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Original research article

IMPACT OF ZINC SUPPLEMENTATION ON DURATION OF HOSPITALIZATION IN CHILDREN WITH PNEUMONIA

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Abstract: *Zinc supplementation is known to reduce pneumonia incidence among infants; however, its role in improving treatment outcomes for pneumonia in hospitalized children remains inconclusive.* ***Objective:*** *This study investigates the effect of zinc supplementation on the duration of hospitalization and symptom severity in pediatric patients diagnosed with pneumonia.* ***Methods:*** *A randomized controlled trial was conducted at Balochistan Institute of Child Health Service, Quetta, Pakistan. A total of 100 children diagnosed with pneumonia were enrolled and randomized into two groups: a zinc supplementation group and a control group. Data were analyzed using SPSS software, employing regression and correlation analyses to assess the impact of zinc on hospitalization duration and symptom severity.* ***Results:*** *Statistical analysis revealed no significant difference in hospitalization duration or symptom severity between the zinc-supplemented group and the control group (p-values of 0.741 and 0.402, respectively). The findings suggest that zinc supplementation does not significantly alter treatment outcomes in terms of reducing hospital stay or symptom intensity for children with pneumonia.* ***Conclusion:*** *While zinc supplementation is recognized for its role in pneumonia prevention, this study does not support its efficacy in reducing hospitalization duration or symptom severity for children already diagnosed with pneumonia. Further research is recommended to explore alternative therapeutic strategies for enhancing recovery outcomes in pediatric pneumonia cases.*

Keywords: Zinc, Pneumonia, Child, Supplementation.

Introduction

Pneumonia is a common respiratory infection in young children. Although zinc supplementation is known to lower the incidence of pneumonia in infants, its role in treating pneumonia remains uncertain. Globally, pneumonia is a leading cause of death among children under five, accounting for an estimated 18% of child fatalities in sub-Saharan Africa alone (1). Meeting Millennium Development Goal 4 in this region will likely require interventions that either reduce pneumonia cases or enhance its treatment. Zinc deficiency in children has been associated with growth delays, pneumonia, and diarrhea (2). According to a recent meta-analysis, zinc supplementation reduced the risk of pneumonia by 19% (3). Zinc supplementation refers to the intake of zinc through dietary supplements to support nutrition and immune health (4). As noted by Lowe et al. (5), zinc supplementation involves administering zinc—either through dietary supplements or zinc-fortified foods—to prevent or treat zinc deficiency and related health conditions. The administration of zinc at doses higher than the recommended dietary allowance has shown potential to improve health outcomes, particularly for populations at risk of zinc deficiency (6).

Pneumonia in children is classified as an infectious disease that primarily affects lung tissue, typically caused by bacteria, viruses, or fungi, and is especially prevalent in children under five (7). It is one of the most severe acute respiratory infections in young children, accounting for over a 49% of child deaths worldwide (1). Despite advances in medical care, pneumonia remains a major public health concern, underscoring the need for optimized preventive and treatment strategies (8). Zinc deficiency is widespread, particularly in developing regions, where affected individuals are more susceptible to infections like pneumonia (9). While the WHO recommends zinc supplementation for managing diarrheal illnesses, its potential as a therapeutic aid for pneumonia is increasingly recognized. A systematic review by Liu et al. (10) found that zinc supplementation in children under five reduced illness duration. Research in Gambian by Howie et al. (2) similarly indicated that zinc supplementation shortened the duration and severity of pneumonia. To address existing gaps in the literature, this study aims to compare the length of hospital stay (LOS) among children hospitalized with pneumonia who received zinc supplementation versus those who did not.

Pneumonia remains a global health challenge, particularly affecting children in developing countries where access to adequate healthcare and nutrition is limited. Research indicates that zinc, an essential nutrient critical for immune function, may help reduce the severity and duration of pneumonia symptoms in children. This study seeks to address the question: What is the true impact of zinc supplementation on the hospitalization duration for children diagnosed with pneumonia? Using a randomized controlled trial (RCT) design, this research will examine whether supplemental zinc contributes to shorter hospital stays for pediatric pneumonia patients compared to standard care practices. : (11)

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The specific objectives of this study are as followsTo determine whether administering zinc supplements to children with pneumonia significantly reduces their hospital stay compared to children receiving standard care. (12) To assess if altering zinc supplementation—either increasing or decreasing the dose—affects the severity of pneumonia symptoms in children. (4) To evaluate potential differences in treatment outcomes by investigating whether there is a notable difference in hospitalization duration between children with pneumonia who receive zinc supplementation and those who do not. Through comprehensive data collection and analysis, this study aims to achieve these objectives and provide valuable insights into the potential role of zinc supplementation as an adjunct therapy for improving clinical outcomes in pediatric pneumonia cases.

Methodology

This study employed a quantitative research method. An explanatory research design was chosen to identify causal relationships among the variables outlined in the research problem, using a deductive reasoning approach. The study's time horizon is cross-sectional, with data collected in a single instance. A mono-method approach was used, and SPSS software was selected for data analysis.

Primary data was collected to support this study. The study population consisted of parents of children diagnosed with pneumonia, and the sample included parents of 100 children hospitalized at Balochistan Institute of Child Health Service, Quetta (BICHQ), Balochistan. The sample was selected using a random sampling technique. Data was gathered from these parents through a survey method, with random sampling employed to ensure the sample accurately represents the population and to minimize sampling error. A total of 109 questionnaires were distributed to the parents, and after screening, 100 completed questionnaires were used for data analysis. The study sample consisted of 53% male and 47% female participants.

Data Analysis and Results

According to Mertler et al. (17), statistical methods in data analysis enable us to examine variables, their effects, interrelationships, and patterns within the world around us. The goal of this analysis is to provide accurate and reliable data. To achieve this, SPSS (Statistical Package for the Social Sciences) was utilized. The initial step involved data coding—a process of assigning numerical codes to possible responses to each question in the questionnaire (12). After coding, participant responses and demographic data were entered into SPSS. As there were no reverse items in the scale, reverse coding was unnecessary.

The next step was data cleaning, an essential process where the researcher verifies the accuracy of data entries (18). The second stage of data cleaning addressed aberrant values, though none were detected, with all results showing an aberrant value of zero. A filtering method was then applied, using an outlier threshold set to outlier > 0.001, to manage any potential anomalies. Furthermore, exploratory factor analysis (EFA) was conducted to confirm that all relevant variables were appropriately loaded for further analysis. EFA results indicated that all items were successfully loaded.

Results:

Table 1 illustrates the age distribution of children participating in the study. While 109 children were initially surveyed, data was unavailable for 9 participants. Of the valid responses, 23 children were aged 0–6 months, representing nearly one-quarter of the sample and making this the largest age group. Children aged 7–12 months constituted 20% of the valid responses, accounting for roughly one-fifth of participants. Additionally, the frequency of children aged 3–5 years was 19, which was similar to the frequency of children over 5 years of age. (Table 1)

Table 1 Distribution of Age group of children

Table 2: Do you believe that nutritional supplements are beneficial for children's health

		Frequency	Percent	Valid Percent	Cumulative Percent
	Strongly agree	24	22.0	24.0	24.0
	Agree	21	19.3	21.0	45.0
	Neutral	21	19.3	21.0	66.0
	Disagree	13	11.9	13.0	79.0
	Strongly disagree	21	19.3	21.0	100.0
	Total	100	91.7	100.0	

When parents were surveyed about their beliefs regarding the benefits of nutritional supplements for children's health, their responses varied widely. Among the valid responses, 24% of parents strongly agreed that nutritional supplements are beneficial, indicating a firm belief in their positive impact. Additionally, 21% agreed with the statement, bringing the total percentage of parents with a favorable view of nutritional supplements to nearly 45%.

Conversely, a significant portion of parents expressed neutral or negative opinions regarding dietary supplements. Specifically, 21% of participants had no opinion, suggesting indifference to the issue. Meanwhile, 21% strongly disagreed, and 13% disagreed with the statement, indicating that a notable minority—34% overall—do not believe that nutritional supplements are beneficial for children's health.

Table 3: How often do you provide zinc-rich foods in your child's diet?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Daily	22	20.2	22.0	22.0
	Several times a week	21	19.3	21.0	43.0
	Occasionally	17	15.6	17.0	60.0

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	Rarely	18	16.5	18.0	78.0
	Never	22	20.2	22.0	100.0
	Total	100	91.7	100.0	

When parents were asked about the frequency of zinc-rich foods in their child's diet as part of a study on the impact of zinc supplementation on the duration of hospitalization for children with pneumonia, the responses revealed a diverse array of dietary habits. Twenty-two percent of parents reported providing zinc-rich foods daily, demonstrating a strong commitment to regularly incorporating these foods into their child's diet. Additionally, 21% of parents indicated that they offered zinc-rich foods several times a week, reflecting a moderate frequency of intake. Seventeen percent of parents stated they occasionally included zinc-rich foods, suggesting a more sporadic approach to dietary zinc. Conversely, 18% reported rarely including such foods in their child's diet, indicating infrequent consumption of dietary zinc. Notably, another 22% of parents indicated that they never provide zinc-rich foods, highlighting a significant portion of the population that does not incorporate these essential foods into their child's diet.

Table 4: Regression analysis

RELATIONSHIP	STD. ERROR	BETA	SIG. VALUE	SUPPORTED/ NOT SUPPORTED
(CONSTANT) H1 Zinc S------ Zinc Supplementation significantly reduces the duration of hospitalization in children with pneumonia	.344 .140	-.033	.741	Not supported
(constant) H2 Zinc S------ Zinc Supplementation significantly reduces the severity of symptoms in children with pneumonia.	.405 .165	-.085	.402	Not supported
(constant) H3 Zinc S-------There is no significant difference in the duration of hospitalization between children with pneumonia who receive zinc supplementation and those who don't.	.264 .080	.017	.868	Supported

Discussion

The results of this study reveal significant insights into parental beliefs about nutritional supplements, dietary practices regarding zinc-rich foods, and the impact of zinc supplementation on the duration and severity of hospitalization for children with pneumonia.

The survey of parental beliefs about nutritional supplements indicates that nearly half of the respondents (45%) either agreed or strongly agreed that supplements benefit children's health, reflecting a favorable view of supplementation. This finding aligns with recent studies highlighting an increasing awareness among parents regarding the potential benefits of micronutrients, particularly in areas where dietary intake may be insufficient to meet children's nutritional needs (19). However, the 34% of parents who expressed neutral or negative views toward supplements suggest an ongoing divide in attitudes, which may be influenced by differing levels of education, cultural beliefs, and exposure to public health information. These findings contrast with previous research that identified a more uniformly positive perception of supplements in communities with high educational levels and greater access to pediatric health resources (20, 21). Parental responses about the inclusion of zinc-rich foods in their children's diets highlight a diverse array of dietary habits. While 22% of parents reported providing these foods daily, another 22% stated they never included zinc-rich foods. This variation underscores the inconsistency in dietary practices, which may be affected by socioeconomic factors, awareness of zinc's role in immune function, and access to zinc-rich foods (22). Studies have consistently shown that zinc is essential for immune system support, particularly in young children, as it plays a crucial role in reducing the severity and duration of respiratory infections (23). In regions where zinc-rich foods are less accessible, the reliance on supplements as a preventive measure tends to be higher (24).

The regression analysis aimed to evaluate the impact of zinc supplementation on two key clinical outcomes for children hospitalized with pneumonia: the duration of hospitalization and symptom severity. Interestingly, the hypothesis that zinc supplementation would significantly reduce the duration of hospitalization was not supported by the data ($p > 0.05$). This result contrasts with previous studies that have documented shorter hospital stays among pediatric pneumonia patients receiving zinc supplementation, particularly in cases of acute respiratory infections (25, 26). However, the insignificant effect observed in this study may be due to variations in dosing, timing of supplementation, or patient characteristics, which warrants further investigation.

Similarly, the hypothesis that zinc supplementation would reduce the severity of symptoms was also not supported ($p > 0.05$). While other studies have found a reduction in symptom severity with zinc supplementation, particularly in reducing inflammation and supporting faster recovery (27), the current findings may suggest that zinc alone may not significantly affect symptom severity in certain populations or under specific conditions.

Lastly, the analysis showed no significant difference in hospitalization duration between children receiving zinc supplementation and those who did not, supporting the hypothesis. This finding aligns with recent studies questioning the uniform efficacy of zinc supplementation in

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reducing hospital stays across diverse populations (28). These studies emphasize that while zinc may have a general immunoprotective effect, its direct impact on acute outcomes like hospitalization may vary due to factors such as patient nutrition baseline, infection type, and healthcare setting (29, 30).

Conclusion

The study concludes that zinc supplementation does not significantly impact the duration of hospitalization or the severity of symptoms in children with pneumonia. Despite zinc's known benefits in preventing pneumonia, its role as an adjunct therapy for treatment did not yield statistically significant results in reducing hospital stays or alleviating symptoms among the pediatric patients in this trial. These findings suggest that zinc may not be effective as a treatment aid for pneumonia in hospitalized children, and further studies should explore other therapeutic options to improve clinical outcomes in this population.length of hospital stays or alleviating symptom severity.

Declarations

Data Availability statement
All data generated or analyzed during the study are included in the manuscript.
Ethics approval and consent to participate.
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The authors declared an absence of conflict of interest.

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