HISTORY OF MANUSCRIPT PUBLICATION

(Biomedical & Pharmacology Journal)

Decreasing Zinc Levels in Stunting Toddlers in Lampung Province, Indonesia

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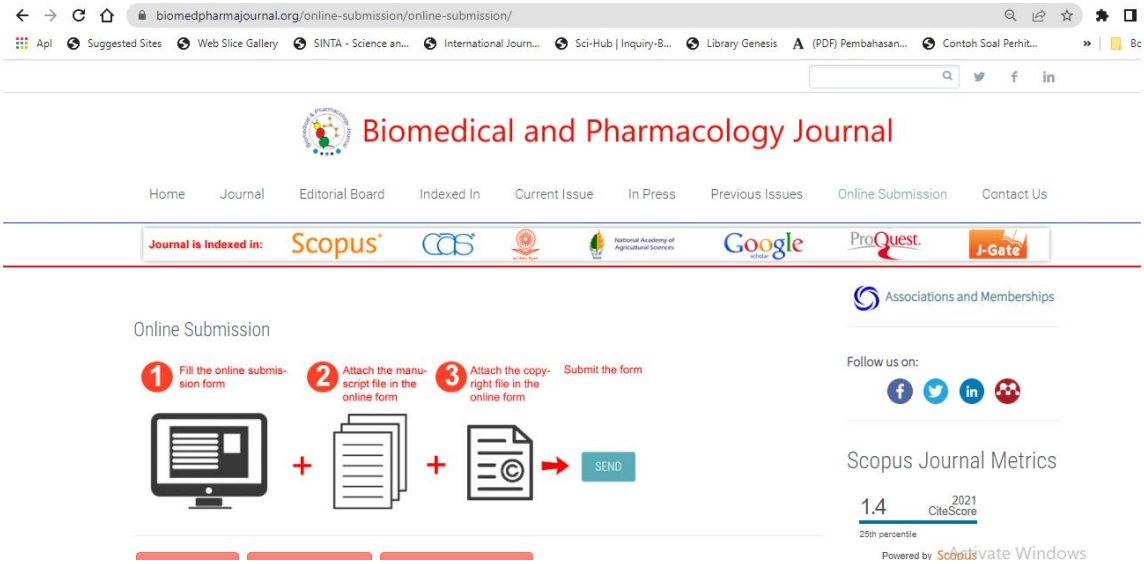

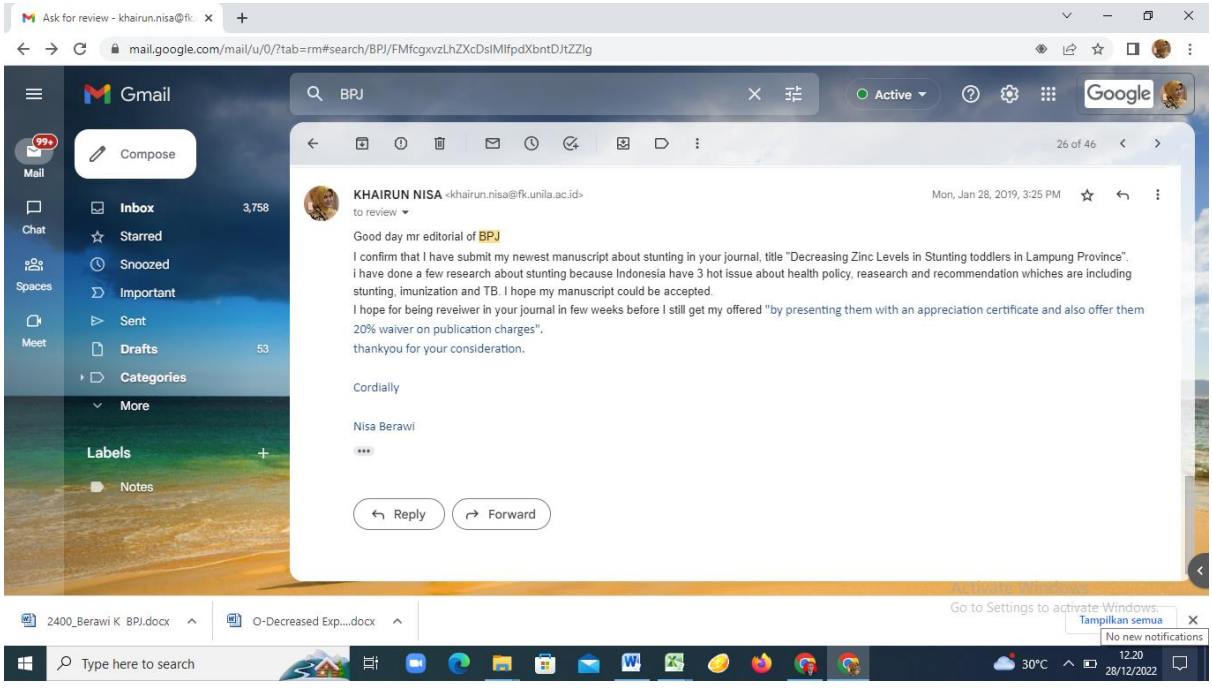

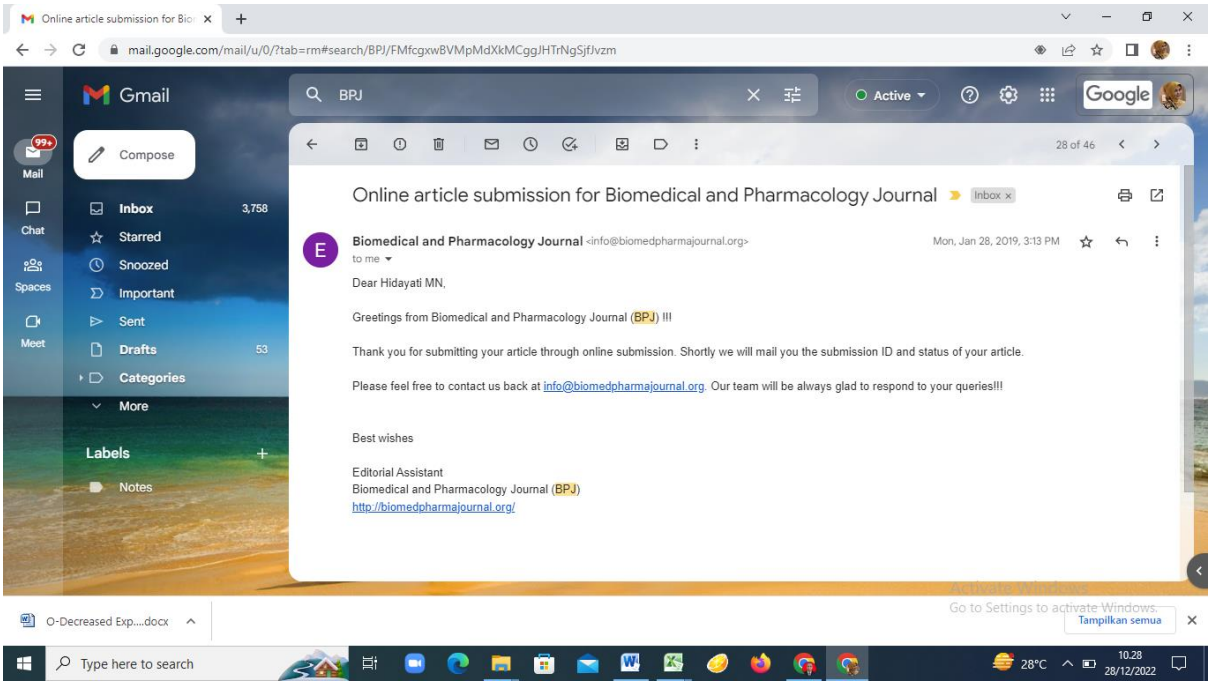
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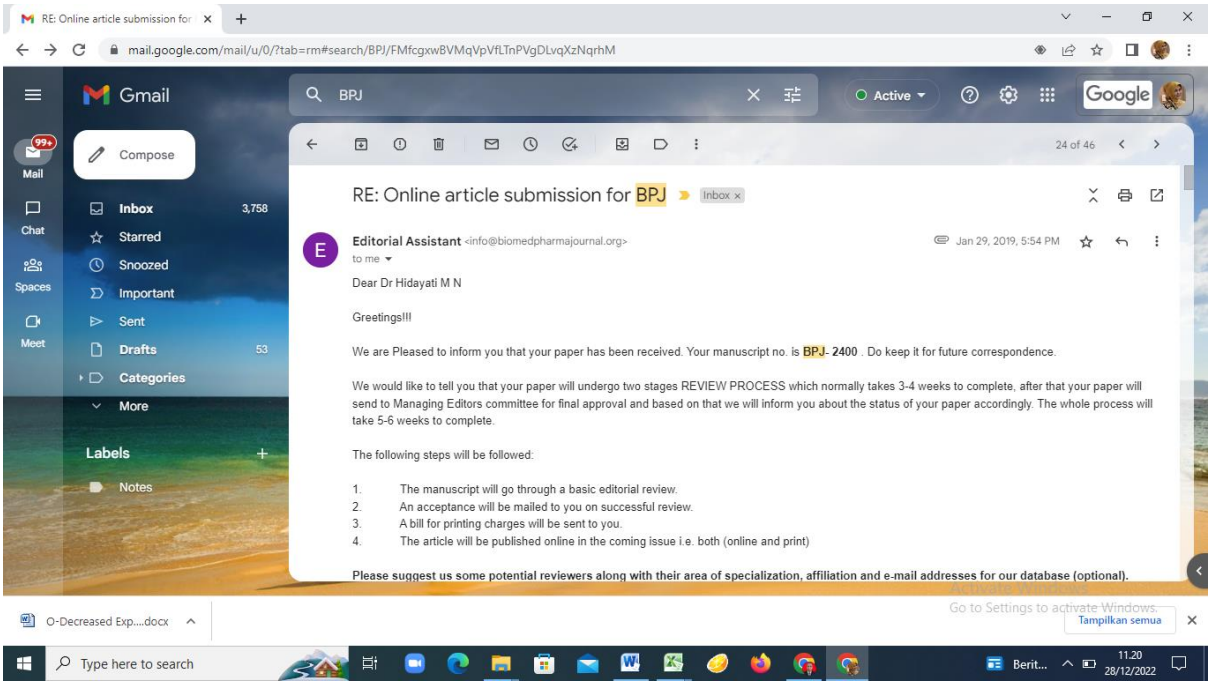

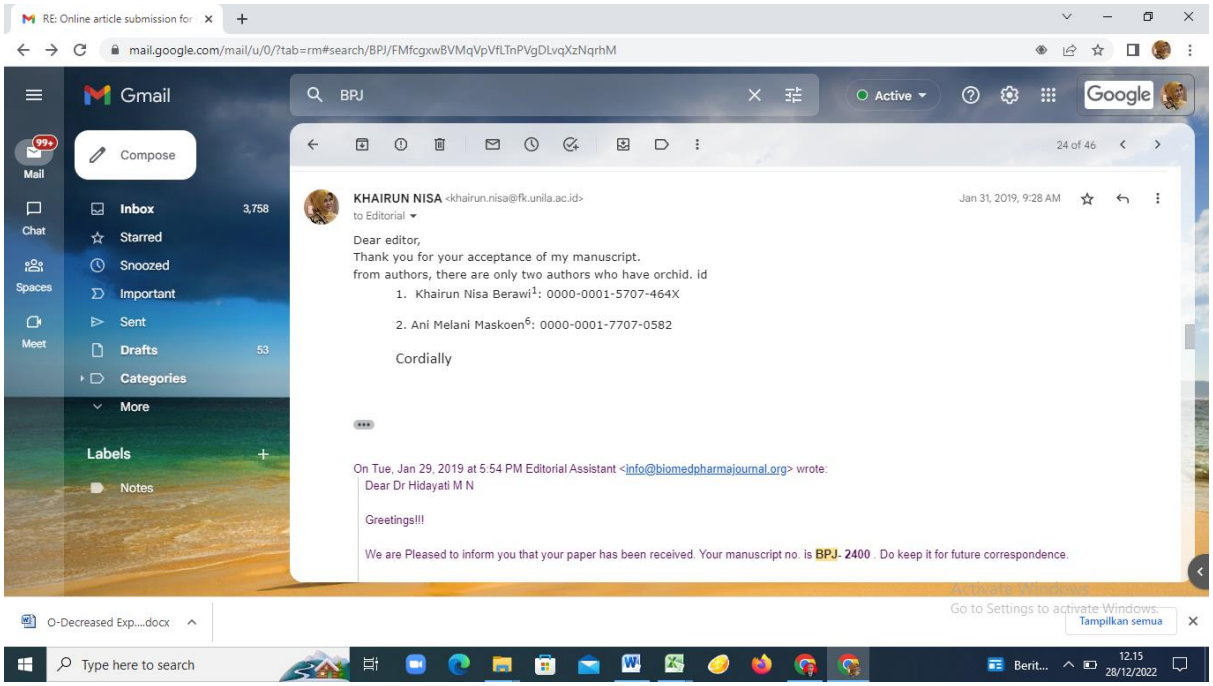

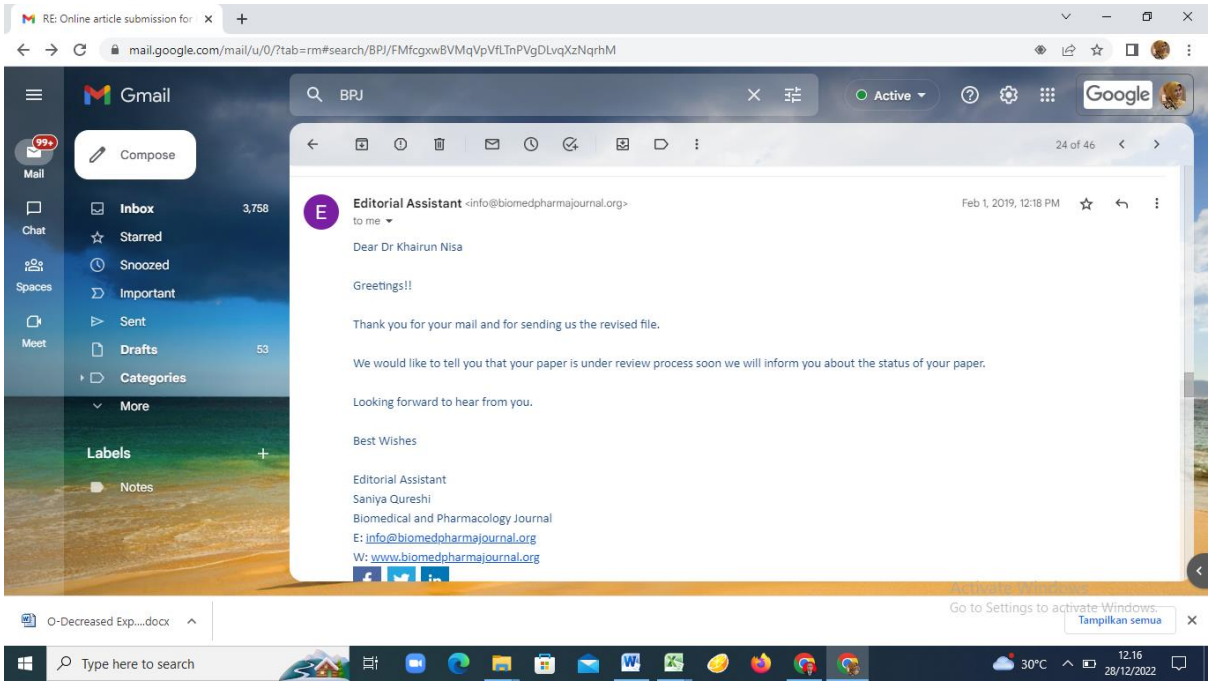
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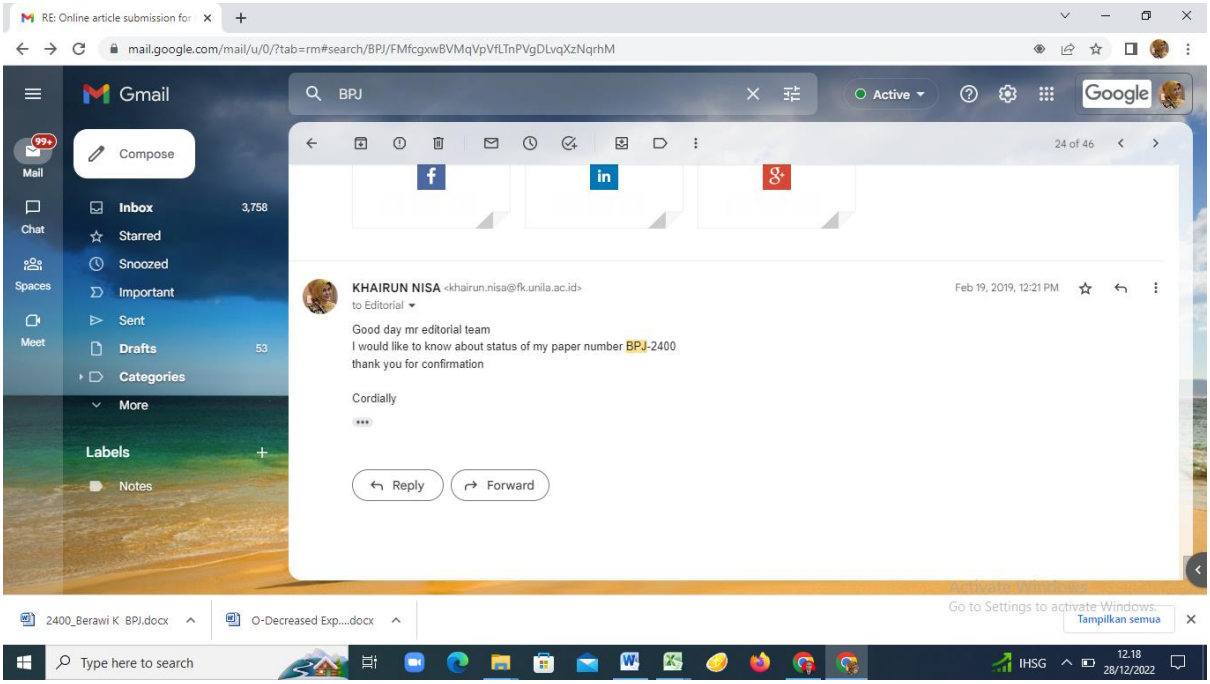

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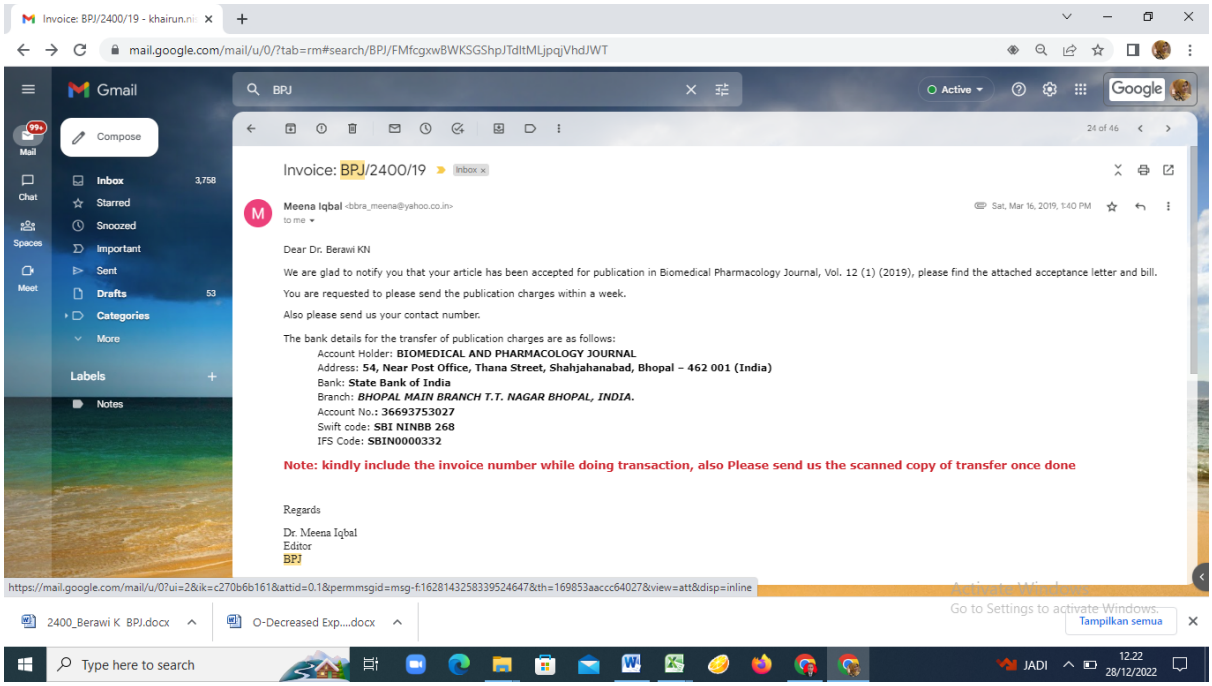

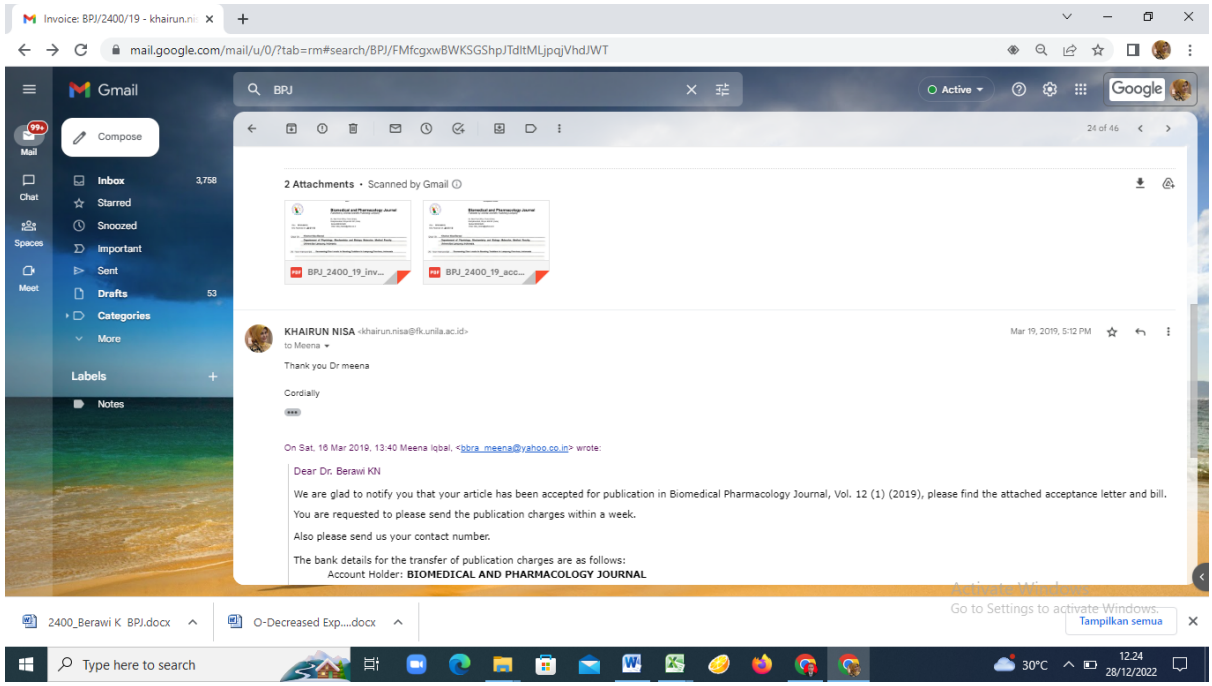

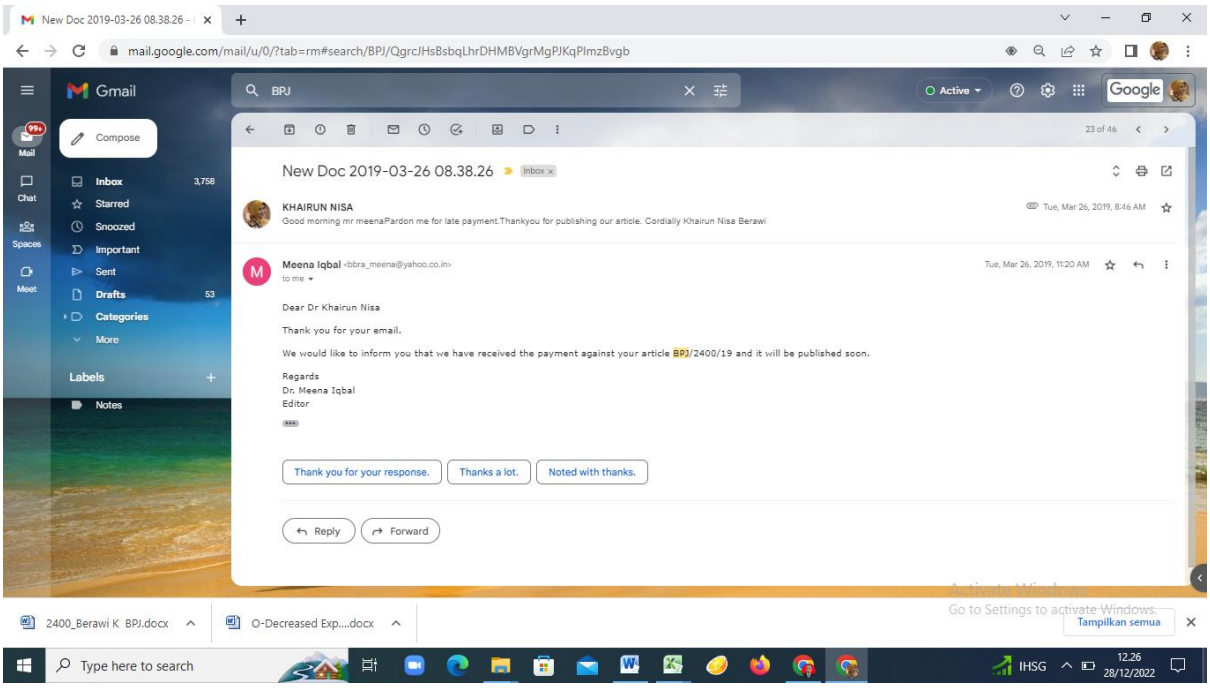
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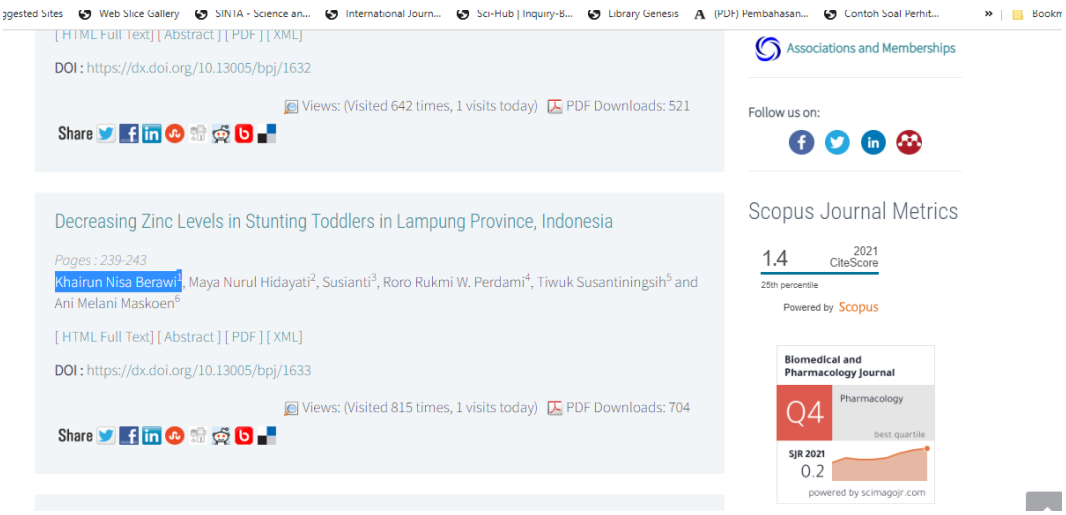

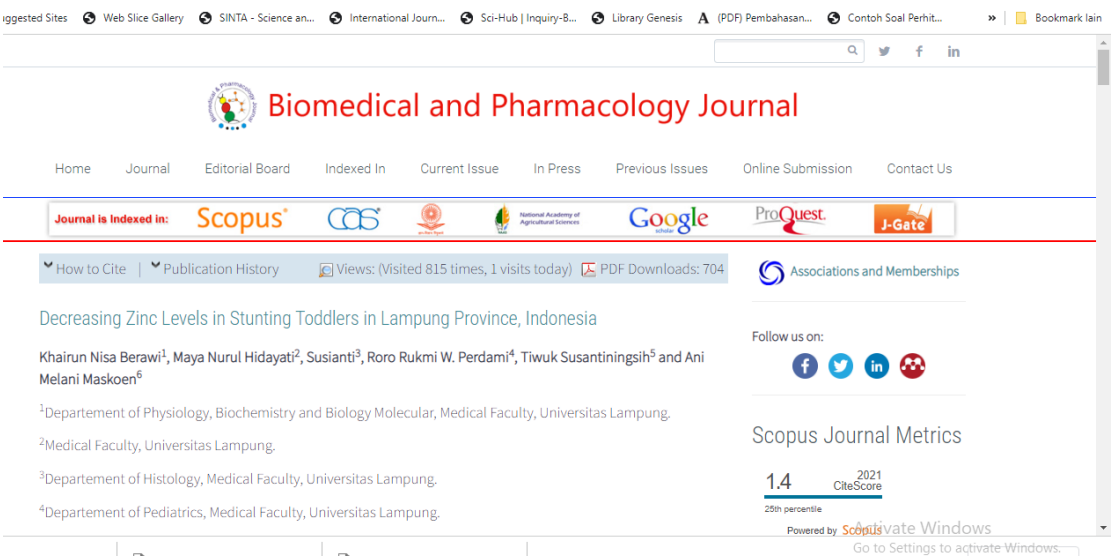

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Decreasing Zinc Levels in Stunting Toddlers in Lampung Province, Indonesia

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Stunting is a condition of chronic malnutrition in children that causes the posture is not optimal and triggers other disorders such as deacreasing of immunity and intelligence. The level of adequacy of zinc is one of the factors that influence the incidence of stunting. Zinc is needed to activate and begin the synthesis of Growth Hormone (GH) so that children with zinc deficiency cause GH receptors to be disrupted and GH production to be resistant. This study aims to examine the decrease in zinc levels by looking at the difference in mean zinc levels in stunting and non-stunting toddlers. The research method was carried out observational analytic with a cross sectional approach used in this study. The study sample was 40 toddlers aged 24-60 months with 18 stunting toddlers and 22 non-stunting toddlers in Gunung Sugih District, Central Lampung Regency. The results of univariate analysis revealed that the average zinc level of toddlers serum was 52.60 ug / dl with the largest value of 76 ug / dl and the lowest value was 24 ug / dl. The results of bivariate analysis showed that there were significant differences in the mean zinc levels of stunting and non-stunting children (p = 0.01). The mean zinc content of stunting infants was 45.06 ± 12.21 lower than the mean zinc level of non-stunting infants 58.77 ± 12.98. There is a decrease in serum zinc levels in stunting toddlers compared to non stunting toddlers.

Keywords: Stunting Toddlers, Zinc, Serum.

Stunting is a condition of chronic malnutrition that causes the body's posture is not optimal and cognitive abilities decrease. Globally in 2017 as many as 22.2% or one of four children aged 0-5years experienced stunting.[1] The results of basic health research in Indonesia in 2013 stunting prevalence was 37.2 percent, Lampung Province had the prevalence above the national average of 42.64 percent for children is very short and short, and Central Lampung has the highest prevalence. that is equal to 52.58 percent. [2,3]

There are several risk factors that influence the incidence of stunting including maternal knowledge about nutrition, family

income, exclusive breastfeeding, genetics, the level of adequacy of iron and zinc. Among these factors the most influential on the incidence of stunting is the level of sufficiency of zinc

Zinc is an essential mineral that has an important role in enzymatic processes, gene expression and cell stabilization. Zinc deficiency can cause disrupted growth and decreased immunity.5 Zinc is needed to activate and start the synthesis of growth hormones that play a role in the process of growth and development of toddlers. Low zinc levels will cause the Growth Hormone (GH) receptor to be disrupted and GH production become resistant and can inhibit the metabolite effects of GH so that the synthesis and secretion of Insulin Like Growth Factor 1 (IGF-1) decreases which can cause growth to stunt the child .[4,6]

Zinc confinement was first reported in boys and adolescents in Egypt, Iran and Turkey with short body shapes and sexual delay in the 1960s.[7] Zinc deficiency in infants and children can be caused by inadequate intake and availability, malabsorption , increased zinc loss from the body as in diarrhea.[8] Research in Kejawan Putih Tambak Surabaya in stunting and non-stunting infants concluded that toddlers with inadequate levels of zinc were at risk of 7.8 times greater stunting compared with children with zinc intake adequate.[6] In addition, according to the results of research conducted on stunting toddlers in urban and rural areas states that the level of adequacy of zinc greatly affects the incidence of stunting in infants in both rural and urban areas.[4] This shows that zinc has an important role in growth. This is what makes researchers interested in examining the decrease in zinc levels by looking at the difference in mean zinc levels in stunting and non-stunting children in GunungSugih District, Central Lampung Regency..

MATERIALS AND METHOD

This study used an observational analytic method with a cross sectional approach (cross section). This research was conducted at several posyandu in the working area of Gunung Sugih Health Center in Central Lampung in October-November 2018. The research sampling technique used consecutive sampling technique with a sample size of 40 people divided into 18 stunting balta and 20 non-stunting toddlers. The population in this study were stunting and non-stunting toddlers in Gunung Sugih District, Central Lampung.

The inclusion criteria in this study were toddlers aged 2-5 years with results of TB / U: stunting: -3 SD up to <-2 SD and non stunting: - 2 SD to 2 SD, and parental consent had agreement in informed consent. The exclusion criteria for this study were toddlers with zinc and Fe supplementation and toddlers with chronic diarrhea> 1 month. Primary data collection includes age, gender, height and serum zinc levels. Measurements of serum zinc levels were carried out in the Technical Implementation Unit of the Integrated Laboratory and Innovation Center of the University of Lampung using *a Microwave Plasma Atomic Emission Spectrometer* (MP-AES) device. Taking 3 cc blood samples was carried out in the cubital vein which was then centrifuged to become 1cc serum. Data were analyzed using the Independent T Test to determine differences in zinc levels of stunting and non-stunting children with normally distributed data.This study has obtained a research ethics permit from the Research Ethics Committee of the Faculty of Medicine, University of Lampung on 2018.

RESULTS

In the study found 40 respondents with the characteristics of respondents based on univariate analysis are as follows:

Table 1 shows that the number of samples of male sex is 5 toddlers (13%) stunting and 8

Table 1. Characteristics of gender-based and age-based in toddler

Characteristics Gender	Groups	N=40	Percentage (100%)
Male	*Stunting*	5	13
	Non stunting	8	20
Female	*Stunting*	13	33
	Non Stunting	14	35
Age			
24-35 months	*Stunting*	7	18
	Non stunting	11	28
36-47 months	*Stunting*	6	15
	Non stunting	4	10
48-60 months	*Stunting*	5	13%
	Non stunting	7	18%

Table 2. Results of examination of Zinc serumlevels in all toddlers

Levels	Mean	Minimum	Maximum	Standard Deviation
Zinc serum	52,60	24	76	14,26

Table 3. Distribution of Zinc serumlevels in stunting and non stuntingtoddlers

Nilai	Stunting	Non stunting
Minimum	24	36
Maximum	64	76
Mean±SD	45,06±12,21	58,77±12,98

Table 4. Independent T Test Test Results find out the difference in mean levels of Zinc serum between stunting and non-stunting toddlers

	Average Level of Zinc Serum (SD)	Mean difference	p value (p <0,05)
Non stunting	58,77 (12,98)	13,717 (5,62-21,8)	0,001
Stunting	45,06 (12,21)		

toddlers (20%) non stunting, while the number of female samples is 13 toddlers (33%) stunting and 14 toddlers (35%) non stunting. This figure shows that the number of female respondents is more than the male sex in the stunting and non-stunting groups. Based on the age of the number of samples aged 24-35 months as many as 7 toddlers (18%) stunting and 11 toddlers (28%) non stunting, for the number of samples aged 36-47 months as many as 6 toddlers (15%) stunting and 4 toddlers (10 %) non stunting while the number of samples aged 48-60 months was 5 toddlers (13%) stunting and 7 toddlers (18%) non stunting.

Table 2 shows that serum serum zinc levels averaged 52.60 ug / dl with the lowest zinc content of 24 ug / dl and the highest value was 76 ug / dl and the standard deviation value was 14.26.

Table 3 shows that the results of serum zinc levels in stunting toddlers have an average zinc level of 45.06 ug/dl with the highest levels of 64 ug/dl and the lowest levels of 24 ug/dl. Whereas the results of serum zinc level testing in non-stunting infants showed an average of 58.77 ug/dl with the highest levels of 76 ug /dl and the lowest levels of 36 ug/dl. Based on these data non-stunting toddlers have higher serum zinc levels than stunting toddlers.

Based on the results of the independent t test in table 10 the results are 0.001 which means that there is a statistically significant difference in zinc levels in stunting and non-stunting children because the value of p <0.05.

DISCUSSION

The serum zinc level in infants in research is 52.60 ug / dl with the lowest value of 24 ug/dl and the highest value of 76 ug/dl. In accordance with the reference serum zinc values are said to be normal if> 65 ug/dl, [9] the serum zinc average in infants in research is below the normal value. In the 75% percentile of toddlers in this study had low zinc levels and only 25% of toddlers had normal zinc levels.

Zinc is an essential micromineral that has many function and role in the body, thats are: stabilizing cell membranes, helping the body's defense against free radical attacks, play a role in the body's immune system, as well as the process of growth and development. Zinc also plays a role in the synthesis, storage and release of the insulin hormone in the pancreas, although it does not have a direct role. Zinc interacts with platelets in the process of blood clotting, affecting the function of thyroid hormones.Zinc is needed to produce the active form of vitamin A (retinal) in pigment-vision, wound healing, sperm formation, fetal development and taste sensations (Whitney, Rolfes, 2005).[16]

Low serum zinc levels in infants can be caused by several factors such as inadequate intake

due to malnutrition, malabsorption, increased excretion, systemic abnormalities and tissue damage.[9,17, 20] The prevalence of zinc deficiency in children and adolescents is 5-30% that occurs in various countries.[11] Zinc deficiency can cause health effects such as the weakening of the immune system as a result of an increased prevalence of infectious diseases in children, can also occur barriers to the process of growth and development in infants, children and adolescents. [18]

Based on the results of statistical calculations after the Independent t test was tested, the results showed that there were differences in the mean serum zinc levels in stunting and non-stunting infants. The mean serum level of stunting for toddlers was 45.06 ug / dl and mean serum zinc levels for non-stunting children were 58.77 ug/dl and the average difference was 13.71 ug / dl. This is in line with the results of a study conducted by Pramono *et al* (2016) which showed the results of the average serum zinc levels of children with a normal TB / U index higher than stunting and severely stunting children. [13]

Research conducted in Cameroon in 2014 also stated that the prevalence of serum zinc deficiency was higher in stunting children than non-stunting children.[14,19] Another study conducted by Hidayati (2010) stated that children with low zinc intake had a risk of 2.67 times greater experience of stunting.[15]

CONCLUSIONS

Based on the previous description, the conclusion of this study is that There is a decrease in serum zinc levels in stunting toddlers compared to non stunting toddlers

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