Int. J. Curr. Res. Med. Sci. (2025). 11(3): 1-9

International Journal of Current Research in Medical Sciences

ISSN: 2454-5716

(A Peer Reviewed, Indexed and Open Access Journal)

www.ijcrims.com

Original Research Article

Volume 11, Issue 3 -2025

DOI: http://dx.doi.org/10.22192/ijcrms.2025.11.03.001

Prospective observational study on utilization pattern of antibiotics in post operative patients admitted in surgical departments

Dr.Davan. B. Bevoor[1], Dinesh Kumar V[2], Mohammed Mateen Maaz[3], Sadiya[4], Mashidur Rahman Mollah[5]

[1]Asst.Professor, Sree Siddaganga College of Pharmacy, Tumakuru
PharmD, PGDPV. Sree Siddaganga College of Pharmacy Tumkuru
E-mail: *davanbevoor27@gmail.com*

[2,3,4,5]Pharm D., Sree Siddaganga College of Pharmacy

Corresponding Author: Dr.Davan. B. Bevoor
Asst.Professor, SreeSiddaganga College of Pharmacy, Tumakuru
PharmD,PGDPV. SreeSiddaganga College of Pharmacy Tumkuru
E-mail: *davanbevoor27@gmail.com*

Abstract

Background:
Antibiotics play an essential role in preventing and treating post-operative infections; however, their misuse is a major contributor to AMR. Understanding patterns of antibiotic use during post-operative care is essential for maximizing patient safety and good prescribing practices. The study examines the antibiotic utilization pattern in post-operative patients concerning prescriptions trends, guidelines adherence, and potential risks for AMR.

Methods:
A prospective observational study was conducted over six months at Siddaganga Hospital, including patients who underwent surgery. Patient demographics, medical history, laboratory findings, and antibiotic prescriptions were recorded. Descriptive statistics were used to analyze frequency, class, route of administration, and WHO-AWaRe classification of antibiotics.

Results:
Cephalosporins were the most prescribed antibiotic class, with Cefoperazone + Sulbactam (76 cases) and Ceftriaxone (36 cases) being the most commonly used drugs. Watch group antibiotics (169 cases) were used more frequently than Access group antibiotics (80 cases), highlighting a higher AMR risk. Intravenous administration (143 cases) was preferred, and broad-spectrum antibiotics (218 cases) dominated over narrow-spectrum agents (33 cases).

Conclusion:
This study highlights the extensive use of broad-spectrum antibiotics in surgical care, raising concerns about antimicrobial resistance. Emphasizing the need for antibiotic stewardship, it advocates for a strategic shift toward narrow-spectrum agents, optimized dosing, and early oral transition to balance effective infection control with long-term antibiotic efficacy.

Keywords: Antibiotic utilization, Post-operative infections, Antimicrobial resistance, WHO-AWaRe classification, Cephalosporins, Antimicrobial stewardship

Introduction

Preventing and treating post-operative infections that are one of the important causes of morbidity and prolonged hospital stays in surgical patients is the primary role of antibiotics. Use of appropriate antibiotics allows infection control with the fewest complications; however, irrational antibiotic prescribing, the overuse of broad-spectrum agents, and failure to adhere to the standard guidelines may contribute to antimicrobial resistance (AMR). The postoperative patients are highly prone to surgical-site infections (SSIs), urinary tract infections (UTIs), as well as pneumonia, and thus careful advice is needed on the selection of antibiotics. Evaluation of prescription patterns against guidelines and their patient impacts would improve antibiotic stewardship in surgical care.[1,2,3]

Antibiotic selection in the postoperative period is dependent on many factors, such as type of operation, an infection risk, comorbidities, as well as local resistance patterns for the antimicrobials. Cephalosporins, aminoglycosides, and beta-lactam inhibitors are mostly used in the prophylaxis against surgery and infection treatment. However, the frequent administration of broad-spectrum antibiotics without microbiological confirmation increases the resistance risks. Variations in dosage, frequency, and route of administration also determine the recovery of the patient and antibiotic efficacy. The patterns of utilization of antibiotics can help determine gaps in prescribing patterns and areas of intervention to generate further promotion for rational drug use.[4,5,6]

In view of appropriate antibiotic selection, the World Health Organization introduced the AWaRe classification whereby drugs are classified into three categories: Access, Watch, and Reserve, according to the level of the antibiotic's risk versus clinical need. Evidence suggests that Watch group antibiotics have been overprescribed, increasing the chances of resistance and therapeutic failures. Underuse of Access group antibiotics would require better prescribing. With hospital-based antibiotic usage data, healthcare providers can formulate department-based protocols to promote evidence-based prescribing to minimize the unnecessarily broad-spectrum usage and favor infection control.[7,8]

This prospective observational study plans to assess antibiotic use in post-operative patients at Siddaganga Hospital. Investigation of drug prescriptions; adherence to the treatment guidelines; and the use of different antibiotic classes concerning patient outcomes will enlighten antimicrobial stewardship programs. The findings will assist in recognizing overuse, underuse, and unnecessary prescribing patterns, which could direct future interventions on the best practices of antibiotic therapy. It will rationalize the use of antibiotics without only reducing the burden of AMR but also improving clinical outcomes, reducing healthcare costs, and improving patient safety in post-operative settings.[9,10]

Primary objective

- To study the utilization pattern of antibiotics among inpatients who have undergone surgery

Secondary objective:

- To access the class, frequency and spectrum of antibiotics prescribed in surgical department.
- To categorize the prescribed antibiotics using WHO-EML AWaRe criteria

Methodology:

Study Site: The study was conducted at Siddaganga Hospital.

Study Duration: The study is conducted over a period of 6 months.

Study Design: Prospective Observational Study

Sample Size: A total of 120-160 cases were collected

Study method:

This prospective observational study was conducted over six months at Siddaganga Hospital, including patients who had undergone surgery. Informed consent was obtained before data collection. A pre-designed data collection form recorded patient demographics, past medical and medication history, laboratory investigations, and current treatment. The collected data were analyzed to assess antibiotic utilization patterns in post-operative patients. Descriptive statistics, including frequencies, means, and proportions, were calculated and represented using graphs and tables. The study aimed to evaluate prescribing trends, adherence to guidelines, and potential antimicrobial resistance risks, providing insights for improving antibiotic stewardship in surgical care.

Study Criteria

Inclusion Criteria:

1. All the subjects who have undergone surgery in General surgery, ENT, Orthopedics.
2. Drugs prescribed above 18 years and both genders are considered.
3. Patients who are receiving antibiotics after surgery are only considered.

Exclusion Criteria:

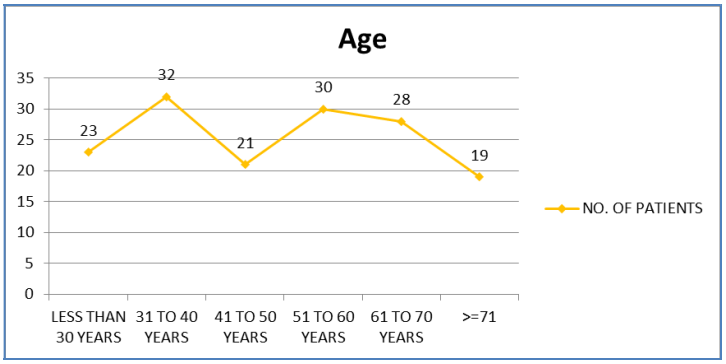
1. Pregnancy and lactating women.
2. Any patient who is not willing to give consent form.
3. Patients who are admitted in super specialty wards.

Statistical Analysis

The data collected was entered in MS Excel worksheet and descriptive statistics like percentage, mean were analyzed. Graphical representation such as bar graph, pie charts, pivot chart and tables has been used for visual interpretation of the analyzed data.

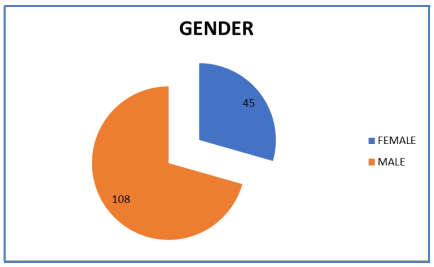
Results

1. Distribution according to Age:



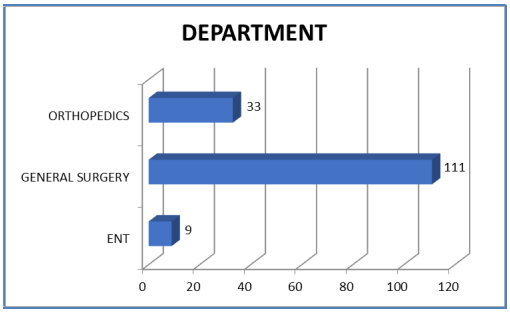
The study included 153 post-operative patients, with the highest number of cases in the 31–40 years age group (32 patients), followed by 51–60 years (30 patients). Patients aged 71 years and above were the smallest group (19 patients), indicating that middle-aged individuals required surgical interventions more frequently.

2. Distribution according to Gender:



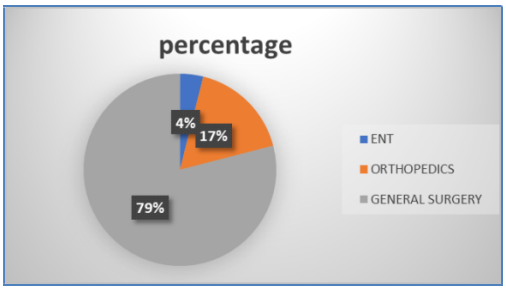
The study population had 108 males and 45 females, showing a higher prevalence of surgical procedures among males.

3. Distribution of patients according to department:



Among different departments, General Surgery had the highest number of patients (111), followed by Orthopedics (33) and ENT (9). This indicates that abdominal and wound-related surgeries were more common than orthopedic and ENT procedures.

4. Department wise antibiotics given:



General Surgery patients (79%) received the highest number of antibiotics, followed by Orthopedic patients (17%) and ENT patients (4%).

5. Distribution according to type of surgery performed:

Type of surgery performed	No. Of patients	Percentage (%)
Abdominal Surgery	62	40.3
Orthopedic Surgery	47	30.5
Urological Surgery	3	1.9
Ent Surgery	5	3.25
Miscellaneous Surgery	36	23.4

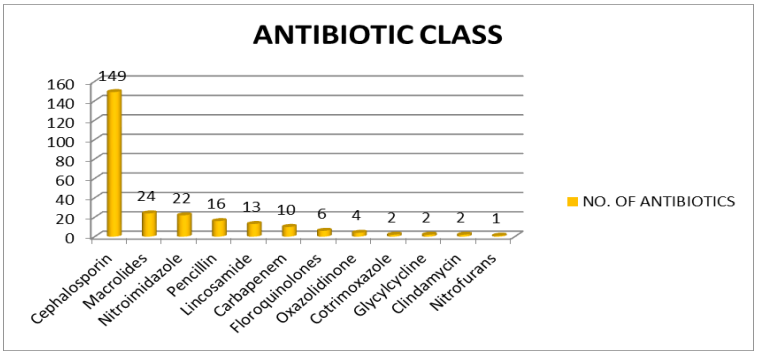
The study also examined antibiotic utilization based on the type of surgery performed. Among the 153 post-operative cases, the highest number of procedures were abdominal surgeries (62 cases), followed by orthopedic surgeries (47 cases), miscellaneous surgeries (36 cases), ENT surgeries (5 cases), and urological surgeries (3 cases).

6. Utilization pattern of antibiotics :

Antibiotic name	No. Of patients	Percentage (%)
Cefoperazone + Salbactum	76	30.28
Ceftriaxone	36	14.34
Amikacin	22	8.76
Metronidazole	22	8.76
Ceftriaxone + Salbactum	18	7.17
Clindamycin	15	5.98
Piperecillin + Tazobactum	14	5.58
Meropenem	8	3.19
Cefepime + Tazobactum	5	1.99
Linezolid	4	1.59
Cefotaxime	3	1.20
Ofloxacin	3	1.20
Cefuroxime	3	1.20
Ciprofloxacin	3	1.20
Clarithromycin	2	0.80
Cefixime	2	0.80
Tigecycline	2	0.80
Feropenem Sodium	2	0.80
Ceftazidime	2	0.80
Cefadroxil	2	0.80
Sulfamethoxazole + Trimethoprim	2	0.80
Ceftriaxone + Tazobactum	2	0.80
Ampicillin + Potassium Clavulanate	2	0.80
Nitrofurantoin	1	0.40

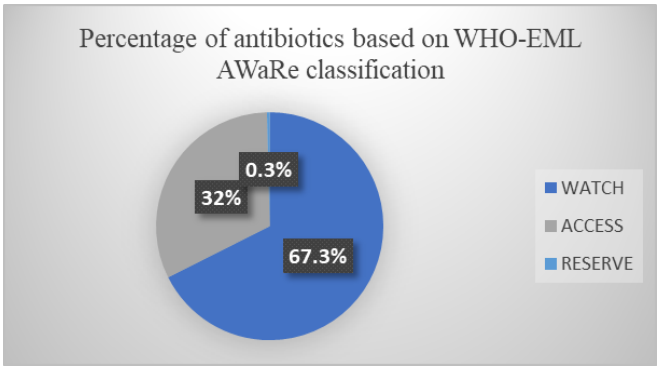
A total of 251 antibiotic prescriptions were recorded among 153 post-operative patients. Cefoperazone + Sulbactam (76 cases) was the most frequently prescribed antibiotic, followed by Ceftriaxone (36 cases), Amikacin (22 cases), and Metronidazole (22 cases). The frequent use of beta-lactam inhibitors such as Sulbactam and Tazobactam suggests the need for enhanced coverage against resistant pathogens. Combination therapy was commonly used, particularly in high-risk cases requiring broad-spectrum empirical treatment.

7. Based on class:



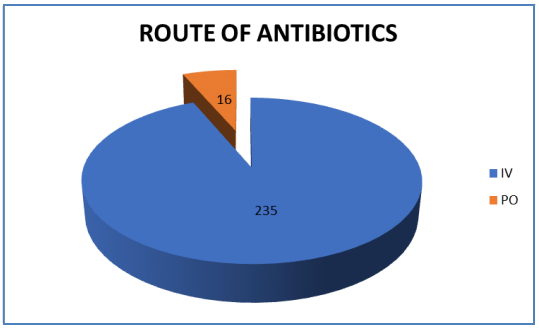
Cephalosporins were the most commonly prescribed antibiotic class, accounting for 149 cases, reflecting their widespread use in surgical prophylaxis and post-operative infection control. Among cephalosporins, Cefoperazone + Sulbactam (76 cases) and Ceftriaxone (36 cases) were the most frequently used. Nitroimidazoles (22 cases), aminoglycosides (22 cases), and penicillins (14 cases) were also widely prescribed. Fluoroquinolones (6 cases) and carbapenems (8 cases) were used selectively in severe or resistant infections.

8. Based on WHO-EML AWaRe classification:



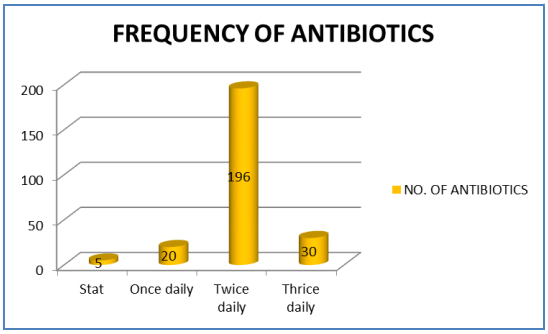
The WHO-EML AWaRe classification revealed a high reliance on Watch group antibiotics, which accounted for 169 cases (67.33%). Access group antibiotics, which are safer first-line options, were used in only 80 cases (31.87%), indicating potential underutilization of these preferred agents. Reserve group antibiotics were used in only 1 case (0.40%), suggesting their restricted use for severe multidrug-resistant infections. The dominance of Watch group antibiotics, including Cefoperazone + Sulbactam and Ceftriaxone, highlights the need for antimicrobial stewardship programs to reduce unnecessary use and slow resistance development.

9. Based on route of administrations:



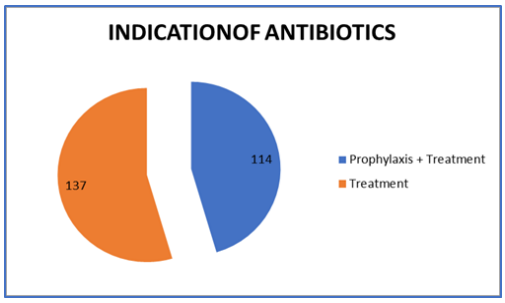
The majority of antibiotics were administered intravenously (143 cases), ensuring rapid onset and higher bioavailability, which is essential in critically ill post-operative patients. Only 10 patients received oral antibiotic.

10. Based on frequency of antibiotics:



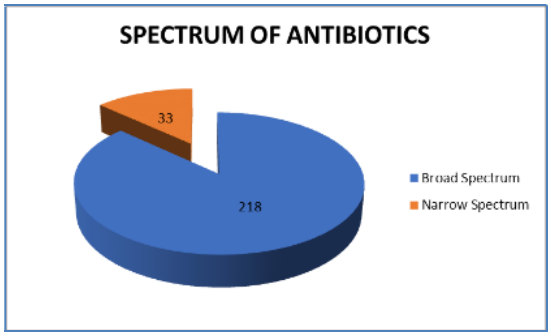
The study found that twice-daily dosing (196 cases) was most common, ensuring consistent drug levels, especially for Cefoperazone + Sulbactam and Ceftriaxone. Thrice-daily dosing (30 cases) was used for Amikacin and Metronidazole, while once-daily dosing (20 cases) was preferred for Ceftriaxone and Linezolid, reflecting their extended half-lives.

11. Based on indication of antibiotics:



Antibiotics were primarily prescribed for infection treatment (137 cases), while 114 cases received antibiotics for both prophylaxis and treatment. The higher number of treatment cases suggests that post-operative infections were a significant concern, necessitating broad-spectrum empirical therapy.

12. Based on spectrum of antibiotics



The study showed a strong preference for broad-spectrum antibiotics, with 218 cases receiving broad-spectrum agents, while 33 cases were prescribed narrow-spectrum antibiotics. Broad-spectrum cephalosporins, beta-lactam inhibitors, and carbapenems were widely used, suggesting a focus on empirical treatment before definitive microbial diagnosis.

Discussion

This study provides a comprehensive analysis of antibiotic utilization patterns in post-operative patients across various surgical departments. The General Surgery department had the highest antibiotic usage (111 cases), followed by Orthopedics (33 cases) and ENT (9 cases), aligning with the higher risk of infections in abdominal and wound-related surgeries. The most prescribed antibiotic was Cefoperazone + Sulbactam (76 cases), followed by Ceftriaxone (36 cases), Amikacin (22 cases), and Metronidazole (22 cases). The predominance of cephalosporins (149 cases) highlights their role as first-line agents in surgical prophylaxis and infection management. However, the high reliance on broad-spectrum antibiotics (218 cases) suggests an empirical treatment approach, increasing the risk of antimicrobial resistance (AMR). The dominance of Watch group antibiotics (169 cases) over Access group antibiotics (80 cases) further raises concerns about resistance development, underscoring the need for enhanced antimicrobial stewardship programs (ASPs).

The route of administration showed a strong preference for intravenous (IV) antibiotics (143 cases), with only 10 cases receiving oral therapy, reflecting the critical need for rapid action in post-operative care. While IV administration is necessary in early post-operative stages, early de-escalation to oral therapy could help reduce hospital stays and IV-related complications. The frequency of administration varied, with most antibiotics given twice daily (196 cases), thrice daily (30 cases), and once daily (20 cases), depending on pharmacokinetic properties and infection severity. The indication for antibiotic use was primarily for treatment (137 cases), while 114 cases received antibiotics for both prophylaxis and treatment, indicating a higher burden of post-operative infections. Ensuring proper adherence to prophylactic guidelines can help prevent unnecessary broad-spectrum antibiotic use in surgical settings.

The high use of broad-spectrum antibiotics (86.85%) over narrow-spectrum antibiotics (13.15%) suggests a lack of targeted therapy based on microbiological confirmation, which may contribute to antibiotic overuse and resistance. The limited use of Reserve group antibiotics (1 case) aligns with ASP guidelines, restricting them to severe multidrug-resistant infections. However, the underutilization of safer Access group antibiotics presents an opportunity to optimize prescribing practices and minimize AMR risks. To improve antibiotic stewardship, routine microbial culture testing, selective de-escalation strategies, and department-specific antibiotic guidelines should be implemented. A balanced approach to antibiotic use can ensure effective infection control while reducing unnecessary broad-spectrum exposure, ultimately improving post-operative patient outcomes

Conclusion

This study highlights the extensive use of broad-spectrum antibiotics, particularly cephalosporins, in post-operative infection management. The high reliance on Watch group antibiotics (169 cases) over Access group antibiotics (80 cases) raises concerns about antimicrobial resistance (AMR). The preference for intravenous administration (143 cases) underscores the need for early de-escalation to oral therapy when appropriate. Additionally, the dominance of empirical broad-spectrum therapy (218 cases) over targeted narrow-spectrum therapy (33 cases) suggests a lack of microbiological confirmation before antibiotic selection.

To optimize antibiotic stewardship in post-operative care, it is essential to enhance microbiological testing, promote rational antibiotic prescribing, and encourage the use of safer Access group antibiotics. Transitioning stable patients to oral antibiotics when feasible

can reduce hospital stays and minimize IV-related complications. Implementing department-specific guidelines and antimicrobial stewardship programs (ASPs) will help balance effective infection control while mitigating the risks associated with antibiotic resistance, ultimately improving patient safety and treatment outcomes.

References

1. Alsaeed OM, Bukhari AA, Alshehri AA, Alsumairi FA, Alnami AM, Elsheikh HA. The Use of Antibiotics for the Prevention of Surgical Site Infections in Two Government Hospitals in Taif, Saudi Arabia: A Retrospective Study. Cureus. 2022 Jul 11;14(7):e26731.
2. Dhole S, Mahakalkar C, Kshirsagar S, Bhargava A. Antibiotic Prophylaxis in Surgery: Current Insights and Future Directions for Surgical Site Infection Prevention. Cureus. 2023 Oct 28;15(10):e47858.
3. Birgand G, Dhar P, Holmes A. The threat of antimicrobial resistance in surgical care: the surgeon's role and ownership of antimicrobial stewardship. Br J Surg. 2023 Nov 9;110(12):1567-1569
4. Pinchera B, Buonomo AR, SchianoMoriello N, Scotto R, Villari R, Gentile I. Update on the Management of Surgical Site Infections. Antibiotics (Basel). 2022 Nov 11;11(11):1608.
5. Menz BD, Charani E, Gordon DL, Leather AJM, Moonesinghe SR, Phillips CJ. Surgical Antibiotic Prophylaxis in an Era of Antibiotic Resistance: Common Resistant Bacteria and Wider Considerations for Practice. Infect Drug Resist. 2021 Dec 7;14:5235-5252.
6. Ravi G, Chikara G, Bandyopadhyay A, Handu S. A prospective study to evaluate antimicrobial prescribing pattern among admitted patients in hilly Himalayan region of northern India. J Family Med Prim Care. 2021 Apr;10(4):1607-1613.
7. Zanichelli V, Sharland M, Cappello B, Moja L, Getahun H, Pessoa-Silva C, Sati H, van Weezenbeek C, Balkhy H, Simão M, Gandra S, Huttner B. The WHO AWaRe (Access, Watch, Reserve) antibiotic book and prevention of antimicrobial resistance. Bull World Health Organ. 2023 Apr 1;101(4):290–6
8. Patel KM, Jadav SD, Parmar SP, Trivedi H. Drug prescribing pattern in surgical wards of a tertiary care hospital in Western part of India. International Journal of Basic & Clinical Pharmacology . 2018 Jul 23 :7(8);1587–92.Battu Rakesh. (2020). Assesment of prescribing pattern in coronary artery disease. International Journal of Allied Medical Sciences and Clinical Research, 4(4), 698-715.
9. Y. KK, Cheekavolu C, Obulesu G. Drug utilization pattern in ENT OPD of government tertiary care teaching hospital in Raigarh. International Journal of Otorhinolaryngology and Head and Neck Surgery. 2017 Sep 22;3(4):1042.
10. Palikhey, Anjan MD, Sharma, Satya Prakash, Lamsal, Ashish, Shrivastava, Amit Kumar, et al. Exploring drug utilization patterns in postoperative patients to combat post-surgical complication: a descriptive cross-sectional study. International Journal of Surgery Open 2024 August;62(4):406-10.

How to cite this article:
Davan. B. Bevoor, Dinesh Kumar V, Mohammed Mateen Maaz, Sadiya, Mashidur Rahman Mollah. (2025). Prospective observational study on utilization pattern of antibiotics in post operative patients admitted in surgical departments. Int. J. Curr. Res. Med. Sci. 11(3): 1-9.
DOI: http://dx.doi.org/10.22192/ijcrms.2025.11.03.001

Access this Article in Online	
	Website: www.ijcrims.com
Quick Response Code	Subject: Medical Sciences
DOI: 10.22192/ijcrms.2025.11.03.001	