Original Article

Comparison of the Prophylactic Effect of Dexamethasone, Ondansetron with the Combination of Dexamethasone on Decreasing Nausea and Vomiting in Children

Sheharyar Ashraf, Jawad Hameed, Abid Haleem Khattak and Sajjad Orakzai

ABSTRACT

Objective: The study aims to predict the efficacy of dexamethasone alone and dexamethasone plus ondansetron in a pediatric population age range from 3 to 10 years old. This research is specifically designed for measuring the outcomes of PONV incidents among the pediatric population and confirm the success ratio of these two anti-emetogenic drugs.

Study Design: Double-blinded randomized controlled trial study.

Place and Duration of Study: This study was conducted at the Anesthesia and Critical Care Department Lady Reading Hospital-MTI Peshawar from January to December 2019.

132 patients in total, were selected for the study. Patients on physical status stage I and II described by the American Society of Anesthesia (ASA) were selected for this research. We administer a 30mg dose of dipyrone NSAID as a placebo. Initially, 0.1 mg dose of ondansetron associated with dexamethasone was used later on dose was increased up to 4 mg whereas 0.15 mg dexamethasone was used alone.

Results: Postoperative vomiting was observed in 16 total cases, out of which the majority belonged to placebo and dexamethasone alone group (14.3% and 14% respectively). Little (6.8%) cases of postoperative vomiting were found among the ondansetron group. We did not find any significant statistical differences in our study. All the p values were greater than 0.05.

Conclusion: There is a need for routine administration of anti-emetogenic drugs among the high emetogenic risk surgeries in order to avoid PONV. Whereas in low emetogenic risk surgeries regular administration of prophylactic treatment is not much necessary.

Key Words: Postoperative Nausea and vomiting, Placebo study, Dexamethasone, Ondansetron plus dexamethasone.

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INTRODUCTION

After surgery, complications like nausea and vomiting occurs immediately which causes adverse effects on the patient's health.[1-5] This condition causes discomfort among patients and needs proper treatment[6-7]. It may also result into the maximization of the hospital stay of patients[8]. This lengthened hospital stay leads to excessive hospital stay cost which might be a financial burden on many patients[9].

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The literature revealed that the risk of postoperative nausea and vomiting is comparatively high (8.9% to 42%) among the pediatric population as compared to adults[10-11]. Not every child expresses his discomfort of nausea which results in unreported cases and is considered as a major obstacle in measuring the actual incidence of nausea among the pediatric population[11]. PONV causes dehydration, esophageal rupture, bleeding, and increased morbidity among patients[13].

Many treatments are introduced in the market to sort out this issue. The majority of the children had less tolerance of nausea and vomiting which needs proper management for this age group[14]. Children are sensitive and not all kind of medicine suits them. There is a limitation of drugs for children and physicians prefer different drugs with limited side effects which helps to control complications of nausea and vomiting among the child age group[14]. Still, there is no specific drug found yet for this age group. Most commonly physicians used serotonin 5-HT3 receptor antagonists (ondansetron) and the dexamethasone but still, it is not considered as an ideal treatment for the pediatric group[15-17].

In this study we try to predict the efficacy of dexamethasone alone and dexamethasone plus ondansetron in a pediatric population age range from 3 to 10 years old. This research is specifically designed for measuring the outcomes of PONV incidents among the pediatric population and confirm the success ratio of these two anti-emetogenic drugs.

MATERIALS AND METHODS

This double-blind randomized Placebo-controlled trial was conducted in Lady Reading Hospital Peshawar, from January to December 2019. A total of 129, children from the age group 3 to 10 years were admitted to the surgical department during studies. All the patients were divided into three major categories; dexamethasone, ondansetron in combination with dexamethasone, and placebo for the prophylactic treatment of POV. Patients were selected only after they fulfill inclusion criteria and their parents signed written consent. The sample size was extracted from two previous studies in which they report 8.9%[10] vomiting incidence in the group receiving dexamethasone plus ondansetron whereas in the placebo group they report 42% vomiting incidence[11-12]. With the help of this population proportion, the stat calc function formula was used to calculate sample size with a 5% margin of error on a 90% confidence interval. After the calculation of sample size, 120 patients were allocated equally into three groups (40 in each). Predicting a loss of about 10%, 12 more patients were included and then 132 patients were randomly assigned into three subdivisions with an equal number of participants (44 each). A random allocation software program was used for the randomized allocation of participants. Patients on physical status stage I and II described by the American Society of Anesthesia (ASA) were selected for this research. All the children who already use anti-emetogenic drugs, having a history of vomiting within 24 hours of the pre-surgical process, and having any kind of previous allergic history of dexamethasone and ondansetron were excluded from this research.

We collected all the information regarding patient age, sex, gender, anesthesia stage, surgery type, postoperative pain, the occurrence of vomiting, and vomiting following discharge from hospital as a major variable of this research.

For this research, vomiting is described as a condition in which one episode of forceful expulsion of the stomach content occurs from the mouth in between admission in PACU and 24 hours of hospital discharge. Those patients who fulfilled inclusion criteria were shifted to the anesthesia preparation room. In the operation room, a regular checkup was conducted including cardioscopy, capnography, monitoring through oximeter, and we measured blood pressure of patients. After these observations, anesthesia was administered by inhalation of sevoflurane and nitrous oxide with the help of a facemask. Patients were strictly prohibited from taking any food and drink before the surgical process. 20 ml /kg Ringer's lactate solution was immediately administered to the patient and maintained throughout the procedure. Bupivacaine 0.25% was used as general anesthesia. We administer a 30mg dose of dipyrone NSAID as a placebo. Initially, 0.1 mg dose of ondansetron associated with dexamethasone was used later on dose was increased up to 4 mg. Whereas 0.15 mg dexamethasone was used alone.

The dose was injected through syringes which were prepared by another anesthesiologist who prepared two syringes containing 5ml and 10ml dose respectively in order to conduct a double-blind study. Physicians who evaluated the patient's condition were also blind about the medication. Frequency of vomiting and pain was observed during the study. In the case of medical emergency 0.15 mg metoclopramide was used as a rescue drug. When the child retains consciousness, pain was observed and for those cases who had no complaint of pain were allowed to take oral ingestion of clear fluids. We formed discharged policy on the following criteria; those who retain their consciousness with drowsiness, mild pain, and low vomiting frequency, and who easily tolerate oral ingestion. A telephone call was conducted after the 24 hours of discharge in order to investigate the frequency of vomiting and pain[18].

For the statistical analysis, we used SPSS version 23.0 to apply a t-test for the independent group. All the data were analyzed by using the Chi square test $\chi 2$. A Chi square test was applied to calculate the original ratio with our expected outcomes. To analyze the frequency of vomiting and pain we used Chi square and Fisher's formula. $P< 0.05$ was set as significant and two-tail tests were applied for all variables.

RESULTS

During the study time, a period total of 219 children underwent from surgery. From these participants, only 134 patients fulfilled the inclusion criteria. From these selected participants, patients of two children did not agree to give written consent which was excluded from the research. In each group 44 participants were allocated, unfortunately, two from the placebo group and one from the dexamethasone group refuse to participate in the study anymore. Homogeneous baseline characteristics were taken for the studies to create harmony in our results. The majority of the patients were male and belong to ASA I stage. We observed that 5 participants had a family history of PONV and two of them had vomiting before surgery. The inguinal hernia was the most frequently performed surgical process during the study interval.

A total of 16 cases of postoperative vomiting was observed and the majority of them belong to the

placebo and dexamethasone alone group (14.3% and 14% respectively). Little (6.8%) cases of postoperative vomiting were found among the ondansetron group. We did not find any significant statistical differences in our study. All the p values were greater than 0.05.

Table No.1: Demographic characteristics of selected participants[18]

Variables	Group			P-value
	Dexame-thasone n= 43	Placebo n= 42	Ondan-setron+ dexame-thasone n= 44	
Gender				0.92
Male	33 (76.7)	31(73.8)	34 (77.3)	
Female	10 (23.3)	11(26.1)	10 (22.7)	
Weight	20.6 (8.8)	19.8(6.9)	19.5(6.0)	0.76
Age	4.6 (2.5)	5 (2.4)	4.7 (2.4)	0.79

Table No.2: Baseline characteristics, information regarding type of surgery and postoperative observations.[18]

Variables				P-value
	Dexame-thasone n= 43	Placebo n= 42	Ondanse-tron+ dexame-thasone n= 44	
ASA				0.65
I	41(95.3)	42(100)	43 (97.7)	
II	2 (4.7)	0 (0.0)	1 (2.3)	
Surgery type				0.1802
Orchidopexy	2 (4.7)	3 (7.1)	1 (2.3)	
Phimosis surgery (circumcision	10 (23.3	8 (19.0)	16 (36.4)	
Double surgical procedure	4 (9.3)	4 (9.5)	2 (4.5)	
Umbilical hernia	6 (14.0	10 (23.8)	14 (31.8)	
Inguinal hernia	21 (48.8)	17 (40.5)	11 (25.0)	
Vomiting (n/%)	6.0 (14.0) 2.0 (4.7)	7.0 (16.7)	3.0 (6.8) 0 (0.00)	0.47
Pain	4.0 (9.3)	8.0 (19.0)	5.0 (11.4)	0.37
Vomiting following discharge from hospital	2.0 (4.7)	3.0 (7.1)	0 (0.00)	0.16

DISCUSSION

Post-operative nausea and vomiting are complications which cause discomfort in patients. The majority of the children had less tolerance of nausea and vomiting which needs proper management for this age group. Children are sensitive and not all kind of medicine suits them. There is a limitation of drugs for children and physicians prefer different drugs with limited side effects which helps to control complications of nausea and vomiting among the child age group[14]. Still, there is no specific drug found yet for this age group[15]. For this study, we use prophylactic ondansetron plus dexamethasone, dexamethasone alone. Our results revealed that Dexamethasone alone had no significant results to control the Nausea in the high-risk pediatric population. On the other hand, combination of these two drugs with droperidol enhance the postoperative adverse events. The majority of the patients suffer from drowsiness after the administration of drugs[19].

In past, a very limited amount of studies had been conducted to access the benefits of anti-emetogenic drugs for children. A prospective study evaluates the efficacy of anti-emetogenic drugs on adult patients and revealed that these drugs decrease the postoperative Nausea and Vomiting incident ratio from 28% to 22%[20]. On the other hand, we observed that Ondansetron plus Dexamethasone reduce the incidence of POV among high-risk children. Recent studies show that almost 30-70% of children are at high risk of POV in the absence of anti-emetogenic drugs[21]. Our results are in accordance with the previous study of Gunter and colleagues in which they found greater efficacy in the group using Ondansetron plus Dexamethasone as compared to the group who used three anti-emetogenic drugs (Ondansetron, dexamethasone, and droperidol) at the same time[22].

Our study demonstrates that the risk of POV is found in 12% of children without any significant difference between groups. In 5 patients vomiting reported after the hospital discharge. During the study, we did not find any difference in POV at the time of surgery, duration of anesthesia, in the post-anesthesia care unit, and in-hospital stay. In a previous study of Kovac and Schofield, the ratio of PONV among ranges from 8.9%-42%[10-12]. This ratio depicts that the risk of PONV is twice higher than the adults[11,23]. Difficulty in estimating true incidents of nausea induce a high variation of incidence. After the introduction of ondansetron different researches were conducted to justify its efficacy as a prophylactic treatment of PONV in the pediatric population[14,24,25]. Researchers claim that Ondansetron is the best treatment for preventing Nausea and vomiting complications among children especially when combined with dexamethasone[26]. In our study the risk of POV was very low still we did not find any significant statistical significance of ondansetron. These contradictory results might occur due to the difference in a surgical procedure. There is a chance that this treatment will be effective in case of

surgeries like adenoidectomy, tonsillectomy, strabismus with high emetogenic potential[27].

In tonsillectomies, a high risk of POV occurs due to the serotoninergic receptors (5-HT3)[28]. Many studies observed that PONV increases hospital stay and enhance the risk of re-admission among pediatric population[28-29]. This risk can be avoided with regular administration of anti-emetogenic drugs. Some other researchers revealed that due to the absence of nausea reports by children the incidence of nausea and vomiting is highly underestimated in the pediatric population[30]. In our study, we found a low ratio of POV, and the incidence of POVN did not increase hospital stay. POV incidence was not frequent, so the any significant association with the adverse event and other risk factors like a family history of POV was not found.

CONCLUSION

We conclude that there is a need for the routine administration of anti-emetogenic drugs among the high emetogenic risk surgeries in order to avoid PONV. Whereas in low emetogenic risk surgeries regular administration of prophylactic treatment is not much necessary. We recommend that more studies will be conducted on this age group to find an association between adverse events and the history of patients in order to establish an efficient method of management.

Author's Contribution:

Concept & Design of Study:	Sheharyar Ashraf
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