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DRUG UTILIZATION PATTERN OF HIGH ALERT MEDICATIONS IN CARDIOLOGY DEPARTMENT OF A TERTIARY CARE HOSPITAL–A PROSPECTIVE OBSERVATIONAL STUDY

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ABSTRACT

Background: High alert medications (HAMs) are defined as medications that bear a heightened risk of causing significant patient harm when these medications are used in error. Though Medication mishaps with high alert medications may or may not be more common than other medications, the consequences following an error with these medications can be serious to the patient.

Aim: The aim of the study was to conduct a Prospective Observational Study on Drug Utilization Pattern of High Alert Medications in Cardiology Department.

Methodology: A Observational Study was conducted in Cardiology Department of Pushpagiri Medical College Hospital over a period of 6 months. A total of 87 patients administering High Alert Medications aged above 18years were included. Patient data was collected from the Case-sheet and recorded using patient data collection performa and applied WHO DUE indicators to evaluate Utilization Pattern of High Alert Medications. Nurses Knowledge of High Alert Medication were also analysed using self structured questionnaires.

Results: This study shows that High Alert Medications can cause serious adverse effects when they are used in

error or as intended. Majority of reactions was associated with adverse drug reactions. Adequate remedial measures taken have reduced the drug related problems associated with High Alert Medications. Nurses perception scores showed that nurses have significant knowledge on High Alert Medications after providing counselling through leaflets.

Conclusion: Drug Utilization pattern of High Alert Medication is appropriate to the standards and criteria of the study in the majority of prescriptions. Very few drug related problem such as Adverse drug reactions and drug-drug interactions were identified and adequate strategies have been taken to prevent these drug related problems. Nevertheless, the monitoring of High Alert Medications error rate should be continued to ensure its effectiveness. The comparison of nurses perception scores regarding High Alert Medications before and after the intervention showed significant improvement.

Keywords: HAM; heparin; warfarin; adverse drug reactions; bleeding; hyperkalemia; haematuria; hemoptysis

INTRODUCTION

The Institute for Safe Medication Practices (ISMP) describes HAMs as drugs "that bear a heightened risk of causing significant patient harm when used in error." **[1]** HAMs share several characteristics—a narrow therapeutic index and the risk of significant harm if the wrong route is chosen or a system failure occurs. Drugs with a narrow therapeutic index are dangerous because small changes in dosage or blood drug levels can lead to dose or blood concentration-dependent critical therapeutic failures or adverse drug events. These adverse events are persistent, life- threatening, permanent, or slowly reversible and can lead to disability, the need for hospitalization, or death **[2]**. Organizations with guidelines on using HAMs include the ISMP, the Institute for Healthcare Improvement (IHI), and TJC. All relevant organizations identify four specific HAM drug classes such as anticoagulants, sedatives, insulins, and opioids—because they're frequently linked to potentially harmful outcomes.

For safe handling and management of HAMs- a list of high alert medications used within the facility shall be identified and disseminated to all healthcare personnel in the facility **[3]**, high alert medications should have HIGH ALERT MEDICATION labels on storage shelves, containers, product packages **[4]**. The purpose of identifying High Alert Medications is to establish safeguards to reduce the risk of errors with these drugs in all phases of the medication-use process. The primary goals of implementing risk-reduction strategies are to:1) prevent errors, 2) make errors visible 3) mitigate harm. To be effective, all of these interdisciplinary components are needed: Understand the causes

of errors, Be sure actions are comprehensive, Patient Education **[5]**. Healthcare professionals are encouraged to actively monitor the safety of the high alert medications by avoiding their inappropriate use **[6]**.

This study was aimed to assess Drug Utilization Pattern of High Alert Medications in Cardiology Department with objectives of assessing the drug related problems in patients with High Alert Medications, identifying the strategies to prevent the drug related problems, analysing the perception of High Alert Medications in nurses.

MATERIALS AND METHODS

A single centered, hospital based, prospective observational study was conducted in the Department of Cardiology, Pushpagiri Medical College Hospital, Thiruvalla, Kerala, India. for a duration of 6 months including a total of 87 patients and 64 nurses.

The Sample size was calculated using expected proportion (p)from previous study: $n = Z\alpha^2 PQ/d^2$

INCLUSION CRITERIA

All IP patients who have given consent to voluntarily participate in the study, of age group 18 yrs and above admitted in the Cardiology Department of Pushpagiri Medical College Hospital.

EXCLUSION CRITERIA

Patients admitted in other departments and outpatients were excluded from the study.

STUDY PROCEDURE

A Prospective Observational study was conducted in Cardiology department of a tertiary care hospital. A written informed consent form was obtained from the patient or care giver after giving a brief introduction about the study. Patients administering high alert medications were identified in accordance with the inclusion and exclusion criteria. Data collection form was used for recording the demographic details, past medical and medication history, reason for admission, clinical features. Information about the current drug treatment i.e. generic name and trade name, formulation, dose, frequency, drug utilization pattern, ADR and drug interactions collected. Patient Information leaflet were provided. Nurses knowledge was assessed using self structured questionnaire and leaflet was provided to them. The collected data was further analysed based on aim and objectives.

STATISTICAL ANALYSIS

Data collection was tabulated and statistically analysed using SPSS Software. Nurses perception scores were compared using Paired t test.

RESULTS AND DISCUSSION

1. Drug Utilization Pattern of High Alert Medications in Cardiology department.

Among the High Alert Medication, Inj. Heparin (74.7%) is the mostly prescribed drug. Majority

of the patients received single HAM (37.93%). The number of HAMs per prescription is an indicator of High Risk Disease. Most of High Alert Medicines are prescribed in the generic name (70.71%). Prescribing in generic name helps to avoid duplication between drug class and therapeutic class. High Alert Medication is prescribed mostly for CAD Patients. Coronary Artery Disease (CAD) constitute the majority of diagnosis (82.8%). Distribution of comorbidities among the study population highlights the substantial prevalence of diabetes mellitus and hypertension, each reported at 63.2%. This spectrum of comorbidities underscores the complexity of patient population understudy.

2. Identify the drug related problems in patients with High Alert Medications.

During the study period, 7 Adverse effects and 5 drug interactions were found to be caused with the use of HAM. Of that Inj Heparin was found to cause the highest number of adverse drug reaction. Haematuria and Hemoptysis was the commonly reported ADR.

3. The strategies to prevent the drug related problems.

A total of 304 potential Drug Interactions and five actual drug interaction were found out. The commonly used strategy to prevent drug related problem was to withheld the drug. Drug interactions was prevented by monitoring for signs of bleeding, changing the timing of the dose given and by preventing simultaneous administration of drugs.

4. Analyse the perception of High Alert Medications in Healthcare professionals.

Nurses perception mean score during pre intervention was18.06 and post intervention was 19.52. Perception of the nurses after the educational intervention is more better than the pre intervention. This improvement underscores the efficacy of education initiatives in bolstering healthcare professionals comprehension of high risk medications, thereby potentially reducing the incidence of medication errors and enhancing safety.

Table 1: Drug utilization pattern of High Alert Medication using WHO indicator

PRESCRIBING INDICATORS	OPTIMAL VALUE	OBSERVED VALUE
Average no:of medicines prescribed per patient encounter	1.6-1.8	1.7
Percentage of encounters with An antibiotic prescribed	20-26.8	25.2
Percentage encounters with generic drugs prescribed	100	70.7
Percentage encounters with an injection prescribed	13.4-24.1	89.6
Percent medicines prescribed from essential medicines list or formulary	100	90

Table 1.1: Distribution of patients based on disease

DISEASE	FREQUENCY (n=87)	PERCENTAGE (%)
Coronary artery disease	71	81.6
Acitrom induced coagulopathy	1	1.1
Acute gastroenteritis with thrombocytopenia	1	1.1
Acute pulmonary edema	1	1.1
Atrial fibrillation	1	1.1
Anaphylactic shock	1	1.1
Cardiogenic shock	1	1.1
Diabetic kidney disease	1	1.1
Drug induced coagulopathy	1	1.1
Heart failure	2	2.3
Hyperkalemia induced bradycardia	1	1.1
Junctional bradycardia with hemodynamic instability	1	1.1
Pacemaker site haemotoma	1	1.1
Pre syncope	1	1.1
Pulmonary venoocclusive disease	1	1.1
Rheumatic heart failure	1	1.1
TOTAL	87	100

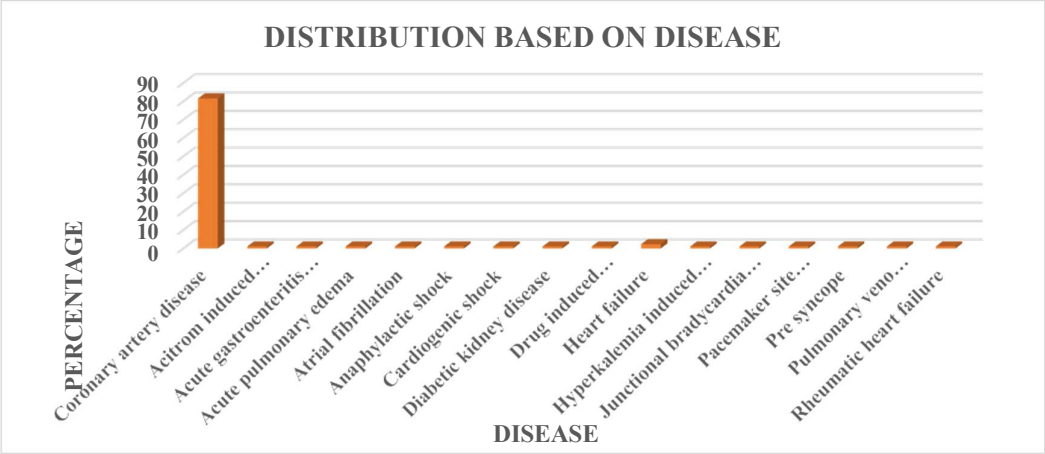

Figure 1.1: Distribution of patients based on disease

Table 1.2: Distribution of patients based on comorbidities

COMORBIDITIES	FREQUENCY (n=87)	PERCENTAGE (%)
Diabetes mellitus	55	63.2
Hypertesion	55	63.2
Dyslipidemia	21	24.1
COPD	6	6.9
CKD	5	5.7
Thyroid disorders	5	5.7
Seizures	4	4.6
Sick sinus syndrome	3	3.4

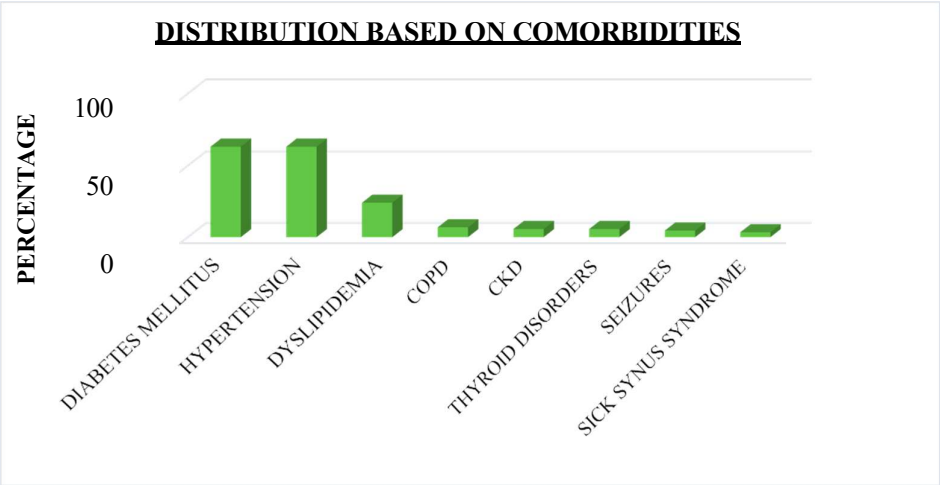

Figure 1.2: Distribution of patients based on comorbidities

Table 1.3: Distribution based on High Alert Medication characteristics

HIGH ALERT MEDICATION CHARACTERISTICS	FREQUENCY (n=181)	PERCENTAGE (%)
BRAND NAME	53	29.28%
GENERIC NAME	128	70.71%

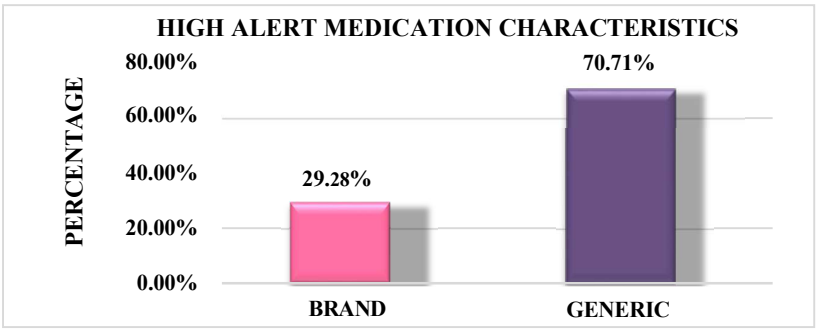

Figure 1.3: Distribution based on High Alert Medication characteristics

Table 1.4: Distribution based on most commonly prescribed High Alert Medication

NAME OF DRUG	FREQUENCY OF DRUGDISPENSED	PERCENTAGE OF DRUG DISPENSED (%)
Inj.Heparin	65	74.7
Inj. H Actrapid	22	25.3
T. Warfarin	17	19.5
Inj .Mixtard	15	17.2
Inj. Lasix	13	14.9

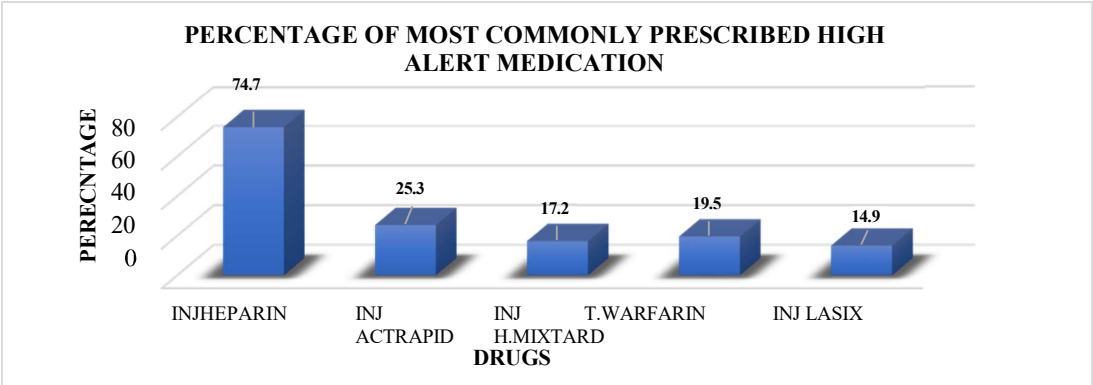

Figure 1.4: Distribution based on most commonly prescribed High Alert Medication

Table 1.5: Distribution of patients based on Drugs per Prescription

DRUGS PER PRESCRIPTION	NUMBER OF ENCOUNTERS(n=87)	PERCENTAGE (%)
One HAM	33	37.93
Two HAM	29	33.33
Three HAM	18	20.68
Four HAM	3	3.44
Five HAM	2	2.29
Six HAM	2	2.29

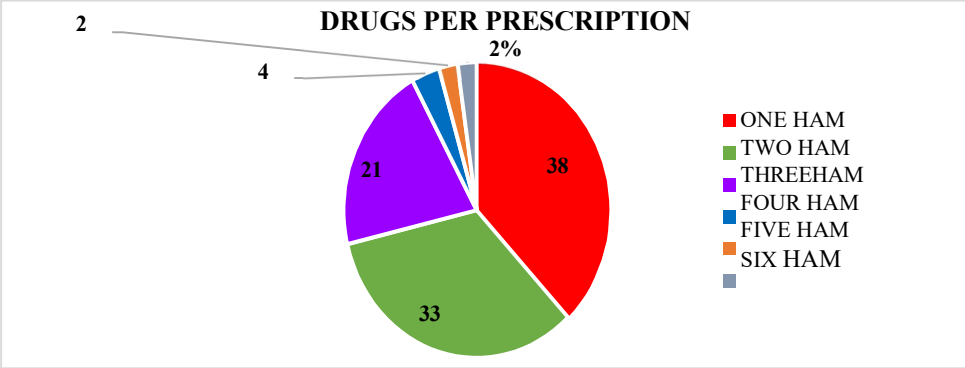

Figure1.5: Distribution of patients based on drugs per prescription

Table 2: Distribution of patients based on adverse drug reactions

DRUG	ADR OBSERVED	FREQUENCY
Inj.Heparin	Haematuria	2
	Hemoptysis	2
T.Warfarin	Bleeding	1
Inj.Human Actrapid	Hypoglycemia	2

Table 2.1: Drug–Drug Interactions

DRUG DRUG INTERACTIONS			
ACTUAL DRUG INTERACTIONS (5)		POTENTIAL DRUG INTERACTIONS (304)	
DRUG–DRUG INTERACTIONS	OBSERVED REACTION	MAJOR	MINOR
Heparin+Aspirin(2)	Bleeding	268	36
Heparin+clopidogrel(2)	Bleeding		
Telmisartan+Heparin(1)	Hyperkalemia		

Table 3: To identify the strategies to prevent drug related problems in the study

DRUG-DRUG INTERACTION	OBSERVED REACTION	MONITORING STRATEGIES
Heparin+ Aspirin	Bleeding	Monitor the signs of bleeding
Heparin+Clopidogrel	Bleeding	Monitor the signs of bleeding
Telmisartan+Heparin	Hyperkalemia	Change the timing of dose given
Heparin+Clopidogrel	Bleeding	Simultaneous administration prevented
Heparin+ Aspirin	Bleeding	Change the timing of dose given

Table 3.1: Drug interactions and their monitoring strategies

DRUG	ADVERSE EFFECT	FREQUENCY	REMEDIAL MEASURE
Inj.Heparin	Haematuria	2	Withheld the drug
	Hemoptysis	2	
T.Warfarin	Bleeding	1	Withheld the drug
Inj.Human Actrapid	Hypoglycemia	2	Decrease the dose of the drug

Table 4: Comparison of nurses perception score about High Alert Medication before and after intervention

PARAMETER	TIME	MEAN SCORE	SD	TEST STATISTIC AND P VALUE
Nurses knowledge score	Pre intervention	18.06	2.007	t =7.298
	Post intervention	19.52	0.591	P <0.001*

#-paired t test,*-statistically significant at p<0.05

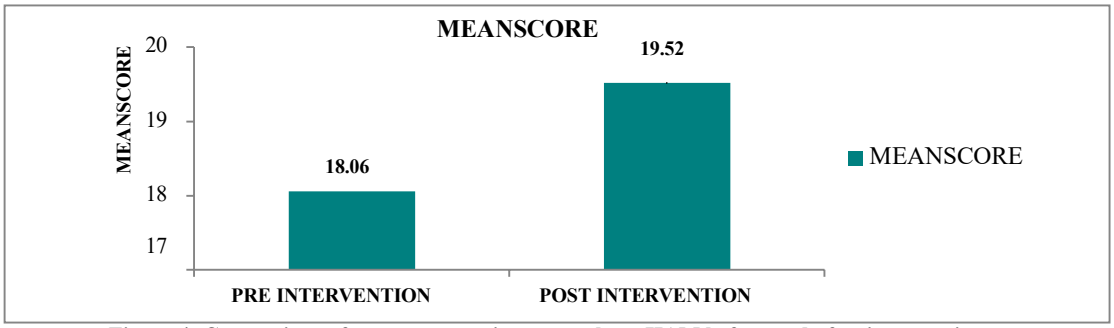

Figure 4: Comparison of nurses perception score about HAM before and after intervention

CONCLUSION

High Alert Medications are associated with greater risk of causing significant patient harm. Although mistake may or may not be more common with these drugs, consequences of error are more devastating to patients. Utilization of High Alert Medication is appropriate to the standards and criteria of the study in the majority of prescriptions. Very few drug related problem such as adverse drug reactions and drug-drug interactions were identified and adequate strategies have been taken to prevent these drug related problems. However, the surveillance of HAM error rate should be further monitored for its effectiveness. The comparison of nurses perception scores regarding high alert medications (HAM) before and after the intervention revealed significant. This improvement underscores efficacy of educational initiatives in bolstering health care professionals comprehension of high risk medications, thereby potentially reducing the incidence of medication errors and enhancing patient safety.

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CONFLICT OF INTEREST

The authors declared no potential conflicts of interest with respect to the research, authorship and/ publication of this article.

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