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The Influence of Zinc Sulfate Supplementation on the Growth of School Age Children in Villages Around Shiraz 2002, 2003

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In order to study the influence of zinc sulfate supplementation in height and weight growth and upper arm span increase of school age children, a research has been done on 60 school age boys between 6-12 years old in two village east of Shiraz. In this research, they were divided into two groups of 30 people. In the first group, 8 mg of zinc sulfate and in the second one, placebo was prescribed. Then, their height, weight and upper-arm span were measured and registered every 2 months and for 6 months. The amount of height growth of zinc sulfate receptive group was 4.25 cm comparing to 3.39 cm of placebo group ($p = 0.04$). Upper-arm span increase was 3.42 cm in the control group and 2.2 cm in the experiment group ($p = 0.03$). Weight increase in two groups did not have any significant difference. This study demonstrates adding zinc sulfate to school age boys' diet has had useful impacts in increasing the speed of growth.

Key words: Zinc sulfate, height growth, weight growth, upper arm span, school age children

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INTRODUCTION

Zinc is an essential micronutrient for human growth, development and immune function (Berger, 2002). Zinc has been shown to enhance growth (Brown *et al*., 2002). The role of zinc inhuman nutrition is being increasingly high lighted after recent advance in biomedical research. Zinc as a micronutrient, Contributes greatly to healthy growth and development especially of children (Sur *et al*., 2003). After the sixth month of life, zinc requirements of infants must be provided by complementary foods, so that the bodily demand for these micronutrients can be met (Anonymous, 2000). In children, a marked reduction in dietary zinc is followed quickly by growth failure (King *et al*., 2000). Signs and symptoms of zinc deficiency include anorexia, growth retardation, alopecia, impaired wound healing (Hambidge *et al*., 2000). Zinc deficiency affects the growth hormone metabolism and may be a limiting factor in growth regulation (Mac Donald, 2000). This problem of zinc deficiency is important, because zinc Is required for normal growth and development and its deficiency results in growth stunting among children (Kikafunda *et al*., 1999). A recent study also found that the zinc content of the most commonly consumed foods in developing countries in below the Recommended Daily Allowance (RDA), This problem of marginal zinc status is important, because zinc is required for normal growth and development and its deficiency results in growth stunting among children (Kikafunda *et al*., 1999).

The objective of this study was to assess the influence of zinc sulfate supplementation on the growth of school age boys children by using the outcome measures of height, Weight, Upper arm span. The influence of zinc sulfate supplementation on the growth of male school age children whose result can be useful and influential in removing growth disharmonies caused by nutrition in school age children.

MATERIALS AND METHODS

We carried out, a longitudinal double-blind, randomized clinical trial to detect differences in growth between experimental group (receive zinc sulfate) and control group (receive placebo). Thus, we tested the influence of zinc sulfate on the growth of school age boys children for 6 months. In this study was conducted between March to September 2002 in two villages around of the Shiraz, Iran. From among school age boys children of the two villages being between 6-12 years old, 60 children were selected randomly and divided in to two groups. The children were placed in either of two groups according to the supplementation they received. One child was assigned to the experimental group and another one was placed in the control group until the total size was reached. The intervention comprised that group 1 (experimental) received a syrup contain of 8 mg of zinc sulfate given once a day for 6 month and group 2 (control) received placebo (Juice of sweat and water) once a day for 6 months. The syrups containing zinc (sulfate and placebo were identical and the taste and smell of the solutions were the same. To provide the zinc sulfate syrup, a contract was made with a pharmacy according to which there must by 8 mg of zinc element in each 5 cc syrup. The placebo was provided in completely similar bottles containing sweat and water which were distributed among the children monthly, controlling the previous bottle consumption was done. Probable adverse effect of zinc sulfate were asked from mothers too. Anthropometric measurement of each child taken by the same person and same situation and recorded for 3 times during 6 months. The tools used for measuring growth factors (height, weight, upper arm span), consist of centimeter stick and standard measuring scale. The demographic status and specific information such as birth weight, type of birth, Pregnancy weeks, mother and father height, gathered by questionnaires. These questionnaires organized in two sections which were completed by mother or father of the children through interviews. After the end of the third month, measuring growth factors was done. Again, at the end of the sixth month, The third of final measuring was performed. Two children affected to heart-failure and down syndrome were excluded from the research. In the analytic section, First, For making responses natural, non-parametric kelmogragh-Smirnogh test was used. The responses about height, Weight growth and upper- arm span in both groups of control and experiment were studied using t-student test. Also men-Whitney test was used about binary comparisons demonstrating the same results.

RESULTS

Concerning the achieved results, as presented the tables, the zinc sulfate syrup increases height growth to the extent of 4.25 cm in the experiment group and 3.39 cm in the control group (Table 1). According to the above table and the t-test, there is a significant difference between height growth of people under study in both groups between the first and second stages. In the experiment group, the height growth shows an increase

Table 1: Comparing height growth in both groups

	Control		Experiment		
Height growth index group	Mean	Standard deviation	Mean	Standard deviation	Test result (1-Tail)
Stages 1 and 2	3.39	1.83	4.25	2.20	p = 0.04 T = 1.75
Stages 2 and 3	2.00	1.84	2.41	0.99	p = 0.27 T = 0.61
Stages 1 and 3	5.72	1.69	2.26	1.77	p = 0.22 T = 0.78

The above table demonstrates that the zinc sulfate syrup increases height growth to the extent of 4.25 cm in the experiment group vs. 3.39 cm in the control group. A significant difference observed between stages 1 and 2 (p = 0.04)

Table 2: Comparing upper arm growth in both groups

	Control		Experiment		
Upper arm span index group	Mean	Standard deviation	Mean	Standard deviation	Test result (1-Tail)
Stages 1 and 2	2.20	2.03	3.42	3.44	p = 0.03 T = -1.94
Stages 2 and 3	2.71	1.97	4.40	3.81	p = 0.15 T = -1.08
Stages 1 and 3	5.81	3.18	6.80	3.91	p = 0.25 T = -0.68

The above table demonstrates that upper-arm span had an increase of 3.42 cm in the experiment group vs 2.20 cm in the control group. A significant difference was observed between the first and second stages (p = 0.03)

Table 3: Comparing weight growth in both groups

	Control		Experiment		
Weight growth index group	Mean	Standard deviation	Mean	Standard deviation	Test result (1-Tail)
Stages 1 and 2	2.31	1.33	1.47	2.20	p = 0.08 T = 1.43
Stages 2 and 3	1.78	1.07	3.36	3.33	p = 0.12 T = -1.20
Stages 1 and 3	4.2	1.73	4.60	2.78	p = 0.35 T = -0.39

The above table and performed t-tests demonstrate that there is no significant difference statistically between weight growth in various stages

(p = 0.04). Also, the amount of upper-arm span increased 3.42 cm in the experiment group and 2.20 cm in the control group (p = 0.03) (Table 2). According to the above table, upper-arm span growth between stages 1 and 2 of measurement demonstrated a significant difference and zinc caused an increase in upper-arm span growth. Comparing weight growth in two groups shows the zinc sulfate medicine not having any influence on the weight of two groups (Table 3). Besides, performed t-tests shows no significant difference statistically between weight growth in different stages. The considerable point is that this positive influence had been more significant through the first three months, between stages 1 and 2.

The reason why might be attributed to the children, positive incentive at he beginning of the medicine consumption. Any way, it is influential in the next measuring stages too; while it was not significant; it was positive concerning restrictions in the way of this study; The influence of zinc sulfate was considered positive on children, height growth before maturity.

DISCUSSION

This survey demonstrates that zinc sulfate supplementation has had useful impact in increasing the speed of height growth and upper arm span of the school age boys. The result of this survey shows, that zinc sulfate has positive effect on linear growth. An approval to this study, another studies had been taken in this filed. For instance; in a survey done by Kaji *et al.* (1997) It was mentioned that, Oral zinc supplementation improved the height velocity in short boys children. Codoceoj *et al.* (1997) showed similar results, they reported that oral zinc supplementation improved the height gain of both pre-adolescent and adolescent boys. Also, in a survey performed by Castillo-Duran *et al.* (1994) it was mentioned that, zinc supplementation, increased growth velocity in male school children and adolescents of short stature. In this survey the zinc sulfate influence on the height growth and upper arm span of school age boys, But not have any influence on the weight of male school age children. In contrast, another studies, shows that the zinc sulfate effect on the growth of height, upper arm span and weight of preschool children and infants. In a study done by Sur *et al.* (2003) in India, it was concluded that zinc supplementation had a beneficial impact on the weight gain and linear growth in low birth weight infants. In another survey done by Diaz-Gomez and Domenech (1997), in Spain, mentioned that zinc supplementation has a positive effect on linear growth of premature infants. By Castillo-Durance *et al.* (2001) it was concluded that zinc supplementation has effect on development and motor quality behavior of Chilean infants, In other study done by Kikafunda *et al.* (1999) in Uganda, it was mention zinc supplementation increased weight, height and mid upper school age boys, but not have influence on the weight of male school children. In contrast, the influence of zinc sulfate is on the growth of height and also on the weight

gain in preschool and infants and causes increased weight of them. The considerable point is weight gain due to effect of zinc sulfate is more in preschool children and infants. In studies done by Kaji *et al.* (1997) and (Codoceoj *et al.*, 1997) mentioned: Oral zinc supplementation not improved the height velocity in short girls children. The reasons for the difference in the effects between the sexes are not clear. They hypothesized that the predominance of the x-chromosome in females of Indian origin was the cause of the reduced height gain for the females in their studies. For further study is repaired to determine the mechanisms of the effects of zinc supplementation on growth and the causes of the gender differences. The other suggestion for research is using more children and also a longer supplementation period and a stricter morbidity protocol is needed to establish the role of zinc among children in developing countries. As it is observed, these studies demonstrated to the positive role of zinc sulfate supplementation in growth increase factors, especially height and can be an approval to the above study. It is also high lighted in our study that school age boys supplemented with zinc sulfate for 6 months shows improvement.

CONCLUSIONS

According to the results of this study, zinc sulfate supplementation has had useful impact in increasing the speed of height growth and upper arm span of the school age boys, but not have influence on the weight of school age boys. Thus, concerning most of the surveys in this field and also, in this study, the effects of zinc sulfate supplementation is positive and its daily consumption of 10-20 mg is advised to accelerate growth and achieve desirable growth factors. In children suffering issues like idiopathic dwarfism, growth delay and malnutrition, zinc sulfate must be taken into consideration as a part of treatment.

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