



COMPLETE HAEMOGRAM PICTURE CHANGES BY *ESCHERICHIA COLI* INDUCED URINARY TRACT INFECTION

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ABSTRACT

Complete haemogram of *E. Coli* induced urinary tract infection patients was studied. After analysis it was found that there was leucocytosis with neutrophilia and mild normocytic normochromic anaemia in these patients.

KEYWORDS: UTI, *E. coli*, anaemia, leucocytosis, neutrophilia.

INTRODUCTION

Urinary tract infection (UTI) can be defined as a spectrum of disease caused by the microbial invasion of the genito-urinary tract that extends from renal cortex of the kidney to the urethral meatus. There are different classification of UTI. According to site of infection UTI is classified as upper UTI which includes pyelonephritis (infection of renal parenchyma) and urethritis (infection of ureter) and lower UTI which includes urethritis (infection of urethra), cystitis (infection of bladder) and prostatitis in male (infection of prostate). Based on Source UTI is classified as Nosocomial UTI which Occurs mainly due to catheterisation and caused by *Klebsiella* species, *Escherichia coli*, *Enterococcus* species, *Proteus mirabilis*, *Pseudomonas* species and Community Acquired UTI which occurs in a previously healthy person and caused by *Escherichia coli*, *Enterobacter* species, *Klebsiella* species, *Proteus* species, *Staphylococcus saprophyticus*, *Pseudomonas* species. Based on Anatomy and neurology there are Uncomplicated UTI where Urinary tract is structurally and neurologically normal which includes pyelonephritis and cystitis and Complicated UTI where Urinary tract that is structurally and neurologically complicated that includes neurogenic bladder, pelvic pouch and urinary calculi. Based on Symptoms there are Symptomatic UTI with symptoms of infection and Asymptomatic UTI without clinical symptoms commonly seen in pregnant women and children. Finally based on time duration there are Acute UTI and Chronic UTI. There is a long list of microorganisms causing UTI. In general, common bacteria causing UTI are *E. coli* (mainly O1, O2, O4, O6, O7, O25, O50 Serotypes), *Proteus* species (*Proteus mirabilis*, *Proteus vulgaris*), *Staphylococcus* species (*S. aureus*, *S. saprophyticus*), *Klebsiella* species, *Pseudomonas* species, *Serratia* species, *Enterococcus*

species, *Group B Streptococcus*. Less Common Organisms causing UTI are *Gardnerella vaginalis*, *Ureaplasma urealyticum*, *Mycobacterium* species, *Mycoplasma hominis*, *Leptospira* species, *Citrobacter* species, *Salmonella* species, *Chlamydia trachomatis*. Viruses causing UTI are Adenovirus 11, 21, Cytomegalovirus, Herpes Simplex virus, Rubella virus. Fungi causing UTI are *Candida albicans* (most common), *Aspergillus* species, *Penicillium* species. Parasites causing UTI are *Trichomona vaginalis* and *Schistoma haematobium*.

E. coli accounts for the most predominant cause of UTI and is responsible for approximately 90% of the UTI in young women. The symptoms include urinary frequency, dysuria, haematuria and pyuria. Flank pain is associated with upper UTI.

The *E. coli* strains responsible for UTI are referred to as the uropathogenic *E. coli*. These are the O antigen types that facilitate colonisation and subsequent clinical manifestations. These strains produce hemolysin which is cytotoxic and facilitates tissue invasion. Those strains that cause Pyelonephritis express K antigens and produce a specific type of pilus, P fimbriae.

Only a few studies are there in human beings to see any change in routine haematologic parameters (Horowitz et al, 1960) although there are some interesting studies in canines (Norris et al, 2000; Roopali et al, 2018). Though a CBC is not helpful in differentiating Upper UTI from Lower UTI but severe leukopenia are seen in older age group individuals or immunocompromised individuals. The WBC count may or may not be elevated in patients with uncomplicated UTI but it is generally elevated in patients with complicated UTI. Moreover the patients

with complicated UTI generally suffer from anemia. Anemia is also commonly observed in females having UTI during pregnancy. Haematuria is often found in UTI. Thus there are chances of haematological changes in UTI. Considering all these aspects, in this study we observed haematological parameters in patients suffering from *E. Coli* induced UTI.

MATERIALS AND METHODS

Specimen collection

The first voided morning Clean catch mid-stream urine sample was collected in standard sterile containers (100 ml) and transported to the laboratory within 2 hours. Standard instructions for collection were given to all patients as given in Chart 1.

A male patient should

Wash his hands thoroughly with soap and water and dry them with clean towel.

Pull back the foreskin and wash the glans penis thoroughly using sterile cotton. During wash, the patient should not touch the cleaned area.

Pull back the foreskin and pass small amount of urine still holding back the fore skin. The patient should pass the urine into sterile wide mouthed clean screw capped container. Close the lid of the container as soon as urine has been collected.

A Female patient should

Wash her hands thoroughly with soap and water and dry them with clean towel.

Spread the labia and cleanse the vulva and labia thoroughly using water and dry with sterile cotton pad.

Pass a small amount of urine, the patient should collect most of the remaining urine in a sterile screw capped container and close the lid as soon as the urine has been collected.

Indwelling catheter or Foley's catheter

Hospitalised patients who have indwelling or Foley's catheter are specially at risk of developing UTI. To avoid contamination the specimen is collected by disinfecting the collection part of the catheter tubing with alcohol puncturing the tubes directly with a sterile syringe and needle and aspirate the urine.

Chart 1: Showing instructions given to the patients for collection of urine samples.

Processing and testing of urine Sample

Culture was done on MacConkey's Agar and inoculation was done by Calibrated Loop method which was convenient to determine the quantity and types of bacteria present in the urine sample. A standard calibrated loop is used to culture a fixed volume of uncentrifuged urine, loop of 4mm diameter colony representing 1000 cfu/ml in original urine. Then the inoculated plate was kept for overnight incubation and then observed for growth. The colonies were then identified and sensitivity (AST) was done by automated method that is Vitek2 System. After 16-18hrs, the ID and AST was given by the Vitek2 System.

Study of complete haemogram

The complete haemogram test was done in patients showing a significant bacterial count in culture and when the bacterial identification was *E. Coli*. The patient's blood was collected in an EDTA vial. Then the Complete Haemogram test was done by the Sysmex Cell Counter machine XP-100(3 Part).

RESULT

The results are shown in Table 1.

Table 1: Showing complete haemogram parameters in patients suffering from *E. Coli* induced UTI.

Complete Haemogram parameters	Mean	Standad Deviation(SD)	Standard Error of Mean(SEM)
Hb(gm/dl)	11.814	1.182	0.447
TC of RBC(million/cu mm)	4.297	0.570	0.215
TC of WBC(per cu mm)	13071	3611	1365
DC			
Neutrophil(%)	80.71	5.50	2.08
Eosinophil(%)	3.71	1.25	0.47
Basophil(%)	0	0	0
Lymphocyte(%)	13.71	4.57	1.73
Monocyte(%)	1.86	0.38	0.14
Platelet Count (Lakh/cu mm)	3.557	0.635	0.240
PCV (%)	36.74	3.91	1.479
MCV(cu μ)	86.229	9.143	3.456
MCH(μ g gm)	27.786	3.318	1.254
MCHC(%)	32.171	0.785	0.297

Hb- Haemoglobin, TC – Total Count, DC- Differential Count, PCV-Packed Cell Volume, MCV-Mean Corpuscular volume, MCH-Mean Corpuscular Haemoglobin, MCHC-Mean Cell Haemoglobin Concentration.

DISCUSSION

According to our study we have considered 7 patients among 50 cultures who were suffering from Urinary Tract Infection by *E.coli*. After analysis of the complete haemogram pattern we observed mild anaemia in these patients with increased leucocyte counts and neutrophilia. In one observation anaemic patients showed more urinary tract infection and iron deficiency was often found common in UTI (Giles and Brown, 1962). Other than this observation there is no important previous study and thus we conclude that there is significant change in leucocyte count with increased neutrophils in the blood associated with mild normocytic and normochromic anaemia in patients suffering from UTI.

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