

## Assessment of Knowledge, Attitude and Practice Towards Whole Grains Among Children Aged 10 and 11 Years In Kuala Lumpur, Malaysia

Research Article

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### Abstract

**Introduction:** The potential contribution of knowledge, attitude and practices (KAP) studies towards whole grains on childhood obesity research and control has not received much attention in Malaysia. This study aimed to evaluate KAP towards whole grains among children aged 10 and 11 years in Kuala Lumpur, Malaysia.

**Methods:** A cross sectional study was undertaken in six randomly selected primary schools in Kuala Lumpur. A validated questionnaire encompassing socio-demography (24 items), knowledge (15 items), attitude (15 items) and practice (10 items) towards whole grains was self-administered by 384 children aged 10 and 11 years. The overall KAP was analyzed using the sum score of each outcome based on Bloom's cut-off point. Body weight and height were measured.

**Results:** Of the 384 children, 70.3% had low knowledge level on whole grains. Only 8.6% children had positive attitude and 2.3% had good practice. Median scores of knowledge, attitude and practice were 7.00 (IqR 4.00), 51.00 (IqR 8.00) and 23.00 (IqR 8.00), respectively. Significant positive correlations were found between knowledge with attitude ( $r=0.335$ ,  $p<0.001$ ), attitude with practice ( $r=0.171$ ,  $p<0.01$ ) and knowledge with practice ( $r=0.162$ ,  $p<0.01$ ). BMI z-score was inversely associated with practice ( $r=-0.117$ ,  $p<0.05$ ).

**Conclusions:** The findings of this present study indicate that children supplied with knowledge may eventually develop positive attitude and good practice towards whole grains, which may be useful in managing childhood obesity by lowering BMI z-score. This study reveals the importance of KAP towards whole grains among children that assist with identification of specific preventive childhood obesity actions.

**Keywords:** Attitude; Children; Knowledge; Practice; Whole Grains.

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**Received:** October 29, 2014

**Accepted:** January 02, 2015

**Published:** January 09, 2015

**Citation:** Hui-Chin Koo, Poh B. K, Ruzita A. T (2015). Assessment of Knowledge, Attitude and Practice Towards Whole Grains Among Children Aged 10 and 11 Years in Kuala Lumpur, Malaysia *Int J Food Sci Nutr Diet.* 04(1), 171-177. doi: <http://dx.doi.org/10.19070/2326-3350-1500032>

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### Introduction

The United State Food and Drug Administration (FDA) define a whole grain as consisting of the intact grain, cracked, flaked kernel or ground, which includes the endosperm, bran and germ. This definition has been adapted from the American Association

of Cereal Chemists (AACC). Whole grains are a good source of B vitamins, mineral, fiber, basic amino acids and phytochemicals [1]. Several studies have focused on the role of whole grains in body weight regulation [2]. It has been demonstrated that whole grains consumption as part of an overall healthy lifestyle may be beneficial for children to achieve and maintain a healthy weight, as the outcome of the study showed that whole grains intake was inversely associated with body mass index (BMI) z-score [3]. Whole grains which are enriched with fiber and low energy density may help with weight maintenance by inducing the satiety [4].

The Dietary Guideline for American (2010) [5] and Malaysian Dietary Guideline (2010) [6] recommend that at least half of all grains should be consumed as whole grains and that whole grains consumption should be increased by replacing refined grains with whole grains. The federal evidence-based dietary recommendation to increase whole grains consumption in childhood has implication for overall health and quality of life extending into adulthood. In spite of positive health benefits and dietary recommendations, national dietary intake data from United State demonstrated that whole grains consumption by children were less than one serving per day [7]. Several potential barriers exist that may be contributing to the low consumption of whole grains among children including appearance, cost, taste, texture, lack of knowledge towards whole grains benefits and ability to

identify whole grains foods [8]. It is necessary to develop and implement effective nutrition education particularly on whole grains, strengthen whole grains education through multiple channels, enhance the whole grains knowledge of children, focus on whole grains intervention measures and urge the children to form a good whole grains intake practice.

To plan such interventions, nutrition professionals need to understand the various factors that contribute to whole grains consumption behaviors. Enhancements in knowledge, attitude, practice, outcome expectations, perceptions, skills and self-efficacy are deemed to be the potential mediating and enabling factors for the attainment of appropriate dietary preferences and practices [9]. It would be helpful to have detail information about the KAP towards whole grains which may facilitate efforts to improve child health and whole grains consumption among this population group. To our knowledge, there are no published studies on KAP focused primarily on whole grains in Malaysia. Hence, this study was carried out to investigate KAP towards whole grains among aged 10 and 11 years children in Kuala Lumpur, Malaysia. The information will be used to develop continuing education intervention regarding promotion of whole grains to children.

## Methods

### Study Design and Sampling

Kuala Lumpur is classified into three zones, namely Keramat, BangsarPudu and Sentul. Two primary schools from each zone were randomly selected to participate in this study from a list of entire primary schools in Kuala Lumpur were obtained from the Kuala Lumpur Federal Territory Education Department. In this cross sectional study, a total of 384 school children aged 10 and 11 years were derived from six primary schools through two-stage random cluster sampling method. Kuala Lumpur is situated midway along the west coast of Peninsular Malaysia, possessing a population of over one and a half million people drawn from Malaysia's entire multiethnic group. The study protocol was reviewed and approved by the ethics committee of Universiti Kebangsaan Malaysia. Permission to carry out data collection was granted by Ministry of Education, Malaysia and Kuala Lumpur Federal Territory Education Department. Parental consent was obtained for all children prior to participation. Verbal consent was obtained from the children too before the study began in order to enable us to administer the questionnaires and acquire anthropometric measurements.

The sample size was calculated using a formulation by Krejcie & Morgan (1970) [10] as follows:

$$n = \frac{[\chi^2 NP (1-P)]}{[d^2 (N-1) + \chi^2 P (1-P)]}$$

where n is the required sample size,  $\chi^2$  is the table value of chi square, N is the population size in Kuala Lumpur, P is the population proportion and d is the degree of accuracy expressed as a proportion. At a total 42183 school children aged 10 and 11 years in Kuala Lumpur, confidence level of 95%, a relative precision of 5% and a predicted prevalence of 50% since there are no similar studies conducted in Kuala Lumpur, the sample size required for the study was 381. Taking into account a non-response rate of 10%, the required sample size was increased to 419. A total of 420 children within the inclusion criteria were invited to participate in this study. Respondents comprised both sexes and from

all the main ethnic groups in Malaysia, namely Malays, Chinese and Indians as well as Sabah and Sarawak natives. In this present study, no differentiation was made between the ethnic groups. Inclusion criteria were apparently healthy Malaysian school children aged 10 to 11 years, were able to read, write and understand Malay. School children with mental disabilities and who were unable to read were excluded from the study. However, only 384 children successfully completed the study, resulting in a response rate of 91.4%. Drop-outs were mainly due to absent from school or parents refusing to give consent.

Data was collected in two stages: first stage involved the answering of guided self-administered KAP towards whole grains questionnaire by children. The investigator was present in the classroom to assist children so that the questions were fully understood and well-completed. While in the second stage, anthropometric measurements of the children were taken. The whole process was conducted by one investigator throughout to avoid the problem of inter-interview variations.

### Study Questionnaire

A validated guided self-administered questionnaire, which comprised of 24 demographic factors, 15 knowledge items, 15 attitude items and 10 practice items was used for data collection. The language used was Bahasa Malaysia which is the mother tongue of Malaysian. Questionnaire was pre-tested for clarity and ease of comprehension prior to being applied in the study [11]. The overall questionnaire consisted of four main sections namely demographic factors, knowledge domain, attitude domain and practice domain. Demographic factors were intended to discover the demographic and whole grains consumption pattern. Whereas, knowledge domain reflects general nutrition and whole grains information including food pyramid, source of carbohydrate, definition of whole grains, source of whole grains, nutritional content of whole grains and the benefits of whole grains consumption. Attitudedomain defined as school children's opinions and belief towards whole grains consumption, awareness and socio-cultural perspective. Whereas, practice domain corresponded to school children's practice towards whole grains consumption such as the frequency of intake of whole grains ready-to-eat cereal, whole grains bread, corn, whole grains biscuit, oat, barley and brown rice.

Knowledge domain consisted of 15 multiple choice items. Each item had two answer options and "Not Sure" option. Only one of the options was the correct answer. Correct answer received one point, incorrect and "Not Sure" answers received zero points. Attitude domain comprised of 15 liker scale items. School children could indicate their degree of agreement towards the statement given. Liker scale of five points will be used to represent the scores, as such "Strongly Agree", "Agree", "Not Sure", "Disagree" and "Strongly Disagree". Numerical scores 5, 4, 3, 2 and 1 will be given to category "Strongly agree", "Agree", "Not Sure", "Disagree" and "Strongly Disagree" respectively. For those items which were negatively phrased, scores will be re-coded as 5, 4, 3, 2, and 1 for category "Strongly Disagree", "Disagree", "Not Sure", "Agree" and "Strongly Agree". Meanwhile, practice domain comprised of ten items assessed by "Everyday", "Always" (1-7 days in a weeks), "Sometimes" (14 days in a month), "Seldom" (not in the category of "Always" and "Sometimes") and "Never" category, scored as 5, 4, 3, 2 and 1. The detail of the development and validation of the questionnaire will be published somewhere else.

## Anthropometric Measurements

The body weight of each child was measured twice using a calibrated TANITA digital scale Model 300GS (TANITA, Cranlea & Co. Birmingham, England) and recorded to the nearest 0.1kg. The children were weighed with their uniforms on, without belts, barefooted with emptied pockets. Respondents were asked to stand still with the body weight equally distributed on both feet. The angles of head of the respondents have to be in the Frankfurt plane [12]. The height of the child was measured twice using a portable stadiometer (Leicester, UK) attached to a smooth wall and recorded to the nearest 0.1cm. The respondents were asked to stand erect, barefooted, with heels, buttocks, head and shoulder blades in a vertical line against the wall. Height was measured in the upright position against a vertical scale and with the head positioned so that the top of the external auditory meatus was in the level with the inferior margin of the bone orbit [12]. The reported body weight and height were the average values from both readings. Z scores for BMI-for-age were determined using the software WHO Anthro version 1.0.3 (WHO, Geneva, Switzerland).

## Statistical Analysis

Statistical analysis was done using the SPSS version 22.0 (IBM SPSS Statistics, 2014). Data was entered, cleaned and checked before data analysis. Each variable was examined for normality

distribution using Kolmogorov Smirnov test. Distribution of the data was assessed by descriptive analysis, and presented as means with standard deviation for normally distributed or median with interquartile range for non-normally distributed. The scores for KAP were transformed into percentage scores by dividing the scores obtained by the respondents with the possible maximum scores and multiplied by 100. The sum score of each outcome was assessed based on Bloom's cut off point [13]. Based on the sum scores, level of knowledge was classified into low level knowledge (less than 60%; 0-8 scores), moderate level knowledge (60-80%; 9-11 scores) and high level knowledge (80-100%; 12-15 scores). Meanwhile, the scores were classified into positive attitude (80-100%; 60-75 scores), neutral attitude (60%-80%; 45-59 scores) and negative attitude (less than 60%; 15-44 scores). Subsequently, level of practice was classified into poor level (less than 60%; 10-29 scores), fair level (60-80%; 30-40 scores) and good level (80-100%; 41-50 scores). The Spearman's rank correlation test was applied to determine the associations among knowledge, attitude and practice. Meanwhile, the Pearson correlation coefficient was applied to investigate the relationships between BMI z-score with knowledge, attitude and practice. A two sided p value of < 0.05 was considered statistically significant.

## Results

The demographic information and anthropometric measurements of the children is summarized in Table 1. A total of 384

**Table 1. Demographic information and anthropometric measurements of the children (n=384).**

Variables	n (%)
<b>Age</b>	
10 years old	194 (50.5)
11 years old	190 (49.5)
<b>Gender</b>	
Boys	196 (51.0)
Girls	188 (49.0)
<b>Ethnicity</b>	
Malay	309 (80.5)
Indian	34 (8.9)
Chinese	24 (6.2)
Others	17 (4.4)
<b>Whole grains product consumption</b>	
Consumed	286 (74.5)
Never consumed	98 (25.5)
<b>Frequency of whole grains product consumption</b>	
Daily	35 (9.1)
4-6 times in a week	51 (13.3)
2-3 times in a week	46 (12.0)
Once a week	39 (10.2)
Once a month	9 (2.3)
Very rare	107 (27.9)
Never tried	97 (25.3)
<b>Choice of whole grains breakfast</b>	
Whole grains ready-to-eat cereals	232 (60.4)
Whole grains bread	79 (20.6)
Oat	49 (12.8)
Whole grains biscuit	13 (3.3)
Corn	11 (2.9)
Others	0
Anthropometric measurements	

Weight	34.33± 9.93 <sup>a</sup>
Height	134.64 ± 11.08 <sup>a</sup>
BMI z-score	0.42 ± 1.49 <sup>a</sup>

<sup>a</sup> Mean ± standard deviation; BMI: body mass index

children aged 10 and 11 years or studying in Grade 4 and Grade 5 consented to the study. 51.0% were boys and 49.0% were girls with 1:1.04 female and male sex ratio. Majority of the school children were Malays (80.5%). It was found that out of a total of 384 school children, 74.5% of them had tried whole grains foods before. However, only 9.1% of them consumed the whole grain products on a regular basis (daily). If given a choice, majority of the children chose whole grains ready-to-eat cereals as their preferred whole grains breakfast (60.4%), followed by whole grains bread (20.6%), oat (12.8%), whole grains biscuit (3.3%) and corn (2.9%). The overall mean ± SD of BMI z-score was 0.42 ± 1.49.

Children answered a total of 15 close-ended questions about food pyramid, source of carbohydrate, definition of whole grains, source of whole grains, nutritional content of whole grains and the benefits of whole grains consumption. The median score for knowledge was 7.00 (IqR 4.00). Majority (70.3%) of the children had low knowledge on whole grains. Meanwhile, 24.8% had moderate knowledge and 4.9% had high level of knowledge on whole grains. The knowledge items with percentage of correct answer are displayed in Table 2. A large majority of the children (83.3%) were aware of the food pyramid's shape. However, less than half were able to identify the detail of food pyramid and the function of carbohydrate. In response to items assessing knowledge about whole grains, only 48.7% of the children were able to correctly identify the definition of whole grains, while the majority of the children correctly answered the question regarding whole grains foods and nutrients. However, more than half of the children were unable to identify the benefits of whole grains consumption.

Concerning attitudes towards whole grains consumption, the

children obtained a median score of 51.00 (IqR 8.00) out of 75. The attitude towards whole grains was generally neutral as majority (72.6%) of the children scored 45-59. Meanwhile, 8.6% were in positive attitude and 18.8% were in negative attitude towards whole grain consumption. The attitude items with percentage for positive attitude are presented in Table 3. Only 26.8% of them showed some concern regarding whole grains foods choices despite they were still young and healthy. Susceptibility perception was high as majority of them chose to put effort towards increasing whole grains consumption, such as studied hard to determine the functions of whole grains, spent more time on internet to search the advantages of eating whole grain foods and spent more time on book reading to search the food which contains whole grains. The median score for practice was 23.00 (IqR 8.00).

The practice towards whole grains was generally poor as majority (83.9%) of the children showed unsatisfactory score. Meanwhile, only 2.3% and 13.8% of the children were in good and fair practice level, respectively. The practice items with percentage for good practice are presented in Table 4. The analysis for each item on consumption practices showed that the whole grains intake was relatively poor. Table 5 presents the correlation coefficient between whole grains knowledge, attitude, practice and BMI z-score. It was found that only practice domain was inversely associated with BMI z-score ( $r=-0.117$ ,  $p=0.022$ ). With regard to the KAP towards whole grains, it was found that the children who had higher knowledge level would have a better attitude and greater practice towards whole grains consumption. Significant positive correlations were found between knowledge with attitude ( $r=0.335$ ,  $p<0.001$ ), attitude with practice ( $r=0.171$ ,  $p=0.001$ ), as well as knowledge with practice ( $r=0.162$ ,  $p=0.001$ ).

**Table 2. Knowledge items with percentage of correct answer (n=384).**

No.	Knowledge items	Correct n (%) <sup>a</sup>
<b>Food pyramid</b>		
K1	What is the shape of food pyramid?	320(83.3)
K2	Which level of the food pyramid consists of complex carbohydrate foods?	137(35.7)
K3	Based on the food pyramid, which group should be consumed adequately?	50(13.0)
<b>Nutrient and function of complex carbohydrate</b>		
K4	Complex carbohydrate is the main energy source required by our body?	106(27.6)
K5	Among the following, which is the complex carbohydrate?	204(53.1)
<b>Nutrient and sources of whole grains</b>		
K6	What is whole grain?	187(48.7)
K7	Among the following, which belongs to whole grain product?	135(35.2)
K8	Corn is a whole grain food.	235(61.2)
K9	Whole grains ready-to-eat cereals enrich with	105(27.3)

K10	Whole grains food enrich with	221(57.6)
K11	Whole grains food high in	304(79.2)
<b>Nutrient and function of whole grains</b>		
K12	Whole grains ready-to-eat cereals intake may increase the satiety	169(44.0)
K13	What is the function of fiber from whole grains ready-to-eat cereal?	134(34.9)
K14	Whole grains food may help in	195(50.8)
K15	Taking whole grains ready-to-eat cereal as breakfast may stronger the bone?	176(45.8)

<sup>a</sup> Percentage of children who gave the correct answers

**Table 3. Attitude items with percentage for positive attitude (n=384)**

No.	Attitude items	Positive Attitude n (%) <sup>a</sup>
<b>Improving the whole grain intake</b>		
A1	I don't like to consume whole grains ready-to-eat cereal as my breakfast because it will increase my satiety and I have no appetite to enjoy fried chicken in the afternoon.	200(52.1)
A2	I seldom take the whole grains foods because it is difficult to get in my neighbourhood.	170(44.2)
A3	I will choose cream biscuit if there is a choice between whole grains biscuit and cream biscuit.	135(35.1)
A4	I don't like to eat whole grains ready-to-eat cereal with low fat milk because it is tasteless.	224(58.3)
<b>Effort towards increasing whole grain intake</b>		
A5	I study hard to determine the function of whole grains.	253(65.9)
A6	I try to spend more times on internet to search the advantages of eating whole grains foods.	201(52.3)
A7	I try to spend more times on book reading to search the food which contains whole grains.	235(61.2)
A8	I will buy whole grains ready-to-eat cereal as breakfast if it is sold at school canteen.	222(57.8)
<b>Action towards achieving whole grain recommendation</b>		
A9	I will finish all the whole grains foods despite I don't like it.	161(41.9)
A10	I am not worried about the whole grains food choices because I am still healthy.	103(26.8)
A11	I will choose whole grains ready-to-eat cereals as my breakfast if there is a choice between whole grains ready-to-eat cereal and coconut milk rice.	254(66.1)
A12	I will seek for the advice from teacher and parents if encounter any problem regarding whole grains.	163(42.5)
<b>Health and whole grain intake</b>		
A13	I am interested to take whole grain foods if I am informed about the benefit of it.	248(64.6)
A14	In my opinion, whole grains ready-to-eat cereals have more nutrients and healthier compared to non-whole grains food such as white bread, coconut milk rice and roti canai.	215(56.0)
A15	I will choose white bread if there is a choice between whole grains bread and white bread at home.	57(14.9)

<sup>a</sup> Percentage of children who answered “strongly agree” or “agree” for attitude that they should have and “strongly disagree” or “disagree” for attitude that they should not have

**Table 4: Practice items with percentage for good practice (n=384)**

No.	Practice items	Good Practice n (%) <sup>a</sup>
<b>Whole grain snack</b>		
P1	I am taking whole grains ready-to-eat cereal with low fat milk as my morning or afternoon tea.	32(8.4)
P2	I am taking whole grains ready-to-eat cereal as my snack.	54(14.0)
P3	I am taking corn as my snack.	45(11.8)
P4	I am taking whole grains biscuit as my snack.	71(18.5)
<b>Whole grain meal and drink</b>		
P5	I am taking barley as my drink.	112(29.1)
P6	I am taking brown rice as my main meal	46(12.0)
P7	I am taking oat whenever I feel hungry.	26(6.8)
<b>Whole grain breakfast</b>		
P8	I am taking whole grains ready-to-eat cereal with low fat milk as my breakfast.	69(17.9)
P9	I am taking whole grains ready-to-eat cereal with chocolate drink as my breakfast.	77(20.1)
P10	I am taking whole grains bread as my breakfast.	95(24.8)

<sup>a</sup>Percentage of children who answered “always” or “often”

**Table 5. Correlation coefficient between whole grains knowledge, attitude, practice and body mass index z-score (n=384).**

	Knowledge	Attitude	Practice
Knowledge	-	-	-
Attitude	0.335***	-	-
Practice	0.162**	0.171**	-
BMI z-score	0.073	0.028	-0.117*

BMI: body mass index.

\*\*\* is significant at the 0.001 level.

\*\*is significant at the 0.01 level.

\* is significant at the 0.05 level.

All r values are Spearman’s correlation coefficients except those for BMI z-score.

## Discussion

The present study assessed knowledge, attitudes and practice towards whole grains among children aged 10 and 11 years in Kuala Lumpur, Malaysia. Bloom’s cut off point was used to determine the level of KAP because the conceptual framework of the present study was based on taxonomy of educational objectives developed by Bloom (1956). According to Bloom’s taxonomy (1956), human behaviours are derived from the integration of the cognitive, affective and psychomotor domains. Knowledge, attitudes and practices could be representative of the cognitive, affective and psychomotor domains, respectively. Knowledge refers to the factual, conceptual, procedural and met cognitive thought [13]. Attitude is an internal or covert feeling and emotion or selective nature of intended behaviour which represents the affective domain [13]. Meanwhile, practice represents the psychomotor domain. It refers to the physical movement, coordination and use of motor or neuromuscular activities [13].

The outcomes of the present study showed that children had low

level knowledge and practice towards whole grains. Data from USDA’s 1994-1996 Continuing Survey of Food Intakes by Individuals (CSFII) indicated that only 9% of children aged 2 to 19 consumed three or more servings of whole grains daily [7]. The obstacles for the consumption of whole grains foods that are most frequently cited are limited availability, confusion about the identification of whole grains, low consumer awareness and aversion to the colour, texture and taste of whole grains foods [8]. These issues present challenges to school foodservice as well as their parents, to provide whole grains foods that children will consume and to educate children about the health benefits of whole grains inclusion in their meal.

The finding also demonstrated that knowledge, attitude and practice were correlated with each another. The KAP model suggested that behaviour was a result of knowledge and practice, it is in accordance with a KAP model [14]. There is a need for nutrition and food professionals to collaborate on a variety of fronts to encourage the increase consumption of whole grains. Education programs are more likely to be more successful if they include examples of whole grains foods and activities that reflect the target children’s lifestyle, preferences and culture. Behavioural change is

difficult to achieve, but is more likely to occur if food and nutrition professionals can speak with one voice about the benefits of whole grains consumption as an integral part of an overall healthy diet. Besides, respective organisations and government sector may offer whole grain foods which provide the opportunity for children to experience and accept a healthy new repertoire of whole grain alternatives in their diet at young ages. Previous interventions have been made through recipe modification and social marketing techniques, to successfully modify the intake of low fat milk [15], fruits and vegetables [16], as well as fat intake [17]. The program demonstrated that change in food preparation practices markedly increased vegetable, fruit and low fat milk intakes, while modified fat content of foods, resulted in significant changes in nutrient intake of children. Such modifications were well received by the children, as the program provided them with palatable food options.

A nutritionally adequate diet is essential for optimal growth and development. For the school-aged children, a healthy diet containing all the food groups in required amounts is important for optimum BMI and reduces the risk of diet-related chronic diseases. The study revealed that practice domain was inversely associated with BMI z-score and it is indicated that children with higher whole grains consumption have lower BMI z-score. It is in line with a previous study [3]. Reduced BMI z-score with higher whole grains consumption may be mediated in part by enhanced insulin sensitivity and increased satiety [4]. Proper nutrition education particularly on whole grains in childhood may reinforce lifelong healthy eating habits that contribute to improve long-term health and the development of healthier eating habits that are carried into adulthood.

It is possible that the children might not tell the truth especially questions on attitude and practice which may introduce to social desirability bias. It was minimized by assuring children of their anonymity and confidentiality of individual reports. The present study provides preliminary information to increase our understanding of the factors that may influence the whole grains consumption of the children. Further a comprehensive study is needed in all geographical locations of the country to know the actual KAP towards whole grains in whole Malaysia.

## Conclusion

The outcomes of the present study indicated that children supplied with knowledge may eventually develop positive attitude and good practice towards whole grains, which may be useful in managing childhood obesity by lowering BMI z-score. However, a wide gap was observed between the recommended and actual practices, and their overall whole grains-related knowledge was insufficient. This study reveals the importance of KAP towards whole grains among children that assist with identification of specific preventive childhood obesity actions. Therefore, we suggest that further action is required to develop whole grains-related

education programs for the children.

## Acknowledgment

We extend our gratitude to the headmaster, teachers and staff of Sekolah Kebangsaan Bandar Tasek Selatan, Sekolah Kebangsaan Seri Permaisuri, Sekolah Kebangsaan Taman Sri Rampai, Sekolah Kebangsaan Desa Tun Hussein Onn, Sekolah Kebangsaan Seri Delima and Sekolah Kebangsaan Batu Muda for providing us with the help throughout data collection and facilities. Heartily thank to the children for participating. Thanks are also due to Dr Sarjit Singh who spent precious time discussing and proofreading the article. Finally, our gratitude goes to Universiti Kebangsaan Malaysia for funding the research study.

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