

The Role of Albumin in Adding Zinc to Vitamin A Supplementation on Taste Acuity and Body Weight in Wasted Children

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Abstract. A Randomized Double Blind placebo Pre Test Post Test Control Group Design of a single dose of 200.000 I.U of vitamin A with daily Zinc supplementation was done in wasted children in Bojonegoro. Children aged 4-5 years were randomized to received a single dose of vitamin A and zinc sulfate six days a week (n= 12) and single dose of vitamin A (n=120) placebo for six months. Children were evaluated taste acuity and the changing of body weight every month in 2 months. At the end of the study there were no significant increase of taste acuity in low albumin wasted children ($p>0.005$) but significant increase of taste acuity in normal albumin wasted children ($p<0.005$). There were significant increase of changes body weight in wasted children with low and normal albumin levels ($p<0.005$). These result suggest that adding zinc to vitamin supplementation increased taste acuity in wasted children with normal albumin levels. However, there was only increasing of body weight in wasted children under five years old with low and normal albumin levels. It could may play a key role control and strategies for low appetite children under five years old. Zinc can affect taste acuity on the tongue that affect the gustducin in mucosa of the tongue, which can improve taste function, so that it could increase appetite of underfive children.

Keywords: Zinc supplementation, Taste function, Changes of body weight, Albumin levels

1. Introduction

Zinc is critical for normal immune function and physical growth. Zinc deficiency seems to be common in developing countries and that makes children in those countries prone to infectious diseases (Wirjatmadi, 1998)

Zinc is one of the micro-nutrient substances that have a very important role in child development primarily related to its role in metabolic processes. In addition, the role of zinc on child growth could be demonstrated by the occurrence of stunted growth, failure to thrive due to anorexia. State of anorexia caused a shortage of nutrient intake of both macro-nutrients and micronutrients into the body and can also cause interference with cellular metabolism. Zinc was micronutrient that can affect the sense of taste on the tongue that affect the gustducin in mucosa of the tongue, which can improve the sharpness of taste function, so that it could increase appetite underfive children.

In the early 1970s, a pilot project to distribute 200,000 IU vitamin A capsules to approximately 100,000 children aged 1-5 years was launched in 20 districts of Java as a collaborative effort by the Government of Indonesia and Helen Keller International. That project represents one of the earliest phases of widespread - based supplementation activities in Indonesia. Based on the success of that initial pilot program, the GOI decided to expand vitamin A distribution activities to reach over 7 million children. At that time, the United Nations Children's Fund (UNICEF) distributed 200,000 IU vitamin A capsules to support the program activities (HKI, 2000)

Vitamin A Deficiency (VAD) continues to be a major public health concern in Indonesia. Although the Vitamin A Supplementation (VAS) program has been conducted for three decades In 1992, 50 percent of underfive children showed sub-clinical VAD as their serum retinol were less than 20 microgram/deciliter

(WHO, 1996). Periodic vitamin A supplementation is a major intervention to reduce morbidity, mortality, and blindness among children in Indonesia (Depkes, 1995).

Evidence of a positive effect of adding zinc in vitamin A supplementation on infection and linear growth, is hypothesized that, due to the potentially synergistic effect of adding zinc in vitamin A supplementation, dual supplementation with these two micronutrient would decrease infection and increase linear taste acuity.

2. Methods

2.1. Study Design and Population

The aim of this study was to discover and analyze the differences in taste acuity and body weight in malnourished infants 4-5 years with normal and low albumin level after zinc supplementation in District Bojonegoro.

Randomized pretest-posttest control group design research with double blind method under taken for 2 months continues measurement every 1 month. The population was children 4-5 years in District Bojonegoro. The samples were screened using the following criteria : malnourished infant 4-5 years and albumin level 3,5-5 g/dl. Screening by simple random sampling recieved 24 subjects. Using allocation random sampling subject they were divided into 2 group. Group one consisted in 12 subjects that received zinc supplement and group 2 consisted in 12 subjects that received placebo. Each child had prior to treatment a stool examination to detect worm infestation; children who had a positive stool test received treatment with Pirantel Pamoate tablet 7 days before the initiation of supplementation. Baseline history of fever, cough, cold, diarrhea and daily food intake, vitamin intake were recorded. After enrolment, children were allocated to either Zinc and vitamin A or a vitamin A in two blokcs by manual table random number selection (Wuegard, 1980).

2.2. Informed Concern and Ethical Clearance

Informed consent was obtained from parents or caretakers of children before participated on this study. Ethical Clearance was presentation in Research Center of Airlangga University

2.3. Supplement

The supplements Vitamin A 200,000 I.U, were distribution by Government Health Center every six month and syrup zinc for supplementation Airlangga Pharmacy syrup zinc were encoded for the two groups and these codes were kept off site in a secure place that could not be accessed by the study team, clinical staff, field workers, and parents. In the supplemented group each child received a single capsule of vitamin A contained 200,000 I.U and a bottle 20 cc of syrup zinc containing 0.37 mg of elemental zinc orally 1 teaspoon before going to bed. In the placebo group each child received a single capsule containing vitamin A 200,000 I.U and a daily placebo that consisted of a zinc-free syrup with glucose (placebo). The supplement and the placebo 6 days a week for 2 month.

2.4. Data Collection

During these research the following data were collected :

2.4.1 Clinical Assessment

Clinical assessments conducted by medical professionals are used to determine the nature, cause, and potential effects of a patient's injury, illness, fever or wellness.

2.4.2 Anthropometric Assessment

Height was measured twice, standing on a flat surface using a microtoise . The mean of the two measurements was calculated and entered as the child's height (Gibson, 2005). All anthropometric measurements were taken at monthly intervals for 2 months

2.4.3 Dietetic Assessment

The information on the dietary intake was elicited from a 24- h recall method. The children and their mothers provided all information. The interviews were conducted in the subject's homes. In order to assist the subjects in quantifying the food portion consumed, an food models showing foods and utensils was used (Gibson, 2005).

2.4.4 Biochemistry Assessment

Taste acuity data obtained from direct measurement of taste acuity.

2.4.5 Statistical Analysis

Techniques for data analysis of the results of research carried out by descriptive and analytical way by using the computer. The data were analyzed descriptively presented in tabulated form a frequency distribution, cross tabulation, the average value and standard deviation.

A Multivariate statistical analysis was used to determine the effect of zinc supplementation on taste acuity and changes in weight infants in the treatment group and control group together.

3. Results

3.1. Before and After Supplementation

Twenty six children were randomized and 2 children were unavailable for analysis because they migrated out of study area (1 in each group). The supplemented (n= 12) and control group n = 12) were similar term of age, health centre attendance, and biochemistry and anthropometric indexes. There was no difference in mean at baseline.

Homogeneity test result showed that there were homogeneity for all of variable tested, so that could be assumed that both of study group (trial and control group) became from same population (homogen).

From this study we found that 75% of infant in the treated group increased taste acuity after 1 month zinc supplementation and increased in all infant (100%) after 2 month zinc supplementation. Body weight increased 0,5-0,9 kg in 75% of infant after 2 months zinc supplementation. Analysis result showed that zinc supplementation in malnourished infants 4-5 years and albumin level 3,5-5 g/dl could increase taste acuity and body weight. Statistically result showed highly significant differences in the first post test and the second post test to the group in taste acuity with $p=0,001$ and $p=0,000$. In the body weight showed highly significant difference with $p=0,000$ and $p=0,000$.

4. Discussion

4.1. Differences in Taste Acuity

Before the intervention, taste acuity between the treatment and control groups were homogeneous ($p = 0.761$), after 1 month of statistical analysis that compares interventions taste acuity between the treatment and control groups showed a significant differences of 0.000 and after 2 months of the intervention show a significant differences of 0.000. This suggests that there are significant differences in taste acuity between the treatment and control group both after 1 month of the intervention and after 2 months of intervention.

Similarly, the results of statistical tests that compare the taste acuity in the treated group and control group. The analysis in the treatment group compared the difference between taste acuity before the intervention, one month after the intervention and 2 months after the intervention showed a significance of 0.000. This suggests that there are significant differences between taste acuity before, one month after the intervention and 2 months after the intervention in the treatment group.

However, statistical analysis that compares the difference between taste acuity before the intervention, one month after the intervention and 2 months after the intervention in the control group showed a significance of 1.00. This suggests that there was no significant difference between taste acuity before the intervention, one month after the intervention and 2 months after the intervention in the control group.

From the survey results revealed that after the intervention, showed no significant differences in sweetness taste acuity between the treatment and control groups. In the treatment group there are also significant differences of taste acuity. Whereas in the control group no significant changes. This suggests that administration of zinc in infants with normal albumin levels may increase the sensitivity of taste buds to taste sweet. The increased sensitivity of the sense of taste is very helpful to increase appetite toddler. Therefore, the success of supplementary feeding, the adequacy of zinc in food consumption is needed.

Provision of zinc will increase plasma levels of zinc and zinc saliva. Zinc levels in saliva associated with the function of taste buds, because the zinc in the saliva needed to synthesize gustin required in the establishment and maintenance of taste buds (Curzon, 1983). Changes in taste buds have an impact on food

selection and consumption levels that result in malnutrition, immunity, and decreased health status (Steven, 2000).

Concluded that zinc supplementation in infants with normal albumin levels can affect the taste acuity. Under normal circumstances adequate zinc intake will improve the structure of taste buds so that the sense of taste returned to normal function and a change of taste acuity improvement. Functioning of the sense of taste back impact on food selection and consumption levels which in turn will increase the weight infants.

4.2. Differences in Weight

Before the intervention, weight underfive children between the treatment and control groups were homogeneous. After the intervention, the results of statistical tests that compared weight loss after 1-month weight loss intervention between before the intervention, one month after the intervention and 2 months after the intervention in the treatment group showed no significant difference with p value = 0.079. Whereas in the control group also showed no significant difference with p value = 0.780. However, the results of a statistical test that compares the difference in weight gain in the treated group and control group showed no significant difference with p value = 0.000 after 1 month from intervention. This occurs because the difference in weight gain in the treated group after the intervention is greater than the difference in weight gain in the control group.

The difference in weight gain difference between the treatment and control groups for zinc in addition to improving the sensitivity of the sense of taste (Ameragon, 1998), zinc can alter appetite control by working directly on the central nervous system, changing the level of responsiveness to neurotransmitter receptors. Zinc deficiency is usually accompanied by changes in ability to taste and smell acuity, and also through anorexia and weight loss. Padalevel others, zinc participates in the synthesis of DNA and RNA are ultimately associated with cell division, differentiation chondrocytes, osteoblasts and fibroblasts, cell transcripts, synthesis of somatomedin-C, collagen, osteocalcin, and alkaline phosphatase. Alkaline phosphatase is produced in osteoblasts and provide calcium deposits on bone diafase. Zinc also plays a role in the metabolism of carbohydrates, lipids and proteins that in turn will lead to a better utilization of food (Riyadi, citation 2011).

From the description it was concluded that zinc supplementation in infants with normal albumin levels may increase the weight infants, through increased intake of nutrients better.

4.3. Relationship Between Taste Acuity and Weight

The results of statistical tests showed effect on taste acuity increased weight to the value of $p = 0.000$ and $r = 0.852$ strong relationship. This suggests that administration of zinc in infants with normal albumin levels will directly affect the quality improvement of taste buds that taste acuity for the better toddlers that will increase your appetite toddler. Increased appetite characterized by an increased consumption of energy, fat and protein in infants following administration of zinc. Increased consumption of nutrients will be followed by increased body weight infants. Increasing protein intake along with giving children zinc also enhances immunity, so children do not easily suffer from infectious diseases that result in weight loss.

Conclude that taste acuity have a strong relationship with weight gain through increasing appetite and nutrient intake better.

4.4. Limitation in This Study.

The limitation of the current study is that the number of subjects in the trial was small. We hope that our results will stimulate larger adding zinc in supplementation vitamin A trials in the stunted children under five year old.

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