

ORIGINAL ARTICLE

COMPARATIVE EFFECTS OF HIGH FAT AND CAGED CHICKEN DIET ON BODY WEIGHT GAIN IN ALBINO RATS

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Background: Consumption of high fat diet, caged chicken meat and sedentary lifestyle have seriously caused weight gain in developed countries resulting in hyperlipidemias and imbalance in the steroidal sex hormones ultimately. Objective of this study was to compare the effects of high fat and caged chicken diet on body weight of female albino rats. **Methods:** This randomized control trial was conducted in collaboration with National Institute of Health and Anatomy Department of Islamic International Medical College after approval from the Ethics Review Committee, from Sep 2021 to Sep 2022. This study was performed on 30 Albino Sprague Dawley adult female rats weighing 250–300 gm with no gross abnormality. They were divided into 3 equal groups of 10 rats in each group. Control group A was given standard rat diet. Experimental group B animals were given 60% fat while experimental group C animals were given cubes of caged chicken diet (20 gm/rat in the raw form orally) for 9 weeks. At the end of the experiment, animals were observed for relative body weight changes among groups. **Result:** The mean weight of the animals increased normally in control group A from 220 to 236 gm. Group B gained weight from 220 to 268 gm, and group C grew from 220 to 333 gm during 9 weeks. The weight gain was significantly higher in group C. **Conclusion:** Caged chicken diet as compared to high fat diet affects animals' weight more harmfully, and hence the health.

Keywords: High fat diet, polycystic ovaries, caged chicken, ovary, steroidal sex hormones

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INTRODUCTION

Excessive weight gain and obesity causes many disorders. Some of them may be quite serious like hypertension, diabetes, and other metabolic disorders including polycystic ovary syndrome (PCOS). PCOS is a complex endocrine disorder characterized by weight gain, insulin resistance, hyperandrogenism, menstrual abnormalities, polycystic ovaries, chronic anovulation, and decreased fertility.¹ It occurs after menarche in teenage girls or young adults who present with oligomenorrhea, hirsutism, infertility, and obesity.^{2,3}

Food containing excess of oils and fats triggers the emergence of excessive deposition of adipose tissue and this leads to excessive weight gain.^{4,5}

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 (HFD) and caged chicken meat consumption is leading to changes in body weight.⁸

The present study was designed to compare relative body weight changes of female albino rats on feeding normal, high fat diet, and caged chicken diet.

MATERIAL AND METHODS

This randomized control trial was conducted in collaboration with National Institute of Health (NIH) and Department of Anatomy, Islamic International Medical College, Rawalpindi after approval by the Ethics Review Committee of the College. The study duration was 12 months from 15th September 2021 to 15th September 2022.

Simple random sampling was done by assigning numbers. The study was performed on 30 Albino Sprague Dawley adult female rats. Standard pellet animal diet was used for group A, 60% HFD for group B, and Caged Chicken Cubes 20 gm per rat were given to group C. The body weight of all the animals was recorded at the start of the study as well as before the sacrifice of animals.

Data was analysed on SPSS-21. Mean and standard error of mean were calculated. ANOVA was applied and results expressed as Mean±SD. Post hoc Tukey's test was applied for multiple comparisons among groups.

RESULTS

The control group A showed normal gain of body weight from 220 to 236 gm during 9 weeks of study. Experimental group B (High Fat Diet) showed weight gain from 220 to 268 gm. In experimental group C

(Caged chicken diet) the rats significantly gained body weight from 220 to 333 gm. Inter group comparison showed a significant increase in final body weight of experimental group C (Caged chicken diet) as compared to experimental group B (HFD) and experimental group A (Control) (Table-1).

Multiple comparison (Post hoc Tuckey's test) showed significant gain in body weight of caged chicken diet group C ($p < 0.001$) as compared to high fat diet group B and Control group A (Table-2).

Table-1: Mean values for change in relative body weight of rats (ANOVA) in control and experimental groups (Mean±SD)

Groups	Group A (n=10)	Group B (n=10)	Group C (n=10)	p
Initial animal weight (g)	220±8.16	220±8.16	220±8.16	1.000
Final animal weight (g)	236±9.66	268±38.24	333±51.22	<0.001*

*Significant

Table-2: Comparison of the mean values for change in relative final body weight of rats among control and experimental groups

Final Body weight (Grams)		
Groups	Mean differences	p
A vs B	32	0.153
A vs C	97	<0.001*
B vs C	65	0.002*

*Significant

DISCUSSION

Excessive consumption of high fat diet, caged chicken meat and sedentary lifestyle have seriously increased the weight gain in developed countries.⁸ Chicken meat is selected and consumed largely by general population of Pakistan as it is cheap, easily available and considered to be rich in dietary nutrient. Therefore, the population at large is consuming more fats and cholesterol rather than proteins hence gaining weight gain. Subsequently, numerous studies indicate that increased incidence of weight gain especially in young girls has caused many metabolic diseases from systemic malfunctions to reproductive disorders.

Weight gain is shown to reduce percentage of the pregnancy among the women through triggering abdominal fat accumulation and decreasing ovulation rates. Consequently, studies concerning the negative effects of weight gain on fertilization have gained more importance in recent years.

Female rats with diet-induced weight gain exhibit infertility and thus can serve as a model for human infertility models like polycystic ovaries. Weight gain is associated with adipogenesis, metabolic syndrome and abnormal accumulation of abdominal fat triggering the emergence of PCOS.⁷⁻¹⁰

This study revealed that caged chickens reared on commercial feed led to increase weight gain and growth rates in the experimental animals of group C. This was however, not seen in control animals A and high fat diet group B. Weight gain and high

growth rates in Groups C was subjected to commercial feed and poultry grown on such feed. It was reported previously that chicken meat and chicken feed are rich of proteins, fats and cholesterol. This can be attributed to the recent increase in the rate of weight gain and obesity in the Pakistani population consuming chicken meat on daily basis. Caged chicken diet group gained more body weight due to hyperlipidemia and imbalance in the steroidal sex hormones as compared to control group and high fat diet group.¹¹

The current study is the first one providing a comparison that shows feeding of rats with HFD and caged chicken meat bringing changes in animal body weight. This probably is attributed to the contents that are included in the feed provided to caged chickens to grow upon. Similar effects are anticipated in the humans who consume caged chicken on routine basis, hence bringing the deleterious effects on their health in terms of weight gain, growth, obesity and hormonal irregularities levels that may lead to progression of PCOS.⁹

CONCLUSION

Present study revealed marked increase in relative body weight of group C fed on caged chicken, as compared to HFD group B, and Control group A. Caged chicken diet is more harmful than HFD for weight gain and its consequences.

RECOMMENDATIONS

Excessive use of caged chicken must be discouraged, especially in young girls who are vulnerable to much weight gain and resulting PCOS. Further large scale studies including humans are recommended.

REFERENCES

- Hilal G, Fatma T, Ferruh Y, Sabire G, Yüksel A. Effect of high-fat diet on the various morphological parameters of the ovary. *Anat Cell Biol* 2020;53(1):58–67.
- Akram M, Roohi N. Endocrine correlates of polycystic ovary syndrome in Pakistani women. *J Coll Physicians Surg Pak* 2015;25(1):22–6.
- Rostamtabar M, Esmacilzadeh S, Tourani M, Rahmani A, Bae M, Shirafkan F, *et al.* Pathophysiological roles of chronic low-grade inflammation mediators in polycystic ovary syndrome. *J Cell Physiol* 2021;236(2):824–38.
- Zulfiqar S, Noor S, Rafique H, Rehman B, Babar A, Shahid T, *et al.* Investigation of prevalence and awareness of polycystic ovary syndrome among Pakistani females: Proceedings of the Pakistan Academy of Sciences: Part B. *Life Environ Sci* 2022;59(1):77–83.
- Sidra S, Tariq MH, Farukh MJ, Mohsin M. Evaluation of clinical manifestations, health risks, and quality of life among women with polycystic ovary syndrome. *PLoS One* 2019;14(10):e0223329.
- Saara Ahmad. Observation of various blood biochemical changes and their effects on ovaries secondary to administration of various diets in female albino Wistar rats. (PhD Thesis). Baqi Medical University, Karachi, Pakistan; 2015.
- You W, Henneberg M. Meat consumption providing a surplus energy in modern diet contributes to obesity prevalence: an ecological analysis. *BMC Nutr* 2016;2(1):22.
- Ahmad S, Ahmed I, Haider S, Batool Z, Ahmed F, Tabassum S, *et al.* Effects of consumption of caged and un-caged chicken meat on

- ovarian health of female wistar rats. Pak J Zool 2018;50(2):487-93.
9. Rajan RK, Siva Salva Kumar M, Balaji B. Soy isoflavones exert beneficial effects on letrozole-induced rat polycystic ovary syndrome (PCOS) model through anti-androgenic mechanism. Pharm Biol 2017;55(1):242-51.
10. Sharma H, Zhang X, Dwivedi C. The effect of ghee (clarified butter) on serum lipid levels and microsomal lipid peroxidation. Ayu 2010;31(2):134-40.
11. Rocha AL, Oliveira FR, Azevedo RC, Silva VA, Peres TM, Candido AL, *et al.* Recent advances in the understanding and management of polycystic ovary syndrome. F1000Res 2019;8:F1000 Faculty Rev-565.

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