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Prevalence of Medication Errors and Its Associated Factors at District Hospital A in Sabah – A Cross-Sectional Study.

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KEYWORDS

Medication Errors, Rural Hospital, Patient safety, Healthcare workload, Environmental factors.

ABSTRACT:

Introduction: Medication errors (MEs) remain a major patient safety concern globally and contribute significantly to avoidable harm within healthcare systems.

Objectives: This study aimed to determine the prevalence of near-miss medication errors and identify factors associated with these errors among healthcare workers at District Hospital A in Sabah.

Methods: A cross-sectional study was conducted using secondary data from the Pharmacy Information System (PHIS) for the year 2023 and a structured questionnaire administered to healthcare workers. Descriptive statistics, Chi-square tests, and logistic regression analyses were performed using SPSS version 29.

Results: The overall prevalence of near-miss medication errors was 3.6%. The prevalence was higher in inpatient wards (8.8%) compared with outpatient settings (2.6%). Multiple logistic regression analysis identified high patient-to-staff ratio (OR 26.7), inadequate workspace layout (OR 53.8) and insufficient equipment and technology (OR 58.6) as significant predictors of medication errors.

Conclusions: Workload pressures, environmental constraints, and limited technological resources contribute substantially to medication errors. Addressing these factors through improved staffing allocation, workspace redesign, and technological investment may significantly enhance medication safety in District Hospital A.

1. Introduction

Medication errors represent one of the most common causes of preventable harm in healthcare systems worldwide. The World Health Organisation has identified medication errors as a leading threat to patient safety, with estimated global economic burden exceeding USD 42 billion annually. These errors can occur at any stage of the medication process including prescribing, dispensing, administration, and monitoring. Complex healthcare systems, high patient loads, and increasing treatment complexity contribute to the risk of such errors.

In Malaysia, medication errors remain a persistent concern despite the implementation of reporting systems such as the Medication Error Reporting System (MERS) by the Ministry of Health. Previous studies have reported medication error prevalence ranging between 5–10%

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across different healthcare settings. Rural hospitals may face additional challenges including limited resources, workforce shortages, and infrastructure limitations which may increase the risk of medication errors.

District hospitals in Sabah serve diverse populations and often operate with limited resources compared to tertiary healthcare centres. Healthcare workers frequently manage high patient loads while simultaneously performing multiple clinical tasks. These operational challenges may contribute to a higher likelihood of medication errors if appropriate safety systems are not in place.

Despite the growing awareness of medication safety, there remains limited research focusing on medication errors within rural hospital settings in Malaysia. Understanding the prevalence and determinants of medication errors in these contexts is essential to guide targeted interventions and policy improvements aimed at strengthening patient safety systems.

Therefore, this study was conducted to determine the prevalence of medication errors and identify associated workload, staff, and environmental factors contributing to medication errors in District Hospital A in Sabah.

2. Objectives

The objectives of the study were:

1. To determine the prevalence of medication errors at District Hospital A in Sabah.
2. To identify workload-related factors associated with medication errors.
3. To assess staff-related factors contributing to medication errors.
4. To examine environmental factors associated with medication errors.

3. Methods

This cross-sectional study was conducted at District Hospital A in Sabah, Malaysia. The study population consisted of healthcare workers directly involved in medication management processes including doctors, pharmacists, nurses, and medical assistants. A total of 191 respondents participated in the study.

Data were obtained from two main sources. First, secondary data on medication errors were extracted from the Pharmacy Information System (PHIS) database for the year 2023. Second, a structured self-administered questionnaire was distributed to healthcare workers to collect information on workload conditions, staff-related factors, environmental conditions, and medication error experiences.

Descriptive statistics were used to summarise the characteristics of respondents and the prevalence of medication errors. Chi-square tests and Fisher's exact tests were used to examine associations between categorical variables. Logistic regression analysis was subsequently performed to identify factors independently associated with medication errors. Statistical analyses were conducted using SPSS version 29 with statistical significance set at $p < 0.05$.

Ethical approval for this study was obtained from the Medical Research and Ethics Committee (MREC), Ministry of Health Malaysia.

4. Results

A total of 191 healthcare workers participated in the study. Nurses constituted the majority of respondents followed by pharmacists, doctors, and medical assistants. The overall prevalence of near-miss medication errors recorded in the PHIS database was 3.6% (Table 1). The prevalence differed across healthcare settings, with outpatient departments reporting 2.6% and inpatient wards reporting 8.8%. The most frequently reported error type was improper dosing (60.2%) (Table 2).

Bivariate analysis demonstrated significant associations between medication errors and several workload factors including feeling overwhelmed, workload interruptions, time constraints for double checking, high patient-to-staff ratios, fatigue, and managing high workload.

Staff-related factors such as knowledge deficiency, inadequate training, poor teamwork, low confidence in preventing medication errors, and unfamiliarity with reporting protocols were also significantly associated with medication errors.

Environmental conditions including inadequate workspace layout, insufficient equipment and technology, high environmental distractions, weak organisational culture, and inadequate staffing levels were found to significantly influence the occurrence of medication errors.

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Multiple logistic regression analysis identified three key predictors of medication errors: high patient-to-staff ratio, inadequate workspace layout, and insufficient equipment and technology. These findings highlight the critical influence of healthcare system infrastructure and workload pressures on medication safety.

5. Discussion

The findings of this study highlight the significant influence of workload, environmental, and staff-related factors on medication errors in District Hospital A. The observed prevalence of medication errors is consistent with previous studies conducted in healthcare institutions globally, where increasing clinical demands and workforce pressures have been identified as key contributors to medication safety incidents.

Workload factors were strongly associated with medication errors in this study. Healthcare workers who reported feeling overwhelmed or experiencing frequent interruptions during medication processes were significantly more likely to report medication errors. High patient-to-staff ratios may contribute to cognitive overload, reduced attention to detail, and increased risk of mistakes during medication preparation and administration. Previous research has similarly demonstrated that excessive workloads and staffing shortages significantly increase the likelihood of medication errors.

Environmental factors also played a major role in influencing medication safety. Inadequate workspace layout and environmental distractions were strongly associated with medication errors. Poorly designed medication preparation areas can increase the risk of confusion, incorrect drug selection, and dosing errors. Improving physical work environments by creating organised medication preparation spaces and reducing environmental distractions may significantly improve medication safety.

The lack of adequate equipment and technological support was another important predictor of medication errors identified in this study. Healthcare facilities without modern systems such as electronic prescribing or barcode medication administration may face increased risks of human error during medication dispensing and administration processes. Investments in healthcare technologies have been shown to reduce medication errors by improving accuracy, standardisation, and verification of medication orders.

Staff-related factors including inadequate training and knowledge gaps were also strongly associated with medication errors. Continuous professional training and education programmes are therefore essential to ensure that healthcare workers remain competent in medication safety practices. Regular training sessions and competency assessments may help reinforce safe medication practices among healthcare workers.

Overall, the findings emphasise that medication errors are rarely caused by a single factor. Instead, they result from a complex interaction between human factors, organisational conditions, and environmental limitations. A systems-based approach focusing on improving workplace environments, staffing structures, training programmes, and technological infrastructure is therefore necessary to strengthen medication safety systems in rural healthcare settings.

6. Conclusion

Medication errors remain a significant patient safety concern in District Hospital A. This study demonstrated that workload pressures, environmental conditions, and staff-related factors significantly influence the occurrence of medication errors. Key predictors included high patient-to-staff ratios, inadequate workspace layout, and insufficient equipment and technological support.

Addressing these challenges requires a comprehensive strategy involving workforce planning, improved infrastructure design, continuous professional training, and investment in healthcare technologies. Strengthening these areas may substantially reduce medication errors and enhance the quality and safety of patient care in rural hospital settings.

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Tables

Table 1. Prevalence of Medication Errors at District Hospital A based on PHIS System (2023)

Setting	N (%)	95% CI
Overall	1682 (3.6%)	3.46 – 3.80
Outpatients	1028 (2.6%)	2.48 – 2.80
Inpatients (wards)	654 (8.8%)	8.19 – 9.48

Table 2. Types of Medication Errors Reported by Healthcare Workers (n=191)

Type of Medication Error	n (%)
Omission errors	102 (53.4%)
Prescribing errors	100 (52.36%)
Wrong timing	111 (58.12%)
Unauthorized medicine	101 (52.88%)
Improper dose	115 (60.21%)

Table 3. Factors Associated with Medication Errors (Chi-square / Fisher's Exact Test)

Factor	Chi-square (χ^2)	p-value
Feeling overwhelmed	94.165	<0.001
Workload interruption	75.954	<0.001
Knowledge deficiency	55.399	<0.001
Inadequate training	84.658	<0.001
Inadequate workspace layout	122.045	<0.001
Insufficient equipment & technology	109.594	<0.001

Table 4. Predictors of Medication Errors Using Logistic Regression

Variable	Crude OR (95% CI)	Adjusted OR (95% CI)	p-value
High patient-to-staff ratio	14.42 (6.28–33.11)	26.70 (1.98–358)	0.013
Inadequate workspace layout	131.08 (39.03–440.1)	53.83 (5.36–540)	<0.001
Insufficient equipment & technology	163.58 (34.59–773)	58.63 (2.74–1254)	0.009
Limited resources	48.40 (17.94–130.5)	142.11 (6.50–3103)	0.002
Managing high workload	19.63 (8.28–46.56)	6.71 (0.75–59.79)	0.088