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Original Article

Body Weight In Relation To Carbimazole Induced Hypothyroidism In Female Albino Rat

*Amber Ilyas,**Imran Ishaque,***Sahar Mubeen,****Ghulam Sarwar Qureshi

*Associate Professor (Anatomy), Jinnah Sindh Medical University, Karachi.** Associate Professor (Anatomy), United Medical and Dental College, Karachi. Associate Professor (Anatomy), Dow University of Health Sciences, Karachi.****Professor, H.O.D, Chairman(Anatomy) & Principal SMC, Jinnah Sindh Medical University, , Karachi.

ABSTRACT

Objectives: In present study, the effects of carbimazole on the body weight of female wistar albino rats were studied. **Study Design:** Experimental study. **Place and duration of study**: This study was conducted in the Animal House of DUHS for a period of 10 months. **Materials and Methods:** In this study 30 Wistar Albino rats were used from Dow University of Health Sciences Animal house Karachi. These animals were divided into two groups comprising of fifteen animals each.The first group was the control group which only received tap water and normal balance diet. The second group was the hypothyroid group which received an antithyroid drug (carbimazole) at a dose of 0.02% per ml in normal drinking water through feeding tube for six weeks. All the animals were weighed at the start of experiment then weekly till the end of six weeks. **Results**: The mean ± S.D (standard deviation) of initial weight of animals in control group was 185.13 ± 20.29 gm and the mean ± S.D value of final weight of animals in control group was 199.73 ± 19.00 gm (p value = 0.062). In hypothyroid group, the mean ± S.D of initial weight of animals was 161.53 ± 10.38 gm whereas mean ± S.D of final weight was 185.13 ± 20.29 gm. Comparison of the final weight of animals in between the groups was done which showed a significant increase in weight $p < 0.05$) but when the controls were compared with the hypothyroid group, no significant increase in weight was observed (p value = 0.083). **Conclusion:**Carbimazole induced hypothyroidism although cause increase in body weight but no significant results were obtained when compared with the control group.

KEY WORDS: Hypothyroidism, Carbimazole, Brown Adipose Tissue (BAT), Leptin, Albino Wistar rats.

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Correspondence:
DR. AMBER ILYAS
M.B.B.S, M.Phil
Associate Professor (Anatomy)
Jinnah Sindh Medical University
Email: dr.amberilyas@gmail.com
Cell: 0321-2448825

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INTRODUCTION

The thyroid gland is a butterfly shaped unique and largest endocrine

gland which is located superficially and functions in the production, storage and release of the thyroid hormones; thyroxine (T4) and triiodothyronine (T3).[1] They are the basic hormones considered to be important regulators of growth, differentiation, proliferation and metabolism of most tissues and organs.[2]These hormones are also the basic regulators of basal metabolic rate and energy consumption in homeothermic animals thus having a very strong effect on the body weight.[3]

Weight gain was found to be associated with hypothyroidism and this incidence was more common in females.[4]Men were although not spared as the weight gain, loss of appetite and decrease food intake was also observed in them.[5]It is also evident that Brown Adipose Tissue (BAT) which is responsible for maintaining body temperatue is also present in animals. The normal development and function of BAT is also related to the levels of thyroid hormones.[6]

Several experiments were performed on the different animal models by keeping the hypothesis that the weight of an animal will increase due to hypothyroidism. It was surprisingly found that there was discrepancy of results in weight gain of rats and mice used as the experimental models. Therefore, the current study was designed to study the effects of experimentally induced hypothyroidism on the body weight of female wistar albino rats to provide a justified explanation for the discrepancy of results in humans and rats.

METHODOLOGY

With approval from local Research Committee, IRB, Funding Committee BASR/DUHS the project was started. The animals were kept in an experimental room 10 days prior to the start of an experiment. It was made sure that all the animals were adult female, fertile rats of wistar strain and albino species. They were monitored for 10 days initially to rule out any diseased or medically unfit animals. Any animal observed to be lethargic, inactive or undergoing constant decline in weight was considered unfit for the experiment and was replaced. They were kept on balanced diet and normal tap water. The constant weight gain of an animal was taken to be a healthy parameter.

The total number of 30 animals were selected for the project and were divided into 2 groups. Each group comprised of 15 animals as control group and hypothyroid group respectively. All the animals of different groups were kept in different cages separately in an experimental room on the normal balanced diet and tap water. The diet was daily weighed and given. Even the diet left the next day was weighed so that the increase or decrease of appetite could be measured.

Simultaneously the stock solution of Neomercazole was prepared. The animals were made hypothyroid by giving 0.02% per ml Neomecazole orally for 6 weeks.

The control group was maintained on tap water and normal balanced diet for 6 weeks observed for 6 weeks and their health and fitness was assessed. The hypothyroid group was given Neomercazole daily at a dose of 0.02% for 6 weeks through oral feeding tube. The feeding tube was attached with the insulin syringe and then it was passed in the gut of animal through mouth. The required dose was administered through feeding tube in the gut of experimental rats. It was made sure that whole of the amount was ingested by the animal and nothing was wasted. [7,8]All the animals were weighed at the start of experiment then weekly till the end of 6 weeks.

STATISTICAL ANALYSIS

The data was recorded on raw format and then was entered on SPSS.16 work sheet. A pair sample t-test was used for each group to identify the mean difference in initial and final weight. P- Value < 0.05 was considered as significant.

RESULTS

The mean ± S.D (standard deviation) of initial weight of animals at the start of experiment in control group was 185.13 ± 20.29 gm and the mean ± S.D value of final weight of animals at the end of experiment in control group was 199.73 ± 19.00 gm (p value = 0.062) as shown in table and graph no 1. In hypothyroid group, the mean ± S.D of initial weight of animals was 161.53 ± 10.38 gm whereas mean ± S.D of final weight was 185.13 ± 20.29 gm. The weight of animals in hypothyroid group were significantly increased ($p< 0.05$) as shown in table no 1 and graph no 2.

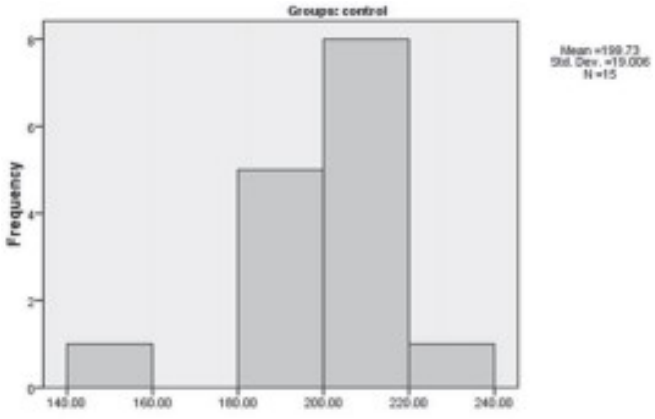
TABLE 1
Mean Body Weight of Animals in Different Groups

Groups	No of animalsn	Body weight (gm)		P value
		Initial weight Mean ± S.D	Final weight Mean ± S.D	
control	15	185.13 ± 20.29	199.73 ± 19.00	0.060
Hypothyroid	15	161.53 ± 10.38	185.13 ± 20.29	0.023

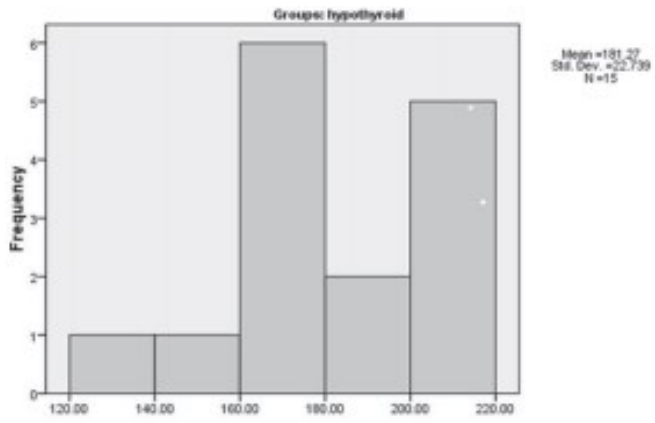
TABLE 2
Comparison of Mean Final Body Weight In Between the Groups

Comparison	P value
Control with hypothyroid	0.083

GRAPH 1 :
Mean weight of animals in control group



GRAPH 2:
Mean weight of animals in hypothyroid group



Comparison in between the groups

Comparison of the final weight of animals in between the groups revealed that when the controls were compared with the hypothyroid group, no significant increase in weight was observed (p value = 0.083) as shown in table no 2.

DISCUSSION

Thyroid hormones are the major regulator of energy metabolism. Elevation in the levels of thyroid hormones will lead to an increase metabolic rate resulting in loss of weight.[9]T3 & T4 are the basic regulators of metabolism affecting the Body Mass Index (BMI) and weight. Therefore, in hypothyroidism due to decrease metabolic rate, weight gain is a common finding.[10]It is documented that there is a difference of weight gain in humans and animals.This is probably due to the presence of BAT in animals which lead to the decrease in weight gain of hypothyroid animals.[11]

In this study, the initial and final weight of animals in each group were compared. It was observed that there was a marked increase in body weight of hypothyroid group. Although the weight gain was also seen in the control group but the increase was not significant. This finding is in accordance with those studies performed previously by Parveen K et al.[12] Statistically no significant change was observed when the final weight of control and treated groups were compared, hence supporting the studies done previously on rats but contradictory with respect to data on humans as in humans there is a profound increase of weight. In humans it is observed that the

decrease level of thyroid hormones reduces the basal metabolic rate and thus increases the fat content and in result probably affects the level of leptin by indirectly regulating the mass of adipose tissue.[13] In rats it has been reported that the administration of Methimazole for long period increases the level of plasma leptin.[14]This increased level of plasma leptin decreases the intake of food in hypothyroid rats.[15] This decreased intake can reduce the level of metabolism and growth of body.[16] Although it was also observed in the previous studies, that the rats in which thyroidectomy was carried out, also showed a reduction in body growth.[17-19] Thus it clearly indicates that the metabolism of rats is much not affected in hypothyroidism and there is also no difference in the amount of food taken in the control and experimental groups.

It is also suggested that the BAT mechanism in hypothyroid animals is mainly responsible for not gaining weight therefore the difference exist in gaining of weight in rodents and humans as BAT is only functionally active in rodents and not in adult humans.[20]

CONCLUSION

It is concluded from the present study that the weight gain in hypothyroid animals is moderate and not marked. We assume that there is reduced weight gain in hypothyroid animals due to the presence of functionally active BAT which is present in rodents and not in adult humans.

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Authors Contribution: ** Doing the research project, collection of data, writing of article ** Helping in doing the experiment and in collection of data *** Helping in doing the experiment and in collection of data **** In guiding the conduction of experiment and helping in writing of article.*

Conflict of interest statement: No conflict of interest