

# Nutritional Status of Children Aged 6-17 Years: The Condition during the COVID-19 Pandemic Reviewing Weight Indexed by Height

Diajeng Tyas Pinru Phytanza<sup>1,2</sup>, Erick Burhaein<sup>3,4,\*</sup>, Carla Cristina Vieira Louren<sup>5</sup>, Budiman<sup>4,6</sup>, Jamaludin Yusuf<sup>7,8</sup>, Angkit Kinasih<sup>9</sup>, Maharani Fatima Gandasari<sup>10</sup>, Bangkit Seandi Taroreh<sup>11</sup>

<sup>1</sup>Department of Special Education, Faculty of Education, Universitas Negeri Yogyakarta, Yogyakarta 55281, Daerah Istimewa Yogyakarta, Indonesia

<sup>2</sup>Doctoral Program of Education Science, Faculty of Education, Universitas Negeri Yogyakarta, Yogyakarta, 55281, Daerah Istimewa Yogyakarta, Indonesia

<sup>3</sup>Department of Sports Education, Faculty of Teacher Training and Education, Universitas Ma'arif Nahdlatul Ulama Kebumen, Kebumen, 54316, Jawa Tengah, Indonesia

<sup>4</sup>Doctoral Program of Sports Education, School Postgraduates Studies, Universitas Pendidikan Indonesia, Bandung, 40154, Jawa Barat, Indonesia

<sup>5</sup>Department of Sport of Science, University of Beira Interior, Covilhã 6201-001, Portugal

<sup>6</sup>Physical Education Health and Recreation, STKIP Pasundan, Cimahi, Jawa Barat, 40512, Indonesia

<sup>7</sup>Department of Physical Education, Faculty of Health Sciences, Universitas Muhammadiyah Pekajangan Pekalongan, Pekalongan, 51173, Jawa Tengah, Indonesia

<sup>8</sup>Doctoral Program of Sports Education, School Postgraduates Studies, Universitas Negeri Semarang, Semarang, 50237, Jawa Tengah, Indonesia

<sup>9</sup>Physical Education Health and Recreation, Fakultas Kedokteran dan Ilmu Kesehatan, Universitas Kristen Satya Wacana, Salatiga, Jawa Tengah, 50711, Indonesia

<sup>10</sup>Department of Sports Education, Faculty of Teacher Training and Education, Universitas Tanjungpura, Pontianak, 78124, West Kalimantan, Indonesia

<sup>11</sup>Department of Sports Education, Faculty of Teaching Science Education and Language, Universitas Bina Dharma, Palembang, 30111, Sumatera Selatan, Indonesia

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**Abstract** This study aims to find out the nutritional status of students based on height and weight. Study participants were randomly selected from two countries: Indonesia and Portugal. This study is a quantitative descriptive study using survey methods, instruments for the calculation of weight index by height in children aged 6-17 years. The study used measurements of weight and height. Data collection techniques using anthropometric measurements that include measurements of weight and height are then calculated based on data analysis

techniques using quantitative descriptive with percentages. The results of the above study and discussion concluded that the nutritional status of children aged 6-17 years during the COVID-19 pandemic was reviewed and the weight index by height was the majority in the normal category. This study has implications for 1) Helping children understand the importance of nutritional status for development and growth, especially for those who do not fall into the normal category and; 2) Children are expected to maximize the role of physical activity to improve the

physical freshness and nutritional status of students. Then, this study contributes to future research that is the need to include certain free variables to be known the dominant variables in affecting nutritional status in children.

**Keywords** Aged 6-17, Children, Nutritional Status, Pandemic

## 1. Introduction

Coronavirus (COVID-19) is an infectious disease caused by the SARS-CoV-2 virus [1]–[3]. Most people who contract COVID-19 will experience mild to moderate symptoms and will recover without special treatment [4]–[6]. However, some people will experience severe pain and need medical help. Various countries in the world are currently experiencing shock in various sectors of life. One of the sectors affected is the health sector. It also affects the nutritional level of the world community as a result of the weakening of the country's economy so it also affects the welfare of people's lives. Nutritional fulfillment is needed to maintain the body's immunity during the COVID-19 pandemic [7]–[9].

Instability in anthropometric parameters occurs in body weight. Nutritional needs are balanced with the presence of nutritional intake and the development of weight by the change in age into a normal state experienced by a person [10]–[12]. But if the opposite happens when a person has experienced a condition called abnormal. This will result in weight changes that occur to run slower than normal.

Weight check that is reviewed regularly the results will have an impact as a form of prevention to overcome the possibility of unwanted weight gain or loss where continuous nutritional interventions will be carried out. Assessment of the nutritional status of children is done by comparing the results of measurements of weight and length/height with standard anthropometry [8], [13], [14]. The visible condition in excess fat, either localized to a certain part or overall is a form of state commonly called obesity. Pandemics experienced by the whole world has a considerable effect or impact in almost all sectors of human life.

World Health Organization (WHO) has determined that COVID-19 becomes a pandemic threat that is currently being experienced by the whole world. [15]–[17]. The current state of the pandemic cannot be disputed how its fate will be in the future. Currently what can be done by the whole world and one of them is as a form of prevention to minimize the current situation so as not to increase the impact. One of them that can be done at this time is the implementation of the form of activities carried out at home both in the field of work, education, and others.

Many people spend longer doing activities online at home and this is seen from a percentage of about ninety-one percent of the sample stated so. While the other

fact that the increase in weight of 2.5 - 5 kg with the achievement of twenty-two percent of the results obtained from the total sample that the height of this percentage is seen from the form of response of the senses of sight, smell, stress management, by eating this is different when compared to those who claim not to change the behavior at all [18]–[20].

Health losses will be experienced by obese people if not handled properly. Where this can restore a person's quality of life becomes decreased and the amount of spending for health interests that swell. So it is not uncommon to be declared bring obesity be the cause of premature death/death at a young age, which is the cause of obesity, among others, obesity becomes the prefix of several degenerative diseases that are very deadly such as cardiovascular disease, heart disease, stroke, hypertension, DM, cancer, Alzheimer and sleep apnea [21]–[23].

The importance of nutrition for elementary school students both for growth, development, and physical fitness [24]–[26]. Not only nutrition is the importance of healthy living behaviors that also need to be socialized to students so that they can get used to behaving in a healthy life. Every teacher or educator and parent of students should always control the state of the student's condition both physically (nutritional status) [27]–[29], and mentally (student behavior) [30]–[32] in accustoming to healthy living both from food, personal hygiene, and the surrounding environment, so that it can be detected early if experiencing disorders that later affect the growth of children.

For people with nutritionally underweight status (thin) and people with more nutritional status (overweight), the body's defenses become weak, making it easily infected [16], [33], [34]. Therefore, we need to maintain good nutritional status (normal) that is by having an ideal body weight and height. For those who are less weight, it is necessary to increase intake to achieve the ideal body weight, while the overweight can reduce the intake of certain food ingredients to lose weight and do not forget to be coupled with regular exercise [15], [35], [36].

Fulfillment of good nutrition will affect the process of growth and development of a person, in addition, to also affect the process of maintenance of cells in the body and metabolism in the body [20], [37]–[39]. Nutrition has a very important role from still in the womb until old age. Therefore, the provision of a balanced nutritious diet is needed, so that the body will not be malnourished. Poor nutrition will affect physical, mental, and thinking growth.

Knowledge of children and adolescents who are lacking about nutritious food will affect the selection of food consumption. Children often have the habit of not having breakfast, irregular diet, and snack habits, drinking less water so that nutritional intake cannot be met properly [11], [40], [41]. Therefore, the role of nutrition is very important for the body for the growth and development of children. To know about the picture of health caused by the food

consumed is an obligation for teachers, caregivers, and parents.

Malnutrition has a major effect on concentration and learning achievement in students and decreases the quality of human resources in the future. The personality and physicality of students must be formed early from small as provisions to continue to a higher level, thus cooperation from all parties is needed to participate directly in supporting programs to improve or improve nutrition in children [41]–[43].

Nutritional intake is very important for children during pandemic times like now, according to the statement of WHO nutritionists who stated that during this pandemic we know the intake of fruits and vegetables must be increased because it contains vitamins C and E that can increase our body's immunity [10], [44], [45].

Responding to the pandemic situation, through the Healthy Living Community Movement, WHO issued Guidelines for Balanced Nutrition [10], [17]. Whose goal is to issue these guidelines is expected by applying these guidelines in everyday life, it is expected that the public, especially school-age children, has stronger endurance to avoid several of diseases.

Children are the next generation of the nation. Human development must begin from the beginning, at this time the child must get enough attention, especially in terms of nutritional adequacy. With the maintenance of quality and quantity of nutrition, it is expected that children can learn well so that children have real knowledge, skills, abilities, and behaviors in everyday life.

During the Covid-19 Pandemic, people are encouraged to adopt a healthy lifestyle by exercising, maintaining distance, diligently washing hands, using masks, and eating nutritious food [46], [47]. As we know, the Covid-19 pandemic attacks the human body that has low immune power. The importance of nutritional intake during the Covid-19 pandemic is very important to support endurance.

To deal with the current situation, optimal body defense is needed. In terms of nutrition that needs to be considered, among others, maintaining normal nutritional status, and applying balanced nutrition guidelines in everyday life. The nutritional status of everyone can be known by looking at weight and height.

It is therefore important to uncover the problem of "How students' nutritional status is based on height and weight during pandemics". So, from the formulation obtained the purpose of the study is to find out the nutritional status of students based on height and weight.

## 2. Materials and Methods

### 2.1. Research Method

This research is quantitative descriptive research [6],

[38], [48]. The research method used is a survey. The survey is a technique of gathering information that is done by compiling a list of questions asked by respondents in the form of a sample of a population [2], [5], [28]. In survey studies, researchers examined the characteristics of causal relationships between variables in the absence of intervention [24], [29], [39], [41].

### 2.2. Participant

Participants in this study were selected with the provision of a random sampling technique [49]. Before data retrieval, researchers communicate with participants to explain the purpose of the study and the entire research process. Their participation in the study requires the consent of participants to be willing to participate or not. About participants' involvement in the study, researchers explained in detail the purpose of the study, and they were assured that their participation in the study was voluntary and that their data would only be used for research purposes. Students are required to give written permission as proof of their willingness to follow the study.

An additional participant determination technique is to look at different participant regions. Participants in this study came from two countries, namely Indonesia, and Portugal. The difference between these two countries is on different continents so it certainly requires. The difference between participants is environmental, behavioral, and cultural factors that can produce a direct effect on weight and height. Researchers determined the minimum-maximum value on the height and weight of children ages 6-17 years (see Table 1). The number of participants who received data was 104 children with male and female genders from Indonesia and Portugal. The participants are described in detail in Table 1.

**Table 1.** Research Participant Statistics

Information	Statistical Figures
Gender	
Man	46
Woman	58
Total	104
Ages 6-17 years old	
M	12.34
SD	2.13

### 2.3. Instrument

The next stage is the determination of the instrument. Measuring instruments are important as a tool in measuring something that will be measured precisely and consistently. Measurement of nutritional status generally uses 1) Index

of body mass index (BMI) in adulthood (17-69 years), and 2) Standard nutrition index at the age of children (6-17 years). Because this study involved participants at the age of children, it uses the standard provisions of the nutrition index.

This is a standard instrument of nutrition index that is reviewed by height so that it is valid and reliable [50]. Research intrusions using weight and height measurements were then consulted based on the weight index calculation category based on height in children aged 6-17 years. The results of height measurements are then included in the formula which is further analyzed and interpreted in category form.

## 2.4. Data Collection Technique

Data collection techniques using anthropometric measurements that include measurements of weight and height are then calculated based on the calculation of weight index according to height in children aged 6-17 years then explained about the process of implementing weight and height measurements, then the child is guided to take measurements.

The implementation of weight measurements is as follows 1) Participants wear shorts and stand barefoot; 2) Testi stands upright on the scales, 3) Weight measurement is carried out with digital scales with the sensitivity of 0.1 kg and; 4) The measurement results are recorded in kilograms (kg).

After getting weight data, the next one is to measure height. As for the implementation of height measurements, that is, 1) Participants wear shorts and stand by bringing their back closer to the measuring pole; 2) Testi stands upright with the position of the legs tightly and the head and body are tight with the pole; 3) The measuring instrument is pulled until it touches the head, 4) The participant's height is measured by a scale with a sensitivity of 0.1 cm, and; 4) The measurement results are recorded with units of centimeters (cm).

## 2.5. Data Analysis

This study used a percentage descriptive analysis technique to find out the picture of nutritional status by measuring weight with units of kilograms (kg) and height with units of meters (m) then calculated by a table based on the calculation of weight index according to height in children aged 6-17 years.

The formula used to calculate nutritional status is this formula of index [50].

$$\text{Index} = \frac{\text{Weight}}{\text{Height}}$$

Then to determine the nutritional status with the criteria described in Table 2.

**Table 2.** Categorization of the Nutritional Status Index

Index	Nutritional Status Category	Threshold
Nutrition Index reviewed Weight by Height	Very Thin	<-3SD
	Thin	-3SD s/d <-2 SD
	Normal	- 2 SD s/d 1 SD
	Fat	>1SD s/d 2 SD
	Obesity	>2 SD

Source: Kemenkes RI [48]

After the data is obtained, the data is analyzed to conclude the research that has been done. To analyze data is used statistical analysis techniques with percentages, with the following formula of percentage [50].

$$\text{Percentage} = \frac{\text{Frequency}}{\text{Total Participant}}$$

## 3. Results

### 3.1. Descriptive Statistical Data

The results of research on the nutritional status of children are known by measurements of height and weight. The description data from the results of the study can be seen in Table 3.

**Table 3.** Descriptive Statistics Data

Information	Statistical Figures
Weight	
Min.	100.15
Max.	180.64
M	120.24 cm
SD	5.34 cm
Height	
Min.	20.32 Kg
Mix.	75.67 Kg
M	45.35 Kg
SD	4.32

The raw data results are then processed using the standard formula of the nutrient index, then the results are interpreted in the form of five categories. The results of the nutritional status measurement can be seen in Table 4.

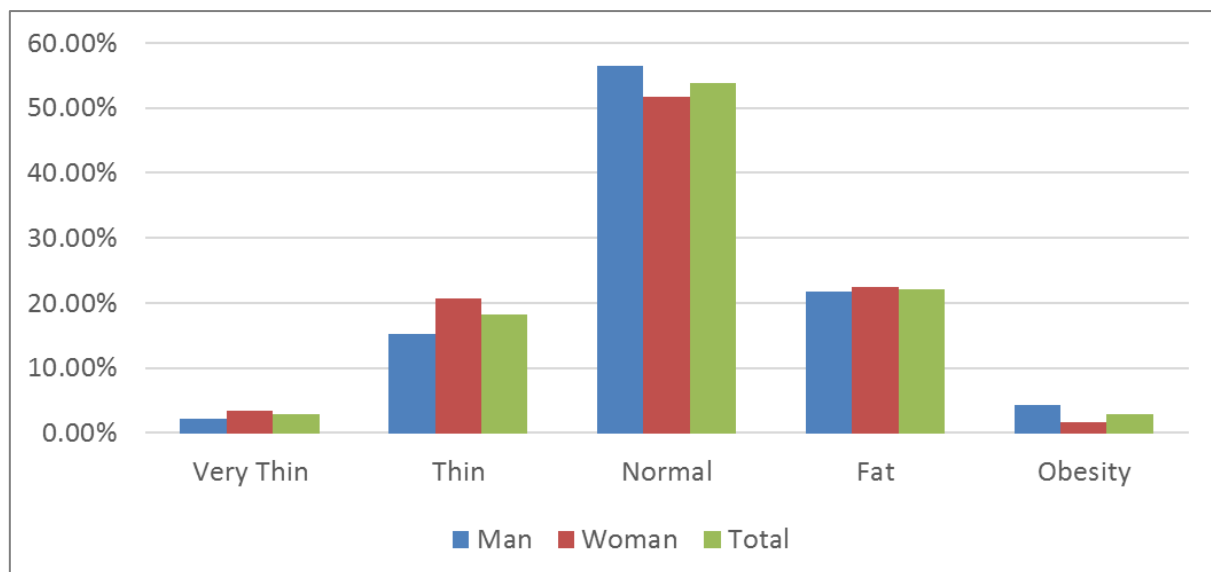


Figure 1. Nutritional Status Measurement Diagram

Table 4. Nutritional Status Measurement Results

No	Category	Man		Woman		Total	
		Frequency	%	Frequency	%	Frequency	%
1	Very Thin	1	2.17	2	3.45	3	2.88
2	Thin	7	15.22	12	20.69	19	18.27
3	Normal	26	56.52	30	51.73	56	53.85
4	Fat	10	21.74	13	22.41	23	22.12
5	Obesity	2	4.35	1	1.72	3	2.88
	Total	46	100	58	100	104	100

Based on the table 4, it is seen that the nutritional status of children is presented based on male, female, and reviewed gender of five categories. These five categories are very thin, thin, normal, and obese. The majority of results were obtained for the male gender, namely, in the normal category of 56.52%, the female gender was in the normal category by 51.73%, and judging from the total participants in the normal category of 53.85%. More detail can be seen in the image diagram results of nutritional status measurements in Figure 1.

#### 4. Discussion

The covid-19 disease will become riskier when the child has an accompanying disease, such as pneumonia. Therefore, it is important to maintain and improve the nutritional status of the child. It is explained that the limited income of the elderly can provide a domino effect

that causes a decrease in purchasing power during a pandemic. The availability of food in households and parents' knowledge of the selection of nutritious foodstuffs at affordable prices are of particular concern.

It also means an additional threat to the health of children with the potential for malnutrition and stunting everywhere. Therefore, cooperation is needed between all components to help each other, including to maintain the fulfillment of child nutrition in the pandemic period. This pandemic is only a short-term problem but maintaining the growth and development of children is a long-term task that must continue to be done so that the problem of malnutrition and malnutrition does not increase in children in the second. The effect on nutritional deficiencies will affect the height of the child for a relatively long time.

The results showed that the nutritional status of children aged 6-17 years during the COVID-19 pandemic was reviewed and the weight index by height was the majority in the normal category. Although overall the nutritional status of many children is in the normal category, some need attention. Some children have a nutritional status that is very thin, thin, and fat. Children who have thin a nutritional status turned out to be children who tend to have less physical activity [2], [51]. As a result, the muscles of the child's body do not develop properly, so the body composition becomes not ideal. Children who are in the fat category have several reasons. First, their parents suffer from obesity. In addition, the child's diet also tends to be uncontrolled and the child's physical activity is inadequate [4], [52]. Excess nutrients in daily calorie uptake will accumulate as a calorie reserve. Calories in the body are stored into fat which results in an imbalance between weight and child height.

The results stated that children who have obese parents are a risk factor for the occurrence of obesity. A study

found children with overweight parents are more likely to experience more nutrition by 48%. Characteristics of parents with a history of obesity affect the genetic traits and behavior of food consumption in the family [53], [54].

Racial/ethnic/region of origin background is a variable that is a protective factor in the incidence of obesity. Race/ethnicity/region of origin is part of social and cultural environmental factors that affect biological and behavioral aspects in the process of maintaining a person's health, including child health. Ethnic or tribal cultural background also influences a person's belief system, principles, and behavior. According to Peter Davis, a public health scientist from New Zealand, a group of cultural factors that can be beliefs, practices, or lifestyles, are usually manifested in the form of food consumption patterns or diets, which can be key factors related to nutritional and digestive health conditions. Culture forms a perception of the body image that influences parents to determine strategies or decisions related to diet and the right amount of food for their children [12], [55].

Based on the results of statistical analysis, low maternal education levels proved to be a protective factor of obesity incidence. Factors that exist in a mother are one of the first factors that affect a person's health status, especially the child. The low level of maternal education leads the mother to practice more traditional or simple food consumption patterns for her child than highly educated mothers who can prepare various types of food [56].

Another study found that the level of maternal education influenced the incidence of obesity. The level of maternal education influences the level of maternal knowledge about child nutrition, including the selection and provision of healthy types of food. Low levels of education tend to direct choosing fast food to be consumed by their children with high frequency [57].

It is important to provide adequate nutritional intake to meet the needs of the body in their growth and development, which is inseparable from the role of parents in paying attention to the content of balanced food for their children [8], [38]. Normal nutrition is inseparable from several factors that affect it that nutritional status is influenced by nutritional imbalance intake and output, namely intake that exceeds the output or vice versa, in addition to errors in choosing ingredients to eat will result in poor nutrition. In the growth and development of adolescence, nutritional status has a very important role that the growth and development of the human body can carry out its daily physical activities, so the human body must be met with the needs of food substances/nutrients.

The level of food substances (nutrients) in every food is not the same, some are low and there are also high because it is by paying attention to the "four healthy five perfect" that is always recommended by the government, each food ingredient will complement each other's food/nutrients that are always needed by the human body to ensure growth and physical development and sufficient energy to carry out its activities [50], [58].

As a follow-up to the results of the study, researchers sought information on the social status and work of the students' parents, researchers then held interviews with residents around where students lived, for example, students with the initials "BE" had an obese nutritional status, after the interview, it turned out that the parents of the students were classified as having an economic level that tended to be high judging from the status of work and property assets owned. The next analysis is that students with the initials "ID" have very thin nutritional status, then after an interview, the parents of the students work as farm workers, so that from the interviews taken randomly it can be concluded that the work and income of the parents of students are very influential on their nutritional status during the COVID-19 pandemic.

Aside from family economic factors, schools also have a role that is no less important to the formation of the nutritional status of its students. Not only providing school briefings are also able to provide examples of food that has a balanced amount of nutrition, but the school is also able to control food traders around the school and canteen to provide healthy foods, more than that through school students also get sports education that has a role as a means of activities and activities to reduce excess food intake that can lead to obesity.

Nutritional status in children was closely related to weight and height in this study analysis. The first is the relationship of weight with nutritional status Weight describes the amount of protein, fat, water, and minerals in the bones. In teenagers, the amount of fat tends to increase, muscle protein decreases weight is one measure that gives a picture of body time. Weight is sensitive to sudden changes both due to infectious diseases and decreased consumption. Weight loss is also the best parameter, easily visible in a relatively short time.

Next the second, the relationship of height with high nutritional status provides a direct picture of the tall, medium, or short conditions. The relationship of height with nutritional status is weight gain, weight can be used as one of the guidelines to determine nutritional status. Good nutritional status means the growth and development of our body will be compatible and age-appropriate [10], [50].

Based on the above literature, the conclusions will be synchronous and strengthened in the measurement of the nutritional status of children in this study. The measurement is through a nutritional index reviewed weight by height. This research is also reinforced by several previous studies or findings related to nutritional status in pandemic times.

The first relevant research results [59], findings found that the nutrition of elementary school-aged children with very thin categories as many as 9 students (4.05%), skinny category as many as 39 students (17.57%), normal category as many as 156 students (70.27%), fat category as many as 16 students (7.21%), and obesity category as many as 2 students (0.90%). The results of the study concluded that the nutritional status of elementary

school-age children was mostly in the normal category.

The second relevant research result [60] That is, there is an effect of the Covid-19 pandemic on physical activity and the application of the principle of balanced nutrition. Based on the results of this study, respondents must maintain immunity through doing physical activity every day for at least 30 minutes and consuming a balanced nutritious meal.

The third relevant research result is the literature review [61], The study concluded the impact of the Covid-19 pandemic on physical activity and the application of balanced nutrition in students during online learning during the pandemic. However, other factors are the impact of the Covid-19 pandemic on students during online learning during the pandemic.

The fourth relevant research result [62], showed that the respondents' physical activity, health behaviors, and nutritional awareness were further improved in new normal conditions. Respondents became more aware and concerned about each other's health, especially for personal hygiene.

The four relevant studies above, all have something in common and strengthen this study, namely about the importance of knowing and measuring nutritional status in children/students. This study has an originality side compared to relevant/previous research, namely 1) measurement of nutritional status in the broad age range of 6 to 17 years; 2) Measurements are done randomly, so that the resulting data is more dynamic, and; 3) Participants come from two countries namely Indonesia and Portugal, although not in large numbers.

## 5. Conclusions

The results of the above study and discussion concluded that the nutritional status of children aged 6-17 years during the COVID-19 pandemic reviewed the weight index by height is the majority in the normal category. The description of the status of children aged 6-17 years at the time of the pandemic is at normal limits and parents' knowledge about child nutrition is mostly in good condition. This study has implications for 1) Helps improve understanding to children about the importance of nutritional status for development and growth, especially for those who do not fall into the normal category, and; 2) Children are expected to maximize the role of physical activity to improve the physical freshness and nutritional status of students. This study has limitations that are participants obtained still on a scale not too large. Then, this study contributes to future research that is the need to include certain free variables to be known the dominant variables in affecting nutritional status in children.

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## Conflict of Interest

All the authors said that this study was without any conflict of interest from any party.

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