Effects of zinc with and without multivitamin on growth of school going children after pneumonia

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Abstract- Zinc and many vitamins are important for development. Various vitamins and zinc deficiencies are communal in emerging states.

Objective: The purpose of this is to find out the Effects of zinc with and without multivitamin on growth of school going children after pneumonia.

Methods: Children aged 5-10 attending a school were included. 60 participants were randomised to take multivitamins (200 IU vitamin D, 1,000 IU vitamin A, 10 mg B1, 1 mg B6, 3 mg B2, nicotinamide 40mg, B12 10 mcg) along with zinc chelated zinc glycinate (20 mg elemental zinc) or once daily zinc treatment was given for 5 days in a week for six-months. The height change from reference value was the primary outcome which was taken significant till conclusion of the analysis. The outcomes which were secondary were variations in body weight. An intent to treat analysis was accomplished.

Results: The participants average age was 7.36±1.67 years in group A and 7.633±1.73 in group B, with 20(66.7%) of them being men and 10(33.3%) being female in group A and 14(46.7%) being male and 16(53.3%) being female. There is marked increase in height and weight in group B with p-value <0.05

Conclusions: 6-month supplementation with zinc chelated and multivitamins significantly increase height among school going children and was better endured.

Index Terms- zinc, multivitamin, pneumonia

I. Introduction

Acute lower respiratory infections (ALRIs), predominantly pneumonia, cause approximately 4 million deaths every year, accounting for one-third of all childhood deaths in developing countries.(1) Respiratory infections are among the leading causes of child mortality globally and were responsible for the deaths of 1.9 million children <5 y of age in 2011.(2) Micronutrient supplementation is one such strategy and is particularly compelling given the important role of numerous vitamins and minerals in systemic immune function and the maintenance of local defenses, coupled with its relative cost-effectiveness(3). Micronutrients, counting multivitamins and zinc, are crucial for growing babies. As a constituent of many most important classes of enzymes and metalloenzymes, zinc is essential for growth of cells, metabolism and differentiation (4). It chelates compound with histidine and cysteine to formulate zinc fingers that have vital part in the transcription of proteins(5). The deficiency of zinc is communal in under-developed states like Pakistan with a predictable incidence exceeding 21%. The deficiency of zinc is associated with poor growing (6). There is inadequate research evaluating the zinc role supplementation in encouraging growth in children. Growth factors that play a role in the repair and growth of tissues, bones, and muscles depend on an adequate supply of multivitamins (7, 8).

Zinc is an essential nutrient that, because of its fundamental role in many aspects of cellular metabolism (9), is critical for normal immune function (10) and physical growth (11). Zinc deficiency appears to be widespread in low-income countries because of a low dietary intake of zinc-rich animal-source foods and a high consumption of cereal grains and legumes, which contain inhibitors of zinc absorption (12). Children in poor countries are also frequently affected by diarrhea, which causes excess fecal losses of zinc (13). In such settings, zinc supplementation has been shown to reduce the rates of diarrhea and pneumonia (14) and to enhance the physical growth of young children at risk of stunting (11). The purpose of this study was to evaluate the effectiveness of multivitamin supplementation with zinc in enhancing the schoolchildren growth after pneumonia.

II. Materials and Methods

1) This double blind, randomized, controlled trial was held in the department of Pediatrics, Al Mustafa medical trust centre, Lahore and different public schools of Lahore for one-year duration from January 2023 to December 2023. Sample size was 60, 30 in each group calculated from epitool. Children recovered from pneumonia aged 5 to 10, both gender and in grades KG to six were included for study eligibility. Children who take vitamin or mineral supplements on a regular basis or have allergies to them, a known history of behavioural or psychiatric issues, congenital heart disease, cerebral palsy or chronic systemic illness were excluded. The ethics committee gave its approval to the protocol. Prior to registration, the children's written informed consent of their parents or legal guardians were obtained. All volunteers, including parents and children, was free to leave the study whenever they want. The reasons for quitting the study were noted. A statistician unrelated to the study's implementation phase used a sealed envelope method to randomly assign children who had been enrolled in 2 groups, Group A receive a zinc supplement and Group B receive zinc supplement plus multivitamin. The intervention was hidden from the researchers, parents,

children and teachers. Participants were randomised to take multivitamins (200 IU vitamin D, 1,000 IU vitamin A, 10 mg B1, 1 mg B6, 3 mg B2, nicotinamide 40mg, B12 10 mcg) along with zinc chelated zinc glycinate (20 mg elemental zinc) or once daily zinc supplement treatment was given for 5 days in a week for six-months. Children in the study population received vitamin supplements in amounts roughly equivalent to the Recommended Dietary Allowances (RDA) for child. The medication was provided in single-dose sachets as a powder. Before administration, the sachet's contents were dissolved in one glass of water. The volunteers in the group B were given solution for oral rehydration grounded on a placebo that was produced by the similar company and was the same colour and favour as the experimental product. The medication was not given on weekends, holidays, or when the youngster was not present on the designated day. During the time of the study, parents were advised not to take mineral or vitamin supplements. The difference in height between the study's beginning and completion was its primary outcome. Changes in other anthropometric measurements like body weight, served as secondary outcomes. Training research staff record the anthropometric data and baseline demographic, such as gender, age, height and weight. Using an electronic scale, the weight was determined with an accuracy of 100 grammes. A stadiometer was used to measure the height with a precision of 0.1 cm. At the beginning of the study and till its end, anthropometric indices were measured using the same scales at one-month intervals. To evaluate the side effects in both groups, open-ended questions were posed. Medication intake was added to determine therapy compatibility. The Kolmogorov Smirnov test was applied to examine normality. To determine the percentage, standard deviation and mean; descriptive statistics are presented for anthropometric and demographic data. Comparisons of continuous and categorical variables between groups were made using the independent sample t-test and Pearson's chi-square test. Each anthropometric parameter's deviation from the mean was determined using a paired t-test and accessible as a mean with CI of 95%. All of the randomly selected children were included in an intent-to-treat analysis. For the statistical analysis, SPSS version 23.0 for Windows was used.

III. Results

The participants average age was 7.36±1.67 years in group A and 7.633±1.73 in group B, with 20(66.7%) of them being men and 10(33.3%) being female in group A and 14(46.7%) being male and 16(53.3%) being female. Difference in height and weight in both groups are mentioned in table 1.

Table 1: Difference in height and weight at the start and end of the study in both groups

Parameter	**Group A (Zinc) Mean±SD**	**Group B (Zinc + Multivitamin) Mean±SD**	**P-value**
Height			
At the start of the study	46.04 ± 4.13	47.78 ± 3.93	0.10
At the end of the study	46.68±4.07	50.92 ± 3.68	0.00
Weight			
At the start of the study	23.16 ±4.53	24.05± 4.75	0.46
At the end of the study	24.15±4.57	26.6± 5.01	0.05

There is marked increase in height and weight in group B with p-value <0.05

IV. Discussion:

In this randomised controlled study, we demonstrated that, supplementation with multivitamins along with zinc chelated (20 mg elemental zinc) for 6 months Significantly promoted height gain in schoolchildren (15). In 2 metaanalyses, Brown et al., stated that linear growth had shown favourable results. Ramkrishnan et al., haven't demonstrated any advantage (16). However, preschoolers were a part of the majority of the studies in the meta-analysis. There is not enough information to determine whether zinc supplementation increases school-age children's height (17). Various studies have shown the beneficial impact of zinc supplementation in our investigation on linear growth. Castillo-Duran et al., discovered that pre-adolescents with idiopathic short stature who received a 10 mg zinc supplement showed improvements in height gain and HAZ scores (18). Ronaghy et al., demonstrated that supplementing 13-yearold malnourished Iranian schoolchildren with 40 mg of zinc in the zinc carbonate form in addition to other nutrients (proteins, fats, minerals and vitamins) led to a considerably larger rise in height and weight (18). In contrast to our study, which revealed substantial differences in increase from month two, height gain and weight gain were not substantial in the initial six months of the trial but were substantial in the last twelve months. In Indian schoolchildren between the ages of 11-17 Sharma et al., demonstrated that supplementation with 30 or 50 mg of zinc had a significant effect but had no effect on gain in weight, WAZ score in the first three months (19) . In Guatemalan children with a mean age of 81.5 months, Cavan et al. compared supplementing with zinc chelated with amino acids at 10 mg/day with minerals and vitamins alone (without zinc) for three months(20). Despite having no apparent impact on height, zinc supplementation assisted to increase body structure measurements including the middle arm circumference and triceps skinfold. (21) According to research by Sandstead et al., children's height increased more when given 20 mg of zinc along with special micronutrients than when given either zinc or micronutrients alone (22). The height of children of school age has not been positively impacted by zinc supplementation, according to several earlier research. It should be remembered that inhabitants in underdeveloped nations frequently co-exist with a variety of impairments. In school-age children with low plasma concentrations of zinc and retinol, Udomkesmalee et al., studied the effects of supplementing with zinc and/or vitamin A. Its main aim was to determine the functional and biochemical indicators (time of eyesight recovery) following vitamin A and zinc supplements. They discovered that following supplementation, zinc levels and visual function both improved. Plasma levels vary for a few weeks following zinc depletion (23). Plasma zinc levels can also be impacted by dietary intake, endotoxemia, infections, steroid use, and plasma volume expansion. In our study, we did not evaluate food intake (24). High dietary phytate consumption or concurrent mineral intake that affects zinc bioavailability can affect how much zinc is absorbed. Using a blind, randomised, controlled methodology, we predicted that the two matched groups' eating habits would be comparable. Additionally, we urged families not to take any minerals or vitamins throughout the study and delivered study medicine with meals.

V. Conclusion

Regardless of baseline height and weight, supplemental zinc and multivitamins increased linear height (height) in schoolchildren recovered after pneumonia. During treatment, no notable side effects were noticed. Consideration should be given to conducting bigger, multi-center trials and other delivery strategies, such as dietary supplements, to enhance the school-going children growth in regions where zinc deficit is widespread.

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