Asymptomatic Bacteriuria In Patients With Diabetes Mellitus

Thesis

Submitted For Partial Fulfillment of The
M.D. Degree In **Microbiology and Immunology**

By

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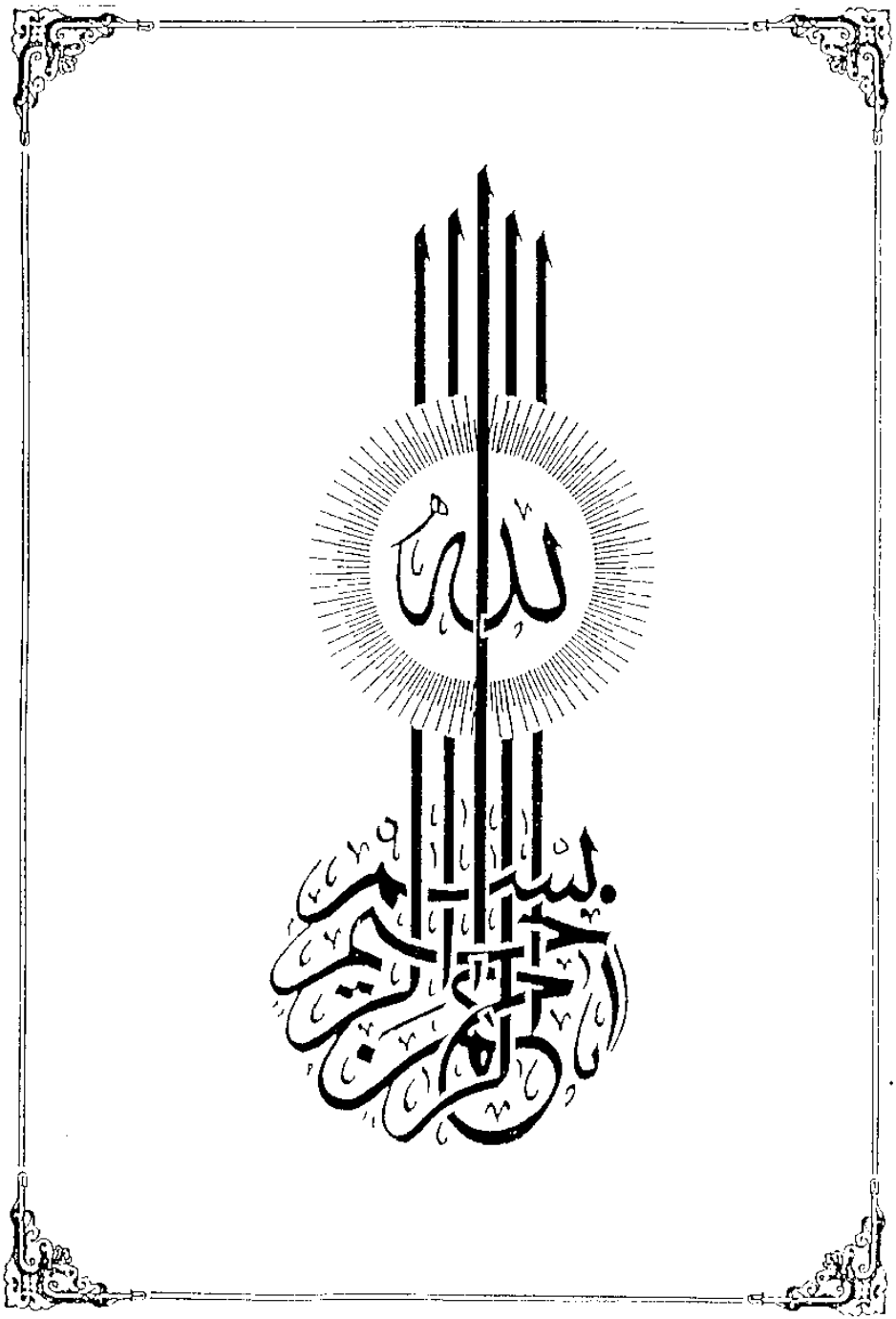
بسم الله الرحمن الرحيم

سُبْحَانَكَ لَا عِلْمَ لَنَا إِلَّا مَا عَلَّمْتَنَا

إِنَّكَ أَنْتَ الْعَلِيمُ الْحَكِيمُ

سورة البقرة - آية ٣٢



ACKNOWLEDGEMENT

THANKS GOD

WHO ALLOWED AND HELPED ME ACCOMPLISHING THIS WORK

I wish to express my sincere gratitude and indebtedness to Prof. Dr. Abla Abdel Salam Haroun, Chairman of Microbiology and Immunology Department, Ain Shams University, for her valuable help, constant support, the skilful guidance, generous participation and continuous encouragement all through this work.

I would like to convey my appreciation to Dr. Mouchira Fayek Helmy, Assistant Professor of Microbiology and Immunology Department, Ain Shams University, for her close supervision, kind care, unfailing tender advice and valuable suggestions and continuous encouragement.

Also, I am greatly indebted to Dr. Amany Mostafa Kamal, Lecturer of Microbiology and Immunology Department, Ain Shams University, for her precious guidance, valuable suggestions and continuous encouragement.

My sincere thanks are to Professor Dr. Hussin El Damasy, Professor of Internal Medicine, Ain Shams University, for his helpful collaboration and valuable instructions which were of utmost importance.

Finally I would like to thanks Dr. Mona Omar Abbas, Lecturer of Microbiology and Immunology, Ain Shams Univ. for her generous co-operation, and every one who helped me throughout this work.

Amany Tharwat.

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INTRODUCTION AND AIM OF THE WORK

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The urinary tract is a frequent site of infection in diabetic patients. Suggested mechanisms for the greater susceptibility of the diabetic ..ary tract to infection include decreased antibacterial activity of the urine as a result of dilution of inhibitory substances such as urea, defects in polymorphonuclear leukocyte function or cellular immunity, and increased adhesive capacity of bladder epithelial cells (Obana and Nishino, 1989).

Poor control of blood glucose level, diabetic neuropathy with neurogenic bladder, impairment of leukocyte function as a result of hyperglycemia, frequent instrumentation of the urinary tract, and diabetic microangiopathy are risk factors for asymptomatic bacteriuria in diabetic patients (Beyer, 1984).

Microorganisms causing asymptomatic bacteriuria in diabetic patients are similar to those causing bacteriuria in non diabetic individuals (Korzeniowski, 1991). The majority of infections (~75%) are caused by Escherichia coli. However, other bacteria, including Proteus species, Klebsiella species, Enterobacter species, and Enterococcus faecalis, are frequently cultured (Zhanel et al., 1991). Rare infecting

organisms include Streptococcus agalactiae, Streptococcus milleri, other Streptococci, anaerobic streptococci and Gardnerella vaginalis can cause asymptomatic bacteriuria in diabetics (Collins et al., 1986).

Localization of urinary tract infection was most accomplished by direct methods such as urethral catheterization or bladder-washout technique. These methods are time consuming, uncomfortable to the patient and are associated with potential risks of instrumentation (Thomas et al., 1974).

An immunological approach was described by Thomas et al.(1974) dependent on the demonstration of specific antibody against the infecting bacteria in the patient's urine by indirect serologic methods. Using immunofluorescence as a mean of visualizing antibody complexes with bacteria in the urine.

AIM OF THE WORK

The aim of this work is to determine the rate of asymptomatic bacteriuria in diabetic patients, to isolate and identify the causative organisms from urine of these cases, and to apply a simple, reliable, and risk-free technique for localization of urinary tract infection.

REVIEW OF LITERATURE

URINARY-TRACT INFECTIONS

A. HISTORICAL REVIEW

The ninth century Arabic physician Alrhazi is credited by Asscher (1980) for the initial diagnosis of pyelonephritis in a patient from Baghdad with a febrile illness and necrotizing papillitis.

Pasteur (1863) recognized urine as a good culture medium for bacteria, and Roberts (1881) related the presence of bacteria in the urine to symptoms. In (1894), Escherichin cultured "bacillus coli" in the urine of children with UTI (Asscher, 1980).

Very little progress was made in exploring the relationship between the presence of bacteria in the urine and symptoms until quantitative assessments of bacterial number in the urine of patients with urinary tract infection were carried out by Marple (1941), Barr and Rantz (1948) and Sanford et al.(1956).

Also, Kass in (1955, 1956 and 1957) published systemic analyses of bacterial count of urine, in order to establish reliable criteria for separating contamination from infection. He defined that when urine contained over 100,000 bacteria/ml this could be regarded as true or significant bacteriuria. Most patients with clinical infection had count of 100,000 organisms/ml but even when there were no symptoms, a few

patients had bacterial count of this magnitude. Thus the concept of symptomless bacteriuria was established. Its association with the development of clinical infection and renal damage is well recognized. Initial reports (Kunin, 1966; Kunin and McCormick, 1968; Asscher et al.,1969) suggested that symptomless bacteriuria was linked to significant long-term morbidity. But it is accepted that spontaneous remission or cure is the commonest outcome and complications occur only under certain conditions.

Despite the vast wealth of published literature on UTI, the wide range of available investigative procedures, diagnostic aids and the therapeutic possibilities, the basic reason why asymptomatic infections are so common, particularly in women, still remains to be elucidated (Leigh, 1990).

B. DEFINITIONS IN URINARY-TRACT INFECTION

Urinary tract infection (UTI) refers to microbial colonization of the urine and tissue invasion of any structure of the urinary tract. Bacteria are most commonly responsible, although fungi and viruses may produce urinary infections. UTI may be relatively mild, such as the "honeymoon cystitis" syndrome or catastrophic such as a perinephric abscess in diabetics (Anderiole, 1988).

Bacteriuria is a frequently used term and literally means bacteria in the urine. The probability of the presence of infected urine in the bladder can be ascertained by means of quantitating numbers of bacteria in voided urine and in urine obtained via urethral catheterization (Sobel and Kaye, 1989).

Significant bacteriuria is a term that used to describe the number of bacteria in voided urine that exceed the number due to contamination from anterior urethra (i.e, $>10^5$ bacteria/ml urine). The implication is that in the presence of $>10^5$ bacteria/ml, infection must be seriously considered (Sobel and Kaye, 1989).

Although more than 10^5 organisms /ml are considered to be indicative of UTI, infection may also be present with lower colony count. In men with urinary symptoms, count of < 100,000 organisms/ml should not be considered insignificant: true infection may be found with counts as low as 150 organisms /ml (Stamey et al., 1965). If the culture demonstrates between 10^4 and 10^5 organisms/ml Barry and coworkers (1975) recommended reporting the number of bacteria per milliliter of urine and identifying a single organism or a single predominating organism. Stamm et al. (1980, 1982) also suggested that a low count of coliform bacteria (<100 organisms/ml) should always be considered significant in women with symptoms, particularly when there is pyuria.

In most cases, significant bacteriuria is due to single bacterial strain. The presence of more than one species usually indicates urethral or perineal contamination. Multiple strains may, however, become established in patients with indwelling urethral catheters. Infections associated with the urethra, para urethral glands and kidney may be polymicrobial and may include anaerobic or fastidious organisms (leigh, 1990).

C. AGE AND SEX DISTRIBUTION OF URINARY TRACT INFECTION

The incidence of bacteriuria in infants up to 6 months is about 2 cases per 10000 live births and is much more common in boys secondary to an increased incidence of urogenital congenital anomalies in males (McCracken, 1987).

During the preschool years, urinary tract infection is more common in girls than boys. The prevalence of significant bacteriuria in this age group is 4.5% for girls and about 0.5% for boys. Infection during this period often are symptomatic (Randolph and Greenfield, 1964).

Among school girls, Kunin (1970) and Gillenwater et al. (1979) reported that bacteriuria is common, often asymptomatic and frequently recurs with a prevalence rate 1.2%. Bacteriuria is rare in school boys (Prevalence: 0.03%).

Once adulthood is reached the prevalence of bacteriuria increases in the female population. At least 10-20% of the female population experience asymptomatic urinary tract infection at some time during their life. Both sexual intercourse and pregnancy are risk factors for UTI in women (Sobel and Kaye, 1989).

Pregnant women are predisposed to develop renal infection. This is probably as a result of dilatation of the ureters and pelvis of the kidney secondary to pregnancy-related hormonal alteration. Pyelonephritis is associated with increased risk of preeclampsia, foetal mortality, congenital defects and prematurity (Montgomerie, 1989).

The prevalence of bacteriuria in adult men is low (0.1% or less) until the later years, it rises. At least 10 % of men and 20% of women over 65 years have bacteriuria. In both sexes the prevalence of bacteriuria rises substantially with age due to obstructive uropathy from the prostate and loss of bactericidal activity of prostatic secretion in men, poor emptying of the bladder due to prolapse of uterus in women, neuromuscular diseases, increase instrumentation and bladder catheter usage in both sexes (Sobel and Kaye, 1989).

D. CLINICAL PRESENTATION OF UTI

Urinary tract infection is often categorized by the site of infection. However, it is often not possible to diagnose the various types of infections

on clinical ground alone. Andriole (1988) classified urinary tract infection into:

1. Uncomplicated Urinary Tract Infection

It is the infection of the bladder or kidney occurring in a normal host without structural or functional abnormality of the urinary tract. Uncomplicated infections include cystitis, pyelonephritis, asymptomatic bacteriuria, Symptomatic abacteriuria (acute urethral syndrome) and renal carbuncle.

a. Cystitis. It is a symptomatic infection of the urinary bladder. The term cystitis was used to describe the syndrome involving dysuria, frequency, urgency and occasionally suprapubic tenderness. However, these symptoms may be related to lower tract inflammation without bacterial infection and can be caused by urethritis. Furthermore, the presence of symptoms of lower tract infection without upper tract symptoms does not exclude upper tract infection, which is also often present (Sobel and Kaye, 1989). Uncomplicated cystitis did not cause permanent injury to the urethra or bladder. However, its major significance lies in the possibility of spread of infection upward to the kidneys (Ronald and Pattullo, 1991).

b. Acute pyelonephritis. It is an inflammatory disease of microbial aetiology that involves both the parenchyma and the pelvis of