

## Prevalence and Antibiogram of Gram Positive Organism Isolated from Patients of Urinary Tract Infection

Dharmendra Singh<sup>1</sup>, Dr. Shewtank Goel<sup>2\*</sup>, Dr. Umar Farooq<sup>3</sup>

<sup>1</sup>Student, Department of Microbiology, Teerthanker Mahaveer Medical College and Research Centre, Moradabad, Uttar Pradesh, India

<sup>2</sup>Associate Professor, Department of Microbiology, Teerthanker Mahaveer Medical College and Research Centre, Moradabad, Uttar Pradesh, India

<sup>3</sup>Professor & HOD, Department of Microbiology, Teerthanker Mahaveer Medical College and Research Centre, Moradabad, Uttar Pradesh, India

### Original Research Article

#### \*Corresponding author

*Dr. Shewtank Goel*

#### Article History

Received: 16.03.2018

Accepted: 26.03.2018

Published: 30.03.2018

#### DOI:

10.21276/sjams.2018.6.3.107



**Abstract:** Urinary tract infection (UTI) is one of the most frequent types of nosocomial infections and probably affects about one-half of all people during their lifetimes. The predominant pathogen responsible for UTI is *E. coli* which constitutes up to 80-85% and followed by *Staphylococcus saprophyticus*, a Gram positive coagulase negative staphylococcus, and causes about 10% of infections among young, sexually active women. The objective of the study was to isolate Gram Positive Uropathogens causing urinary tract infections & to determine the antimicrobial susceptibility pattern of the isolates. Mid-stream urine (MSU) specimens will be collected from both inpatients (IPD) and outpatients (OPD) suspected to be having urinary tract infection. Urine microscopy will be done for pus cells and cultured on Blood agar, MacConkey agar & CLED agar. The plates will be incubated at 37°C for 24-48 hours. Gram stain will be done to see the Gram positive cocci in pairs or short chains. During 1 year period (January 2017 to December 2017.) A total 355 urine samples of UTI suspected patients were screened 119 (33.52%) patients were showed to be urine culture positive of which 80 (67.22%) females and 39 (32.77%) Male. The isolation percentages of gram positive uropathogens were found as 45(37.81%) in which *Staphylococcus aureus* 22(48.88%) in which 8 were MRSA & 14 MSSA, *Enterococcus spp.* 14 (31.11%), and Coagulase negative staph aureus (CoNS) 9(20.00%). The gram positive and gram negative bacterial proportion was 45(37.81%) and 74(62.18), respectively. The present study exhibit that *staphylococcus aureus* is the most common causative agent of urinary tract infection. Vancomycin, Teicoplanin and Linezolid seem to the most effective drugs for treatment of gram positive uropathogens causing UTI.

**Keywords:** UTI, *Staphylococcus*, CoNS, MSU, Vancomycin.

### INTRODUCTION

Urinary tract infection (UTI) is one of the most frequent types of nosocomial infections and probably affects about one-half of all people during their lifetimes [1, 2].

UTI occurrence is widely related to social class, age of the patients, birth rank or size of family. UTI affects people in varying incidences depending on age group and gender [3].

Most of the time boys are greater risk before the age of 3 months but girls become at greater risk thereafter. Studies have shown that 3% of prepubertal girls and 1% of prepubertal boys are diagnosed with a UTI [3, 4].

Incidence of Urinary tract infection is higher in women than men, 40%-50% of whom will suffer at least one clinical episode during their lifetime [5].

Most urinary tract pathogens originate in the fecal flora but only aerobic and facultative species such as *Escherichia coli* possess the attributes required to colonize and infect the urinary tract. Virulence factor of causative organisms such as capsule which inhibiting phagocytosis, pili which enable adherence and bacteria production like haemolysins which cause kidney damage, and urease production which cause pyelonephritis [6].

The family enterobacteriaceae are the most frequent pathogens detected causing 84.3% of the Urinary Tract Infections [7].

The worldwide increase of uropathogens resistant to former first line antibiotics, such as Cotrimoxazole, fluoroquinolones and Cephalosporins, has had detrimental consequences not only for treatment but also for prophylaxis of infectious complications after urological interventions. A paradigm shift concerning asymptomatic bacteriuria has had a great impact on the definition and management of UTIs today [8].

**MATERIALS AND METHODS**

In this study Total 355 patients with clinical symptoms of any age group patient either Male or Female suspected to UTI were sampled attending Hospital of Teerthnaker Mahaveer Medical College & Research Centre, Moradabad.

Mid-stream urine (MSU) specimens will be collected from both inpatients (IPD) and outpatients (OPD) suspected to be having urinary tract infection.

Urine microscopy will be done for pus cells and cultured on Blood agar, Macconkey agar & CLED agar. The plates will be incubated at 37°C for 24-48 hours. Any significant growth obtained will be identified using general appearance of the colonies and characters like pigment production and haemolysis.

Gram stain will be done to see the characteristic morphology of Gram positive cocci in pairs or short chains. Bacterial isolates were identified and confirmed using standard microbiological method which included Catalase test, Coagulase test and Bile-Esculin Hydrolysis test.

Antimicrobial susceptibility testing of the isolates will be carried out using Kirby-Bauer disc diffusion method on Mueller-Hinton agar as recommended by Clinical and Laboratory Standards Institute (CLSI). Using following antibiotics Amoxy/Clavulanic acid (30mcg), Amoxicillin (10mcg), Ampicillin/Sulbactam (10mcg), Vancomycin (30mcg), Cephalexin (30mcg), Co-trimoxazole (25mcg), Nitrofurantoin (300mcg) Norfloxacin (10mcg) Ciprofloxacin (5mcg) Cefotaxime (10mcg) Teicoplanin (300mcg) Linezolid (30mcg) Ofloxacin (5mcg) Clindamycin (2mcg) and Tobramycin (10mcg).

Interpretation of diameter of growth inhibition zone was done by using the standard interpretative chart provided by disc manufacture. At 37°C after 24 hours of incubation organisms were scored as sensitive or resistant to corresponding antibiotics on the basis of zone of inhibition following the criteria of Clinical and Laboratory Standards Institute (CLSI).

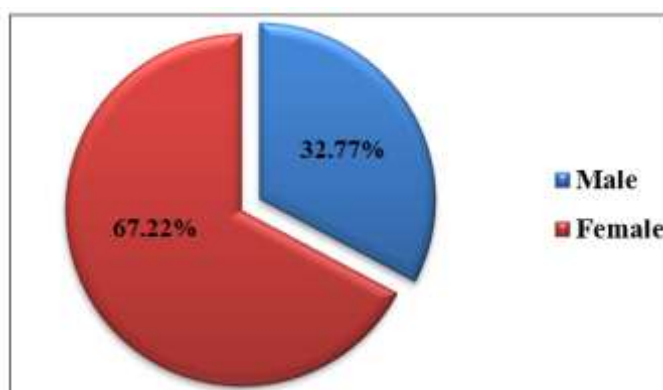
**RESULT AND DISCUSSION**

A total 355 midstream urine samples (both IPD & OPD) were processed from patients having clinically suspected UTI attending Teerthnaker Mahaveer Hospital and Research Centre Moaradabad. Out of which 119(33.52%) patients were showed to be urine culture positive. Among them 80(67.22%) were females and 39(32.77%) were male.

Total sample- 355  
 No. of culture positive sample- 119(33.52%)  
 No. of culture negative sample- 236 (67.42%)

**Table -1: Sex wise distribution**

Sex	Positive cases	%	Negative cases	%
Male	39	32.77	56	23.72
Female	80	67.22	180	76.27
Total	119	100	236	100



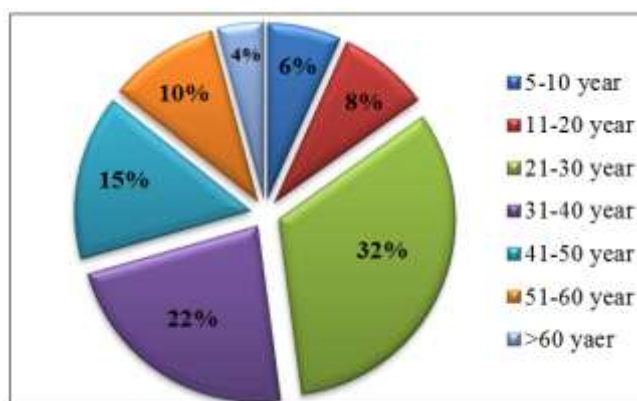
**Fig-1: Sex wise distribution**

Table-1 & Figure-1 shows a total 355 midstream urine samples were processed from patients having clinically suspected UTI among them

119(33.52%) samples yielded growth on culture in which 80(67.22%) were females and 39(32.77%) were male.

**Table-2: Age and sex wise distribution**

Age group	Male	Female	Total
5-10	4	4	8
11-20	3	7	10
21-30	13	26	39
31-40	8	19	27
41-50	7	11	18
51-60	4	8	12
> 60	3	2	5
Total	39	80	119



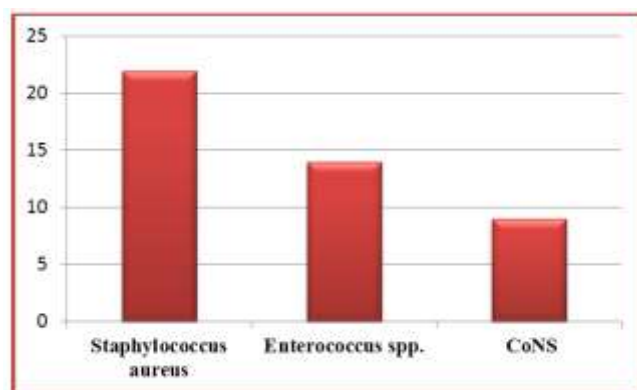
**Fig-2: Age and sex distribution**

Table -2 & Figure-2 shows age & sex distribution. Highest prevalence was seen in age group 21 to 30 years 39 (32.77%) followed by 31 to 40 years

27 (22.68%) and the least affected age group above 60 years 5 (4.20%). This represented the increased susceptibility of the younger population to UTIs.

**Table-3: Gram Positive Organism distribution**

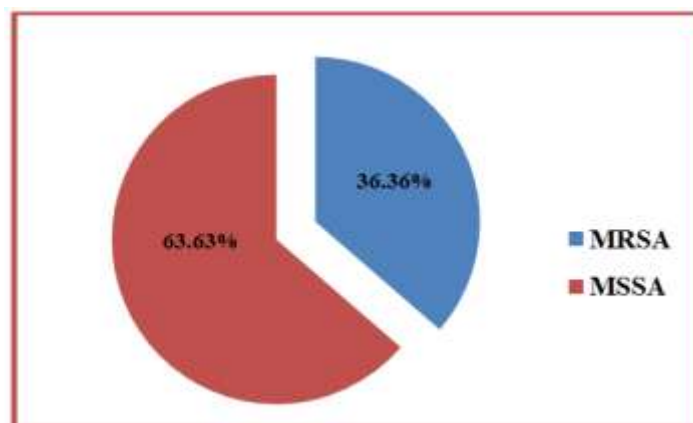
Gram positive organism	No. of Cases	Percentage
Staphylococcus aureus	22	48.88%
Enterococcus spp.	14	31.11%
CoNS	9	20.00%
<b>Total</b>	<b>45</b>	<b>100%</b>



**Fig-3: Gram Positive Organism distribution**

Table-3 & Figure-3 shows Staphylococcus aureus (48.85%) was most common gram positive

bacteria followed by Enterococcus (31.11%) and Coagulase negative staphylococcus (CoNS) (20.00%).



**Fig-5 Distribution of MRSA & MSSA**

Figure-5 showed total 22 Staphylococcus aureus isolates from urine sample in which 8 (36.36%) Were MRSA & 14 (63.63%) MSSA.

Recent studies have lighted the importance of gram positive cocci in urinary tract infections. Urinary tract infection (UTI) is one of the most frequent types of nosocomial infections and probably affects about one-

half of all people during their lifetimes. Many of nosocomial infections are associated with microorganisms that are resistant to antibiotics and can easily spread by hospital environment and personnel. Monitoring of antimicrobial susceptibility can aid clinicians for prescription of appropriate antibiotics and prevention of development of drug resistance.

**Table-4: Gram positive organism’s antibiotic sensitivity pattern**

Antibiotics	Staphylococcus aureus N=22		Enterococcus spp. N=14		CoNS N=9	
	R	S	R	S	R	S
Amoxy/Clavulanicacid	16 (72.72%)	6 (27.27%)	10 (71.42%)	4 (28.57%)	5 (55.55%)	4 (44.44%)
Amoxicillin	19 (86.36%)	3 (13.63%)	9 (64.28%)	5 (35.71%)	4 (44.44%)	5 (55.55%)
Ampicillin/Sulbactam	15 (68.18%)	7 (31.81%)	11 (78.57%)	3 (21.42%)	6 (66.66%)	3 (33.33%)
Vancomycin	2 (9.09%)	20 (90.00%)	1 (7.14%)	13 (92.75%)	1 (11.11%)	8(88.88%)
Cephalexin	17 (77.27%)	5 (22.72%)	7 (50.00%)	7 (50.00%)	5 (55.55%)	4 (44.44%)
Co-trimoxazole	14 (63.63%)	8 (36.36%)	9 (64.28%)	5(35.71%)	8 (88.88%)	1 (11.11%)
Nitrofurantoin	10 (45.45%)	12 (54.54%)	10 (71.42%)	4(28.57%)	5 (55.55%)	4 (44.44%)
Norfloxacin	9 (40.90%)	13 (59.09%)	8 (57.14%)	6 (42.85%)	5 (55.55%)	4 (44.44%)
Ciprofloxacin	13 (59.09%)	9 (40.90%)	7 (50.00%)	7 (50.00%)	7 (77.77%)	2 (22.22%)
Cefotaxime	11 (50.00%)	11 (50.00%)	12 (85.71%)	2 (14.28%)	7 (77.77%)	2 (22.22%)
Teicoplanin	4 (18.18%)	18 (81.81%)	2 (14.28%)	12 (85.71%)	1 (11.11%)	8 (88.88%)
Linezolid	3 (13.63%)	19 (86.36%)	1 (7.14%)	13 (92.85%)	2 (22.22%)	7 (77.77%)
Ofloxacin	15 (68.18%)	7 (31.81%)	8 (57.14%)	6 (42.85%)	5 (55.55%)	4 (44.44%)
Clindamycin	11 (50.00%)	11 (50.00%)	6 (42.85%)	8 (57.14%)	3 (33.33%)	6 (66.66%)
Tobramycin	7 (31.81%)	15 (68.18%)	4 (28.57%)	10 (71.42%)	2 (22.22%)	7 (77.77%)

In this study, we investigated the Prevalence and antibiogram of gram positive organism isolated from patients of urinary tract infection.

In our study total 355 urine samples of UTI suspected patients were screened 119 patients were showed to be urine culture positive and 236 were sterile.

In our study the isolation rate of gram positive cocci (37.81%) from urine which was less than gram negative bacteria (62.18%), these are similar to recent study Zahra Tayebi *et al.*, [9] (Gram positive-41.3% & Gram negative -58.7%), S. Farajnia, M. Y. Alikhani *et*

*al.*, [10] (Gram positive-39.23% & Gram negative 60.77%), B. Tessema, A. Kassu *et al.*, [11] (Gram positive-34.99% & Gram negative- 65.01%), J. A. Dromigny *et al.*, [12] (Gram positive-36.25% & Gram negative-63.75%).

In our study the frequency of UTI 67.22% in female was higher than the occurrence in male 32.77% .This finding is in agreement with studies carried out by Mahajan ruchita *et al.*, [13] where UTI was higher in female 60% than in male 40%. The high prevalence of UTI in females could be attributed to the physiological and anatomical differences in male & females. With respect to anatomical differences shows that the

female's urethra and vagina makes it labile to trauma during sexual intercourse as well as bacteria been massaged up the urethra in to the bladder during pregnancy and child birth.

In our study the high prevalence of UTI between the age of 21 to 30 year is due to the relatively higher sexual activity that is observed in the age group and multiple sex partners and the least infection was recorded in subject above 60 years, this is an agreement with the study conducted by Tia Neelam, Moti lal *et al.*, [14]

This study revealed that the occurrence rate of staphylococcus aureus (48.88%) which was higher than the occurrence rate of (10.00%) recorded by Kotgire Santosh *et al.*, [15] followed by (9.68%) recorded by Prakash devanand *et al.*, [16], and lower than (59.80%) recorded by Tayebi Zahra *et al.*, [9]. The presence of Staphylococcus aureus in UTI could be due to the increased use of instrumentation like bladder catheterization in patients admitted in the hospital with primary disease.

This study showed a high prevalence rate of resistance to the commonly prescribed antibiotic agent. In our study, the highest resistance rate of the Staphylococcus aureus was against Cefotaxime (85.71%) followed by Ampicillin/Sulbactam (78.57%), Amoxy/Clavulanic acid (71.42%), Nitrofurantoin (71.42%), Amoxicillin (64.28%) Co-trimoxazole (64.28%), Clindamycin (42.85%). Resistance to Vancomycin (9.09%) among our isolates was very low. This data is consistent with some earlier reports P. Preethishree *et al.*, [17] and Amit A Rangari *et al.*, [18].

Enterococcus spp. was highly sensitive to Linezolid (92.85%) followed by Vancomycin (92.75%) Teicoplanin (85.71%), Tobramycin (71.42%), Clindamycin (57.14%) and Ciprofloxacin (50.00%) similar sensitivity pattern was seen in Shah *et al.*, [19] Razak *et al.*, [20].

In our study, the highest resistance rate of the CoNS was against Co-trimoxazole (88.88%) followed by Ciprofloxacin (77.77%), Cefotaxime (77.67%), Ampicillin/Sulbactam (66.66%), Amoxy/Clavulanic acid (55.55%) Amoxicillin (44.44%) while all of them were sensitive to vancomycin and Teicoplanin. This data is consistent with some earlier reports Kotgire Santosh *et al.*, [15] Awoke Derese *et al.*, [21].

## CONCLUSION

In our study total 355 urine samples of UTI suspected patients were screened 119 patients were showed to be urine culture positive and 236 were sterile.

Among all the gram positive organism Staphylococcus aureus is the most predominant

pathogen cause of urinary tract infection that is of 48.88% other organism like Enterococcus spp. (31.11%) and Coagulase negative staph aureus (CoNS) (20.00%).

The prevalence of urinary tract infection higher in females (67.22%) as compared to male (32.77%). According to age and sex distribution the most affected age group are from 21 to 30 years of age group.

According to our findings, Amoxicillin, Cephalexin, Ampicillin/Sulbactam and Co-trimoxazole are not effective drugs for treatment of UTI. Progressive increase in resistance to these antibiotics and multiple resistances to antibiotics in present study may be related to increased usage of these antibiotics for treatment of UTI and ability of strains in acquisition of resistance genes.

The high level of resistance among gram positive bacteria causing UTI limits the use of antimicrobial agents for therapy and also the spread of MDR isolates is a threat for hospitalized patients. Continuous Surveillance for multidrug-resistant strains is necessary to prevent the further spread of resistant isolates.

As well last but not least Urinary tract infections are be painful, but you can take steps to ease your discomfort until antibiotics treat the infection. Follow these tips-

**Drink plenty of water:-**Water helps to dilute your urine and flush out bacteria.

**Avoid drinks that may irritate your bladder:-**Avoid coffee, alcohol, and soft drinks containing citrus juices or caffeine until your infection has cleared. They can irritate your bladder and tend to aggravate your frequent or urgent need to urinate.

**Use a heating pad:-**Apply a warm, but not hot, heating pad to your abdomen to minimize bladder pressure or discomfort.

## REFERENCES

1. Barišić Z, Babić-Erceg A, Borzić E, Zoranić V, Kaliterna V, Carev M. Urinary tract infections in South Croatia: aetiology and antimicrobial resistance. International journal of antimicrobial agents. 2003 Oct 1;22:61-4.
2. Prais D, Straussberg R, Avitzur Y, Nussinovitch M, Harel L, Amir J. Bacterial susceptibility to oral antibiotics in community acquired urinary tract infection. Archives of disease in childhood. 2003 Mar 1;88(3):215-8.
3. Prakasam AK, Kumar KD, Vijayan M. A cross sectional study on distribution of urinary tract infection and their antibiotic utilisation pattern in

- Kerala. *Int J PharmTech Research*. 2012;4(3):1309-6.
4. Kolawole AS, Kolawole OM, Kandaki-Olukemi YT, Babatunde SK, Durowade KA, Kolawole CF. Prevalence of urinary tract infections (UTI) among patients attending Dalhatu Araf Specialist Hospital, Lafia, Nasarawa state, Nigeria. *International journal of medicine and medical sciences*. 2010 May 30;1(5):163-7.
  5. Ahmed MA, Shukla GS, Bajaj HK. Incidence of Urinary Tract Infections and determination of their susceptibility to antibiotics among Pregnant Women. *International Journal of Cell Science and Biotechnology*. 2016;5(1).
  6. Cedric M, HAZEL MH, Richard VC, Derek W, and Mark Z. *Medical microbiology*, third edition, Mosby-year book Europe Ltd; 2004.
  7. Gales CA, Jones RN, Gardon KA. Activity urinary tract infection pathogens in hospitalised patients in latin America *Jouranl of Antimicrobial chemotherapy* Vol. 45, No 3 pp 293-303.
  8. Naber KG, Schito G, Botto H, Palou J, Mazzei T. Surveillance study in Europe and Brazil on clinical aspects and Antimicrobial Resistance Epidemiology in Females with Cystitis (ARESC): implications for empiric therapy. *European urology*. 2008 Nov 1;54(5):1164-78.
  9. Tayebi Z, Seyedjavadi SS, Goudarzi M, Rahimi MK, Boromandi S, Bostanabad SZ, Mirzaei A, Mahdiyoun M. Frequency and antibiotic resistance pattern in gram positive uropathogenes isolated from hospitalized patients with urinary tract infection in Tehran. Iran. *J Genes Microb Immun*. 2014;2014:1-9.
  10. Farajnia S, Alikhani MY, Ghotaslou R, Naghili B, Nakhband A. Causative agents and antimicrobial susceptibilities of urinary tract infections in the northwest of Iran. *International Journal of Infectious Diseases*. 2009 Mar 1;13(2):140-4.
  11. Tessema B, Kassu A, Mulu A, Yismaw G. Pridominant isolates of urinary tract pathogens and their antimicrobial susceptiblity patterns in Gondar University Teaching Hospital, nothwest Ethiopia. *Ethiopian medical journal*. 2007 Jan;45(1):61-7.
  12. Dromigny JA, Nabeth P, Juergens-Behr A, Perrier-Gros-Claude JD. Risk factors for antibiotic-resistant *Escherichia coli* isolated from community-acquired urinary tract infections in Dakar, Senegal. *Journal of Antimicrobial Chemotherapy*. 2005 Apr 15;56(1):236-9.
  13. Mahajan R, Gupta S, Mahajan B. Antibiotic Susceptibility Pattern of Isolates in Urinary Tract Infection in a Tertiary Care Hospital. *J Rational Pharmacother Res*. 2014;2(2):44-9.
  14. Tia N, Lal M. Bacteria Associated with Urinary Tract Infection (UTI). *Int. J. Curr. Microbiol. App. Sci*. 2016;5(8):248-54.
  15. Santosh K, Siddiqui S. Prevalence and Antibigram of Uropathogens from Patients Attending Tertiary Care Hospital: An overview. *Medicine*. 2017;146:21-31.
  16. Prakash D, Saxena RS. Distribution and antimicrobial susceptibility pattern of bacterial pathogens causing urinary tract infection in urban community of meerut city, India. *ISRN microbiology*. 2013 Oct 29;2013.
  17. Preethishree P, Rai R, Kumar KV, Pai KA, Bhat UP. Uropathogens and their antibiotic susceptibility pattern at a tertiary care teaching hospital in Coastal Karnataka, India. *Int. J. Curr. Microbiol. App. Sci*. 2016;5(1):23-31.
  18. Rangari AA, Sharma S, Tyagi N, Singh P, Singh G, Thakur R. Antibiotic susceptibility pattern of bacterial uropathogens isolated from patients at a tertiary care hospital in Western Uttar Pradesh of India. *J. Curr. Microbiol. Appl. Sci*. 2015;10:646-57.
  19. Gratz LE, Ambrose JL, Jaffe DA, Shah V, Jaegle L, Stutz J, Festa J, Spolaor M, Tsai C, Selin NE, Song S. Oxidation of mercury by bromine in the subtropical Pacific free troposphere. *Geophysical Research Letters*. 2015 Dec 16;42(23).
  20. Abdul Razak AH, Zayegh A, Begg RK, Wahab Y. Foot plantar pressure measurement system: A review. *Sensors*. 2012 Jul 23;12(7):9884-912.
  21. Hailu D, Mekonnen D, Derby A, Mulu W, Abera B. Pathogenic bacteria profile and antimicrobial susceptibility patterns of ear infection at Bahir Dar Regional Health Research Laboratory Center, Ethiopia. *SpringerPlus*. 2016 Dec;5(1):466.