Ovarian Weight Evaluation in Hyperprolactin Female Sprague-Dawley Rats treated with Green Coconut Water

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ABSTRACT

BACKGROUND: Ovarian weight change has long been used as a sensitive indicator of chemically induced changes in reproductive organs and processes.

AIM: This study was carried out to determine the effect of green coconut water on ovarian weight in hyperprolactin female Sprague- Dawley rats.

MATERIALS AND METHODS: The study was divided into 6 study groups (A- F). In study group A, metoclopramide hydrochloride was administered and this was used to experimentally induce hyperprolactinaemia at 0.2mg/100g body weight/day through oral route for 28days and this was withdrawn for 8, 16 and 28days. The study group B was post-treated with 5 ml/100 g. b. w. and 10ml/100gbw of green coconut water following the administration of metoclopramide hydrochloride. In study group C, animals were co-administered with 0.2mg/100g body weight of metoclopramide and 5ml/100gbw of green coconut water and 10ml/100gbw of green coconut water. In study group D, animals were pre-treated with 5ml/100gbw and 10ml/100gbw of green coconut water prior to the administration of metoclopramide hydrochloride while study group E animals received 5 ml/100 g. b. w. and 10ml/100gbw of green coconut water only. The study group F received distilled water only.

RESULTS: There were gradual increase in ovarian weights with increase in the number of days of post-treatment with green coconut water in hyperprolactin rats.

CONCLUSION: Green coconut water causes increase in ovarian weight in hyperprolactin rats which may be attributed to its estrogenic property and consequent stimulation of ovarian follicles.

KEYWORDS Green coconut water, Hyperprolactin, Metoclopramide, Ovary, Weight

INTRODUCTION

Datura stramonium (*D. Stramonium*),

The ovary produces mature egg for fertilization each month and also reproductive hormones (estrogen and progesterone) that are essential in establishing and maintaining pregnancy. Therefore morphological study of the ovarian as it relates to its composition and resultant weight is a critical aspect in reproductive researches (Ross and Pawlina, 2011). Organ weight change has long been used as a sensitive indicator of chemically induced changes in organs. The comparison of organ weights between treated and untreated groups of animals have conventionally been used to evaluate the effects of test substances (Bindhu *et al.,* 2007). Specifically ovarian weight has been associated with certain substances exerting their effects on the ovary. Hence, the evaluation of ovarian weight has been implicated in some reproductive disease conditions (Siti, 2014).

Metoclopramide hydrochloride (MCH) is a white crystalline, odourless substance that is soluble in water. It is an antiemetic and gastroprokinetic agent commonly used to prevent vomiting and used to enhance gastrointestinal motility via frequency increase which consequently contracts to facilitate gastric emptying (Patterson,1999). It is well established that metoclopramide causes hyperprolactinaemia. The data available indicate that metoclopramide stimulates pituitary PRL secretion by dopamine antagonistic properties

in rat (Regina *et al*., 2011). Dopamine are known to keep prolactin release under tonic inhibitory control hence when antagonized its action is obstructed with free release of prolactin. High serum prolactin level has been associated with the inhibition of the hypothalamic gonadotropin releasing hormone (GnRH), suppression of preovulatory LH-surge and inhibition of gonadal function with decrease in the growth of ovarian follicles (Yazigi et *al.,* 1997). The decreases in the growth of ovarian follicles has been attributed to decrease in ovarian weight (Cheng *et al.,* 2015)

Cocos nucifera is the botanical name of coconut. Green coconut water (GCW) is the water from an immature coconut. Nearly one third of the world population depend on coconut as a source of food and medicine **(**Bourke and Tracy 2009). It has been reported that GCW is use in the treatment of many disease conditions, justified by its unique chemical composition. It is a rich source of nutrients (Sugars, Minerals, Proteins, Vitamins, Fat and fibers) and Photochemical (Phytohormones, Nitrogenous compounds, Organic acids and Enzymes) **(**Tulecke, 1991**;** Ma, 2008 **;** Yong *et al.,* 2009). A study reported that GCW aids the maintenance of pregnancy as the number delivered at the end of the gestation period corresponded to the number of implantation sites counted on day 10 of pregnancy in mice. It can therefore be used in women with threatened or habitual abortion (Pragya, 2010; Kennedy *et al.,* 2013). This present study was carried out to investigate the effects of green coconut water on ovarian weight in metoclopramide treated female Sprague-Dawleys rats.

MATERIALS AND METHODS

Collection of Green coconut fruit

The immature coconut fruits were harvested from a coconut farm in Ajara, Topa, Badagry, Lagos. The average weight of the fruit was 1.55kg. The fruit was authenticated in the forest herbarium, Ibadan. The plant's ascension number is No FHI 109665**.** The unripe coconut fruits were washed and dehusked. The extraction of the water was done through the germinal pore, poured directly into an airtight bottle and kept in the refrigerator.

Animal Material

A total of one hundred and twenty-five adult female SD- rats weighing 145-170g were obtained from the Nigerian Institute of Medical Research, Yaba, Lagos and were authenticated by a taxonomist in the department of Zoology of the University of Lagos. The animals were kept in standard plastic cages in the animal house of the Department of Anatomy and allowed to acclimatize for two weeks under standard laboratory conditions of room temperature 27ºC with a photoperiodicity of twelve hours light alternating with twelve hours of darkness. The animals had free access to clean tap water and pellets.

Experimental Procedure

A total of one hundred and twenty-five cyclic female Sprague-Dawley rats were used for this study. The animals were randomly divided into six (6) major experimental study groups A to F. In experimental study group A, 20 rats were subdivided into four groups A1, A2, A3 and A4 of 5 rats each. A dose of metoclopramide hydrochloride at 0.2mg/100g body weight/day through oral route for 28days was used to experimentally induce hyperprolactinaemia in A1 and this was withdrawn for 8, 16 and 28days in A2, A3 and A4 respectively. Experimental study group B was made up of 30 rats subdivided into six groups; B1, B2 ,B3, B4, B5 and B6 of 5 rats each. The animals were post-treated with 5 ml/100 g. b. w. and 10ml/100gbw of green coconut water following the administration of metoclopramide for 8, 16 and 28days in (B1, B2 and B3,) and (B4, B5 and B6) respectively. In experiment C, 10 rats were subdivided divided into C1 and C2 of 5 rats each, C1 rats were co-administered with 0.2mg/100g body weight of metoclopramide and 5ml/100gbw of green coconut water and C2 rats were co-administered with 0.2mg/100g body weight of metoclopramide and 10ml/100gbw of green coconut water Rats. In experimental group D, 30 rats were subdivided into six groups; D1, D2, D3, D4, D5 and D6 of 5 rats each. The animals were pre-treated with 5ml/100gbw and 10ml/100gbw of green coconut water prior the administration of metoclopramide for 8, 16 and 28days in (D1, D2 and D3) and (D4, D5 and D6) respectively. Experiment E was made up of 30 rats subdivided into six groups; E1, E2, E3, E4, E5 and E6 of 5 rats each. The animals received 5 ml/100 g. b. w. and 10ml/100gbw of green coconut water only for 8, 16 and 28days in (E1, E2 and E3) and (E4, E5 and E6) respectively while experiment F, the control group received distilled water only. All procedures involving animals in this study conformed to the guiding principles for research involving animals as recommended by the Declaration of Helsinki and the Guiding Principles in the Care and Use of Animals.

Measurement of organ weights

Twenty-four hours after the last treatment, each rat was rendered inactive following cervical dislocation. Incision was made on the ventral surface of the pelvic region and the ovaries were dissected out and trimmed of fat. The ovary was place on a sensitive weighing balance and weight estimated and expressed per 100g body weight of the animal.

Measurement of body weights

The body weight was measured twenty-four hours after the last treatment using a weighing balance.

STATISTICS

Results were expressed as means ± standard deviation and subjected to statistical analysis using analysis of variance (ANOVA) and the Scheffe's post-hoc test. The significance level considered was $p < 0.05$.

RESULTS

The value of the ovary in the control group was 0.1g/100g body weight of animal (Figure 1-3). The ovarian weight value of 0.06g/100gbody weight was evaluated in the induced group. This value was significantly lower than that of the control group (Figure 3). There was gradual increase in ovarian weight with increase in the number of days of withdrawal. However, by the 28th day of withdrawal, the value of ovarian weight measured was still significantly lower when compared with the control groups (Figure 1-3). The group post-treated with GCW for 8 days at low and high doses demonstrated significant lower values in the ovarian weight when compared with the control (Figure 1). However, in the groups post-treated with GCW for 16 and 28 days, the values of ovarian weights were comparable with that of the control group (Figure 2-3). The co-administered and the post-treated groups demonstrated significant lower values of ovarian weights when compared with the control group (Figure 3). More so, the administration of GCW only for 8, 16 and 28 days demonstrated comparable values in the weight of the ovaries when compared with the control (Figure 1-3).

DISCUSSION

Evaluation of ovarian weight has been employed as a critical tool in accessing follicular development in the ovary. Folliculogenesis is achieved by increase in cell proliferation and formation of follicular fluid, hence increase in the number of granulosa and theca cells and corresponding increase in the volume of the antrum have been characterized in folliculogenesis. These activities are controlled by FSH under the influence of estrogen (Erickson. 2008). Decrease in ovarian weight has clearly been indicated in hyperprolactin rats. The loss of ovarian weight has been attributed to decrease in the structural developmental activities in the ovary due to low level of steroid hormones and gonadotropins (Shivalinagappa, *et al.,* 2002). In this study, morphometric analysis of ovarian weight demonstrated a duration dependent increase with increase in the number of days of post-treatment with GCW. This implies that significant increase in ovarian weight in the green coconut water treated groups may be due to the increase in the releases of gonadotropins due to its oestrogenic characteristic of GCW as reported by Nisaudah (2009). These explain that more follicles ascended to the mature graafian stage due to oestrogen- induced pituitary release of LH and FSH which are essential for follicular growth and development (Ehlers and Halvorson, 2013).

CONCLUSION

The results of this investigation have demonstrated clearly that green coconut water causes an increase ovarian weight in metoclopramide induced-ovarian weight loss in rats. The increased ovarian weight is assumed to be a consequent of increased follicular growth with a resultant increase in the number and development of follicles. The GCW may therefore have fertility Potential that can further be researched.

CONFLICTS OF INTEREST STATEMENT

We declare that we had no conflicts of interest.

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