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B J. Farooqi
Aga Khan University

F Shareeq
Aga Khan University, muhammad.shariq@aku.edu

Q K. Rizvi
Aga Khan University

H S. Qureshi
Aga Khan University

M K. Ashfaq
Aga Khan University

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Changing Pattern of Antimicrobial Susceptibility of Organisms Causing Community Acquired Urinary Tract Infections

B.J. Farooqi (Departments of Microbiology, The Aga khan University Hospital, Karachi.)
F. Shareeq (Department of Physiolology, Sindh Medical College, Karachi.)
Q.K Rizvi (Departments of Nursing Services, The Aga khan University Hospital, Karachi.)
Hina S. Qureshi (Departments of Pathology, The Aga khan University Hospital, Karachi.)
M.K. Ashfaq (Departments of Biochemistry, The Aga khan University Hospital, Karachi.)

Abstract

Objective: To assess common organisms causing Urinary I teat inflection (UTI) in this community and to see antimicrobial susceptibility pattern of these isolates.
Design: Prospective stud on urine samples.
Setting: Tertiary care hospital in Karachi.
Methods: Over a period of 8 years (1990-97) 9,892 Urine samples grew significant bacteriuria for various organisms. All Gram negative rods and entercocci was identified by using A PI 20E and API 32 strips respectively. Staphylococci were identified by catalase coagulase and D\'Nase tests. Antimicrobial sensitivity testing ol all isolates was performed on Diagnostic Sensitivity Tesst plates by Kerby Bauer method. The discs used were ampiciIlin, trimethoprim-sulfamethoxazole cefotaxime, ceftrixone, aztreonam, of loxacin, carbenicillin amikacin, gentamicin, penicillin, clindamvcin, methicillin, vancomycin, ceftazidime cef u roxime, Nalidixic acid, pipemedic acid and Nitrofurantoin,
Results: Our results indicate that E. coil and Klebsiella aerogenes are the most common organisms causing CTI in t-his community, Other organisms involved are Pseudomonas aeroginosa Enterobecter species, ENterococcus, Proteus mirabillus, Staphylococcus aureus and Staphylococcus saprophyticus. Organisms resistant to various antimicrobial agents such as gentamicin, Amikacin, Ofloxacin, Cefotaxime and Ceftazidime are increasing.
Conclusion: In conclusion, F., coil and Klebsiella aerogenes are the most common organisms causing UTI in this community. Pattern of antibiotic susceptibility to first line antibiotics is changing. Antimicrobial susceptibility testing of all isolates is crucial for the treatment of UT! (JPMA 50:369, 2000).

Introduction

Community acquired Urinary Tract Infection (UTI) is a major public health problem. It is a commonly observed condition in clinical practice[1] Studies show prevalence rate of 1-2% in neonates mostly boys and up to 2.0% in school girls, sonic 50 limes more than those of boys of similar age. Figures available for pre-school children suggest that it tends to become commoner in girls during infancy[2]. There is a trend of increasing antibiotic resistance in pathogens causing Urinal Tract Infection. The effective management needs the knowledge of various organisms and their antibiotic sensitivity pattern. The aim of this study was to assess common organisms causing UT! in this Community and anti-microbial susceptibility pattern of these isolates.

Material and Methods

Nine thousand eight hundred and ninety two samples of urine were collected over a period of 8 years (1990-97) randomly. Each sample was collected in a sterile screw capped container. Mid-stream urine was collected from in—patients who were more than three years of age. These samples were sent to the Microbiology I laboratory within an hour of collection[3,4] The samples. This could not be delivered within an hour. were refrigerated at 4°C For UI) to 24 hours[5] Each urine sample was mixed well and

cultured on to Cysteine Lactose Electrolyte Deficient (CLED) agar medium by using a 5mm diameter calibrated loop[6] Plates were incubated at 37°C for 24 hours. Colony forming units were counted for the presence of bacteuria.

All gram negative rods (both lactose and non-lactose fermenters) and entercocci were identified biochemically by using API 201* and API 32* strips respectively (API=Analytical Prolik Index API System S.A. LA Balmeles rolles-38390 monta lieu). Colonies suspected to be Staphylococcus auras were identified by catalase, coaglase and D\'Nase tests. Antimicrobial sensitivity testing of all isolates was performed on Diagnostic Sensitivity lest (DST) plates by Kerby Bauer method[7]. The discs used were ampicillin (30mg/l). triniethoprim-sulfamethoxazole (1.25/23.75mg/l) cefotaxime (30mg/L), cefiriaxone (30mg/l) aztreonam (30mg/l) ofloxacin (5mg/l) carbcnic ill in (1 (100mg/l) amikacin (30mg/I). genlarnicin (10mg/l). penicillin (10 IU) clindamycin (2mg/I). methacillin (5mg/l). vancomycin (30mg/l), ceftazidime (30mg/l), ceforoxime (30mg/l) Nalidixic acid (30mg/l) pipemedic acid (20mg /l) and Nitrofurantoin (300mg/l)). COntrol strains of E.coli I ATCC 25922 Staphylococcus aureus ATCC 25923 and Pseudornonas aeruginosa A l(C 27853 were treated in the same way as test Strains.

Results

E.COLI

Table. Common Community Aquired Urinary Pathogens (n= 40,194).

Pathogens	No.	%
Escherichia coli	20974	52
Klebsiella aerogenes	3825	9
Pseudomonas aerugenosa	3825	9
Enterobacter species	1465	4
Entercoccus	881	2
Beta Haemolytic Streptococci gp. B	774	1.9
Proteus Mirabilus	662	1.6
Psuedomonas species	596	1.5
Staphylococcal aureus	565	1.4
Candida albicans	415	1
Staphylococcus saprophyticus	356	0.8

Klebsiella aerogenes

TableI1 shows common organism causing corn mun it' acquired UTI. E.Coli is the most common organism causing UTI in this community
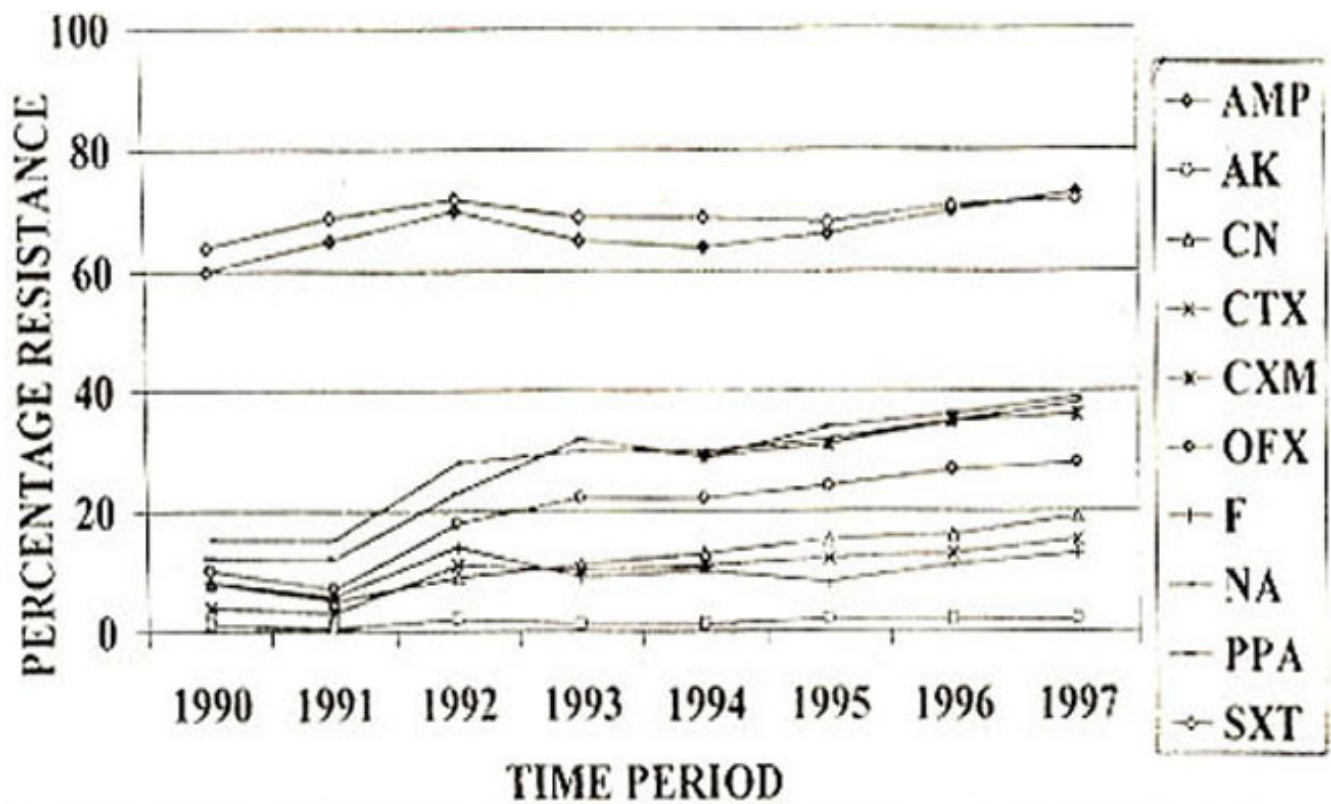
Figure 1. Pattern of antibiotic resistance of E. Coli.

Figure1 shows antimicrobial resistance has been negligible. Resistance to ofloxacin has 2one up from 5% to 25%. Resistance to cefixime. nalidixic acid and pipemedic acid has gone up from 15 to to 35%.
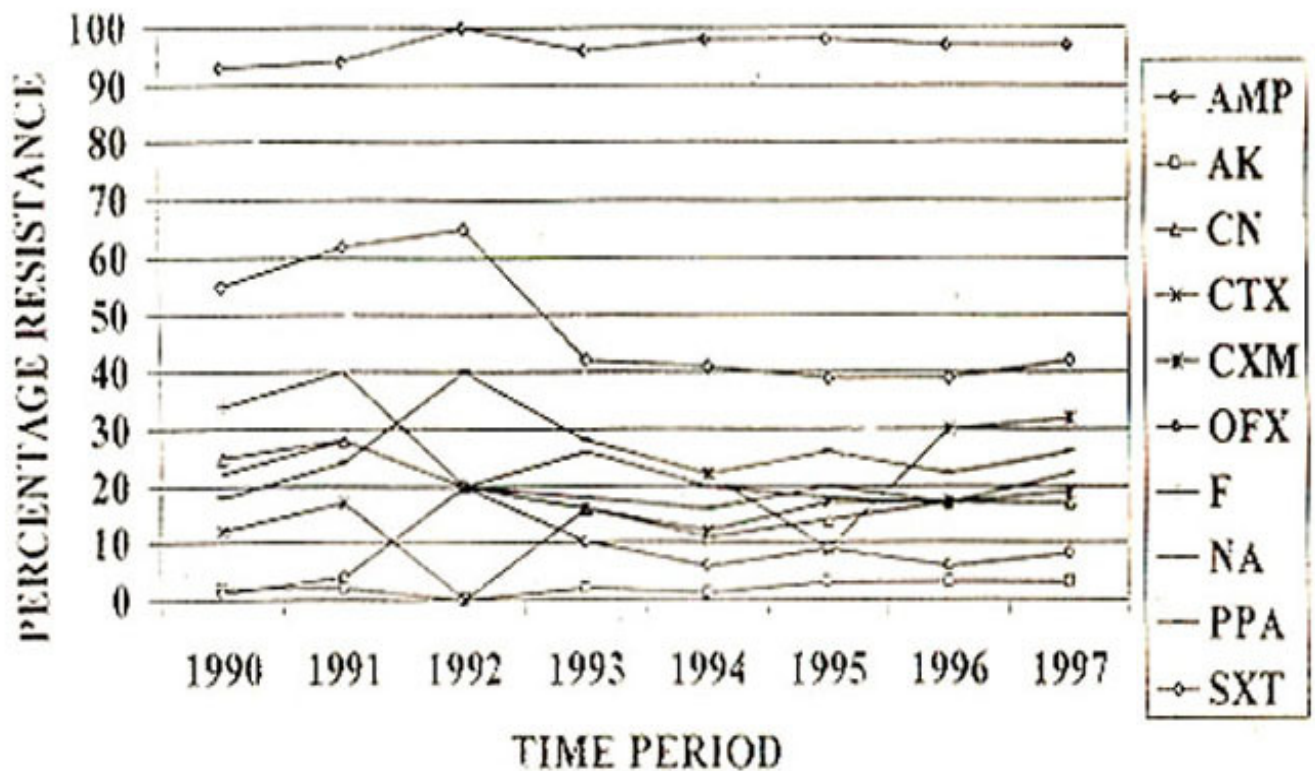

Figure 2 Pattern of antibiotics resistance of Klebsiella aerugines

Figure 2 shows antimicrobial resistance pattern of Kiebsiella aerogenes. There is little change except resistance to trimethroprim-sulfaniethoxazole was 55% in 1990 and went up-to 65% in 1992, but decreased to 40% in 1993, which persisted until 1997. As regards amikacin, cefotaxime and nitrofurantoin the resitance has been negligible. Resistance to ofloxacin has gone up from 5% to 25%. Resistance to cefixime, nalidixic acid and pipemedic acid has gone up 15% to 35%.
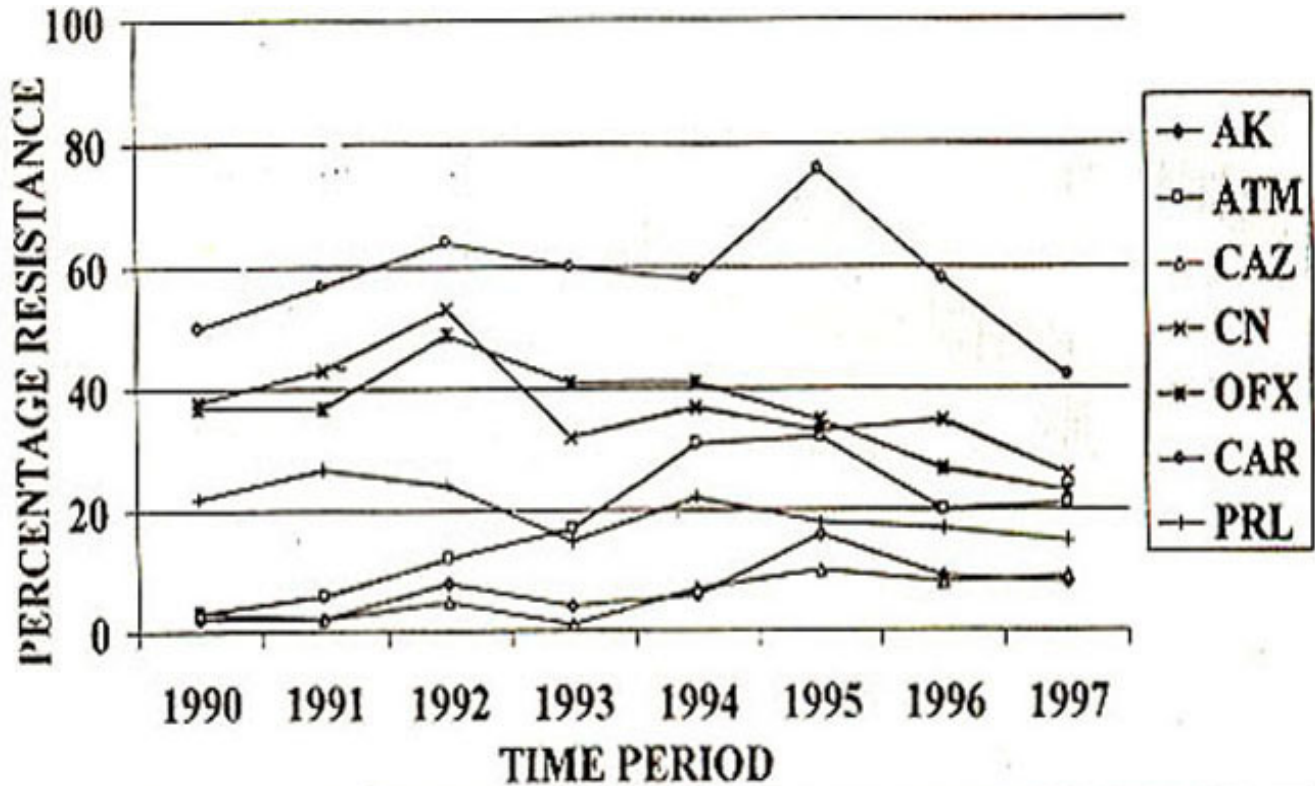
Pseudomonas aeroginosa

Figure 3. Pattern of antibiotic resistance of pesudomonas aeruginosa.

Figure shows antimicrobial resistance pattern of various species of Pseudomonas aeroginosa and their comparison from 1990-97. As regards amikacin and ceflazidime, the resistance has been negligible. About 50% of strains have been resistant to carbenicillin in 1990. Resistance went up to 70% in 1995 but decreased to 40% in 1997. As regard gentamicin the resistance was 38% in 1990, went up to 46% in 1992, then came down to 25% in 1997. As regards aztreonam resistance have gone up from 5% in 1990 to 30% in 1994 with a small decline to 20% in 1997. As regards ofioxacin the resistance was 38% in 1990, decreased to 22% in 1997. Resistance to pipracillin has been between 15 to 20%.
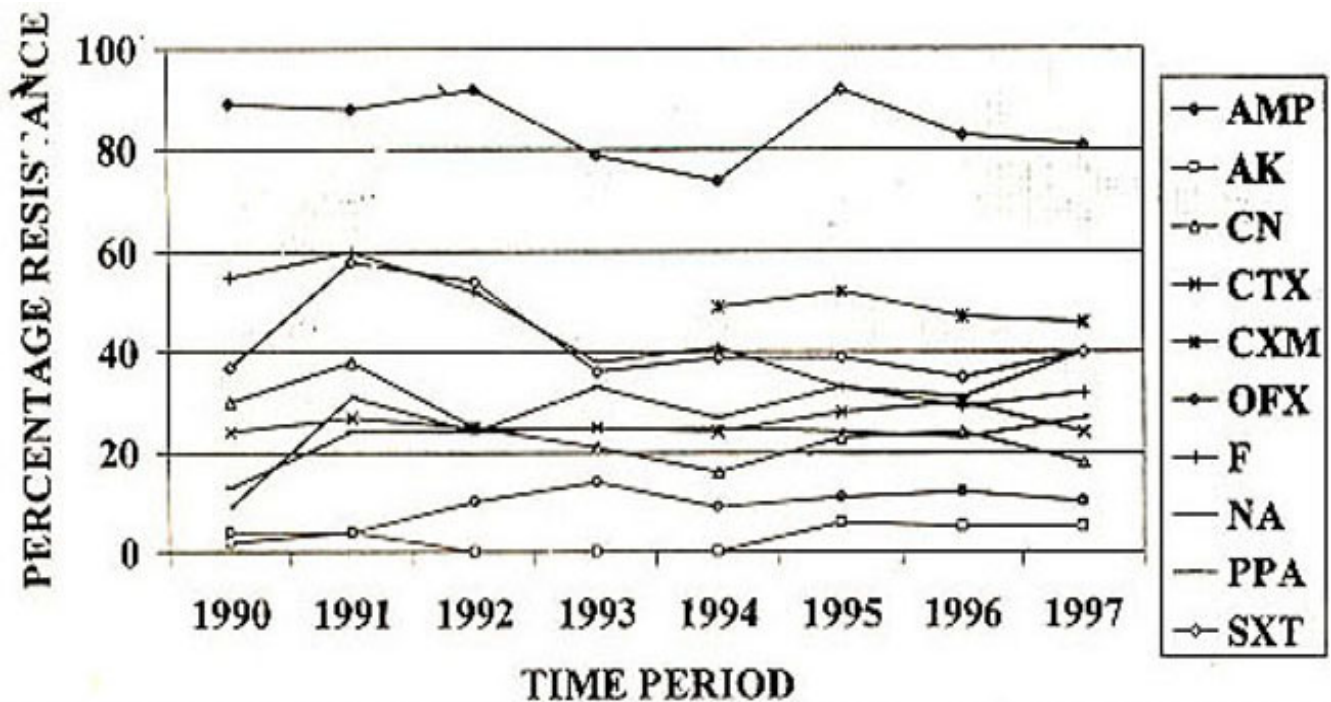
Enterobacter species

Figure 4. Pattern of antibiotic resistance of enterobacter.

Figure 4 shows antibiotic resistance pattern of various antibiotic for Enterobacter species and their comparison from 1990-97. About 90% of strains were resistant to ampicillin through out this period. Resistance to trimethoprim-sulfaniethoxazole was 38% in 1990, went up to 60% in 1 991, then declined to 38% in 1993 and remained 38% until 1997, Gentamicin resistance was 25% in 1990 and remained the same through out these years. As regards amikacin. ofloxacin and cefotaxinie the resistance has been negligible. Cefixime was tested since 1994. In 1994 50% strains we resistance to this antibiotic. There was negligible change in resistance between 1994 and 1997. Fitly flve percent strains were resistant to nitrofurantoin in 1 990. The resistant patter has slightly decreased in the following years. Only 30% strains were resistant to nitrolurantoin in 1997.

There has been negligible change in the resistance pattern of nalidixic acid and pipeniedic acid.
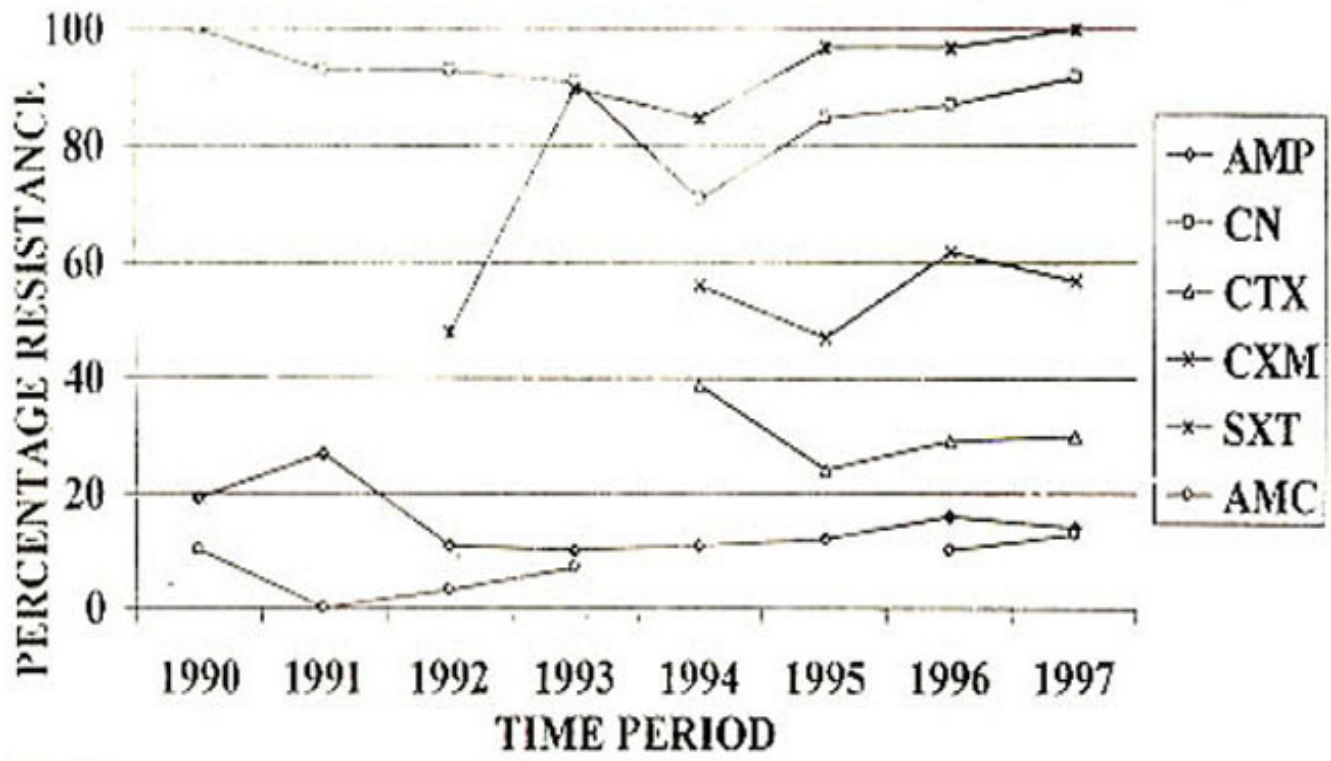
Enterococcous

Figure 5 Pattern of antibiotics resistance of enterococcus.

Figure 5 shows antibiotic resistance pattern of various antibiotics for Entcrcoccous and their comparison from 1990-97. Resistance to trimethoprim-sulfamethoxazole has increased from 45% in 1992 to 100% in 1997. Resistance to Ampicillin remains negligible through out the period. Ampicillin resistant strains were tested for augmentine showed 60% oF resistance in the year 1996-97.

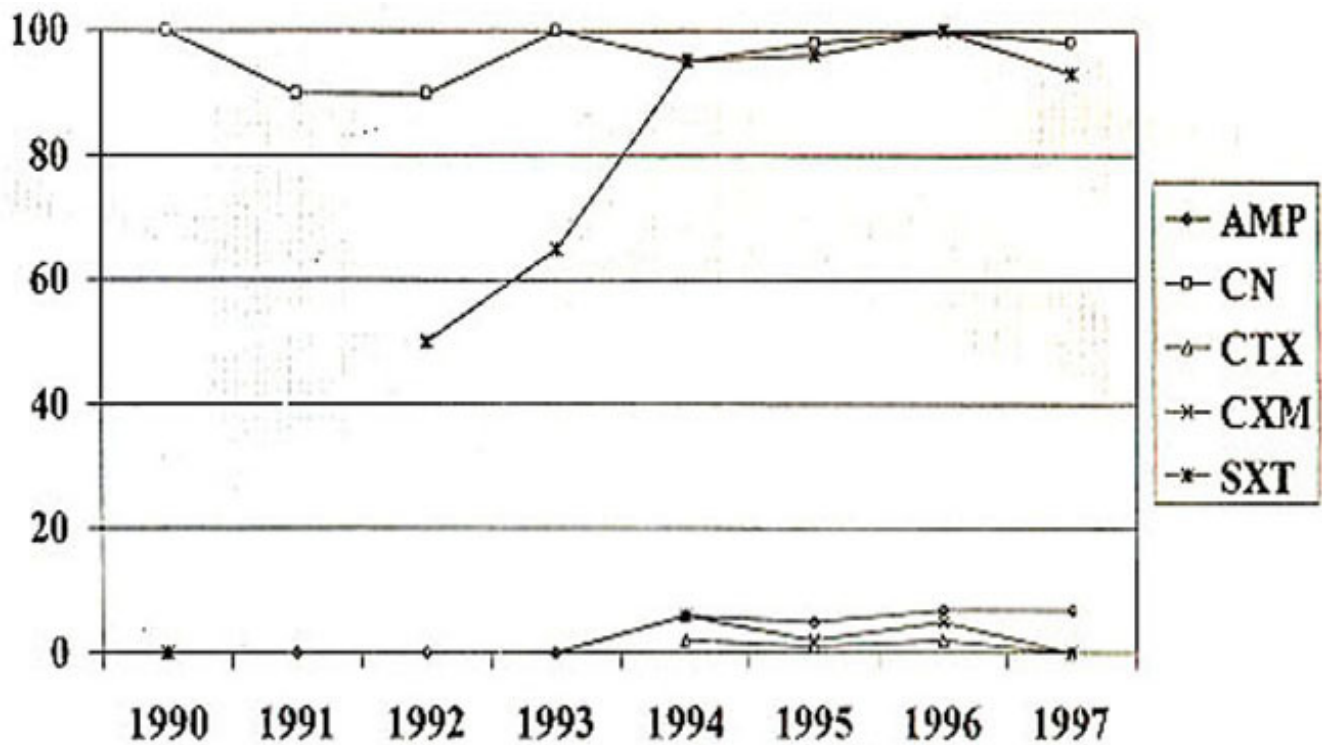**Beta Haemolytic streptococci group B**

Figure 6. Pattern of antibiotic resistance of BHS GP B.

Figure 6 shows antibiotic resistance pattern of various alitihiotics for Beta H aeni o lyt ic streptococci group B and their comparison from 1990-97. Resistance to trimethoprim-su Ifamethoxazole has increased from 45% in 1992 to 45% in 1997. Resistance to ampicillin and cefixime remains negligible through out the period.
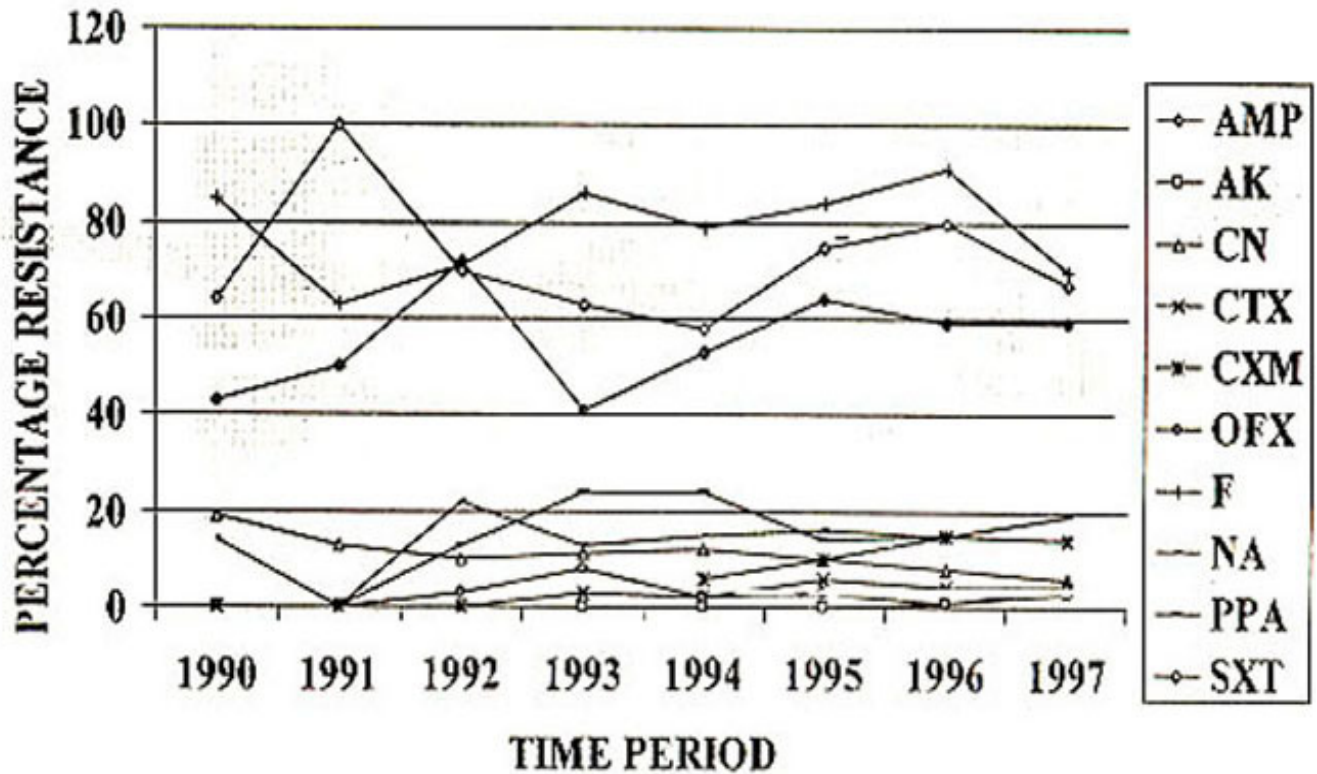
Proteus mirabillus

Figure 7. Pattern of antibiotic resistance of Proteus Mirabilus.

Figure 7 shows antibiotic resistance pattern of proteus mirabillus against various antibiotics. From 1990 to 1997 resistance to ampicillin and nitrogurantin was 40-60%. Resistance to trimethoprim-sulfamethocxazole was fluctuating between 60 to 100% from 1990 to 1997. As regards gentam icin, am ikacin, cefotax ime cefixini e, ofloxacin. nalidixic acid and pipemedic acid the resistance has been negli2ihle and remains the same over a period of seven years.
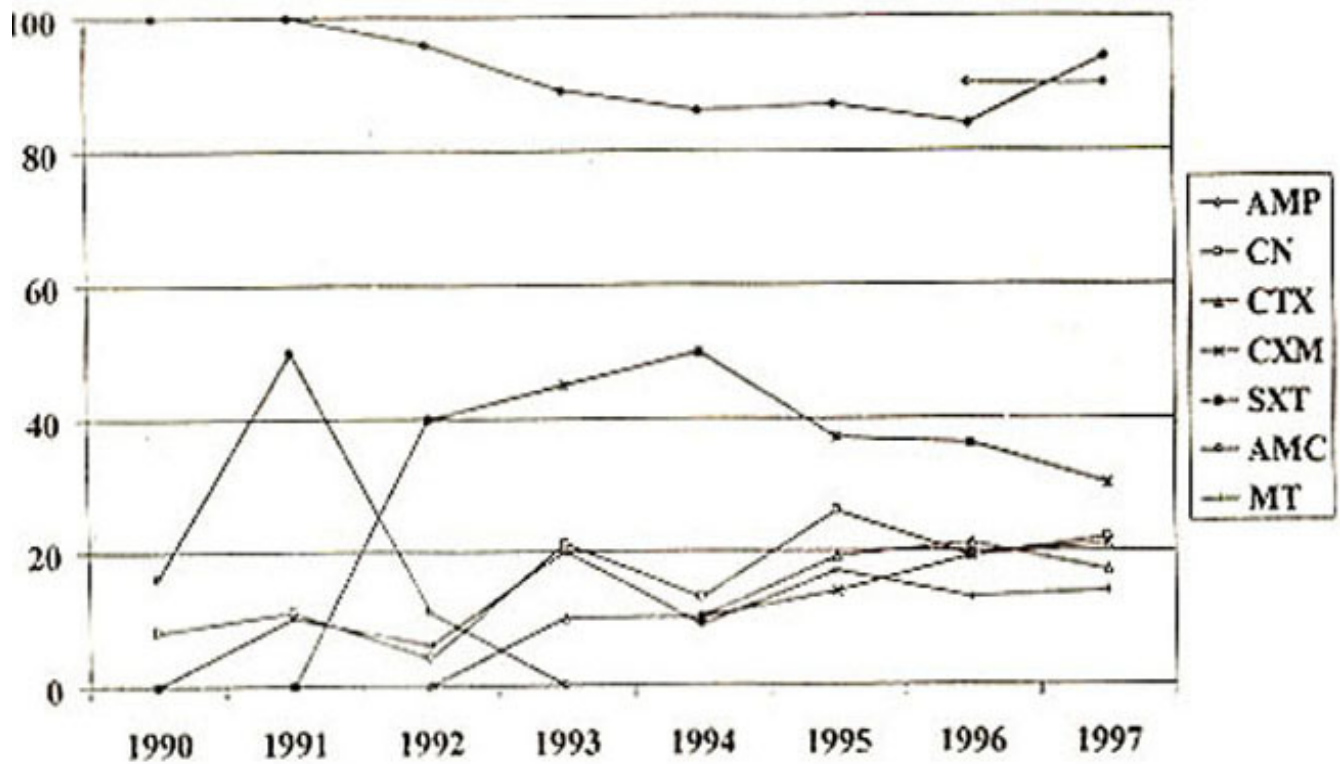
Staphylococcus aureus

Figure 8 Pattern of antibiotic resistance of Staph. aureus

Figure 8 shows antibiotic resistance pattern of various antibiotics for Staphylococcus aureus and their comparison from 1990—97. All isolates were sensitive to trimethoprim—sulfamethoxazole in 1990. However, resistance has increased to 30% in 1997. Resistance to ampicillin and augmentin was almost 95% throughout this period. Resistant to methicillin, cefixime and gentamicin in showing gradual rise from 10% in 1990 in 20% in 1997.
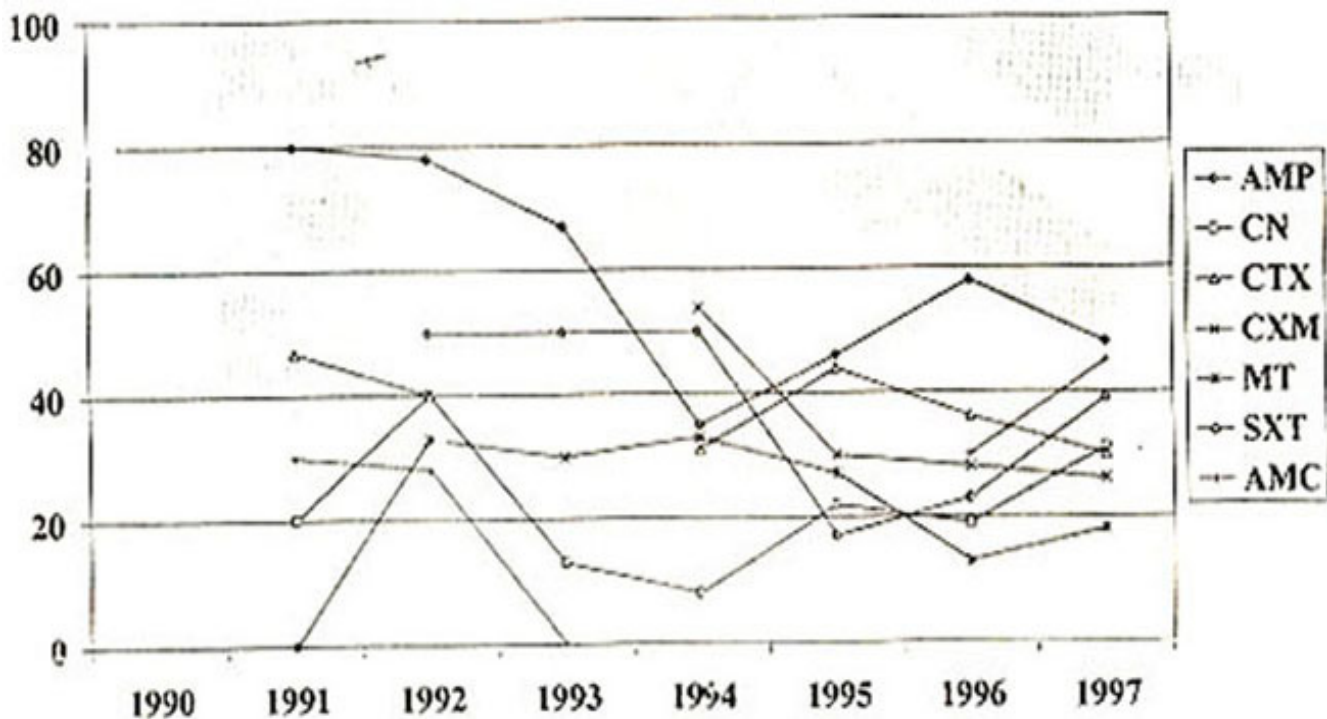
Figure 9. Pattern of antibiotic resistance of Staph. Saprophyticus.

Figure 9 shows antibiotic resistance pattern of various antibiotics for Staphylococcus saprophyticus and their comparison from 1990-97. All isolates were resistant to tromethoprim-sulfamethoxazole from 1992 to 1994, followed by a dec line to 20% in 1995. There is again a gradual increase to 40% in 1997. Resistance to ampicillin was 80% in 1991 declined to 35% in 1994 and then went up to 50% in 1997. All isolates were sensitive to methicillin in 1 99 1 1 lowever. resistance has been fluctuating from 30°/a to 20% during 1992 to 1997. Testing of cefixime started in 1994 and 50% isolates were resistant to it however pattern decline and only 25% isolates were resistant to this antibiotic in 1997. Resistance Pattern of gentamicin has been fluctuating between 20% to 40% during the period1991 to 1997.

Discussion

E.Coli was the commonest organism causing Urinary Tract Infection in this community. This is keeping with the studies carried out by other authors from Pakistan[8-11]. E.Coli was isolated in 52% of our samples which is less than reported by other authors[12,13] This may be because our outside referrals also included samples from other hospitals (out patients as well as in—patients). Detail history of these patients was not available. Other organisms isolated were Klebsiella aerogenes (9%), Pseudonionas aeroginosa (7.7%). Enterohacter species (4%). Enterococcous (2%), Beta Haemolytic streptococci group B (2%). Proteus mirabillus (1.6%), Staphylococcus auerus (1.4%) and Staphylococcus saprophyticus (0.8%). Pseudomonas aeroginosa was isolated in 7.7% of' our samples which is more than what is reported by other authors [15] This may be because our outside referrals include samples from other hospitals (in-patients).

Klebsiella aerogenes in present study is isolated in 9% of cases. It is the second most leading cause of UTI in this community. Similar findings have been reported by other authors[9]. Enterobacter species has been isolated in 4% of cases. Similar findings have been reported by other authors[9].

The findings of Pseudomonas aeroginosa. in present studies in 7.7%. Similar findings has been reported by other authors [18] No decrease in incidence of Pseudomonas aeroginosa was noted with time,

which in contrast of the findings of other authors who reported a decrease in the isolates of Pseudomonas aerogenosa from 1970 to 1990 [17]. Proteus mirabillus is isolated in 1 .6% of our samples. Our study shows marked decrease of Proteus mirabillus which might be due to changing pattern of UTI pathogens in recent years. Similar findings have been reported by other authors from the West [16,17]. Enterococcus was isolated in 2.0% of cases. Staphylococcus aureus has been isolated in 1.4% of cases and Staphylococcus saprophyticus in 0.8% of cases. This is in keeping with the study carried out by other author[16]. Beta Haemolytic streptococci group B was isolated in 2% of our samples. This is similar to what has been reported by other authors[17].

As regards antimicrobial susceptibility pattern, overall 75% E.coli remains resistant to ampicillin and Trimethoprim-sulfamethoxazole throughout this period Similar observation was reported In other authors from Pakistan[8-11]. For gram negative rods other than Ecoli. however, significantly high rules of resistance are also seen for ampiciIlin and trimethoprime-sulfamethoxazole Similar have been reported by other authors[13,14]. These organisms have shown low rate of resistance to cefotaxime, ceftriaxone. aztreonani. otloxacin. am ikacin. gentam icin, nalidixie acid, pipemedic. acid and nitrofurantion. Although resistance to these above antimicrobials have gone tip from I 0% to 40% over a period of 7 years (1990-97). Other gram negative rods show a similar pattern to those reported earlier[17,18].

As regards Pseudomonas aeroginosa resistance to earbenicillin has gone down from 75 in 1995 to 40% in 1997. This may be because cathenicillinma not be used during this period.

Our Study shows that the antimicrobial drug resistance pattern ot above-mentioned organisms has changed significant ly in the past 7 ears. This is in keeping w ith the studies carried out by other authors[15,17], Our findings are similar to those reported by oilier authorst[12].

As regards Beta Haemolytic streptococcus group B. it is sensitive to most agents. I However, resistance to cefurox line has gone up from 45% in 1992 to 100% in 1997. Our findings are Similar to those reported by other authors [13]. Most strains of Staphy lococcus aureus has been resistant to ampicillin. However these organisms have shown tow rate of resistance to other antimicrobials tested. As regards Staphylococcus saprophvticus resistance to ampicillin has gone down from St 80% in 199I to 40% in 1997, This may be because ampicillin may not be used during this period. These organisms have shown low rate of' resistance to other antimicrobials tested. As regards Enterococci, the organisms have shown low rate of resistance to antimicrobials tested.

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