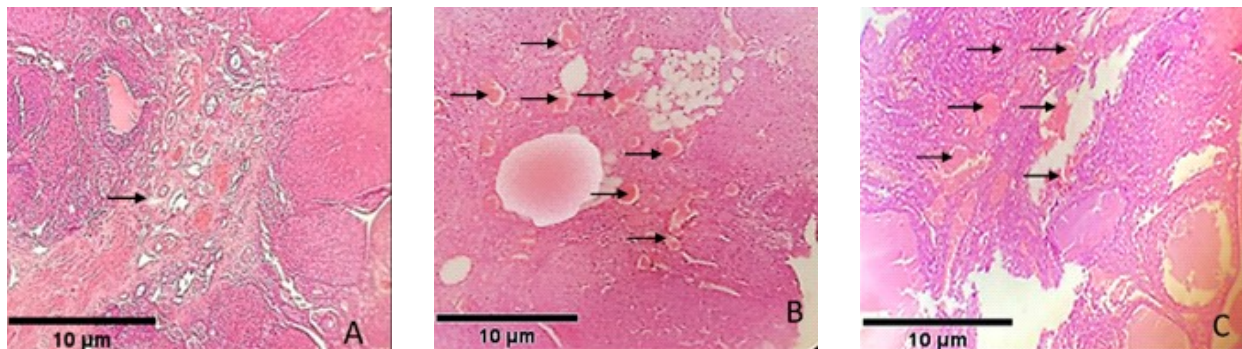


Figure-1: Photomicrographs of ovaries of Sprague Dawley rats

Photomicrographs showing normal stroma in control group A, moderate to severe (grade=3–4) stromal vascular congestion in experimental group B, and severe (Grade=4) stromal vascular congestions in experimental group C. H&E stain, 100×

DISCUSSION

In Pakistan, the most favourable consumption in meat nowadays is chicken. The inclination of the dietary pattern to chicken meat more than red meat may be because of its better taste, easy availability and low cost.⁹

Excessive consumption of high fat diet, caged chicken meat and sedentary lifestyle have seriously increased the weight gain in developed countries.¹⁰ Weight gain is associated with abiogenesis, metabolic syndrome and abnormal accumulation of abdominal fat, triggering the emergence of various ovarian histomorphological changes associated with reproductive problems in female young ones, as reported by Paouli A.¹¹

The present study examined a histomorphological comparison in ovaries of the female Sprague

Dawley rats fed with HFD and caged chicken diet for 9 weeks¹². The current study may be the first one providing a comparison that shows feeding of rats with HFD and caged chicken meat bringing changes in ovarian weight¹³, causing ovarian stromal hyper vascularity and also deranging hormonal profile. Female albino rats in caged chicken diet group C gained more body weight due to hyperlipidemia and imbalance¹⁴ in the steroidal sex hormones as compared to control group A and high fat diet group B. This showed that increased ovarian weight is associated with the increased animal body weight. These results are consistent with a study by Ahmad S *et al*¹⁵. Similarly in another study done by Gul S *et al*¹⁶, the results showed that excessive consumption of caged chicken meat in diet leads to increased ovarian weight in female rats which are in favour of current findings.

Regarding the histological features, control group A conserved the normal stroma of the ovarian cortex while in experimental group B and C, marked disturbances in ovarian stroma¹⁷ were observed. Ovarian cortical stroma showed severe to moderate congested blood vessels surrounding the follicles at different developmental stages.¹⁸ Limited studies are available regarding the effect of caged chicken diet on the cortical stromal vascular congestion. Mild to moderate congested blood vessels were observed in cortical stroma of high fat diet group B. These results are consistent with study of Wang MX¹⁹.

CONCLUSION

There is significant increase in weight of ovaries and ovarian stromal vascularity in caged chicken diet group compared to high fat diet group. Consumption of caged chicken diet proved to be more harmful than the high fat diet due to its effects on histomorphology of ovaries in albino rats.

RECOMMENDATIONS

Current study has considered the effect of caged chicken meat as a replacement diet for 9 weeks only. The effects of caged chicken meat consumption can be compared at different intervals like once or twice a week and then evaluated for ovarian as well as other systemic parameters.

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