

Histomorphological Study of Aqueous Extract of *Hibiscus Sabdariffa* on Hormonally Induced Prostatic Enlargement of Adult Wistar Rat

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Abstract: - Aim: to investigate some effects of aqueous extract of *Hibiscus sabdariffa* on induced benign prostatic hyperplasia. **Material and Method:** Forty eight male adult wistar rats weighing between 190g and 220g were used for the study. They were acclimatized for 2 weeks and fed with standard rat chow and water ad libitum before the study. They were divided into six groups. Group1- control group received 0.3ml of corn oil, others were induced for BPH with hormones (200µg Testosterone and 100µg estradiol) for 3 weeks; after induction Group 2 took distilled water, Group 3 received 0.71g of finasteride, Group 4, 5 and 6 received 0.3, 0.6 and 0.9g/kg bw *Hibiscus sabdariffa* (HS), respectively. The prostate were excised, processed and stained with H&E and Masson Trichrome. **Result:** The weight of group 4, 5 and 6 rats decrease compared to group 2 rats. There were pronounced reduction in the mucosal (epithelial) and fibromuscular stroma hyperplasia of the treated groups when compared with the group 2 rats. **Conclusion:** This indicates that the test herb has no adverse effect on prostatic parameters of healthy rats and also shows that *Hibiscus sabdariffa* extract can be viewed as a candidate novel medication for benign prostate hyperplasia therapy.

Key Words: Benign prostatic hyperplasia, finasteride, prostate gland, *Hibiscus sabdariffa*, Hormones

I. INTRODUCTION

The prostate is largest accessory gland of the male reproductive system. It lies in the lesser pelvis, just beneath the neck of the urinary bladder where urine is stored and behind the lower part of the pubic symphysis and upper part of the pubic arch. It is found in front of the ampulla of the rectum, above the urogenital diaphragm (2). The Prostate gland comprises of glandular part and fibro muscular part. A fibrous capsule envelopes the prostate which contains neurovascular plexus of veins and nerves, The prostate gland is a major secondary endocrine organ of males whose development and growth depends on androgen stimulation especially by dihydrotestosterone (DHT), an active metabolic product from the conversion of testosterone by steroid 5 α -reductase (28). The prostatic fluid is thin, slightly acidic (pH 6.4). It contains spermine (for the motility of sperms), spermidine, prostataglandins (for uterus stimulation), zinc (affects testosterone metabolism of the prostate), citric acid (buffer), immunoglobulins, phosphatases and proteases

(liquefaction of the semen) (7). The main function of the prostate is to secrete a slightly alkaline fluid, milky or white in appearance. Fluid that is secreted by epithelial cells lining the acini and prostate ducts is rich in proteins, enzymes and metal ions. It includes proteases such as prostate-specific antigen (PSA), prostatic acid phosphatases (PAPs), immunoglobulins and zinc (17).

Prostatic enlargement in men is a condition in which the prostate is enlarged and not with cancerous causing pain and difficulty during urination. Benign prostatic hyperplasia (BPH) involves the hyperplasia of the prostatic stromal and epithelial cells resulting in the formation of large fairly discrete nodules in the transitional zone of the prostate (15). When large the nodules create a resistance for the flow of urine which leads to obstruction of the urinary bladder, as a result there is progressive hypertrophy also instability or weakness of the urinary bladder. Benign prostatic hyperplasia involves hyperplasia (an increase in number of cells) rather than hypertrophy (an increase in size of cells). Benign prostate hyperplasia also involves increased adrenergic tone in prostate smooth muscle mediated by α 1-adrenoceptors (29). *Histologically*, the glandular epithelial cells and the stromal cells (including muscular fibers) undergo hyperplasia in Benign Prostatic Hyperplasia. (20). Anatomically the median lobe is usually enlarged in BPH. The anterior lobe has little in the way of glandular tissue and is seldom enlarged. Carcinoma of the prostate typically occurs in the posterior lobe. In the population of the aging male, it occurs in older men from 50 years above about 34% of men in the USA, 29% of European men and 18% of men in Asian countries aged between 50-80 years reported (31). In Nigeria researchers stated that the prevalence of symptoms of BPH is very high showing 6.0% in those aged 40-49 years to 69.9% in 70years and above (12). Problems associated with BPH shows a prevalence of 30% to 60% in men older than 60 years and 80% in men by age 80 years (37). Prostate specific antigen levels may be elevated in the patients due to the increased organ volume and inflammation due to urinary tract infections (11). Two conditions are necessary for the development of Benign Prostate Hyperplasia; aging and the presence of testes. It is well known that males who are castrated prior to the time

of puberty never developed Benign Prostate Hyperplasia. The development of Benign Prostate Hyperplasia requires the presence of testosterone hormone (27).

As the prostate enlarges, it can constrict the urethra, resulting in various symptoms such as a weak urinary stream, incomplete urinary bladder emptying, nocturia, dysuria and urinary bladder outlet obstruction (34, 35). It has a high public health impact and is one of the most common reasons for surgical intervention among elderly men.

Inflammation in the prostate gland has recently been related also to benign prostatic hyperplasia (BPH) (24). It was also stated that no significant relationship has been found between prostate size and changes in the symptom index over time. A possibility remains that cytokines secreted by inflammatory cells have systematic influence or when released into secretion by glandular inflammation, influence neurogenic mechanism or muscular functions of the lower urinary tract and cause functional changes such as abnormal detrusor contractility (8).

Hibiscus sabdariffa

Hibiscus sabdariffa is a Roselle plant which belongs to the family *Malvaceae* and tribe *Hibiceae*, (14), which is derived from the plant calyces, which are the collection of sepals and the petals. In Northern Nigeria (Hausa) it is known as *zoborodo*, in Western Nigeria (Yoruba) it is known as *Isapa*, and in Eastern Nigeria (Igbo) it is called *Okworo Ozo* (16). *Hibiscus sabdariffa* is widely produced in different part of the country most commonly grown in the Central and West Africa, South East Asia (18). *Hibiscus sabdariffa* is an annual plant located in the tropical and subtropical regions, for the cultivation of stems, fiber, edible calyces, leaves and seed. The leaf, fleshy calyx, seed or fiber, are also used for medicinal and nutritional purposes, (16). Roselle (*Hibiscus sabdariffa* L) is known for delicacy and also has medicinal properties. Worldwide trend towards the use of natural plant remedies has created an enormous need for information about the properties and uses of medicinal plant as Antitumor, analgesic, insecticides. Besides medicines, plants provides thousand of novel compounds, such as fragrance, flavorings, dyes, fibers, foods, beverages (18). The calyces of *Hibiscus sabdariffa* have been found to be rich in Vitamins, natural carbohydrate, protein and Vitamin C and other antioxidants and also minerals (43) which constitute the major reason(s) for consuming soft drink and fruit juice (32, 33). In Nigeria it is used as drinks (zobo) also taken as tea in some other parts of the country (1). Research indicated that *Hibiscus Sabdariffa* is effective to reduce body weight due to the presence of substances that inhibit the production of amylase (41). It is also anti-oxidants which perform disease preventive and protective functions (42). It also consists of alkaloids, comprising a large group of nitrogenous compounds which are widely used as cancer chemotherapeutic agents due to the presence of phenolic acid (40). It also contains flavonoids which are well known for

their anti-viral, anti-inflammatory, antioxidant cytotoxic activities, also used for the treatment of hypertension, diabetes and rheumatic fever (5). The existence of Benign Prostate Hyperplasia (BPH) and prostate cancer in humans and the effect on the quality of life of people have made a search for their treatment a priority for public health (30). Some plants have been known to be a good sources of natural antioxidants which protect against degenerative diseases and cancer (23). The increase rate of prostate disorders due to dietary changes has been demonstrated in both human and animal studies (36; 39). Dietary fiber through the consumption of fruit and vegetables has been shown to be protective and associated with decreased incidence of BPH (10)

II. MATERIALS AND METHODS

Male Wistar rats, corn oil, cotton wool, dissecting set, dissecting board, EDTA bottles, eosin solution, feed, feeding can and water troughs, methylated spirit, needle and syringe, oral cannula, water, sensitive weighing scale, specimen bottle, distilled water, Calyces of *Hibiscus sabdariffa*, Finasteride- a product of MA holder, TEVA UK limited, eastbourne, BN22 9AG, PLC 00289/1024 (gotten from Damak Pharmacy Shagamu Ogun State Nigeria). *Hormones*; Testosterone propionate Brand name: Ricostrone; a product of Greenfield pharma, Jiangsu

Co Ltd., China. Estradiol valerate (by Medipharm Ltd., 108-Kotlakhpat industrial Est; Lahore, India. Testosterone propionate (T) and estradiol valerate E2 (puregynon depot) from Damak Pharmacy Shagamu Ogun State were used for the induction of prostatic enlargement at a dose of 200µg T and 100µg E₂ for three weeks subcutaneously in the inguinal region (8).

2.1 Plant Extraction

Mature calyces of *Hibiscus sabdariffa* were purchased from a local market in Ikenne, Ogun State, Nigeria, and authenticated in Forestry Research Institute of Nigeria, Herbarium Ibadan with a reference number 110344 by scientist Soyewo Temitope. The Extraction procedure used in our laboratory was as described previously (22). Briefly, 30 g of the dry petals of *Hibiscus sabdariffa* were brewed in 400 ml of boiled distill water for 45 mins. The resulting decoction was filtered using a filtration sieve (pore size 0.5mm diameter). The concentrations in the extract groups (0.6 g/100 ml, 1.2g/100ml, 1.8 g/100 ml,) were derived as follows: 10 ml of filtrate was added to 48 ml of distill water to make approximately 0.6 g/100 ml tap water also 10mls of filtrate was added to 13mls of distill water while 10 mls was added to 9 ml of distill water to make approximately 1.8g/100 ml distill water (22).

2.2 Induction Of Prostatic Enlargement

200µg of testosterone were injected into the subcutaneous layer of the animals while 100µg of estradiol were injected to each animal subcutaneously layer (7, 8), the route of induction being subcutaneous around the inguinal region for three

weeks simultaneously on alternate day. At the end of the third week of induction they were being treated with *Hibiscus sabdariffa* and 0.71mg of finasteride. The administration of extract was totally by oral gavage. Proper concentrations were administered by the use of oropharyngeal canula and calibrated hypodermic syringe. Treatment lasted for three weeks after which they were all sacrificed and organs were excised.

2.3 Animal Care and Management

Forty eight male adult wistar rats weighing between 190g and 220g at the age of 8-10 weeks were used for the experiments. They were given feeds and water *ad libitum* and acclimatized for two weeks before the commencement of the experiment. Animal were maintained in standard laboratory cages with wood chip beddings at the Animal House, Faculty of Basic Medical Sciences, Olabisi Onabanjo University, Ikenne.

2.4 Experimental Design

Experimental animals were randomly selected based on body weight divided into two groups, Group one the control (8 rats) and group two which is the hormone treated, were later subdivided into five groups of 8 rats each.

Normal Control Group (Group 1). Control group received the vehicle 0.3ml of corn oil.

BPH Group (Group 2). Hormone Treated Control- received 200µg T and 100µg E₂

Finasteride Group (Group 3). Received 200µg T and 100µg E₂ for three weeks, at the end of 3week took *finasteride* (0.71mg/Kg bw) for another 3weeks.

Treated 1 (low dose) (Group 4). Received 200µg T and 100µg E₂ for three weeks, at the end of 3week took *Hibiscus Sabdariffa* (0.3g/kg bw) for another 3weeks.

Treated 2 (medium dose) (Group 5). Received 200µg T and 100µg E₂ for three weeks, at the end of 3week *Hibiscus Sabdariffa* (0.6g/kg bw) for another 3weeks.

Treated 3 (high dose) (Group 6). Received 200µg T and 100µg E₂ for three weeks, at the end of 3week *Hibiscus Sabdariffa* (0.9g/kg bw) for another 3weeks.

2.5 Animal Sacrifice

After 3 weeks of treatment animals were anaesthetized, piece of cotton wool was soaked with chloroform and was placed inside the glass jar. Animals were placed in the chloroform glass jar one after another and dissected. Prostate were excised and fixed in formal saline and histological processes were done.

2.6 Histological Processing

Heamatoxylin and eosin was used to demonstrate the general histoarchitecture of the prostate. Masson trichrome was then used to demonstrate the connective tissues.

2.6.1 Haematoxylin and Eosin Staining Technique H&E Procedure

Dewax section in xylene 1(5mins) and xylene11 for another (3mins)

Hydrates slides through the following:

Absolute alcohol 1min

Absolute alcohol 1min

90% alcohol 1min

70% alcohol 1min

50% alcohol 1min

Rinse on running tap water

Stain in haematoxylin for 10-15mins

Wash in running tap water

Differentiate in 1% Acid alcohol for 10sec

Blue in running tap water for 5mins

Counterstain in 1% eosin for 1min

Wash in running tap water for 5 mins

Dehydrates through the following:

50% alcohol 1min

70% alcohol 1min

90% alcohol 1min

Absolute alcohol 1min

Let dry

Mount in Xylene with DPX and let dry

Examine under microscope.

2.6.2 Masson'S Trichrome Stain Procedure

Procedure:

- Deparaffinize and rehydrate through 100% alcohol, 95% alcohol 70% alcohol.
- Washed in distilled water.
- Re-fix in Bouin's solution for 1 hour at 56 C to improve staining quality although this step is not absolutely necessary.
- Rinse in running tap water for 5-10 minutes to remove the yellow color.
- Stain with Weigert's iron hematoxylin working solution for 10 minutes.
- Rinse in running warm tap water for 10 minutes.
- Washed in distilled water.
- Stain in Biebrich scarlet-acid fuchsin solution for 10-15 minutes. Solution can be saved for future use.
- Wash in distilled water.

- Differentiate in phosphomolybdic-phosphotungstic acid solution for 10-15 minutes or until collagen is not red.
- Transfer sections directly (without rinse) to aniline blue solution and stain for 5-10 minutes and rinse briefly in distilled water also differentiate in 1% acetic acid solution for 2-5 minutes.
- Washed in distilled water.
- Dehydrated very quickly through 95% ethyl alcohol, absolute ethyl alcohol (these step will wipe off Biebrich scarlet-acid fuchsin staining), clear in xylene and mounted.
- Examine under microscope

III. RESULTS

3.1 Body Weight of the Animals

The mean body weight of the animals in the control group (NCT) increased compared to the other groups after randomization to the end, showing that body weight in the control groups is higher compared to the other groups, low dose of *Hibiscus sabdariffa* results in weight loss when compare to the other groups at ($p \leq 0.32$). The body weight gained by the control group at the end of the experiment is 43.87g. While at the end of the experiment weight loss by the low dose (treated 1) is 88.16g (figure 3.1).

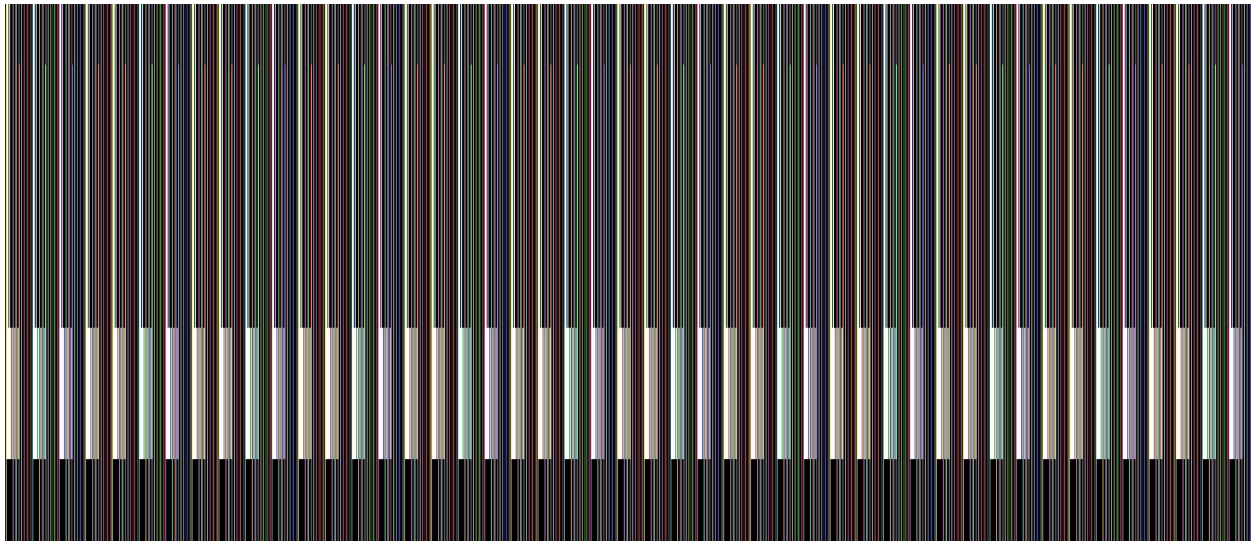


Figure 1: Bar chart of the effect of *Hibiscus sabdariffa* extract on the Body weight. Data are expressed as Mean SEM. (n=8, $p < 0.05$).

Relative Organ Weights (Prostate)

The weight of prostate glands was measured in all the experimental groups at the end of the experiment, BPH group has the highest organ weight when compare with the rest of the groups, the Treated groups especially the low dose

significantly lowered (0.07 ± 0.00) when compared with the BPH group (0.15 ± 0.01) the differences were statistically significant at ($p < 0.01$). While other treated group medium dose (0.09 ± 0.02), high dose (0.08 ± 0.01), FNS (0.07 ± 0.01) and control group (0.05 ± 0.12).

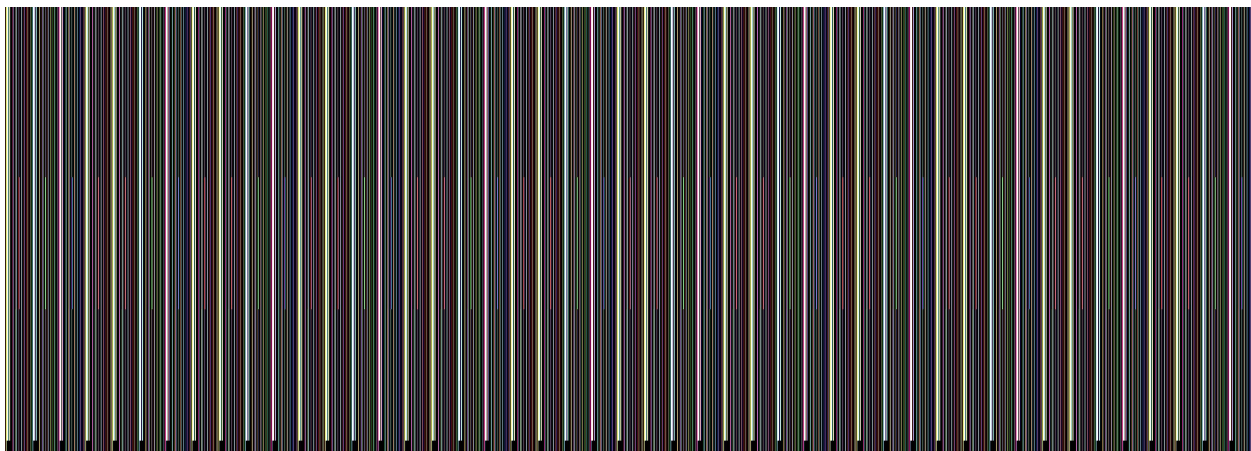


Figure 2: Bar chart of the effect of *Hibiscus sabdariffa* on organ weight. Data are expressed as Mean SEM. (n=8, $p < 0.01$).

Histological Analysis of the Prostate Glands

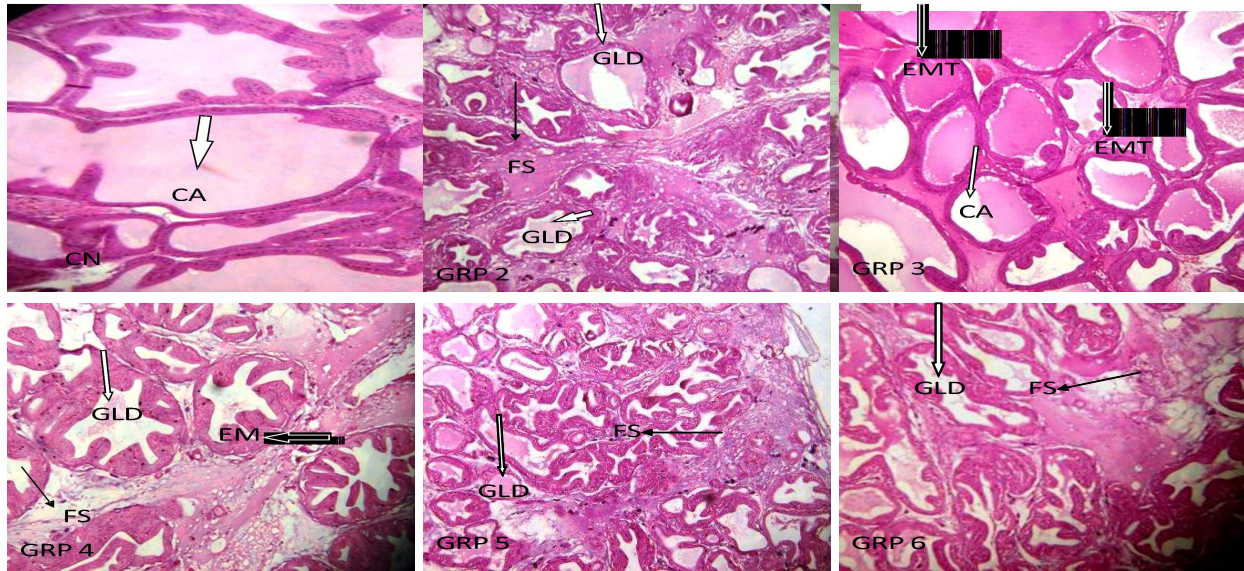


Plate 4.1: Photomicrographs of Prostate gland of Control (Group1) (H&E x100). It showed normal Prostatic Glands Containing Normal Concretions/ Corpora Amylacea (White Arrow), also showed normal fibromuscular stroma (slender Arrow)..

Plate 4.2: Photomicrograph of prostatic enlargement of group2 (Hormone control group) (H&E X100). Showing predominantly glandular proliferation(white arrow),the glandular cells show severe epithelial hyperplasia, there is severe hyperplasia of the fibromuscular stroma (slender arrow), considerable alteration in the shape of the glands are noted.

Plate 4.3: Photomicrograph of prostate gland (finasteride positive control group) (H&E X100), it showed normal Concretions/Corpora Amylacea (white arrow), the glands are lined by normal tall columnar secretory cells (black arrow).

Plate 4.4: Photomicrographs of Prostatic gland group 4 (low dose) (H&E X100). Showing Normal Prostatic Glands Containing Normal Concretions/ Corpora Amylacea (White Arrow). The glands cells showing no epithelial hyperplasia (Black Arrow), the fibromuscular stroma appear normal (Slender Arrow).

Plate 4.5: Photomicrograph of prostate gland group5 (medium dose) (H&E X100) showed mild glandular proliferation with mild corpora amylicea, there is slight increased of the fibromuscular stroma (slender arrow).

Plate 4.6: Photomicrograph of prostate gland (high dose) (H&E X100). Alteration in the Shape of the Glands are noted Showed slight glandular proliferation(white arrow), slight increased of fibromuscular stroma (Slender Arrow)

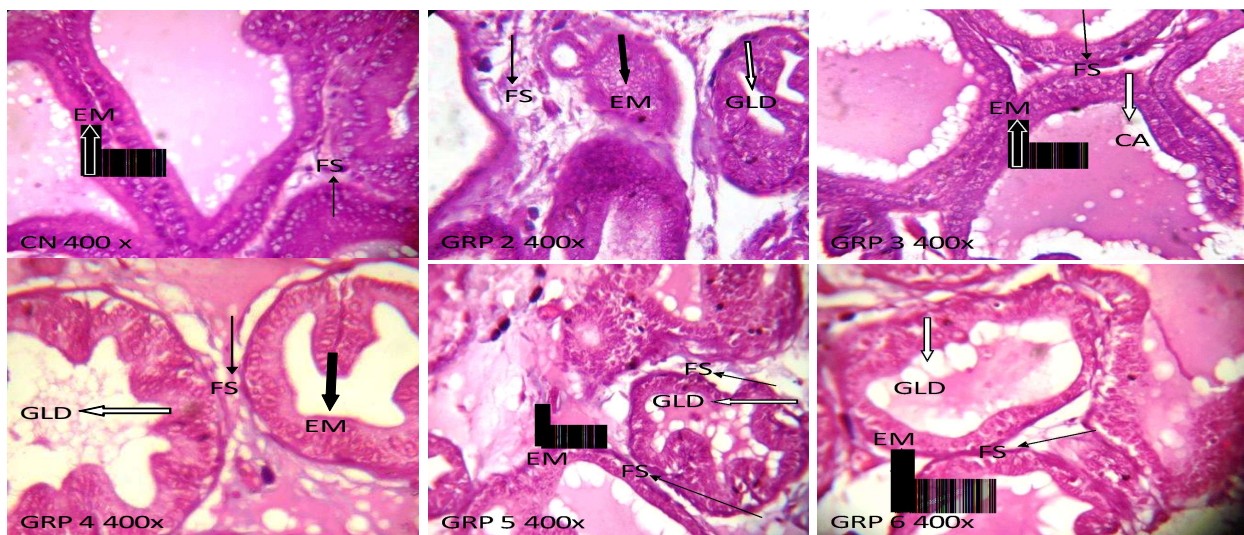


Plate 4.7: Photomicrographs of Prostate gland of Control (Group1) (H&E x400). Photomicrographs is shown at higher magnification, normal epithelial mucosa is clearly seen (black arrow) also showed normal fibromuscular stroma (slender Arrow).

Plate 4.8: Photomicrographs of Prostate gland of Group2 (hormone control group) (H&E x400). Photomicrographs is shown at higher magnification, Showing predominantly glandular proliferation(white arrow), there is severe hyperplasia of the fibromuscular stroma (slender arrow),hyperplasia of the epithelial mucosa is also observed (black arrow)

Plate 4.9: Photomicrograph of prostate gland (finasteride positive control group) (H&E X400), it showed Normal fibromuscular stroma (slender arrow), normal epithelial mucosa(black Arrow), and also Glands contained normal Concretions/Corpora Amylacea (white arrow).

Plate 4.10: Photomicrographs of Prostatic gland group4 (low dose) (H&E X400) at higher magnification. Showed normal Prostatic Glands containing normal concretions/ Corpora Amylacea (White Arrow). The glands cells showed no epithelial hyperplasia (Black Arrow), the Fibromuscular Stroma appear normal (Slender Arrow).

Plate 4.11: Photomicrograph of prostate gland group5 (medium dose) (H&E X400) showed mild glandular proliferation with mild corpora amyacea, there is slight increased of the fibromuscular stroma (slender arrow),and also showed normal epithelial mucosa (black arrow)

PLATE 4.12 Photomicrograph of prostate gland (high dose) (H&E X400). Alteration in the Shape of the Glands are noted showed slight glandular proliferation(white arrow), slight increase of fibromuscular stroma (Slender Arrow), showed normal epithelial mucosa.

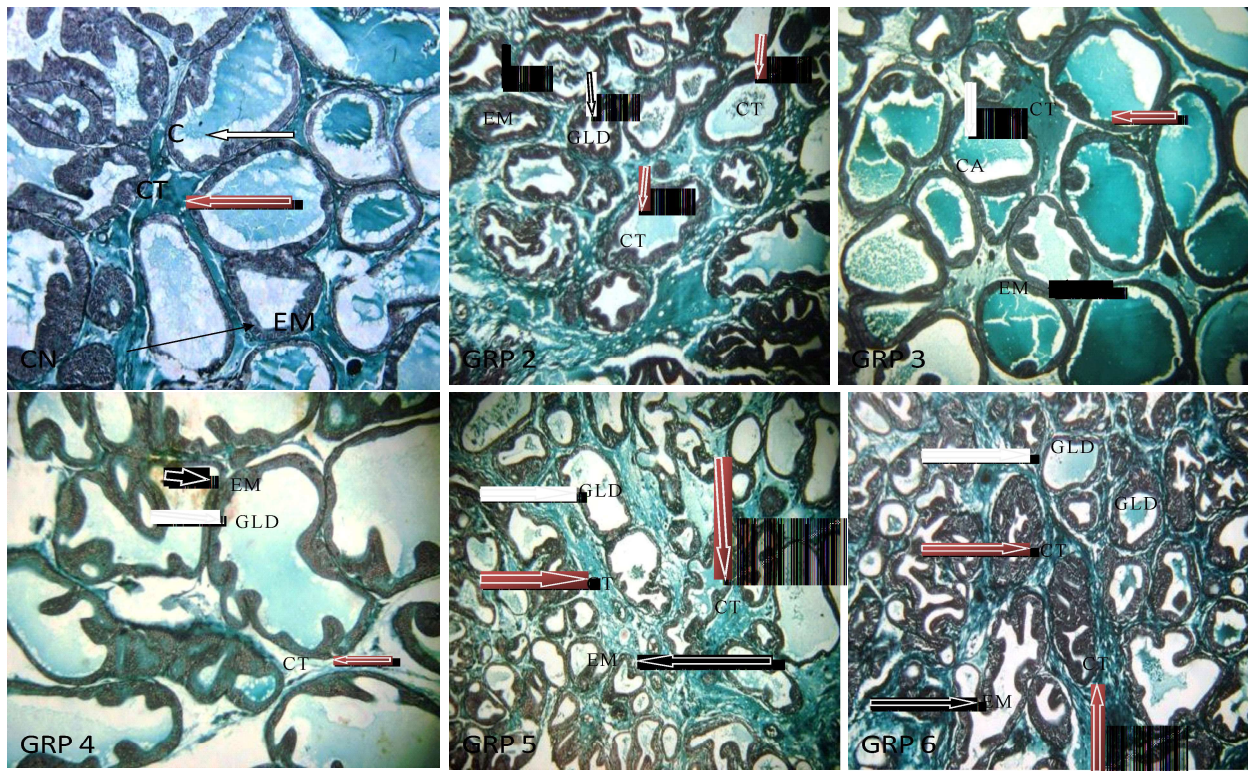


Plate 4.13: Photomicrographs of Prostate gland of Control (Group1) (MT x100). It shows Normal Prostatic Glands Containing Normal Concretions/ Corpora Amylacea (White Arrow), also showing no epithelial mucosa hyperplasia (slender Arrow) and Normal Connective Tissue (Red Arrow).

Plate 4.14: Photomicrograph of prostatic enlargement of group 2 (Hormone control group) (MT X100). Showed predominantly glandular proliferation(white arrow),the glandular cells showed severe epithelial mucosa hyperplasia (black arrow), there is abundant proliferation of connective tissues and the Stroma Showed Severe Fibrosis(Red

Arrow).considerable alteration in the shape of the glands are noted.

Plate 4.15: Photomicrograph of prostate gland (finasteride positive control group) (MT X100), it showed normal Concretions/Corpora Amylacea (white arrow), the glands are lined by normal epithelial mucosa (black arrow).

Plate 4.16: Photomicrographs of Prostatic gland group4 (low dose) (MT x100). showed normal prostatic glands containing normal concretions/ corpora amylacea (White Arrow), glands

cells showed no epithelial hyperplasia (Black Arrow), also normal connective tissue is observed (Red Arrow).

Plate 4.17: Photomicrograph of prostate gland group5 (medium dose) (MT X100) showed mild glandular proliferation with mild corpora amylcea, there is slight increase of the fibromuscular stroma (slender arrow),and also showed normal epithelial mucosa (black arrow), Mild Proliferation of Connective Tissues (Red Arrow)

Plate 4.18: Photomicrograph of prostate gland (high dose) (MTx100). Alteration in the Shape of the Glands are noted Showed slight glandular proliferation(white arrow), slight increase of fibromuscular stroma (Slender Arrow). Slight proliferation of connective tissues (Red Arrow),slight epithelial hyperplasia is seen (black arrow).

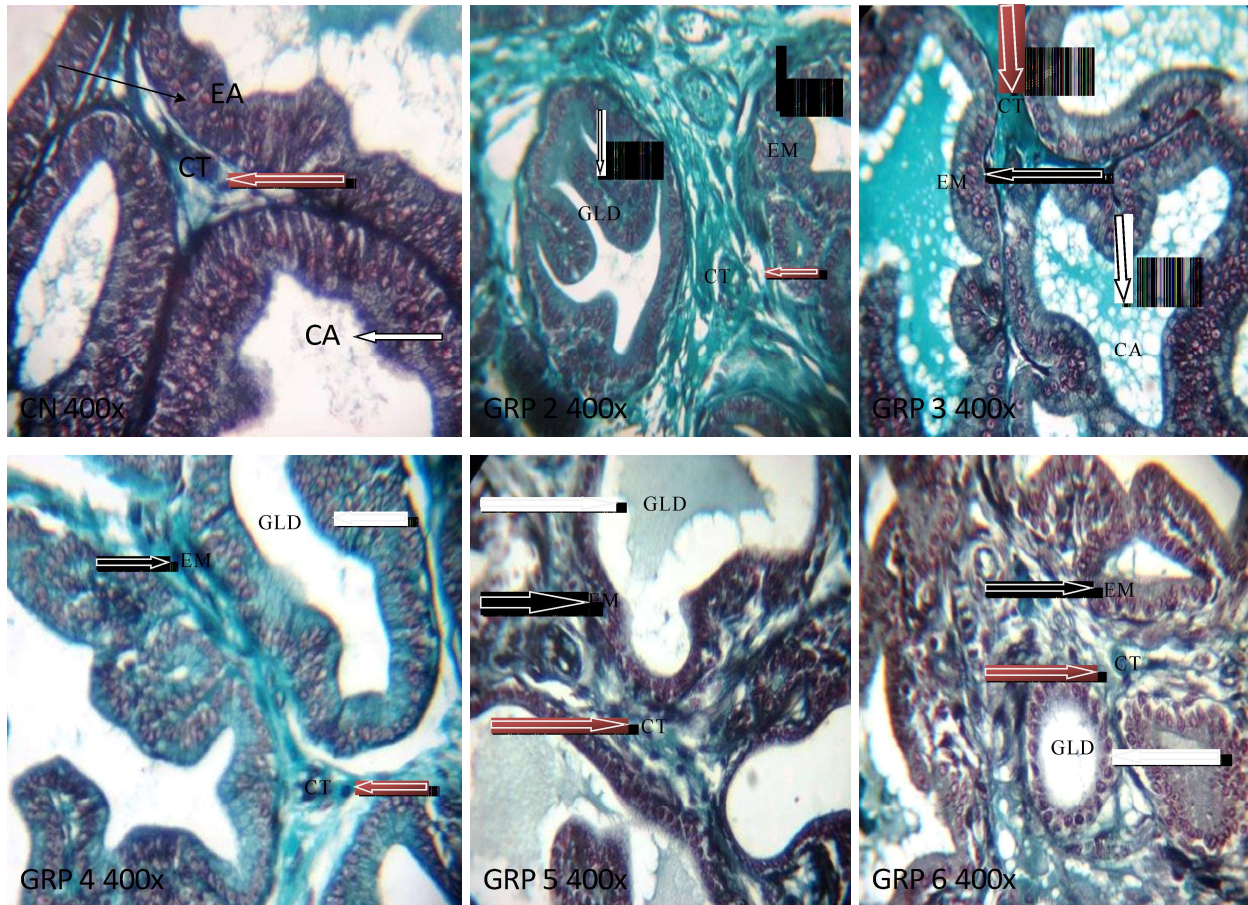


Plate 4.19: Photomicrographs of Prostate gland of Control (Group1) (MT x400). Photomicrographs is shown at higher magnification, normal epithelial mucosa is clearly seen (slender arrow) also showed normal Connective Tissue (Red Arrow).

Plate 4.20: Photomicrographs of Prostate gland of Group 2 (hormone control group) (MT x400). Photomicrographs is shown at higher magnification, Showed predominantly glandular proliferation(white arrow), Showed abundant proliferation of Connective Tissues and the stroma show severe Fibrosis (Red Arrow), hyperplasia of the epithelial mucosa is also observed (black arrow)

Plate 4.21: Photomicrograph of prostate gland (finasteride positive control group) (H&E X400), normal epithelial mucosa(black Arrow), and also Glands contained normal

Concretions/Corpora Amylacea (white arrow), also showed normal connective tissue and muscle (red arrow)

Plate 4.22: Photomicrographs of Prostatic gland group 4 (low dose) (MT x400). showed normal prostatic glands containing normal concretions/ corpora amylacea (White Arrow), glands cells showed no epithelial hyperplasia (Black Arrow), also normal connective tissue is observed (Red Arrow).

Plate 4.23: Photomicrograph of prostate gland group5 (medium dose) (H&E X400) showed mild glandular proliferation with mild corpora amylcea, there is slight increase of the fibromuscular stroma (slender arrow),and also showed normal epithelial mucosa (black arrow), proliferation of Connective Tissues (Red Arrow)

Plate 4.24: Photomicrograph of prostate gland (high dose) (MTx400). Alteration in the Shape of the Glands are noted

Showed slight glandular proliferation(white arrow), slight proliferation of connective tissues (Red Arrow),slight epithelial mucosa hyperplasia seen (black arrow).

IV. DISCUSSION

The calyces of hibiscus sabdariffa are used as beverages that are consumed worldwide, the extract serve as local soft drinks (25). It is used as herbal medicine against many diseases such as liver disorder, pyrexia, hypertension, also the leaves are used as vegetable in africa. Research indicated that polyphenols presence in the hibiscus leaves impede growth and destroy melanoma cancer cells invasion (13), it was also stated that aqueous extract of hibiscus sabdariffa affect the kidney.

Prostate gland is a secondary endocrine gland in male whose growth depends on an androgen stimulation which is converted to dihydrotestosterone (38) the active form of the hormone which is necessary for the gland to grow. Benign prostatic hyperplasia (BPH) is one of the most common diseases among aged men (42). Safe and effective natural interventions that reduce the symptoms and reverse or halt the progression of BPH have been the subject of considerable research interest. The present study was undertaken to investigate the efficacy of *Hibiscus sabdariffa* extract in hormone-induced BPH in male Wistar rats. When the prostate is sufficiently large, it constricts the urethral canal to cause obstruction of urine. For these reasons, many studies have tested the inhibitory effects of various substances on the development of BPH by measuring prostate weights (19). At the end of the third week of induction animals with Benign Prostatic Hyperplasia showed the enlargement of the prostate by inspection which shows increased prostatic weight when compared with the control group. According to previous studies, increased prostate weight is an important marker indicating the development of BPH (21). After the end of the experiment there was increased in the relative prostate weight in the BPH control while the *Hibiscus sabdariffa* treated caused a significant decreased in relative prostate weight, this indicates that the test herb inhibit the development of BPH (4). Finasteride decreases the conversion of testosterone to dihydrotestosterone and it has been used in the treatment of benign prostatic hyperplasia (25).in the finasteride group there is a positive changes, a reduction in the prostate gland occur. The calyce of hibiscus sabdariffa extract is known to reduce body weight. In the present study, the body weights of all the animals treated with *Hibiscus sabdariffa* were found to have decreased significantly. However, the low dose 0.3g/kg bw *Hibiscus sabdariffa* decrease significantly in weight as shown in figure 1. The decrease in body weight could be as a result of the presence of substance that inhibits the production of amylase in aqueous extract state as reported by Vilasinee (2005), Benign hyperplasia has a significant impact on the quality of life. Despite current available medical therapies, a significant number of men still require surgical intervention with a lifetime risk for surgery of around 25–30% . The calyces of *Hibiscus sabdariffa* have been found to be rich in

Vitamins, natural carbohydrate, protein and Vitamin C and other antioxidants (43) and also minerals (6) which constitute the major reason(s) for consuming as soft drink and fruit juiced (33).

Histologically, the glandular epithelial cells and the stromal cells (including muscular fibers) undergo hyperplasia in Benign Prostatic Hyperplasia, (20). In the study above the treated groups showed protective effect on prostatic enlargement, indicating a normal histoarchitecture. In low dose group there were more pronounced reduction in the mucosal (epithelial) and fibromuscular stroma hyperplasia and also it is however interesting to know that connective tissue layer showed similar to the control group. In medium dose the histoarchitecture of the prostate gland showed mild glandular proliferation, also the epithelia mucosal and the fibromuscular stroma. The tissue did not also have any sign of structural enhancement to improvement relative to the control group. The connective tissue layer also shows a mild hyperplasia. In high dose, there is a slight hyperplasia of the epithelia mucosal and fibromuscula stroma, also showed a slight hyperplasia of the connective tissue which showed that there is a slight reverse of the bph. This study shows the inhibitory effect of the aqueous extract of hibiscus sabdariffa on benign prostatic hyperplasia.

V. CONCLUSION

Many diseases are lethal in nature unlike Benign Prostatic Hyperplasia. Drugs which are currently used for the treatment of BPH have been reported to produce side effects, including reduced libido and erectile dysfunction. Therefore, it will be interesting to search for new safe and less expensive drugs for Benign Prostatic Hyperplasia therapy. It has been demonstrated that *Hibiscus Sabdariffa* is not toxic to the liver and kidney. *Hibiscus sabdariffa* is believed to be very safe because it has been widely used in Nigeria for many years. *Hibiscus sabdariffa* treatment inhibited the cells at the epithelial mucosal hyperplasia and most significantly inhibited the relative prostate weight. Thus, by reducing glands proliferation and fibromuscular stroma hyperplasia, *hibiscus sabdariffa* could be considered effective for the treatment of BPH. The study above shows that aqueous extract of *Hibiscus sabdariffa* could be develop as a potential inhibitory agent for benign prostatic hyperplasia.

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