THESIS SUBMITTED FOR PARTIAL FULFILLMENT

OF

THE MASTER DEGREE OF UROLOGY.

SUBJECT

URINARY TRACT INFECTIONS IN INFANTS AND CHILDREN.

BY

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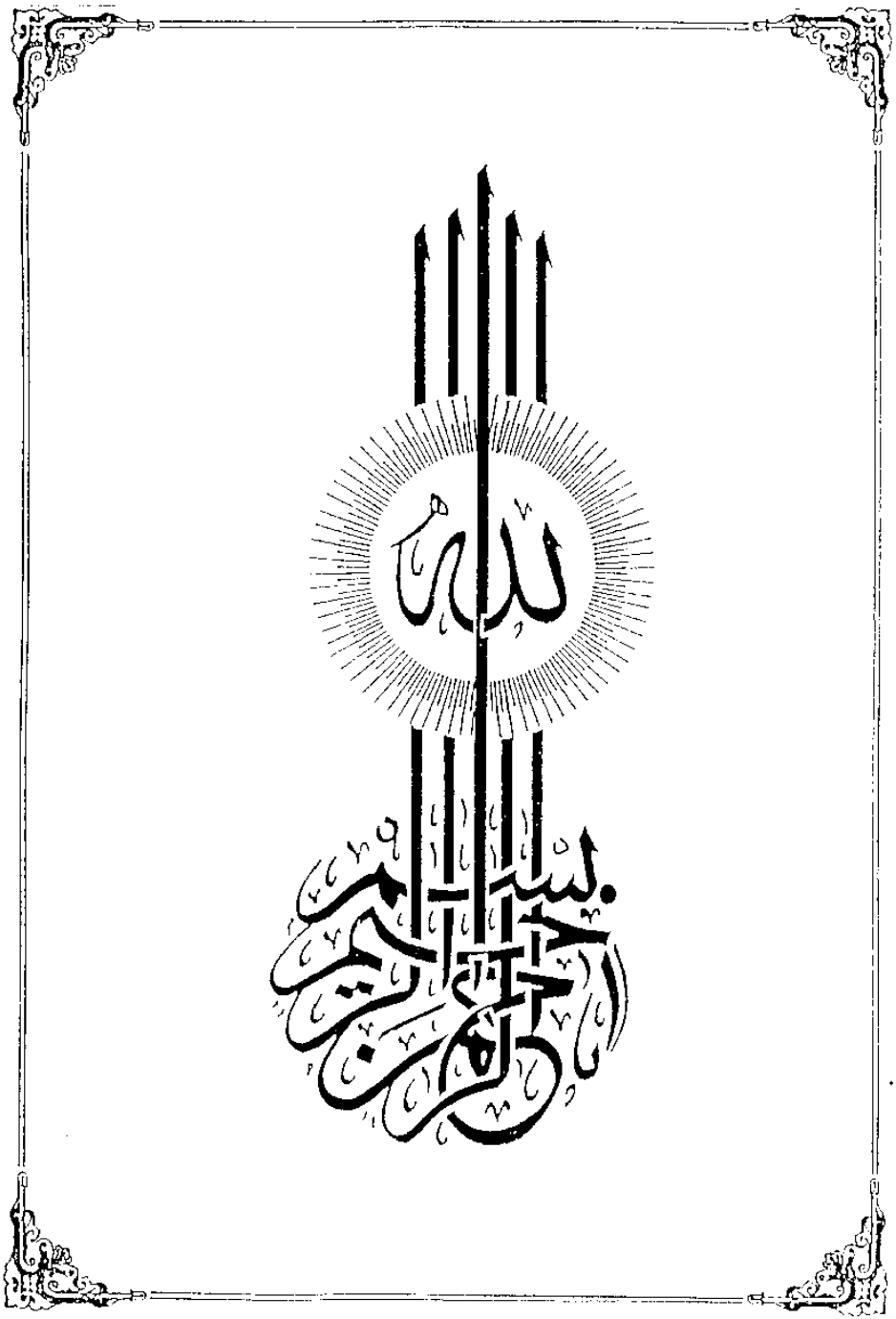

TO

MY PARENTS

AND

MY WIFE.

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INTRODUCTION

UTI is one of the major bacterial diseases of childhood. The risk of falling ill with symptomatic UTI is about 3% of female newborns and about 1% of male newborns. The risk of recurrence is about 50% of cases. The risk of developing renal scar is about 5-10% of cases. Few will develop hypertension or uraemia.

The risk of occurrance regarding asymptomatic bacteruria (ABU) is about 1% of girls at preschool and school ages. About 80% of cases of ABU develop symptomatic UTI. So, UTI is a disease of major concern both qualitatively and quantitatively. The physician's first concern should be to look for evidence of obstruction of the urinary flow. The goal of management is to prevent progressive renal disease. Chemotherapy and close follow-up, including radiologic and urologic exploration and, if needed, surgical treatment, are equivalent links in the management. The course and prognosis of UTI are influenced by age at onset, sex, earlier history, and presence or absence of reflux and obstruction.

DEFINITION AND CLASSIFICATION

UTI is the denomination of several conditions that have one feature in common, that is the presence of significant amounts of bacteria in the urine.

Classification :

a) Classification with regard to localization:

1-Urethritis.
2-Cystitis.
3-Pyelonephritis.

b) Classification with regard to pathogenesis:

1-Nonobstructive.
2-Obstructive.
3-Neurogenic bladder.
4-ABU.

c) Classification with regard to management:

1-First infection.
2-Unresolved bacteruria during therapy.
3-Recurrent UTI: - bacterial persistence.
- reinfection.

N.B.:

Chronic pyelonephritis is a confusing term to describe certain histological findings, X-ray findings or clinical conditions. Pyelitis is a term used to describe a febrile UTI. As no pure pyelitis occurs, it must not be used longer.

Cystourethral syndrome is a term used to describe cases with classic symptoms of cystitis without demonstrable bacteruria.

EPIDEMIOLOGY

Symptomatic UTI :

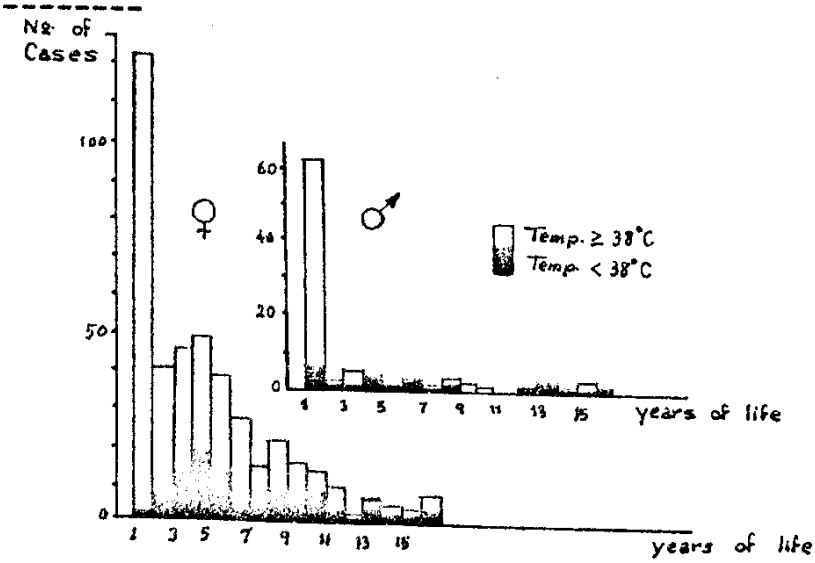

Figure (I) Apparently primary onset of UTI in 419 girls and 104 boys between 2 months and 16 years of age.(neonates zero to 30 days old are excluded.)The proportion of nonfebrile infections was very small during the first year of life but increased with age.Fifty-four male and 21 female neonatal infections were not included. (From Winberg,J.,et al.:Acta Paediatr.Scand. ,"Suppl.252",1974."Quoted from Campbell's Urology.")

From figure (I),the risk of UTI before age of 11 years is about 1.1% in boys and about 3.0% in girls.Boys with acute symptomatic infections seem to grow out of their [illegible]oneness to infections more than girls.

Asymptomatic bacteruria.(ABU) :

Those infections diagnosed from surveys of healthy populations. The incidence is about 0.7%-2.0% in girls between 4-16 years of

age,with no definite increase with age.In boys,the frequency is very low after the newborn period.(Meadow et al.,I969).In neonates,the incidence is about I-3% (winberg,I974."Cuoted from Campbell's Urology"),and associated usually with heavy pyuria of unknown significance.

AETIOLOGY

Aetiologic bacterial pattern :

In patients without complications,E.coli cause the majority of UTI's,about 2/3 of cases.Proteus,is a common invader in older boys.Staphylococcus epidermidis is common at puperty in either sex.Klebsiella is seen in the newborn period.E.coli isolated in the urine are usually of the same serotype as those dominating in the fecal flora.So,they are not special uropathogenic bacteria.On the other hand,staphylococci and proteus UTI's do not follow the fecal flora dominance.So,they are special uropathogenic bacteria.

In patients with complications,E.coli is also common.Proteus, Pseudomonas,Alcaligenes faecalis,White and Yellow Staphylococcus epidermidis,Enterococci and Candida are frequently found. From table (I),except for staphylococcus epidermidis,there is no much differences between girls of 1 month to I year & I to I0 years age and no differences between I-I0 years & I0-I6years

Resistance pattern :

The vast majority of infecting bacteria are sensitive to the most commonly used antimicrobials.Drugs affecting the physiologic bacterial reservoirs cause development of resistance through inducing resistant mutants.e.g. Sulfonamides,Ampicillin and Tetracycline.This is not true for Nitrofurantoin.

	Neonates both sex	Girls		Boys	
		Imo-I0ys	I0ys-I6ys	Imo-Iy	I4-I6ys
	N=73	N=389	N=30	N=62	N=42
	%	%	%	%	%
.E.coli.	75	83	60	85	33
.Klebsiella.	II	< I	0	2	2
.Proteus.	0	3	0	5	33
.Enterococci	3	2	0	0	2
.Staphylococcus epidermidis.	I	< I	30	0	I2
.Other bacteria	4	< I	0	3	2
.Mixed.	4	I	3	2	5
.Unknown.	I	9	7	3	I0

Table (I) Aetiologic bacteria in 596 apparent first nonobstructive infections in relation to sex and age.
(From Winberg,J.,et al.:Acta Paediatr.Scand."Suppl.252",I974. "Quoted from Campbell's Urology.")

PATHOGENESIS AND PREDISPOSING FACTORS.

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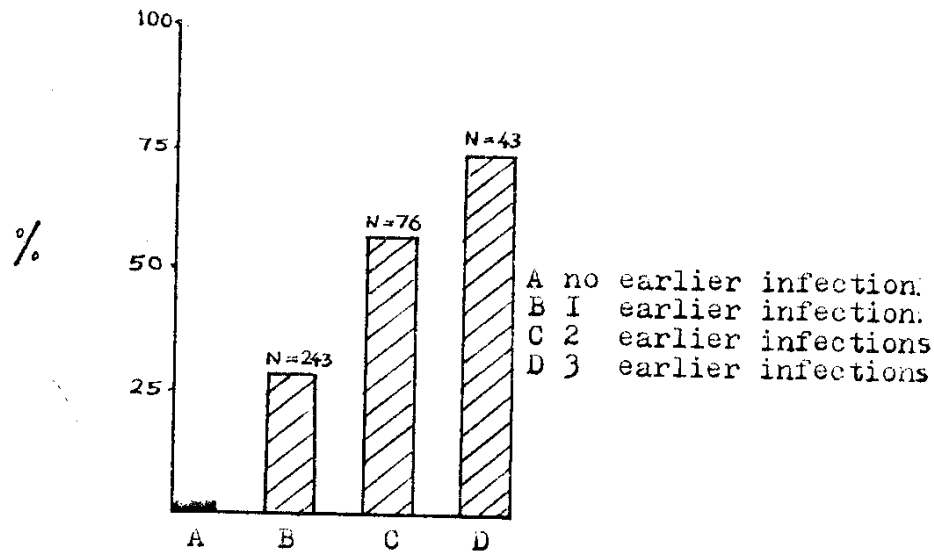

Figure (2) Recurrence rate within I year of a preceding infection, related to the number of earlier infections. (A), approximate risk of a 30-day-old healthy girl having a symptomatic infection before II years of age. (B), observed risk in 243 girls with one earlier infection (C), observed risk in 76 patients with 2 earlier infections. (D), observed risk in 43 patients with 3 earlier infections.
(From Winberg, J., et al.: Acta Paediatr. Scand., "Suppl. 252", 1974. "Quoted from Campbell's Urology".)

The route of entery of bacteria into the urinary tract is believed to be mainly by two routes, the ascending route and the haematogenous route. The ascending route is the main route and the haematogenous one in the newborn period may takes place. From figure (2), the risk of reinfection with symptomatic UTI is 50 times greater in girls with previous ABU than in girls

previously healthy.It increases with number of previous infections.So,we can classify girls and boys,between I month to I year,into UTI prone individuals"susceptible" and non-UTI prone individuals"nonsusceptible".

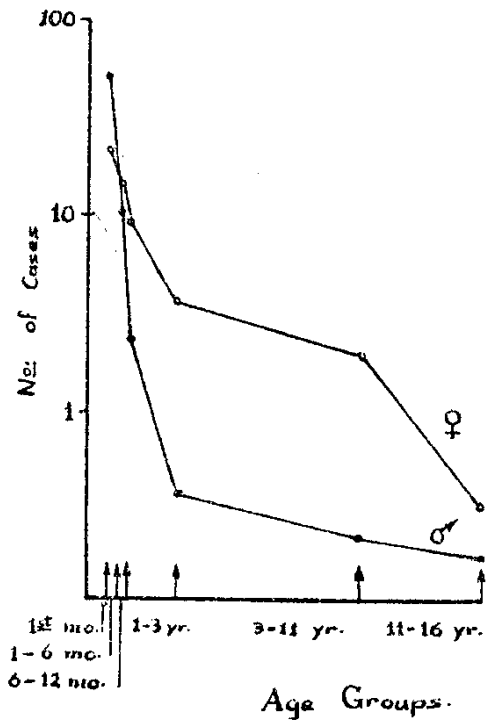

Figure (3) Mean number of new cses per month in different age groups in males and females,calculated from figure (I).
(From Winberg,J.;Kidney Int.,8:I0I,I975."Quoted from Campbell's Urology.").

In figure (3),the curve decline may be explained by the differences between the pathological factors operating in early infections and those operating later.e.g. in male newborns,the Gm -ve septicaemia may explain symptomatic UTI during the first month,and the I-3% ABU suggest decreased local defenses in

this age. The faecal soiling is of no decisive importance because the rapid decrease in frequency begins to occur during the first few months of life.

Predisposing Factors :

I) Urethral length and maturation of the defense mechanisms.

Age	♀/♂
I month.	0.4
2-6 months	I.5
7-I2 months	4.0
2-3 years.	I0.o
4-II years.	9.0

Table (2) Sex ratio of onset nonobstructive UTI in different age groups.

From table (2), the successive change in sex ratio with age is against that the short urethra is the cause of female preponderance in UTI, but is more suggestive of a successive functional maturation of a defense mechanism or successive disappearance of a predisposing factor that progress at different speeds in the two sexes.

2) Bladder neck obstruction and urethral meatal stenosis, play a small role. (Kendall and Karafin, I973).

3) Incomplete bladder emptying may encourage infection in some patients especially those with posterior urethral valves, ureterocele, bladder diverticulae, neurogenic disorders or calculi. (O'Grady and Cattell, I966.)