Nutritional Education Model Through Crossword Puzzles Toward Knowledge And MacroNutrient Intake Of Primary School Student In Bengkulu City

by Emy Yuliantini

Submission date: 31-Mar-2023 11:12AM (UTC+0700)
Submission ID: 2051714917
File name: nutritional-education-Nov_2020.pdf (271.14K)
Word count: 3061
Character count: 16942

Sys Rev Pharm 2020;11(10):722-725
A multifaceted review journal in the field of pharmacy

Nutritional Education Model Through Crossword Puzzles Toward Knowledge And Macro Nutrient Intake Of Primary School Student In Bengkulu City

Kamsiah*[1], Emy Yuliantini[1], Andi Eka Yunianto[2]

[1]Department of Nutrition, Bengkulu Health Polytechnic, Bengkulu, Indonesia
[2]Department of Nutrition, Siliwangi University, Tasikmalaya, Indonesia

ABSTRACT

Crossword puzzles are one of the preferred education models for school-age children. The purpose of this study was to analyze the effect of the balanced nutrition education model via the crossword puzzle on the knowledge and intake of macronutrients for elementary school students in Bengkulu. This study used a pre-experimental research design with one group pre-test and post-test design. The sample in this study was about 30 children by purposive sampling. It was providing education by giving 14 times crossword puzzles for 14 days. The Paired T-Test was used to analyze the differences in respondent characteristics, knowledge, energy, protein, and fat intake, while carbohydrate intake used the Wilqocon test before and after an intervention. The results showed that the provision of nutrition education along the crossword puzzle had a significant effect on elevating knowledge ($p < 0.05$) and intake of energy, carbohydrates, and protein ($p < 0.05$). However, it was not significant for fat intake. The improvement of knowledge and macronutrient intake (except fat) obtained a significant effect before and after nutrition education is given. This research concludes that learning model as an alternative in providing nutritional education lessons should be attractive for school children.

Keywords: Crossword puzzle, education model, nutritional education, primary student

Correspondence:
Kamsiah
Department of Nutrition, Bengkulu Health Polytechnic, Bengkulu, Indonesia
Email: kamsiah74@yahoo.com

INTRODUCTION

Nutrition is an essential factor that influences the growth and development of children at school age (Karavida et al., 2019; Li et al., 2019). Consuming well nutrition contributes to maintaining health and provides protection against chronic diseases and reduces the risk of premature death (Ojo, 2019; Schulze et al., 2018). Several non-communicable diseases, such as diabetes, osteoporosis, and hypertension, are also linked to unhealthy eating habits that develop during childhood (Uauy et al., 2008). Thus, it is crucial to improve good eating habits from an early age so that healthy eating habits can continue into adulthood (Neumark-Sztainer et al., 2011; Nicklaus & Remy, 2013). School-age children should be of particular concern to families, communities, and governments since the children are experiencing rapid growth (growth spurt), i.e., the age of 10-11 years for girls and 12-13 years for boys, so nutrients also have increased (Soliman et al., 2014). Childhood is a good start in providing education about balanced healthy eating. This is very important in developing dietary practices according to the guidelines for balanced nutrition in the following years (Özdogan, 2015).

Schools are famous places in implementing health promotion and preventive interventions, especially in increasing nutritional knowledge and practices for school-age children, starting with promoting healthy behaviour from an early age (Lee et al., 2019). Data from Riskesdas (2018), as many as 26 % of Indonesian children only consume the drinks at breakfast, either water, tea, or milk. Not all children who eat breakfast have adopted a healthy and balanced breakfast pattern. Based on the same data source, only 10.6 % have enough energy intake by 30 %. School-age children with BMI/Age indicators for the skinny category of 2.4%, 6.8% categorized as thin, 10.8% categorized as fat, and 9.2% categorized as obese (Kemenkes RI, 2019).

According to previous studies, it shows there are still many elementary school children who do not know about balanced nutrition, so nutrition education is needed (Asakura et al., 2017; De Villiers et al., 2016). Nutritional education about healthy eating during childhood can not only prevent some of the leading causes of illness and death but can also reduce health costs and can improve the quality of human life (Hamulka et al., 2018; Shahid & Bishop, 2019). One step in increasing children's nutritional knowledge through learning media (Nova et al., 2019).

Learning media has an important role in supporting the learning process (Tafonao et al., 2019). The use of learning media in the learning process can generate new desires and interests (Sudarsana et al., 2019). Also, learning media can generate motivation and stimulation of learning activities and even have psychological influences on students (Puspitarini & Hanif, 2019). Crossword puzzles are a form of learning media in the form of games that are liked by school-age children. Previous research has shown that card games can improve children's knowledge and practice of school-age children's nutritional intake (Andressakis, 2001). Games are an effective form of media in promoting nutrition education. School-age children tend to act like to play and ask many questions so that the method chosen allows children to play a full role in learning so that children appreciate the knowledge and skills acquired on their efforts (Darling-Hammond et al., 2020).

METHODOLOGY

This study used a pre-experimental design with a one-group pre-test and post-test design. In this research

design, there was a comparison group. This research was conducted by doing preliminary observation (pre-test) that had not been given balanced nutrition education. This research was conducted at Public Primary Schools of SDN 01 and SDN 05, Bengkulu City, from July to October 2019 on male and female subjects aged 9-10 years.

The provision of education was carried out in 2 stages. The first stage was the provision of balanced nutritional material two times a week. The second stage was giving the crossword puzzles for 14 times with a duration of 2 times a week. The level of students' knowledge was measured by giving pre-test and post-test before and after prevention. The macronutrient intake of school children was carried out before and after being given nutrition education using a 3x24 hour recall and knowledge using a questionnaire. The Paired T-Test analyzed the data obtained if the data were normally distributed for abnormal data distribution; the Wilcoxon test was used. This test was conducted to analyze the differences in the level of knowledge, energy, carbohydrates, protein, and fat of nutritional education.

RESULTS AND DISCUSSION

Following Table 1, it can be seen that the characteristics of subjects based on age and sex found no significant differences. In this study, there were 30 subjects aged 10-11 years 14 (46.7%), and 11-13 years old 53.3%), consisting of 15 men (50%) and 15 women (50%).

Table 2 shows a significant difference found in the effect of nutritional education on knowledge (p = 0.000). The provision of nutritional education significantly affects the improvement in student knowledge. Nutrition education also had a significant effect on increasing the nutrients intake, such as energy (p = 0.004), protein (p = 0.000), and carbohydrates (p = 0.001), while fat intake did not have a significant effect (0.065).

Health promotion through nutritional education is the initial stage in encouraging healthy eating practices and increasing knowledge that has great potential for health during childhood and the later stages of life. Organizing school-based nutrition education must consider the needs of students in schools. Educational strategies include efforts to increase students' health awareness and improve the practice of changing better eating patterns (Pérez-Rodrigo & Aranceta, 2003). Besides, nutrition education for primary school children can provide information and skills for children to choose healthy foods and change good eating habits (Perera et al., 2015).

Table 1. Distribution of respondent characteristics based on age and sex of primary school children in Bengkulu City

Variable	Total	Frequency (%)	p
Age 10-11 11-13	 14 16	 46.7 53.3	0.659
Sex Male Female	 15 15	 50 50	0.160

Table 2: Effect of nutritional education on knowledge and nutrient intake

Variable	N	Pre	Post	*P*
		Mean ±SD	Mean ±SD	
Knowledge	30	70.00±16.19	90.00±10.83	0.000*
Energy	30	1089.11±561.28	1421.83±478.36	0.004*
Protein	30	53.96±13.05	67.90±24.48	0.000*
Fat	30	36.76±8.79	39.23±11.23	0.065
Carbohydrate	30	116.53±144.97	155.27±197.85	0.001*

The implementation of nutrition education into the primary school curriculum must indirectly support the increase in nutrition knowledge (Kostanjevec et al., 2011). Based on Table 2 it shows that the provision of nutritional knowledge has a significant effect on increasing student knowledge. This is following previous research conducted by (Tavassoli et al., 2015) stated that the provision of nutrition education has an effect on increasing knowledge, attitudes and has a positive effect on changes in student diet. Nutrition education also affects cognitive enhancement towards changing attitudes towards food selection (Anderson et al., 2005; Ruzita et al., 2007). Besides, this education can influence positive behaviour change in creating sustainable changes in the future (Demirozu et al., 2012).

Nutritional education has a vital objective in improving diet and lifestyle and at the same time, reducing non-communicable diseases and obesity in the future (Hamulka et al., 2018). The effect of nutrition education significantly affects changes in nutrient intake, such as energy, protein and carbohydrate intake. This is in accordance with previous research by (Said et al., 2020) shows that the provision of nutrition education has a positive effect on better nutrient intake for school children. Nutrition education also affects the selection of healthier foods and snacks for school children (de Vlieger et al., 2019; Yeom & Cho, 2019). Nutritional education is one of the recommended nutrition support strategies to increase nutrient intake and to correlate with improving the nutritional status of elementary school students (Kooshki et al., 2018)

CONCLUSION

The knowledge and the nutrient intake (energy, protein, fat, and carbohydrate) of elementary school children before and after nutritional education intervention was increased. Except for fat intake, there was an effect of knowledge, energy, protein, and carbohydrate intake of the student of Public Primary School of SDN 05, Bengkulu City before and after education. Nutrition education is a strategy that supports the improvement of knowledge and nutrients intake, so it needs to be recommended for inclusion in the primary school curriculum. It is suggested that the nutritional education provided can be

maintained throughout their lives for the next superior generations.

ACKNOWLEDGMENT

Thanks to the Bengkulu Health Polytechnic, Bengkulu, Indonesia that providing research funds, also to the enumerators, and all participants involved in this research

CONFLICT OF INTEREST

All authors declare that there is no conflict of interest in this study.

REFERNCES

1. Anderson, A., Porteous, L., Foster, E., Higgins, C., Stead, M., Hetherington, M., Ha, M.-A., & Adamson, A. (2005). The impact of a school-based nutrition education intervention on dietary intake and cognitive and attitudinal variables relating to fruits and vegetables. *Public Health Nutrition*, *8*(6), 650–656. https://doi.org/10.1079/PHN2004721
2. Andressakis, K. (2001). Phosphorus and potassium handouts, quizzes, and puzzle. *Journal of Renal Nutrition*, *11*(4), 231–236. https://doi.org/10.1053/jren.2001.25283
3. Asakura, K., Todoriki, H., & Sasaki, S. (2017). Relationship between nutrition knowledge and dietary intake among primary school children in Japan: Combined effect of children's and their guardians' knowledge. *Journal of Epidemiology*, *8*(10), 483–491. https://doi.org/10.1016/j.je.2016.09.014
4. Darling-Hammond, L., Flook, L., Cook-Harvey, C., Barron, B., & Osher, D. (2020). Implications for educational practice of the science of learning and development. *Applied Developmental Science*, *24*(2), 97–140. https://doi.org/10.1080/10888691.2018.1537791
5. De Villiers, A., Steyn, N. P., Draper, C. E., Hill, J., Gwebushe, N., Lambert, E. V., & Lombard, C. (2016). Primary school children's nutrition knowledge, self-efficacy, and behavior, after a three-year healthy lifestyle intervention (HealthKick). *Ethnicity and Disease*, *26*(2), 171–180. https://doi.org/10.18865/ed.26.2.171
6. de Vlieger, N., Riley, N., Miller, A., Collins, C. E., & Bucher, T. (2019). Nutrition education in the Australian New South Wales primary school curriculum: An exploration of time allocation, translation and attitudes in a sample of teachers. *Health Promotion Journal of Australia*, *30*(1), 94–101. https://doi.org/10.1002/hpja.188
7. Demirozu, B. E., Pehlivan, A., & Camliguney, A. F. (2012). Nutrition Knowledge and Behaviours of Children Aged 8-12 Who Attend Sport Schools. *Procedia - Social and Behavioral Sciences*, *46*, 4713–4717. https://doi.org/10.1016/j.sbspro.2012.06.324
8. Hamulka, J., Wadolowska, L., Hoffmann, M., Kowalkowska, J., & Gutkowska, K. (2018). Effect of an Education Program on Nutrition Knowledge, Attitudes toward Nutrition, Diet Quality, Lifestyle, and Body Composition in Polish Teenagers. The ABC of Healthy Eating Project: Design, Protocol, and Methodology. *Nutrients*, *10*(10), 1439. https://doi.org/10.3390/nu10101439
9. Karavida, V., Tympa, E., & Charissi, A. (2019). The Role of Nutrients in Child's Brain Development. *Journal of Education and Human Development*, *8*(2). https://doi.org/10.15640/jehd.v8n2a18
10. Kemenkes RI. (2019). *Laporan Nasional Riset Kesehatan Dasar 2018*. Kementerian Kesehatan Republik Indonesia.
11. Kooshki, A., Mohammadi, M., & Rivandi, M. (2018). Nutritional intake and its association with educational achievement in high-school students in Islamic Republic of Iran. *Eastern Mediterranean Health Journal*, *24*(6), 532–537. https://doi.org/10.26719/2018.24.6.532
12. Kostanjevec, S., Jerman, J., & Koch, V. (2011). The effects of nutrition education on 6 th graders knowledge of nutrition in nine-year primary schools in Slovenia. *Eurasia Journal of Mathematics, Science and Technology Education*, *7*(4), 243–252. https://doi.org/10.12973/ejmste/75208
13. Lee, A., Lo, A. S. C., Keung, M. W., Kwong, C. M. A., & Wong, K. K. (2019). Effective health promoting school for better health of children and adolescents: Indicators for success. *BMC Public Health*, *19*(1), 1–12. https://doi.org/10.1186/s12889-019-7425-6
14. Li, C., Zeng, L., Wang, D., Allen, S., Jaffar, S., Zhou, J., Chen, T., Watson, V., & Yan, H. (2019). Growth in early life and physical and intellectual development at school age: A cohort study. *British Journal of Nutrition*, *121*(8), 866–876. https://doi.org/10.1017/S0007114519000060
15. Neumark-Sztainer, D., Wall, M., Larson, N. I., Eisenberg, M. E., & Loth, K. (2011). Dieting and disordered eating behaviors from adolescence to young adulthood: Findings from a 10-year longitudinal study. *Journal of the American Dietetic Association*, *111*(7), 1004–1011. https://doi.org/10.1016/j.jada.2011.04.012
16. Nicklaus, S., & Remy, E. (2013). Early Origins of Overeating: Tracking Between Early Food Habits and Later Eating Patterns. *Current Obesity Reports*, *2*(2), 179–184. https://doi.org/10.1007/s13679-013-0055-x
17. Nova, F., Allenidekania, A., & Agustini, N. (2019). The effect of multimedia-based nutrition education on parents' knowledge and body weight change in leukemia children. *Enfermeria Clinica*, *29*. https://doi.org/10.1016/j.enfcli.2019.04.027
18. Ojo, O. (2019). Nutrition and chronic conditions. *Nutrients*, *11*(2), 9–14. https://doi.org/10.3390/nu11020459
19. Özdogan, Y. (2015). Nutrition Education in Preschool Children. *The Journal of International Educational Sciences*, *2*(5), 449–449. https://doi.org/10.16991/inesjournal.188
20. Perera, T., Frei, S., Frei, B., Wong, S. S., & Bobe, G. (2015). Improving Nutrition Education in U.S. Elementary Schools: Challenges and Opportunities. *Journal of Education and Practice*, *6*(30), 41–50.
21. Pérez-Rodrigo, C., & Aranceta, J. (2003). Nutrition education in schools: Experiences and challenges. *European Journal of Clinical Nutrition*, *57*(S1), S82–S85. https://doi.org/10.1038/sj.ejcn.1601824
22. Puspitarini, Y. D., & Hanif, M. (2019). Using Learning Media to Increase Learning Motivation in Elementary School. *Anatolian Journal of Education*, *4*(2), 53–60. https://doi.org/10.29333/aje.2019.426a
23. Rozita, A. T., Wan Azdie, M. A. B., & Ismail, M. N. (2007). The effectiveness of nutrition education

programme for primary school children. *Malaysian Journal of Nutrition*, *13*(1), 45–54.

24. Said, I., Hadi, A. J., Manggabarani, S., Tampubolon, I. L., Maryanti, E., & Ferusgel, A. (2020). The Effectivity of Nutrition Education Booklet on Knowledge, Fast-food Consumption, Calorie Intake, and Body Mass Index in Adolescents. *Journal of Health Promotion and Behavior*, *5*(1), 11–17. https://doi.org/10.26911/thejhpb.2020.05.01.02
25. Schulze, M. B., Martínez-González, M. A., Fung, T. T., Lichtenstein, A. H., & Forouhi, N. G. (2018). Food based dietary patterns and chronic disease prevention. *BMJ (Online)*, *361*, 1–6. https://doi.org/10.1136/bmj.k2396
26. Shahid, S. M., & Bishop, K. S. (2019). Comprehensive approaches to improving nutrition: Future prospects. *Nutrients*, *11*(8), 1–19. https://doi.org/10.3390/nu11081760
27. Soliman, A., De Sanctis, V., & Elalaily, R. (2014). Nutrition and pubertal development. *Indian Journal of Endocrinology and Metabolism*, *18*(November), S39–S47. https://doi.org/10.4103/2230-8210.145073
28. Sudarsana, I. K., Nakayanti, A. R., Sapta, A., Haimah, Satria, E., Saddhono, K., Achmad Daengs, G. S., Putut, E., Helda, T., & Mursalin, M. (2019). Technology Application in Education and Learning Process. *Journal of Physics: Conference Series*, *1363*(1). https://doi.org/10.1088/1742-6596/1363/1/012061
29. Sifonao, T., Setinawati, S., & Tari, E. (2019). *The Role of Teachers in Utilizing Learning Media as A Learning Source for Millenial Students*. *October*. https://doi.org/10.4108/eai.30-7-2019.2287549
30. Tavassoli, E., Vardanjani, A., Reisi, M., Javadzade, H., & Pour, Z. (2015). The Effect of nutrition education on knowledge, attitude, and performance about junk food consumption among students of female primary schools. *Journal of Education and Health Promotion*, *4*(1), 53. https://doi.org/10.4103/2277-9531.162349
31. Uauy, R., Kain, J., Mericq, V., Rojas, J., & Corvalán, C. (2008). Nutrition, child growth, and chronic disease prevention. *Annals of Medicine*, *40*(1), 11–20. https://doi.org/10.1080/07853890701704683
32. Yeom, M. Y., & Cho, Y. O. (2019). Nutrition education discouraging sugar intake results in higher nutrient density in diets of pre-school children. *Nutrition Research and Practice*, *13*(5), 434–443. https://doi.org/10.4162/nrp.2019.13.5.434

Nutritional Education Model Through Crossword Puzzles Toward Knowledge And MacroNutrient Intake Of Primary School Student In Bengkulu City

ORIGINALITY REPORT

9%	6%	3%	2%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	Danijela Pfeifer, Josip Rešetar, Magdalena Czlapka-Matyasik, Aleksandra Bykowska-Derda et al. "Changes in diet quality and its association with students' mental state during two COVID-19 lockdowns in Croatia", Nutrition and Health, 2023 Publication	1%
2	Susilena Arouche Costa, Gustavo G. Nascimento, Patrícia Maria Gomes Colins, Cláudia Maria Coelho Alves et al. "Investigating Oral and Systemic Pathways between Unhealthy and Healthy Dietary Patterns to Periodontitis in Adolescents: a population ‐ based study", Journal of Clinical Periodontology, 2022 Publication	1%
3	repository.up.ac.za Internet Source	1%
4	thekeep.eiu.edu Internet Source	

		1 %
5	ukmsarjana.ukm.my Internet Source	1 %
6	ghi.xjtu.edu.cn Internet Source	<1 %
7	Submitted to Holmesglen Institute of TAFE Student Paper	<1 %
8	bmcpublichealth.biomedcentral.com Internet Source	<1 %
9	jurnalfahum.uinsby.ac.id Internet Source	<1 %
10	repository.poltekkes-denpasar.ac.id Internet Source	<1 %
11	www.isrctn.com Internet Source	<1 %
12	apothesis.lib.teicrete.gr Internet Source	<1 %
13	core-cms.prod.aop.cambridge.org Internet Source	<1 %
14	ejournal.undiksha.ac.id Internet Source	<1 %
15	fliphtml5.com Internet Source	<1 %

16	scholar.sun.ac.za Internet Source	<1 %
17	www.elsevier.es Internet Source	<1 %
18	www.emerald.com Internet Source	<1 %
19	www.ethndis.org Internet Source	<1 %
20	Submitted to University of Western Ontario Student Paper	<1 %
21	Submitted to Adtalem Global Education Student Paper	<1 %
22	Ali Hussein Najmi, Hanan M. A Al-Sayed, Mohamed Fathy Abdel Fattah Hussein, Ghena M Mohamed et al. "The Assessment of teachers' role in guiding primary school students towards eating breakfast in the city of Tabuk", 2022 ,مجلة كلية التربية فى العلوم التربوية Publication	<1 %
23	jurnalmahasiswa.unesa.ac.id Internet Source	<1 %

Exclude quotes	Off	Exclude matches	Off
Exclude bibliography	On		