GESA
GLOCAL ENVIRONMENT & SOCIAL ASSOCIATION

International Journal of Biological Innovations
http: //ijbi.org.in | http://www.gesa.org.in/journals.php
Doi: https://doi.org/10.46505/IJBI.2021.3211
IJBI 3(2): 318-322 **(2021)**
E-ISSN: 2582-1032

ANTIBIOTIC SUSCEPTIBILITY PROFILE OF BACTERIA FROM NATURAL SOURCES OF RURAL AREAS OF NIMAD, MADHYA PRADESH

Hemlata Rane and Rakesh Patel*

Department of Life Science,
Shree Rewa Gurjar Bal Niketan College, Sanawad Dist. Khargone (M.P.), India

**Corresponding author*: rakeshpatelbmt@gmail.com

Article Info:
Research Article
Received
02.09.2021
Reviewed
20.09.2021
Accepted
29.09.2021

Abstract: Antibiotics are microbial products naturally produced in the stationary phase of the growth curve. These are known to kill or inhibit the growth of susceptible infectious microorganisms, so determination of antibiotic susceptibility can help in clinical treatment of infections. *E.coli, S. aureus,* and *Pseudomonas* were used as test organisms, isolated from rural habitations of West Nimad, District. Khargone (M.P.). Authors found that *S. aureus, E. coli* and *Pseudomonas* are multidrug resistant bacteria but highly susceptible for Ertapenem (34 mm zone of inhibition) and Levofloxacin (30 mm zone of inhibition) so these antibiotics should be used for the treatment of infections caused by the said bacteria and early recovery of patients. Regular monitoring of antimicrobial susceptibility in the Nimad area may be helpful in recovery from these infections.

Keywords: Antibiotic, Ertapenem, Levofloxacin, Infection, Pathogen, Susceptibility.

INTRODUCTION

Eshcherichia coli, *Staphylococcus aureus* and *Pseudomonas* sp. are the true bacteria belong to Kingdom Eubacteria as per classification of six kingdom system (Verma and Prakash, 2020). The bacteria and protozoans both are unicellular but former is prokaryotes and latter eukaryotes (Verma, 2021). Antibiotics are naturally produced microbial products or their derivatives that can kill or inhibit growth of other microorganisms including bacteria. Determination of bacterial susceptibility to antibiotics can help for the treatment of infections as well as it provides comparative data for analysis that which antibiotic is more potent for a particular type of pathogen. *Escherichia coli* is a commensal found in human intestine, but also occur in water, soil and easily isolated from sewage sample. This is gram negative rod shaped, aerobic, mesophilic bacterium. Its colony appears large in size with regular margin, translucent, smooth and grayish white pigmentation in agar nutrient.

Most of *E.coli* strains are not harmful but they are opportunistic pathogens and cause diarrhea, abdominal pain, vomiting and sometimes intestinal infections. It is one of the leading pathogens causing urinary tract infections, blood stream infections, wounds and other severe complications in human body. Antibiotic resistance in *E. coli* has been reported worldwide and increasing rates of resistance among *E. coli is* a global concern both in developed and developing countries. A rise in bacterial resistance to antibiotics complicates the treatment of infections. Occurrence and susceptibility profiles of *E. coli* show substantial geographic variations as well as significant differences in various populations and environments (Turner *et al.*, 2006).

Staphylococcus aureus is a Gram-positive, round-shaped bacterium and is a member of Firmicutes. It constitutes a part of the usual microbiota of the body, frequently found in the upper respiratory tract and on the skin. It is often positive for catalase and nitrate reduction and is a facultative anaerobe that can grow without the need for oxygen (Masalha *et al*., 2001). It causes skin and wound infections, food poisoning, boils, impetigo, toxic shock syndrome. *Pseudomonas* is a genus of Gram-negative bacteria, belonging to the family Pseudomonadaceae. The members of this genus show a great deal of metabolic diversity and consequently are able to colonize a wide range of niches. It infects blood, bones, eyes, ears, urinary tract, lungs and wounds.

MATERIALS AND METHODS

In this study, following test organisms or pathogenic bacteria were isolated from natural sources of rural habitations of West Nimad, Sanawad, District Khargone (M.P.):

(1) *Staphylococcus aureus* (Gram positive): isolated from ground soil of SRGBN College, Sanawad.

(2) *Escherichia coli* (Gram negative): isolated from sewage sample of leprosy hospital, Sanawad.

(3) *Pseudomonas* (Gram negative): isolated from a farm soil of village Bhogava, Sanawad.

All three isolates were tested for their antibiotic susceptibility. Muller-Hinton agar is used for checking antibiogram of 24 hours old culture of bacterial isolates. Antibiotic disks (table 1) are 6 mm in diameter; size of petri dish is 150 mm and agar depth is approximately 5 mm. Authors used 24 hours old culture of all the 3 isolates (*S. aureus, E. coli* and *Pseudomonas*), Muller-Hinton agar, petri dishes, wire loop, antibiotic disks, sterilized forceps etc. Bauer-Kirby Disk Diffusion (Bauer *et al.,* 1966) method is used for sensitivity analysis, but for inoculation, authors used loopfull culture suspension and perform whole plate streaking instead of swabbing.

The study was conducted in rural habitations of West Nimad of Khargone district, India, where sources of water are wells and canals. In this test, small filter paper disks (6 mm) were impregnated with a standard amount of antibiotic placed on an agar plate to which bacteria have been swabbed. The plates are incubated overnight, and the zone of inhibition of bacterial growth is used as a measure of susceptibility. Large zones of inhibition indicate that the organism is susceptible, while small or no zone of inhibition indicates resistance.

Table 1: Description of antibiotic disks used in the experiment.

S. No.	Antibiotic abbreviations	Antibiotic full name	Commercial code from Himedia
1.	AK	Amikacin	Sd035
2.	CF	Ciproflaxacin	Sd060
3.	CD	Clindamycin	Sd051
4.	CN	Cephoxitin	Sd041
5.	CPM	Cefepime	Sd219
6.	CAC	Ceftazidime	Sd107
7.	CS	Cefoperazone	Sd072
8.	CL	Ceftriaxone	Sd109
9.	ETP	Ertapenem	Sd280
10.	LE	Levofloxacin	Sd216
11.	NX	Norfloxacin	Sd057
12.	OX	Oxacillin	Sd088
13.	PT	Piperacillin	Sd210

RESULTS AND DISCUSSION

In this study, authors used Disk Diffusion Method for antibiotic sensitivity analysis. Authors recorded that *E. coli* and *Pseudomonas* were susceptible to 8 (61.53 %) and resistant to 5 (38.46 %) while *S. aureus* was susceptible to 9 (69.23 %) and resistant to 4 (30.76 %) out of 13 antibiotics tested (table 2).

All 3 isolates examined were resistance to CN, CPM, CAC and OX antibiotics. Both the Gram-negative bacteria were found resistant to CD also. *S. aureus* (42 mm) and *E.coli* (34 mm) showed maximum sensitivity to ETP whereas *Pseudomonas* (32 mm) showed maximum sensitivity to LE (fig. 1-6 and table 2).

Authors concluded that understanding about antibiotic susceptibility of *S. aureus, E. coli* and *Pseudomonas* may be useful to early cure of infections when developed in humans. Determination of bacterial susceptibility to antibiotics can help to treat the infections as well as it can provide comparative data for analysis that which antibiotic is more potent for a particular type of pathogen.

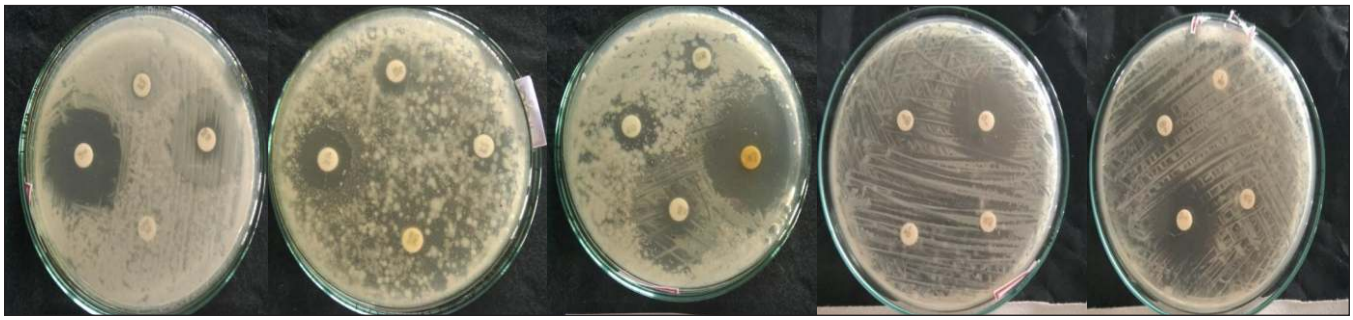

Fig. 1: Antibiotics sensitivity of *E.coli.*

Fig. 2: Antibiotics sensitivity of S. *aureus.*

Fig. 3: Antibiotic sensitivity of *Pseudomonas*.

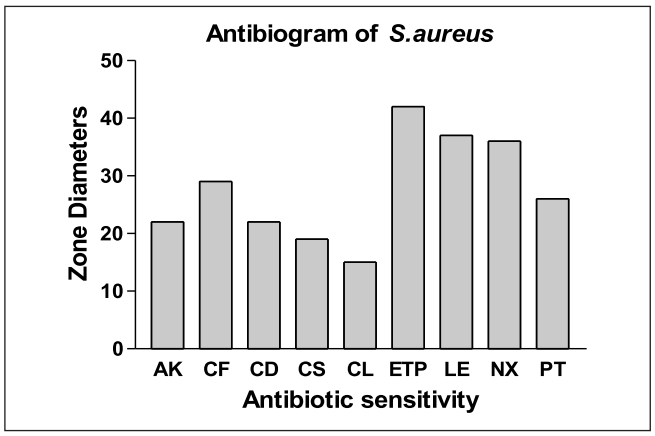

Fig. 4: Profile of antibiotic sensitivity (mm) of *S.aureus*

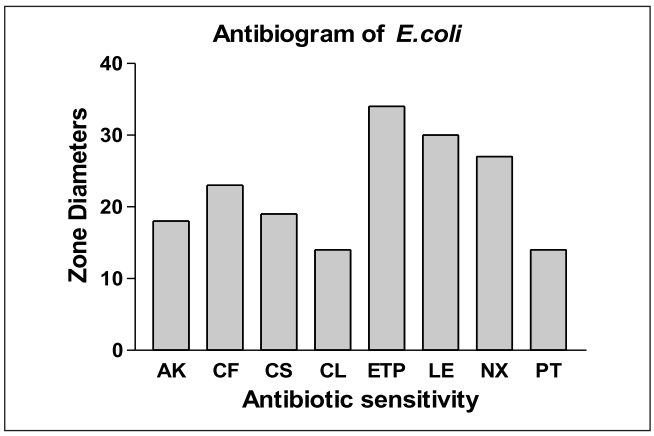

Fig. 5: Profile of antibiotic sensitivity (mm) of *E.coli*.

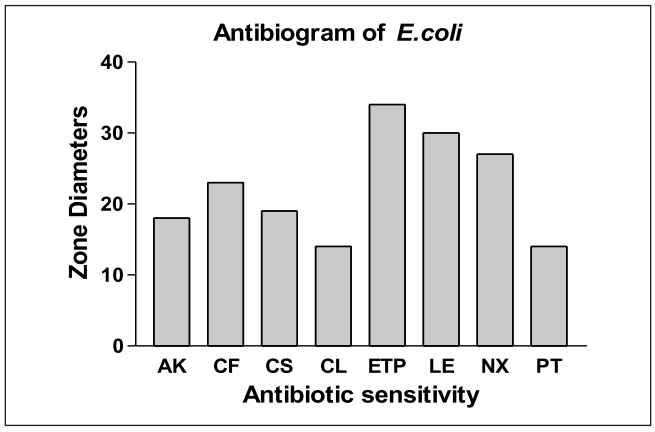

Fig. 6: Profile of antibiotic sensitivity (mm) of *Psuedomonas*.

Table 2: Antibiotics sensitivity profile of all the 3 isolates studied.

Sl. No.	Antibiotic	Antibiotics sensitivity to *S. aureus* (mm)	Antibiotics sensitivity to *E.coli* (mm)	Antibiotic sensitivity to *Pseudomonas* (mm)
1.	AK	22	18	21
2.	CF	29	23	31
3.	CD	22	R	R
4.	CN	R	R	R
5.	CPM	R	R	R
6.	CAC	R	R	R
7.	CS	19	19	20
8.	CL	15	14	11
9.	ETP	42	34	31
10.	LE	37	30	32
11.	NX	36	27	28
12.	OX	R	R	R
13.	PT	26	14	17

ACKNOWLEDGEMENTS
Authors sincerely acknowledge Shree Rewa Gurjar Bal Niketan College Sanawad for providing financial assistance and facilities.

REFERENCES

1. **Bauer A.W., Kirby W.M., Sherris J.C. and Turck M.** (1966) Antibiotic susceptibility testing by a standardized single disk method. *Am J Clin Pathol*. 45(4):493-496.
2. **Masalha M., Borovok I., Schreiber R., Aharonowitz Y. and Cohen G.** (2001). Analysis of Transcription of the *Staphylococcus aureus* Aerobic Class Ib and Anaerobic Class III Ribonucleotide Reductase Genes in Response to Oxygen. *Journal of Bacteriology*. 183 (24): 7260-7272. https://doi.org/10.1128/JB.183.24.7260-7272.2001.
3. **Turner S.M., Scott-Tucker A., Cooper L.M. and Henderson I.R.** (2006). Weapons of mass destruction: virulence factors of the global killer enterotoxigenic *Escherichia coli*. *FEMS Microbiol Lett.* 263(1):10-20. 10.1111/j.1574-6968.2006.00401.x.
4. **Verma A.K.** (2021). Protozoans: Animals or Protists? *International Journal of Life Sciences*. 9(1): 41-44.
5. **Verma A.K. and Prakash S.** (2020). Status of Animal Phyla in different Kingdom Systems of Biological Classification. *International Journal of Biological Innovations.* 2 (2): 149-154. https://doi.org/ 10.46505/IJBI.2020.2211.