کارکاه های آموزشی مرکز اطلاعات علمی جهاد دانشگاهی

کارکاه آنلاین بررسی مقاله ای متنون (مقدماتی)

پروپوزال

کارکاه آنلاین بررسی نویسی و پایان نامه نویسی

آشنایی با اطلاعات علمی جهاد دانشگاهی و ترفندهای جستجو
THE EFFECT OF SUPPLEMENTAL ZINC ON THE HEIGHT AND WEIGHT PERCENTILES OF CHILDREN

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Background: Considering the high incidence of low weight and short stature among Iranian children as well as the high prevalence of both mild and moderate types of zinc deficiency, this study was conducted among patients who were referred to the Pediatric Clinic at Massih Daneshvari Hospital during 1997 – 1999. The aim of this study was to determine the effect of zinc supplementation on the children’s height and weight percentiles.

Methods: Age, sex, and height and weight percentiles before and after administration of zinc were determined and recorded. The zinc supplement used in this project was in the form of a zinc sulfate solution in 0.1% and 0.5% concentrations. The dose was the upper limit of a tolerable dose, which was given in three divided doses per day.

The serum zinc level was measured with the atomic absorption spectrophotometry method. The effect of age, sex, and initial serum zinc level on the percentile changes were determined.

Results: This study was conducted on 42 children with equal distribution of gender (21 male and 21 female patients). The mean age was 4.9 ± 4.1 years. Means of height and weight were 101.8 ± 23 cm and 16.5 ± 8.1 kg, respectively. The initial serum zinc level was 85.1 ± 31.6 µg/dL. The duration of zinc administration was 3.2 ± 2.6 months. The subjects were followed for a minimum of one month to a maximum of 10 months.

The percentage of children with weight and height percentiles below the 50th percentile was reduced from 69% to 54% (P < 0.05) and from 50% to 33% (P < 0.01), respectively. Also, it was noted that children with low serum zinc levels demonstrated greater percentile changes.

Conclusion: It was concluded that supplemental zinc increases height and weight percentiles.

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Keywords: Atomic absorption spectrophotometry • height and weight percentiles • oral zinc sulfate solution • serum zinc • zinc deficiency syndrome

Introduction

Zinc is an essential micronutrient that is necessary for different stages of growth and development. The importance and significance of this mineral in nutrition and also its effect on the health of individuals in society has been shown in recent years.1 – 5 Forty years ago, it was demonstrated that people living in some Middle-Eastern countries suffered from zinc deficiency as a result of poor nutrition and consumption of phytic acid-containing foods. This resulted in low weight and short stature in the children of the affected areas.6 – 8

In addition to the rare and uncommon type of “severe zinc deficiency”, marginal and mild forms have also been recently identified. While the severe form of zinc deficiency is very rare, its mild and marginal deficiencies are very common. In reviewing the literature, we detected 17% – 43% zinc deficiency in different regions of Iran.1, 2, 4, 6
Today, zinc can be one of the most common hidden health problems in children, since, unlike iron deficiency, zinc is not something for which pediatricians routinely screen. The recommended intake of zinc in children—aged 1 – 6 years—is 10 mg/day.1, 9

One of the important problems that children face is short stature and low body weight. The prevalence of this issue in our country has been reported to be 15.7%. Body mass index (BMI) is considered as an important index for the determination of nutritional status. So, low weight, short stature, and low BMI are considered to be the result of poor nutrition. Different reasons such as major organ diseases, environmental-related disorders, and zinc deficiency are responsible for poor nutrition. Deficiency of zinc results in a condition which is known as “nutritional zinc deficiency syndrome”. It has been shown in different studies that zinc supplementation increases the height and weight.1 – 4, 10, 11

Since an article studying the effect of zinc on the height and weight of children did not exist in Iran, we recognized the need for such a study and, thus, conducted a study on children referred to Massih Daneshvari Hospital during 1997 – 1999. The aim of this investigation was to evaluate the effect of zinc supplementation on the height and weight percentiles of children.

**Materials and Methods**

This clinical trial consisted of “before” and “after” measurements. Parents were informed about the research and a written consent was obtained. Demographic characteristics of children such as age, sex, weight, and height were recorded. The children were weighed by Seca scale. Also, a 3-mL fasting blood was collected from each child between 8 – 9 AM and kept in “acid-washed” tubes. After separating the serum, it was sent within 12 hours to the Atomic Energy Organization where the serum zinc level was measured by the “atomic absorption spectrophotometry” method.

Zinc was given as zinc sulfate solution (in 0.1% and 0.5% concentrations). Zinc sulfate powder was purchased from the Merck Company, Germany. Solutions were contained in 250 mL bottles. The oral zinc sulfate solution was given according to the doses shown in Table 1.

After measuring the height and weight percentiles of the subjects “before” and “after” zinc supplementation, a growth table showing the height and, weight percentiles in Iran was employed. Thus, the results were compared with the height and weight percentiles of Iranian children with normal nutritional status. In the final follow-up, the height and weight of children were recorded in the same manner. Patients who were not followed up for at least one month were excluded from the study.

In the case of normal distribution of the height and weight changes “paired test” and otherwise “sign test” were performed. McNemar’s test was used to assess the changes in the height, and weight percentiles above and below the 50th percentile, “before” and “after” zinc administration. The role of age, sex, and age at zinc supplementation initiation were examined by Chi-square and Fisher’s exact tests.

**Results**

Overall, 42 subjects including 21 males and 21 females were studied. The mean age of the children was 4.9 ± 4.1 years (range: 7 months-14 years). Meanwhile, the mean age in girls and boys was 4.3 ± 4.5 years and 5.5 ± 3.8 years, respectively. The mean weight was 16.5 ± 8.1 kg.

<table>
<thead>
<tr>
<th>Life stage</th>
<th>Age</th>
<th>Males (mg/day)</th>
<th>Females (mg/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infants</td>
<td>0 – 6 months</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Infants</td>
<td>7 – 12 months</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Children</td>
<td>1 – 3 years</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Children</td>
<td>4 – 8 years</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Children</td>
<td>9 – 13 years</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Adolescents</td>
<td>14 – 18 years</td>
<td>11</td>
<td>9</td>
</tr>
<tr>
<td>Adults</td>
<td>19 years and older</td>
<td>11</td>
<td>8</td>
</tr>
<tr>
<td>Pregnancy</td>
<td>18 years and younger</td>
<td>—</td>
<td>12</td>
</tr>
<tr>
<td>Pregnancy</td>
<td>19 years and older</td>
<td>—</td>
<td>11</td>
</tr>
<tr>
<td>Breast feeding</td>
<td>18 years and younger</td>
<td>—</td>
<td>13</td>
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<tr>
<td>Breast feeding</td>
<td>19 years and older</td>
<td>—</td>
<td>12</td>
</tr>
</tbody>
</table>
The effect of supplemental zinc on the height and weight percentiles of children

(range: 7 – 45 kg). The mean weight in girls and boys was 14.7 ± 7.1 kg and 18.3 ± 9.1 kg, respectively. The mean height was 101.8 ± 23 cm (range: 65 – 148 cm). The mean height in girls and boys was 98.4 ± 24.5 cm and 105.3 ± 21.5 cm, respectively.

The mean initial serum zinc concentration was 85.1 ± 31.6 µg/dL. This value was 87.1 ± 35.1 µg/dL in girls and 83.2 ± 28.1 µg/dL in boys. The mean duration of zinc supplementation was 3.2 ± 2.6 months. The subjects were followed for a period between 1 and 10 months. Weight changes observed in the children averaged 1.3 ± 0.7 kg. The paired t-test showed that the 5.3% increase in the weight of the subjects was statistically significant (P < 0.001).

The percentage of children who had a weight less than the 50th percentile decreased from 69.1% to 54.8% during follow-up (Table 2). This was statistically significant according to McNemar’s test, (P < 0.001). Weight percentiles of the subjects before and after zinc administration are shown in Figure 1. It is noteworthy that zinc supplementation affected the weight of boys more than girls. In other words, the increase in weight was more pronounced in boys than in girls (data not shown).

The height of the subjects increased by 2.7 ± 2.5 cm (a 2.7% increase). Based on the sign test, this increase was statistically significant (P < 0.001).

Table 3 shows the height of the children based on the 50th and greater percentiles, before and after zinc administration. According to this table, the height of the children (less than the 50th percentile) decreased from 50% to 33%. McNemar’s test proved that this result was statistically significant (P < 0.01). The distribution of children before and after zinc administration is shown in Figure 2.

Table 4 was proposed to answer the question, “Does the initial serum zinc concentration have any effect on the height and weight percentiles of children?” In zinc-deficient children (serum zinc <60 µg/dL), 70% demonstrated an increase in the weight percentile of more than 10%. However, in cases with normal serum zinc concentration, this increase was observed in 22% of subjects. Similarly, in the case of height, 40% of children

<table>
<thead>
<tr>
<th>Weight percentile after zinc administration/ Weight percentile before zinc administration</th>
<th>Less than 50th percentile</th>
<th>50th percentile and greater</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 50th percentile</td>
<td>23</td>
<td>6</td>
<td>29 (69.1)</td>
</tr>
<tr>
<td>50th percentile and greater</td>
<td>0</td>
<td>13</td>
<td>13 (30.9)</td>
</tr>
<tr>
<td>Total</td>
<td>23 (45.2)</td>
<td>19 (54.8)</td>
<td>42 (100)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Height percentile after zinc administration/ Height percentile before zinc administration</th>
<th>Less than 50th percentile</th>
<th>50th percentile and greater</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 50th percentile</td>
<td>14</td>
<td>7</td>
<td>21 (50)</td>
</tr>
<tr>
<td>50th percentile and greater</td>
<td>0</td>
<td>21</td>
<td>21 (50)</td>
</tr>
<tr>
<td>Total</td>
<td>14 (33.3)</td>
<td>28 (66.7)</td>
<td>42 (100)</td>
</tr>
</tbody>
</table>
with zinc deficiency showed an increase in their height percentiles of more than 10%. Meanwhile, 34% of children with normal serum zinc concentration showed an increase of 10% or more in their height percentiles. By the way, Fisher’s and Chi-square tests showed that this difference was not statistically significant. In other words, we can say that, whatever the initial serum zinc concentration, zinc supplementation affects the height and weight of the children.

Figure 3 demonstrates the effect of zinc supplementation on the weight of children of different age groups. The effect of zinc supplementation is more pronounced in younger age groups. Thus, in children below 2 years of age, weight changes of more than the 10th percentile were about 61.5%, while in older children of about 10 – 14 years, this increase was 14% (P < 0.05).

Discussion

It has been stated that about 50% of the population living in developing countries suffer from nutritional zinc deficiency.5,11 Recent studies have shown that 20% of the world’s population have a deficiency of this element. The problem of zinc deficiency in Iran is that of “mild zinc deficiency”. The treatment required is zinc sulfate supplement. Our study proved that zinc administration is associated with an increase in the height and weight percentiles. In our study, zinc sulfate was given in a dose of 3 mg/kg/day (0.5% concentration of zinc sulfate solution) for a duration ranging from 1 – 6 months. The doses of zinc in our study were based on the doses mentioned in reference textbooks. However, in some investigations, 5 mg/kg was the dose of zinc sulfate administered.

Brown et al12 have updated a metaanalysis of the effects of zinc supplementation on the growth of children in developing countries. This analysis, which was based on 33 randomized controlled trials, showed a highly significant aggregative effect size of 0.350 (95% CI: 0.189, 0.511) for height, 0.309 (95% CI: 0.178, 0.439) for weight, and ≈0 for weight for height increments. The previous effort found smaller but significant effects such as an effect size of 0.22 for height increments.12

In an article, which was published in the British Medical Journal,13 it was mentioned that nearly 2 billion people from developing nations suffer from nutritional zinc deficiency. It has been concluded in numerous metaanalysis studies that zinc supplementation has a significant positive effect on the growth and development of children in developing countries. It was also pointed out that the first and foremost clinical manifestation of zinc deficiency in neonates and children is a decrease in the velocity of physical growth.12

In a study conducted in Tehran,1 the prevalence of zinc deficiency among secondary school children was reported to be 31%, while in Zahedan this figure was 43%.

Our study showed that zinc supplementation increases the height and weight percentiles. Based on the results of recent research carried out in Iran,1 the prevalence of zinc deficiency, based on at least 2 indices, was 31% (59% in boys and 41% in girls). It is noteworthy that in the above study the incidence of zinc deficiency among the
students of secondary schools of Tehran was reviewed and studied. However, important growth periods including neonatal and preschool ages, were not evaluated.

Recent results have shown that zinc is an essential and vital element which is necessary for DNA and RNA polymerases as well as transcription factors that, in the form of “zinc fingers”, form the essential structure for binding with DNA. Also zinc, by binding with proteins, stabilizes the structures of cell membranes.

Further experiments are required to fully examine the role of zinc supplementation on different aspects of human life.

References

1. Hakimi SM, Hashemi F. Zinc and Human Health. Zinc Studies and Research Unit, National Research Institute of Tuberculosis and Lung Diseases: Shaheed Beheshti University of Medical Sciences; Spring 2004, Tehran, Iran.
2. The First National Congress on Zinc and Human Health: Abstract Book. National Research Institute of Tuberculosis and Lung Disease: Shaheed Beheshti University of Medical Sciences; April 2000, Tehran, Iran.
کارگاه های آموزشی مرکز اطلاعات علمی جهاد دانشگاهی

کارگاه آنلاین بررسی مقابله ای فتون (مقدماتی)

کارگاه آنلاین بررسی پروپوزال نویسی و پایان نامه نویسی

کارگاه آنلاین آشنا کردن با پایگاه های اطلاعات علمی بین المللی و ترفند های جستجو