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A Review of The Effect of Nutritional Status on Gross Motor Skills of Early Childhood

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Abstract. Nutrition is an essential factor for children's development. Nutrition is substances in food that the body needs to function properly. Adequate nutrition is essential for growth, health, and development of children. Nutritional status is a measurement of a person's body condition that can be seen from the food consumption and the use of nutrients in the body, or the physiological state of an individual, which resulted from the relationship between nutrient intake and requirements and from the body's ability to digest, absorb, and use the nutrients. The purpose of this research is to investigate the effect of nutritional status on gross motor skills development in early childhood. During the early childhood period, the child is vulnerable to the problem of nutritional status or malnutrition/obesity, which affect proper growth and development as well as day-to-day physical and mental functions. If the children miss the opportunities of normal development due to influences of environmental factors, they undergo the risk of future retardation. The undernourished children decrease their activity levels and they will become more apathetic. This in turn affects their social interactions and cognitive functioning. The nutritional status will be determined using weight and height measurements and the age of the children. The test of gross motor development for preschool by Ulrich (2000) is the tool used for measuring the gross motor skills.

Keyword: Nutrition Status, Gross motor skills

INTRODUCTION ~ Obesity is a global health problem in the world, both in developed continents such as Europe and America and developing continents such as Asia and Africa (Prentice, 2006). Childhood obesity is a serious public health challenge in the world with 43 million preschool-aged children overweight or obese with a prevalence of 6.7% (De Onis et al., 2010). According to the World Health Organization (WHO, 2014), obese children and adolescents are at high risk of developing various health problems, and the children tend to be obese adults. The number of children who are overweight or obese almost doubled from 5.4 million in 1990 to 10.6 million in 2014. Nearly half of children under the age of 5 who are overweight or obese in 2014 lives in Asia.

Based on data from Basic Health Research (Riskesdas) in 2017 shows that in Indonesia, the prevalence of obesity (Body Mass Index or BMI ≥ 25-27 and BMI ≥ 27) was 33.5%, while the obese population with BMI ≥ 27 alone was 20.7%. In the obese population, the prevalence is higher in women (41.4%) than in men (24.0%). Prevalence is higher in urban areas (38.3%) than in rural areas (28.2%). Whereas according to age group, obesity is highest in the age group of 40-49 years (38.8%).

Obesity causes impaired motor ability in children. In doing activities, children feel tired more quickly, children's movements become inflexible and obstructed, unlike in children with normal body weight. So that children tend to be unable to do activities for long periods of time and are slow to do things (Wati, 2010).

Children can get various kinds of movement experiences if their nutritional needs are met. Children with good nutrition will look nimble, active, and always eager to participate in various activities that affect the child's motor development. Similarly, poor nutritional status in children can result in children's motor development that is not optimal.

Food or nutrition is a basic need for human life to support daily activities, and for the growth and improvement needed. Food consumed in various types with various processing will affect the growth and development of children. Therefore, eating patterns in children are very important, especially the content and nutritional value of the foods consumed.

Nutrition is a substance needed by the body to perform its function. These nutrients are obtained from the food consumed. Food consumption will affect one's nutritional status. A good nutritional status will occur if the body gets adequate intake of nutrients and in accordance with the body's needs. This needs to be considered by parents in meeting the nutritional needs of their children so that the child's growth and development process can be optimal.

The nutritional status of children can be assessed by looking at the nutritional status. Nutritional status is a measure of success in fulfilling nutrition for a child as indicated by the child's weight and height. Nutritional status is also defined as health status which is produced by a balance between nutrient needs and inputs. Poor nutritional status results in slow child development, which indicates the amount of nutritional intake obtained does not meet the needs of nutrients received by the body, especially by the brain, consequently it will interfere with the child's development. Gross motor skills require good brain and muscle performance; therefore, children need good nutrition (Wauran, Kundre, & Wico, 2016).

Nutritional status is one indicator in determining children's health. Good nutritional status can help the optimal child development process. Good nutrition will help the body's defenses so that the body will be good. Nutritional status can help to detect the risk of child health problems early. Nutrition status monitoring can be used as an anticipation in planning children's health improvement (Hidayat, 2008).

If the child's nutritional status is good, it can help the child's growth and development process in achieving optimal maturity (Hidayat, 2008). Health care for children must also be considered so that health problems in children do not occur so that growth and development in children is not disrupted, for example health care for children can be done by conducting health checks, immunizations, and monitoring children's growth by weighing children regularly every month (Soetjiningsih, 2012).

According to data obtained from WHO, 5-25% of preschool children experience

minor brain dysfunction, one of which is impaired fine motor development (Widati, 2012). Also, data obtained from UNICEF in 2011 showed that there are still a high number of events in growth and development disorders in children under five, especially in motor development disorders with a percentage of 27.55% or equivalent to 3 million children who experience the disorder.

The Indonesian Ministry of Health (2006) also reported that 0.4 million or 16% of children under five in Indonesia experience developmental disorders, both gross and fine motor development, hearing loss, lack of intelligence, and delayed speech. From the Basic Health Research (Riskesdas) data in 2010 concerning data on growth and development disorders in children, in Indonesia it reached a percentage of 35.7% and it was classified as a high public health problem according to WHO because it was still above the 30% percentage.

Republic of Indonesia's Ministry of Health (2016) in monitoring nutritional status said that there were 38.9% of children under five in Indonesia who are experiencing nutritional problems, especially toddlers with short and normal weight and height, and 23.4% who were potentially overweight. The prevalence of malnutrition in infants is 3.4% and malnutrition is 14.4%. The prevalence of short toddlers tends to be high at 8.5% in very short toddlers and 19.0% of short toddlers. The prevalence of skinny toddlers is 3.1% and 8.0% on very skinny toddlers.

Data from Basic Health Research (Riskesdas) in 2018 showed an improvement in the nutritional status of children under five in Indonesia. The proportion of nutritional status who is very short and short decreased from 37.2% (Riskesdas, 2013) to 30.8%. Likewise, the proportion of malnutrition and malnutrition status decreased from 19.6% (Riskesdas, 2013) to 17.7%.

Malnutrition can cause growth disorders of children who are late that is not able to reach maximum weight and height, low endurance, children are susceptible to disease, and do not have good body development (Pudiastuti, 2011).

RESULT

1. Concept of Nutrition and Nutrition Status

Nutrients are substances obtained from food consumed which have very important values depending on the types of food that are useful for the maintenance process, growth, and development process as well as for obtaining energy for daily physical activities (Marsetyo and Kartasapoetra 1995: 1).

Food consumed by humans must have good nutritional qualities in order to be of maximum benefit to the body. According to Djoko Pekik Irianto (2007: 5), various nutrients needed by the body can be

classified into six types namely Carbohydrates, Protein, Fat, Vitamins, Minerals, and water.

Nutritional status is the health condition of individuals or groups determined by the degree of physical need for energy and nutrients obtained from food and food whose physical impact is measured anthropometrically. Nutritional status is a state of the body as a result of food consumption and use of nutrients that are divided into very poor nutritional status, poor nutritional status, good nutritional status, and over nutritional status (Almatsier, 2005).

Nutrition is one of the important factors that determine the level of health and harmony between physical development and mental development. The level of normal nutritional status is reached when optimal nutritional requirements are met. A person's nutritional level in a period is not only determined by the consumption of nutrients in the past, even long before that time (Budiyanto, 2002).

Djoko Pekik Irianto (2007: 65) added that nutritional status is an expression of a state of equilibrium in the form of certain variables or it can be said that nutritional status is an indicator of good or bad daily food supply. This is in line with the opinion of Suhardjo (2008: 15) which stated that nutritional status as a state of the body that is caused by absorption and use of food.

Nutritional status is the health condition of individuals or groups that is determined by the degree of physical need for energy and other nutrients obtained from food and food whose physical impact is measured anthropometrically (Suhardjo, 2003). Then according to Soekirman (2000), nutritional status means the physical health condition of a person or group of people determined by one or two combinations of certain nutritional measures and is the state or level of health of a person at a certain time due to food in the previous time.

Various types of nutritional status are as follows:

1. Malnutrition

   Circumstances where insufficient nutritional input is due to insufficient intake, indigestion, or absorption (Alfyan M Taufik., 2010). There are three forms of malnutrition:

   a. Mild malnutrition, which is lack of nutrition which is characterized by growth inhibition.
   b. Moderate malnutrition, which is almost the same as mild malnutrition, but clinical signs and symptoms are more common.
   c. Severe malnutrition, for example marasmus, kwashiorkor, or both. Marasmus is a form of malnutrition that is caused by severe and chronic lack of protein calories, often found in infants. Kwashiorkor is a protein deficiency accompanied by other nutrient deficiencies that are

commonly found in infants and toddlers.

2. Good Nutrition

The state of the body that reflects the balance between consumption and use of nutrients by the body.

3. Overweight

Excessive accumulation of fat in subcutaneous tissue or other tissues.

4. Obesities

Excessive accumulation of fat in all tissues. Obesity is usually caused by energy input that exceeds the body's needs and is usually accompanied by a lack of physical activity.

According to Andriyanto (2010), nutritional status assessment often uses anthropometric measures which are divided into 2 groups which include:

1. Age dependent
   a. Weight (BB) towards age
   b. Height (TB) towards age
   c. Head circumference (LK) towards age
   d. Upper arm circumference (LLA) towards age
2. Not dependent on age
   a. Weight towards height
   b. Upper arm circumference towards height

Then, the measurement results are compared with certain standard values, for example Harvard standard and NCHS or national standard.

1. Weight

Body weight is one measure that gives a picture of tissue mass and body fluids. Body weight is very sensitive to sudden changes, both due to infectious diseases and decreased food consumption. Body weight is used in the body weight/age index (body weight by age). Body weight is the most widely used because it only uses one measurement and depends on the age. However, the body weight/age index is less able to describe the tendency of changes in nutritional status over time (Andriyanto, 2010).

2. Height

Height gives a picture of growth function as seen from a state of emaciation and shortness. Height is very good to see the state of nutrition in the past, especially related to the state of low birth weight and malnutrition in the previous period. Height is used in the Height/Age index (height by age) or Weight/Height index (weight by height). The use of the Weight/Height index is clearer and more sensitive in showing nutritional status when compared to the body weight/age index (Andriyanto, 2010).

To find out nutritional deficiencies or excesses, nutritional status assessments can be done in the form of measurement of Body Mass Index (BMI), which is also a measure of children's growth. According to the Centers of Disease Control (CDC), nutritional status in children is divided into good nutrition, mild malnutrition, moderate malnutrition, severe malnutrition, overweight, and obesity. BMI measurement is one of the anthropometric measurements to determine a person's body composition. BMI is widely used with the formula:

$$\text{BMI} = \frac{\text{Weight (Kg)}}{\text{Height (m2)}}$$

The BMI threshold according to WHO distinguishes between men (normal 20.1-25.0) and women (normal 18.7-23.8).

Table 2.1. BMI Threshold Category

Classification	Interpretation
< 16.0	*Severe Thinness*
16.0 – 18.49	*Moderate Thinness*
17.00 – 18.49	*Mild Thinness*
18.50 – 24.99	*Normal*
25.00 – 29.99	*Grade 1 overweight*
30.00 – 39.99	*Grade 2 Overweight*
≥ 40.0	*Grade overweight*

The CDC-NCHS 2000 reference standard is established as a comparison in the nutritional status and growth of individuals and communities in Indonesia. This standard is explained in the percentile and Eid index provisions of the BMI. Nutritional status measurement results based on the Eid Index can be classified as percentile of severe malnutrition (< 3rd), moderate malnutrition (3rd-5th), mild malnutrition (5th-10th), good nutrition (10th-85th), overweight (85th-97th), and obesity (≥ 97th).

According to Soekirman (2000), the factors that influence nutritional status are divided into two:

1. Direct

The direct cause of malnutrition in children is food consumption and infectious diseases. Both causes are mutually influential. Thus, the emergence of malnutrition, not only because of lack of food but also because of infectious diseases, especially diarrhea and acute respiratory infections.

2. Indirect

a. Nutritional Care

Nutritional care is a practice in the household that is realized by the availability of food and health care for the survival, growth, and development of children.

b. Psychology

A person's psychological condition can affect diet. Overeating or undereating can occur in response to loneliness, grieving or depression and can also be a response to stimuli from outside such as food advertisements.

c. Genetic

Genetic is one of the factors of nutritional status because in children with over nutritional status or obesity is likely to be influenced by their parents (hereditary).

d. Health Services

Other indirect factors are access or affordability of children and families to clean water and health services. These health services include immunizations, antenatal care, childbirth assistance, and weighing.

2. Gross Motor Skills Concept

Motorik is a translation of the word "motor" which according to Gallahue in Samsudin

(2008: 23) is a biological or mechanical basis that causes motion to occur. In other words, motion is the culmination of an action based on motor processes.

Zukifli in Samsudin (2008: 24) explained that what is meant by motor is everything that has to do with body movements. He further explained that in motor development there are three elements that determine it, namely muscles, nerves, and brain. These three elements carry out their respective roles in positive interactions, meaning that one element is interrelated, mutually supporting, and complementing each other to achieve a more perfect motor condition. A child whose brain is impaired seems to be less skilled at moving his/her body.

One aspect of development that is quite significant in the life of kindergarten children is physical development. In terms of aspects of individual physical development, Kuhlen and Thompson in Saputra Yudah M. and Rudyanto (2005: 16) explained that in general, the physical development of kindergarten-age children includes 4 aspects, namely:

1. The nervous system, which is very closely related to the development of intelligence and emotions.
2. Muscles that affect the development of strength and motor skills.
3. Endocrine glands that cause the emergence of new behavioral patterns, such as in adolescence, humans will develop a feeling of pleasure to be active in an activity; sometimes the members consist of the opposite sex.
4. Physical/body structure which includes height, weight, and body proportions.

Purpose and function of gross motor:

1. The objectives of the early childhood motor skills development program model include the development of gross motor skills, namely:

1). Able to improve movement skills. 2). Able to maintain and improve physical fitness. 3). Able to instill an attitude of confidence. 4). Able to behave in a disciplined, honest, and sportive manner.

The aim of developing teaching materials for the motor skills development program model according to Sumantri (2005: 9) is to serve as a guideline for Kindergarten Teacher Education Program (PGTK), kindergarten teachers, play group educators, caregivers and managers of the Child Care Park (TPA), and parents in developing early childhood motor skills that are appropriate to their growth and development.

2. The function model of an early childhood motor skills development program, after knowing the purpose of developing motor skills, the function of its development should be known. The function model of the gross motor skills development program is:

a. As a means of promoting physical growth and development, spirituality, and health for early childhood.

b. As a tool to shape, build, and strengthen the body of early childhood.
c. As a tool to practice the skills and dexterity of motion, and the power of thinking of early childhood.
d. As a tool to improve motor physical development.
e. As a tool to enhance social development.
f. As a tool to foster feelings of pleasure and understand the benefits of personal health.

Motor is used as a general term for various forms of human motion behavior. While psychomotor is used to study the development of motion in humans. So, motor scope is broader than psychomotor. Although synonyms are commonly used with motoric terms, psychomotor refers to movements called electronic vibrations from large muscle centers.

According to Bambang Sujiono (2007: 37) aspects of ability in children's gross motor skills can be seen from the child's motor elements which include the following:

1. Strength, which is a person's ability to generate tension, as the child's muscle strength must be possessed early on, then muscle strength can be developed through muscle exercises such as running, jumping, throwing, climbing, hanging, and pushing.
2. Endurance, which is the body's ability to supply the oxygen needed to carry out activities. Endurance is given in the form of slow running or brisk walking at a distance, muscle endurance can be provided with exercises such as jumping, running upstairs, pushing, and pulling that is done repeatedly in a relatively long time.
3. Speed, which is a skill that is based on flexibility in a certain time unit. Speed can be done by providing fast-paced training activities, for example by running short distances.
4. Agility, which is the ability of a person to move quickly, for example, running fast and then stop suddenly, the speed of reaction, and make changes in direction of movement quickly.
5. Coordination, which is an ability that includes two or more abilities of motion patterns, for example in the game of catching a ball.
6. Accuracy, is an activity that can be done in early childhood such as throwing a small ball to a certain target or putting the ball into the basket.
7. Balance, which is divided into two types, namely statistical balance and dynamic balance. Statistical balance is the ability to maintain certain body positions not to sway or collapse, while dynamic balance is the ability to keep the body from falling during movements. Activities that can be done are walking on the beam, loading balance with one foot, resting the other leg straight back while both hands straight side to side with the

eyes closed or following the style of movement on an airplane.

According to Bambang Sujiono (2007: 38), in general the gross motor skills of children aged 5 years are grouped into activities as follows:

1. In running activities, children aged 5 years can run and control the movement of them almost like an adult.
2. In jumping, the movements can be combined with other movements such as running then jumping.
3. In throwing, the children can throw in the right motion, by stepping the right foot forward while throwing.
4. In capturing, children can catch small balls using the palm of the hand.
5. In bouncing, the skill can be done by using a ball. Bouncing the ball fosters eye and hand coordination that is used to aim the ball down.

3. Relationship between Nutritional Status and Gross Motor Skills

The problem of malnutrition is not only caused by the reduced amount of consumption, but also due to the weakening of people's purchasing power, and low nutritional quality is also caused by the large number of people who are lack of knowledge about the importance of fulfilling nutrition since infancy (Coordination Team for the Control of Food and Nutrition Problems, 2009). Preschoolers (1-5 years old) are a group that needs to be considered for their nutritional needs, because they are in their infancy. Lack of nutritional needs during childhood will not only result in disruption to physical growth but will also cause a disruption in the child's mental development. Children who suffer from malnutrition after reaching adulthood will not be as tall as they could have achieved, as well as underdeveloped muscle tissue (Sutarta, 2008). Soetjiningsih (1995) also mentioned that children development includes physical, cognitive, emotional, language, motor (gross and fine), personal, social, and adaptation development. Many factors affect children growth and development process. However, one important factor is nutrition. Nutrition consumption greatly affects the nutritional status of children. Incorrect nutritional intake can result in over or under nutritional status. In addition, nutrition influences development, ability to respond to stimuli, and resistance to infectious diseases (Sulistyoningsih, 2011: 5). Motor development is one of the factors in children development, and because nutrition affects children's development, so children with poor nutritional status will retract activities in their environment (Rosidi, et. al: 2012). Mahendra and Saputra (2006) stated that motor development is strongly influenced by nutrition, health status, and motion treatment in accordance with the period of its development. Therefore, anatomically, development will occur in an individual's body structure that changes proportionally as a person age. Poor nutritional status will inhibit the rate of

development experienced by individuals, and as a result, the proportion of body structure becomes incompatible with the person's age which in the end all of that will have implications for the development of other aspects.

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