

Extent of relationship between vitamin D deficiency and urinary tract infections

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Abstract: The study aimed to evaluate the relationship of vitamin D deficiency with urinary tract infections. One hundred and eighteen urine samples were collected from patients suffering from urinary tract infections (UTI) (46 males and 72 females) with different ages (20 to 70 years). The samples were collected from different Kirkuk hospitals during the period from October 2021 to December 2021.

Different bacterial species were characterized, *E.coli* was the most predominant bacteria included 51 (43.2%) ((19 (41.3%) in males and 32(44.4%) in females)), followed by Klebisella spp.29 (24.5%) ((11 (23.9%)in males and 18 (25%) in females)). While *Pseudomonas aeruginosa* was isolated from 14(11.8%) ((5 (10.8%)in males and 9(12.5%) in females)), and *Proteus* was recorded in 14 (11.8%) (6 (13%)in males and 8 (11.1%) in females)), *Staphylococcus aureus* 6 (5%) ((3 (6.5%) in males and in females 3 (4.1%)). *Enterococcus* bacteria was the lowest bacteria isolated from UTI patients 4 (3.3%) ((2 (4.3%) in males while in females was 2 (2.7%)). The results also showed that people with urinary tract infections were mostly vitamin D deficient in both sexes, (37.80.4%) of patients lacked vitamin D compared to normal people 9(19.5 %) and 8(11.1%).

Keywords: Urinary tract infections, Vitamin D, role of Vit D in bacterial infections

Introduction

The urinary system, which consists of the kidneys, ureters, bladder, and urethra, is one of the important organs in the human body, as it plays a significant role in purifying the blood from harmful and surplus substances that the body needs. Urination is a good indicator of the normal or pathophysiological state of the human body [1]. Urinary tract infection is one of the health problems that affect a large proportion of members of human society [2]. Bacteria are the main cause of many cases of urinary tract infection [3], and Gram-negative bacteria has a major role in UTI, especially *E. coli* bacteria in the main, as well as other species, but in lower rates [4] and these infections may be accompanied or not with clinical symptoms, and in some causes the infection might progress to reach the kidneys and cause kidney failure when the treatment is neglected [5]. Most of UTI occurred by ascending of bacteria to the upper parts of urinary system, as bacteria inhabit the vagina and the area around the urethra can reach the bladder and then continue their way to infect the kidneys [6].

Vitamin D is one of the fat-soluble vitamins that are stored in the body [5] and the only vitamin that the body can synthesize naturally when the skin is directly exposed to sunlight. This vitamin can also get from diet such as Milk, eggs, fish, etc. as well as from vitamin D supplements [7, 8]. Vitamin D is essential for human body, and plays a crucial role in calcium and phosphorus absorption, supporting immune system functions, fighting illness and many other functions. Therefore, lacking of vitamin D causes various diseases, including rickets, heart disease, bacterial infections as well as weakness in the immune system [9].

Materials and Methods

118 urine samples were collected from patients suffering from urinary tract infections, and their ages ranged from 20-70 years and from both sexes (46 males and 72 females). The samples were collected from patients visiting different private laboratory centers in Kirkuk city with taking into account the non-use of antibiotics by patients within 72 hours prior to sampling. Simultaneously, blood samples were also taken from patients in order to test their vitamin D levels as shown in Table (1).

Table 1: Urine & blood samples taken from UTI patients (Males & females)

| Sex | No: | % |
|--------|-----|------|
| Male | 46 | 38.9 |
| Female | 72 | 61 |
| Total | 118 | %100 |

Midstream specimen of urine (MSU) was collected from patients in a special sterile container after washing the external organs of urinary system [10]. The urine sample was divided into two portions, the first part was used for General Urine Examination (GUE) and the second portion for bacterial culture. Different culture media such as MacConkey agar, Blood agar and Nutrient agar was used for bacterial inoculation. The plates were then incubated at 37°C for 24 hours. After the incubation, the bacterial colonies presented on the culture media were identified based on morphological and biochemical tests using accurate scientific diagnostic methods. API 20E was also used for confirmatory diagnosis according to what was stated in the diagnostic systems [10, 11].

On the other hand, blood samples were also taken from the same patients in order to examine their vitamin D level. Two milliliter of blood was collected from each individual, and vitamin D test was conducted according to I CHROMA II kit by following manufactures instructions.

Results and discussion

The results showed the clear diversity in the causes of UTI in infected persons of both sexes. *E.coli* bacteria recorded the highest infection rate (43.2%), followed by Klebsiella bacteria , *P. aeruginosa*, then Proteus spp., while *S.aureus* and Enterococcus isolates represented the lowest percentage as shown in Table (2). This result is close to [12]. The high percentage of bacterial UTI is more likely due to lack of Health awareness or attention to personal hygiene, as well as weak immunity which play a major role in bacterial infections.

Table 2: Percentages of bacterial species in UTI

| Bacteria | Male | % | Female | % | Total | % |
|----------------------|------|------|--------|------|-------|------|
| <i>E.coli</i> | 19 | 41.3 | 32 | 44.4 | 51 | 43.2 |
| <i>Klebsiella</i> | 11 | 23.9 | 18 | 25.0 | 29 | 24.5 |
| <i>P. aeruginosa</i> | 5 | 10.8 | 9 | 12.5 | 14 | 11.8 |
| <i>Proteus</i> | 6 | 13.0 | 8 | 11.1 | 14 | 11.8 |
| <i>S. aureus</i> | 3 | 6.5 | 3 | 4.1 | 6 | 5.0 |
| <i>Enterococcus</i> | 2 | 4.3 | 2 | 2.7 | 4 | 3.3 |
| Total | 46 | 100 | 72 | 100 | 118 | 100 |

The results of vitamin D ratio test showed that most of UTI patients suffer from vitamin D deficiency for both sexes, and the percentage of deficiency among men was 37 (80.4) and the percentage of normal people was 9 (19.5), while for females the percentage of vitamin D deficiency was 64 (88.8) the normal percentage for women was 8 (11.1), as shown in Table (3). The reason of vitamin D deficiency might be poor nutrition or lack of exposure to sunlight, and usually associated with weakness of immune system and increase susceptibility to infection including urinary tract infection.

Table 3: Percentages of normal and vitamin D deficiency in UTI patients

| Sex | deficiency | % | Normal | % | Total | % |
|--------|------------|------|--------|------|-------|------|
| Male | 37 | 80.4 | 9 | 19.5 | 46 | %100 |
| Female | 64 | 88.8 | 8 | 11.1 | 72 | %100 |
| Total | 101 | 85.5 | 17 | 14.4 | 118 | %100 |

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