

## Infertility in Hypothyroid Wistar Rats

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### ABSTRACT

**Background:** The objective of the present investigation was to study the effect of hypothyroidism on the fertility of female wistar rats. Moreover, its effects on the gross morphology of the pups was also observed.

**Methods:** For this purpose. 30 female wistar rats were divided into 2 groups, 15 as control group and 15 rendered hypothyroid and then made to conceive.

**Results:** After 28-29 days, it was observed that some of the hypothyroid rats could not conceive while others had very reduced litter size. On the 7th day of birth, it was further observed that the size and weight of pups in hypothyroid group were significantly lower as compared to those of control group but no other physical deformity was observed.

**Conclusion:** This led to the conclusion that hypothyroidism has a significant effect on fertility of females as well as on size and weight of offspring.

**Keywords:** Hypothyroidism, wistar rats, infertility, propylthiouracyl.

### INTRODUCTION

Normal thyroid function is a requirement for the normal growth and development of many tissues<sup>1</sup>. Hypothyroidism affect people of all ages. South Asian population has a high prevalence of thyroid disorders mainly due to iodine deficiency<sup>2</sup>. According to health experts, more than 50% adults, mostly women, remain undiagnosed. The most interesting fact is that even the doctors are not well aware about the symptoms of this disease and so fail to diagnose it.

There is a lot of literature with clinical evidence showing that normal reproductive function depend significantly on thyroid activity. Hypothyroidism interferes with implantation<sup>3</sup>. Maternal hypothyroidism leads to reduction of fetal size and weight, but on the contrary, some researchers<sup>4</sup> state that although thyroid hormone is necessary for some aspects of prenatal tissue differentiation, it is not required for fetal growth in uterus. Because of such conflicting reports on the role of thyroid in the maintenance of normal pregnancy, this experiment was designed to study the effect of hypothyroidism on the fertility rate as well as on size and weight of litter born to hypothyroid dams.

### MATERIAL AND METHODS

This study was conducted in the Department of Anatomy, University of Health Sciences, Lahore. All animal related procedures were conducted in accordance with the guidelines of the Ethical Review Committee for medical research at UHS. No rats were sacrificed for this experiment. After a week of acclimatization, the treatment of all groups was started one week before conception. As the period of gestation is around 22-23 days in albino rats, and the neonates were examined and weighed on 7th postnatal day, the duration of study was around 28-29 days

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after conception. Group A served as control (n=15) whereas group B (n=15) was given propylthiouracyl 15mg/kg/day, administered orally one week before conception and continued daily, throughout the period of gestation and weaning upto 7th day after delivery. Food and water were regularly provided and monitored.

### RESULTS

It was observed that the hypothyroid rats either failed to conceive or the offspring could not survive after the first 3 days of birth. Some still births were also observed in hypothyroid group. The surviving pups were weak, sluggish and underweight as compared to the control group. On the contrary, the control group had a significantly greater number of pups, which were comparatively of more weight as compared to hypothyroid group. The food and water intake was quite similar in both the groups.

Table: Comparison of percentage of fertility and mean body weights

Groups	%age of fertility in dams	Mean body weight of pups (gms) on 7 <sup>th</sup> day of weaning
Control	95%	39± 2.54
Hypothyroid	45%	31± 3.820
Statistics	p<0.001	p<0.05

Where p<0.05 is significant whereas p<0.001 means highly significant.

### DISCUSSION

Hypothyroidism impairs reproductive function both in humans and experimental animals. The present study supports this statement, as a marked reduction in fertility rate was seen in hypothyroid group. There are many indications in clinical medicine that hypothyroidism is associated with inadequate reproductive function. Koutras (2015)<sup>5</sup> was of the opinion that hypothyroidism leads to

severe menstrual disturbances, leading to infertility. Wei et al. (2018)<sup>6</sup> also observed that thyroid hormones alter estrous cycle and antioxidative status in the ovary of the rat through the nitric oxide synthase signaling pathway. On the other hand, Krassas (2010)<sup>7</sup> was of the opinion that infertility related to thyroid disorders was mainly due to lack of ovulation, and that hypothyroidism did not lead to menstrual irregularities.

Hypothyroidism produces significant changes in the morphology of ovarian structure which leads to infertility in females<sup>8</sup>. A low metabolic rate is also often found in women attending fertility clinics and many clinicians believe that thyroid extract is the most useful hormone in the treatment of infertility.

Ovaries are highly vibrant glands, performing both endocrine and exocrine functions. They are the basis for continuity of life in all species. It is a well known fact, documented and experimentally proved that hypothyroidism is the leading cause of infertility, not only in females but also in males<sup>8</sup>. Infertility can be due to many reasons, but one remarkable reason of infertility during low thyroid functions is a decrease in number of follicles in the women of reproductive age group. On the other hand, not all the experiments conducted so far on the effect of thyroid function on ovaries led to any definite conclusions. It has also been documented that resection of the thyroid gland of mother has no effect upon the morphology of the reproductive system of the developing fetus during intrauterine life<sup>9</sup>.

Many changes have been observed in anatomy and physiology of the thyroid gland of mother during pregnancy<sup>9</sup>. This is as a result of the necessity to facilitate the fetus with thyroid hormones until the fetal hypothalamic pituitary thyroid system is fully functional. For example, the thyroid gland of the mother is enlarged, iodide uptake is increased and both T3 and T4 concentrations in the fetal blood are increased<sup>9</sup>. Now if the mother is suffering from hypothyroidism, this will impair the growth of developing fetus by compromising the transfer of T4 via blood through the placenta, which is later converted into T3. This was the case in the present study, as due to impairment of maternal thyroid functions, the growth of developing fetuses was impaired, leading to significant reduction in their weights.

In the current study, a significant rate of infertility was observed in hypothyroid rats as compared to control. A similar study was conducted by Cakic-Milosevic et al., in 2004<sup>10</sup> in which he observed a significant effect on fertility rate in hypothyroid rats. Similar effects on body weight in adult albino rats were also reported by Hayat et al (2016)<sup>11</sup> during hypothyroidism.

As mentioned previously, low levels of thyroid hormone in serum is the most important cause of various

disorders related to reproductive system in both males and females. Moreover, impaired production of thyroid hormones can be due to many reasons, both structural and functional. Once the status of thyroid hormone levels is changed, be it due to any reason, it leads to many physiological disorders as there is not a single organ in the human body that is not influenced by this hormone. We therefore conclude that gestation is significantly affected by changes in thyroid function as the latter is closely related to fertility.

## CONCLUSION

It is therefore concluded that hypothyroidism has a significant effect on fertility of females as well as on size and weight of offspring.

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