FUNCTIONAL DISORDER AND CHANGES IN UROLOGICAL SYSTEM: PROBLEM AND MANAGEMENT THEREOF

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Article Info :

Received : 21-12-2022

Revised : 26-01-2023

Accepted: 04-02-2023

ABSTRACT

The primary role of the urinary system is to ensure that bodily fluid occur in both volume and composition within normal ranges. It is frequently referred to as the renal system since one component of this role is to cleanse the body of waste products that gather as a result of cellular metabolism. Age-related alterations in glomerular basement membrane thickness, tubulointerstitial modifications, variations in the total nephron size and number, and elevated glomerulosclerosis are all observed. The urothelium is a transitional epithelium with the luminal surface comprised of a unique layer of umbrella cells. The kidneys produce the urine and are responsible for the other urinary system activities. Urinary bladder serves as a temporary urine storage and is reached by the ureters. Interstitial cystitis/bladder pain syndrome (IC/BPS) is a collection of symptoms with pain as its overarching symptom.

Keywords: Urinary System, Interstitial Cystitis, Urothelium, Renal System.

INTRODUCTION

Diseases of the male and female urinary tract are treated by the medical specialty of urology (kidneys, ureters, bladder and urethra) [1]. The primary role of the urinary system is to ensure that bodily fluid occur in both volume and composition within normal ranges. It is frequently referred to as the renal system since one component of this role is to cleanse the body of waste products that gather as a result of cellular metabolism. By managing the amount of water discharged in the urine, the urinary system ensures the proper fluid volume. Controlling the levels of different electrolytes in body fluids and preserving a proper pH in the blood are two other facets of its function. The urinary system regulates red blood cell synthesis by secreting the hormone erythropoietin, which also helps to maintain fluid equilibrium in the body. By secreting the enzyme renin, the excretory system also helps to maintain appropriate blood pressure. The body's drainage mechanism for eliminating wastes and surplus fluid from urine is the urinary tract. All of the body parts in the urinary system must cooperate and move in the right order for proper urination to take place [2]. The kidneys, ureters, urinary bladder, and urethra make up the urinary system. The body's drainage system for getting rid of wastes and surplus fluid is called the urinary tract. The urinary tract's body parts must cooperate and function in the right order for proper urination to take place [3]. The kidneys produce the urine and are responsible for the other urinary system activities. Urinary bladder serves as a temporary urine storage and is reached by the ureters, which transport urine from the bladder. The urethra is a tubular organ that connects the urinary bladder to the exterior of the body to transport urine [2]. Numerous

changes occur all through genitourinary tract as individual's age. Figure 1 comprising the functional disorder and changes in urological system

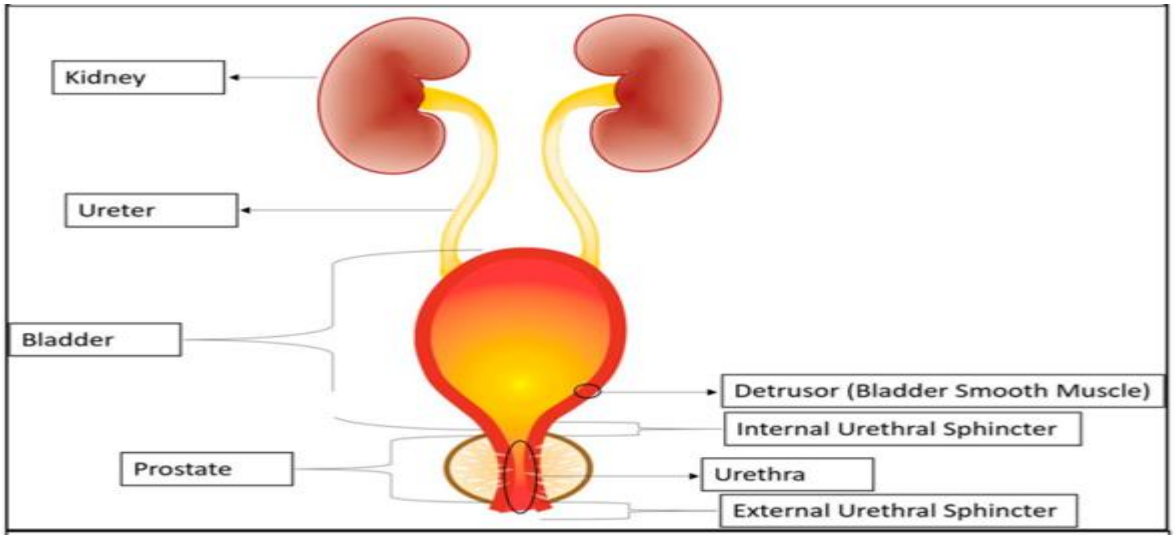

Figure 1: Functional disorder and changes in urological system (Diagram adapted and recreated form the Peterson NT, Vezina CM. Male Lower Urinary Tract Dysfunction: An Underrepresented Endpoint in Toxicology Research. Toxics. 2022 Feb 16;10(2):89., under the open access creative common CC BY licenses)

Ageing-Related Alterations in The Kidneys

Age-related alterations in glomerular basement membrane thickness, tubulointerstitial modifications, variations in the total nephron size and number, and elevated glomerulosclerosis are all observed [4]. Nephrosclerosis, the term used to characterised this age-related histologic appearance, is usually used to denote a combination of two or more histologic characteristics, including any global glomerulosclerosis, tubular atrophy, interstitial fibrosis >5%, and any arteriosclerosis [3, 4]. The weight of the kidneys gradually decreases as people get older. Nearly two-thirds of persons (even those without renal disease) experience a steady reduction in the rate at which their kidneys filter blood beyond the ages of 30 to 40. The rate does not alter in the remaining one-third of elderly individuals, indicating that factors outside age may have an impact on renal function [4].

The arteries that nourish the kidneys narrow with advancing age. Kidney size may reduce because the restricted arteries may no longer be able to supply adequate blood for normal-sized kidneys. Additionally, the function of the remaining glomeruli is diminished as a result of the thickening of the walls of the tiny arteries that flow into them. Along with these losses, the nephrons' capacity to excrete waste materials and many medications declines, and they become unable to concentrate or dilute urine or eliminate acid. However, enough kidney function is still retained to support the body's needs regardless age-related alterations. Age-related changes don't necessarily lead to disease, but they do lessen the percentage of reserve kidney function that is still present. That is to say, in order to perform all of the usual kidney tasks, both kidneys may need to operate at close to their maximum capacity [5].

Ageing Related Alteration in The Ureters

Age-related changes to the bladder and urethra are more noticeable than those to the ureters. The bladder's maximum storage capacity for urine reduces. Delaying urine after initially feeling the desire to urinate gets harder as time goes on. Urinary flow from the bladder into the urethra slows down. The majority of these contractions are suppressed by spinal cord and brain regulation in younger people, but as people age, they become more common, occasionally leading to episodes of urine incontinence. As a result, individuals might need to pass urine more often and run a greater risk of getting urinary tract infections [6].

Ageing Related Alteration in The Urethra

The urethra in women shrinks and develops a thinner lining. The urinary sphincter's capacity to contract tightly is decreased as a result of these urethral alterations, which raises the risk of urine incontinence. As a woman enters

menopause, her estrogen levels appear to decline, which appears to be the cause of these changes in her urethra [7].

Ageing Related Alteration in The Prostate Gland

With time, men's prostate glands enlarge and gradually obstruct the flow of urine. If left untreated, a blockage could progress to a virtually or fully blocked state, leading to urine retention and possibly kidney injury [8].

Functional Disorders and Diseases

The urothelium is a transitional epithelium with the luminal surface comprised of a unique layer of umbrella cells. Uroplakins and a hydrophilic mucin layer formed of glycosaminoglycans are present on the surface of these umbrella cells [9].

Overactive Bladder Syndrome

The presence of "urinary urgency, usually accompanied by frequency, nocturia, with or without urgency urinary incontinence, in the absence of obvious pathology" is what the International Continence Society (ICS) defines as having an overactive bladder (OAB), which is a very common benign urologic condition [6]. OAB is thought to affect 7 to 43% of people, and its related urinary symptoms have a significant negative influence on patients' quality of life [10].

Interstitial Cystitis/Bladder Pain Syndrome

Interstitial cystitis/Bladder Pain Syndrome (IC/BPS) is a collection of symptoms with pain as its overarching symptom. Most typically, IC/BPS sufferers feel pain when filling their bladders, however levator spasm, perineal discomfort, and extra-genitourinary pain are not unheard of either [11, 12]. The definition of IC/BPS according to the Society of Urodynamics, Female Pelvic Medicine & Urogenital Reconstruction is an uncomfortable sensation (pain, pressure, and discomfort) considered to be related to the urinary bladder, associated with lower urinary tract symptoms of longer than six weeks duration, in the absence of infection or other identifiable causes [13]. In comparison to males, who are predicted to have a prevalence of 2.9-4.2%, women are expected to have a prevalence of 2.7-6.5% for IC/BPS [14, 15]. Like OAB, IC/BPS is a distressing syndrome for patients and clinicians because it is a chronic pain illness that is challenging to treat and has a wide range of patient presentations. It also significantly lowers patient quality of life [16].

Urinary Tract Infection

UTIs are a major healthcare burden that can range from a straightforward bladder infection in young, healthy women to the catastrophic and sometimes deadly condition urosepsis in vulnerable groups. Additionally, the widespread use of urinary catheters makes it more difficult to administer drugs effectively in cases of catheter-associated urinary tract infections (CAUTIs), as a result of the entry of a foreign object, the development of crystals, and the growth of bacterial biofilms [17].

Urologic Malignancy

Millions of individuals throughout the world are affected by urologic malignancies, which are among the top 10 cancers diagnosed in both men and women. In the United States, prostate carcinoma is the second most prevalent cancer diagnosed in males, followed by kidney cancer in sixth place and bladder cancer in ninth place for both sexes [18].

Nocturia

Nocturia is the complaint that a person must rise up during the night, often more than once, to urinate, with each void being preceded and accompanied by sleep or the intention of sleep. Nocturnal enuresis is the medical word for when a person has to urinate while they are asleep [19]. Nocturia is a prevalent disorder that affects older people more frequently. Around 60% of persons aged 50 to 59 have nocturia, compared to 72% of women and 91% of males over 80 [20]. Nocturia is frequently uncomfortable, and disrupted sleep patterns, lower sleep quantity, or poor sleep quality are linked to a poorer quality of life [21, 22].

Hydronephrosis

In infants, hydronephrosis is the swelling or dilatation of the renal pelvis, which is the basin where urine collects in the middle of the kidney. One kidney or both may develop hydronephrosis. This issue is frequently identified during a prenatal ultrasound before delivery.

In some circumstances, minor forms of hydronephrosis resolve on their own without medical intervention. In other circumstances, hydronephrosis could be an indication that the urinary system is blocked or that urine is backing up from the bladder into the kidney and has to be treated [23].

Kidney Stones

When there are excessive concentrations of particular minerals in your urine, kidney stones—solid, pebble-like pieces of material—can develop in one or both of your kidneys. Whenever kidney stones are handled by a medical specialist, they seldom result in permanent harm [24].

Acute Urinary Retention

Urinary incontinence that occurs suddenly is referred to as acute urinary retention. It will frequently come as a surprise, typically be inconvenient, and almost always hurt. A man's likelihood of experiencing acute urine retention is extremely high if he lives a long enough life. Within the next five years, acute urinary retention will affect more than one in ten men in their 70s. Nearly one in three men in their 80s are at risk [25].

Glomerular Hematuria

Acute and chronic glomerulonephritides, as well as genetic abnormalities, are subcategories of glomerular hematuria, which is caused by a disturbance of the composition and architecture of the basement membrane [26].

Acute Glomerulonephritides

Patients with post streptococcal glomerulonephritis (PSGN), also known as acute post infectious glomerulonephritis, may appear with an initial onset of edoema or tea-colored urine (gross hematuria), which is consistent with glomerular haemorrhage, albeit the hematuria may only be microscopic. Frequently, there is a history of an earlier sickness or impetigo that occurred one to three weeks before and from which the kid has almost completely recovered [27].

Henoch-Schanlein Purpura

Urinalysis should be performed on children suspected of having Henoch-Schonlein purpura (HSP) in order to determine the degree of renal involvement. The renal symptoms of HSP include acute kidney failure, nephrotic syndrome, active glomerulonephritis, high blood pressure, and also no participation. Although often temporary, hematuria and proteinuria can last for several months [28-30].

Rapidly Progressive Glomerulonephritis

Although uncommon, rapidly progressing glomerular nephritis (RPGN) is one of the few paediatric nephrology crises. Signs and symptoms of rapidly progressing glomerulonephritis resemble those of post streptococcal glomerulonephritis. Renal function tests reveal renal insufficiency, which justifies sending a child right away to see a paediatric nephrologist [31-35].

CONCLUSION

Numerous changes occur all through genitourinary tract as individual’s person and according to their age and different diseases and discussed and aged related alternation in ureters and urethra& and functional disorders and diseases related to urology system like OAB, IC/BPS etc. was discussed and their effect in urology system. Because of these correlations with urologic illnesses, it is crucial that to be aware of these problems.

ACKNOWLEDGMENTS

We, thank you to the R.C. Patel Institute of Pharmaceutical Education and Research Shirpur, Maharashtra, India, and METs, Institute of Pharmacy, Adgoan, Nashik, MH, India, for their constant support and providing all facilities to complete this work.

Author contributions

NC, PK and MG wrote and revised the first draft. English editing was done by PS, and proofreading and editing of final draft was performed by EDA and RKK, all authors are agreed the final version and submitted the article.

Ethics approval and consent to participate

Not applicable.

Funding

Nil

Conflicts of interest

None

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