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Investigating the Impact of Vitamin E Supplementation on Clinical Recovery Time in Pediatric Gastroenteritis Accompanied by Electrolyte Disturbances

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ABSTRACT

Background and Aim: Gastroenteritis is a common illness in the pediatric population and can lead to dehydration and several related complications. Vitamin E is a fatsoluble vitamin recognized for its antioxidant effects and its role in protecting cells from oxidative damage. Because oxidative stress and inflammation may contribute to the progression of gastrointestinal infections, vitamin E could potentially support recovery and improve clinical outcomes. Therefore, this study aimed to assess whether vitamin E supplementation can reduce the duration of treatment in children diagnosed with gastroenteritis.

Methods: In this randomized interventional study, 60 children aged 12 months to 13 years with gastroenteritis were assigned to intervention or control groups using block randomization with eight blocks. The intervention group received vitamin E for 10 days in addition to standard therapy, while the control group received standard treatment alone. Blinding was not possible due to the inability to prepare a suitable placebo and the involvement of the researcher in the randomization process. Clinical outcomes—including diarrhea, vomiting, abdominal pain, fever, and dehydration—were defined using standard clinical criteria and assessed at baseline and after the treatment period using a structured checklist. Data were analyzed using the SPSS software (version 23).

Results: The mean age of children in the vitamin E and control groups was 5.2 and 5.67 years, respectively. No significant differences were observed between the two groups in terms of age or sex (P=0.106 and P=0.437, respectively). The duration of diarrhea, abdominal pain, and anorexia were significantly shorter in the vitamin E group than in the control group (P<0.0001). By contrast, the duration of fever, dehydration, and vomiting did not differ significantly between the groups (P=0.810, P=0.536, and P=0.685, respectively).

Conclusion: Overall, the findings indicate that vitamin E reduces the duration of diarrhea, abdominal pain, and anorexia in children with gastroenteritis but has no effect on the duration of fever, dehydration, and vomiting.

Keywords: Vitamin E, Gastroenteritis, Diarrhea, Vomiting

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Introduction

Gastroenteritis is an intestinal infection characterized by diarrhea and vomiting in children. In many cases, diarrhea lasts only one day; however, it may persist for up to 10 days in some patients. Prolonged diarrhea can lead to severe dehydration, which is particularly dangerous in infants and young children. Epidemiological data indicate that all children under 5 years of age experience at least one episode of viral gastroenteritis. Pediatric gastroenteritis is highly prevalent and may be life-threatening. It accounts for approximately 10% of childhood mortality and is estimated to cause about 70 million deaths annually worldwide, making it the second leading cause of death globally [1-3]. In children, gastroenteritis may be caused by a variety of factors, including viruses, bacteria, bacterial toxins, parasites, chemicals, and certain medications. Transmission commonly occurs via the fecal-oral route, through contaminated food or water, or through person-to-person contact. This is the most frequent mode of transmission and a major contributor to the spread of norovirus and *Shigella*. The disease is also associated with poor hygiene and poverty [4, 5]. Clinical manifestations may include nausea and vomiting, suggesting upper intestinal involvement, and fever, which may indicate inflammation, tissue invasion, dehydration, or concurrent infection. Severe abdominal pain and tenesmus suggest large intestinal involvement. The presence of nausea, vomiting, absence of fever, periumbilical pain, and watery diarrhea is more consistent with a non-severe small intestinal infection [6-9]. Further studies are needed to determine whether antioxidant supplementation, as an adjunct to conventional treatment, is beneficial in this condition. Therefore, the present study aimed to investigate the effect of vitamin E on reducing treatment duration in children with gastroenteritis.

Materials and Methods

This study was conducted as a randomized interventional trial, after obtaining ethical approval from the Ethics Committee of Arak University of Medical Sciences, on all patients aged over 12 months to 13 years suffering from gastroenteritis who presented to Amir Kabir Hospital with symptoms of diarrhea, vomiting, abdominal pain, and dehydration. Eligible patients were randomly divided into two intervention groups—one receiving vitamin E for 10 days along with standard gastroenteritis treatment (fluid therapy and oral rehydration salt=ORS]), and the other group receiving only the standard treatment (fluid therapy and oral rehydration salt=ORS]).

The duration of treatment, considering the 10-day course for gastroenteritis, was 10 days.

In the intervention group, in addition to routine treatment, patients received vitamin E drops from Bahsa Company, with each milliliter containing 10 international units of vitamin E (according to the drug brochure). The dosage was administered for 10 days based on age as follows:

Age 1–3 years: 18 drops (0.9 mL); age 4–8 years: 21 drops (1.05 mL); age 9–13 years: 33 drops (1.65 mL)

The duration of the illness was based on clinical symptoms of gastroenteritis, including:

Diarrhea: Defined as loose or watery stool, frequent defecation, or increased stool volume (10 mL/kg/day). This was evaluated at the beginning and end of the study.

Vomiting: A series of coordinated episodes resulting in forceful expulsion of stomach contents through the mouth. This was assessed at the beginning and end of the study.

Abdominal pain: Any type of pain in the abdominal area was considered abdominal pain, evaluated at the beginning and end of the study.

Fever: Defined as a body temperature above 38 ˚C, assessed at the beginning and end of the study.

Dehydration: Loss of body water, graded according to the amount of water lost and corresponding clinical symptoms, evaluated at the beginning and end of the study.

Inclusion and exclusion criteria

Inclusion criteria

All children aged 1-13 years diagnosed with acute gastroenteritis, confirmed by a pediatric specialist based on symptoms of diarrhea, vomiting, abdominal pain, and dehydration, who were admitted to Amir Kabir Hospital. Obtained informed consent to participate in the study.

Exclusion criteria

Children who cannot tolerate oral vitamin E. Children who do not cooperate.

Sample size

Due to limited resources regarding the effect of vitamin therapy on improving gastroenteritis symptoms, the sample size was determined based on the study by Kheirkhah et al. According to their results, the mean duration of diarrhea in the vitamin-consuming group was 3.5±1.64 days, and in the control group, it was 4.9±1.73 days [10].

Statistical analysis method

To compare the mean duration of diarrhea between the intervention and control groups, an independent t-test was used. The significance level was set at 0.05, and all analyses were performed using SPSS software, version 23.

This study was conducted as a randomized interventional trial after obtaining ethical approval from the Ethics Committee of Arak University of Medical Sciences. The study population consisted of all children aged 12 months to 13 years who presented to Amir Kabir Hospital with clinical manifestations of gastroenteritis, including diarrhea, vomiting, abdominal pain, and dehydration.

Eligible participants who met the inclusion criteria and provided informed consent were assigned to one of the two study arms using block randomization. A pre-generated, unpredictable randomization sequence with blocks of eight was used to ensure balanced allocation. Participants were allocated sequentially based on their order of admission and in accordance with the predefined randomization list, resulting in assignment to either the intervention group (vitamin E plus standard treatment) or the control group (standard treatment only).

Randomization and blinding considerations

Block randomization with blocks of eight was used to maintain balanced group allocation. The randomization sequence was generated prior to patient enrollment, was fully unpredictable, and consisted of a random arrangement of the two treatment assignments.

Blinding was not feasible in this study. Due to clear differences between standard therapy and vitamin E administration, no placebo formulation with similar characteristics could be produced; therefore, the use of a placebo control arm was not possible. Additionally, because the student researcher was responsible for participant enrollment and the implementation of the randomization procedure, investigator blinding could not be achieved. Consequently, this study was conducted as an open-label (non-blinded) trial, in which both participants and the researcher were aware of the treatment assignments.

Results

A total of 60 participants were enrolled in this study, with 30 individuals assigned to the intervention group (vitamin E) and 30 individuals to the control group.

Age and gender of the children participating in the study

Table 1 presents the age and gender of the children participating in the study in the two groups. According to the findings of this table, the mean age of the children in both groups was between 5 and 6 years. No significant difference was observed between the two groups in terms of age and gender (P>0.05).

Assessment of symptom duration in the two study groups

Table 2 presents the assessment of symptom duration in the two study groups based on the Mann-Whitney test. According to the findings in this table, there was a significant difference between the two groups in the duration of diarrhea, abdominal pain, and anorexia (P<0.0001).

In other words, the mean duration of diarrhea, abdominal pain, and anorexia in the vitamin E group was significantly shorter than in the control group. However, no significant difference was observed between the two groups regarding the duration of fever, dehydration, and vomiting.

Table 1. Age and gender of children participating in the study in two groups

Variables		Mean±SD/No. (%)		P
		Vitamin E Group (n=30)	Control Group (n=30)	
Age (y)		5.20±1.15	5.67±1.1	0.106
Gender	Female	17(56.7)	14(46.7)	
	Male	13(43.3)	16(53.3)	

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Table 2. Evaluation of symptom duration in the two study groups

Variables	Mean±SD		P*
	Vitamin E Group (n=30)	Control Group (n=30)	
Duration of vomiting (day)	2.07±0.64		2.13
Duration of diarrhea (day)	2.87±0.68		4.47
Duration of abdominal pain (day)	3.33±0.66		4.63
Duration of dehydration (day)	2.7±0.59		2.83
Duration of fever (day)	3.67±0.75		3.73
Duration of anorexia (day)	3.33±0.92		4.53

*Mann-Whitney test.

Discussion

Acute gastroenteritis is one of the leading causes of morbidity and mortality in children worldwide, accounting for approximately 1.34 million deaths annually in children under 5 years, or roughly 15% of total child mortality [11]. The severity of the disease depends on the extent of fluid loss, making accurate assessment of dehydration status a critical step in preventing mortality. In severe cases, the disease can lead to dehydration and significant fluid loss in children. One of the key issues in the assessment, monitoring, and treatment of this disease is the duration of symptoms in children, as prolonged symptoms can result in serious complications. Vitamin E, a fatsoluble vitamin with potent antioxidant and anti-inflammatory properties, holds significant potential for evaluation in relation to diarrhea and symptoms associated with gastroenteritis, which is the focus of this study.

In the present study, the mean age of children in the vitamin E and control groups was 5.2 and 5.67 years, respectively, with no significant differences in age or gender between the two groups (P=0.106 and P=0.437, respectively). These findings suggest that confounding factors such as age and gender did not influence the outcomes of this intervention. Notably, the mean age of gastroenteritis onset in our study was between 5 and 6 years, which differs from reports in various studies. Epidemiological studies have indicated that children under 5 years constitute the most affected population, with diarrhea being more prevalent in Asia and Africa, accounting for 80% of annual cases [11]. Another epidemiological study reported that children under 1 year are among the most common age groups affected by gastroenteritis [12]. However, since our study focused on children over 1 year, this difference may be attributed to the age restriction applied in our study.

The study found that the mean duration of diarrhea, abdominal pain, and anorexia was significantly shorter in the vitamin E group than in the control group (P<0.0001). However, no significant differences were observed between the two groups in the duration of fever, dehydration, or vomiting (P=0.810, P=0.536, and P=0.685, respectively). In other words, our findings suggest that vitamin E may have beneficial effects on certain symptoms in patients with gastroenteritis. Few studies have evaluated the effects of this vitamin on the gastrointestinal system. A study by Bayiroğlu et al. observed a correlation between antioxidant levels and gastroenteritis in children. However, it noted that further research is needed to determine whether antioxidant supplementation could be a useful adjunct to conventional treatment [13].

Regarding the effects of vitamin E on gastroenteritis symptoms, limited precise evaluations have been conducted. However, in terms of etiology and pathophysiology, a study by Gothandapani et al. reported positive effects of vitamin E on the gut microbiome, as beneficial bacteria and their metabolites increased with vitamin E supplementation. This highlights the critical role of vitamin E in positively influencing the gut microbiome, potentially delaying aging and the progression of agerelated diseases [14]. Vitamin E supplementation has also been shown to reduce oxidative stress and improve gut barrier permeability, potentially alleviating some gastrointestinal symptoms and diarrhea [15]. The differences between our study's results and some studies or theoretical models on vitamin E's effects on the gut may be due to our study being conducted in children, whose gut microbiome and intestinal barrier conditions differ from those of adults, as the referenced studies were mostly conducted in adult populations or animal models.

Regarding the pathophysiology of vitamin E's effects on gastroenteritis symptoms, various results and theories have been proposed, some of which have been further evaluated. A key theory focuses on vitamin E's effects on intestinal inflammatory conditions and its antioxidant and antiinflammatory properties. A study by Kamisah et al. suggested that the protective effects of vitamin E may involve improving oxidative stress and inflammation, as well as restoring endogenous gastrointestinal protective substances, indicating its potential role in treating gastric and duodenal mucosal injuries [16]. A study by Omid Asbaghi et al. found that among the various chemical forms of vitamin E, alphatocopherol—unlike other forms—reduced serum levels of CRP and IL6, demonstrating a beneficial antiinflammatory effect in adults [17]. Regarding the effect of vitamin E on anorexia as a symptom of gastroenteritis, limited studies have been conducted. However, Philipp et al. reported that in disorders such as anorexia, fatsoluble vitamins, particularly vitamin E, are reduced. This suggests a potential relationship between vitamin E and anorexia, although the pathophysiological pathways are not fully understood. The study proposed that vitamin E status could play a significant role in improving anorexia conditions [18]. Few studies have specifically investigated the effects of vitamin E on nausea and vomiting. However, it should be noted that the populations in our study differed in terms of symptoms and conditions, and our finding that vitamin E did not improve vomiting may be influenced by various confounding factors.

From a clinical perspective, the safety profile and practical relevance of vitamin E supplementation in the pediatric population should also be considered. Current pediatric nutritional guidelines indicate that vitamin E is generally safe when administered within recommended dietary ranges, and toxicity is uncommon at standard therapeutic doses. Systematic reviews evaluating vitamin E supplementation have reported that moderate doses are well tolerated in children and adults, with adverse effects primarily associated with very high or prolonged intakes. Given its antioxidant and antiinflammatory properties, vitamin E has been explored in several inflammatory and gastrointestinal conditions. However, its routine use in the management of acute gastroenteritis has not yet been incorporated into major pediatric clinical guidelines. Therefore, while the findings of the present study suggest potential benefits of vitamin E in reducing certain symptoms such as diarrhea, abdominal pain, and anorexia, additional largescale randomized controlled trials and systematic reviews are needed to confirm its clinical efficacy, longterm safety, and optimal dosing strategies in children [19].

Conclusion

Overall, the findings demonstrated that the mean duration of diarrhea, abdominal pain, and anorexia was significantly shorter in the vitamin E group than in the control group. However, no significant differences were observed between the two groups in the duration of fever, dehydration, or vomiting. Further studies are needed to investigate the anti-inflammatory and protective effects of vitamin E on the gastrointestinal system.

Ethical Considerations

Compliance with ethical guidelines

This research was approved by the Research Ethics Committee of Arak University of Medical Sciences, Arak, Iran (Code: IR.ARAKMU.REC.1402.164).

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Authors' contributions

All authors contributed equally to the preparation of this article.

Conflict of interest

The authors declared no conflict of interest.

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