Original Article

To Elucidate the Decrement of Testicular Weights After Oral Doses of Lithium Carbonate in Albino Rats

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ABSTRACT

Objective: To find out the effects of Lithium carbonate on the testes weights in Control group and the treated group with Lithium carbonate of albino rats.

Study Design: Experimental study

Place and Duration of Study: This study was conducted at the Department of Anatomy, Basic Medical Sciences Institute, Jinnah Postgraduate Medical Centre, Karachi, from 30th June till July 2013.

Materials and Methods: Forty male adult albino rats of three months of age were chosen for this study and distributed into two equal groups A, B. They were, treated for six weeks .Group A served as control received laboratory oral diet, group B received lithium Caronate orally in flour pellets at a dose of 34 mg/kg body weight. For six weeks. At the end of treatment testes weights were recorded in both groups.

Results: The rodents were weighed on digital weighing balance at the start and end of the study. The body weights were recorded and compared. The Body weight of Albino rats of group A were highly significantly increased as compared to Group B. The mean values of weights of testes were highly significantly decreased in B, when comparing with group-A. The values of weights of testes in groups A were highly significantly increased when compared with group B. These findings showed that Lithium induced testicular toxicity due to reduction in testes weights.

Conclusion: One of the many harmful adverse effects of lithium is its reduction of testicular weights in albino rats.

Key Words: Elucidate, Decrement, Testes. Reproductive toxicity

Citation of article: Kohari T, Azhar M, Azhar F, Faruqui U. To Elucidate the Decrement of Testicular Weights After Oral Doses of Lithium Carbonate in Albino Rats. Med Forum 2021;32(11):60-62.

INTRODUCTION

The male glands testis is present one on each side in the scrotum[1] and in humans testicular weights[2] vary from 10 to 25 grams each. The organ of male fertility that is testis in adult rats weights around 1000 milligrams each[3]. Lithium caronate[4] has an impact on manic disorders, its long standing use it causes damage to spermatogenic cells, such as reduced number of primary and secondary spermatocytes which leads to decreased testicular weight.[5] Ghajari G, Nabiuni M, Amini[6] E, (2021) in study found that Lithium causes induces oxidative stress through lipid peroxidation which causes germ cells apoptosis and decrease in sperm count leading to decrease in testicular weights.

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Received: January, 2021
Accepted: August, 2021
Printed: November, 2021

The soft alkali metal causes degeneration of heart and testis due to increased lipid peroxidation[7] and decrease in glutathione reductase leading to increased oxidative stress, which causes increase in sperm death all leading to decreased testicular weight.

The favourable mood stabilizer Lithium is prescribed for a manic episode in bipolar disorder as well as maintenance therapy of bipolar disorder [8] but its deleterious effects on male reproductive organs has been documented by researchers, one such study showed a marked decrease in spermatozoa and spermatids in seminiferous tubules, Epididymis, due to which there is marked reduction in male genital organ weights[9]

We carried out this research as there is scanty knowledge and documentation of the adverse effects of Lithium carbonate at a dose of 34 mg/kg on testis for a period of six weeks.

MATERIALS AND METHODS

According to the experimental designing, forty male adult Albino rats of 90 days of age were chosen from the Animal House of Basic Medical Science Institute, Jinnah Postgraduate Medical Centre, and Karachi .The rodents were observed for seven days prior to the commencement of the study. The rats were kept in the cages of Animal House under natural environment, water and food supplied ad libitum

The animals were divided into two groups of twenty albino rats in each groups:
Group A: served as control, on Lab diet.
Group B: received Lithium carbonate 34mg[10]/kg/day
Group A received its respective designed lab diet and Group B ingested LI2CO3 according to the period of treatment, which was 6 week. Laboratory diet was fresh green vegetables and flour pellets
Group B received Tablet Lithium carbonate at a dose of 34 mg/kg/day. The dose of lithium was calculated according to body weight of each animal. The tablet was crushed into powder form weighed at a dose of 34 /mg/kg on departmental weighing balance mixed in flour pellets and was only given at fixed time of 10 am daily for six weeks daily.
At the start and end of treatment rats were weighed in both groups and the weight was documented Testis were weighed at the end of treatment after sacrifice of the animals. At the end of treatment the animals were sacrificed under ether anesthesia. A midline abdominal incision extending up to the skin of scrotum was made the testes were identified and removed and then placed on dissection tray to study the morphology .The testes were dried weighed on Sartorius balance.
Testicular weight was calculated by the given formula[11]

The weight of the testes =

$$\frac{\text{Mean weight of testes (mg)}}{\text{Final Weight of the animal (mg)}} \times 100$$

Testes weights were calculated for each group. Significant (P) value was calculated with the help of student's t-test. The highly significance level was considered as $p < 0.001$. All the calculations were done utilizing, SPSS 15.

RESULTS

The rodents were weighed on digital weighing balance at the start and end of the study. The body weights were recorded and compared .The Body weight of Albino rats of group A were highly significantly increased as compared to Group B.
The mean values of weights of testes were highly significantly decreased in B, when comparing with group-A. The values of weights of testes in groups A were highly significantly increased when compared with group B as shown in Table-2. These findings showed that Lithium induced testicular toxicity due to reduction in testes weights.

Table No.1: Mean* Body Weights (gms) of Albino Rats in Different Groups at Variable Time interval

Groups	Treatment Received	Body Weights (Gm.)		P-value A vs. B
		Mean Initial Weight	Mean Final Weight	
A (n=20)	Control Group A	238.88 ±2.12	381.60±2.27	P<.001

B (n=20)	Lithium Group B	302.46±0.48	212 .28±5.10	

Table No.2: Mean* Weights (mg) of Testes of Albino Rats in Different Groups at Variable Time interval

Groups	Treatment Received	Duration of Treatment		P-value A vs B
		Final Weight		
A (n=20)	Control Group A	1302 ±2.51	P<.001	P<.001
		F	----	
B (n=20)	Lithium Group B	1126.68±0.55		
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DISCUSSION

Heavy metal mixture[12] has been found to increase DNA fragmentation and sperm apoptosis resulting in decreased testicular weight .The same is in accordance with our study this may be due to the fact that Lithium blocks adenosine triphosphate (ATP) production leading to decreased motility of sperms which justifies infertility .[13]
Similar results were observed by T. Iqbal [14] et al, they in their research had reported that other metals like cadmium causes cellular infiltration, tissue degeneration leading to increase in the distance of spermatozoa in tubules this causes a decrease in testicular weight .This study is in agreement with our findings
Similar results of male infertility due to reduction in testicular weights were observed by Semet [15] (et al) they in their study reported the adverse effects of antipsychotic drugs like spermatogenesis impairment and their observations are in agreement with the results of our research. This may be due to the reason that Lithium causes increased release of reactive oxidant[16] species which leads to increased DNA fragmentation[17] which plays a pivotal role in sperm death and reproductive toxicity[18]

CONCLUSION

This study concluded that lithium reduce the testes weights in albino rats, which is more pronounced with increase time period. It is suggested that, ingestion of Antipsychotic and mood stabilizers drugs may lead to reproductive toxicity and the clinicians along with our population should be made aware of the adverse effects of popular drugs like lithium carbonate.

Author's Contribution:

Concept & Design of Study:	Tazeen Kohari
Drafting:	Tazeen Kohari, Meshaal Azhar
Data Analysis:	Tazeen Kohari, Faryal Azhar, Usama Faruqui
Revisiting Critically:	Tazeen Kohari
Final Approval of version:	Tazeen Kohari

Conflict of Interest: The study has no conflict of interest to declare by any author.

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