Scholars Journal of Applied Medical Sciences
Abbreviated Key Title: Sch J App Med Sci
ISSN 2347-954X (Print) | ISSN 2320-6691 (Online)
Journal homepage: https://saspublishers.com

OPEN ACCESS

Hematology

Sonographic Prevalence of Lower Urinary Tract Infection among Out and in Patients in Biosensors Medical Diagnostics Wuse II Abuja Metropolis: A Case Study of Those Presented for Bladder Ultrasound

Ajobiewe J.O[1*], Ajobiewe H.F[2], Ehinlaiye S[2], Chioma Austin -Onuoha[2], Alau K[3], Yashim N[4], Vamparious M[5], Udefuna P[7], Umeji L[7], Ibrahim S[6]

[1]Veritas University Bwari Abuja
[2]National Open University Jabi Abuja
3Bingham University New Karu Nasarawa State of Nigeria
[4]Health System Consults Limited (HSCL) Abuja No 14 Asba and Dantata Street,Life Camp. Old Gwarimpa Road, Abuja F.C.T.
[5]Baze University Jabi Abuja
[6]National Hospital Abuja, Hematology Department
[7]United State Department of Defense, Walter Reed Program Nigeria, US Embassy Abuja, Nigeria

DOI: 10.36347/sjams.2023.v11i07.010 | **Received:** 17.01.2023 | **Accepted:** 22.02.2023 | **Published:** 11.07.2023

***Corresponding author:** Ajobiewe J.O
Veritas University Bwari Abuja, Nigeria
E-mail: josephajo2000@yahoo.com

Abstract **Original Research Article**

Introduction: Two hundred outpatients were recruited for the study only sixty-five (65) of them were used from those who presented for bladder ultrasound. Masmed F5 4D ultrasound machine with a curvilinear transducer at 3.5MHz of frequency was used for the study. Pre and post void urinary bladder volume, anterior and posterior bladder wall thickness measurements were made on 65 healthy asymptomatic outpatients. There was no statistically significant difference between anterior and posterior bladder wall thickness (P>0.05) however there was a statistical significant difference between pre-void and post-void urine volume (P<0.05). Females were more prevalent in the study population than males with higher bladder wall thickness (BWT) consistent with lower urinary tract infection, the sonographic prevalence of urinary bladder retention was 8(12.31%), consisting of a male (1.54%) and females 7(10.77%) In line with bladder outlet obstruction (BOO) assessed at 5% level of significance. The sonographic prevalence of lower urinary tract infection in Biosensors medical diagnostics Wuse ll Abuja was 32.5% when assessed at the 5% level of in-significance (P>0.05), and it was most prevalent in individuals between the ages of 26 and 30. In Nigeria, it is advised that lower urinary tract infections should be diagnosed and treated early in both males and females.

Keywords: Sonography, Bladder, Biosensors, Urinary Tract, Thickness, Ultrasound.

INTRODUCTION

Background of the Study

One of the most common bacterial illnesses in people are urinary tract infections, or UTIs. However, because of the physical differences between men and women, women are more likely than males to get UTIs [1]. Urinary tract infections (UTIs) happen when bacteria or other organisms get past the body's defenses in the urinary tract. They may have an impact on the tubes that connect the bladder, kidneys, and other organs. Upper and lower urinary tracts make up the urinary system. The lower urinary tract is made up of the bladder and urethra, whereas the upper urinary tract is made up of the kidneys and ureters [2].

Any infection of the urinary system is referred to as a urinary tract infection (UTI). The kidneys, ureters, bladder, and urethra make up the urinary tract. Infections can occur in any area of these tissues, although bladder and urethral infections are the most frequent. While the kidney infection is more deadly and is known as pyelonephritis, the bladder infection is known as cystitis [3].

The two forms of UTI are upper UTI, an infection of the upper urinary system, and lower UTI, an infection of the lower urinary tract (the bladder and urethra) Due to the potential for kidney damage, the upper UTI (kidneys and ureters) may be more dangerous than the lower one. Because lower urinary tract infections are a sign of extensive genital tract colonization, pregnant women who have them are at an increased risk of preterm delivery and early membrane rupture [4]. The majority of lower urinary tract infections are simple to recognize and manage. However, the more complex situations need careful assessment, examination, and conversation with a urologist and microbiologist rather than additional prescription of empirical antibiotics due to the growth in multi-resistant organisms [5]. The most prevalent bacterial infection in humans, urinary tract infections are caused by microbial growth and replications in the urinary system. Nearly 150 million deaths per year globally are caused by infection and the complications that result from its linked disorders. 40% to 50% of females and 5% of men may acquire the morbidity. Pregnancy has been found to increase the likelihood of urinary tract infections (UTIs) [1]. Gram-negative bacteria, such as E. coli (60–70%), Klebsiella (10%), Proteus (5–10%), and Pseudomonas (2–5%), and gram-positive bacteria, such as Group B Streptococcus and Staphylococcus species, are the leading causes of urinary tract infections [6].

Hypothesis

Hypothesis 1

Null Hypothesis

There is no statistically significant difference between pre and post void urinary bladder volume as key parameters in ultrasound assessment of pathophysiologic condition during lower urinary tract infection in clinical investigations.

Alternative Hypothesis

There is significant difference between pre and post void urinary bladder volume as key parameters in ultrasound assessment of pathophysiologic condition during lower urinary tract infection in clinical investigations.

Hypothesis 2

Null Hypothesis

There is no statistically significant difference between anterior and posterior bladder wall thickness as basic requirements in pathophysiologic assessment of lower urinary tract infect during ultrasound process and procedure.

Alternative Hypothesis

There is significant difference between anterior and posterior bladder wall thickness as basic requirements in pathophysiologic assessment of lower urinary tract infect during ultrasound process and procedure.

Literature Review

Conceptual Review

The aberrant proliferation of bacteria causes urinary tract infections (UTIs), which are inflammatory illnesses of the urinary system. It is well recognized that urinary tract infections can result in kidney scarring permanently as well as short-term morbidity such fever, dysuria, and lower abdominal pain (LAP) [7]. Bacteria that may reside in the vagina, the digestive system, or the area around the urethra are the most common causes of UTIs. When germs get inside the typically sterile urinary tract and start to grow there, infection happens. They create enzymes that let them feed on the host tissues and harm them in this way [8]. UTIs come in two different forms: lower urinary tract infections, which affect the lower urinary system (the bladder and urethra), and upper urinary tract infections, which affect the upper urinary tract (kidney and ureters). Due to the potential for kidney damage, the upper UTI may be more dangerous than the lower one [8]. Women are more susceptible to lower urinary tract infections than males. Lower urinary tract issues affect more than 60% of Korean women in their middle age (LUTS). Although LUTS are not life-threatening, they can still have an impact on quality of life, hence it is crucial to thoroughly research LUTS [9].

However, benign prostatic hyperplasia (BPH) is a typical reason why older men experience urinary issues. BPH causes symptoms of the lower urinary tract and narrows the urethral lumen (LUTS). Greater detrusor pressure, increased urethral assistance, and a resulting decrease in urine flow rate are the hallmarks of bladder outlet obstruction (BOO), which is brought on by BPH. An increase in bladder mass, or bladder hypertrophy, is one of the main hallmarks of BOO caused by BPH [10]. Lower urinary tract symptoms (LUTS), benign prostatic hyperplasia (BPH), bladder outlet obstruction (BOO), spinal cord injury, infection, and carcinoma are pathophysiologic conditions of the urinary bladder and other adjoining organs that have been linked to an increase in urinary bladder wall thickness [10]. Symptoms of lower urinary tract dysfunction (LUTD) include urine incontinence, urgency, frequency, nocturia, malfunction of the voiding reflex, and others. Diseases such stress incontinence, detrusor overactivity (DO), hypoactive bladder, intrinsic sphincter deficit (ISD), and decreased bladder compliance have been identified in patients with these symptoms. Overactive bladder (OAB) and LUTD clinical diagnosis is often based on present symptoms [9]. Numerous investigations have demonstrated a considerable difference between blocked, unobstructed outlet and bladder walls in terms of thickness [11]. In the southeast of Nigeria [12] performed pre and post void urine bladder wall thickness assessment based on sonographic evaluation of thickness of urinary bladder wall in a healthy Nigerian population. By evaluating bladder wall thickness (BWT) with ultrasonography, attempts have recently been made to discriminate between urinary symptoms. BWT increase has been demonstrated in some prior research to correlate with DO, although other investigations have shown the reverse [9]. In a healthy adult population, accurate measurement of bladder weight, detrusor wall thickness, and bladder wall thickness can be used as a clinical tool to rule out diseases of the bladder and detrusor [13].

Detrusor muscle hypertrophy is known to be linked to a number of LUTS problems, and several research have examined the relationship between female LUTS and BWT. The association between BWT measurements, bladder outlet blockage and DO in males is well known, however it is not yet known for women [9].

Description of Urinary Bladder

The urinary bladder has a broadly spherical form, while individual differences in size and shape exist, and the amount of urine it can hold has a significant impact on both. The typical adult bladder has a 300- to 600-ml capacity. The interior wall of the bladder is lined with numerous microscopic creases called rugae, which allow the bladder to expand when it fills with pee. The rugae flatten and the bladder wall thins as it expands as pee builds up, allowing the bladder to hold more urine without experiencing a major increase in internal pressure. The outer adventitia, mid detrusor, and inner mucosa are the three layers that make up the bladder wall [13].

Both nosocomial and community-acquired urinary tract infections are possible. Community-acquired urinary tract infections (CA-UTIS) are defined as urinary tract infections that occur in a person's life in a public place or in a hospital setting within 48 hours after admission. The second most frequent microbiological illness in a community environment is a community-acquired UTI. While nosocomial urinary tract infections (N-UTIs) are the infection of the urinary tract that occurs after 48 hours of hospital admission, and the patient was not incubating at the time of admission or within 3 days after discharge [7].

Due to its noninvasiveness, simplicity, speed, and widespread acceptance, sonography is frequently used to determine BWT, DWT, and BW. With sonography, the detrusor is hypoechogenic, whereas the adventia and mucisa walls are hyperechogenic [13].

Preparation

Only after the bladder is completely full can it be evaluated accurately. Before the exam, patients should not empty their bladders and should instead consume 1 liter of liquids per hour. But for other people, this is not a viable option. Patients with incontinence, for instance, might not be able to hold a full bladder, and those with renal failure might only very slowly fill their bladders. In these situations, compromise is required, and patients should be advised to arrive with as much bladder capacity as feasible [14].

The incomplete evacuation of the bladder leads to post-void residual urine (PVR). PVR is defined as the volume (ml) of urine left in the bladder at the end of micturition [15]. PVR is very frequently the consequence of lower urinary tract dysfunction (LUTD), with bladder outlet obstruction (BOO) and underactive or a contractile detrusor as its most prevalent [15].

If a patient has a urinary catheter, the catheter needs to be clamped one hour before the exam, and they should also consume one liter of water. A patient's bladder that is catheterized can be filled by injecting sterile water through the catheter if, for whatever reason, it is not full. Although air must be avoided at all costs to avoid shadowing artifacts on the scan, air is frequently introduced despite precautions being made [14].

In the study of [16] (3.5mm) 37 patients were included 17 had BOO and 20 had no BOO. Measurements of bladder wall of patients with BOO were significantly thicker than that without BOO at all bladder volumes. (0.515cm vs 0.382cm at 100mL, 0.395cm vs 0.293cm at 200mL, 0.351 cm vs 0.258cm at 300mL) Exploration of test efficiency identified 0.35cm to be the optimal cutoff value, with higher accuracy at larger bladder volume. BWT appeared to correlate well with BOO. They established an optimal cut-off value of 0.35cm. Measurement of BWT can be incorporated into the initial assessment for male LUTS [15].

The Patient's Position

The patient should be lying on his or her back.

Scanning Method

The transducer is placed immediately above the pubic symphysis to scan the bladder from the front. Sagittal and axial planes are used to scan the bladder, which is then swept across in an arc. The transducer is moved from cephalad to caudad in the axial plane to include the whole bladder. The transducer should be positioned behind the pubic symphysis with the scan plane passing behind it in order to examine the prostate and the base of the bladder.

To guarantee that the whole bladder is investigated, the transducer is first positioned in the middle of the sagittal plane and then swept in an arc to both sides. The transducer beam is frequently tangential to the lateral walls of the bladder, making it challenging to see them. To get around this, the transducer is turned around and then inclined sharply in the direction of the wall being scanned. For a variety of reasons, it is challenging to visualize the anterior wall. It is near to the transducer and frequently not in the maximum focus zone until the parameters are altered. Additionally, the picture is typically degraded by noticeable reverberation artifacts since it is parallel to the skin surface. The focus and gain settings must be optimized to minimize these effects [14]. In the study of [15], USG was performed when patients had a sense of bladder fullness (the routine protocol for pelvic USG) or palpable full bladder, and a cutoff value of 3.9mm for BWT was found to be the optimal cutoff value to distinguish BOO from non-BOO by the correlation of the Q max. The etiology of LUTS is multifactorial and can be associated with pathology of the prostate, benign prostatic enlargement (BPE), prostatitis, urethral stricture, bladder detrusor under/over activity and kidney (nocturnal polyuria [17]. The approach described above could seem challenging. In actual reality, performing an ultrasound of the bladder is simple as long as the technician follows certain simple guidelines to make sure every component is seen as clearly as possible. When searching for malignancies, careful approach is very crucial. The capacity of a typical bladder when it is fully filled is roughly 500 ml. Although there is typically a band of increased echo density caused by reverberation artefact over the anterior section, the contents are mostly anechoic. Very minute speckles in the urine may be observed using high-resolution devices. If they are excessive, they may be a sign of hematuria, an infection, or poor bladder emptying [14]. There was a statistically significant difference in the urinary bladder wall thickness between the diabetic subjects and the control group ($p<0.001$). The ranges of urinary bladder wall thickness in the diabetics and non-diabetics were 1.68–4.68 mm and 1.77–2.59 mm, respectively, with a mean of 3.18 ± 1.50 mm and 2.18 ± 0.41 mm, respectively [18]. In epidemiological studies, LUTS were present in 57.1% of men and 48% of women. As populations continue to age, the prevalence and social impact of LUTS will progressively increase [15]. Uro-dynamic studies (UDS) are the most definitive tests available to determine the etiology of voiding dysfunction. Although considered the current gold standard for the diagnosis of bladder outlet obstruction (BOO), but it is an invasive, expensive, and time-consuming procedure. The use of catheters in conventional UDS can cause discomfort to patients and is associated with a 19% risk of adverse events e.g. urinary retention, macroscopic hematuria or urinary tract infection [17]. Although the bladder's form changes with distension and pressure from surrounding organs, it may be thought of as a generally oval structure. In the transverse plane, particularly in women, the shape is more like a rectangle, and in the sagittal plane, it is pyramidal. The patient's sex affects the nearby organs. Males' seminal vesicles and rectum may be located at the bladder's apex and posterior, respectively. The uterus and ovaries are posterior to the bladder in females [14]. It is also possible that the presence of a catheter in the urethra would influence the reproducibility of the patient's symptoms and the urodynamic readings, despite its small size. There are also cost issues and potential embarrassment to the patient. Hence, a number of non-invasive investigations have been developed [17]. The goal is not to replace, but rather to provide alternatives that may better suit patients and the logistics of different environments (e.g. primary care centers, mobile or remote clinics). These innovations in healthcare enable us to expand our knowledge, modify clinical practice and provide better, more tailored service to patients [17]. Bladder wall thickness (BWT) assessment has been shown to be promising substitutes for pressure flow study (PFS) to diagnose BOO, they are noninvasive, easy to perform, and less time-consuming than PFSs [17]. There are just these crucial anatomical relationships. When the bladder is full, the usual bladder wall is around 3 mm thick, and when the bladder is not distended, it is about 5 mm thick. The mucosa, submucosa, muscularis, and serosal layers are the four anatomical layers of the wall. There is also a layer of perivesical fat, which on an ultrasound image might look like a wall. The wall is frequently perceived ultrasonically as a single, medium echo dense band with no separation between the levels. Three layers are frequently discernible with high-definition systems. The muscularis layer is an echo-poor line, the serosal layer is commonly combined with the perivesical fat, and the mucosa shows as a very echo-rich line [14]. In the study of [19], the mean anterior bladder wall thickness was 1.78 mm, with a standard deviation of 0.13 mm. There was a significant difference between the mean anterior wall thickness and the mean posterior wall thickness ($P<0.05$), as well as between the mean anterior wall thickness and the mean lateral wall thickness ($P<0.05$).

With a standard variation of 0.15mm, the median thickness of the posterior bladder wall was 2.10mm. It differed significantly from the anterior and lateral bladder wall thicknesses ($P<0.05$) [19]. This was likewise the conclusion reached by other scientists, but only Kuzmic reported no discernible variation in lateral, posterior, and anterior bladder wall thickness [19].

The definition varies depending on the technique utilized, the patient's physical make-up, and the area of the bladder wall being checked. Although in the absence of access to magnetic resonance imaging (MRI) or CT, the individual layers of the bladder wall cannot be reliably seen to stage bladder tumors accurately [14]. In the study of [17] the age of the patients ranged from 18 and 80 years with a mean of 52 years. Oelke and associates conducted a study including 160 men between 40 and 89 years (median 62). While Guzel and coworker's study's mean age was 62.5 (39-77) years. Ahmed and Bedewi study's median age is 65 (55-70) [15] divided the patients into bladder outlet obstruction patients 39 (52%) and non-bladder outlet obstruction patients 36 (48%). They found that the median of BWT of non- obstructed patients was 2 (1.7-2.55) and range 1.4-6.5 and the median BWT in the obstructed patients was 7 (6-7.9) and range 2.5-8.8. They found that the cutoff value of 3.9mm for BWT (mainly detrusal) was found to be the best threshold value to distinguish patients with BOO from those without BOO. The most frequent justification for a bladder ultrasound scan is the evaluation of bladder emptying. Various factors may contribute to poor emptying [14]:

- Prostatic hypertrophy and primary bladder dysfunction are frequently linked in elderly men. Prostatic hypertrophy may be the source of dysfunction; however, it is unclear whether it alone causes outlet blockage. In either sex, primary bladder dysfunction is possible.
- Multiple sclerosis, spinal bifida, and other uncommon conditions can also contribute to neurogenic bladder.
- Urethral valves might restrict the outflow in young males.

It is frequently required to measure bladder emptying in order to make management decisions, regardless of the source of the outlet obstruction. The upper tracts (kidneys and ureters) are always evaluated during an ultrasound investigation together with the bladder, mostly to detect hydronephrosis or scarring [14]. Diabetes mellitus is an increasing health challenge with accompanying urological complications. Over 50% of men and women with diabetes have bladder dysfunction.

According to the current understanding of bladder dysfunction, it refers to a progressive condition encompassing a broad spectrum of lower urinary tract symptoms including urinary urgency, frequency, nocturia, and incontinence [18]. Urinary bladder dysfunction has been classically described as diminished bladder sensation, poor contractility, and increased post-void residual urine, termed bladder cystopathy. Ultrasonography of the urinary bladder, which is a cheap, safe, radiation free, non-invasive and reliable imaging modality, may help to identify diabetes mellitus patients prone to develop urinary bladder dysfunction [18]. It is crucial to fully fill the bladder since a partially full bladder may lead to an incorrectly high post-micturition residue. While there may be additional pathological indicators visible, the primary purpose of imaging the full bladder is to ensure that it is adequately full for the post-micturition examination. A thick muscularis layer may be present in outlet blockage, frequently displaying an uneven pattern of trabeculation and projecting the muscle bundles into the lumen [14].

Contrast this with a polypoidal tumor to avoid confusion. Trabeculation is occasionally localized and can resemble a tumor; however generalized trabeculation is often not a diagnostic issue. Contrarily, it is challenging to rule out tiny tumors when there is trabeculation. Trabeculation shows that the outlet restriction has been there for a while [14]. The study population of [18] comprised 80 diabetic subjects recruited from the diabetic outpatient clinic and another 80 age and sex-matched asymptomatic control subjects. Ultrasound scan of their urinary bladder wall was performed using a curvilinear transducer to determine the thickness and other sonographic features [18]. Out of the 80 diabetic subjects, 30 (37.5%) were males, while 50 (62.5%) were females; of 80 non-diabetic control subjects, 40 (50%) were males and 40 (50%) were females. The mean age of the diabetic subjects was 59.5 ± 10.4 years with a range of 40– 82 years, while that of the controls was 60.2 ± 7.4 years with a range of 40–85 years. There was no statistically significant difference ($p = 0.637$) between the mean age of the diabetic and control subjects. The mean urinary bladder wall thickness in the diabetics was greater than in the non-diabetics in the study subjects. There was a statistically significant difference between the urinary bladder thickness of diabetic subjects and the control group ($p<0.001$) [18]. The degree of neurological impairment affects how a neurogenic bladder looks. Generally speaking, spinal lesions cause hypertrophy with trabeculation, which can happen at different points following the commencement of the illness. Typically, cerebral lesions cause a thin-walled, enlarged bladder [14]. Examining the bladder after micturition is the second stage. It is important to remind patients to urinate regularly. For instance, they should do this if double micturition is their usual habit. Sometimes a post-catheter residue is sought from patients who self-catheterize. After micturition, patients should have scanned as soon as possible since the bladder begins to fill right away [14]. The mean urinary bladder wall thickness of the male and female subjects included in the study of [18] was 2.84 ± 1.31 mm and 2.9 ± 1.37 mm, respectively, with no statistically significant difference between them ($p = 0.159$). It was statistically significant between diabetic men and women ($p = 0.027$). Using Spearman's rank correlation to test the relationship between the glycaemic haemoglobin level of diabetic subjects and urinary bladder wall thickness, it was revealed that there was no correlation between these variables (Spearman's rho = 0.119, $p = 0.309$). The relationship between the urinary bladder volume of diabetic subjects and their mean urinary bladder wall thickness showed no correlation either (Spearman's rho = –0.009, $p = 0.937$). Only gender was a statistically significant predictor of urinary bladder wall thickness among other variables [18].

By measuring the bladder's diameter from front to back, side to side, and from the head to the feet, keeping the measures at roughly right angles to one another, the post-micturition residue is evaluated. The estimate is based on the presumption that the bladder has an even, ovoid shape and is calculated by multiplying the three diameters together by 0.52 [14]. Mean bladder wall thickness in patients with type 2 diabetes mellitus was greater than in the control subjects, and also greater in diabetic men compared to diabetic women, but the difference did not attain statistical significance. Urinary bladder wall thickness of the diabetics did not correlate with their glycaemic haemoglobin levels. Only gender was found to be a predictor of bladder wall thickness [18]. Some patients may not experience this. In reality, clinical evaluation calls for an estimated trabeculated bladder with bundles of mucosa-covered hypertrophied muscle on the posterior wall rather than a measurement that is extremely precise [14]. On the posterior wall figure, where therapy might be based, trabeculation is frequently more noticeable and easier to see. Even for a very irregular bladder, such as one that has undergone surgical augmentation, the described procedure will be able to do this. The typical bladder should theoretically totally empty following micturition. In reality, a residual of under 20 milliliters in an adult and under 10 milliliters in a kid is considered normal, or at the very least, clinically inconsequential [14]. Numerous studies described the use of sonographic equipment to assess lower urinary tract infections. In their investigation [14] came to the conclusion that sonographic examination of the BWT is a simple, quick, and noninvasive way for a potential diagnostic tool for dysfunction of the lower urinary tract [20] studied 200 patients (111males+ 89 females), with a mean age of 35.16 ± 12.37 years undergoing ultrasound (USG) abdomen and pelvis for non-urological causes from January 2016 to January 2017. The patients with any history of urological complaints, urolological interventions catheterization, pregnant females, and females with pelvic organ prolapse were excluded from the study. All the patients Bladder wall thickness varied with age both in males and females, however the difference was not statistically significant. Although there was an age wise variation of each of the wall thickness, the variation was not statistically significant [14].

Empirical Review

The clinical manifestations of urinary tract infections (UTIS) depend on the portion of the urinary tract involved, the etiologic organisms, the severity of the infection, and the patient's capacity to mount an immune response to it. Urinary tract infections can be asymptomatic, acute, chronic, complicated, or uncomplicated. A substantial danger to public health care exists from both asymptomatic and symptomatic UTIS, which lowers quality of life and increases absence from work [7]. The amount of urine that the bladder can hold as well as medical circumstances has an impact on bladder wall thickness. The BWT diminishes as the amount of pee in the bladder grows. If the bladder wall thickens by more than 3mm when it is inflated or more than 5mm when it is not inflated, a differentiating diagnosis for this condition should be made. The bladder volume is estimated as the sum of the bladder's length, breadth, and depth as determined by sonography, plus a correction factor of 0.6 [13].

According to [12] it was found that males usually had larger bladder wall thickness (BWT) than females. Males had an average pre-void BWT of 3.10mm. Males had a mean post-void BWT of 5.39mm while females had a mean BWT of 5.18mm. However, [9] found that individuals with hypoactive bladder and intrinsic sphincter deficit (ISD) had higher bladder wall thickness (BWT) values >3mm than other patients with lower urinary tract dysfunction. Although the bladder walls and its layers may be easily visualized with sonography, it is necessary to provide accurate sonographic prevalence of lower urinary tract infection among patients. Sonography is a noninvasive test that is increasingly being used to determine BWT, DWT, and BW values to identify BOO and detrusor instability. Hence, the determination of normal BWT, DWT, and BW values in healthy adults is important because it provides normal-pathogenic boundaries [13]. Lower urinary tract infection affects more women than men, on average. Urinary tract infections affect women on average once every three years (approximately 50 times more than for males). Age-related prevalence rises in both men and women [5]. The most prevalent bacterial infection is urinary tract infection, which accounts for nearly seven million doctor visits, one million visits to the emergency room, and 100,000 hospitalizations of elderly women, people with spinal cord injuries, people who are diabetic, people with multiple sclerosis, HIV, and people who use catheters[21]. Male age was noticeably older than female age. Although women's body mass index (BMI) was greater than men's [13].

Risk Factors for Lower Urinary Tract Infection

Low socioeconomic position, advanced maternal age (in women) or advanced age (in men), increased sexual activity, multi parity, diabetes, abnormalities and deformities of the urinary system are risk factors for lower urinary tract infections women who have sickle cell anemia with bacterial vaginosis, age and multi parity continue to be contentious issues. High viremia raises the risk of lower urinary tract infection in both men and women with human immunodeficiency virus positivity [4].

Lower urinary tract infections were more common in South Indian women with diabetes (26%) compared to those without diabetes (6%). Patients with diabetes have a higher chance of developing UTIs [21]. Cystitis, an infection of the superficial bladder mucosa, is the most common kind of lower urinary tract infection. The most frequent method used by germs like Escherichia coli to enter the bladder is through the urethra. 80–90% of infections are caused by E.coli. Staphylococcus saprophyticus (5–10%), enterococci, Proteus mirabilis, and other enteric Gram-negative rods such Klebsiella species are some additional pathogens. Although it is uncommon, organisms including Staphylococcus aureus, Salmonella species, and Mycobacterium TB can spread from a single homogeneous source [5].

MATERIALS AND METHODS

Research Design

This is an ex post facto research design, using Masmed F5 4D ultrasound machine with a curvilinear transducer at 3.5MHz of frequency to collect data from 65 outpatients of Biosensors medical diagnostic in Abuja metropolis.

Map of Wuse 2 study area

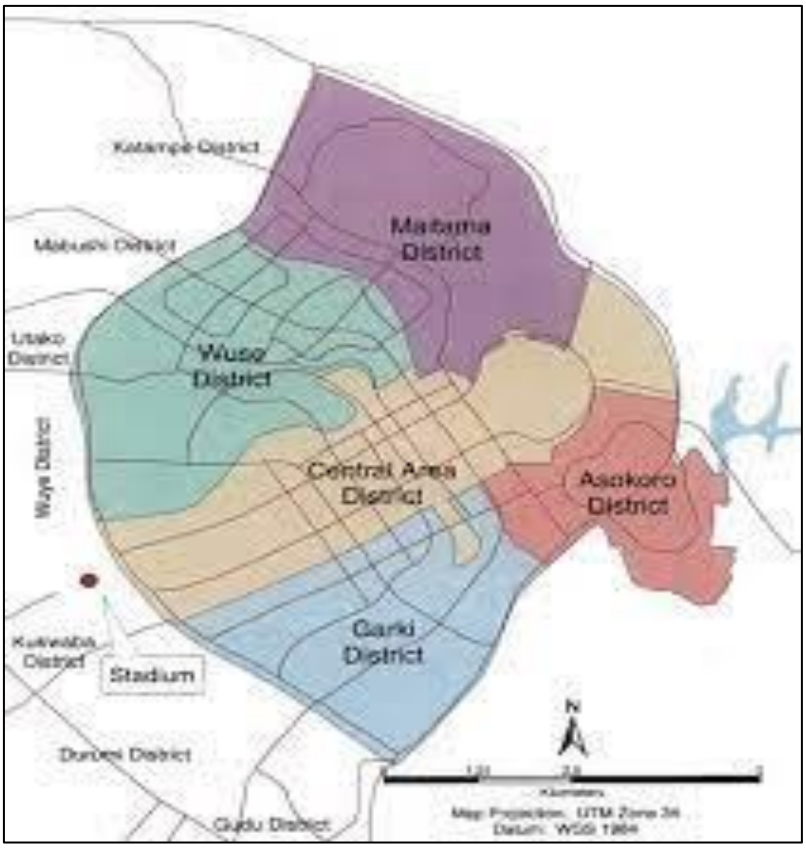

Figure 1: Map of wuse II study area
Source: www.google.com

Study Population

The sample was collected from 65 outpatients of Biosensors medical diagnostic Wuse II, Abuja that presented for bladder ultrasound, both males and females.

Sample Collection

Two hundred outpatients of Biosensor medical diagnostic Wuse II Abuja were used for the study. Only those who presented for bladder ultrasound were used. The sixty-five (65) of them were the total sample population. The age bracket of the outpatients was 20-65 years old.

Instrument for Data Collection

Data was collected for anterior and posterior bladder wall thickness, post void and pre void volume of the bladder was also collected. Age and sex of the patients was included. The instrument was Masmed F5 4D ultrasound machine with a curvilinear transducer at 3.5MHz of frequency.

Procedure for Data Collection

A crucial factor in determining the pathophysiologic state of the urine bladder and/or other nearby organs is the urinary bladder wall thickness (BWT). Ultrasound was used to quantify the pre- and post-void urine bladder volume as well as the anterior and posterior bladder wall thickness in 65 healthy, asymptomatic outpatients at biosensors medical diagnostic wuse II Abuja facility. The patients were instructed to drink water in order to have a full bladder, and the volume of the bladder was taken when the bladder was full by measuring the height, width, and length of the bladder to obtain the pre void urine volume. Data for this study was collected using a Masmed F5 4D Ultrasound machine with a curvilinear transducer at a frequency of 3.5MHz. The anterior bladder wall thickness and posterior bladder wall thickness was taken. The patient was then asked to empty his or her bladder to determine the volume of urine remaining in the bladder which was the post void urine volume (POVV).

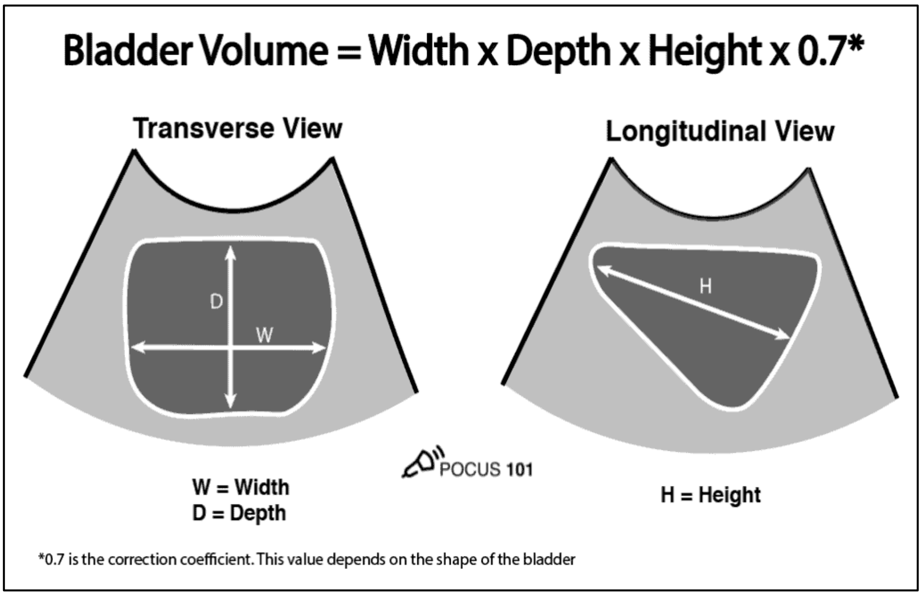

Figure 2: shows bladder volume measurement. Source: www.google.com

Data was taken and recorded for pre void, post void, anterior and posterior bladder wall thickness. Research trusted source showed that normal bladder wall thickness is 3mm when the bladder is full and 5mm when the bladder is empty, values greater than 3mm when the bladder is full and greater than 5mm when the bladder is empty shows an inflammatory process in keeping with lower urinary tract infection. Pre void and post void urine volume was collected, values greater than $50cm^3$ for post void urine volume was suggestive of urinary retention.

Technique for Bladder Volume Measurement:

1. The curvilinear transducer was placed just above the pubic ramus with the index marker towards the patient's right. This is the transverse plane.
2. The probe was fanned caudad to localize the bladder in the pelvis.
3. Bladder dimensions are measured using the caliper from the top to the bottom and from the left to the right of the screen. These are the depth and the width of the bladder, respectively.
4. The probe was rotated so that the index marker is pointing towards the head of the patient, this is the longitudinal, or long axis view.
5. Bladder dimension is measured from the left to right of the screen. This was the height of the bladder from cephalad to caudad.

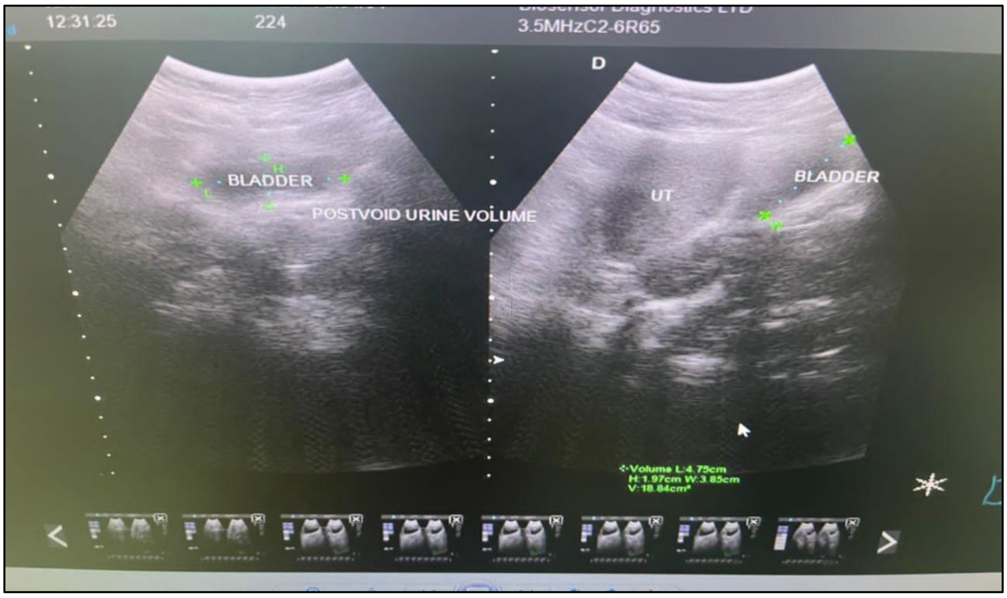

Figure 3: showing transverse and longitudinal section of the bladder for measurement of post void urinary bladder volume

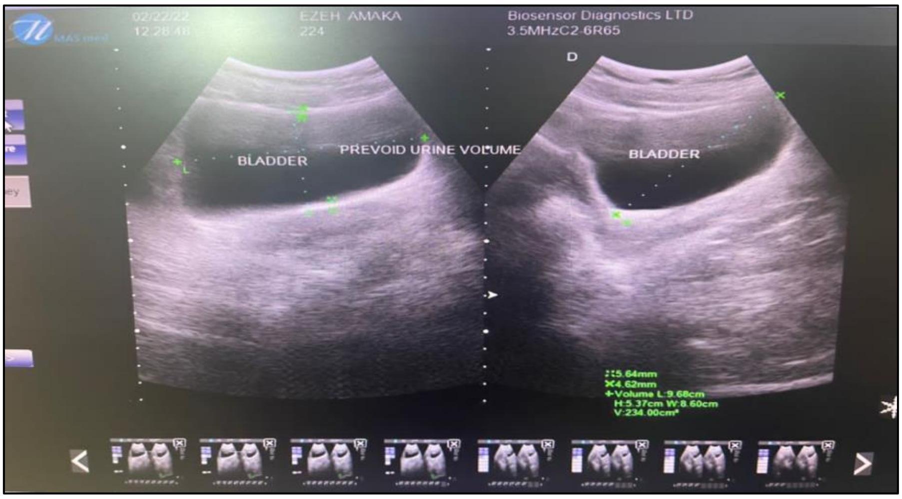

Figure 4: showing transverse and longitudinal section of the bladder for measurement of pre void urinary bladder volume

Urinary bladder wall thickness was obtained at the anterior wall, the posterior wall and the post void urine volume; pre void urine volumes were obtained. The patient was asked to void and the process repeated for an empty bladder. This method as was described by [22] ensures repeatability.

Method of Data Analysis

The data was subjected to descriptive statistics, while data collected was summarized by using Microsoft excel computer software and the results was analyzed by using simple percentages, pie chart, bar chart, Z test and Chi-square as appropriate.

ANALYSIS AND RESULTS

The data of this research project are analyzed based on grouping of research questions from the raw data. The results are analyzed by simple percentages, Chi-square, Z test and presented in pie chat, bar chart and tabular forms for easy analysis.

Table 1: Socio-demographic characteristics

S/N	Variable	Frequency Number	Percentage (%)
	Age:		
1	20-25 years	20	30.77
2	26-30 years	22	33.85
3	31-35 years	8	12.31
4	36-40 years	5	7.69
5	41-45 years	2	3.08
6	46-50 years	2	3.08
7	51-55 years	3	4.62
8	56-60 years	2	3.08
9	61-65 years	1	1.54
	Total	**65**	**100**

Table 1 shows the socio-demographic characteristics. Age: 20(30.77%) were 20-25 years old, 22(33.85%) were 26-30 years old, 8(12.31%) were 31-35 years old, 2(3.08%) were 41-45 years old, 2(3.08%) were 46-50 years old, 3(4.62%) were 51-55 years old, 2(3.08%) were 56-60 years old and 1(1.54%) were 61-65 years old. This shows that age 26-30 years old of the patients were higher, followed by 20—25 years old in the study population. Gender: 12(18.46%) were male, while 53(81.53%) were female. This shows that females were higher in the study population with increased bladder wall thickness.

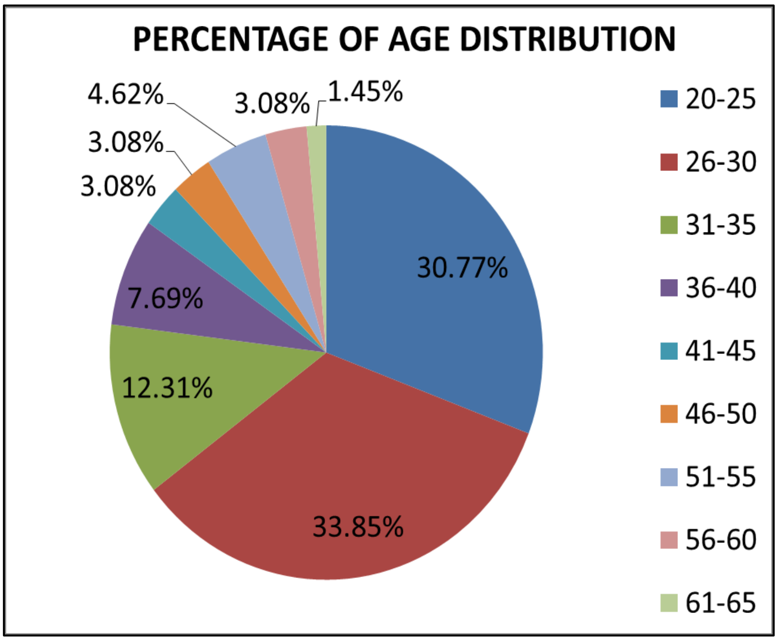

Figure 5: Pie chart showing percentage age distribution.

Table 2: The rate of lower urinary tract infection among outpatients

Gender	Number examined	Number sonographic LUTI (%)
Male	12	12(18.46)
Female	53	53(81.54)
Total	**65**	**65(100)**

Table 2 shows the number of sonographic lower urinary tract infection among outpatients in Biosensors medical diagnostics Wuse II Abuja Metropolis: 12(18.46%) were males and 53(81.54%) were females. The total number of sonographic lower urinary tract infection were 65(100%) in the study population based on those presented for bladder ultrasound.

Table 3: The sonographic prevalence of lower urinary tract infection among outpatients in Biosensors Medical Diagnostics wuse II Abuja

Variable	**Frequency Number**	**Percentage (%)**
Number recruited	200	100
Number examined	65	32.5
Number of sonographic LUTI	65	32.5

Table 3 shows the prevalence of lower urinary tract infection among outpatients in Biosensors Medical Diagnostics Wuse II Abuja metropolis. The number of outpatients recruited were 200 (100%), the number of outpatients examined were 65(32.5%) with increased bladder wall thickness which shows that the sonographic prevalence of lower urinary tract infection in this study population was 65(32.5%).

Table 4: The prevalence of urinary retention among outpatients using post void urine volume (POVV ≥ 50cm^3)

Variables	Values (%)	X^2(Chi square value)
Male	1(1.54)	6.13
Female	7(10.77)	0.13
Total no retention	8(12.31)	

Using the chai square equation X^2= (e-o)^2/e where e is expected value, o is observed value and X^2 is chi square value. If X^2 table value greater than X^2 calculated value is significant ($X^2_{\text{Table value}} > X^2_{\text{Calculated value}}$ is significant).

The table 4 above shows the prevalence of urinary retention among outpatients using post void urine volume (POVV): one male outpatient had 1(1.54%) prevalence of urinary retention with X^2 value of 6.13 while the female outpatients had 7(10.77%) prevalence of urinary retention with X^2 value of 0.13. if X^2 table value greater than X^2 calculated value is significant, X^2 table value is 3.840. This shows that there is more prevalence of urinary retention among female outpatients than male outpatients in the study population.

Table 5: Impact of parity on BWT among the female outpatients

Variables	Parity (%)	X^2
Non-gravid	45(84.91)	1.21
Gravid	8(15.09)	38.21
Total	**53(100)**	

Table 5 shows the impact of parity on BWT among female outpatients in Biosensors Medical diagnostic Wuse II Abuja. The non-gravid were 45(84.91%) with X^2 value 1.21, while the gravid were 8(15.09%) with X^2 value 38.21. These shows that non-gravid were higher in the study population than the gravid. But the 8(15.09%) of gravid had significant increase in bladder wall thickness (BWT) in keeping with lower urinary tract infection.

Table 6: Sonographic prevalence of lower urinary tract infection among outpatients based on ABWT

S/N	Variable	Frequency Number	Percentage (%)
	ABWT (mm):		
1	3.50-4.00	8	12.31
2	4.01-4.50	9	13.85
3	4.51-5.00	12	18.46
4	5.01-5.50	12	18.46
5	5.51-6.00	10	15.38
6	6.01-6.50	4	6.15
7	6.51-7.00	1	1.54
8	7.01-7.50	8	12.31
9	7.51-8.00	0	0
10	8.01-8.50	0	0
11	8.51-9.00	0	0
12	9.01-9.50	1	1.54
	Total	**65**	**100**

Table 7: Sonographic prevalence of lower urinary tract infection among outpatients based on PBWT

S/N	Variable	Frequency Number	Percentage (%)
	PBWT (mm):		
1	3.50-4.00	5	7.69
2	4.01-4.50	10	15.38
3	4.51-5.00	16	24.62
4	5.01-5.50	8	12.31
5	5.51-6.00	10	15.38
6	6.01-6.50	8	12.31
7	6.51-7.00	4	6.15
8	7.01-7.50	0	0
9	7.51-8.00	1	1.54
10	8.01-8.50	0	0
11	8.51-9.00	0	0
12	9.01-9.50	3	4.62
	Total	**65**	**100**

Percentage Distribution of Anterior and Posterior Bladder Wall Thickness

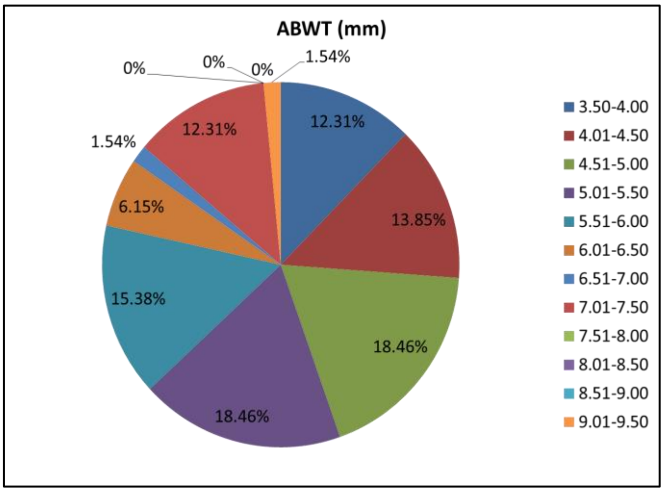

Figure 6: Pie chart showing percentage distribution of anterior bladder wall thickness (ABWT)

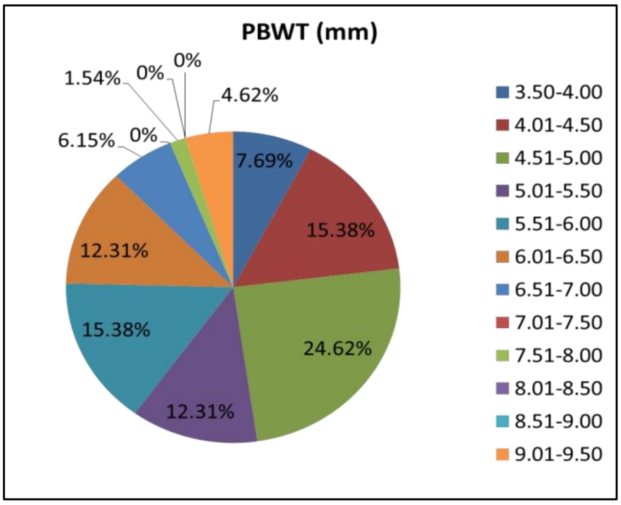

Figure 7: Percentage distribution of posterior bladder wall thickness (PBWT)

Table 6 shows the sonographic prevalence of lower urinary tract infection among outpatients in Biosensors medical diagnostic Wuse II Abuja. 8(12.31%) of the study population had ABWT of between 3.50mm-4.00mm, 9(13.85%) had ABWT of between 4.01mm-4.50mm, 12(18.46%) has ABWT of between 4.51mm-5.00mm, 12(18.46%) had ABWT between 5.01mm-5.50mm, 10(15.38%) had ABWT of between 5.51mm-6.00mm, 4(6.15%) had ABWT of between 6.01mm-6.51mm, 1(1.54%) had ABWT of between 6.51mm-7.00mm, 8(12.31%) had ABWT between 7.01mm- 7.50mm, none of the patient in the study population had ABWT of between 7.51mm-8.00mm, 8.01mm-8.50mm and 8.51mm-9.00mm.This shows that patients with bladder wall thickness between 4.51mm-5.00mm and 5.01mm-5.50mm are the highest in the study population which are significantly increased indicating a higher prevalence of sonographic LUTI in the study population.

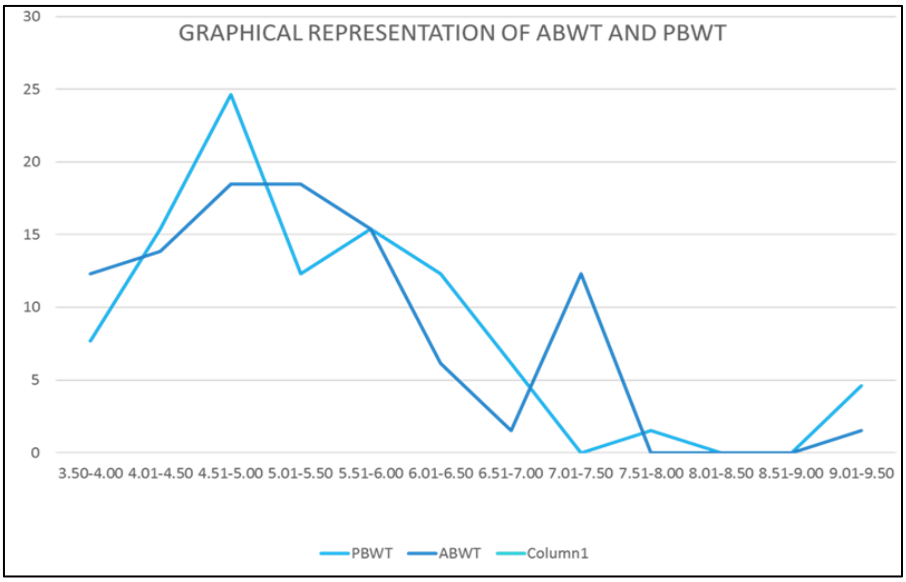

Figure 8: Graphical representation of ABWT and PBWT

12(18.46%) had ABWT of between 4.51mm-5.00mm, 12(18.46%) had ABWT between 5.01mm-5.50mm while 16(24.62%) had PBWT of between (4.51mm-5.00mm) in the study population which is in line with [12] which showed that urinary bladder wall thickness has been noted to increase in patients with pathophysiologic conditions of the urinary bladder and other adjoining organs such as benign prostatic hyperplasia (BPH), bladder outlet obstruction (BOO), lower urinary tract symptoms (LUTS), spinal cord injury, infection and carcinoma [9] reported that women with lower urinary tract dysfunction showed higher bladder wall thickness (BWT) values >3mm, especially patients with hypoactive bladder and intrinsic sphincter deficiency (ISD).

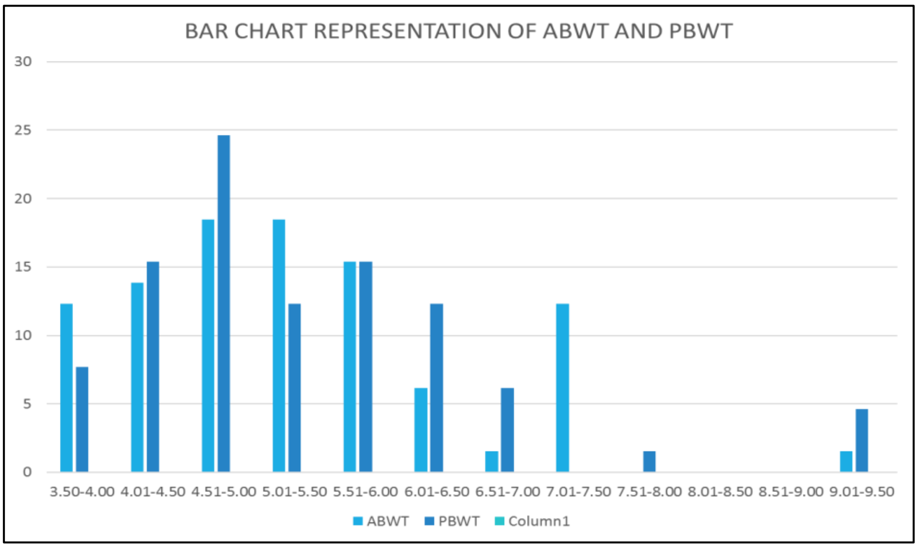

Figure 9: Bar chart representation of ABWT and PBWT

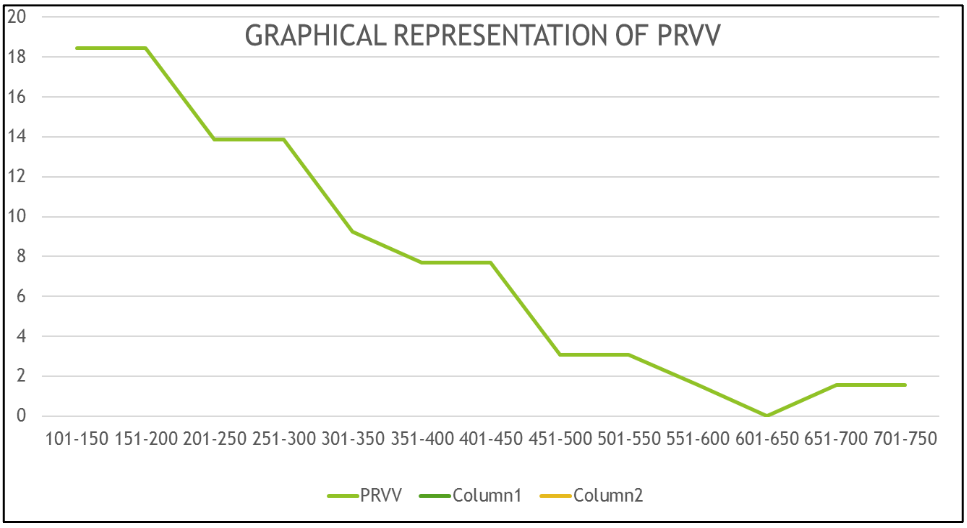

Figure 10: Graphical representation of PRVV

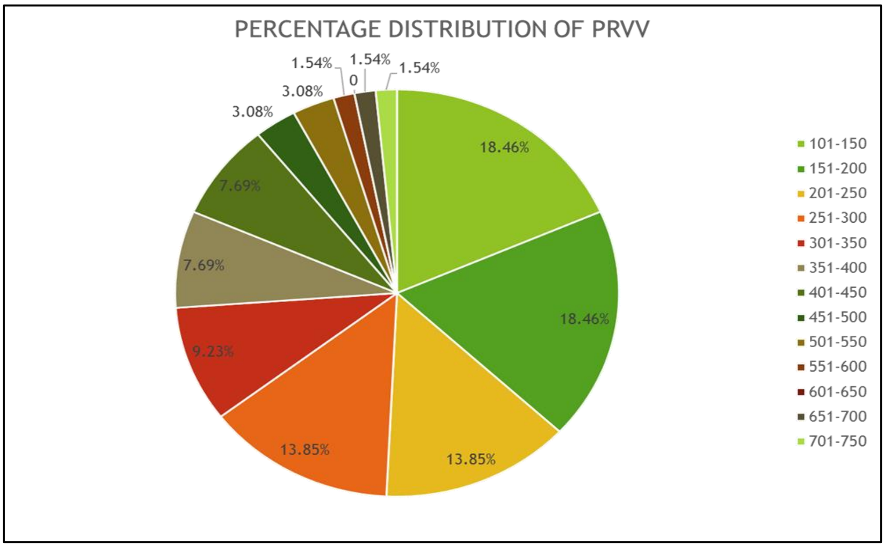

Figure 11: Pie chart representation of PRVV

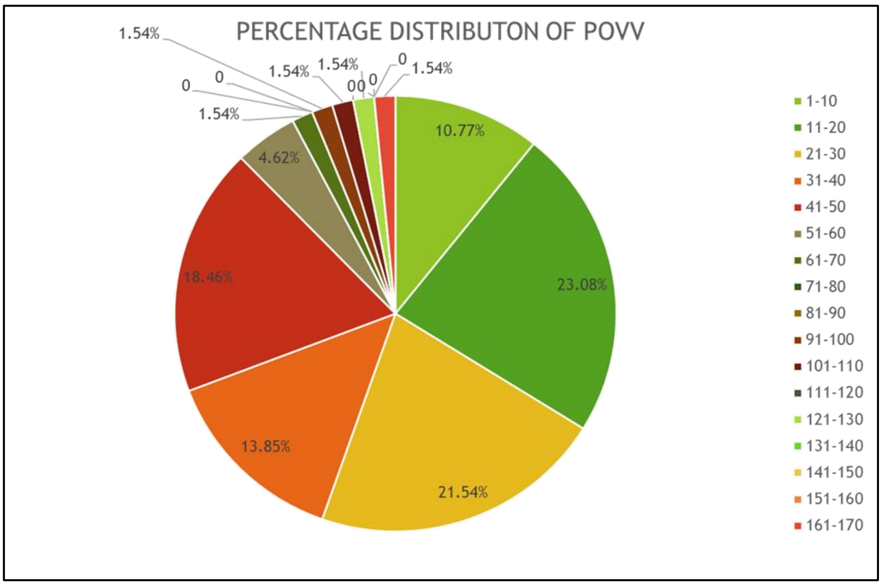

Figure 12: Pie chart representation of POVV

Table 8: Frequency and Percentage distribution of Pre void urinary bladder volume

S/N	Variable	Frequency Number	Percentage (%)
	PRVV (cm^3):		
1	101-150	12	18.46
2	151-200	12	18.46
3	201-250	9	13.85
4	251-300	9	13.85
5	301-350	6	9.23
6	351-400	5	7.69
7	401-450	5	7.69
8	451-500	2	3.08
9	501-550	2	3.08
10	551-600	1	1.54
11	601-650	0	0
12	651-700	1	1.54
13	701-750	1	1.54
Total		**65**	**100**

Table 9: Frequency and Percentage distribution of Post void urinary bladder volume

Variable	Frequency Number	Percentage (%)
POVV (cm^3):		
1-10	7	10.77
11-20	15	23.08
21-30	14	21.54
31-40	9	13.85
41-50	12	18.46
51-60	3	4.62
61-70	1	1.54
71-80	0	0
81-90	0	0
91-100	1	1.54
101-110	1	1.54
111-120	0	0
121-130	1	1.54
131-140	0	0
141-150	0	0
151-160	0	0
161-170	1	1.54
Total	**65**	**100**

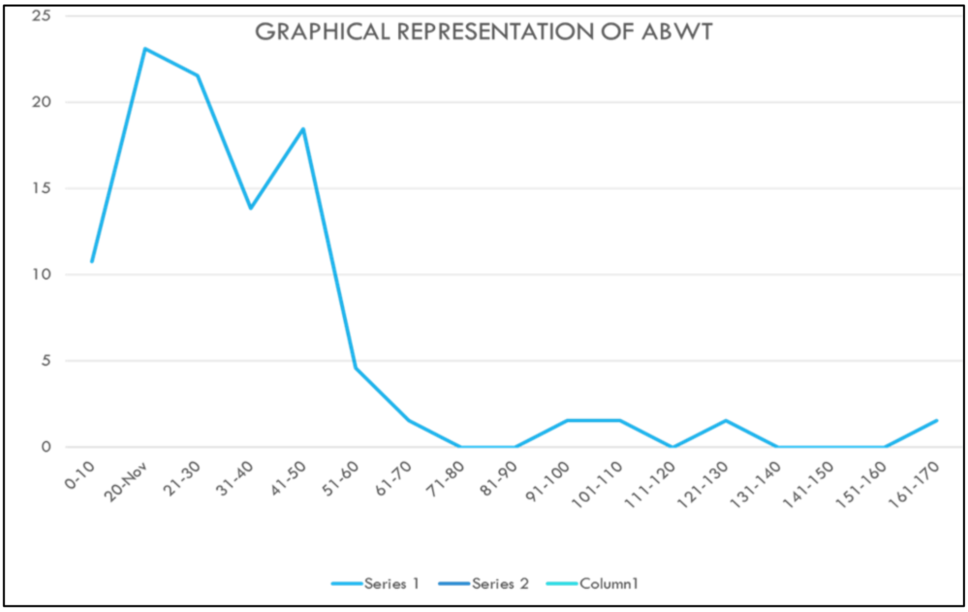

Figure 13: Graphical representation of POVV

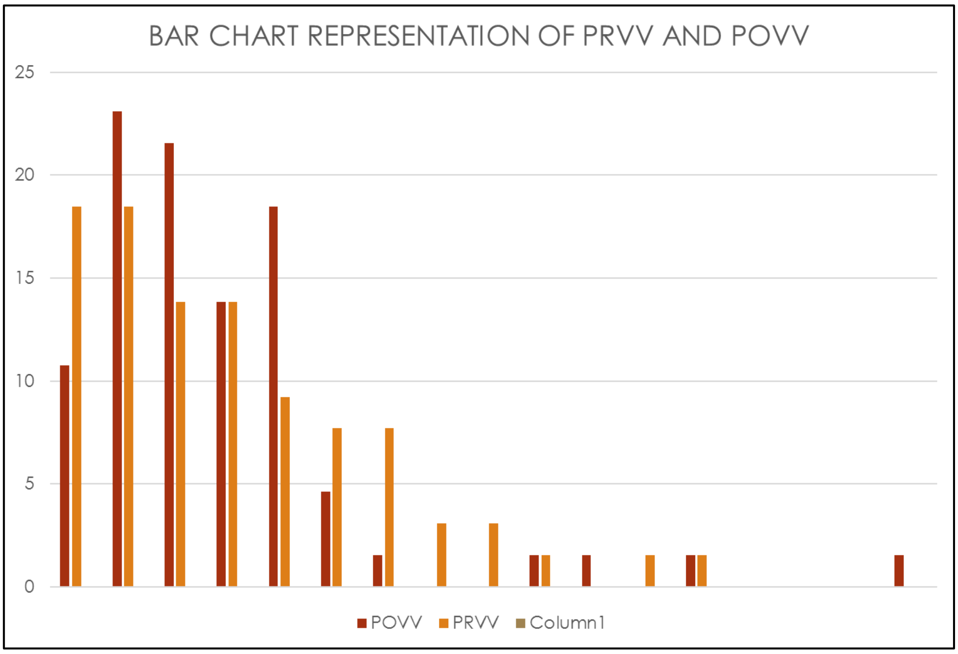

Figure 14: Bar chart representation of PRVV and POVV

DISCUSSION, SUMMARY, CONCLUSION AND RECOMMENDATIONS

Discussion

Research question 1: What is the rate of sonographic prevalence of lower urinary tract infection among outpatients in Biosensors Medical diagnostic Wuse II Abuja?

From the research study, the female outpatients were more than the male outpatients in the study area. In this research study, a total of 65 participants were sonographically examined and there were 53(81.54%) rate of sonographic lower urinary tract infection among female outpatients and 12(18.46%) rate among male outpatients which showed that females were more affected than males in the study population with increased bladder wall thickness in keeping with LUTI. This is in line with the study of [9] that lower urinary tract infection affects women more than men [12] showed that urinary bladder wall thickness has been noted to increase in patients with pathophysiologic conditions of the urinary bladder and other adjoining organs such as benign prostatic hyperplasia (BPH), bladder outlet obstruction (BOO), lower urinary tract symptoms (LUTS), spinal cord injury, infection and carcinoma [9] reported that women with lower urinary tract dysfunction showed higher bladder wall thickness (BWT) values >3mm, especially patients with hypoactive bladder and intrinsic sphincter deficiency (ISD).

Research question 2: What is the sonographic prevalence of lower urinary tract infection among outpatients in Biosensors medical diagnostic Wuse II Abuja?

The sonographic prevalence of lower urinary tract infection among outpatients in Biosensors medical diagnostic Wuse II Abuja in both males and females from 200 outpatients recruited is about 65(32.5%) consist of 53(81.54%) females and 12(18.46%) males with increased bladder wall thickness in keeping with lower urinary tract infection (LUTI) which is significantly high in the study population. The sonographic prevalence of lower urinary tract infection in Biosensors medical diagnostics Wuse II Abuja is 32.5% which is highly significant. 12(18.46%) had ABWT of between 4.51mm-5.00mm, 12(18.46%) had ABWT between 5.01mm-5.50mm while 16(24.62%) had PBWT of between (4.51mm-5.00mm) in the study population in keeping with LUTI which is in line with [12] which showed that urinary bladder wall thickness has been noted to increase in patients with pathophysiologic conditions of the urinary bladder and other adjoining organs such as benign prostatic hyperplasia (BPH), bladder outlet obstruction (BOO), lower urinary tract symptoms (LUTS), spinal cord injury, infection and carcinoma. Shin *et al.,* (2018) reported that women with lower urinary tract dysfunction showed higher bladder wall thickness (BWT) values >3mm, especially patients with hypoactive bladder and intrinsic sphincter deficiency (ISD). One male had post void urine volume (POVV) greater than $50cm^3$ 1(1.54%) while the females that had post void urine volume (POVV) greater than $50cm^3$ were 7(10.77%) in keeping with urinary bladder retention. this agrees with the report of [8] that prevalence of urinary tract infection was quite high in Ebonyi state.

The pregnant state is one of the contributing factors to lower urinary tract infection. Among the 65(32.5%) examined of the study population that had increased bladder wall thickness in keeping with lower urinary tract infection, 53(81.54%) were females while 12(18.46%) were males. 8(15.09%) were pregnant with increased bladder wall thickness at the time of sonographic examination. This is in agreement with the report of [4] that low socio-economic status, higher level of sexual activity; multi parity is risk factors for lower urinary tract infection.

Research question 3: Who are more infected with lower urinary tract infection among outpatients in Biosensors medical diagnostic Wuse II Abuja?

Both sexes can get a lower urinary tract infection. However, among outpatients at Biosensors Medical Diagnostic Wuse II Abuja, females were more impacted by lower urinary tract infections. A lower urinary tract infection was consistent with increased bladder wall thickness in 53 (81.54%) of the females. This is consistent with the findings of [1], who found that 5% of men and 40%–50% of women may have lower urinary tract infections, respectively. Women are more susceptible to lower urinary tract infections than males. Lower urinary tract issues affect more than 60% of Korean women in their middle age (LUTs). Although LUTS are not life-threatening, they can still have an impact on quality of life, hence it is crucial to thoroughly research LUTs [9]. The most prevalent bacterial infection, urinary tract infections cause 100,000 hospitalizations per year for women, the elderly, those with spinal cord injuries or catheters, people with HIV, diabetes, multiple sclerosis, and one million visits to the emergency room [21]. In comparison to women, men were much older. Despite the fact that women's body mass index (BMI) was greater than men's [12, 13] revealed that patients with pathophysiologic conditions of the urinary bladder and other adjoining organs, such as benign prostatic hyperplasia (BPH), bladder outlet obstruction (BOO), lower urinary tract symptoms (LUTs), spinal cord injury, infection, and carcinoma, have been noted to have increased urinary bladder wall thickness. According to [9], individuals with hypoactive bladder and intrinsic sphincter deficit (ISD) had greater bladder wall thickness (BWT) values >3mm in women with lower urinary tract dysfunction.

Research question 4: What are the age brackets that are more affected with lower urinary tract infection among outpatients in Biosensors medical diagnostic Wuse II Abuja?

The lower urinary tract infection is an infection that affects the bladder and urethra. The sonographic age prevalence of lower urinary tract infection among outpatients in Biosensors medical diagnostic Wuse II Abuja is higher among the age bracket 26-30 years with increased bladder wall thickness. About 22(33.85%) of the age 26-30 years old were affected, while 20(30.77%) of the age 20-25 years old were also affected with increased bladder wall thickness (BWT) in keeping with lower urinary tract infection (LUTI). This is in line with the work of [13] that age was significant factor of lower urinary tract infection.

Moreover, the only male affected with the lower urinary tract infection and urinary bladder retention was 54 years old which had POVV value of 55.37cm3 in keeping with urinary bladder retention, ABWT of 5.48mm and PBWT of 6.69mm. This shows that advanced age is also a risk factor of lower urinary tract infection. This agrees with [4] that advanced age (in men) is a risk factor of lower urinary infection.

Hypothesis 1

Null Hypothesis

There is no statistically significant difference between pre and post void urinary bladder volume as key parameters in ultrasound assessment of pathophysiologic condition during lower urinary tract infection in clinical investigations.

Alternative Hypothesis

There is significant difference between pre and post void urinary bladder volume as key parameters in ultrasound assessment of pathophysiologic condition during lower urinary tract infection in clinical investigations.

Table 10: Showing values of standard deviation, mean and sample size for PRVV, POVV

	PRVV	POVV
MEAN (cm^3)	279.17	33.72
STANDARD DEVIATION(cm^3)	138.46	27.56
NUMBER OF SAMPLE	65	65

Since Z test calculated greater than Z table value is significant ($Z_{\text{calculated value}} > Z_{\text{table value}}$ is significant) and P<0.05.

From table 8 below, the mean of pre void urine volume was 279.17cm^3, the mean of post void urine volume was 33.72cm^3, the standard deviation for pre void urine volume was 138.46cm^3, the standard deviation for post void urine volume was 27.56cm^3, the number of samples for pre void urine volume was 65 and that of post void urine volume was also 65.The alternative hypothesis, according to which there is a statistically significant difference between pre and post void urine bladder volume as essential parameters in ultrasonography evaluation of pathophysiologic state during lower urinary tract infection in clinical investigations, cannot be ruled out since the Z calculated value was bigger than the Z tabulated value then P<0.05. As a result, there is not enough evidence to reject the alternative hypothesis, hence it was retained. According to [23], there was a statistically significant difference in the volume of the urinary bladder before and after a void (P<0.05). Additionally, [19] demonstrated that among healthy school-aged children in Lagos, there was a statistically significant difference between pre and post void urine bladder volume (P<0.05).

Hypothesis 2

Null Hypothesis

There is no statistically significant difference between anterior and posterior bladder wall thickness as basic requirements in pathophysiologic assessment of lower urinary tract infect during ultrasound process and procedure.

Alternative Hypothesis

There is significant difference between anterior and posterior bladder wall thickness as basic requirements in pathophysiologic assessment of lower urinary tract infect during ultrasound process and procedure.

Table 11: Showing values of standard deviation, mean and sample size for ABWT, PBWT

	ABWT	PBWT
MEAN (mm)	5.28	5.38
STANDARD DEVIATION(mm)	1.13	1.19
NUMBER OF SAMPLE	65	65

Using the Z test equation

$$Z = \frac{\#_1 - \#_2}{\sqrt{\frac{S_1^2}{N_1} + \frac{S_2^2}{N_2}}}$$

Since Z test calculated less than Z test tabulated is not significant then P>0.05

Where Z is the Z test value, $\#_1$ is the average of sample one, $\#_2$ is the average of sample two, S_1 is the standard deviation of sample one, S_2 is the standard deviation of sample two, N_1 is the number of sample one, and N_2 is the number of sample two. Since Z calculated value less than Z table value is not significant ($Z_{\text{calculated value}} < Z_{\text{table value}}$ is not significant).

The mean of the anterior bladder wall thickness was 5.28 mm, the mean of the posterior bladder wall thickness was 5.38 mm, the standard deviation of the anterior bladder wall thickness was 1.13 mm, and the standard deviation of the posterior bladder wall thickness was also 1.19 mm. The calculated Z test value was less than the table value, P>0.05, so there is no difference between the two values.

This is contrary to [19] who found out that the mean anterior bladder wall thickness was 1.78 mm with a standard deviation of 0.13 mm, and that there was a significant difference between it and the mean posterior wall thickness and between it and the mean lateral wall thicknesses(P<0.05).

The mean thickness of the posterior bladder wall was 2.10mm, with a 0.15mm standard deviation. When compared to the anterior and lateral bladder wall thickness, there was a significant difference (P<0.05) among healthy school-aged children in Lagos. This was also the conclusion of other writers, but only Kuzmic reported that there was no discernible difference (P>0.05) between the thickness of the front, posterior, and lateral bladder walls. According to [12], there was a statistically significant difference in the thickness of the front and posterior bladder walls (P<0.05). There was a statistically significant difference in the urinary bladder wall thickness between the diabetic subjects and the control group (p <0.001), the ranges of urinary bladder wall thickness in the diabetics and non-diabetics were 1.68–4.68 mm and 1.77–2.59 mm respectively with a mean of 3.18 ± 1.50 mm and 2.18 ± 0.41 mm, respectively [18]. In this study, there was a statistically significant difference between pre- and post-void urinary bladder volume as key parameters in ultrasound assessment of pathophysiologic condition during lower urinary tract infection (P<0.05), but there was no statistically significant distinction between anterior and posterior bladder wall thickness as basic requirements in pathophysiologic evaluation of lower urinary tract infection during ultrasound process and procedure (P>0.05).

Summary

The inflammation-causing conditions that affect the bladder and urethra are lower urinary tract infections. According to sonographic findings, more female outpatients than male outpatients were included in the study population at Biosensors Medical Diagnostic Wuse II in the Abuja metropolis. Only sixty-five (65) of the 200 outpatients who were selected for the research had bladder ultrasonography appointments. A curvilinear transducer operating at 3.5MHz frequency on a Masmed F5 4D ultrasound machine was utilized in the experiment. 65 healthy, asymptomatic outpatients had their pre- and post-void urine bladder volume and anterior and posterior bladder wall thickness measured. In this research population, ladies were more than the men with thicker bladder walls which was consistent with an increased prevalence of UTIs. There were 8 (12.31%) outpatients with urinary retention in line with BOO, including a man 1 (1.54%) and 7 (10.77%) women. As a result of the severe genital tract colonization, pregnant women are at an increased risk for preterm labor and early membrane rupture. The sonographic prevalence of lower urinary tract infection in Biosensors medical diagnostics Wuse II Abuja was 32.5%, which was highly significant. The age group that were most affected by sonographic lower urinary tract infection were 26-30 years old. In this study population, 12 (18.46%) had ABWTs between 4.51mm and 5.00mm, 12 (18.46%) had ABWTs between 5.01mm and 5.50mm, and 16 (24.62%) had PBWTs between 4.51mm and 5.00mm. Multi-parity, pregnant state, being older, and socioeconomic characteristics are risk factors. In this study there was no statistically significant difference (P>0.05) between anterior and posterior bladder wall thickness as basic requirements in pathophysiologic assessment of lower urinary tract infection during ultrasound process and procedure however there is a statistically significant difference (P<0.05) between pre and post void urinary bladder volume as key parameters in ultrasound assessment of pathophysiologic condition during lower urinary tract infection in clinical investigations.

Conclusion

Lower urinary tract infection affects both males and females. The females were more in the study population with increased bladder wall thickness than males in keeping with lower urinary tract infection in the study population. The number of outpatients with urinary retention in keeping with bladder outlet obstruction (BOO) were 8(12.31%), in which 1(1.54%) was a male and 7 (10.77%) females. The lower urinary tract infection is the symptom of heavy genital tract colonization and hence is associated with high risk for premature rupture of membranes and preterm labor in pregnant women. The ages that were more affected with lower urinary tract infection among outpatients was 26-30 years old, while the sonographic prevalence of lower urinary tract infection in Biosensors medical diagnostics Wuse II Abuja with increased bladder wall thickness was 32.5% which was highly significant. 12(18.46%) had ABWT of between 4.51mm-5.00mm, 12(18.46%) had ABWT between 5.01mm-5.50mm while 16(24.62%) had PBWT of between (4.51mm-5.00mm) in the study population in keeping with LUTI. there was no statistically significant difference (P>0.05) between anterior and posterior bladder wall thickness as basic requirements in pathophysiologic assessment of lower urinary tract infect during ultrasound process and procedure however there is a statistically significant difference (P<0.05) between pre and post void urinary bladder volume as key parameters in ultrasound assessment of pathophysiologic condition during lower urinary tract infection in clinical investigations.

Recommendations

i. There should be early diagnosis and treatment of urinary tract infections during pregnancy to ensure the safety of the mother and the fetus.
ii. All pregnant women should be screened for urinary tract infections and urinary bladder retention using ultrasound processes and procedures.
iii. Bladder ultrasound procedures should be carried out for all outpatients to check for

urinary bladder retention and lower urinary tract infection.

Suggestion for Further Studies

1. The data set should be used for future research in other parts of the country.
2. More studies on sonographic prevalence of lower urinary tract infections should be carry out among outpatients in government hospitals.
3. Studies should also be conducted more on the factors that can pre-dispose patients to lower urinary tract infections in Nigeria.

REFERENCES

1. Ayub, M., Amir, S., Firdous, K., Khan, S., & Iqbal, I. (2018). E.coli the most prevalent causative agent. Urinary Tract Infection in pregnancy: comparative analysis of susceptibility and resistance pattern of antimicrobials. *Arch Clin Microbial.*, 7, 1-4.
2. Lacovelli, V., Gaziev, G., Topazio, L., Bove, P., Vespasiani, G., & Finazzi, A. E. (2017). Nosocomial Urinary tract infections: a review. *Urologia*, 81(4), 222-227.
3. Anon. (2018). Urinary tract infection in women. http://family doctor.org/online/famdocen/home/women/gen-health/190/html.
4. Hanna, S., & Marcin, J. (2018). Urinary tract infections during pregnancy – An updated overview. *Dev. Period Med.*, xx(4), 263-272
5. Australian Prescriber (2020). Assessment and management of lower urinary tract infection in adults. 37(1), 7-9.
6. Ali, M., & Abdallah, M. S. (2019), Prevalence of urinary tract infection among pregnant women in Kano, Northern Nigeria. *Archives of Reproductive Medicine and Sexual Health*, 2(1), 23-29.
7. Odoki, M., Aliero, A. A., Tibyangye, J., Maniga, J. N., Wampande, E., Kato, C. D., Agwu, E., & Bazira, J. (2019). Prevalence of Bacterial Urinary Tract Infections and Associated Factors among Patients Attending Hospitals in Bushenyi District, Uganda. *Hindawi lnternational Journal of Microbiology*, pp 1-8.
8. Ani, O. C., & Mgbechi, E. K. (2018). Prevalence of urinary tract infections (UTI) in sexually active women of Abakaliki, Ebonyi State, Nigeria. *Animal Research lnternational*, 5(2), 876-879.
9. Shin, U. J., Koh, J., Song, J., Park, S., Park, E. J., Kim, C., Kim, S. H., Kang, B. M., & Chae, H. D. (2018). Sonographic evaluation of bladder wall thickness in women with lower urinary tract dysfunction. *Obster. Gynecol. Sci.*, 61(3), 367-373.
10. Eze, B. U., Mbaeri, T. U., & Orakwe, J. C. (2020). Anterior Bladder Wall Thickness, Post-void urine Residue, and Bladder Emptying Efficiency as indicators of Bladder Dysfunction in Nigerian Men with Benign Prostatic Hyperplasia. *Niger of Clin. Pract.*, 23, 1215-1220.
11. Cruz, F., Heesakkers, J., Khullar, V., & Tubaro, A. (2019). Bladder wall thickness in overactive bladder: does it have a role? *Eur. Urol. Suppl.*, 8, 769-771.
12. Idigo, F. U., Agu, C. l., Okeji, M. C., Anakwe, A. C., & Nwogu, U. B. (2017). Sonographic Determination of Urinary Bladder Wall Thickness in a Healthy Nigerian Population. *World J. Med. Sci.*, 14(2), 33-38.
13. Ugwu, A. C., Maduka, B. U., Emeh, E. C., Agbo, J. A., & Oriaku, B. I. (2019). Sonographic Reference Values for Bladder Wall Thickness, Detrusor Wall Thickness, and Bladder Weight in Apparently Healthy Adults in a Nigerian Population. *Journal of Diagnostic Medical Sonography*, 35(1), 40-46.
14. World Health Organization (WHO) (2020). Manual of diagnostic ultrasound. Vol. 2, 3rd ed. WHO Press, Geneva. pp 430.
15. Fady, M., Kamel., Mohammed, K., Magdy, F., & Mansour, M. D. (2022). The Role of the Bladder Wall Thickness in the Evaluation of the Male Lower Urinary Tract Symptoms. *Med. J. Cairo Univ.*, 90(1), 83-89.
16. Chan, T. C., Kan, R. W., Li, T. C., Ng, C. M., Kan, C. F., Kam, Y. C., Hui, P. Y., To, H. C., Ngai, H. Y., & Au, W. H. (2019). The role of bladder wall thickness in the evaluation of male lower urinary tract symptoms. *In BJU International*, 123, 4-4.
17. Mangat, R., Henry, S. S., & Tricia, L.C. (2018). Non-invasive evaluation of lower urinary tract symptoms (LUTS) in men. *Asian Journal of Urology*, 5, 42e47.
18. Adegbehingbe, O. O., Ayoola, O., Soyoye, D., & Adegbehingbe, A. (2022): Urinary bladder wall thickness in type 2 diabetes mellitus patients. *J Ultrason*, 22, e12–e20. doi: 10.15557/JoU.2022.0003.
19. Oguntobi, S. O. (2010). Sonographic measurement of urinary bladder wall thickness in healthy school-aged children in lagos ((FMCR).
20. Patil, S. B., Nilesh, G., Vinay, K., Bhushita, L., & Swapnil, K. (2018). *International Journal of Current Research*, 10(12), 76085-76088. DOI https://doi.org/10.24941/ijcr.33395.12.2018.
21. Janifer, J., Geethalakshmi, S., Satyavani, K., & Viswanatha, V. (2019). Prevalence of lower urinary tract infection in South Indian type 2 diabetic subjects during pregnancy. *Indian Journal of Nephrology*, 19(3), 106-111.
22. Blatt, A. H., Titus, J., & Chan, L. (2018). Ultrasound measurement of bladder wall thickness in the assessment of voiding dysfunction. *J. Urol.*, 179, 2275-8.
23. Park, J., Suh, J., Yoo, S., Cho, M. C., & Son, H. (2020). Bladder wall thickness and detrusor wall thickness can help to predict the bladder outlet obstruction in men over the age of 70 years with symptomatic benign prostatic hyperplasia. *Investigative and clinical urology*, *61*(5), 491.