



A multicenter prospective study on prescribing pattern of pre and post operative medications in geriatric patients

Corresponding author: Sai Saran Thokada, Pharm .D (Intern at VIMS Hospital, Visakhapatnam), Department of Pharmacy Practice, Vignan Institute of Pharmaceutical Technology.

Harsha Kandregula, Pharm .D (Intern at VIMS Hospital, Visakhapatnam) Department of Pharmacy Practice, Vignan Institute of Pharmaceutical Technology.

Mamatha Arma, Pharm .D (Intern at VIMS Hospital, Visakhapatnam), Department of Pharmacy Practice, Vignan Institute of Pharmaceutical Technology.

Anusha Mendem, Pharm .D (Intern at VIMS Hospital, Visakhapatnam), Department of Pharmacy Practice, Vignan Institute of Pharmaceutical Technology.

V. Sravana Swathi, Assistant Professor at Vignan Institute of Pharmaceutical Technology, Department of Pharmacy Practice.

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Abstract

Background: The post-operative complications has been the major challenge among surgical geriatric patients due to treatment failure, the need for monitoring and management of these complications through pharmacotherapeutic regimen, monitoring plans can lead to provide positive outcome and quality of life.

Aim: To check the prescribing pattern of pre and post-operative medications in elderly patients undergoing non cardiac surgery.

Methods: This descriptive prospective study conducted in two tertiary care hospitals. Hundred patients who underwent non cardiac-surgery of age above 60 were included. Simple random sampling technique has been employed for selection of participants. The search strategy used in this literature has been derived from various databases such as PUBMED, SCIENCE DIRECT, COCHRANE LIBRARY, TRIP, EMBASS etc. Age, gender, department of surgery, diagnosis,

prescribing pattern of pre and post operative medications, surgical procedure and complications are noted.

Results: Of the total cases available hundred cases of elderly surgical patients were selected from two tertiary care centres. All the cases were redistributed depending age, gender, department, category of medication, diagnosis, pattern in preoperative and post operative and non cardiac wise. Prescribing patterns were determined from this data and was assessed. Prescribing pattern of pre operative drug (cumulative) category include 21% of antibiotics use. Whereas in post operative drug made 28% of antibiotics use. The Prescribing pattern of pre operative drugs in non cardiac surgery patients (cumulative) includes 26% ranitidine, whereas in post operative drugs include 16% ceftriaxone.

Interpretation and conclusions: Prescribing for older patients is an extraordinarily complex endeavor. The incidence of antibiotics use in postoperative drugs given for surgical elderly patients is more than the preoperative drugs given for the same category. Increasing age itself is an important risk factor for surgical patients. Post operative complications are directly related to poor surgical outcomes in the elderly. A comprehensive preoperative evaluation is recommended to identify and address these issues.

Key words: *Geriatrics, Elderly patients, Preoperative medications, Prescribing pattern, Post-operative medications, Risk assessment.*

Introduction

Geriatric patients are over-represented by hospitalizations, surgeries, and perioperative complications. Special care is required for this geriatric patient group in the perioperative period because of the occurrence of co morbid diseases, functional impairments, and other problems. A comprehensive preoperative evaluation is recommended to identify and address these issues. A discussion about the patient function and long-term health goals is also important for providing patient-centered care of the geriatric surgical patient.^[1]

Postoperative complications are directly related to poor surgical outcomes in the elderly. This review outlines evidence based quality initiatives focused on decreasing neurologic, cardiac, and pulmonary complications in the elderly surgical patient. Delirium is the most common neurologic complication in the elderly. Important anesthesia quality initiatives for prevention of delirium in elderly surgical patients include use of structured clinical protocols focused on delirium risk factor modification, and careful selection and titration of drugs when sedation is required. There is few age-specific quality measures aimed at prevention of cardiac and pulmonary complications.^[2]

MATERIAL AND METHODS

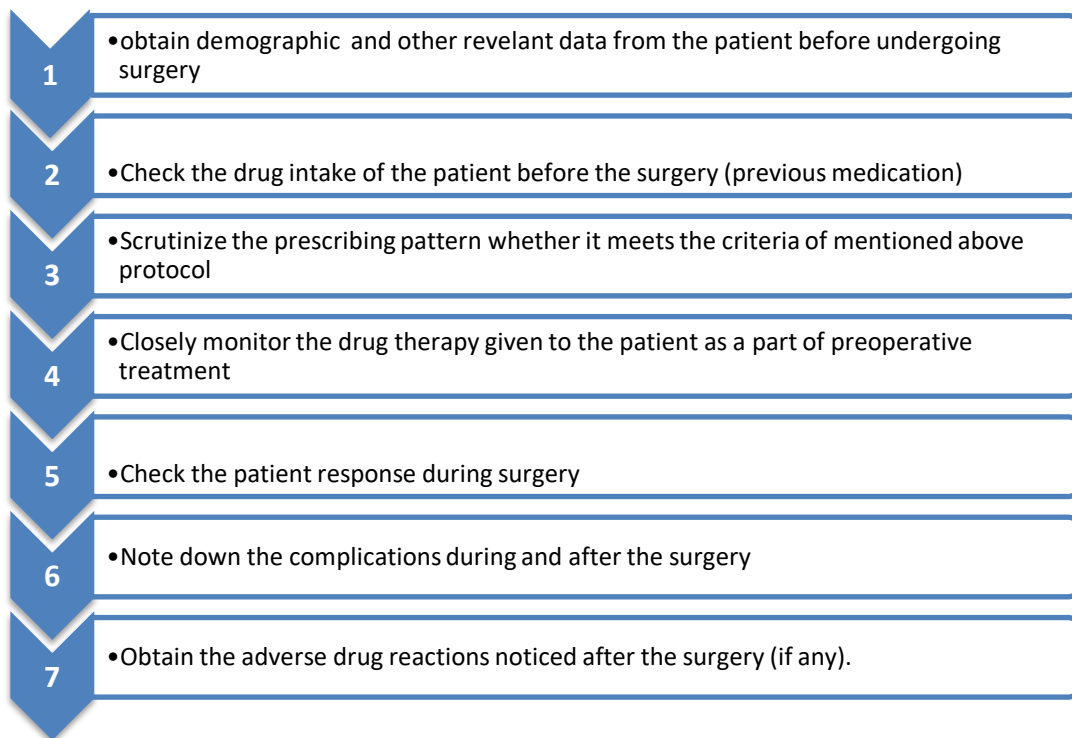
This Study was conducted in Visakha institute of medical sciences (VIMS) hospital and RK hospital, Visakhapatnam, Andhra Pradesh, India, between August 2018 to March 2019. The period for collecting data and follow up took Six months where period for analyzing and reporting the data took two month. This is a prospective study, which involves observation of inpatients in wards and ICU. Written informed consent was taken and the study was approved by

the Institutional Ethics Committee. The patients from the inpatient wards and ICU were selected on the basis of the following criteria, which includes age above 65 years, gender both male and female, participants undergoing non cardiac surgery and participants who already undergone surgery. Sampling technique, size and instrument: The patients were selected by using Simple Random Sampling. Hundred patients were included in this study. Case collection form was used as an instrument.

Data was collected from hand-written prescription forms, patient interview, and lab reports, on daily basis which includes age and sex of the patient, their primary diagnosis, past medical and medication history. Data was documented in patient case profile forms. The source of Data collection may include case reports, medication charts and other clinical data from patient profile. Steps involved in collection of data was depicted in Fig: I.

Ethical approval: Our study was approved by ethical committee of hospital Visakha institute of medical science(VIMS) and RK hospital.

Fig: I Steps involved in collection and processing of clinical data



Results

Among the selected participants, the frequency was high in adults i.e. the range of 60 to 80 years of age group patients which accounts for 91% of the study population. The mean age in RK hospital was observed to be 68.44 (SD±6.42) whereas in VIMS hospital it was observed to be 65.36 (SD± 5.18).The predominance of female patients was high when compared to male patients in both the hospitals. Age and gender wise distribution of participants was mentioned in Table I.

Table:III Surgery wise percentage distribution of cases

Characteristics	Number of Participants		Total
	R.K. Hospital	VIMS Hospital	
Age- (60-80)	43	48	
(80-90)	7	2	
Gender- Male	12	17	
Female	38	33	

While considering the department wise distribution, the high predominance was found in Orthopedics department (51%) from both the hospitals (i.e. n=31 from RK hospital and n=20

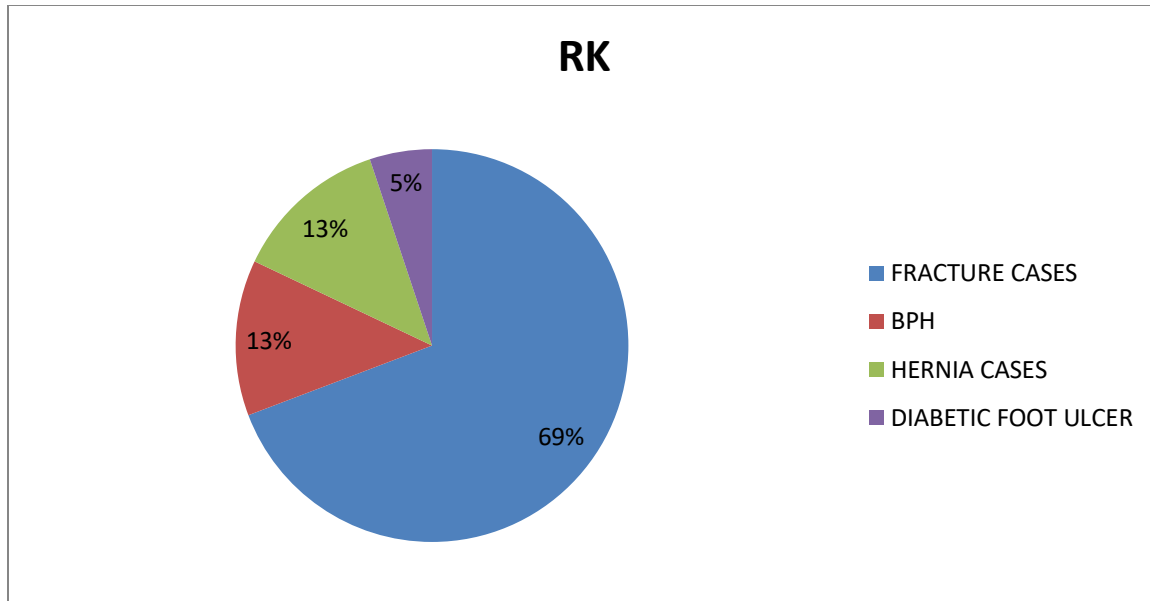
from VIMS hospital). Thirty one patients had the history of hypertension, 16 had the diabetic history, 10 patients were found to have upper limb injury. Frequency distribution of participants based upon past medical history was discussed in Table II.

Past medical history	Number of Participants		Total
	R.K. hospital	VIMS Hospital	
Diabetes	10	6	16
Hypertension	18	13	31
Prostamegaly		3	3
Upper limb injury	1	9	10
Lower limb injury	2	3	5
Hemiplegia	-	2	2
trauma	-	2	2
Burning Micturition	3	-	3
COPD	3	-	3
Head injury	2	-	2
Benign prostrate Hypertrophy	1	-	1
Anemia	2	-	2

Of the total number of surgery cases, Hemi- Arthroplasty was reported to be performed in 37 patients which accounts a total of 18.5%, followed by Orif plating surgery(10%) and Trans urethral resection of prostate(8.5%). Surgery wise percentage distribution of cases was mentioned in Table III. In our study which was conducted in RK hospital out of 50 patients, 69% patients were diagnosed with fracture cases, 13% for BPH and other 13% for Hernia cases (Fig. II). Whereas in VIMS, out of 50 patients, 56% were diagnosed with fracture, 16 % are head injury, 16 % are inguinal hernia and 12% are osteoarthritis (Fig. III)

Name of the surgery	Percentage of cases		Total (%)
	R.K hospital	VIMS hospital	
Hemi- Arthroplasty	-	37%	37%
Transurethral resection of prostate	-	17%	17%
Orif plating	-	20%	20%
Screw fixation	-	11%	11%
hernioplasty	13%	9%	11%
Surgical correction of long bone	42%	6%	24%
Conservative	16%	-	16%
Laminectomy and discectomy	10%	-	10%
Ilizarov ring fixator application	7%	-	7%
Implant removal and orif of tibia with plating	6%	-	6%
cystolithotomy	6%	-	6%

Fig:II Diagnosis wise distribution in RK hospital



Antibiotics and anti-hypertensives followed by antihistamines are the category of drugs which are widely used in preoperative period in our study. There is a major role of antibiotics in our study (Fig. IV). Even during post operative condition, antibiotics and antihistamines are greatly used (Fig. V). When comparing prescribing pattern from both the hospitals, highest prescribing percentage was found to be antibiotics (i.e. 52.6% in RK hospital, 47.3% in VIMS hospital).

Fig III: Diagnosis wise distribution in VIMS hospital

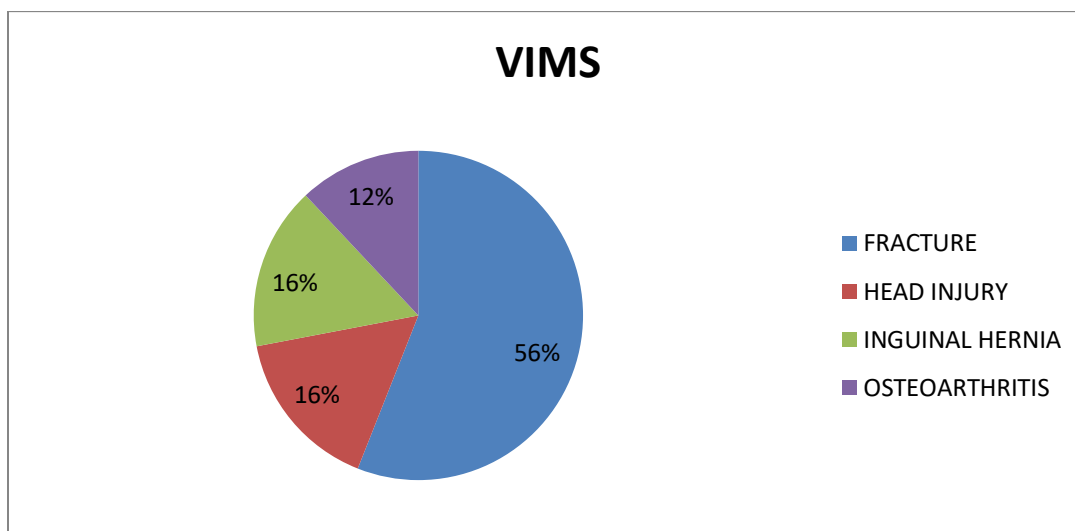
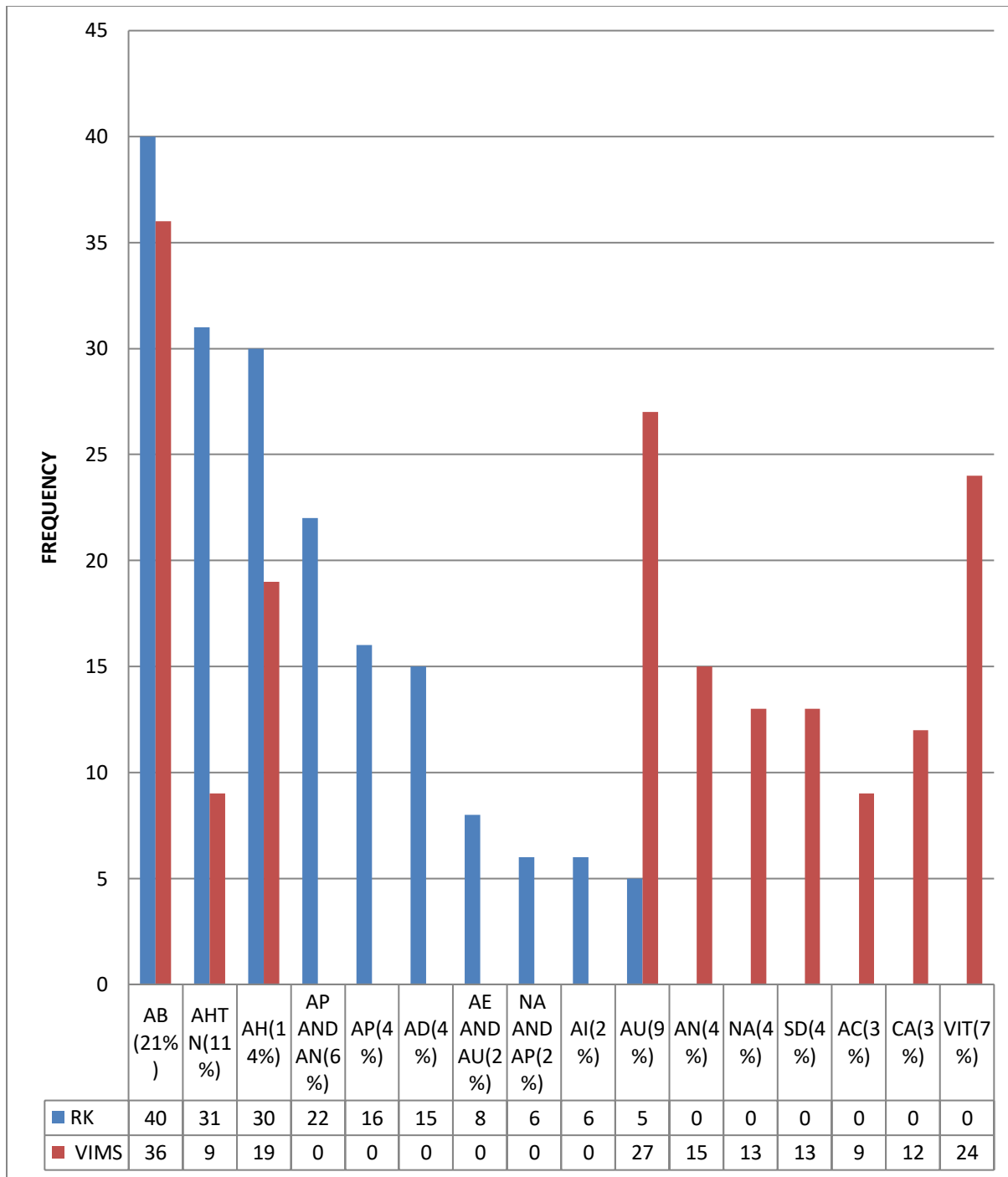
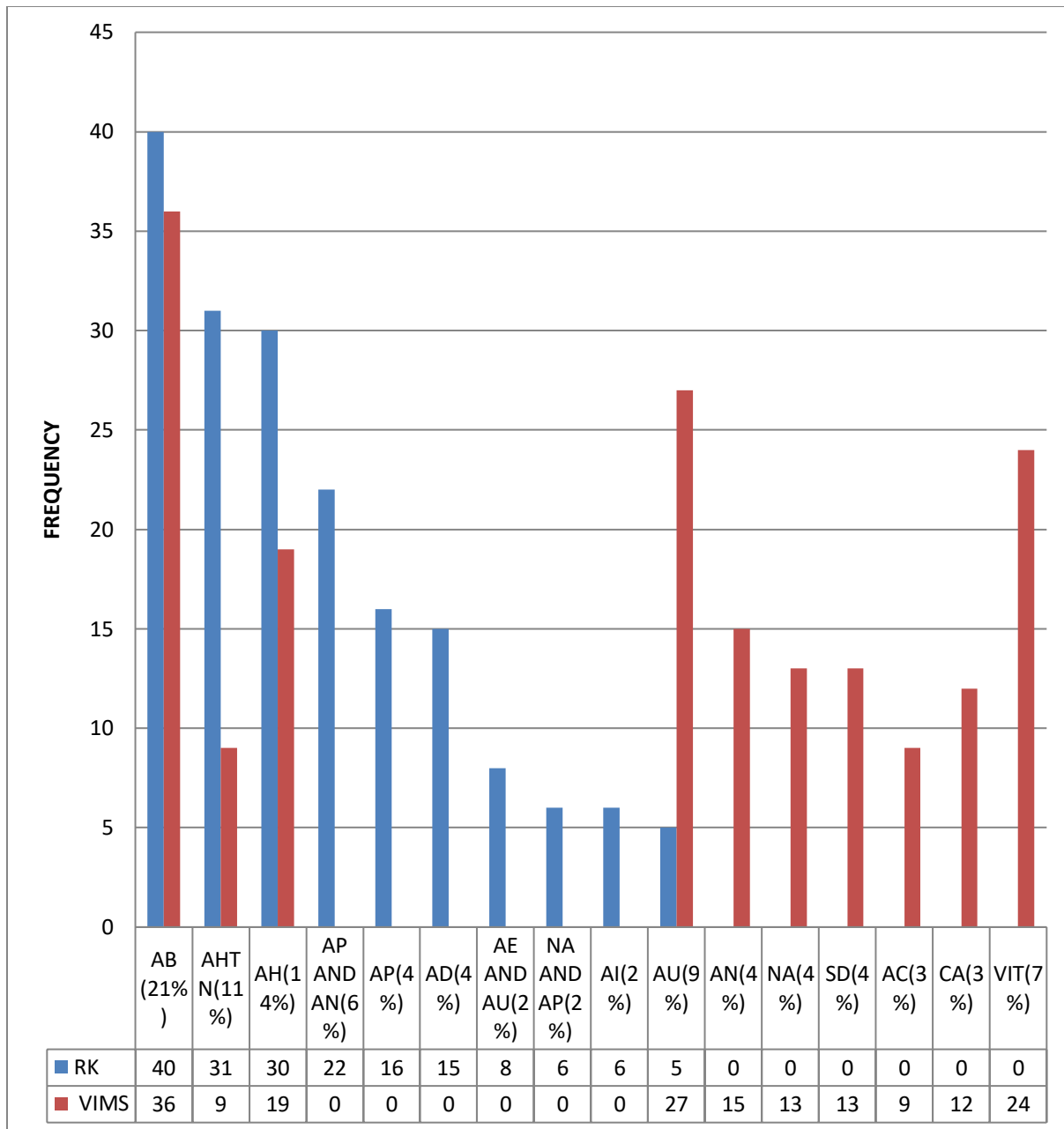


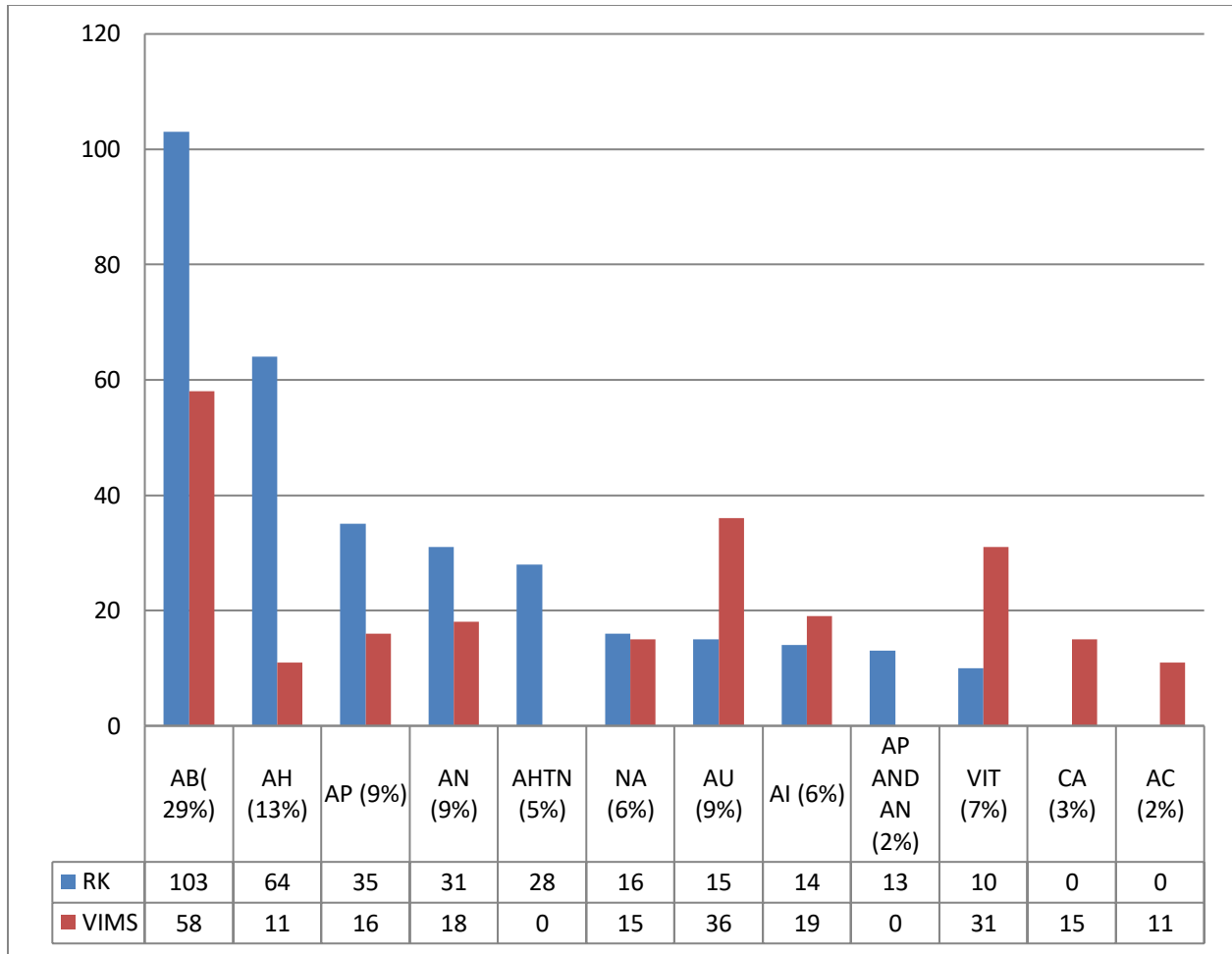
Fig:IV Prescribing pattern of preoperative drug categories





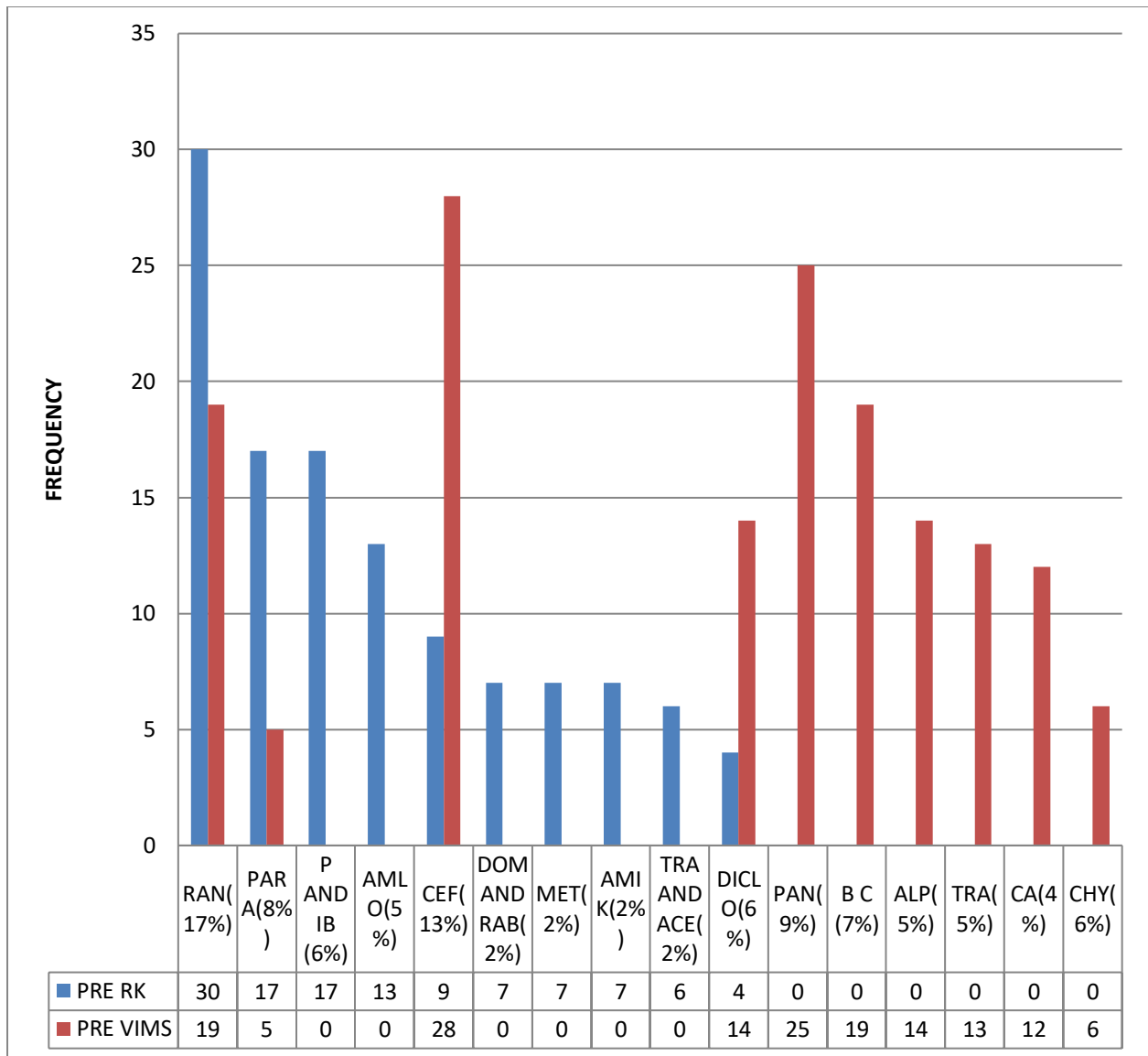
AB- Antibiotics, AHTN- Anti hypertensives, AH- Antihistamine, AP- Antipyretic, AN- Analgesic, AD- Antidiabetic, AE- Antiemetic, AU- antiulcer , NA- Narcotic analgesic, SD- sedatives, CA-calcium supplements, AC- anticonvulsant, VIT- Vitamin supplements.

Fig: V Prescribing pattern of Post Operative drug category



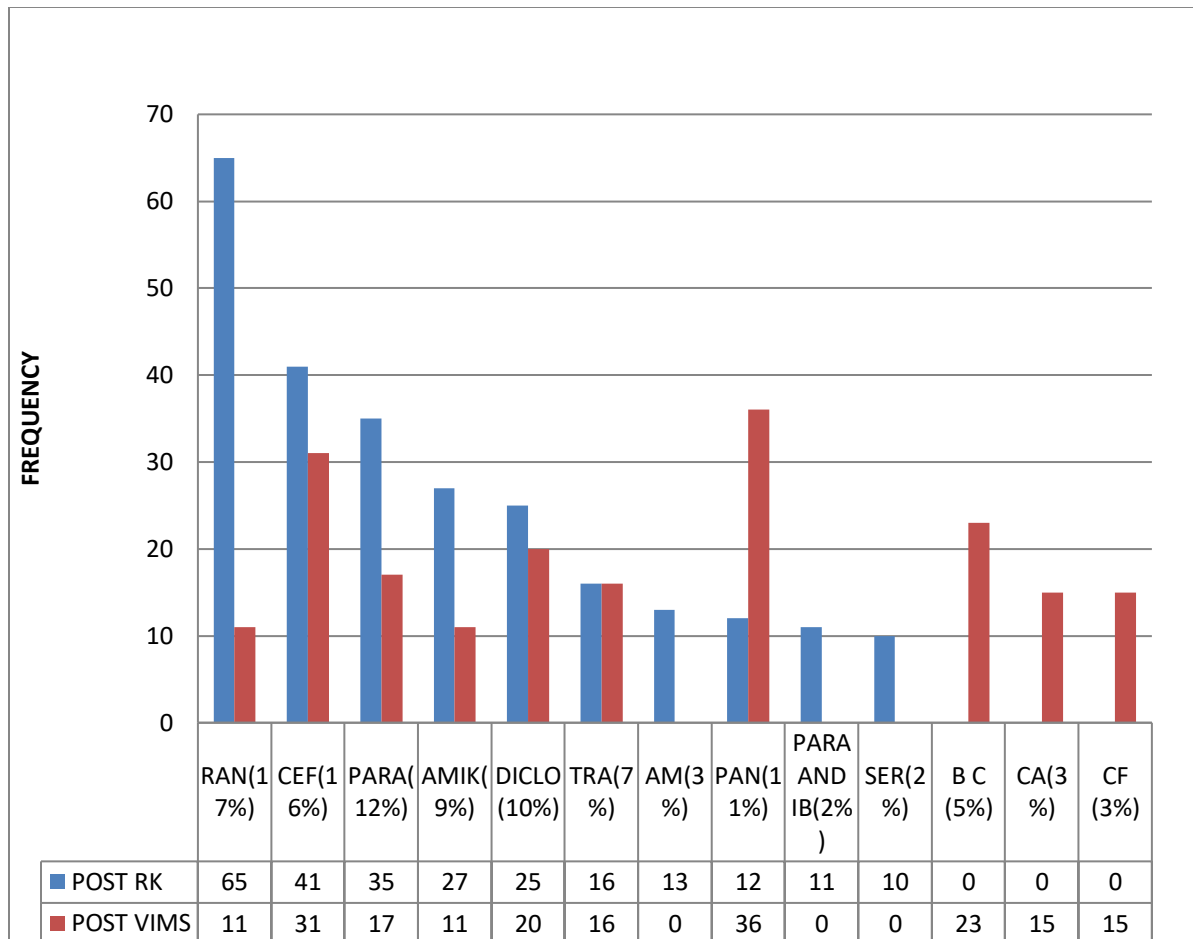
AB- Antibiotics, , AH- Antihistamine, AP- Antipyretic, AN- Analgesic, AHT- Anti hypertensives, NA- Narcotic analgesic, AU- antiulcer , AI- Anti inflammatory, VIT- Vitamin supplements, CA-calcium supplements, SD- sedatives, AC- anticonvulsant, Before undergoing surgery general anesthesia is the major risk factor for the patient to aspirate. Oral ranitidine administered one night before surgery reduces this potential risk by improving gastric environment. Hence high use of ranitidine(26%) was reported. Amlodipine was also prescribed in higher frequency to treat patients with hypertension (Fig. VI).

Fig:VI Prescribed pre-operative drugs in non-cardiac patients



RAN-ranitidine, PARA- paracetmol, P- paracetmol and IB- ibuprofen, AML- Amlodipine, CEF- ceftriaxone, DOM- Domeperidone and RAB- Rabeprazole, MET- Metformin, AMI- Amikacin, TRA- tramadol and ACE- acetaminophen, DICLO- Diclofenac. Pantoprazole, BC- b complex, ALP- Alprazolam, CA- calcium carbonate, CHY- Chymoral forte.

Fig: VII Prescribed Post-operative drugs in non-cardiac patients



RAN-ranitidine, , CEF- ceftriaxone, PARA- paracetmol, AMI- Amikacin, DICLO- Diclofenac , TRA- tramadol, AML- Amlodipine, PAN-Pantoprazole, SER- Serratiopeptidase, BC- b complex, CA- calcium carbonate, , CHY- Chymoral forte.

Discussion

In the present study 62.5% of fracture cases (cumulative) were registered. Antibiotics are frequently prescribed for the treatment of open fractures and for prophylaxis in procedures for open reduction and internal fixation. Many patients who have a fracture also require antibiotic treatment for an unrelated condition such as a chest infection.^[3, 4] Cell culture studies have shown that the amino glycoside, Tobramycin, is toxic to osteoblasts *in vitro*, an observation which is dose dependent.^[5] While antibiotics remain an important part of trauma care in preventing infection, the clinician should be aware of these studies which indicate that it is prudent to avoid high doses of Ciprofloxacin, Rifampicin and topical Gentamicin in order to minimize the risk of non union.

Antihypertensive agents are widely used to prevent the adverse cardiovascular outcomes associated with uncontrolled hypertension.^[6] Despite these hypotheses, various observational studies have not supported consistent effects of various antihypertensive drug classes on

fractures.^[7] Oral non-steroidal anti-inflammatory drugs (NSAIDs) can be effective in some patients, but have an established gastrointestinal, cardiovascular and renal risk, which increase with age. In particular, traditional NSAIDs increase risk for major vascular events (heart failure, myocardial infarction and stroke), hospitalization and upper gastrointestinal events, while the newer selective COX-2 inhibitors (coxib) have a lower risk of stomach and intestinal side effects, but a higher risk of heart and circulatory side effects compared to older NSAIDs. In addition, current evidence provides little guidance about the safe use of NSAID in the elderly.^[8] M. S. Gaston et al., in his study stated that non-steroidal anti-inflammatory drugs (NSAIDs) inhibit Cyclooxygenase (COX) activity and are widely used in the management of arthritis as post-surgical analgesia and for the relief of acute musculo skeletal pain. Their mode of action is to inhibit the synthesis of prostaglandins^[9].

Older adults are especially sensitive to the central nervous system- and anticholinergic-related side effects of sedating antihistamines because of decreased cholinergic neurons or receptors in the brain, reduced hepatic and renal function, and increased blood-brain permeability. These patients also often have coexisting conditions and often take multiple medications that increase the risk of drug-drug interactions and the potential for sedative adverse effects.

Even when first-generation antihistamines are used at the lowest doses recommended by the manufacturer, they can cause serious central nervous system side effects, including dizziness, hypotension, and next-day sedation. These side effects can greatly increase the risk of falls and fall-related injury, with the impact of even one fall in an older adult potentially having tremendous negative consequences, including diminished quality of life and loss of independence.^[10] Opioid use should be implemented only when alleviation of pain and improvement of function outweigh the risks to the patient.^[11] The goals of chronic pain therapy are to decrease pain, increase function, and improve overall quality of life.^[12] Prevention and elimination of unnecessary suffering are the keys to successful management of chronic pain.^[13]

Healthcare professionals should be cautious when prescribing and dispensing opioid medications to patients aged 65 years and older. Because of their age, elderly patients may have reduced renal function even in the absence of renal disease, thereby leading to a reduction in medication clearance. Since elderly patients may have an increased risk of drug accumulation because of decreased renal function, there is a narrow therapeutic window between dosages that are safe and those that could lead to respiratory depression or overdose.^[11] It is important that the physician monitor the patient's glomerular filtration rate and creatinine to determine appropriate dosing. In the present study 16% of post-operative drugs in non-cardiac patients used ceftriaxone. Kellum et al., found a single dose of preoperative ceftriaxone to be effective in reducing post-operative sepsis in high-risk patients undergoing biliary surgery, e.g. those with common bile duct stones, over the age of 70 years or those with recent or on-going cholecystitis.^[14] Similarly, De La Hunt et al found that, 2 g Ceftriaxone given intravenously prior to induction of anesthesia provided reliable protection against post-operative wound infection in patients undergoing elective biliary surgery. Their study clearly establishes the efficacy of Ceftriaxone as a prophylactic antibiotic for the prevention of post-operative sepsis after biliary surgery, when given in a single pre-operative dose. They noted a marked reduction in the incidence of post-operative chest infection in patients receiving Ceftriaxone due to the prolonged activity of the drug in the body. They consider that the pharmacokinetics of Ceftriaxone offer special advantages when compared with other equally wide-spectrum antibiotics, since a single intravenous injection of Ceftriaxone will give satisfactory antimicrobial cover for 24hours.^[15]

Review Of Literature

- Search like Pub med, Medline, Trip Medical Database, Embase, Cochrane Library, and Science Direct. Studies having patients with age 65 years, gender among both males and females are considered, only inpatients are monitored. Studies having patient's undergone cardiac surgery are excluded. Out patients are also excluded. Three stages of screening were performed to include relevant studies. Stage 1 is title screening wherein duplicate titles were excluded. Stage 2 is abstract screening where abstract was screened for inclusion into the review. Stage 3 is full paper screening where in full paper was screened for inclusion into the study.

S.NO	Author and year	Type of study	No of subjects	Outcome measures	Outcome
1.	Jacques et al.,2014 ^[16]	Meta-analysis	1,91,873	Age, Sex, Odd's ratio, survival days, mortality, morbidity.	An intra operative management and alignment of multidisciplinary hospital teams (physicians and nurses) and hospital care paths toward optimal care as well as an early surgery are key factors that may improve morbidity and mortality.
2.	Barnett et al., 2009 ^[17]	Cross-sectional study	3000	OTC Medications, ADR evaluation.	Accurate preoperative histories of medication usage are critical and should include nonprescription remedies. A working understanding of medications that are contraindicated in the elderly, such as those with strong anticholinergic properties, may reduce predictable adverse events in this vulnerable population.
3.	Marcia L et al., 2009 ^[18]	Cross-sectional study	96	Evaluation of elderly issues, medication use, patient-provider discussions,	Attention to the quality of care in elderly patients is of great importance due to the increasing numbers of elderly undergoing surgery.

				intraoperative care, postoperative management, discharge planning, and ambulatory surgery	This project used a validated methodology to identify and rate process measures to achieve high quality perioperative care for elderly surgical patients.
4.	F.E Turrentine et al., 2006 ^[19]	Cross-sectional study	7696	Age, Procedures, Patients, Preoperative risk factors, Morbidity, Mortality.	Although several risk factors for postoperative morbidity and mortality increase with age, increasing age itself remains an important risk factor for postoperative morbidity and mortality
5.	Dong hoonsuh et.al ^[20]	Prospective or retrospective study	60	Age group (yrs),cancer stage, surgical complexity, post operative complication, PS, BFI,ASA scale, MMSE score.	PS seems to be useful in predicting multiple complications in elderly patients with gynecologic cancer. CGA was not useful in predicting postoperative complications.
6.	Li Xu et.al ^[21]	Prospective study	1422	age, female gender, body mass index, history of angina, history of hypertension, history of diabetes, preoperative ST-T abnormality by electrocardiogram, pre-operative hemoglobin <110 g/L, and high-risk surgery.	The incidence of MACE in elderly patients with CAD who underwent non-cardiac surgery was 9.1%. Seven independent risk factors for a perioperative MACE were identified.
7.	Kenneth A. Egol et. Al ^[22]	Prospective or retrospective study	18,209	age, sex, medical comorbidities, mental status, and pre injury level of function on postoperative function, complication rate and mortality, ASA scale.	Multidisciplinary care in the treatment of the geriatric patients with hip fracture can significantly reduce complications and mortality after hip fracture.

8.	Luca Pasina et.al ^[23]	-	5247	age-related physiologic changes, polypharmacy and multimorbidity diagnosis and drug treatment at admission, NRS scale.	NSAIDs may cause potentially serious side effects on the heart and circulatory system. We also confirmed the conservative attitude to prescribe opioids in older patients previously observed in REPOSI through a period of 5 years.
9.	M. Wiens et. Al, ^[24]	case-control or cohort studies	-	Age, sex, alcohol, OBS, paralysis, stroke, hospitalization, nursing home residence, BMI, use of medications.	Multiple observational studies suggest that both thiazide diuretics and b-blockers, appear to lower the risk of fractures in older adults.
10.	Jürgen Bauer MD et. Al, ^[25]	Meta analysis, prospective or retrospective study	610	Age, sex, body weight, PROT-AGE Study	The members of the PROT-AGE Study Group reviewed an extensive medical literature and compiled evidence to show that getting adequate dietary protein is important to maintaining functionality. We found that optimal protein intake for an older adult is higher than the level currently recommended for adults of all ages. New evidence shows that higher dietary protein ingestion is beneficial to support good health, promote recovery from illness, and maintain functionality in older adults.

Conclusion

Prescribing for older patients is an extraordinarily complex endeavor. The incidence of antibiotics use in postoperative drugs given for surgical elderly patients is more than the preoperative drugs given for the same category. However rantidine was prescribed in higher ratio

in pre operative drugs for non cardiac patients which improves gastric environment before induction of anesthesia. Increasing age itself is an important risk factor for surgical patients. A special care is always required for this geriatric patient group in the perioperative period because of the occurrence of co -morbid diseases, functional impairments, and other problems. There is few age-specific quality measures aimed at prevention of cardiac and pulmonary complications. Before surgery, patients will meet anesthesiologist. They will review all medical and dental problems and allergies, as well as any medicines taken, including herbal supplements, vitamins, and any over-the-counter drugs like aspirin. In terms of medications, prior to surgery, an antibiotic may be given to prevent infections at the surgical site. There are different medications given during surgery, which includes Anesthesia (Local, Regional, General) and sedatives (Benzodiazepines and Barbiturates). There are different medications given after surgery (post-operative) such as Analgesics, Anticoagulants and symptom reducing drugs such as Ondansetron, Famotidine etc. Antibiotics are most commonly used medication sugery patients to prevent surgical site infections. Post operative complications are directly related to poor surgical outcomes in the elderly. A comprehensive preoperative evaluation is recommended to identify and address these issues.

Conflicts of interest: All authors declare that they have no conflicts of interest.

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Name of the Authors:

1. Corresponding author: Sai Saran Thokada, Pharm .D (Intern at VIMS Hospital, Visakhapatnam), Department of Pharmacy Practice, Vignan Institute of Pharmaceutical Technology.
Address: Door no. 27-8-14, Srinagar, Gajuwaka, Visakhapatnam, Pin code: 530026, Andhra Pradesh, India. Mobile number: +917989901498, e-mail- tsaisaran11@gmail.com.
2. Harsha Kandregula, Pharm .D(Intern at VIMS Hospital, Visakhapatnam) Department of Pharmacy Practice, Vignan Institute of Pharmaceutical Technology.
Address: Door no. 14-16-6/1, old LIC building, park center, gavrapalem, Anakapalli, Visakhapatnam, Andhra Pradesh. Mobile number: +91 8125592622. e-mail- Kandregulaharsha@gmail.com.
3. Mamatha Arma, Pharm .D (Intern at VIMS Hospital, Visakhapatnam), Department of Pharmacy Practice, Vignan Institute of Pharmaceutical Technology.
Address: Q.no. 137/D, sector-5, Ukkunagaram, Steel Plant, Visakhapatnam- 530032, Andhra Pradesh. Mobile number: +91 9603072306, e-mail- mammu25@gmail.com.
4. Anusha Mendem, Pharm .D (Intern at VIMS Hospital, Visakhapatnam), Department of Pharmacy Practice, Vignan Institute of Pharmaceutical Technology.
Address: Q.no. 135/C, sector-5, Ukkunagaram, Steel Plant, Visakhapatnam- 530032, Andhra Pradesh. Mobile number: +91 8639427862, e-mail- ponnyanushaa@gmail.com
5. V. Sravana Swathi, Assistant Professor at Vignan Institute of Pharmaceutical Technology, Department of Pharmacy Practice.
Address: Pharmacovigilance Associate, Pharmacovigilance Programme of India, National Coordinating Center, Indian Pharmacopoeia Commission (IPC), Ghaziabad, India. Mobile number: +91 7382434448, e-mail- swathipharmacoo@gmail.com.