CODEN [USA]: IAJPBB ISSN : 2349-7750

INDO AMERICAN JOURNAL OF
PHARMACEUTICAL SCIENCES

SJIF Impact Factor: 7.187

https://zenodo.org/records/11519767

https://www.iajps.com/volumes/volume11-june-2024/03-issue-06-june-24/

Available online at: http://www.iajps.com *Research Article*

ANTIBIOGRAM OF UROPATHOGENS PRODUCING EXTENDED SPECTRUM BETA LACTAMASES AND METHICILLIN RESISTANT *Staphylococcus aureus* ISOLATED FROM URINE OF PREGNANT WOMEN VISITING MATER MISERICORDIAE HOSPITAL AFIKPO

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Abstract:
Pregnant women are exposed to various infections because of their compromised immunity. This study was designed to investigate the prevalence and antibiotic susceptibility profile of extended spectrum beta lactamases and methicillin resistant uropathogens isolated from pregnant women visiting Mater Misericordiae Hospital, Afikpo, Ebonyi State. A total of 150 mid – stream urine collected from pregnant women were bacteriologically analyzed using standard microbiological tests for isolation and identification. Escherichia coli were phenotypically screened for ESBL strain using Kirby – Bauer disc diffusion method. Staphylococcus aureus were phenotypically screened for MRSA strains using Kirby – Bauer disk diffusion method and the results were analyzed using the guidelines of Clinical Laboratory Standard Institute (CLSI). The multiple antibiotic resistance index (MARI) of the isolates were equally determined. The prevalence of UTI among pregnant women was found to be 57.3 %. The predominant uropathogens were S. aureus (41.3 %) and E. coli (12 %), while the least occurring uropathogens was Klebsiella species (4 %). The result of the demographic data of the patients in this study revealed that the highest isolation rate in S. aureus 20 (32.3 %) was found among the age range of 28 – 31 years and the least occurrence rate were recorded amongage range of 40 and above in S. aureus (1.6 %), whereas Klebsiella species and E. coli both recorded (0.0 %) respectively. The isolates for MRSA exhibited high resistance within the range of 50 – 100 % against cefoxitin, oxacillin, amoxicillin, erythromycin, cefepime, lincomycin, ceftazidime and tetracycline. Extended spectrum beta lactamase isolates displayedmore resistance within 50 – 100 % in amoxicillin clavulanic acid, nalidixic acid, tazobactam piperacillin, tetracycline and nitrofurantoin. It was further observed that MRSA exhibit multi
– drug resistance (MDR) with MARI value ≥ 0.5 but were susceptible to imipenem and ciprofloxacin. The ESBL were as well susceptible to and ceftriaxone, ceftazidime, meropenem, sulfamethoxazole and ofloxacin in this study. The result of this study raises public health concern for health practitioners (especially antenatal staffs), patients and individuals in both hospitals and communities. Regular surveillance and monitory of MRSA and ESBL, and formulation of policies that will help reduce/ prevent occurrence of these uropathogens will behelpful in the control of such incidence.
Keywords: ESBL- Extended Spectrum Beta-Lactamases MDR- Multi Drug Resistance MRSA- Methicillin Resistance Staphylococcus aureusMSSA- Methicillin Suceptible Staphylococcus aureusMMHA- Mater Misericordiae Hospital, Afikpo

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Please cite this article in press Chukwu Thompson Oko et al, Antibiogram Of Uropathogens Producing Extended Spectrum Beta Lactamases And Methicillin Resistant Staphylococcus aureus Isolated From Urine Of Pregnant Women Visiting Mater Misericordiae Hospital Afikpo.,Indo Am. J. P. Sci, 2024; 11 (6).

INTRODUCTION:

Urinary tract infections (UTIs) are defined as the invasion of any part of the urinary tract by microorganisms (Al Yousef *et al*., 2016; Ejerssa *et al*., 2021). Gram positive bacteria are common causes of urinary tract infection (UTI), particularly among individuals who are elderly, pregnant, or who have other risk factors for urinary tract infections (Kline and Lewis, 2016). Urinary tract infections (UTIs) encompasses a wide variety of clinical entities whose common denominator is microbial invasion of any tissue of the tract from the renal cortex to the urethral meatus (Pokhrel, 2004; Ejerssa *et al*., 2021). Urine itself has several antibacterial features that suppress urinary tract infections and any interference in the normal flow of urinewill be risk of urinary tract infection (Razzaque *et al*., 2017). Urinary tract infections (UTIs) are among the most common bacterial infections leading patients to seek medical care (Shakibaie *et al.,* 2014; Ngong *et al*., 2021). Urinary tract infection is the most prevalent community and hospital-acquired infections, affecting almost 50 % of the population at least once in their lifetime with a high mortality rate. (Salman and Ghaima, 2018). It is mainly caused by Gram-negative pathogens such as *Escherichia coli*, *Proteus mirabilis*, *Klebsiella pneumoniae*, and *Enterobacter* species (Ejerssa *et al*., 2021). The symptoms of UTIs such as fever, burning sensations while urinating, lower abdominal pain (LAP), itching, formation of blisters and ulcers in the genital area, genital and suprapubic pain, and pyuria generally depend on the age of the person infected and the location of the urinary tract infected (Amali *et al*., 2009).

Several factors such as gender, age, race, circumcision (Dias *et al*., 2010; Conway *et al*., 2007), HIV (Banu and Jyothi, 2013), diabetes, urinary catheter, genitourinary tract abnormalities (Mladenovic *et al*., 2015; Yuyun *et al*., 2004), pregnancy, infants, elderly (Ejerssa *et al*., 2021; Ngong *et al*., 2021; Nelson and Good, 2015; Nicolle, 2008) and hospitalization status (Adukauskiene *et al*., 2006) bear significant risk for recurrent UTIs.

The prevalence of UTI is much more common iin women than in men, at a ratio of 8:1, due to their anatomical and physiological reasons (Shirishkumar *et al.,* 2012; Ejerssa *et al*., 2021). One in five adult women experiences UTI in her life (Okonko *et al.,* 2009; Behzadi *et al.,* 2010; Ngong *et al*., 2021). Altered physiological, anatomical, hormonal changes, and challenges in personal hygiene during pregnancy, and other factors make the antenatal mother more prone to infection of the urinary tract than non-pregnant women (Ejerssa *et al*., 2021; Ngong *et al*., 2021). This is a major health problem reported among 20 % of pregnant women and a common cause of admission in obstetrical wards (Ejerssa *et al*., 2021; Ngong *et al*., 2021). If the infection is left untreated, it results in low birth weight, fetus, intrauterine growth retardation, preterm labour, and premature babies, intrauterine fetal death, and increased prenatal mortality and morbidity as well as maternal complications including anemia, preeclampsia, renal failure, septicemia, and adult respiratory syndrome (Ejerssa *et al*., 2021).

MATERIALS AND METHOD:

Study area

Samples were carefully collected from Mater Misericordiae Hospital new site Ozizza road Afikpo, Ebonyi State. The faculty is owned and managed by Catholic Diocese of Abakaliki. It is founded in 1946 by Saint Patrick's missionaries to solve medical needs of the Afikpo people and its environs. This hospital has many facilities that makes it one of the best hospitals found in the eastern part of Nigeria and has accredited schools of nursing and midwifery to her credits as way to educate those who wants to be professional nurses and midwives. Working days are Monday to Sundays 24 hrs, and the hospital has different units in which the ante – natal unit was for this study.

Ethical Clearance

The ethical approval for this study was collected from ethical and research committee of Mater Misericordiae Hospital Afikpo.

Sample collection

A total of 150 mid-stream urine samples were collected from each patient in ante – natal unit of the hospital for six (6) weeks. The pregnant women visiting Mater Misericordiae hospital Afikpo were given instructions on how to collect the mid-stream urine using a sterile container. The samples were immediately transported to Microbiology Laboratory Unit of Ebonyi State University Abakaliki, Nigeria for bacteriological analysis.

Phenotypic Determination of ESBL Production by Double disk synergy test (DDST)

ESBL production in all the *E. coli* isolates was confirmed phenotypically by the double disc synergy test (DDST) method as was previously described (Iroha *et al.* 2017). Antibiotic disks containing amoxycillin/clavulanic acid (20/10µg) was placed at the center of Mueller-Hinton agar plates and antibiotic disks containing ceftazidime (30 µg) and

cefotaxime30 µg) was placed adjacent to the central disk (amoxycillin/clavulanic acid) at a distance of 15 mm. The plates were incubated at 37 ºC for 18-24hours, a ≥ 5 mm increase in the inhibition zone diameter for either of the cephalosporins tested in combination with the central disc versus itszone when tested alone confirms ESBL production phenotypically by the DDST method.

Antibiotic susceptibility testing

Antibiotic susceptibility test of uropathogenic ESBL and MRSA isolates was done by using Kirby-Bauer disc diffusion Method according to Clinical and Laboratory Standards Institute (CLSI, 2007). Bacteria inoculum equivalent to 0.5 McFarland standard of the isolate was streaked on entire Mueller-Hinton agar plate and was allowed for 15 min to pre-diffuse. tetracycline (30 µg), cefotaxime (30 µg), amoxicillin/clavulanic acid (30 µg), cefoxitin (30 µg), cefepime (30 µg), (30 µg), trimethoprim-sulfamethoxazole (30 µg), ciprofloxacin (5 µg),

oxacillin (1 µg), lincomycin (10 µg), vancomycin (15 µg), erythromycin (15 µg), clindamycin

(15 µg), ceftazidime (30 µg), imipenem (10 µg), nitrofurantoin (100 µg), piperacillin- tazobactam (40 µg), meropenem (10 µg), nalidixic (30 µg), ofloxacin (5 µg) Oxoid Ltd, Basingstoke, United Kingdom) were placed aseptically on the agar plates and incubated at 37 ºC for 24 hrs. Diameter of zone of inhibition was measured and zone diameter criterion was used to interpret the level of susceptibility to each antibiotic (CLSI, 2007).

Determination of Multiple Antibiotic Resistance index (MARI)

Multiple antibiotic resistance index (MARI) was determined using the formula MARI = a/b, where **a** is the number of antibiotics to which test isolate displayed resistance and **b** is the total number of antibiotics to which the test organism was evaluated for sensitivity (Christopher *et al.*, 2013).

Data Analysis

Collected data was analyzed by descriptive analysis using SPSS software statistical application version 23 (SPSS INC, Chicago, IL, USA). And the study findings displayed in tables.

RESULTS:

Morphology and biochemical characteristics of uropathogens isolated from urine of pregnant women in Mater Misericordiae Hospital Afikpo.

The morphological features and biochemical characteristics of bacteria isolated from urine of pregnant women in Mater Misericordiae Hospital Afikpo as displayed in table 1. It revealed that three (3) bacteria genera which include *Staphylococcus aureus, Escherichia coli* and *Klebsiella* species were identified based on shape, colour, and mucoid state.

Distribution of the uropathogens isolated from urine of pregnant women attending Mater Misericordiae Hospital Afikpo

Staphylococcus aureus was predomonant with a frequency of 62 (41.3 %), followed by *Escherichia coli* 18 (12 %). While *Klebsiella* species showed the least prevalent rate of 6 (4 %)as shown in table 2A.

Distribution of UTI organisms isolated from urine samples of women visiting Mater Misericordiae Hospital Afikpo with respect to age

Among age group 28 – 31 *Staphylococcus aureus* recorded highest distribution rate of 20 (32.3 %), *Klebsiella* species 2 (33.3) and 2 (11.1 %) for *Escherichia coli.* The least distribution ratewas in age group 40 & above, *Staphylococcus aureus* 1.6 %, *Klebsiella* species and *Escherichia coli* accounting 0 % respectively as displayed in table 2B.

Table 1: Morphology and Biochemical Characteristics of Uropathogens isolated from Urine of Pregnant Women in Mater MisericordiaeHospital Afikpo

Gram staining	Shape	Colour	Catalase	Coagulase	TSI	Oxidase	Motility	VP	Methyl red	Indole	Citrate	Glucose	Lactose	Galactose	Arabinose	Sorbitol	Xylose	Fructose	Probable Bacteria
+	Cocci	Yellow (on MSA)	+	+	A	-	+	-	+	-	+	+	-	+	-	+	+	+	*Staphylococcus aureus*
-	Rod	Pink& Mucoid (Mac)	-	-	A	-	-	+	-	-	+	+	+	+	+	+	+	-	*Klebsiella* species
-	Rod	Pink (Mac)	-	-	A/G	-	+	-	+	+	-	+	+	+	+	+	-	-	*Escherichia coli*

KEY: (+ = positive, - = negative, VP = Voges–Proskaeur test, TSI = Triple sugar iron test, A = Alkaline acid and AG = Acid gas)

Table 2.A: Distribution of the uropathogens isolated from urine of pregnant women attendingMater Misericordiae Hospital Afikpo

S/N	Organisms Isolated	Frequency (%)
1	*S. aureus*	62 (41.3)
2	*E. coli*	18 (12)
3	*Klebsiella* spps	6 (4)
	Total	**86 (57.3)**

KEY: n = 150

Table 2.B: Distribution of UTI organisms isolated from urine samples of pregnant womenvisiting Mater Misericordiae Hospital Afikpo with respect to age

Age Range	No. sampled	*S. aureus* (%)	*Klebsiella* spps (%)	*E. coli* (%)
16 – 19	10	10 (16.1)	1 (16.7)	3 (16.7)
20 -23	42	6 (9.7)	1 (16.7)	4 (22.2)
24 – 27	33	15 (24.2)	1 (16.7)	6 (33.3)
28 – 31	30	20 (32.3)	2 (33.3)	2 (11.1)
32 – 35	20	7 (11.3)	1 (16.7)	1 (5.6)
36 – 39	12	3 (4.8)	0 (0)	2 (11.1)
40 & above	3	1 (1.6)	0 (0)	0 (0)
Total	**150**	**62 (41)**	**6 (4)**	**18 (12)**

Screening for the presence of extended spectrum beta lactamase producing *Escherichia coli* and methicillin resistant *Staphylococcus aureus* isolated from urine samples ofpregnant women visiting Mater Misericordiae Hospital Afikpo.

The distribution of methicillin resistant *Staphylococcus aureus* and extended spectrum beta lactamase producing *Escherichia coli* isolated from urine samples of pregnant women visiting Mater Misericordiae Hospital Afikpo is as shown in table 3. *Staphylococcus aureus* showed 61.3 % (MRSA) and 38.7% (Coagulase negative MRSA). *Escherichia coli* displayed 2 (100%) positive extended spectrum beta lactamase.

Antibiotic susceptibility pattern of extended spectrum beta – lactamase producing *Escherichia coli* from urine of pregnant women visiting Mater Misericordiae Hospital Afikpo.

Antibiotic susceptibility pattern of extended spectrum beta – lactamase producing *Escherichia coli* from pregnant women in Mater Misericordiae Hospital Afikpo. Where *Escherichia coli* showed 100 % resistance in nalidixic and nitrofurantoin but 100 % susceptibility in ceftriaxone,ceftazidime, amikacin, ofloxacin, imipenem, sulphamethoxazole and meropenem as shown intable 4.

Table 3: Screening for the presence of extended spectrum beta lactamase producing *Escherichia coli* and methicillin resistant *Staphylococcus aureus* isolated from urine samples of Pregnant Women visiting Mater Misericordiae Hospital Afikpo.

Organism (No. Sampled)	No. of MRSA (%)	No. of ESBL (%)
S. aureus (62)	38 (61.3)	N/A
E. coli (18)	N/A	2 (11.1)
Klebsiella spps (6)	N/A	0 (0)
Total (86)	38 (44.1)	2 (2.3)

KEY: N/A = Not Applicable, No. = Number, MRSA = methicillin Resistant *Staphylococcusaureus*, ESBL = extended Spectrum Beta Lactamase.

Table 4: Antibiotic susceptibility pattern of extended spectrum beta – lactamase producing *Escherichia coli* from urine of pregnant women visiting Mater Misericordiae Hospital Afikpo

Antibiotics (µg)	Resistance (%)	Susceptible (%)
Amoxicillin ClavulanicAcid (30)	9 (50)	9 (50)
Ceftriaxone (30)	0 (0)	18 (100)
Ceftazidime (30)	0 (0)	18 (100)
Tazobactam Piperacillin(40)	9 (50)	9 (50)
Meropenem (10)	0 (0)	18 (100)
Amikacin (30)	0 (0)	18(100)
Tetracycline (30)	9 (50)	9 (50)
Sulfamethoxazole trimethoprim (25)	0 (0)	18 (100)
Nalidixic acid (30)	18 (100)	0 (0)
Imipenem (10)	0 (0)	18 (100)
Ofloxacin (5)	0 (0)	18 (100)
Nitrofurantoin (100)	18 (100)	0 (0)

Key: n = 18

Antibiotic susceptibility pattern of *Klebsiella* species from urine of pregnant womenvisiting Mater Misericordiae Hospital Afikpo.

Antibiotic susceptibility pattern of *Klebsiella* species from urine of pregnant women visitingMater Misericordiae Hospital Afikpo**.** *Klebsiella* species were 100 % resistant in nalidixic acid and nitrofurantoin but 100 % susceptible to meropenem, ceftriaxone, ceftazidime, amikacin, sulfamethoxazole, imipenem and ofloxacin as shown in table 5.

Antibiotic susceptibility pattern of methicillin resistant *Staphylococcus aureus* isolated from urine samples of pregnant women visiting Mater Misericordiae Hospital Afikpo.

Antibiotic susceptibility pattern of methicillin resistant *Staphylococcus aureus* and coagulase negative methicillin resistant *Staphylococcus aureus* isolated from urine samples of pregnant women attending Mater Misericordiae Hospital Afikpo. *Staphylococcus aureus* were 60 – 100
% resistant in cefoxitin, oxacillin, amoxicillin, cefepime, lincomycin, ceftazidime, erythromycin and tetracycline but 60 – 100 % susceptible in imipenem and ciprofloxacin as displayed in table 6.

Multiple antibiotic resistance index (MARI) of uropathogens from urine of pregnant women visiting Mater Misericordiae Hospi Hospital Afikpo.

Multiple antibiotic resistance index (MARI) of uropathogens showed an average MARI of 0.2and 0.7 for ESBL producers and MRSA strain as shown in table 7.

Table 5: Antibiotic susceptibility pattern of *Klebsiella* species from urine of pregnant womenvisiting Mater Misericordiae Hospital Afikpo**.**

Antibiotics (µg)	Resistance (%)	Susceptible (%)
Amoxicillin ClavulanicAcid (30)	3 (50)	3 (50)
Ceftriaxone (30)	0 (0)	6 (100)
Ceftazidime (30)	0 (0)	6 (100)
Tazobactam Piperacillin(40)	3 (50)	3 (50)
Meropenem (10)	0 (0)	6 (100)
Amikacin (30)	0 (0)	6 (100)
Tetracycline (30)	3 (50)	3 (50)
Sulfamethoxazole trimethoprim (25)	0 (0)	6 (100)
Nalidixic acid (30)	6 (100)	0 (0)
Imipenem (10)	0 (0)	6 (100)
Ofloxacin (5)	0 (0)	6 (100)
Nitrofurantoin (100)	6 (100)	0 (0)

KEY: n = 6

Table 6: Antibiotic susceptibility pattern of methicillin resistant *Staphylococcus aureus* isolated from urine of pregnant women in Mater Misericordiae Hospital Afikpo**.**

Antibiotics (µg)	Resistance (%)	Susceptible (%)
Cefoxitin (30)	38 (100)	0 (0)
Oxacillin (1)	38 (100)	0 (0)
Amoxicillin (30)	30 (78)	8 (12)
Imipenem (10)	2 (5)	36 (95)
Vancomycin (30)	17 (44)	21 (56)
Erythromycin (15)	29 (76)	9 (24)
Cefepime (10)	36 (94)	2 (6)
Lincomycin (2)	31 (81)	7 (19)
Ceftazidime (30)	35 (92)	3 (8)
Clindamycin (2)	20 (52)	18 (48)
Tetracycline (30)	32 (84)	6 (16)
Ciprofloxacin (5)	14 (36)	24 (64)

Key: n = 38

Table 7: Multiple antibiotic resistance index (MARI) of uropathogens from urine of pregnantwomen visiting Mater Misericordiae Hospital Afikpo.

S/N	Organisms	MARI	
		MRSA	**ESBL**
1	*S. aureus*	0.7	N/A
2	*E. coli Klebsiella* spps	N/AN/A	0.2
3			0.2
	Average MARI	0.7	0.2

DISCUSSION:

Pregnant women have been known to be associated with different urinary tract infections. However, this study revealed uropathogens of both Gram positive (*Staphylococcus aureus*) and Gram negative (*Escherichia coli* and *Klebsiella* species) to be the major urinary tract infections in pregnant women attending Mater Misericordiae Hospital Afikpo.

As a clinically important pathogen *Staphylococcus aureus* is one of the important bacteria implicated in urinary infections that usually affects pregnant mothers. In this study, *Escherichia coli, Klebsiella* species and *Staphylococcus aureus* were isolated as major occurring organisms from urinary tract infection (UTI) positive pregnant women in Mater Misericordiae Hospital Afikpo, Ebonyi State. This result correlates with the report obtained by Nwachukwu *et al.,* (2018), among pregnant women attending antenatal care at Kanayo Specialist Hospital and General Hospital both in Onitsha, south eastern, Nigeria. They reported that *Escherichia coli*, *Staphylococcus aureus, Klebsiella* species, *Pseudomonas aerogenes* and *Proteus mirabilis* were among the pathogenic organisms implicated in UTI during pregnancy. In this study it was observed that there was prevalence of *S. aureus* (41.3 %). This prevalence is higher than the 18.0 % reported (Mohamed, 2015) in Kaduna. This incidence indicates that *S. aureus* is emerging as an important uropathogen which may be attributed to the fact that *S. aureus* is been reported to colonize the vagina of 4 % - 22 % of pregnant women (Nester, 1998; Akerele and Okonofua, 2001).

The total prevalence of uropathogens in this study accounted 86 (57.3 %) among pregnant women. This correlate with an earlier study which accounted 45.7 %, 53.8 %, 65.4 %, 79.9 %, 90.1 % and 97.3 % as reported by Prakash and Saxena, 2013; Bhargava *et al.,* (2022). The difference observed in the prevalence could be attributed to the time the study was conducted, pregnancy duration, method adopted for the detection of *S. aureus, E. coli* and *K.* species, patient's clinical background or the pattern of antibiotics used. Highest distribution rate was recorded for *S. aureus* 20 (32.3 %) and *Klebsiella* species 2 (33.3

%) found within age groups 28 – 31 years, followed by *E. coli* 6 (33.3 %) within 24 – 27 years.This result is in agreement with a study by Ayogu *et al.,* (2017), where *S. aureus* amounted 19 (79.2 %), *E. coli* 13 (54.2 %) within the age group 23 – 28 years. This observed age related variation in frequency of *S. aureus* and *E. coli* may be linked to study design (age range, studied population, severity of urinary tract infection and sample size) recruited in the study. It must be recognized that the referenced studies used different age groupings; therefore the comparison are at the general or trend level.

Among the uropathogens *S. aureus* accounted 62 (41.3 %) over *E. coli*, 18 (12 %) and *Klebsiella* species, 6 (4 %). This observation is suggestive of the antibiotic pattern used during treatment which reduces the risk of *S. aureus, E. coli* and *K.* species colonization. While increase in prevalence of *S. aureus* in pregnant women may be attributed to poor personal hygiene among the studied population facilitating successful proliferation of *S. aureus.*

This study reports an MRSA (61.3 %) in pregnant women which is similar to a previous studyin which MRSA colonization was 73 % in *Staphylococcal* isolates screened at antenatal clinic in Niger Delta University Teaching Hospital, Okolobiri South-South, Nigeria (Ebidor *et al.,* 2023). A previous study in 2009 showed the prevalence of MRSA 18.3 % which increased to

42.3 % in 2013 (Abubakar and Sulaiman, 2018). The variation in the prevalence of MRSA across different areas suggests a disparity in the control measures, source of bacteria, nature of the study population and laboratory method used.

The result of this study showed that *E. coli* 2 (11.1 %) were the only ESBL producers in pregnant women, this result is lower than a previous study were *E. coli* recorded 37 % (Youssef *et al.,* 2019). *Escherichia coli* having a low value of 11.1 % could be pointed to the number of samples collected, studied participants and the antibiotic pattern in which these pregnant women were exposed to at that particular time.

In this study, high percentage of MRSA were resistant to Cefoxitin, Erythromycin, Lincomycin, Oxacillin, Amoxicillin and Tetracycline ranging from 76.0 % - 100 % similar to previous studies in Nepal reported by Gaire *et al.,* (2021) where Erythromycin accounted 86.6 % resistance, also in Northern Indian 76.5 % and 66.7 % resistance was seen against Erythromycin and Clindamycin (Kirti *et al.,* 2021). In a study conducted in Nigeria, reported resistance rates of 49.4 % and 25 % for Erythromycin and Clindamycin respectively.

However, this study shows *E. coli* being an ESBL producer amounting 11.1 % were resistant to Nitrofurantoin, Nalidixic acid, Tetracycline and Amoxicillin ranging from 50 % - 100 %. All the strains demonstrated a multidrug resistance with an average MARI value of 0.7 for MRSA and 0.2 for

ESBL. MARI index values ≥ 0.2 as recorded in this study indicates high risk source of contamination where antibiotics are often used (Thenmozhi *et al.*, 2014). Thesefindings raises public health concern for health works, patients and individuals exposed to hospital environments.

Recommendations

1. Regular handwashing and the use of hand gloves among health personnel whenattending and during treatment of pregnant women.
2. Good surveillance should be adopted and carried out for pregnant women to expose them to the need to adhere to hygienic instructions.
3. Appropriate information should always be given to pregnant mothers on the need to always take their routine drugs as prescribed by the doctor.
4. Use of hand sanitizers should be encouraged.
5. Pregnant women should maintain good hygienic practice and balanced diet.
6. Imipenem, ceftriaxone, ofloxacin and amikacin seems to be the only antimicrobial agent that showed 80.0 – 100 % susceptibility against these pathogens in this study. Hence, these antibiotics can be used as a drug of choice in treatment of MRSA and ESBL infections.

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