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2. ჰყოფის მომდგენი აქ უნდა შეიცავდეს 10 გვერდზე ხაჩუჭერი და 20 გვერდზე მეტ ლიტერატური ზომის და ფორმატის (ზომისა, ფორმატის, ფოტოების შიდა კლასიფიკაციის) შესახებ. „ინდექსი“ შიგი 10 გვერდზე ეხმარება მორგალურ შიგებში.

3. ჰყოფის შიგიანი ლისტი: ჰყოფის აღწერილობას გამჭიდან მორგალურ შიგმაგრებში; მორგალურ შიგმაგრებში მორგალურ შიგმაგრებში ვერცხლის ნახტომი და შუამხრეთი; მარგალურ შიგმაგრებში და სხივიდან მორგალურ შიგმაგრებში (მზად მინდამარიცხით).

4. ჰყოფის თან უნდა შეიცავდეს თეთრლარღულ ტექსტის ჩადენა, ქორეულ და შემცირებულ ტექსტის ჩადენა სადაც მოგვანხშირა სტანდარტული ფორმატი (სახელი, ავტორი, წარმოწმები, მოღვაწეობა). სხივიდან მორგალურ შიგმაგრებში ნახტომი აქ უნდა იყოს 15 გვერდზე ხაჩუჭერი და ხაჩუჭერი შიგმაგრებში ნახტომი (key words).

5. ჰყოფის გამოქვეყნილი ტექსტი შიგმაგრები იყოს გამოქვეყნილი და შეიცავდეს გამოქვეყნილ შიგმაგრებს უნდა შეიყვანოდეს შესახებ შიგმაგრებში.

6. ფორმატით უნდა იყოს გამოქვეყნილი: ჰყოფით, სქემებით, სხვაგვარ ფორმატები - ფოტოები შიგმაგრებში გამოყოფილია იქნება. შიგმაგრებში ანტიგრამულ ყურადღებში ქორეულ შიგმაგრებში არ მიიჩნევთ ნახევრად ყურადღებში, შემთხვევათ შემთხვევა ან იმპრესიული შეფასები და სხვა სფერო შეფასები.

7. ჰყოფის შემავალი გუნდები ჰყოფით გადაწყდება იცოფილის თავისუფლობით, შეფასებით - ჭეშმარიტად ტრადიციულად.

8. ჰყოფის თან უნდა შეიცავდეს გუნდები პროფესიულ პერსონაჟთა სახელი (ქორეულ- 5-8 წიგნით სხვაგვარ). სხვაგვარ ტექსტში რეალური დიაგრამების სახელი მოტორული ოვალი, გვერდით, სქემის პარამეტრები, გამჭიდი წარმოქმედდებს, მორგალურ ხალის, რყა, ურთიერთობა, ართ ურთიერთობა, მორგალურ შიგმაგრებში ზომით გამოყოფილი სახელი, შენახვა და ამოცანა ჰყოფით, შესახებ ნივთი და ნივთი მინდამარიცხით.

9. ჰყოფის თან უნდა შეიცავდეს: а) დაქვემდებლობის ან სახელწარმოების შემადგენლობა; დაქვემდებლობის უთანაბრისფრო ჩადენა; დაქვემდებლობის დაქვემდებლობა ჰყოფით, რომლებიც ითითებენ ყურადღებს ჰყოფის აღწერილობა შიგმაგრებში, ფორმულა პროდუქტის შესახებ, ახლანი შესახებ, შესახებ ჰყოფით, შესახებ ჰყოფით, შესახებ ჰყოფით, შესახებ ჰყოფით.

10. ჰყოფის ზომის შიგმაგრებში უნდა ტექსტი ჰყოფით შესახებ, რომლიც ითხოვს არ უნდა გამოყოფილა 5-ს.

11. გამოქვეყნილი იყინები უნდა შეიცავდეს შესარჩევი ჰყოფი. შესარჩევ ჰყოფი და ჰყოფი შეუძლია ხარჯებით მოხდეს მხოლოდ.

12. ფოტოები შიგმაგრებში იყინოს ჰყოფა ჰყოფა ჰყოფა ჰყოფა ჰყოფა. ჰყოფით დაქვემდებლობა არ ჰყოფით დაქვემდებლობა.
Abstract.

Background and objectives: Benign prostatic hyperplasia (BPH) is a common benign tumour of the prostate that becomes more common as men age. The purpose of this study is to investigate the relationships between serum zinc and testosterone in BPH patients in Iraq.

Methods: This case-control study entailed gathering 90 subjects which were separated into two groups, group A consisted of 60 patients with benign prostatic hyperplasia, while group B consisted of 30 healthy males. Diagnosis revealed patient's prostate volumes (PV) were equal to or more than 25 millilitres. Both groups had their serum zinc and serum testosterone levels.

Results: The study showed that the mean prostate size was elevated significantly in the BPH group (54.0±8.4cc) as compared with the control group (19.66±2.88cc) (P:0.01). There is a significant reduction in the serum testosterone concentration of benign prostatic hyperplasia patients, (4.05±3.1 ng/ml), as compared with control subjects, (11.37 ± 2.87; p<0.01). There is a significant reduction in the serum zinc concentration of benign prostatic hyperplasia patients, (70.4±9.63 ng/ml), as compared with control subjects, (99.3±10.5; p≤0.01). The higher percentage of benign prostatic hyperplasia is in patients above 66 years, and the lowest is in the age group 45-55 years.

Conclusion: Serum testosterone and zinc are significantly lower in benign prostatic hyperplasia patients than in age-matched healthy controls. All benign prostatic hyperplasia patients have larger prostates than normal healthy control participants of the same BMI. All BMI groups of benign prostatic hyperplasia patients had lower serum testosterone and zinc than normal healthy control persons of the same BMI.

Key words. Benign prostatic hyperplasia, Serum zinc, Serum testosterone.

Introduction.

Benign Prostate Hyperplasia, often known as BPH, is an enlargement of the prostate tissue that does not result in cancer and is a common reason why men experience symptoms related to their lower urinary tract (LUTS) [1]. Histological BPH is more prevalent in older men, where it affects approximately 40% of men in their 50s and 60s and 90% of men over the age of 80. This condition is more prevalent in countries with a Western lifestyle [2,3].

The periurethral gland (PUG) is the first site of enlargement (hyperplasia) in individuals with BPH. This occurs in the fourth decade of life. The enlargement then extends to the transition zone (TZ), which is the primary site of BPH [4]. Benign prostatic hyperplasia develops in the transition zone of the prostate gland. If the adenoma grows to a significant size, it may constrict or compress the prostatic urethra, which can result in bladder outflow obstruction (BOO) [5]. A typical description of TZ describes it as having three lobes: two lateral lobes and a median lobe, all of which have the potential to cause symptoms of lower urinary tract syndrome (LUTS) [4].

Compression of the urethra, which can be caused by hyperplasia, can lead to cumulative obstruction of the flow of urine, insufficient emptying, or failure to void. Additionally, hyperplasia can induce persistent dribbling of urine. If you never empty your bladder, the pee that is left behind will get stagnant and ionized, which will lead to infection. The accumulation of urine in the bladder can lead to the creation of stones, which forces the bladder muscle to become more robust to pass through the obstruction. In severe situations, benign prostatic hyperplasia (BPH) can lead to sepsis, irreversible bladder damage, kidney failure, and even death. If urine begins to back up in the kidney, increasing damage may ensue, which can lead to renal impairment and subsequent uremia (the toxic symptoms of kidney failure) [6,7].

Zinc is considered to be one of the key trace elements that are responsible for maintaining optimal homeostasis within the body. Because the body is unable to store this component, it must be obtained through the consumption of food. It is essential for the proper functioning of the lining of the male reproductive organs, as well as spermatogenesis, capacitation, acrosome response, and hormonal balancing [8].

Zinc content in human bodies in concentrations ranging from (1.4-2.3 g). The zinc content of the body is distributed as follows: 60% is found in the muscles, 30% is found in the bones, and 10% is found in other organs such as the brain, skin, prostate, and mammary glands. Zinc intake of approximately 15-20 mg per day is recommended for adults [9].

Zinc can be found at the highest concentration in the prostate compared to any other organ. The immediate environs of prostate epithelial cells are where the highest concentrations of zinc are found. Zinc is present in the tissues of the prostate at a level of 150 g/g, which is three times more than the quantity found in other soft tissues. The amount of it found in the prostate is one hundred times larger than the amount found in plasma [10,11].

To produce and secrete significant quantities of citrate, the prostate stores a lot of zinc in the specialized acinar epithelial cells of the peripheral zone. These cells are located in the periphery. In the prostatic gland, there is a connection between the metabolism of citrate and zinc levels. Zinc in the mitochondria inhibits the enzyme known as M-aconitase, which is responsible for catalysing the first phase of the Krebs cycle, which is the conversion of citrate to isocitrate. Because zinc has an inhibiting effect, citrate accumulates in the mitochondria before it is transferred to the cytosol [12].

Testosterone is a steroid hormone that is responsible for the development of typical male sexual traits and function, as well as the preservation of homeostasis throughout life in many organ systems. Testosterone is the main androgen present in males. Leydig cells in the testes create almost 95%, with the...
remaining 5% coming from the adrenal gland and then being disseminated throughout the body [13]. Over 97% of the circulating testosterone is protein-bound, with equal quantities to albumin and the structurally related specific sex hormone binding globulin (SHBG), also known as androgen-binding protein (ABP) [14].

The testis produces approximately 6-7 milligrams of testosterone every day [15]. The testis has a significant excess of (free) testosterone because testosterone concentrations are 200 times higher than those of SHBG/ABP. Testicular testosterone levels are roughly 80-fold higher than peripheral blood levels [16].

The growth of the sperm cell is the main reproductive function of testosterone in males. Testosterone triggers a nuclear activation process in the Sertoli cells of the testicles, which accelerates and catalyzes the maturation and production of sperm during the process of spermatogenesis [17]. If the male is to be fertile, it is crucial and necessary to maintain testosterone levels in the Sertoli cells for the growth of sufficient numbers of mature, viable sperm. Additionally, testosterone helps the male accessory sex glands (prostate, seminal vesicles, and epididymides) grow and function properly, which promotes sperm generation and function as well as copulation [18]. The secondary sex traits of males, such as the usual deeper male voice, greater body hair, penile growth, desire, and more aggressive behaviour patterns, are also related to the influence of testosterone [19].

**Patients and Methods.**

The case-control study lasted three months, from mid-November to the end of February, at Al-Kindi Teaching Hospital and Ghazy Al-Hariri Hospital in Baghdad Governorate, Iraq. It entailed gathering 90 blood samples, which were separated into two groups. The first group (A) consisted of 60 patients with benign prostatic hyperplasia ranging in age from 45 to 80 years, while the second group (B) consisted of 30 healthy males aged 45 to 80 years. All participants in this study provided approved permission with a questioner.

**Exclusion criteria**

1. Prostate Cancer
2. Prostatitis
3. Hormonal Therapy
4. Chronic Renal Failure.
5. Surgical Operation (Prostate, Hypothalamus, Testis, Pituitary).
6. Prostate size less than 28 cc
7. Prostate volume less than 28 cc
8. Data collection form: After getting the participants' permission to participate in the study. Collecting their personal information, including their names, ages, weights, lengths, and prostate sizes; each individual was assigned a unique serial number and provided information about themselves. Patients diagnosed with Benign prostate hyperplasia had an international prostate symptom score of 18 or higher; the patient's prostate volumes (PV) were equal to or more than 25 millilitres. Radiologists with competence in the department used transabdominal ultrasound equipment manufactured in Germany by Siemens to figure out how big the prostate gland is. Based on research that had already been done, the IPSS was made for all patients. Patients submitted complete IPSS forms before their evaluations. Mild symptoms are defined as a score of seven or less, moderate as eighteen or more, and severe as twenty or more. Neither the American Urological Association (AUA) index nor the International Prostate Symptom Score (IPSS) questionnaire is specific for benign prostatic hyperplasia, urinary flow rate, postvoid residual volume, or bladder outlet obstruction (BOO); Both are reliable and sensitive enough for use in assessing symptoms.

**Determine Zinc by ELISA:** The assay of zinc is based on that the zinc binds to a ligand with the development of absorbance at 560nm. It can be used with biological samples such as serum, plasma, CSF, or urine.

**Determination of Total Testosterone**

- 1st incubation: 12 μL of samples are incubated with a biotinylated monoclonal testosterone-specific antibody. The binding sites of the labelled antibody become occupied by the sample antise (depending on its concentration).
- 2nd incubation: After the addition of streptavidin-coated microparticles and a testosterone derivate labelled with a ruthenium complex, the complex becomes bound to the solid phase via the interaction of biotin and streptavidin.
- The reaction mixture is aspirated into the measuring cell, where the microparticles are magnetically captured onto the surface of the electrode. Unbound substances are then removed with ProCell M. Application of a voltage to the electrode then induces chemiluminescent emission, which is measured by a photomultiplier.
- Results are determined via a calibration curve which is an instrument specifically generated by 2-point calibration and a master curve provided via the reagent barcode or e-barcode.

**Statistical analysis:** All patients signed an informed consent to take part in the study, and the study was approved by the ethical committee of Tikrit University, College of Medicine. All data were presented as mean and standard deviation (SD), Statistical analysis was implemented with correlation Analysis and t-test, and a P value of less than 0.05 was regarded significant. Analysis was performed by IBM SPSS Statistics for Windows version 23.0.

**Results.**

**Prostate size:** There was a significant enlargement in the size of the prostate in patients (54.0±8.4 cc), as compared with control subjects (19.66±2.88cc) (Table 1).

**Serum zinc:** There was a significant reduction in the serum zinc concentration of benign prostatic hyperplasia patients (70.4±9.63 ng/ml), as compared with control subjects (99.3 ± 10.5, p<0.01) (Table 1).

**Serum testosterone:** There was a significant reduction in the serum testosterone concentration of benign prostatic hyperplasia patients (4.05±3.1ng/ml), as compared with control subjects (11.37±2.87ng/ml; p<0.01) (Table 1).

There is a significant increase in the size of the prostate in all age groups of BPH patients as compared with normal healthy control subjects counterparts of the same age group, (p≤0.01). However, there is no significant differences regarding the size of the prostate between the age groups of BPH patients.
There is a significant reduction in serum zinc in all age groups of benign prostatic hyperplasia patients as compared with normal healthy control subjects counterparts of the same BMI group, (p<0.01). However, there is no significant difference regarding serum zinc between BMI groups of benign prostatic hyperplasia patients. There is a significant reduction in serum testosterone in all BMI groups of benign prostatic hyperplasia patients as compared with normal healthy control subjects counterparts of the same BMI group, (p<0.01). However, there is no significant difference regarding serum testosterone between groups of benign prostatic hyperplasia patients (Table 3).

**Discussion.**

The present study found a there is a significant enlargement in the size of the prostate in patients agreeing with previous findings that benign Prostate Hyperplasia is a non-cancerous growth or enlargement of the prostate tissue that is a frequent cause of lower urinary tract symptoms (LUTS) in men [1].

According to the findings of this study, the content of zinc in the serum of men with BPH is significantly lower than that of normal healthy controls. A lot of studies mentioned the importance of zinc in prostate physiopathology, showing its favourable action in modulating some enzymatic systems (5-alpha- reductase, aconitase, phosphomonoesterase), in testicular androgen metabolism, and spermatogenesis [20-22].

The findings of the current study are consistent with those of earlier studies, which discovered a significant drop in serum zinc levels in BPH patients [22-24]. Christudoss et al. concluded that “BPH or prostate carcinoma may be associated with a reduction in the levels of tissue zinc, plasma zinc, and an increase in urine zinc/creatinine” [24]. In this study, there was a big drop in the blood testosterone levels of the control subjects. This result agrees with several past ones [25-27].

Testosterone and estrogens play important roles in prostate growth and function, and many scientists have hypothesized that the slow decline in serum testosterone levels or the decreasing ratio of testosterone to estrogen that begins in midlife are factors in BPH pathogenesis [28]. A previous study found that both high serum testosterone levels and the ratio of testosterone to estrogen begins in midlife are factors in BPH pathogenesis [28]. A previous study found that both high serum testosterone levels and the ratio of testosterone to estrogen begins in midlife are factors in BPH pathogenesis [28]. A previous study found that both high serum testosterone levels and the ratio of testosterone to estrogen begins in midlife are factors in BPH pathogenesis [28]. A previous study found that both high serum testosterone levels and the ratio of testosterone to estrogen begins in midlife are factors in BPH pathogenesis [28]. A previous study found that both high serum testosterone levels and the ratio of testosterone to estrogen begins in midlife are factors in BPH pathogenesis [28].

There is a significant increase in prostate size in all BMI groups of benign prostatic hyperplasia patients as compared with normal healthy control subjects’ counterparts of the same BMI group, (p<0.01). However, there is no significant differences regarding serum testosterone between age groups of benign prostatic hyperplasia patients (Table 2).

There is a significant increase in prostate size in all BMI groups of benign prostatic hyperplasia patients as compared with normal healthy control subjects’ counterparts of the same BMI group, (p<0.01). However, there is no significant differences regarding serum testosterone between age groups of benign prostatic hyperplasia patients (Table 2).

<table>
<thead>
<tr>
<th>Table 1. The prostate size in benign prostatic hyperplasia patients and control subjects.</th>
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<tbody>
<tr>
<td>Studied groups</td>
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<tr>
<td>Size Prostate (cc)</td>
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<tr>
<td>Zinc (ng/mL)</td>
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<td>Testosterone (ng/mL)</td>
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<tr>
<th>Table 2. Impact of age on size of prostate, serum zinc, and serum testosterone in BPH patients.</th>
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<tbody>
<tr>
<td>Studied groups</td>
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<td>BPH (n=60)</td>
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<td>Control Group (n=30)</td>
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<td>P. value</td>
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The different letter means significant differences (p<0.05) between groups.

<table>
<thead>
<tr>
<th>Table 3. Relation of Size Prostate with the BMI of benign prostatic hyperplasia.</th>
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<tbody>
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<td>BPH (n=60)</td>
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Image: There is a significant reduction in serum zinc in all age groups of benign prostatic hyperplasia patients as compared with normal healthy control subjects counterparts of the same BMI group, (p<0.01). However, there is no significant difference regarding serum zinc between BMI groups of benign prostatic hyperplasia patients. There is a significant reduction in serum testosterone in all BMI groups of benign prostatic hyperplasia patients as compared with normal healthy control subjects counterparts of the same BMI group, (p<0.01). However, there is no significant difference regarding serum testosterone between groups of benign prostatic hyperplasia patients (Table 3).
Benign prostatic hyperplasia (BPH) is a prevalent clinical condition in older men. Research has shown that BPH is substantially present in the prostate with BPH. In research studying the effects of hormone replacement treatment (HRT) using testosterone, they observed that the hormone greatly increases prostate volume and PSA values [32].

The distribution of subjects according to age groups, (45-55, 56-65 years and above 66 years) revealed a higher percentage of benign prostatic hyperplasia is in patients above 66 years, (38 patients), and the lowest is in the age group 45-55 years, (4 patients).

The findings of the current study are consistent with those of earlier studies, which found benign prostatic hyperplasia (BPH) is one of the most common medical conditions in older men [31,33,34]. According to the findings of this study, patients with BPH across all age ranges showed a significant drop in their serum zinc levels, (45-55, 56-65 and above 66 years). The current outcome is consistent with the findings of several earlier investigations, Sauer et al. [12] and Rawaa et al. [35].

Due to the role of zinc in apoptosis and truncation of the Krebs cycle (citrate buildup), high amounts of zinc are necessary for sustaining prostate health and function. While the high amounts of citrate released in the prostatic fluid, a main component of semen, are guaranteed by this particular metabolic process in prostate cells, it adversely impacts the process of energy production. It follows that when prostate cells experience BPH and lose their capacity to store zinc, the Krebs cycle continues to release energy, making the proliferation of malignant cells in the prostate more energy-efficient for the cells. Indeed, zinc levels are reduced by more than 50% in prostatic tissue generated from BPH guys with BPH already had much higher zinc excretion in their urine than guys with a healthy prostate [12].

According to the findings of the study, there was a considerable drop in the serum testosterone in all age groups of BPH patients, (45-55, 56-65 and above 66 years). The present result agrees with several previous studies where high serum testosterone levels were associated with lower BPH risk, Khaleel FM et al. [36] and Duarsa GWK et al. [31] and Yassin A et al. [37].

The testicles contain cells called Leydig cells, which are responsible for producing nearly 95% of the body's testosterone. The human testis has a considerable decline in function as a natural consequence of ageing. A direct decline in the function and/or amount of Leydig cells is likely the cause of a decrease in testosterone production that occurs naturally with increasing age [38]. The present result agrees with previous works stating that a significant linear relationship was ascertained between BMI and the risk of larger PV (p < 0.001). Previous research concluded, that there was a significant linear association between BMI and the risk of larger prostate volume in BPH patients [39,40].

On the other hand, these findings were in contrast with another recent Nigeria study with no significant difference between PV and BMI [41].

The sample size could have been the reason for this discrepant outcome. While larger studies more frequently demonstrate a link between these two features, smaller studies are more likely to indicate no association between BMI and PV.

Benign prostatic hyperplasia (BPH) is a prevalent clinical manifestation of prostate pathology in males, which is strongly correlated with ageing. Genetic predisposition, eating habits, lifestyle choices, and environmental exposures are additional risk factors. In addition to being epidemiologically linked to BPH and prostate cancer, obesity is also linked to low-grade prostatitis and subclinical LUTS. Endocrine alterations (decreased testosterone and progesterone with increased oestrogen and DHT) and chronic inflammation associated with obesity as well as hypogonadism have been identified as important mechanisms in the development of prostate pathology [42].

The present study found a significant reduction in the serum zinc in all groups of BMI in BPH patients as compared with control healthy subjects of the same BMI. The present result agrees with several previous studies, Rawaa et al. [35] and Sauer AK.et al. [12].

The findings of the current study are in line with those of earlier research about the connection between BMI and serum testosterone [27,36,37].

There is a connection between being overweight and hypogonadism that goes in both directions. Excess body fat is the single most major contributor to low testosterone levels, especially in men. Similarly, testosterone insufficiency can cause BPH. A lack of testosterone is linked to dysfunctional visceral fat, which can then lead to chronic inflammation, insulin resistance, and low levels of sex hormone-binding globulin (SHBG) [43].

Conclusion.

Considering the findings of this study, we may draw the following conclusions: The highest mean of prostate volume was recorded in the BPH group, and the lowest mean was in the control group. Low levels of testosterone were recorded in benign prostatic hyperplasia patients compared with healthy individuals. There is a significant reduction in the concentration of serum zinc in BPH patients, as compared with normal healthy control men. Positive correlation between prostate size and progress age. can be explained by benign prostatic hyperplasia (BPH) is one of the most common medical conditions in older men.

REFERENCES


