# Effects of Nutritional Status on Stress Response in Group B of Kindergarten Students at DKI Jakarta Province

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### Abstract

*This study aims to determine the effect of nutritional status on stress response in young children. The research type used ex-post facto through survey method in group B of 6 (six) kindergartens and in total 120 students were selected by multistage cluster random sampling technique in DKI Jakarta Province. The results showed that nutritional status has a direct negative effect on stress response. This means that the increasing of nutritional status will decrease child's stress response.*

*Keywords: Nutritional status, stress response*

### Introduction

Children development at the early age is a very important moment for development at the next age. The data showed that about 385 million children live in poverty in the world and one in five children in developing countries live in poverty including Indonesia [1]. Other issues that need attention are child nutrition, based on the reports from *United Nations Children's Fund* (UNICEF), *World Health Organization* (WHO), and *Association of South East Asia Nations* (ASEAN) explained that some children are obese; others experience growth restrictions and severe shortages body. The proportion of child growth problems in Indonesia is the same, i.e. 12% overweight, the other 12% are underweight [2]. Moreover, children violence is an iceberg phenomenon in Indonesia, as evidenced by a report of *Indonesian Child Protection Commission* (KPAI) citing an increasing in number of violent complaints and child involvement on legal matters by 15% in 2016 [3]. Poverty, malnutrition, resulting in a child's stress response will have an impact on future child development.

Nutrition status is a food, laboratory, anthropometric, and clinical information of a person or population influenced by intake and use of nutrients. An assessment of nutritional status is an interpretation of information, so that it can determine the nutritional status of a person or a particular population. The concept of nutritional status according to Detsky *et al*., it is the balance of food intake and the body needs to maintain a healthy body composition and function or normal limit [4].

Stress response is the body's reaction to danger that includes nervous system, endocrine system and physical response such as increasing heart rate and release of energy to enable a "fight or flight" response. So with this stress response, there is an increasing in body capacity to deal with danger, either against or fleeing [5].

Stress in children is still a problem that has not been completed until now in Indonesia. The researcher considers that it needs to conduct research in order to determine whether the nutritional status is one of the factors triggering on stress response in young children aged 5 years old, especially in DKI Jakarta as a barometer of education Indonesia.

### Research Method

This research was conducted in Johar Baru Kindergarten, Johar Baru Sub district, Central Jakarta, DKI Jakarta in June 2017. The research type used ex post facto with survey method and target population is all group B of Kindergarten students in DKI Jakarta Province. Total number of kindergarten students in DKI Jakarta Province is 91.827 participants. Sampling technique used is multistage cluster random sampling with 4 stages. The sampling of the secondary groups was done randomly; the selected cluster was Johar Baru Sub-district, consisting of 6 clusters of 120 students selected randomly based on the minimum number of samples. The randomly selected Custer consists of Indriasana Kindergarten (10 students of group B), Johar Baru Kindergarten (15 students of group B), Satu Atap Kindergarten (20 students of group B), Parkit Kindergarten (12 students of group B), Islam Al Jihad Kindergarten (42 students of group B), and Aisyiyah Kindergarten 97 (21 students of group B).

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Nutritional status data obtained through anthropometric measurements of height and weight. Meanwhile, stress response data obtained through laboratory tests of cortical hormone levels in children's saliva.

**Results**

The result of descriptive statistics of nutritional status and stress response in table 1 below:

**Table 1** Result of Descriptive Statistics of Research Data

| Annotation | Nutritional Status | Stress Response |
|---|---|---|
| Mean | 15.57 | 0.22 |
| Error Standard | 0.27 | 0.01 |
| Median | 14.640 | 0.2400 |
| Modus | 14.06 | 0.312 |
| Deviation Standar | 2.70 | 0.11 |
| Variance | 7.2734 | 0.0127 |
| Range | 13.02 | 0.397 |
| Minimum | 12.40 | 0.024 |
| Maximum | 25.42 | 0.421 |
| Score total | 1588.32 | 22.849 |
| Sample size | 102 | 102 |

*Nutritional Status*

Based on the nutritional status data obtained through anthropometric measurements of height and weight, it was found that children with the nutritional status of underweight, normal, obese, and obesity is described as follows:
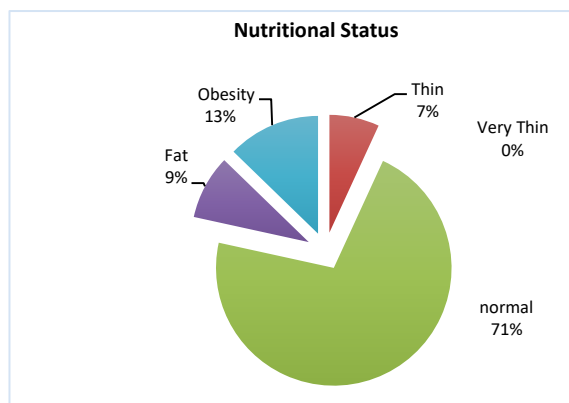


**Figure 1** Distribution Data of Nutritional Status

Based on figure 1, it showed the most nutritional status of normal nutrition, as many as 73 children (71%). 13% of children with obesity status (over nutrition), 9% of children with obese status, and 7% of children with skinny category. There is not any data of children with nutritional status is very thin.

*Stress Response*

Data of the most normal stress response are 98 children (96%), can be seen in the following figure:
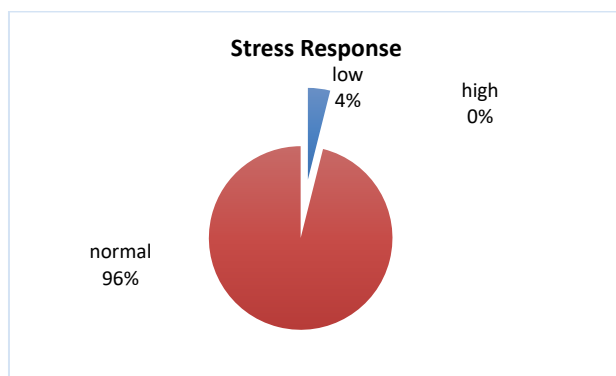


**Figure 2** Distribution Data of Stress Response

**Table 2** Distribution of stress response frequency data by sex, age, and nutritional status

| | Stress Response | | | Total |
|---|---|---|---|---|
| | Low | Normal | High | |
| Sex | | | | |
| Male | 2 | 45 | - | 47 |
| Female | 2 | 53 | - | 55 |
| Age | | | | |
| ≥ 5 years old | 1 | 18 | - | 19 |
| ≥ 6 years old | 2 | 68 | - | 70 |
| ≥ 7 years old | 1 | 12 | - | 13 |
| Nutritional Status | | | | |
| Very thin | - | - | - | - |
| Thin | - | 7 | - | 7 |
| Normal | 1 | 72 | - | 73 |
| Fat | 1 | 9 | - | 9 |
| Obesity | 2 | 13 | - | 13 |

**Table 3** Distribution Frequency Response Stress Score

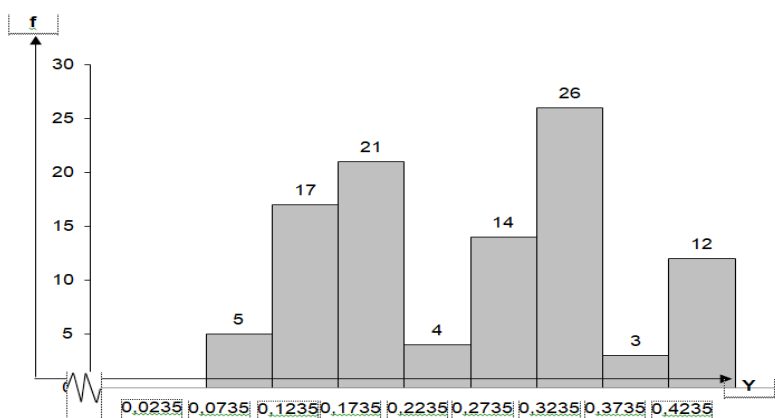| No | Interval class | | | Limit | | Frequency | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Lower | Upper | Absolute | Relative | Cumulative |
| 1 | 0.024 | - | 0.073 | 0.0235 | 0.0735 | 5 | 4.90% | 4.90% |
| 2 | 0.074 | - | 0.123 | 0.0735 | 0.1235 | 17 | 16.67% | 21.57% |
| 3 | 0.124 | - | 0.173 | 0.1235 | 0.1735 | 21 | 20.59% | 42.16% |
| 4 | 0.174 | - | 0.223 | 0.1735 | 0.2235 | 4 | 3.92% | 46.08% |
| 5 | 0.224 | - | 0.273 | 0.2235 | 0.2735 | 14 | 13.73% | 59.80% |
| 6 | 0.274 | - | 0.323 | 0.2735 | 0.3235 | 26 | 25.49% | 85.29% |
| 7 | 0.324 | - | 0.373 | 0.3235 | 0.3735 | 3 | 2.94% | 88.24% |
| 8 | 0.374 | - | 0.423 | 0.3735 | 0.4235 | 12 | 11.76% | 100% |
| | | | | | | 102 | 100% | |



**Figure 3** Histogram Chart of stress Response Data

Laboratory results of cortisol hormone in children's saliva, there is not any data obtained with high stress response. The following table is complete frequency distribution of stress response.

Data of stress response have empirical scores range between 0.024 up to 0.421, so the range of a score is 0.397. The result of data calculation is an average of 0.22; standard deviation of 0.11; variance of 0.0127; median of 0.2400; and mode of 0.312. The grouping of data can be seen in frequency distribution table as in table 3.

Here's a histogram chart of the distribution of stress response data as shown in the following figure 3.

**Discussion**

*Effect of Malnutrition on children's stress response*

Malnutrition status and more equally have an impact on child's body stress response with the change of cortical level compared with children with normal nutrient status. Poor nutrition in childhood is a global health problem of nutrition in society. Malnourished children often experience hunger that causes a stress response in their bodies. Hunger is an unpleasant sensation of the stomach that comes suddenly due to lack of food intake, which can affect learning. Hungry children will be disturbed by this hunger and cannot pay attention and respond to educational stimulation. Although many factors influence children behavior, children with poor nutritional status will be tired easily, have little energy, cannot concentrate, and difficulty to improve their potential [6].

Poor nutrition also causes metabolic stress, which led to increase levels of body cortical with the absence of normal levels diurnal (day time) cortical hormone and the retardation on clearance of hormone cortical. Fasting will suppress the production of proteins that bind to cortical in the blood, thereby free cortical levels increased [7].
Based on explanation above, it can be suspected that the malnutrition is directly negative effect on stress response. If the nutritional status is lower so stress response is higher also.

Overall, effect of malnutrition status on stress response can be illustrated in the following diagram:
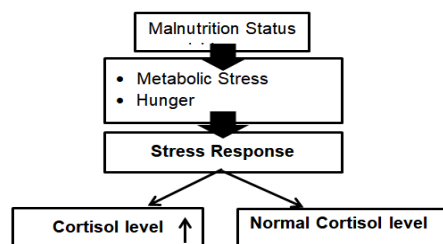


**Figure 4** Effect of malnutrition status on stress response in young children

### Effect of More Nutritional Status on Child's Stress Response

The effect of more nutritional status on stress response is still not known clearly. This may happen because impaired HPA axis that occurs in obesity and metabolic disorders of body [8]. There are two conflicting research results. Research conducted by Kjolhede *et al*, aims to investigate the relationship of salivary cortical levels with body mass index in 342 children aged 6-12 years old. The results showed that levels of salivary cortical in children overweight and obese have better nutritional status than normal [9]. Levels of cortisol obtained through obese child saliva are lower than normal children.

It is different from research conducted by Veldhorst *et al*., also aims to compare the level of cortical hair of 20 obese children with normal. The results showed that hair cortical aims to measure long-term exposure to long-term cortical in obese children compared with normal. This suggests a long-term presence of HPA axis in obese children [10]. The difference in these researches may be due to differences in the method of measuring cortical levels.

Based on description above, it can be suspected that the nutritional status is more directly positive effect on stress response. The higher of nutritional status, the stress response is also higher.

### Effect of nutritional status (balanced) on the child's stress response

The research results are consistent with the results research of Freemark [11] in Uganda children with severe malnutrition. One of research showed that malnourished children had high levels of cortical. When malnourished children are given nutritional therapy in the form of *ready-to-use therapeutic food* (RUCTF) and micronutrient supplementation, cortical levels decrease dramatically. Increasing the nutritional status of the child through a given nutritional therapy lowers cortical levels. Thus, it was concluded that nutritional status had a negative effect on child's stress response.

Poor nutrition in childhood is a global health problem of nutrition in society. Malnourished children often experience hunger that causes a stress response in their bodies. Hunger is an unpleasant sensation of the stomach that comes suddenly due to lack of food intake, which can affect learning. Hungry children will be disturbed by this hunger and cannot pay attention and respond to educational stimulation. Although many factors influence children behavior, children with poor nutritional status will be tired easily, have little energy, cannot concentrate, and difficulty to improve their potential [12].

Poor nutrition also causes metabolic stress, which cause the increasing of levels of cortical body in the absence of normal levels diurnal (daytime) cortical hormone and retardation in clearance of cortical hormone. Fasting will suppress the production of proteins that bind cortical in blood, thereby free cortical hormone levels increased [13].

Based on the findings, it proved that nutritional status (normal) has direct negative effect on stress response. So that it can be concluded that the child's stress response is direct negative effect on nutritional status. The increasing of nutritional status will decrease child's stress response.

### Conclusion

The results showed that nutritional status has a direct negative effect on the stress response in group B of kindergarten students in DKI Jakarta. This implies that the increasing of nutritional status will decrease stress response in young children.

### Acknowledgements

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