RESEARCH ARTICLE

STUDY ON THE PREVALENCE OF URINARY TRACT INFECTION AMONG THE PALIYAR INDIAN TRIBE

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ABSTRACT

Urinary tract infection (UTI) is the leading cause of morbidity and health care expenditures in persons of all the ages. The long range consequences of ignoring UTI can leads to kidney failure, septicaemia, bacterial endocarditis, prostatitis and infertility. In this study the prevalence of UTI among Paliyar tribal group reveals *Klebsiella pneumoniae* (65%) as the predominant uropathogens isolated followed by *Escherichia coli* (55%), *Psuodomonas aeruginosa* (50%), *Staphylococcus aureus* (20%), *Enterococcus faecalis* (10%), *Proteus mirabilis* (5%) and *Candida* Sp (5%). The isolated uropathogens were subjected to antibiotic sensitive analysis. The epidemiological and haematological parameters such as age, pulse rate, blood pressure, haemoglobin level, PCV, MCV, MCHC, sugar in urine specimen were analysed. An extensive KAAP study was conducted by structured questionnaire and their knowledge, attitude, awareness and practices towards the urinary tract infection was recorded.

INTRODUCTION

The urinary system consists of the kidneys, ureters, bladder and urethra. Infections of the urinary tract (UTIs) are the second most common type of infection in the body. Symptoms of UTI include frequent feeling or need to urinate, pain during urination, and cloudy urine. The most common cause for the infection is unhygienic bathrooms where these bacteria are found. *Escherichia Coli* (E-coli) (80 to 85%) which is normally present in the cell lining of the urinary tract and gastrointestinal tract, which is the commonest causative organism other gram negative colonic bacteria have been gaining prominence in India over the last two decades (Acharya and Jadav, 1980). There are three types of UTI such as cystitis, urethritis and pyelonephritis. Cystitis – infection in the urinary bladder, Urethritis - Infection of the urethra and Pyelonephritis – infection that spreads to kidney. It is caused due to untreated lower urinary tract infection that progress to the upper urinary tract (ureter or kidney). Pyelonephritis can cause reduced kidney function and possibly even death in untreated or in severe cases. Bacteria may ascend the ureters to reach the kidneys by being carried in films of fluid or more efficiently by a combination of vesico-ureteric and intra renal reflux. Growth conditions in the renal parenchyma might be expected to be quite different than those in the bladder urine. (Michel and William, 1985).

Urinary tract infection is an excellent example of host-microbe interaction. Microbial factors have shown a rather distressing trend. The binding is an important factor in establishing pathogenicity for these organisms, its disruption results in reduced capacity for invasion of the tissues. The unbound bacteria are removed during voiding. The pathogens subvert innate defences by invading superficial umbrella cells and establish intracellular bacterial communities. This microbial interaction constructs bio films structures that firmly anchored in infected cells and are more resistant to immune-system (Ali *et al.*, 2009; Justice *et al.*, 2006). There are 67.76 million persons belong to scheduled tribes in about 74 distinct group in India Basu (1994). The work by the researchers in focusing the health status of the tribal population was limited. The tribal population of Car nicobar, Gundas, Muria, Madia, Halbas and other groups in India also reported to have symptoms to UTI. In this context the Paliyar tribe in Kombaikadu, Kodaikanal, Tamil Nadu was selected for the present study to evaluate the prevalence of urinary tract infections.

MATERIALS AND METHODS

Selection of the Study population

The criteria considered for the selection of tribal group are isolated population living in remote forest and hilly area far away from urban centre and they have different cultural habit, socio economic pattern, food habitat and having poor health

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status. As per these criteria, Kombaikadu village of Kodaikanal hills, Madurai district, Tamil Nadu, habituated by the people of Paliyars tribal group was chosen for the present study.

Selection of Sample persons

In the study population, 19 men whose age groups range from 10 to 60 years were reported with symptomatic urinary tract infection. During their consultation men were asked about their general aspects of health and their personal habits.

Collection of urine specimens from tribal group

Mid steam urine was collected in a sterile dry wide necked and leak proof container. Then the containers were labelled with the date, the name, time and serial number of the patient. The collected urine specimens were transported with the temperature of 4° to 6° C with coolant pack to the laboratory.

Epidemiological and haematological analysis

The physiological parameters like pulse rate and blood pressure of study group population were recorded. Haemoglobin content of study group population was also measured by Sahli (acid- haematin) method. The presence of sugar in urine specimen were analysed by strip method and recorded.

Physical examination of the urine specimen

The physical parameters of collected urine specimens such as volume, pH, colour, odour, appearance were analyse and recorded.

Microscopical examination of urine specimens

To examine the urine specimens, microscopically wet preparation was made by centrifuging the sample at 500-1000 g for 5 minutes then a drop of sediment was transferred to a slide and covered with glass and finally it was examined under 10 x and 40 x objective. The crystals, casts and bacterial cells, parasites were recorded.

Microbiological analysis of urine specimens

The uropathogens were identified by swabbing the urine specimens on various selective and differential media such as Hi-Chrome UTI agar, Salmonella Shigella agar (SS agar), Thiosulphite citrate bile salt sucrose (TCBS) agar, BiGGY agar (Nickerson medium) and Potato dextrose agar (PDA) based on their colour morphology after the incubation period.

Antibiotic susceptibility testing of the isolated organism

The susceptibility of the entire isolated organism to antibiotics, which were normally used to treat uropathogens were tested by Kirby- Bauer method. The antibiotic disks were obtained from Hi-media laboratory (Mumbai). Pure culture of identified uropathogens was swabbed all over the Muller-Hinton agar for three times and left the inoculums to dry for few minutes at room temperature with the lid closed (Bauer *et al.*, 1966). The WHO recommended antibiotic disk and others

were placed on the inoculated plate using a sterile forceps. After the inoculations at 37^0 C for 24 hours, the diameter of inhibition zone as recommended by the manufactures was measured.

Knowledge, Attitude, Awareness and Practise (KAAP) study

An extensive (KAAP) study was conducted by structured questionnaire and their knowledge, attitude, awareness and practices towards the urinary tract infection was studied.

RESULTS

The management of urinary tract infection is very vital in the present scenario because the prevalence of the pathogencity and development of drug resistance caused by the uropathogens are increasing in a higher magnitude. Literature reports of different countries documented that *E.coli* was found to be the most predominant uropathogen isolated from the patients with UTI and the development of multidrug resistance among uropathogen that causes uncomplicated UTI. In this context, men from Paliyar tribal population in Kombaikadu at Kodaikanal hill were selected and there were screened to confirm the incidence of UTI. All the selected cases from tribal group were detected to have acute UTI. Physical parameter of urine specimens of Paliyar tribal group is presented in (Table 1). The urine specimens show greater variation in colour, odour, appearance and pH of the tribal group. The physical parameters and its different characters of urine specimens in shown in (Table 2). Percentage of cast, crystals and bacterial cells, parasites present in urine specimens deposit is presented in (table 3). The urine specimens was predominant in crystals, cast cells, pus cells, RBC, WBC, parasites and bacterial cells when they were examined under microscope. The epidemiological, haematological parameters such as age, blood pressure, pulse, haemoglobin level, PCV, MCV, MCHC and clinical parameters is presented in (table.4). The urine specimens were subjected to Hi-Chrome UTI-agar. The uropathogens were identified based on colour morphology. There characteristic features confirm the presence of six species of uropathogens as shown in (Table 4). Biodiversity of uropathogens in the urine samples of Paliyar tribal group is shown in (Figure 1). The biodiversity of the study group shows that population suffering from acute UTI. The biodiversity index has been 0.83 (α- index). The occurrence of uropathogens from the selected group is shown that *Klebsiella pneumonia* (*K.pneumonia*) was predominate isolates isolated from the urine specimens following *E.coli, Peudomonas aeruginosa (P.aeruginosa), (Staphylococcus aureus), S.aureus, Proteus mirabilis (P.mirabilis)* and *Enterococcus faecalis (E. faecalis).* The isolated uropathogens were subjected to selective recommended antibiotics; they show a remarkable variation in the sensitivity. The percentage of inhibitory effect on uropathogens by individual antibiotics is presented in (Fig. 2). The zone of inhibition in (mm) by recommended antibiotics to isolated uropathogens were compared with standard sensitive and resistance value is shown in (Table 5). The information revealed from the KAAP study shows that majority of the men did not have adequate knowledge about the various aspects of infection, occurrence and transmission of UTIs. Further this is confirmed when the attitude and awareness of the respondents

Table 1. Physical parameter of urine specimens of Paliyar tribal group

No	Age	Weight (Kg)	Diabetic	Urine Volume (ml)	Colour	Appearance	Odour	pH: Acidic/Alkaline
1	35	51	No	10 to 20	Red	Turbid	Fruity	Acidic
2	55	40	No	10 to 20	Pale yellow	Clear	Foul smell	Acidic
3	27	42	No	10 to 20	Pale yellow	Clear	Ammonical	Acidic
4	55	47	No	10 to 20	Yellow	Hazy	Aromatic	Acidic
5	32	56	No	20 to 50	Pale yellow	Clear	Aromatic	Acidic
6	35	43	No	20 to 50	Pale yellow	Turbid	Aromatic	Acidic
7	30	52	No	10 to 20	Pale yellow	Clear	Aromatic	Acidic
8	25	41	No	10 to 20	Pale yellow	Clear	Aromatic	Acidic
9	25	38	No	10 to 20	Pale yellow	Clear	Aromatic	Acidic
10	60	50	No	20 to 50	Pale yellow	Turbid	Foul smell	Acidic
11	35	55	No	10 to 20	Pale yellow	Clear	Aromatic	Acidic
12	30	54	No	20 to 50	Pale yellow	Clear	Aromatic	Acidic
13	25	47	No	10 to 20	Pale yellow	Clear	Aromatic	Acidic
14	54	44	No	10 to 20	Pale yellow	Clear	Aromatic	Acidic
15	50	48	No	10 to 20	Pale yellow	Clear	Aromatic	Acidic
16	20	40	No	10 to 20	White	Clear	Aromatic	Acidic
17	10	13	No	10 to 20	Pale yellow	Clear	Aromatic	Acidic
18	50	60	No	10 to 20	Pale yellow	Clear	Aromatic	Acidic
19	25	49	No	20 to 50	Pale yellow	Clear	Aromatic	Acidic

Table 2. Different characters of physical parameter of urine specimen in percentage

Parameters	Characters	(%) Percentage of occurrence
Volume	10 to 20	75
	20 to 40	25
Colour	Pale Yellow	85
	White	5
	Red	5
	Yellow	5
Appearance	Clear	75
	Hazy	10
	Turbid	15
Odour	Aromatic	75
	Foul smell	10
	Fruity	5
	Ammonical	5
pH	Acidic	100

Table 3. Percentage of cells present in urine specimens deposit of Paliyar tribal group

Physical structure	Frequency/Cast/Crystals	(%) Percentage of Occurrence
Pus cells	2 to 3	60
	>5	40
Epithelical cells	2 to 3	60
	>5	40
Cast	Red cast cells	60
	White cast cells	65
	Granular cells	10
	Fatty cast	25
	Hyaline cast	35
Cyrstals	Amorphous material	20
	Calcium sulphate	40
	Hippuric acid	15
	Cystine crystals	20
	Leucine	10
	Cholesterol	30
Yeast cells	+	15
Bacterial cells	+	25
WBC cells	+	65
RBC cells	+	55
Parasites	+	25

Table. 4. Epidemiological, haematological and clinical parameters of the Paliyar tribal group

S no	Puslse /min	Blood pressure mm/Hg	Hb mg/dl	RBC mill/cu mm	PCV %	MCV (mm³)	MCHC %	Uropathogens isolated
1	68	110/80	8.6	0.3	2.2	73	39	*K.pneumoniae, P.aeruginosa*
2	70	130/100	9	0.3	2.3	77	39	*P.aeruginosa, E.faecalis*
3	64	102/78	9	0.3	2.3	77	39	*K.Pneumoniae, P.aeruginosa,E.coli*
4	80	110/80	8.6	0.3	2.2	73	39	*K.pneumoniae,E.coli, S.aureus*
5	74	110/90	8.2	0.3	2.1	70	39	*K.pneumoniae,E.coli,Candida SP*
6	61	170/120	6.8	0.2	1.7	85	40	*K.pneumoniae, E.coli, P.mirabilis*
7	84	110/80	7	0.2	1.8	90	48	*P.aeruginosa, S.aureus*
8	62	120/100	7.8	0.3	1.9	63	41	*K.pneumoniae, E.coli, S.aureus*
9	68	120/90	7.2	0.2	1.8	90	40	*E.coli*
10	70	180/90	5.8	0.2	1.5	75	38	*K.pueumoniae, P.aeruginosa,E.coli*
11	60	110/80	7.4	0.2	1.8	90	41	*K.pneumoniae, P.aeruginosa*
12	64	110/88	7	0.2	1.7	85	41	*K.pneumoniae, E.faecalis*
13	66	110/90	7.8	0.3	1.9	63	41	*K.pneumoniae*
14	72	110/70	7.6	0.3	1.9	63	40	*K.pneumoniae, P.aeruginosa*
15	58	110/88	6.6	0.2	1.7	85	38	*S.aureus*
16	68	120/70	5.8	0.2	1.7	75	38	*E.coli*
17	72	110/80	8	0.3	1.5	77	37	*P.aeruginosa,E.coli*
18	68	130/100	8	0.3	2	67	40	*K.poneumoniae,P.aeruginosa,E.coli*
19	90	97/86	9.8	0.3	2.5	83	39	*K.poneumoniae,P.aeruginosa,E.coli*

Table. 5 Antibiogram of isolated uropathogens from Paliyar tribal group

Isolated organism	*E.coli*	*S.aureus*	*K.pneumoniae*	*P.mirabilis*	*P.aeruginosa*	% of sensitive of drugs to uropathogens
Ampicillin (10 mcg)	+	+	-	-	-	50
Streptomycin (100 mcg)	+	+	-	+	-	50
Tetracyclin (30 mcg)	-	-	+	+	+	83
Nalidixic acid (30 mcg)	+	+	-	+	-	100
Kanamycin (30 mcg)	-	+	+	-	-	83
Rifamycin (5 mcg)	+	+	+	+	+	50
Gentamycin (10 mcg)	-	+	+	+	+	83
Chloramphenicol (30 mcg)	+	-	+	+	+	100
Pencillin-G (10 unit)	-	-	-	-	-	0
Norfloxacin (10 mcg)	-	+	-	+	-	83
Nitrofurantoin (300 mcg)	-	-	-	-	-	17
Amoxycillin (10 mcg)	-	-	-	-	-	50
Ciprofloxacin (5 mcg)	-	-	-	-	+	100
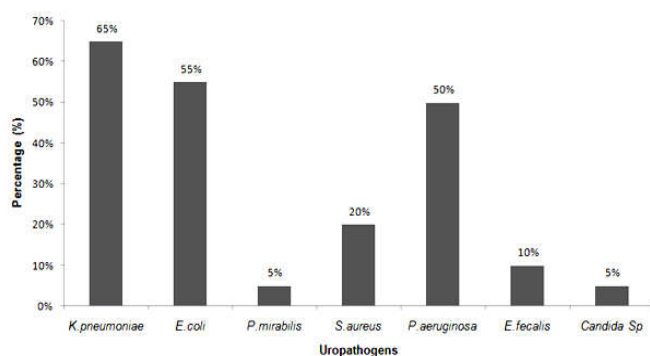
Figure 1. Biodiversity of uropathogens in the urine of Paliyar tribal group
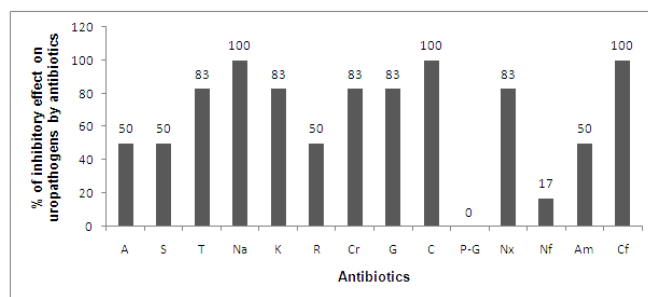
A	Ampicillin (10 mcg)	G	Gentamycin (10 mcg)
S	Streptomycin (100 mcg)	C	Chloramphenicol (30 mcg)
T	Tetracyclin (30 mcg)	P-G	Pencillin-G (10 unit)
Na	Nalidixic acid (30 mcg)	Nx	Norfloxacin (10 mcg)
K	Kanamycin (30 mcg)	Nf	Nitrofurantoin (300 mcg)
R	Rifamycin (5 mcg)	Am	Amoxycillin (10 mcg)
Cr	Cephaloridine	Cf	Ciprofloxacin (5 mcg)

Figure 2 Percentage of inhibitory effect on uropathogens by individual antibiotics

are recorded and it reveals that they the group was not aware of the seriousness and precautionary measures to infections. With regards to the practice the group were not strictly followers of personal hygiene and they seldom change their undergarments. In absence of any proper sanitation facilities and majority of the population confessed to being smokers and alcoholics.

DISCUSSION

Urinary tract infection is a serious health problem affecting millions of people each year. The recent studies have helped to better define the population group at in risk to acute UTI.

UTIs can be categorized in to two as complicated or uncomplicated. UTIs occurs in patients with structurally or functionally abnormal urinary tracts (complicated UTI) and in patient with anatomically normal UTI (uncomplicated UTI). Whereas antibiotic resistant *Enterococcus* Sp and *Candida* Sp often are the causes of complicated UTI Nicolle (2008); Langley *et al.*, 2001). The pathogenesis of urinary tract infection involves a complex interaction between organisms. The organism responsible for UTI are usually gram negative aerobic originating from the gut flora and in fact is 80% - 90% of first infections are by *E-coli* which are usually isolated (Niall *et al.*, 2011). The outer genital and pre-urethral bacterial flora usually reflects the gut flora. Due to subsequent infection *E.coli* are present around 70% of cases although more unusual organisms occur after antibiotic therapy, catheterization and surgery. *K. Pneumonia K. pneumonia, P. aeruginosa, P. mirabilis* and *E. faecalis* are the next predominant uropathogens isolated. *P. mirabilis,* a common cause of UTI in individuals with functional or structural abnormalities or with long-term catheterization, forms bladder and kidney stones as a consequence of urease-mediated urea hydrolysis. (Burall *et al.*, 2004). In a study population it reports that population were suffering from acute UTI. The report of physical parameters reveals that 85% of the urine was pale yellow, white, red and yellow of 5% each. This indicated that about 40 % of the patients have renal disease and haemoglobinuria. About 40% of the patients passed only a small amount of urine, which indicated their symptoms for UTIs. In the present study urine specimens reveals more pus cells indicating that group were suffering from pyuria and non infectious condition such as fever, stress, dehydration, irritation to urethra. The development of cast show that the group were suffering from renal infection, non-infectious inflammation, and glomerular diseases. The presence of crystals reveals that the population were suffering from kidney stones, pyelonephritic condition and lipoid nephrosis. All tribal were reported to have severe anaemic with high prevalence rate of malnutrition. Increase in Mean corpuscular haemoglobin concentration reveals that population suffering from spherocytosis which is an auto- haemolytic anaemia characterized by the production or red blood cells (RBCs) that are sphere shaped rather than bi-concave disk shaped and fragile leads to frequency bouts of mild haemolysis and jaundice with splenomegaly. In this study the isolated uropathogens was sensitive to the various antibiotics in which nalidixic acid, chloramphenicol and ciprofloxacin showed (100%) sensitive towards the isolated uropathogens. Tetracyclin, kanamycin, cephaloridine, gentamycin and norfloxacin shows (83%) sensitive respectively towards isolated uropathogens. Ampicillin, streptomycin, rifampicin and amoxicillin showed (50%) sensitive and nitrofurantoin showed (17%) sensitive to the isolated uropathogens. The isolated uropathogens showed complete resistance towards penicillin–G. The sensitive report reveals that the isolated uropathogens were more sensitive towards the recommended antibiotics. The patients can be easily treated with antibiotics and can prevent recurrent UTI. This study also reveals that the people of Paliyar tribe were far away from the use of antibiotics. Knowledge, attitude, awareness and practice study of Paliyar tribe reveals that they were lack of knowledge about predisposing factor for the development of UTI. It is evidence from ten parameters studies in the present investigation which clearly shows their illiteracy on the symptomatology of UTI.

The most important parameters such as genital discharge, pain in genitalia, difficulties in urination were totally not known by the responders. There were no awareness with reference to hygiene habits seriousness of the problem and necessity to treat their spouse.

Conclusion

The present study throws light on the unexplored aspects in relation to habit and live hood so far untouched tribal population of Paliyar group of Western Ghats. The distribution of isolated uropathogens shows *K.pneumoniae* as the predominant uropathogen followed by *E.coli* which indicates the group have very weak immune system which is also supported by their severe anaemic condition and spherocytosis disease. The isolated uropathogens was completely sensitive to antibiotics nalidixic acid, chloramphenicol**,** and ciprofloxacin. Therefore the patients can be easily treated with antibiotics and can prevent recurrent UTI. This study also reveals that the people of Paliyar tribe were far away from the use of antibiotics. Though this work is a cross sectional study of the smallest population of Paliyar tribe much work is needed to be done in the follow of tribal groups not only investigating the UTIs but also to give emphasize on other health related aspects as well as for the upliftment of their social life.

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