

# Antibiotic Resistance Pattern of Pathogenic Bacteria Isolated from Ram Sagar Talab and Surya Kund of Gaya Town (Bihar)

Jyoti Kumari<sup>1</sup>, Dr. Archana Kumari<sup>2</sup>

<sup>1</sup>Research Scholar, P. G. Centre of Biotechnology, Gaya College Gaya (Under Magadh University, Bodh-Gaya)

<sup>2</sup>Assistant Professor, P. G. Centre of Zoology Gaya College, Gaya (Under Magadh University Bodh Gaya)

**Abstract:** Antibiotic resistance pattern of *E.coli*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa* and *Salmonella sp.* obtained from two perennial ponds of Gaya town were examined against five types of antibiotic drugs. Results obtained during present investigation showed that 89.81%, 85.19%, 76.85%, 72.22% and 38.19% of the total isolates of *E.coli* obtained from the water sample of Ram Sagar Talab showed resistance against Erythromycin, Ampicillin, Gentamycin, Tetracycline and Chloramphenicol respectively. 100%, 98.51%, 91.04%, 20.90% and 11.94% of total isolates of *K. pneumoniae* obtained from the water sample of this pond exhibited resistance against Ampicillin, Erythromycin, Tetracycline, Gentamycin and Chloramphenicol respectively. 90.91%, 81.82%, 51.52% and 33.33% of the total isolates of *P. aeruginosa* of this pond showed resistance against Ampicillin & Tetracycline, Erythromycin, Gentamycin and Chloramphenicol respectively. Cent per cent isolates of *Salmonella sp.* obtained from this pond exhibited resistance against Ampicillin and Tetracycline. Out of 08 isolates of *Salmonella sp.* 87.50%, 25% and 12.50% exhibited resistance against Erythromycin, Gentamycin and Chloramphenicol respectively. 85.71%, 80.95%, 76.19%, 28.57% and 23.81% of the total (21) of *E. coli* bacteria obtained from water sample of Surya Kund showed resistance against Erythromycin, Tetracycline, Gentamycin, Chloramphenicol and Ampicillin respectively. Out of 20 isolates of *P. aeruginosa* obtained from this pond, 90%, 80%, 50% and 35% showed resistance against Ampicillin & Tetracycline, Erythromycin, Gentamycin and Chloramphenicol respectively. 100%, 87.50%, 75%, 37.50% and 12.50% of the total (08) isolates of *K. pneumoniae* obtained from the water sample of this pond showed resistance against Ampicillin, Erythromycin, Tetracycline, Gentamycin and Chloramphenicol respectively. A single isolate of *Salmonella sp.* was obtained from water sample of this pond which showed resistance against Ampicillin, Erythromycin, Gentamycin and Chloramphenicol as well as remained sensitive against Tetracycline.

**Keywords:** Antibiotic Resistance, Pathogenic Bacteria, Ram Sagar Talab, Surya Kund

## 1. Introduction

The best-understood cells in the biological world is that of the bacterium *Escherichia coli*. Studies of *E. coli* is instrumental in establishing the basic principles of microbiology. Fecal coliforms along with other fecal bacteria can be used as indicator of water quality. The most important indicator coliform bacteria is *E. coli*. Pathogenic coliform bacteria cause urinary tract infection in humans. Water borne diseases are prevalent in India due to poor sanitation facilities.

Saxena *et al.* (2011) examined the physico-chemical and bacteriological quality of water obtained during different environmental conditions. They obtained significant results as output of their study. Olorunmola *et al.* (2013) evaluated the virulence properties of *E. coli*. They also examined the antibiotic resistance ability of different strains of this bacteria. Most of the bacterial strains showed non-resistance to Nitrofurantoin. But *E. coli* strains showed resistance against many types of antibiotics such as Amoxicillin, Augmentin, erythromycin, Gentamycin and Tetracycline. Kaur *et al.* (2020) examined the antimicrobial susceptibility of bacterial isolates present in water. They identified 25 isolates of bacteria present in water samples including *E. coli* and *Pseudomonas sp.* These bacterial isolates showed resistance against several antibiotics. They observed multi drug resistant bacteria also. Bacterial strains resistant to antibiotics leads to high rate of mortality and morbidity worldwide. Rising trend of antimicrobial resistance among

the members of Enterobacteriaceae family is a global problem. These bacteria may pose serious health problems in immunocompromised persons. In the above-mentioned perspective, the antibiotic resistance pattern of pathogenic bacteria isolated from water samples of Ram Sagar Talab and Surya Kund were observed during present research work.

## 2. Materials and Method

Water samples from both ponds under study were collected in the month of July, 2022 in sterilized bottles, properly capped and transported to the laboratory. Bacterial isolates were cultured on nutrient agar media. Identification of bacterial isolates was conducted on the basis of morphological characteristics and biochemical characterization with the help of standard literature. Antibiotic resistance properties of each bacterial isolated obtained from both ponds were examined separately by Kirby-Bauer Disc Diffusion method (1966). Ampicillin and Gentamycin with disc concentration of 10µg, Chloramphenicol and Tetracycline with disc concentration of 30µg as well as Erythromycin with disc concentration of 15µg were used during present experimentation. Bacteria exhibiting zone of inhibition as ≤ 11 (mm) with Ampicillin, ≤12 (mm) with Gentamycin and Chloramphenicol, ≤ 13 (mm) with Erythromycin and ≤ 14 (mm) with Tetracycline were considered as resistant.

### 3. Result and Discussion

The antibiotic resistance pattern of different bacterial isolates obtained from water sample of Ram Sagar Talab is mentioned in Table-01. The data presented in this table indicates that out of 108 isolates of *E. coli* obtained from this pond, 92 showed resistance against Ampicillin, 97 against Erythromycin, 83 against Gentamycin, 38 against Chloramphenicol and 78 against Tetracycline. It was also observed that out of 67 isolates of *K. pneumoniae*, all showed resistance against Ampicillin, 66 against

Erythromycin, 14 against Gentamycin, 08 against Chloramphenicol and 61 against Tetracycline. Out of total isolates (33) of *P. aeruginosa*, 30, 27, 19, 11 and 30 showed resistance against Ampicillin, Erythromycin, Gentamycin, Chloramphenicol and Tetracycline respectively. Cent per cent isolated of *Salmonella* sp.(08) obtained from Ram Sagar Pond showed resistance against Ampicillin and Tetracycline. Out of total (08) isolates of *Salmonella* sp. tested, 07 showed resistance against Erythromycin, 02 against Gentamycin and only one against Chloramphenicol.

**Table 1: Antibiotic Resistance Pattern of Bacterial Isolates obtained from Ram Sagar Talab**

S. No.	Bacterial Isolates	Antibiotic Resistance										Total Isolates
		Ampicillin		Erythromycin		Gentamycin		Chloramphenicol		Tetracycline		
		No.	%	No.	%	No.	%	No.	%	No.	%	
1	<i>E.coli</i>	92	85.19	97	89.81	83	76.85	38	35.19	78	72.22	108
2	<i>K. pneumoniae</i>	67	100	66	98.51	14	20.9	8	11.94	61	91.04	67
3	<i>P. aeruginosa</i>	30	90.91	27	81.82	17	51.52	11	33.33	30	90.91	33
4	<i>Salmonella</i> sp.	8	100	7	87.5	2	25	1	12.5	8	100	8

**Table 2: Antibiotic Resistance Pattern of Bacterial Isolates obtained from Surya Kund**

S. No.	Bacterial Isolates	Antibiotic Resistance										Total Isolates
		Ampicillin		Erythromycin		Gentamycin		Chloramphenicol		Tetracycline		
		No.	%	No.	%	No.	%	No.	%	No.	%	
1	<i>E.coli</i>	05	23.81	18	85.71	16	76.19	06	28.57	17	80.95	21
2	<i>K. pneumoniae</i>	08	100	07	87.50	03	37.50	01	12.50	06	75.00	08
3	<i>P. aeruginosa</i>	18	90.00	16	80.00	10	50.00	07	35.00	18	90.00	20
4	<i>Salmonella</i> sp.	01	100	01	100	01	100	01	100	00	00	01

The data presented in table-02 shows that out of 21 isolates of *E. coli* obtained from water sample of Surya Kund, 18,17,16,06 and 05 exhibited resistance against Erythromycin, Tetracycline, Gentamycin, Chloramphenicol and Ampicillin respectively. Out of 20 isolates of *P. aeruginosa* obtained from water sample of this pond, 18, 16, 10 and 07 showed resistance against Ampicillin & Tetracycline, Erythromycin, Gentamycin and Chloramphenicol respectively. Out of the total (08) isolates of *K. pneumoniae* obtained from this pond, 08,07,06,03 and 01 exhibited resistance against Ampicillin, Erythromycin, Tetracycline, Gentamycin and Chloramphenicol respectively. Only one colony of *Salmonella* sp. was identified from the water sample of this pond which showed resistance against almost all tested antibiotics except Tetracycline.

Olorunmola *et al.* (2013) stated that some fecal *E. coli* colonises vaginal mucosa and remain responsible for symptomatic urinary diseases. They also pointed out that *E. coli* infections is increasing in human urinary tract due to multi-antibiotic resistance such as Ampicillin, cotrimoxazolu etc. The treatment of UTI becomes difficult due to multi-drug resistant *E. coli* (Adeleye, 1992). Olorunmola *et al.* (2013) examined antibiotic resistance in *E. coli* and observed 20%, 72.2%, and 57.1% resistance against Gentamycin, Tetracycline and Erythromycin. Casanova and Sobsey (2016) obtained antibiotic resistant enteric bacteria from environmental waters. Blasco *et al.* (2008) isolated multi-drug-resistant bacteria from water reservoirs. Mostafa *et al.* (2013) observed co-relation

between physico-chemical parameters and microbial prevalence while examining the water quality of Egypt.

The results obtained during present research work with regard to antibiotic resistance remained in conformity with results obtained by Olorunmola *et al.* (2013) and Blasco *et al.* (2013) during their research studies. It became evident from the results of present research work that majority of examined isolates of *E. coli* exhibited multiple resistance against all the antibiotics tested. High level of resistance was also observed against each tested antibiotics.

### 4. Conclusion

Out of the total (108) isolates of *E.coli* obtained from water sample of Ram Sagar Talab 35.19% showed multi-drug resistance against all tested antibiotics. 11.94%, 33.33% and 12.50% of the total isolates of *K. pneumoniae*, *P. aeruginosa* and *Salmonella* species respectively isolated from water sample of this pond showed multi-drug resistance against all the tested antibiotics under this study. Out of the total (21) isolates of *E. coli* obtained from Surya Kund 23.81% exhibited multidrug resistance 35% of *P. aeruginosa* and 12.50% of *K. pneumoniae* obtained from this pond showed multi-drug resistance against all tested antibiotics. Only one isolate of *Salmonella* sp. obtained from this pond showed multi-drug resistance against Ampicillin, Erythromycin, Gentamycin and Chloramphenicol. This strain of *Salmonella* sp. remained sensitive to Tetracycline. Thus, it became clear that water of Ram Sagar Talab remains highly contaminated by multi-drug-resistant fecal coliforms than Surya Kund.

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