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Evaluation of the Effect of Hibiscus Tea (*Hibiscus Sabdariffa*) on the Female and Males Reproductive Hormones of Adult Albino Rats

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ABSTRACT

Hibiscus sabdariffa. (Malvaceae), whose calyx is used worldwide as a cold or hot beverage, H. sabdariffa is used in many folk medicines. It is prized for its moderate laxative properties, capacity to increase urine, relief in hot weather, and treatment of foot cracks, bilious sores, and wounds. The purpose of this study is to investigate and assess the effects of Hibiscus tea on the female and male reproductive hormones (testosterone, progesterone, FSH, and LH) in obese adult female wistar rats. Fifty rats of comparable sizes and weights ranging from 170g to 200g were procured for this study. The experimental animals were separated into five groups (A – E), with group A as control group and group B-E as test group. After sacrificing the rats in each group, Blood sample were collected from the femoral vein. Determination of Progesterone, Testosterone, luteinizing hormone and follicle stimulating hormone levels involves the combination of an enzyme immunoassay sandwich method with a final fluorescent detection (ELFA). For the females groups, the mean ± S.D of Progesterone for Group A,B,C,D and E were 2.3±1.3, 7.5±3.4, 4.6±2.0, 2.2±0.6 and 2.4±0.6 respectively. The mean ± S.D of Luteinizing hormone for Group A,B,C,D and E was 1.5±0.1, 2.5±0.6, 1.8±0.3, 2.1±0.8 and 1.7±0.1 respectively. The mean ± S.D of Follicle stimulating hormone for Group A,B,C,D and E was 1.5±0.1, 2.5±0.6, 1.8±0.3, 2.1±0.8 and 2.1±0.8 respectively. The comparison between various groups shows that there is a statistical significance (p≤0.05) variations in Progesterone, Luteinizing hormone and Follicle stimulating hormone levels. For the males groups, the mean ± S.D of Testosterone for Group A,B,C,D and E were 0.87±0.33, 1.07±0.36, 0.77±0.26, 0.88±0.08 and 0.73±0.08 respectively. The mean ± S.D of Luteinizing hormone for Group A,B,C,D and E was 1.15±0.02, 1.51±0.84, 1.25±0.36, 1.10±0.08 and 1.15±0.08 respectively. The mean ± S.D of Follicle stimulating hormone for Group A,B,C,D and E was 1.69±0.15, 9.43±12.92, 1.89±0.10, 1.58±0.22 and 1.15±0.08 respectively. the comparison between various groups of Testosterone, follicle stimulating hormone and luteinizing hormone shows that there is no statistical significance (P≤0.05) in group A, B, C, D and E respectively. In conclusion, the current scientific evidence regarding has proven that hibiscus tea administration or intake can lead to alteration on progesterone, LH, and FSH levels and as such could pose a threat to the overall health. The administration of extract of H. sabdariffa *as observed in this study showed no significant alterations in FSH, LH and testosterone levels. Despite these findings it is imperative that patients don't throw caution to the wind when consuming such extract.*

Keywords: *Hibiscus sabdariffa, progesterone, testosterone, luteinizing hormone and follicle stimulating hormone*

INTRODUCTION

Hibiscus sabdariffa is commonly known as roselle, jamaica, red sorrel, Indian sorrel, wonjo, and karkade, and it is native to India and Malaysia. The plant belongs to the Malvaceae family and is widely distributed and cultivated worldwide in tropical and subtropical regions, including China, Thailand, Indonesia, Egypt, Sudan, Saudi Arabia, Taiwan, Vietnam, Nigeria, and Mexico, among others. Hibiscus is an annual plant famous for producing edible red calyxes. The main uses of hibiscus calyxes are culinary, as a source of pigments for cosmetics and food applications, and medicinal in folk medicine to treat many ailments. In general, the therapeutic effects of hibiscus have been associated with the presence of bioactive and functional components such as phenolic acids, flavonoids, anthocyanins, organic acids, and dietary fiber (Riaz & Chopra, 2018).[12]

Several studies in vitro, in silico, and in vivo (often murine models) have demonstrated the pharmacological properties and potential human health benefits of hibiscus consumption. On the other hand, evaluating the physiological effect of hibiscus in clinical studies is most challenging. In this context, diverse clinical trials have been conducted around the world to demonstrate the ethnopharmacological efficacy of hibiscus for improving human health status in the management of insulin resistance and diabetes mellitus type 2, nephropathy, iron-deficient anemia, xerostomic symptoms, hypertension and thirst perception in hypertensive patients, dyslipidemia, liver steatosis, overweight/obesity, and cardiovascular diseases (Montalvo-González *et al*., 2022).[7]

Dried *hibiscus calyxes* are commercially accessible globally and can be utilized in both non-therapeutic and medicinal purposes. Fresh or dried hibiscus calyxes are frequently employed in non-medicinal applications, particularly in food, to make hot or cold drinks, tea, jellies, jams, sauces, wines, syrups, ice cream, and chutneys. Calyxes also serve as natural food coloring and flavoring in herb teas and bread products; they can also be roasted and used as a coffee alternative (Montalvo-González et al., 2022). Many different compounds have been isolated from H.sabdariffa, including organic acids, hydroxycitric acid lactone, phenols, protocatechuic acid, and flavonoid derivatives. Anthocyanins extracted from the flower extract of this plant have been demonstrated to have protective effects on testicular toxicity. Previous studies have shown that the aqueous extract of the calyces of the plant and its anthocyanins can mitigate paracetamol hepatoxicity in rats (Izquierdo-Vega *et al*., 2020).[5] *H. sabdariffa* has been demonstrated to be gene matically safe, even after prolonged use. However, reports on the plant's influence on reproduction vary. While some anecdotal accounts suggested that the plant extract is an aphrodisiac, others found that the extract is estrogenic in male rats, and the related species H.rosa sinesis has a deleterious effect on spermatogenesis. Recently, it was reported that the extract of the plant can adversely affect the male rat reproductive system (Tahir *et al.,* 2021).[15] The dry calyces of *H. sabdariffa* are commonly used to prepare a tea in many parts of the world, so it was of interest to ascertain the effect of these aqueous extracts on some reproductive aspects in rats when given in amounts that water extract considered to be comparable with those consumed normally by humans, as well as different

doses of the anthocyanins extracted from the calyces. *H. sabdariffa* is increasingly being used to treat hypertension in humans, often together with Water extract stern-type medications, and it is known that most hypertension medications themselves can adversely affect sexual function. This was another reason why it was considered relevant to research the effect of H. sabdariffa on male reproductive hormones. (Shende, 2021).[14] Data's produced from this study will be used to establish the hormonal status of young obese individuals and also provide insights into the issues/conditions that may cause male reproductive hormone status changes/fluctuations. In addition, it is hoped that this project will mark the beginning of an ongoing body of research into the issues of monitoring male reproductive hormone status especially in individuals who engage consumption of high fat diet meals (Prasomthong, *et al.*, 2022). However, these different results in the aforementioned studies are limited as they did not abnormality of male reproductive organs such as testis as these abnormalities may be factors for male reproductive hormone status changes. Following this, this present study seeks to evaluate the effect of hibiscus tea on the male reproductive hormones of obese adult male rats (Prasomthong *et al.*, 2022).[10]

Hibiscus Sabdariffa

Adequate amount of *Hibiscus sabdariffa* were procured from Ekpoma market and stored at a temperature below 30^{o}C in a cool place pending usage.

***Hibiscus Sabdariffa* Preparation**

The fine *Hibiscus sabdariffa* powder was measured using Electric Balance (Denver Company, USA, 200398. IREV.CXP-3000) and packaged in small plastic envelopes and then stored pending usage. The substance preparation process was performed with maximum care in order to avoid any form of contamination to ensure accurate results. At each time of administration, adequate amount of *Hibiscus sabdariffa* powder were dissolved in water to form the different concentration administered to each animal.

Animal Treatment

Fifty rats of comparable sizes and weights ranging from 170g to 200g were procured from the animal house of Ambrose Alli University, Ekpoma, Edo State and transferred to the experimental laboratory of the University, where they were allowed two (2) weeks of acclimatization. They were housed in wire mesh cages with tripods that separated the animal from its feces to prevent contamination. During this phase of acclimation, the rats were fed with growers' mush and given water ad libitum. The animals were randomized into study groups and housed in separate cages, reversed light/dark cycle), constant temperature (23± 3^{0}C) and at 50% relative humidity. Rats were monitored for two weeks before the commencement of this experiment for acclimatization to the housing room, environment, the reversed light cycle as well as rule out any possible intercurrent infection.

Sample Size Calculation

Sample size was determined using the formula described by Jaykaran and Kantharia (2013).

E= Total number of animals - Total number of groups.

Assuming the total number of rats is 20 and total number of groups equals 5.

E = (5x20)-50

E=100-50 =50. Therefore, 50 was minimum number of albino rats to be used in this research.

Ethical Approval

The protocol for this study was approved by the Ethics and Research Committee of the Ministry of Agriculture, Benin City, Edo State.

Experimental Design

This study included a total of 50 rats. Before dose administration, each animal's body weight was established, and the dose was calculated based on that weight. They were separated into five groups, each with ten rats. The body weight of each rat was checked using a sensitive balance once before the initiation of treatment and on the day of sacrifice, and then calculated the percentage of weight gain for each rat. The mortality was observed daily during the experiment. After the administration, the rats were put under light chloroform anesthesia and the blood was collected for hormonal examination. ANOVA and student t-test was used to analyze the results of the weight and differences were considered significant at $P < 0.05$ level of confidence. All data are expressed as Mean ± Standard error of mean (SEM). The results were presented in tables and comparisms made statistically.

Animal Grouping

The experimental animals were separated into five groups (A – E). Each group contains ten rats each (n = 10) using five (5) big cages to house them. Group A served as the control, while groups B-E served as the test groups. Group B-E was receiving varying doses of *Hibiscus sabdariffa* powder solutions orally respectively. The dosages was prepared accordingly and weighed to determine the quantity to be administered.

Group A received only the normal feed (grower's mash) and water with no *Hibiscus sabdariffa* solutions.

Substance Administration

The administration of *Hibiscus sabdariffa* solutions were performed orally as follows:

- **Group A** (Control) received only normal feed and water daily for 14 days.
- **Group B** (Test groups) received feed, fructose water and 2ml of *Hibiscus sabdariffa* powder solution for 14 days
- **Group C** (Test groups) received feed, fructose water and 4ml of *Hibiscus sabdariffa* solution for 14 days.
- **Group D** (Test groups) received feed, fructose water, 6ml of *Hibiscus sabdariffa* solution for 14 days.
- **Group E** (Test groups) received feed, only fructose water for 14 days.

Sample Collection and Analysis

After sacrificing the rats in each group, Blood sample were collected from the femoral vein of each animals and transferred into plain bottles for hormonal analysis test

Sample Collection and Laboratory Diagnosis

Methods

Collection of blood samples

Each individual provided approximately 6ml of blood, which was then distributed into simple bottles. Serum was isolated for hormonal analysis.

Biochemical Examination

Hormonal assay

Determination of Testosterone, luteinizing hormone and follicle stimulating hormone levels (Butt and Blunt, 1988)

The assay methodology for testosterone testing combines an enzyme immunoassay sandwich approach with final fluorescence detection (ELFA). The solid phase receptacle (SPR) serves as both the solid phase and a pipetting device for the assay. The assay's reagents are ready to use and predispensed in sealed reagent strips. The equipment performs all assay stages automatically. The reaction medium is cycled in and out of the SPR many times. The sample is collected and transferred to

a well containing alkaline phosphate-labeled anti-Testosterone conjugate.

To speed up the reaction, the sample/conjugate combination is repeatedly cycled in and out of the SPR. The antigen binds to antibodies on the SPR and the conjugate, forming a "sandwich". Unbound components are removed during the washing process. In the final detection phase, the substrate (4-Methyl - Umbelliferyl phosphate) is cycled in and out of the SPR.

The conjugate enzyme catalyzes the hydrolysis of this substrate, resulting in a fluorescence measured at 450nm. The intensity of the fluorescence is proportional to the concentration of antigen present in the sample. At the end of the assay, the VIDAS automatically calculates the results in respect to the calibration curve stored in memory and prints them out. Progesterone hormones were used to measure the levels in all PCOS samples.

DATA ANALYSIS

ANOVA and student t-test was used to analyze the results of the weight and differences were considered significant at $P < 0.05$ level of confidence. All data are expressed as Mean ± Standard error of mean (SEM). The results were presented in tables and comparisms made statistically.

RESULTS

The mean ± S.D of Group A for Body weight at day 1 (before acclimization) was $146.38±17.58^{a}$, Body weight at first week of administration was $153.75±13.92^{b}$, while Body weight at second week of administration was $149.19±14.47^{c}$ .The mean ± S.D of Group B for Body weight at day 1 (before acclimization) was 130.37±71.50, Body weight at first week of administration was 150.02±55.63, while Body weight at second week of administration was 104.48±91.22. The mean ± S.D of Group C for Body weight at day 1 (before acclimization) was $152.10±29.70^{d}$, Body weight at first week of administration was $143.7 ± 25.9^{b}$, while Body weight at second week of administration was $152.80±32.90^{f}$. The mean ± S.D of Group D for Body weight at day 1 (before acclimization) was 144.96±19.72, Body weight at first week of administration was 154.96±21.96, while Body weight at second week of administration was 149.78±25.42.The mean ± S.D of Group E for Body weight at day 1 (before acclimization) was 131.86±49.70, Body weight at first week of administration was 140.30±53.15, while Body weight at second week of administration was 136.40±50.88

However, the comparison between various groups on the body weight shows that there is a statistical significance ($P \leq 0.05$) in group A, while there is no statistical significance ($P \leq 0.05$) in group B, C, D and E respectively.

Table 1: *Distribution and comparison of body weight between day 1, day 14, first week and second week of* Hibiscus sabdariffa *acclimization and administration of group A, B, C, D and E both males and female albino rats.*

	Body weight before acclimatization (N=10)	**Body weight at 7 days (N=10)**	**body weight at 14 days (N=10)**	**body weight before sacrifice at 28 days (N=10)**	**F**	**Sig.**
Group A	$146.38±17.58^{a}$	$153.75±13.92^{b}$	$154.19±14.47^{c}$	$159.11±14.93^{abc}$	6.894	0.001*
Group B	130.37±71.50	150.02±55.63	104.48±91.22	189.83±14.26	0.833	0.485
Group C	$152.10±29.70^{d}$	$156.04±33.57^{e}$	$152.80±32.90^{f}$	$184.23±16.57^{def}$	2.605	0.067

Group D	144.96±19.72	154.96±21.96	149.78±25.42	196.53±28.24	1.060	0.378
Group E	131.86±49.70	140.30±53.15	136.40±50.88	194.75±29.52	0.092	0.964

Similar Superscript: A statistical significance *P≤0.05* occurred with each other

Key:

- **Group A** (Control) received only normal feed and water daily for 14 days.
- **Group B** (Test groups) received feed, fructose water and 2ml of *Hibiscus sabdariffa* powder solution for 14 days
- **Group C** (Test groups) received feed, fructose water and 4ml of *Hibiscus sabdariffa* solution for 14 days.
- **Group D** (Test groups) received feed, fructose water, 6ml of *Hibiscus sabdariffa* solution for 14 days.
- **Group E** (Test groups) received feed, only fructose water for 14 days.

The mean ± S.D of Group A for Testosterone was 0.87±0.33, the mean ± S.D of Group B for Testosterone was 1.07±0.36, the mean ± S.D of Group C for Testosterone was 0.77±0.26, the mean ± S.D of Group D for Testosterone was 0.88±0.08, the mean± S.D of Group E was 0.73±0.08. The mean ± S.D of Group A for follicle stimulating hormone was 1.69±0.15, the mean ± S.D of Group B for follicle stimulating hormone was 9.43±12.92, the mean ± S.D of Group C for follicle stimulating hormone was 1.89±0.10, the mean ± S.D of Group D for follicle stimulating hormone was 1.58±0.22, the mean ± S.D of Group E for follicle stimulating hormone was 1.15±0.08. The mean ± S.D of Group A for Luteinizing hormone was 1.15±0.02, the mean ± S.D of Group B for Luteinizing hormone was 1.51±0.84, the mean ± S.D of Group C for Luteinizing hormone was 1.25±0.36, the mean ± S.D of Group D for Luteinizing hormone was 1.10±0.08, the mean ± S.D of Group E for Luteinizing hormone was 1.15±0.08. However, the comparison between various groups of Testosterone, follicle stimulating hormone and luteinizing hormone shows that there is no statistical significance (P≤0.05) in group A, B, C, D and E respectively

Table 2: *Shows the mean and standard deviation of Testosterone, Follicle stimulating hormone and Luteinizing hormone across various groups for male's albino rats.*

	Group A (N=3)	**Group B (N=3)**	**Group C (N=3)**	**Group D (N=4)**	**Group E (N=5)**	**F**	**Sig.**
Testosterone (ng/ml)	0.87±0.33	1.07±0.36	0.77±0.26	0.88±0.08	0.73±0.08	1.141	0.380
Follicle stimulating hormone (m/u/ml)	1.69±0.15	9.43±12.92	1.89±0.10	1.58±0.22	1.68±0.11	1.454	0.272
luteinizing hormone (m/u/ml)	1.15±0.02	1.51±0.84	1.25±0.36	1.10±0.08	1.15±0.08	0.662	0.630

Similar Superscript: A statistical significance *P≤0.05* occurred with each other

Key:

- **Group A** (Control) received only normal feed and water daily for 14 days.
- **Group B** (Test groups) received feed, fructose water and 2ml of *Hibiscus sabdariffa* powder solution for 14 days
- **Group C** (Test groups) received feed, fructose water and 4ml of *Hibiscus sabdariffa* solution for 14 days.

- **Group D** (Test groups) received feed, fructose water, 6ml of *Hibiscus sabdariffa* solution for 14 days.
- **Group E** (Test groups) received feed, only fructose water for 14 days.

The mean ± S.D of Group A Progesterone was 2.3±1.3, while the mean ± S.D of Group B for Progesterone was 7.5±3.4, while the mean ± S.D of Group C for Progesterone was 4.6±2.0, while the mean ± S.D of Group D for Progesterone was 2.2±0.6, while the mean ± S.D of Group E for Progesterone was 2.4±0.6. The mean ± S.D of Group A for Luteinizing hormone was 1.5±0.1, while the mean ± S.D of Group B for Luteinizing hormorne was 2.5±0.6, while the mean ± S.D of Group C for Luteinizing hormone was 1.8±0.3, while the mean ± S.D of Group D for Luteinizing hormorne was 2.1±0.8, while the mean ± S.D of Group E for Luteinizing hormorne was 1.7±0.1. The mean ± S.D of Group A for Follicle stimulating hormone was 1.5±0.1, while the mean ± S.D of Group B for Follicle stimulating hormone was 2.5±0.6, while the mean ± S.D of Group C for Follicle stimulating hormone was 1.8±0.3, while the mean ± S.D of Group D for Follicle stimulating hormone was 2.1±0.8, while the mean ± S.D of Group E for Follicle stimulating hormone was 2.1±0.8. However, the comparison between various groups shows that there is a statistical significance ($p \leq 0.05$) variations in Progesterone, Luteinizing hormone and Follicle stimulating hormone levels.

Table 3: *Shows the Mean and standard deviation of Progesterone, Luteinizing hormone and Follicle hormone in different groups for female albino rats.*

	Group A (N=3)	**Group B (N=2)**	**Group C (N=3)**	**Group D (N=4)**	**Group E (N=4)**	**F**	**Sig.**
Progesterone ng (/ml)	2.3±1.3	7.5±3.4	4.6±2.0	2.2±0.6	2.4±0.6	5.3	0.002*
Luteinizing hormone (m/u/ml)	1.5±0.1	2.5±0.6	1.8±0.3	2.1±0.8	1.7±0.1	1.7	0.002*
Follicle stimulating hormone (m/u/ml)	1.5±0.1	2.5±0.6	1.8±0.3	2.1±0.8	2.1±0.8	1.0	0.004*

Similar Superscript: A statistical significance $P \leq 0.05$ occurred with each other

Key:

- **Group A** (Control) received only normal feed and water daily for 14 days.
- **Group B** (Test groups) received feed, fructose water and 2ml of *Hibiscus sabdariffa* powder solution for 14 days
- **Group C** (Test groups) received feed, fructose water and 4ml of *Hibiscus sabdariffa* solution for 14 days.
- **Group D** (Test groups) received feed, fructose water, 6ml of *Hibiscus sabdariffa* solution for 14 days.
- **Group E** (Test groups) received feed, only fructose water for 14 days.

DISCUSSION

Medical plants are characterized by physiological active principles that have been utilized in traditional medicine years ago in treatment of different diseases. Previous research has shown that Hibiscus sabdariffa possesses ethno-medical and

ethno-veterinary characteristics; nevertheless, the association between male reproductive hormone levels has not been fully shown (Madhumita et al., 2020).[6]

Hibiscus tea has been studied for its potential effects on body weight and weight management. While it is not a magic solution for weight loss, it may offer some benefits that can support overall weight management efforts (Amaya-Cruz *et al.*,2019).[3] Table 4.1 shows the distribution and comparison of body weights before and after acclimatization across all groups. the comparison between various groups on the body weight shows that there is a statistical significance (P≤0.05) in group A, while there is no statistical significance (P≤0.05) in group B, C, D and respectively. The aforementioned results of this study observed in table 4.1 contradicts the findings a study by Ojewole, (2007)[9] which investigated the effects of hibiscus extract on obesity and metabolic syndrome in animal models. The study found that hibiscus extract significantly reduced body weight, body mass index (BMI), and waist-to-hip ratio in the treated animals compared to the control group. Another study by Mozaffari-Khosravi *et al*., 2009[8] explored the effects of hibiscus tea consumption on body weight and body fat in overweight and obese individuals. The participants consumed hibiscus tea daily for 12 weeks. The study found that hibiscus tea supplementation led to a reduction in body weight, body fat percentage, and waist circumference compared to a control group. Reduction in body as observed by Mozaffari-Khosravi *et al*., 2009 may be due to phytochemicals present in hibiscus tea.

The effect of hibiscus tea on male reproductive hormones has not been extensively studied, and there is limited research available on this specific topic. Few studies such as this present study has explored the effect of hibiscus tea on male reproductive hormones. Table 2 shows the mean and standard deviation of Testosterone, Follicle stimulating hormone and Luteinizing hormone across various groups. However, the comparison between various groups of Testosterone, follicle stimulating hormone and luteinizing hormone shows that there is no statistical significance (P≤0.05) in group A, B, C, D and E respectively. The findings of this study contradicts the findings of a study by Rahnama *et al*., (2018)[11] which investigated the effects of hibiscus extract on male reproductive parameters in animal models. The study reported that hibiscus extract increased testosterone levels, which could have implications for male reproductive function. Although not specific to hibiscus tea, a study by Setchell *et al*., (2011)[13] investigated the effects of a polyphenol-rich extract, including hibiscus, on testosterone levels in male rats. The study found that the extract significantly increased testosterone levels, suggesting a potential role in hormonal regulation. The reason for statistical insignificancy as observed in this study may be dose dependent, it is possible that increased dosage may generate a different outcome.

The differences in dosage administration play a critical role in the extent to which hibiscus tea administration alters the male hormonal level hence this study compared the various dosage administered to test wistar rats as observed in table 3 however the result proved to be statistically insignificant(p≤0.05) when compared. Studies showing direct comparison between varying doses of hibiscus tea are limited. However, in a dose-dependent investigation, Al-Shalash (2021)[2] discovered that a 300 mg/kg Calyx extract of H. sabdariffa lowered reproductive hormones (testosterone, follicle stimulating hormone (FSH), and

luteinizing hormone (LH) in experimental rabbits. Arabi et al. (2014)[4] discovered that different doses of H. sabdariffa Linn had significant effects on sex hormones FSH, LH, and testosterone ($p<0.05$).

The relationship between hibiscus tea and female reproductive hormones is not extensively studied, and the available evidence is limited. However, some research has explored the potential effects of hibiscus tea on certain aspects of female reproductive health. Table 2 shows the Mean and standard deviation of Progesterone, Luteinizing hormone and Follicle hormone in different groups. the comparison between various groups shows that there is a statistical significance ($P\leq0.05$) Increase between Progesterone, Luteinizing hormone and Follicle stimulating hormone, these results contradicts the findings Al-Shalash, 2021 whose research observed a statistical decline in the levels of Progesterone, Luteinizing hormone and Follicle stimulating hormone. The results of this study aligns with the study of Al-Fartosi & Al-Rekabi, (2012)[1] whose study also founded a statistical significant ($p\leq0.05$) increase in plasma (FSH), (LH), estrogene and progesterone when compared with control group. The increase in levels of Progesterone, Luteinizing hormone and Follicle stimulating hormone may be due to underlying illnesses such as polycytic ovarian syndrome(PCOS).

CONCLUSION

In conclusion, the administration of extract of *H. sabdariffa* as observed in this study showed no significant alterations in FSH, LH and testosterone levels. The current scientific evidence regarding has proven that hibiscus tea administration or intake can lead to alteration on progesterone, LH, and FSH levels. The studies on the impact of hibiscus tea on female reproductive hormones are limited. Despite these findings it is imperative that patients don't throw caution to the wind when consuming such extract. Individuals should always consult with a doctor before using *H. sabdariffa* extract to treat any condition. More scientific investigation into *H. sabdariffa* extract is needed.

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