Knowledge of Nutrition and Macronutrients Consumption as Factors Causing Wasting in School Children and Effective Nutrition Education to Improve It

D U Purnamasari, E Dardjito, Kusnandar
1Nutrition Department of Health Sciences Faculty, Jenderal Soedirman University, Purwokerto, Indonesia
2Physical Department of Health Sciences Faculty, Jenderal Soedirman University, Purwokerto, Indonesia
Email: dyahumiyarni@gmail.com

Abstract. Wasting is a nutritional problem suffered by many school children. The purpose of this study was to determine the factors that cause wasting in school children and effective nutrition education to improve it. This study is a Research and Development. Population of this research is all of children in 4 elementary schools at Sumbang district, amounts 743. The sample was taken by purposive with inclusion criteria are children who they are in the fourth graders study, amounts 101. Data Analysis by univariate and bivariate analysis by rank spearman and wilcoxon analysis. Lack of knowledge (p value=0.037) and low consumption of carbohydrates, protein, fat (p value=0.000;0.001;0.001) as factors that causes wasting. Wilcoxon analysis results showed that there were differences in sample knowledge given audiovisual media and picture book (p value=0.000). Audiovisual media was most effective for improving students' nutritional knowledge (37.22% vs 12.7% knowledge increase). The results of wilcoxon's analysis on changes in nutritional behavior did not show any differences in pictorial and audiovisual stories (p value=0.644), this means that both are equally effective in improving the nutritional behavior of school children. Suggested to carry out nutrition education regularly to reduce wasting in school children.

Key words: Wasting, School Children, Nutrition Education

1. Introduction
Wasting is the most common nutritional problem in children. WHO data shows that 16 million (7.5%) of children worldwide experience wasting [1]. In anthropometric measurements, wasting is characterized by a value of the Body Mass Index for age (BMI / A) less than -2 SD [2].

Health Research show about 11.2% of elementary school children aged 6-12 years suffered wasting. Wasting on school children spread throughout the region in Indonesia. Central Java Province is one of the Provinces with the number of Wasting in school children is higher than the national data which is 12.5% [3]. Banyumas Regency has a high prevalence of Wasting in school children. Research conducted on 4 elementary schools in Banyumas Regency, as many as 7.4% of children suffer from wasting [4].

Wasting needs to be addressed immediately because it will have an impact on the health and learning achievement of school children. Research shows that wasting will make a child susceptible to infectious diseases [5]. Research conducted by Legi [6] as many as 80.9% of children suffering from wasting have poor learning achievement. Research conducted by Purnamasari et al [7] wasting will have an impact on the IQ of a child. Wasting children who reached the high IQ category were only 18.7%, while in children with normal nutritional status there were 31% of children. This study aims to determine the causes of wasting in school children, as well as proper nutrition education to handle wasting in school children in Banyumas Regency.
2. Material and Methods

This study uses the Research and Development (R & D) method. In the 1st year a study was conducted to find the causes of wasting in school children, in the second year a study was conducted to determine the appropriate educational model to reduce wasting in school children.

The population in this research is elementary school children in 4 schools, amounted to 743 children. The location was conducted in 4 elementary schools in Sumbang Subdistrict, It was Banjarsari Kulon I, Banjarsari Wetan 2, Watujaran and Limpakuwus. The time of research is March 2016-July 2017. The sample is taken by purposive, with inclusion criteria for 4th graders amounting to 101 people.

In year 1 an analysis was conducted to find the cause of wasting in school children by using the rank spearmen test. In the second year, pictorial books and audiovisual media intervention was given for 3 weeks to see of changing in knowledge, attitudes and behaviors in school children. The analysis test used was wilcoxon test.

3. Result

The macronutrient consumption of students was mostly deficits, about 54,% of energy, 58.4% of protein, 75.3% of fat and 58.4% of carbohydrates.

| Table 1. Univariat Analysis of Energy, Carbohydrate, Protein, Fat, Nutritional Status and Knowledge of School Children |
|-----------------------------------------------|
| No | Categories    | n  | %  |
|---|----------------|
| Energy |                |    |    |
| 1 | Deficit        | 55 | 54.5 |
| 2 | Low            | 33 | 32.6 |
| 3 | Average        | 8  | 7.9 |
| 4 | Over           | 5  | 5   |
| Total |                | 101 | 100 |
| Protein |               |    |    |
| 1 | Deficit        | 59 | 58.4 |
| 2 | Low            | 22 | 21.7 |
| 3 | Normal         | 10 | 9.9 |
| 4 | Over           | 10 | 9.9 |
| Total |                | 101 | 100 |
| Fat |                |    |    |
| 1 | Deficit        | 76 | 75.3 |
| 2 | Low            | 10 | 9.9 |
| 3 | Normal         | 7  | 6.9 |
| 4 | Over           | 8  | 7.9 |
| Total |                | 101 | 100 |
| Carbohydrate |              |    |    |
| 1 | Deficit        | 59 | 58.4 |
| 2 | Low            | 22 | 21.8 |
| 3 | Normal         | 10 | 9.9 |
| 4 | Over           | 10 | 9.9 |
| Total |                | 101 | 100 |
| Nutritional Status |        |    |    |
| 1 | Overweight     | 14 | 13.9 |
| 2 | Normal         | 71 | 70.3 |
| 3 | Wasting        | 16 | 15.8 |
| Total |                | 101 | 100 |
3.1. Factors causes Wasting in School Children

The results of Rank Spearman's analysis showed a relationship between nutritional consumption and nutritional status with Wasting in school children.

Table 2. Rank Spearman Analysis of Nutrition Knowledge and Nutritional Consumption Level With Wasting in The School Children

| Variable                  | Amount | R   | p-value | Explanation |
|---------------------------|--------|-----|---------|-------------|
| Nutritional Knowledge     | 101    | -0,208 | 0,037   | Significant |
| Energy                    | 101    | -0,387 | 0,000   | Significant |
| Protein                   | 101    | -0,328 | 0,001   | Significant |
| Fat                       | 101    | -0,315 | 0,001   | Significant |
| Carbohydrate              | 101    | -0,361 | 0,000   | Significant |

The results of Rank Spearman's analysis showed correlation between nutritional knowledge (p value: 0,037<0,005), the level of energy, protein, fat and carbohydrate consumption and wasting in school children (p value: 0,000 <0,05).

3.2. Education Intervention to Improve Nutrition Knowledge and Nutrition Practice

There are differences in students' nutritional knowledge before and after giving the media, both pictorial and audiovisual media.

Table 3. Differences in Balanced Nutrition Knowledge of Children before and after Pictorial Books and Audiovisual Intervention

| Variable                  | Z     | p value | Explanation |
|---------------------------|-------|---------|-------------|
| Nutrition Knowledge before and after Pictorial Books Intervention | -3,969 | 0,000   | Differences |
| Nutrition Knowledge before and after Audiovisual intervention | -5,953 | 0,000   | Differences |

The results of the study indicate that there are differences in nutritional knowledge of students before and after the intervention, both pictorial and audiovisual media. The average increase in nutritional knowledge of students with pictorial and audiovisual media intervention can be seen in Table 4.
Table 4. Average of Nutrition Knowledge of School Children

|                        | Pictorial Book | Audiovisual |
|------------------------|----------------|-------------|
| Average Percentage of Correct Answers Before Intervention | 77,83          | 53,35       |
| Average Percentage of Correct Answers After Intervention  | 90             | 85,12       |
| Average Knowledge Increase Percentage                    | 12,7           | 32,77       |

The table shows that the increase in knowledge on audiovisual media is higher than the picture story book.

The changes in nutritional behavior of students after being given nutrition education interventions through pictorial book and audiovisual can be seen in the following table.

Table 5. Differences of Nutrition Behavior Before and After Intervention

| Variabel | Pictorial Book | Audiovisual |
|----------|----------------|-------------|
|          | Pretest        |             |
| Average  | 14,5           | 14,13       |
| Minimum  | 5              | 6           |
| Maksimum | 26             | 24          |
|          | Postest        |             |
| Average  | 19             | 19,5        |
| Minimum  | 8              | 5           |
| Maksimum | 27             | 29          |
| P Value  | 0,000          | 0,000       |

Table 5 shows that differences in balanced nutritional behavior before and after given pictorial book and audiovisual with p = 0.000 (p <0.05). The behavior score at pretest of 14.5 (pictorial book group) and 14.13 (audiovisual group). The average posttest score is 19 (pictorial book group) and 19.5 (audiovisual group).

4. Discussion
The results of rank spearman's analysis showed a correlation between the level of energy consumption and nutritional status in school children (p value: 0,000 <0,05). The results of this study are in line with the research conducted by Pahlevi [5]. His research showed correlation between energy consumption and nutritional status in school children in grade 4.5 and 6 elementary school 02 Ngesrep Banyumanik, Semarang.
In this study 12.9% of students had wasting and 3% severe wasting. The results in this study were higher than the national wasting case, which was 11.2% [3]. Wasting in school children is affected by energy consumption. The average energy consumption in this study was 1,215.9 kcal and 33% had low energy consumption level and 54.5% had deficit energy.

Enough energy consumption guarantees a child to be able to carry out his activities properly. Individual energy needs of children are based on energy requirements for basal metabolism, speed of growth, and activity. Energy for basal metabolism varies according to the number and composition of metabolically active tissue, age, and sex. Growth rates also differ for each age group. Physical activity contributes to energy expenditure. A child with high physical activity needs more energy than child who has light activities. Fulfillment of energy that is not in accordance with their needs will cause a child to have wasting [8].

The results of Rank Spearman's analysis showed a correlation between the level of fat consumption and nutritional status in school children (p value: 0,000 < 0,05). This study is in line with the research conducted by Tam et al with research in school children of Australia [9].

In this study the average carbohydrate consumption is 182.4 grams. The amount of carbohydrate consumption is lower than the average national carbohydrate consumption in children aged 5-12 years in the Indonesians ranges that is equal to 228.4 grams, and the average child consumption in Central Java is equal to 228.7 grams [10].

School children must consume enough carbohydrates. Carbohydrate consumption recommended for Indonesians ranges from 60-70%. One gram of carbohydrate will produce 4 kcal. Although the energy produced is less than fat, but calories from carbohydrates are directly used as energy by the body. Carbohydrates are absorbed by the body in the form of glucose, which is a type of monosaccharide. Lack of carbohydrate consumption causes fat and protein to be used as energy sources. As a result of the use of fat as an energy source is the production of Ketone substances. The speed of formation of this ketone is faster than its disposal so that ketones accumulate in the body and there is poisoning or ketosis. Enough carbohydrate consumption can be used as a sparer protein, which protects the use of protein as energy producer [8].

The results of rank spearman's analysis showed a relationship between the nutritional knowledge of children and nutritional status in school children (p value: 0.037 <0.05). This research is in line with the research conducted by Taylor et al. shows that the intervention carried out in school children, including the addition of knowledge will have a positive impact on changes in children's nutritional status [11].

In this study 49.1% of children still had low levels of nutritional knowledge. Knowledge of nutrition of school children still needs to be improved. The level of nutrition knowledge is one of the factors that can affect the quality and quantity of food. Research conducted by Pok Ja et al. conducted an analysis of the impact of providing nutritional knowledge on school children, found an increase in eating patterns of vegetables, cereals, fish, oil, and sources of carbohydrates, fiber, calcium and vitamin C[12]. Research conducted by Kandian and Jones by giving 45 minutes of nutrition knowledge for school children for 3 times a week for 3 weeks also proved to be able to change their food choices[13]. Children become more aware, and are able to choose foods that are more nutritious and healthy. Changes in behavior will also affect their nutritional status.

The results of nutrition education interventions through pictorial book and audiovisual stories. The results of the Wilcoxon statistical test showed that there were differences in children's nutritional knowledge before and after the provision of media intervention in both pictorial story media (p value: 0,000 <0,05) and audiovisual media (p value: 0,000 <0,05). This is in line with the research by Eliana that the pictorial story media about nutrition in the form of pocket books had an effect on the nutritional knowledge of 5th graders of the Muhammadiyah Dadapan Elementary School in Wonokerto Village, Turi District, Sleman Regency, Yogyakarta [14].

Based on the average increase in knowledge, the most effective media in improving nutrition knowledge of school children is audiovisual media, which is 32.77% compared to 12.7%. Arsyad states that in the learning process, film has functions related to two things, namely for cognitive and
affective purposes. In terms of cognitive, audiovisual is able to help individuals learn the benefits or inspiration in the audiovisual. Audiovisual can teach something that has never been done directly. In terms of affective, audiovisual can influence emotions and attitudes. This makes individuals get enthusiasm and motivation to imitate individual group attitudes[15].

Bivariate analysis shows the value of \( p = 0.000 \) which interprets that there are differences in balanced nutritional behavior before and after the pictorial story media is given. Behavior is a collection of various factors that interact with each other. Human behavior is essentially an activity of man himself. The health behavior can be interpreted as a concept of behavior that appears as an influence of awareness of vulnerability to a health problem[16].

The results of this study are in line with the research conducted by Hamida et al which shows an increase in the knowledge of students with lecture interventions using pictorial story media. Providing counseling to students with illustrated story media will make it easier for students to receive counseling material provided. Students will be more motivated by their reading interest and curiosity. Thus, the nutrition knowledge delivered is more easily accepted[17].

Bivariate analysis showed that the value of \( p = 0.000 \) interpreted that there were differences in balanced nutrition behavior before and after being given audiovisual media in the form of films. This is in line with the research of Auliyah (2016) that there were differences in the results of the study at the pretest and posttest by using films to increase student empathy.

Notoatmodjo also states that school-age children are very sensitive groups to accept change or renewal because this group is in the stage of growth and development. Thus, any stimulus such as guidance, direction and planting habits will be better received. The most important benefits of media are clarifying the messages that will be delivered. Besides that, the media can also increase the effectiveness of the process of nutrition education and counseling held. [16].

The results of this study are in line with the research conducted by Sartika which shows a difference in children's nutritional behavior after various nutritional education such as picture cards, leaflets, and guessing images. This shows that the use of any media is effective in changing the nutritional behavior of children from the media is fun and stimulates the interest of children[18].

5. Conclusion
Knowledge of nutrition and nutrient consumption (energy, protein, fat, carbohydrate) are the variables most associated with wasting in school children. Educational interventions using pictorial and audiovisual storybook media show that audiovisual media is most effective in increasing the knowledge of school children. The audiovisual media and pictorial stories are both effective in improving nutritional attitudes in school children. It is recommended to conduct nutritional education through media on pictorial and audiovisial stories routinely to improve the nutrition knowledge and attitudes of school children in preventing wasting.

References

[1] WHO 2002 Global and Regional Trends World Health Organization Washington
[2] Kemenkes 2011 Keputusan Menteri Kesehatan RI Nomor 1995/Menkes/SK/XII/2010 tentang Standar Antropometri Kementerian Kesehatan RI Jakarta
[3] Kemenkes 2013 Riset Kesehatan Dasar Kementerian Kesehatan RI Jakarta
[4] D. U. Purnamasari, E. Dardjito dan K. Kusnandar 2016 Hubungan Jumlah Anggota Keluarga, Pengetahuan Gizi Ibu dan Tingkat Konsumsi Energi dengan Status Gizi Anak Sekolah Jurnal Kesmas Indonesia. 8 49-56
[5] A. Pahlevi 2012 Determinan Status Gizi pada Anak Sekolah Jurnal Kesehatan Masyarakat. 7
[6] N. Legi 2012 Hubungan Status Gizi dengan Prestasi Belajar Siswa Sekolah Dasar Negeri Malang Kecamatan Malangang Gizi Indonesia Journal. 1 1-12
[7] D. U. Purnamasari, E. Dardjito and K. Kusnandar 2017 Correlation Between Level of Physical Fitness, Iron Consumption and Nutritional Status with Intelligence Quotient of School Children Report of LPPM Unsoed
[8] S. Almatsier 2011 Prinsip Dasar Ilmu Gizi Gramedia
[9] C. Tam, S. Garnet, C. Cowell, K. Campbell dan L. Baur 2006 Soft Drink Consumption and Excess Weight Gain in Australian School Student: Result from The Nepean Study International Journal of Obesity. 30 1091-1093
[10] Balitbangkes 2014 Studi Diet Total Kementerian Kesehatan RI
[11] J. P. Taylor, S. Evers and M. McKenna 2005 Determinants of Healthy Eating in Children and Youth Canadian Journal of Public Health. 96 20-26
[12] K. Pok-Ja and L. Kyoung-Ae A 2000 Survey on Dietary Habit and Nutritional Knowledge for Elementary School Children's Nutritional Education Journal of the Korean Society of Food Culture. 13 201-213
[13] K. Jay dan C. Jones 2002 Nutrition Knowledge and Food Choice Early Child Development and Care. 172 269-273
[14] D. Eliana 2012 Pengaruh Buku Saku Gizi terhadap Tingkat Pengetahuan Gizi pada Anak Kelas 5 Muhammadiyah Dadapan Desa Wonokerto Kecamatan Turi Kabupaten Sleman Yogyakarta Jurnal Kesmas. 6 1-13
[15] A. Arsyad 2011 Media Pembelajaran PT Raja Grafindo
[16] Notoatmodjo 2005 Promosi Kesehatan Teori dan Aplikasi Rineka Cipta
[17] K. Hamida, S. Zulaikha and M. Mutalazimah Penyuluhan Gizi dengan Media Komik untuk Meningkatkan Pengetahuan tentang Keamanan Makanan Jajanan Kemas. 8 67-73
[18] S. RAD 2012 Penerapan Komunikasi, Informasi dan Edukasi Gizi terhadap Perilaku Sarapan Siswa Sekolah Dasar Jurnal Kesmas. 7 76-82