American-Eurasian J. Agric. & Environ. Sci., 16 (3): 466-469, 2016
ISSN 1818-6769
© IDOSI Publications, 2016
DOI: 10.5829/idosi.aejaes.2016.16.3.9483

Potential Effect of Chicken Boneless Meat on the Body Weight and Serum Cholesterol Levels of the Female Albino Wister Rats: in Direct Human Prospective Studies

[1]Saara Ahmad, [2]Omm-e-Hany, [1]Iftikhar Ahmed,
[1]Syed Azhar Ahmed, [2]Aamir Alamgir and [2]Asia Neelam

[1]Biochemical Research Unit, Department of Biochemistry, Baqai Medical University, Karachi, Pakistan
[2]Institute of Environmental Studies, University of Karachi, Karachi 75270, Pakistan

Abstract: Chicken meat is the most preferential consumable edible nowadays. The present increased demand and supply of the chicken has resulted in the provision of chicken feed supplemented with all the basic macro and micronutrients to the poultry. As the consequence enhanced weight gain and growth of the chickens is observed that has allowed them to attain appropriate weight and size for consumption in less than six weeks time. The aim of the present study was to evaluate the effects of consumption of the commercially available chicken meat on serum cholesterol levels and the body weight in the female albino Wister rats. Fifty weaning albino rats were randomly divided into two groups (A and B). Group A was the control group and fed on rat chow. Group B was the experimental group and fed on commercially available chicken boneless meat. Each group was fed with the respective diets for the period of six weeks. The amount of diet consumed and the body weight changes were recorded weekly. The serum cholesterol level was determined at the end of the experiment using standard methods. Weight gain in group B rats increased significantly ($P<0.01$) and had significantly higher serum cholesterol ($P<0.01$), values compared with the group A. The observed increase in the cholesterol levels and the weight gain of the wistar rats may be due to the supplements of the feed concentrated in the chicken meat. These deleterious effects on the rats were inculcated as rapid gain in weight with soaring high levels of cholesterol in the blood. The increase in these parameters may however, be desirable to be studied in by human subjects so as to find any harmful effects of the chicken meat consumption on them.

Key words: Body Weight · Chicken Boneless Meat · Serum Cholesterol Level

INTRODUCTION

The research has shown the association between high plasma cholesterol levels and increased body weight with the chicken boneless meat consumption [1, 2]. Cholesterol can either be produced in the body or taken exogenously in the diet [3]. When the fat rich diets are ingested, fats are digested by lipase enzyme and the resulting triacylglycerol is taken up by the liver to produce lipoproteins [3]. The lipoproteins transport the cholesterol through the blood stream [4]. Two important types of lipoproteins are present in the body. Low density lipoproteins (LDL) and high density lipoproteins (HDL) [5]. Free cholesterol is removed from tissues by plasma high-density lipoprotein (HDL) and carried to the liver, where it is removed from the body either unchanged or after conversion to bile acids [6]. Plasma low-density lipoprotein (LDL) is the vehicle to transport of cholesterol and cholesteryl ester to many tissues including the adipose tissue where they are stored as free fatty acids [7]. Higher adipose tissue in the body marks the over weight and obesity in the body [8].

Cholesterol is the principal sterol being synthesized by all cells in the vertebrates [9, 10]. This production of cholesterol is required to build and maintain membranes and adjust membrane fluidity over an array of physiological temperatures [11]. Cholesterol is also utilized for synthesis of the steroid hormones including the adrenal gland hormones cortisol and aldosterone and sex hormones progesterone, estrogens and testosterone [12]. Diet containing increased amount of fats and cholesterol augment the levels of cholesterol in the body resulting in hypercholesterolemia and weight gain [7].

Corresponding Author: Omm-e-Hany, Institute of Environmental Studies, University of Karachi, Karachi 75270, Pakistan.

The commercially available chicken meat is consumed as a frequent diet on the daily basis in Pakistan. Chicken boneless meat is an important source of fats and proteins [13]. These fats and proteins comprise of 35% and 16% respectively of 100 gram of a serving size and the remaining part consists of vitamins and minerals [14]. The fatty acids and cholesterol in the chicken meat increase the cholesterol content in the body by providing equally the exogenous cholesterol as well as stimulating the endogenous cholesterol synthesis in the body [12,13]. Research has shown that increased cholesterol levels are linked with the health concerns same as obesity, hypertension, diabetes and the chronic heart diseases [15]. The aim of this study was to investigate the effect of the consumption of boneless chicken meat on the body weight and the serum cholesterol indices in the rats.

MATERIALS AND METHODS

Commercially available chicken meat was purchased at a commercial outlet in Karachi. The rat chow was obtained from the Baqai University Karachi animal house. The seventy five weaning albino rats were purchased from the Animal House of the Dow International University, Karachi. The raw chicken boneless meat was used for the rat feeding trial. The fifty weaning albino rats of average 100 grams weight were randomly allocated into two groups of twenty five animals after adaptation. Group A served as the control given with rat chow as feed, Group B was given raw chicken boneless meat. The rats were allowed free access to water and feed ad-libitum (Rat chow, chicken boneless meat respectively). Blood samples were obtained from control rats and experimental rats at the beginning of the experiment for the base line evaluation of cholesterol and then at the end of the feeding period after six week period for the estimation of final cholesterol levels of them. Serum cholesterol by using the kit supplied by the Merck Company. The analysis was done through the instrument spectra junior. In the procedure the serum cholesterol was determined after enzymatic hydrolysis and oxidation. The indicator quinoneimine is formed from hydrogen peroxide and 4-aminoantipyrine in the presence of phenol and peroxidases.

Changes in the body weight of the control and experimental rats were recorded weekly. Amount of the consumed feed during the experiment was also calculated weekly according to the amount left in the hopper. The feed given was weighted first and then served to the rats and the next day the feed left in the hopper was weighed and subtracted from the initial weight of the feed to calculate the amount of feed utilized by the rats. These calculations were summed up at the end of the week to calculate the weekly intake of the food by rats. Statistical analysis was done by Students t test for the final results.

RESULTS

The results revealed that the weekly requirement of the rats increased progressively for the feed as shown in Table (1). This may be due to the growth of the rats which is also observed in terms of the gain in weight in the both the groups of rats as shown in the Table (2). Table (2) also shows the changes and the difference of the gain in the weight of the rats fed on rat chow and chicken boneless meat.

All the rats fed with regular rat chow and chicken meat gained body weight. However, the rats of group B fed on chicken meat gained significantly ($P<0.01$) more weight per week than that of group A fed on rat chow. The final weight taken at the end of the six week period also showed significant ($P<0.05$) increase in the body weight of the group B as compared to the group A.

Table 1: Amount of different diets taken by rats per week

Time in weeks	Group B Rat chow	Group B Chicken boneless meat
1st week	1200 g	4000 g
2nd week	1600 g	6000 g
3rd week	2000 g	6500 g
4th week	2100 g	7000 g
5th week	2150 g	7300 g
6th week	2300g	7500 g

Table 2: the mean body weight gain of rats fed on different diets

	Group A	Group B	Statistical significance
Weight gain after 1st week (g)	132.04±4.69	141.8±8.3	P<0.01**
Weight gain after 2nd week (g)	148.29±4.18	171.5±9.5**	P<0.01**
Weight gain after 3rd week (g)	160.4±7.8	197.9±13.7**	P<0.01**
Weight gain after 4th week (g)	177.3±5.03	220.9±5.4**	P<0.01**
Weight gain after 5th week (g)	208.23±5.2	236.8±6.8**	P<0.01**
Weight gain after 6th week (g)	221.12±5.54	252.9±5.7**	P<0.05*

NB: Values are means ± standard error of means.

** means highly significant (P<0.01)

* means highly significant (P<0.05)

Table 3: Lipid profile of different groups of rats

Serum cholesterol (mg/dl)	Group A	Group B	Statistical significance
Base line value	74.6+6.9	74.0+6.3	P>0.05
After six week	78.6±7.7	104.7±6.7**	P<0.01**

NB: values are means ± standard error of means

** means highly significant (P<0.01)

Table (3) shows the baseline cholesterol levels of the control rats and the experimental rats before the start of the experiment and after the six weeks at the end of the experiment.

These values of cholesterol were measured before the start and at the end of the six week period. Serum cholesterol levels were non significant ($P>0.05$) before the start of the experiment shown the same levels of cholesterol in both the control and the experimental rats. The levels increased significantly ($P<0.01$) in group B as compared to group A.

DISCUSSION

The results of this study indicated that body weight and lipid profile increases with age [8]. Consumption of chicken boneless meat proed growth during the period of study more than the rat chow which could be due to the presence of more energy content in the chicken meat explicitly the higher fat content [9]. The fat content in the diet is utilized for energy expenditures and formation of cholesterol and essential fats in the body [8]. Fats and cholesterol help in maintenance and integrity of the healthy body [7-9].

From the present study it is clear that the chicken meat which is used on a daily basis in food comprises to its major portion as fats and cholesterol [11]. These fat and cholesterol content leads to the increased endogenous or de novo cholesterol synthesis by fats and also by provision of the exogenous, readily available cholesterol in diet [16]. The increased cholesterol in the body tends to provide more precursors for the steroidal and sex hormone synthesis in the body [12]. These hormones are chemical messengers to facilitate the regulatory processes in the body [13]. They are one of the basic factors for causing obesity [8]. The hormones like sex hormones, leptin, growth hormone and insulin affect our appetite and the metabolism [16]. They also effect the distribution of fats in the body [11]. Chicken meat commercially available nowadays is from those chickens which are fed on the commercially available chicken feeds rich in fats, cholesterol and many other nutritional and non nutritional supplements for the better growth of the chickens [17]. These supplements not only concentrate in the flesh of the chickens but also affect the levels of these hormones and encourage the abnormal metabolism along with the accumulation of body fat [18, 19].

Accumulation of fats in the body leads to over weight and obesity like crisis [15]. In the present study the weight gain increased significantly every week. This was seen in association with the fatty tissue accumulation also known as adipose tissue around the abdomen [8]. The adipose tissue around the abdomen of the chicken fed rats was more as compared to the control rats, proving the point that increase cholesterol and fat in diet may lead to increase adipose tissue size and lipoproteins in blood. By using the data from the present study of weight gain and increased cholesterol levels, may determine and indicate the reasons for obesity, cardiovascular risk factors and other health alarming concerns specifically diabetes and hypertension.

CONCLUSION

This study has demonstrated that both rat chow and boneless chicken meat increased the body weight in the both rats groups. However, the chicken boneless meat increased the serum cholesterol values significantly as compared to the control rats. This is however, desirable to perform a comparable study in humans.

REFERENCES

1. Cho, S., C. Ryu, J. Yang, D.T. Mbiriri, C.W. Choi, J.I. Chae, Y.H. Kim, K.S. Shim, Y.J. Kim and N.J. Choi, 2013. Effect of Conjugated Linoleic Acid Feeding on the Growth Performance and Meat Fatty Acid Profiles in Broiler: Meta-analysis. Asian-Australas J. Anim Sci, 26(7): 995-1002.
2. Abou-Elkhair, R., H.A. Ahmed and S. Selim, 2014. Effects of black pepper (Piper nigrum), turmeric powder (Curcuma longa) and coriander seeds (Coriandrum sativum) and their combinations as feed additives on growth performance, carcass traits, some blood parameters and humoral immune response of broiler chickens. Asian-Australas J. Anim Sci, 27(6): 847-54.
3. Maranhão, R.C. and F.R. Freitas, 2014. HDL metabolism and atheroprotection: predictive value of lipid transfers. Adv Clin Chem, 65: 1-41.
4. Do, R.Q., S.J. Nicholls and G.G. Schwartz, 2014. Evolving targets for lipid-modifying therapy. EMBO Mol Med, 6(10): 1215-1230.
5. Sinha, S.K., V. Mishra, S. Nagwani and T.B. Rajavashisth, 2014. Effects of G-CSF on serum cholesterol and development of atherosclerotic plaque in apolipoprotein E-deficient mice. Int J. Clin Exp Med, 7(8): 1979-89.

6. Golshahi, J., E. Validi and M. Akbari, 2014. The association between fasting serum insulin, apo-lipoproteins level and severity of coronary artery involvement in non-diabetic patients. Adv Biomed Res, 3: 192.
7. Akieda-Asai, S., S. Koda, M. Sugiyama, K. Hasegawa, M. Furuya, M. Miyazato and Y. Date, 2013. Metabolic features of rats resistant to a high-fat diet. Obes Res Clin Pract, 7(4): 243-50.
8. Asha, K., S.B. Sharma, A. Singal and A. Aggarwal, 2014. Association of carotid intima-media thickness with leptin and apoliprotein b/apoliprotein a-I ratio reveals imminent predictors of subclinical atherosclerosis in psoriasis patients. Acta Medica, 57(1): 21-7.
9. Cruz-Bautista, I., R. Mehta, J. Cabiedes, C. García-Ulloa, L.E. Guillen-Pineda, P. Almeda-Valdés, D. Cuevas-Ramos and C.A. Aguilar-Salinas, 2014. Determinants of VLDL composition and apo B-containing particles in familial combined hyperlipidemia. Clin Chim Acta, 438C: 160-165.
10. Wassef, H., J. Davignon, D. Prud'homme, R. Rabasa-Lhoret and M. Faraj, 2014. Changes in total and central fat mass after a hypocaloric diet associate with changes of apoC-I in postmenopausal obese women. J. Clin Lipidol, 8(5): 510-9.
11. Arisawa, K., H. Uemura, M. Yamaguchi, M. Nakamoto, M. Hiyoshi, F. Sawachika and S. Katsuura-Kamano, 2014. Associations of dietary patterns with metabolic syndrome and insulin resistance: a cross-sectional study in a Japanese population. J. Med Invest, 61(3-4): 333-44.
12. Gajda, K., A. Sulich, J. Hamułka and A. Białkowska, 2014. Comparing diabetic with non-diabetic overweight subjects through assessing dietary intakes and key parameters of blood biochemistry and haematology. Rocz Panstw Zakl Hig., 65(2): 133-8.
13. Mushtaq, M.M., T.N. Pasha, M. Akram, T. Mushtaq, R. Parvin, H.C. Choi, J. Hwangbo and J.H. Kim, 2031. Growth Performance, Carcass Characteristics and Plasma Mineral Chemistry as Affected by Dietary Chloride and Chloride Salts Fed to Broiler Chickens Reared under Phase Feeding System. Asian-Australas J Anim Sci, 26(6): 845-55.
14. Yin, H.D., E.R. Gilbert, S.Y. Chen, Y. Wang, Z.C. Zhang, X.L. Zhao, Y. Zhang and Q. Zhu, 2013. Oct. Effect of hybridization on carcass traits and meat quality of erlang mountainous chickens. Asian-Australas J. Anim Sci., 26(10): 1504-10.
15. Odden, M.C., M.G. Shlipak, H.E. Whitson, R. Katz, P.M. Kearney, C. Defilippi, S. Shastri, M.J. Sarnak, D.S. Siscovick, M. Cushman, B.M. Psaty and A.B. Newman, 2014. Risk factors for cardiovascular disease across the spectrum of older age: The Cardiovascular Health Study. Atherosclerosis, 237(1): 336-342.
16. Pedroza-Tobias, A., B. Trejo-Valdivia, L.M. Sanchez-Romero and S. Barquera, 2014. Classification of metabolic syndrome according to lipid alterations: analysis from the Mexican National Health and Nutrition Survey 2006. BMC Public Health, 14(1): 1056.
17. Zhou, P., Y.Q. Tan, L. Zhang, Y.M. Zhou, F. Gao and G.H. Zhou, 2014. Effects of dietary supplementation with the combination of zeolite and attapulgite on growth performance, nutrient digestibility, secretion of digestive enzymes and intestinal health in broiler chickens. Asian-Australas J Anim Sci., 27(9): 1311-8.
18. Tan, J., T.J. Applegate, S. Liu, Y. Guo and S.D. Eicher, 2014. Supplemental dietary l-arginine attenuates intestinal mucosal disruption during a coccidial vaccine challenge in broiler chickens. Br J. Nutr, 112(7): 1098-109.
19. Fouad, A.M. and H.K. El- Senousey, 2014. Nutritional factors affecting abdominal fat deposition in poultry: a review. Asian-Australas J Anim Sci., 27(7): 1057-68.