

Vitamin B6 Impact on Pediatric Vomiting and Nausea in Gastroenteritis: A Case-Control Study in Southern Iran

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Abstract

Background: Vomiting and nausea are common symptoms of Gastroenteritis (GE) in children, and high statistics in emergency department visits. Vitamin B6, which plays a significant role in preventing vomiting in pregnant women, is one of the options for controlling GE. This study examines the effect of pyridoxine (vitamin B6) in children with GE.

Method: The study population of this research was a case-control including all children aged 6 months to 12 years with mild to moderate dehydration who were admitted to the children's hospital in Bandar Abbas city between 2021 and 2022. The study included two groups: control and intervention. The intervention group consisted of patients aged 6 months to 14 years of both genders who received pyridoxine to manage nausea and vomiting based on their weight.

Results: A total of 70 individuals were included in our study, of whom 48.57% were female and 51.43% were male. The percentage of dehydration in patients with gastroenteritis in the control group was $64.6 \pm 1.59\%$, while in the group treated with vitamin B6, it was $32.6 \pm 1.46\%$. There was no significant correlation between the percentage of dehydration in the control and vitamin B6-treated groups. Additionally, there was no significant correlation between the amount of fluid received and the mean length of hospital stay in both groups.

Conclusion: Pyridoxine drug was not effective in treating vomiting caused by acute gastroenteritis in children compared to the control sample. Although vitamin B6 is effective in controlling inflammation, it was not able to reduce GE complications.

Key Words: Gastroenteritis, Pediatric, Pyridoxine, Vomiting.

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1- INTRODUCTION

Gastroenteritis (GE) is an inflammatory and infectious disease in children with a high prevalence and is one of the main reasons for children's visits to the emergency department due to abdominal pain and nausea (1, 2). Vomiting and diarrhea may be its manifestations, and severe dehydration is unlikely if there are no symptoms (3). When symptoms are not controlled and severe dehydration occurs, electrolyte imbalance and ultimately death can occur in affected children (4). The most important action to take is to provide the necessary fluids and nutrients to restore inflamed tissues (5). Focusing on substances that reduce symptoms, such as the B-vitamin group, may be helpful.

Vitamin B6, a member of the vitamin B family, has a significant impact on improving disease and repairing damaged organs. This vitamin, known as pyridoxal phosphate (PLP) in its coenzyme state (6), plays a key role in regulating neurotransmitters such as serotonin, dopamine, and gamma-aminobutyric acid (GABA) in metabolism (7-9). This enzyme also regulates inflammatory mediators and molecular reactions in inflammation, as well as playing a role in immune system modulation (10, 11). This pathway highlights the significant role of PLP in inflammatory diseases, such as asthma (12), cardiovascular health (13), skin inflammation (14) and GE (15).

PLP role in gastrointestinal inflammatory diseases like GE is still expanding. While vitamin B-6 has been found to be ineffective in preventing vomiting in cases of GE (16), but a newer study has shown that pyridoxine can effectively control nausea and vomiting caused by Olaparib treatment in ovarian cancer (17). According to these studies, PLP is effective in controlling vomiting and nausea, but further research is needed to clarify its role in GE and its ability to

control vomiting and diarrhea. In this study, we aim to investigate the role of pyridoxine (vitamin B-6) in controlling the symptoms of children with GE by administering it to affected children.

2- METHOD

2-1. Trial Design

This randomized clinical trial was conducted in the city of Bandar Abbas, the center of Hormozgan Province in southern Iran. The study was single-center and adhered to The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement: guidelines for reporting observational studies.

2-1-1. Participants

Hospitalized children from 6 months to 14 years, referred to Bandar Abbas Children's Hospital with primary diagnosis of acute GE was main population. Inclusion criteria include children with acute viral GE presenting symptoms of vomiting and fever in the initial days, followed by watery diarrhea, good general condition, normal stool test, no prior drug treatment before hospitalization, and parental consent. Severe dehydration cases were not included in the study. Exclusion criteria encompassed case of antibiotic-induced diarrhea (onset after 48 hours of hospitalization), chronic diarrhea (lasting over two weeks), abnormal stool test results (blood, white blood cells (WBC), parasites), surgical complications (acute abdomen), patient withdrawal from the study, and patient discharge with personal consent before full recovery.

2-1-2. Interventions

Injectable vitamin B6 (pyridoxine) was administered to the children at a dose of 2 mg per kilogram. Each child received pyridoxine once a day, and the control group did not receive any pyridoxine or oral supplements containing B6.PLP

therapy continued until the first day when they no longer experienced vomiting and diarrhea.

2-2. Data Analysis

The sampling method was convenience sampling among GE children who had visited Bandar Abbas Children's Hospital. Independent t-test and non-parametric Mann-Whitney tests were used for quantitative data with non-normal distribution. Chi-square tests were used to compare qualitative variables between different groups, while T-tests and ANOVA were used to compare mean quantitative variables. A P-value of less than 0.05 was considered statistically significant. The sample size was calculated using the formula provided below, with $\alpha=0.05$ and $1-B=0.8$. Based on information extracted from the study by Yousefi Chayjan et al., the sample size in each group was determined to be 70 (18).

Sample size formula:

$$n = \frac{2 (Z_{1-\frac{\alpha}{2}} + Z_{1-B})^2 SD^2}{d^2}$$

3- RESULTS

3-1. Population outcomes

Out of a total of 140 children included in the study, it was determined that 68 of these individuals were female (48.57%) and 72 were male (51.43%). The youngest child was under 1 year old and the oldest was 8 years old, with the mean age of children with GE being 1.84 years in the control group and 1.76 years in the group treated with vitamin B6. The members of the group who received vitamin B6 were matched with those who did not receive it in terms of gender and number (Table 1).

3-2. Main outcome

As previously mentioned, the mean age of the control group was higher than that of the treated group. However, there

was no significant relationship between age in the control and vitamin B6 treated groups ($P>0.05$). The percentage of dehydration in both groups also did not show a significant difference between the two groups, and there was no specific relationship between the percentage of dehydration in the control and vitamin B6 treated groups. The results showed that the amount of fluid intake in the treated group was slightly lower than that in the control group, and this slight difference was also maintained in the length of hospital stay. There was no relationship between hospital stay in the control and vitamin B6 treated groups ($P>0.05$). In other words, the use of vitamin B6 did not reduce hospital stay (Table 1).

4- DISCUSSION

The present study aimed to investigate the effect of vitamin B6 on controlling nausea and vomiting caused by acute GE in children. The results showed that the severity of symptoms in the vitamin B6 group did not differ significantly from the control group. As Hojjat Derakhshanfar showed (16), there was no significant difference between the two groups in terms of hospital stay, fluid requirement, and dehydration.

Vitamin B6 is a water-soluble vitamin that plays an important role as a coenzyme in the metabolism of amino acids (19), carbohydrates and lipids (20). Pyridoxine (vitamin B6) includes a group of compounds that can be converted to each other, including pyridoxine, pyridoxal, and pyridoxamine (21), which is considered the first-choice treatment for patients with nausea and vomiting during pregnancy (22). Vitamin B6 can relieve symptoms of nausea and vomiting, including loss of appetite, indigestion, weakness, anxiety and numbness in the hands and feet (23). Pyridoxine was effective in reducing the severity of symptoms and length of hospital stay and general symptom (24). However, it should be noted that our

study's findings were contrary to those of this study. Perhaps one reason for the difference in results between this study and others is the difference in the study population. In most of these studies, the target group was older, especially adults. In pediatric medicine, pyridoxine is mostly used for treating pyridoxine-dependent seizures, nutritional deficiencies, and in conjunction with drugs that disrupt pyridoxine metabolism (25, 26). Vitamin B6 may have a coenzyme role in lysine metabolism (lysine residue is a steroid hormone receptor protein) (27), and lysine reaction may increase estrogen levels (28) in patients (especially pregnant women) and consequently reduce the severity of nausea and vomiting. On the other hand, vitamin B6 appears to have a potential role in the synthesis of serotonin, dopamine, norepinephrine, and gamma-aminobutyric acid by catalyzing the decarboxylation process (29-31). Any disruption in the neurotransmitter transporter mentioned may cause nausea and vomiting in individuals. This is while the reflex

stimulation of vomiting is a complex process organized by the vomiting center in the brainstem, which receives stimuli through afferent neurons of the vagus nerve in the autonomic nervous system or centrally through the chemoreceptor trigger zone (32, 33), posterior region, or solitary nucleus (34). Many neurotransmitters such as dopamine, histamine, muscarinic, GABA (35) and serotonin play a role in this phenomenon, which will be altered under the influence of PLP. Also, we should not forget the role of vitamins, especially pyridoxine, in the regeneration of inflamed tissues. PLP plays a role in regulating the immune system's inflammatory mediators. Along with molecular reactions in inflammation. Interleukin-33 (IL-33) is limited by PLP to prevent an excessive immune response that can occur in inflammation (12). C-reactive protein (CRP) is an important diagnostic indicator of inflammation and infection, which, along with interleukin-6, decreased in levels with higher doses of PLP (13).

Table-1: Measured values for two control and treated groups.

Group	The group without treated vitamin B6		The group with treated vitamin B6	
Age average (standard deviation)	1.84±1.35		1.76±1.69	
p-value	0.37			
	Female	Male	Female	Male
Sex	34	34	36	36
p-value	0.56			
dehydration percentage Average (standard deviation)	6.64 ±1.59		6.32±1.46	
p-value	0.23			
The Mean liquid received /Milliliters (standard deviation)	32666.43 ±1535.70		3180.00 ±2045.327	
p-value	0.13			
length of hospitalization Average /day (standard deviation)	2.2±0.81		2.14±1.09	
p-value	0.29			

Sphingosine-1-phosphate (S1P) is a crucial molecule in macrophage signaling during inflammation, which is limited by PLP (10). Therefore, we expect that inflammation can be controlled through molecular aspects of vitamin B-6. Perhaps our results may not show the success of pyridoxine in controlling GE symptoms, but at least we expect pyridoxine to be effective in healing inflammation in GE.

In summary, vitamin B-6 did not appear to have a significant role in controlling nausea and vomiting in GE, based on limited studies. PLP can affect the nausea center by regulating neural mediators, but evidence in this area is unclear and further research is needed. While PLP may not be effective in controlling GE symptoms, it may be able to partially control the inflammatory pathway and be effective in healing inflammation. Further studies may change our understanding of the role of vitamin B-6 in GE or identify other pathways where it may be beneficial.

5- CONCLUSION

The use of pyridoxine (vitamin B6) in the treatment of acute GE-induced vomiting in children was not found to be effective compared to control groups. Physicians should avoid prescribing drugs that have not been scientifically proven to be effective. Given the limited number of studies on this topic, it is suggested that further research be conducted on the effects of vitamin B6 supplements on vomiting in children with a larger sample size.

6- ETHIC APPROVAL

All procedures performed in this study involving human participants were conducted in accordance with the ethical standards of the institutional and national research committee as well as the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. This article does not contain any studies with animals performed by any of

the authors. The present study is part of a Doctor of Medicine (MD) dissertation in social work approved by the University of Hormozgan Medical Science University under ethics code IR.HUMS.REC.1400.349.

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8- CONSENT FOR PUBLICATION

Not applicable.

9- AVAILABILITY OF DATA AND MATERIALS

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

10-CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest.

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