DOI: https://doi.org/10.54393/pjhs.v3i01.42

PAKISTAN JOURNAL OF Health Sciences
https://thejas.com.pk/index.php/tjas
Volume 3, Issue 1 (Jan - Jun 2022)

Original Article

Sonographic Evaluation of Urinary Bladder Wall Thickness in Healthy Adults

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ARTICLE INFO

Key Words:
Ultrasound, Bladder thickness, Walls of bladder, Body mass index

How to Cite:
Zafar, A., John, A. ., Ali, A. ., Ansar, A. ., & Ashfaq, N. . (2022). Sonographic Evaluation of Urinary Bladder Wall Thickness in Healthy Adults : Urinary Bladder Wall Thickness in Healthy Adults . Pakistan Journal of Health Sciences, 3(01). https://doi.org/10.54393/pjhs.v3i01.42

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Received Date: 12th April, 2022
Acceptance Date: 7th May, 2022
Published Date: 30th June, 2022

ABSTRACT

The urinary bladder is distensible empty viscous with thick muscular walls organ in the pelvis. For normal urination the wall thickness of the bladder should be normal in the range. Objective: To determine urinary bladder wall thickness using ultrasound in normal adults. Methods: It was a cross-sectional study conducted over 4 months from December 2021 to March 2022 in the private sector hospital in Gujranwala, Pakistan. A sample size of 60 was collected using the convenient sampling approach from taking mean of sample sizes of previous related study. Participants with no disease were included after informed consent. Data were analyzed and entered using SPSS version 20.0. Results: The mean age of participants was 33.41 ± 11.9, the mean weight was 75.51 ± 13.9 and height was 171.08 ± 12.5. The mean body mass index was 25.00 ± 3.9. The mean of anterior wall thickness was 2.85 ± 0.405 and posterior wall thickness was 2.86 ± 0.430. Regarding lateral wall thickness, mean right lateral was 2.78 ± 0.464 and left lateral was 2.80 ± 0.430. The participants categorized into normal, overweight and obese showed very slight differences in the mean values of anterior, posterior and lateral wall thickness of bladder. Conclusion: In conclusion, ultrasound is the best modality for measuring the wall thickness of the urinary bladder in both males and females. The age and gender do not affect BWT. A small change is noted in thickness of anterior, posterior and lateral walls of urinary bladder.

INTRODUCTION

The urinary bladder is a strong and distensible empty viscous with thick muscular walls organ in the pelvis. It lies Slightly above and behind the pubic bones [1,2]. The rectum and seminal vesicle are posteriorly adjoined by the bladder, the prostate is inferiorly adjoined by the bladder and the pubis and peritoneum are anteriorly adjoined by the bladder in males. The vagina is positioned posteriorly while the uterus is situated superiorly in females [3]. A pair of kidneys, ureters, urinary bladder and urethra form the urinary system [4]. When the bladder became full with urine it becomes oval shaped organ [5]. A normal bladder can hold a maximum of 2 cups of urine for about 2 to 5 hours in a healthy adult [6]. Its shape varies among different individuals [7]. The urinary bladder has the diameter of a pear when it is in an empty state [8]. It is a temporary place for urine storage [9]. In Bladder's inner surface, the rugae line has numerous folds. when urine fills in the bladder its inner surface extends [10]. The normal capacity of an adult's bladder for holding urine lies typically between 300-600ml [11]. In the course of excretion, the muscles of the bladder normally squash and after that all urine transit from the body through the urethra. The urethra in appearance is a tube [12]. Urethra carries urine after the filtration by the pair of kidneys through the urinary bladder to compare the outside of the body [13]. Normal urethras of men measure 8 inches as compared to women the length of urethras is 1.5 inches [14]. Urinary bladder wall is composed of these various layers, a transitional epithelium cells layer that

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surrounds the interior of the kidneys, ureters, urinary bladder and urethra. The layers of cells in this area are urothelial or transitional cells. Lamina propria usually follows urothelium a kind of connective tissue. Muscularis propria is the most obvious layer of the bladder wall. The outer surface of the urinary bladder is covered by loose connective tissue by retaining distance from the various organs [15]. The bladder wall thickness in normal adult women is 3.0 mm, whereas normal adult men have a thickness of 3.3 +/- 1.1 mm [16]. For normal urination the wall thickness of the bladder should be normal in the range. Various factors can alter the bladder wall thickness such as infection and obstruction of U.B, radiotherapy or urinary calculi etc. [17]. It's thickness increases with age in both genders, while women have lower bladder wall thickness than men [16]. The risk of increase in thickness is most commonly seen in old-age men. For the evaluation of these diseases or any kind of pathology in the urinary bladder or the bladder wall or its neighboring organs in the pelvic area, Pelvic ultrasound is performed which is minimally invasive, cheap and easily available [18,19]. Variables that affects the bladder wall thickness are gender, age difference, height and weight of individuals [20]. Ultrasound is done to evaluate normal and abnormal findings. It is considered as one of the safest and preferable modalities worldwide [21]. It provides benefits of direct patient contact over the cross-sectional imaging technologies. It is cheap as compared to CT and MRI [22]. It can be used by people of any age [23]. study investigated the normal measurements of urinary bladder wall thickness in different age groups of individuals using pelvic ultrasound. This study revolves around the normal wall thickness of the urinary bladder in healthy adults. Normal evaluation can provide a great range of benefits for the future spread of the diseases. Moreover, it can help to keep the individuals aware of their internal functioning of organs.

METHODS

It was a cross-sectional study conducted for 4 months from December 2021 to March 2022 in the private hospital of Gujranwala. A sample size of 60 was collected using convenient sampling approach from the previous related published study [2]. All the participants with normal bladder wall thickness were included after informed consent in this study. Participants with UTI, Kidney diseases, prostate-related abnormalities and lower urinary tract disorders were excluded. A high frequency curvilinear probe was used with ultrasound machine Toshiba with patients in supine, for evaluation of urinary bladder. All the patients were instructed to drink a maximum amount of water and avoid micturition before the scan. Data were analyzed and entered using SPSS version 20.0.

RESULTS

The current study included 60 patients to evaluate the normal thickness of the urinary bladder wall. Table 1 shows that males 33(55%) are more prior to have a difference in bladder wall thickness than females 27(45%). More commonly adults have a difference of 35(58%) and in older people is 10(16.7%) in bladder wall thickness.

Gender	Frequency	Percent
Male	33	55.0
Female	27	45.0
Total	60	100.0

Table 1: The frequency distribution of gender

Table 2 shows age groups of participants age groups are 20-30years having frequency 35(58.3%),31-40years as 10(16.7%),41-50years as 6(10.0%),51-60years as 9(15.0%).

Age group	Frequency	Percent
20-30	35	58.3
31-40	10	16.7
41-50	6	10.0
51-60	9	15.0
Total	60	100.0

Table 2: Age group of Participants

Table 3 shows that the mean age of participants was 33.41± 11.9. The mean weight was 75.51 ± 13.9. The mean height was 171.08 ±12.5. The mean body mass index was 25.00 ±3.9. The mean anterior wall thickness was 2.85 ±0.405. The mean posterior wall thickness was 2.86 ±0.430. The mean right lateral wall thickness was 2.78 ±0.464. The mean left lateral wall thickness was 2.80 ±0.430.

Descriptive Statistics	N	Lowest	Highest	Mean±SD
Age of Participants	60	20.00	60.00	33.42±11.9
Weight in Kg	60	52.00	105.00	75.52±13.9
Height in cm	60	149.35	201.17	171.08±12.6
Body Mass Index	60	17.90	36.30	25.01±3.9
Anterior wall thickness	60	2.00	3.40	2.858±0.41
Posterior wall thickness	60	2.00	3.50	2.86±0.43
Right lateral wall thickness	60	2.00	3.50	2.78±0.46
Left lateral wall thickness	60	2.00	3.40	2.81±0.43

Table 3: Descriptive statistics, BMI, bladder wall, Weight, and Height

Table 4 shows that mean of normal anterior wall thickness was 2.8923 ±0.40686, the mean of normal posterior wall thickness was 2.9000 ±0.42332, the mean of normal right lateral wall thickness was 2.9231 ±0.43571 and the mean of normal left lateral wall thickness was 2.8692 ±0.41930. The mean of overweight anterior wall thickness was 2.8393 ±0.41127, the mean of overweight posterior wall thickness was 2.8571 ±0.41135, the mean of overweight right lateral wall thickness was 2.6750 ±0.48582, and the mean of overweight left lateral wall thickness was 2.7643 ±0.45478. The mean of obese anterior wall thickness was 2.8000 ±0.42895, the mean of obese posterior wall thickness was 2.7000 ±0.58310, the mean of obese right lateral wall thickness was 2.6667 ±0.37238 and the mean of obese left

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lateral wall thickness was 2.7333 ±0.39833.

BMI		Thickness of Anterior wall	Thickness of Posterior wall	Thickness of Rt. Lateral wall	Thickness of Lt. Lateral wall
Normal	Mean±SD	2.89±0.41	2.91±0.42	2.92±0.43	2.86±0.42
	N	26	26	26	26
Overweight	Mean	2.84±0.41	2.8571±0.41	2.6750±0.48	2.7643±0.45
	N	28	28	28	28
Obese	Mean	2.8000±0.43	2.7000±0.58	2.6667±0.38	2.7333±0.39
	N	6	6	6	6
Total	Mean	2.8583±0.41	2.8600±0.43	2.7817±0.46	2.8067±0.43
	N	60	60	60	60

Table 4: Urinary bladder wall measurements in different BMI

DISCUSSION

In the current study total number of patients 60 was enrolled to evaluate urinary bladder wall thickness using ultrasonography. The age of patients ranged from 20 to 60 years. In patients with bladder outlet blockage and other voiding disorders, ultrasound assessment of bladder wall thickness has been considered a valuable diagnostic tool. The current study investigated the normal measurements of urinary bladder wall thickness in different age groups of individuals using pelvic ultrasound. Normal evaluation provides a great range of benefits for the future spread of the diseases. It helps to keep the individuals aware of their internal functioning of organs. A similar study was conducted by Elmardi 2020 [2]. He concluded that the anterior, posterior, and lateral wall thickness of the urinary bladder is around 2 to 4 mm similar to my study in which the thickness of the wall is between 2 to 3mm. His study also concluded that BMI affects urinary bladder wall thickness significantly. In current study, the mean weight was 75.51 ± 13.9. The mean height was 171.08 ±12.5. The mean body mass index was 25.00 ±3.9. A study was also done by Ugwu et al in 2018 in which he considered 384 participants showed similar results. The mean of their weight, height, and BMI were 76.0 ± 1.0, 170 ± 1.1 and 27.0 ± 8.0, respectively. They concluded that there are no significant differences in wall thicknesses of the urinary bladder as concluded y my study. In current study, males 33(55%) are more prior to have a difference in bladder wall thickness than females 27(45%)[7]. A study was done by Sidi et al, on 10 august 2021 that aim at evaluating the bladder wall thickness among apparently healthy adults in Kano metropolis, Nigeria using ultrasound. They concluded in his study that the urinary bladder wall thickness can be different at a mild level between males and females[23].

CONCLUSION

The current study concluded that, ultrasound is the best imaging modality for measuring the wall thickness of the urinary bladder. It is a safe, non-invasive, and easily available tool. Age has no significant effect on BWT while gender affects BWT to some extent. A small change was noted in A.W.T, P.W.T., and L.W.T. in all participants

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