



Original Article

Prevalence and Patterns of Omeprazole and H2 Blocker Use in Neonates in a Neonatal Intensive Care Unit Setting

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ABSTRACT

H2 blockers and omeprazole therapy have not been shown to improve clinical symptoms associated with stress ulceration in newborn trials. There were concerns regarding the reliability and efficacy of treating stress ulcers in adults and children with omeprazole and H2 blockers. **Objective:** To investigate the prevalence and patterns of H2 blocker and omeprazole use in neonates, assess their efficacy, and evaluate potential risks associated with their use. **Methods:** Sick infants admitted to NICUs within the Department of Pediatrics 'Sheikh Khalifa Bin Zaid Al Nahyan Hospital', Rawalakot, Azad Kashmir were included in this retrospective study. Data collection was done from the hospital records from January 2022 to December 2022. All NICU infants who were at least 28 days old, were critically sick participated in this investigation. **Results:** There was a twice as high frequency of omeprazole use as of H2 blocker use. More frequently used drugs were Omeprazole and Cimetidine. That was from January to December in the year 2023 Omeprazole group rose from 3.1% to 3.8% and the H2 blocker group rose from 1.3% to 1.9%. **Conclusions:** Hospitalized neonates including those without GIT issues were commonly exposed to prescriptions of H2 blockers and Omeprazole. The findings depicted the need for controlling and effectively utilizing omeprazole and H2 blockers. Hence there was a need for more research in relation to the safety and efficacy of omeprazole and H2 blockers in infants.

INTRODUCTION

The majority of gastrointestinal conditions in neonates comprise gastric acid disorders for which the treatment includes the use of H2 blockers and PPIs like omeprazole [1]. Stress ulceration can be prevented and treated by the use of these medications which have the following properties, they were anti-secretory in the stomach. H2 antagonists include cimetidine and ranitidine and they act by binding on histamine H2 receptors on the parietal cell of the stomach leading to low secretion of acid [2]. PPIs such as omeprazole on the other hand antagonize the proton pump (H⁺/K⁺ ATPase) located in the gastric epithelial lining bringing about a far more profound and sustained inhibition of gastric acid output [3]. These medications of course have compared mechanisms and effectiveness in adults. H2 blockers work by making sure that histamine cannot combine with the H2 receptors and therefore reduces the

incidences where acid production was stimulated in the stomach [4]. Omeprazole, a PPI, irreversibly binds to and inhibits the proton pumps in the gastric parietal cells, resulting in a nearly complete suppression of gastric acid production [5]. While these mechanisms were effective in adults, their application in neonates presents unique challenges. Neonates have different physiological and developmental characteristics compared to adults. For instance, the gastrointestinal system of a neonate was still maturing, which can affect drug absorption, metabolism, and excretion [6]. The liver and kidneys, crucial for drug metabolism and clearance, were not fully developed in neonates, potentially altering the pharmacokinetics and pharmacodynamics of H2 blockers and PPIs [7]. Additionally, the regulatory mechanisms governing gastric acid secretion in neonates may differ from those in adults,



which could influence the efficacy and safety of these medications [8]. In neonates, H2 blockers and PPIs were prescribed to prevent or manage stress ulceration, a condition where stress induces mucosal damage in the stomach [9, 10]. However, the efficacy and safety of these medications in the neonatal population remain areas of concern. The altered physiology of neonates may lead to different outcomes compared to adults, including potential risks of infections due to altered gastric pH, and the development of adverse effects not commonly observed in older children or adults.

This study aimed to investigate the prevalence and patterns of H2 blocker and omeprazole use in neonates, assess their efficacy, and evaluate potential risks associated with their use. By comparing the mechanisms of these medications in neonates versus adults, we seek to understand their impact on neonatal health and contribute to better-informed clinical practices.

METHODS

A retrospective study of sick infants admitted to NICUs within the dept. of pediatrics 'Sheikh Khalifa Bin Zaid Al Nahyan Hospital' Rawalakot Azad Kashmir. Data collection was done from the hospital records from January 2022 to December 2022. The sample size of the study was 115 which was calculated by using the online available calculator Open-Epi software. The sample size was calculated based on a 56,590 population size with an expected proportion of 0.5%, a confidence interval of 95%, and a margin of error of 0.05% [11]. All NICU infants who were less than 28 days old, were critically sick, and stayed in the hospital for at least 7 days participated in this investigation. To reduce the possibility of exposure to acid-suppressive treatments at outside hospitals, we omitted infants admitted to any other hospitals. This excluded infants with shorter hospital stays (< 7 days) due to less severe conditions, which in certain facilities may be treated in newborn nurseries rather than NICUs, and those who were not receiving acid-suppressive medications. After obtaining ethical approval from Sheikh Khalifa Bin Zaid Al Nahyan Hospital, Rawalakot, Azad Kashmir, Ethical Approval No. 2711/SKBZAN/CMH RWKT, data were retrieved from the hospital's electronic health records and NICU. Data were retrieved from the hospital's electronic health records and NICU registry. Data collected was demographic information: age at admission, gender, medication details: type of medication (omeprazole or H2 blocker), presence or absence of gastrointestinal diseases. The primary outcome of the study was to assess the prevalence and patterns of omeprazole and H2 blocker use in neonate. A statistical analysis was conducted to investigate the relationship between patient characteristics, treatment patterns, and outcomes in a neonatal intensive care unit (NICU) setting. The primary quantitative variables included the age of infants, categorized into three groups: less than or equal to 7 days, 8

to 14 days, and 15 to 28 days. Prevalence rates for the use of omeprazole and H2 blockers were calculated over 12 months, allowing for the assessment of changes in prescribing patterns. Logistic regression analysis was employed to determine the likelihood of infants receiving omeprazole compared to H2 blockers based on age and the presence of gastrointestinal diseases. Qualitative variables, including gender, treatment type, and the presence of gastrointestinal conditions, were analyzed using chi-square tests to explore associations among categorical variables. Data was analyzed using SPSS version 26.0. Descriptive Statistics such as frequencies and percentages were used to summarize the demographic and clinical characteristics of the study population. Binary logistic regression analysis was used to determine the odds ratios (OR) and 95% confidence intervals (CI) for the probabilities of getting omeprazole rather than H2 blockers regarding age, gender, and gastrointestinal diagnoses. The statistical significance was considered based on the p-value criterion at $P < 0.05$. Statistical analysis of stress ulceration before and after treatment with omeprazole and H2 blockers was done using a chi-square test.

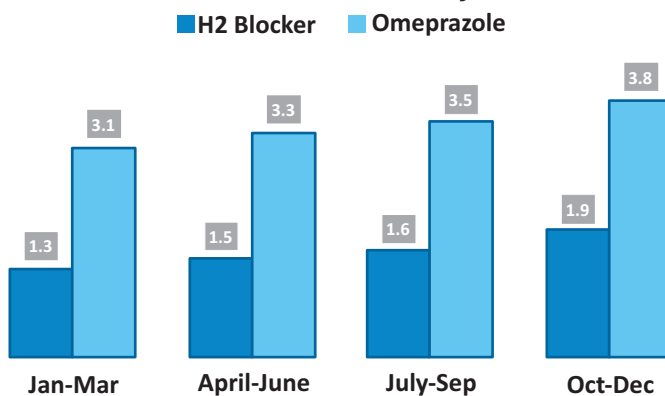
RESULTS

A total of 800 infants younger than 28 days were admitted to the Neonatal Intensive Care Unit (NICU). Among these, 115 infants (14.3%) were treated with acid-suppressive therapy, specifically either omeprazole or H2 blockers. The median duration of NICU admission was 5.2 days (IQR: 2-10 days), and most infants received treatment within the first two weeks of life. Of the 115 infants, 69 (60.0%) were male and 46 (40.0%) were female highlighting a slightly higher prevalence of male infants in the treatment group. The majority of treated infants were between 8 and 14 days old (58.1%), followed by infants aged 15-28 days (26.0%), and those 7 days old or younger (15.7%). The mean age of the infants was 12 ± 2.3 days. In terms of acid-suppressive medications, 72.1% (83/115) of the treated infants received omeprazole, while the remaining 27.8% (32/115) were prescribed H2 blockers, mainly cimetidine. Among the infants who received omeprazole or H2 Blockers, most were diagnosed with gastrointestinal conditions, including gastroesophageal reflux disease (GERD) in 27% (32/115), necrotizing enterocolitis (NEC) in 21.7% (25/115), and sepsis with gastrointestinal complications in 17.4% (20/115). Regression analysis revealed that infants aged 8-14 days were significantly more likely to be prescribed omeprazole compared to H2 blockers, with an odds ratio (OR) of 22.7 (95% CI 18.8-25.2, $p < 0.05$), and those aged 15-28 days had an OR of 8.5 (95% CI 7.3-10.1, $p < 0.05$) (Table 1).

Table 1: Characteristics of Infants Treated with Omeprazole and H2 Blockers (n=115)

Variables	Omeprazole Group N (%)	H2 Blocker Group N (%)	Omeprazole Versus H2 Blocker Group N (%)	P-Value
Gender				
Male	49 (42.6%)	20 (17.3%)	1.0 (Reference)	0.92
Female	29 (25.2%)	17 (14.7%)	2.0 (1.9-2.2%)	
Age Group				
≤7 days	5 (4.3%)	13 (11.4%)	1.0 (Reference)	<0.05
8-14 days	56 (48.6%)	11 (9.5%)	22.7 (18.8-25.2%)	
15-28 days	21 (18.2%)	9 (7.8%)	8.5 (7.3-10.1%)	
Diagnosis				
Without Gastrointestinal Disease	28 (24.3%)	10 (8.6%)	1.0 (Reference)	<0.05
With Gastrointestinal Disease	67 (60.9%)	10 (8.6%)	3.0 (2.8-3.3%)	

The prevalence of omeprazole use increased slightly over the 12 months, from 3.1% to 3.8%, while the use of H2 blockers increased from 1.3% to 1.9% (Figure 1).

**Figure 1:** The Prevalence of Omeprazole/H2 Blocker use in NICU, January–December 2022

DISCUSSION

The experience from the current study aimed at identifying patterns and inform about utilization of omeprazole and H2 blockers in NICU of the past one year. Exposed that, global uses of omeprazole was far much higher than the H2 blockers standards, and its uses were recorded to have increased from 3.1% to 3.8% and was accompanied by a more moderate rise in the use of H2 receptor antagonists from 1.3% to 1.9%. This finding was in concordance with the other works that point towards the increasing use of omeprazole and other PPIs compared to H2 blockers in different settings because of better acid-suppressing ability [12, 13]. From the regression analysis performed in the current study, infants with age greater than 8 days received omeprazole rather than H2 blockers

suggesting a systemic preference of PPI for management of conditions that need long-term acid suppression. This was supported by literature published in the study by van der Benninga MA et al., in 2021 which highlighted that H2 blockers were used in children because of the effectiveness of PPIs in the management of acid related disorders [7]. In addition, this data showed that exposure to omeprazole was significantly associated with GIT disease diagnosis in agreement with the study conducted by Pasman EA et al., in 2020 who found that neonates with GIT diseases commonly received PPIs [14]. However, omeprazole was given more frequently in this study and compared to the H2 blockers; it didn't demonstrate a significant difference in stress ulceration incidence. This implies that although omeprazole was considered ideal its effectiveness in the prevention of stress ulceration in neonates may not be very different from that of H2 blockers. These observations were not inconsistent with a study carried out by Prabhoo RY et al., in 2024 and Reynolds PM et al., in 2023 which noted that the clinical value of PPIs for preventing stress ulceration in pediatric patients may not be as dramatic as was previously perceived [15, 16]. The lack of significant difference between the two treatment groups could imply that both omeprazole and H2 blockers offer similar protective effects against stress-related mucosal disease in this age group. This brings a question on the implication of a greater similarity in the protection afforded by omeprazole and H2 blockers on stress-related mucosal disease in this age group in the two treatment groups. Thus, this study was similar to other studies on the use of PPIs which suggested that these medications should be used cautiously, especially among the pediatric population [17-20]. The outcome of omeprazole preference, however, was not significantly different and therefore one can conclude that these medications should be applied on a patient-by-patient basis, rather than as a protocol. In conclusion, this study showed that there was a trend toward the growing use of omeprazole in the NICU with PPIs instead of H2 blockers for the treatment of gastrointestinal disorders. Nevertheless, taking into account the fact that both medications were equally effective in preventing stress ulcerations there was an urgent need to conduct further research to settle the persistent issue and ensure the use of these medications was evidence-based.

CONCLUSIONS

Hospitalized neonates including those without GIT issues were commonly exposed to prescriptions of H2 blockers and Omeprazole. The findings depicted the need for controlling and effectively utilizing omeprazole and H2 blockers. Hence there was a need for more research about the safety and efficacy of omeprazole and H2 blockers in infants.

Authors Contribution

Conceptualization: SI

Methodology: SI, RM

Formal analysis: IJ

Writing, review and editing: SI, MAQ

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

All the authors declare no conflict of interest.

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