



# Knowledge, attitudes and practices of schoolchildren toward whole grains and nutritional outcomes in Malaysia

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## ABSTRACT

Whole grains play an important role in regulating body weight. However, interventions aimed to increase whole grains consumption have had limited impact on body mass index for age z-score (BAZ) due to insufficient understanding of knowledge, attitudes and practices (KAP) toward whole grains. This survey aimed to evaluate whole grains KAP among schoolchildren, as well as to investigate the associations of whole grains KAP with BAZ among the schoolchildren in Negeri Sembilan, Malaysia. This cross-sectional survey was conducted among 380 schoolchildren aged 9–11 years, cluster sampled from six randomly selected schools. Data were collected through a validated self-administered guided questionnaire. Body weight and height were measured. A majority of the schoolchildren had normal body weight (56.6%), moderate whole grains knowledge (42.6%), as well as neutral attitudes (66.1%) and poor practices (58.9%) toward whole grains consumption. Significant positive associations were found between knowledge and attitudes ( $r = 0.337$ ;  $p < .01$ ), attitudes and practices ( $r = 0.150$ ;  $p < .01$ ) and knowledge and practices ( $r = 0.190$ ;  $p < .01$ ). Further, whole grains consumption's practices was associated with BAZ after adjusting for sex, gender, race and area where children lived in ( $p < .001$ ). Outcome of this present study implies that positive change in whole grain knowledge would help to inculcate positive attitudes and cultivate better practices toward whole grain consumption, which may be useful in lower BAZ among schoolchildren in Negeri Sembilan, Malaysia. This study reveals the importance of KAP toward whole grains among children to assist in identification of specific preventive childhood obesity actions.

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## 1. Introduction

Over the past two decades, there have been notable changes in the Malaysian food consumption pattern; the most significant changes in the food consumption pattern are the increasing demand for grains based products (Sheng, Shamsudin, Mohamed, Abdullah, & Radam, 2008). Grains constitute the largest component of recommended daily intake in Malaysian dietary guidelines (NCCFN, 2013) and other dietary guidelines (USDA, 2010; Danish Veterinary and Food Administration, 2014). Due to their important role in most diets around the world, research regarding their potential health benefits has received considerable attention in these few years, particularly whole grains (Slavin, Tucker, Cynthia, & Jonnalagadda, 2013). Whole grains contain germ, bran and

endosperm: which are a good source of B vitamins, iron, magnesium, zinc and fiber (Slavin et al., 2013). Clinical and epidemiological studies have demonstrated that whole grains consumptions were inversely associated with obesity (Tucker & Thomas, 2009), cardiovascular disease and cancer (Aune et al., 2016). Cross-sectional studies from United State of America have reported that consumption of whole grains improved body mass index for age z-score (BAZ) (Choumenkovitch et al., 2013) and diet quality (Bellisle, Hebel, Colin, Reye, & Hopkins, 2014) among children. However, the majority of children do not meet the recommended whole grain intake and their lifestyles are devoid (Mann, Pearce, McKeivith, Thielecke, & Seal, 2015; Norimah et al., 2015; Reicks, Jonnalagadda, Albertson, & Joshi, 2014).

A consistent increase in the prevalence of childhood obesity has been observed in developed countries. Unfortunately, the prevalence of obesity is also increasing in developing countries (Ahmad, Ahmad, & Ahmad, 2010). In Malaysia, the Ministry of Health carried out the third National Health and Morbidity Survey (NHMS) in

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2006 and found that 5.4% of children younger than 18 years of age were overweight/obese (IPH 2006). Nine years later, the NHMS V revealed that the prevalence of childhood obesity had increased to 11.9% (IPH 2015). Given the increasing prevalence of childhood obesity, it has become urgent to study strategies such as including whole grains that make it possible in childhood obesity intervention (Koo, Poh, & Ruzita, 2016a). Successful childhood obesity intervention might also be useful as secondary prevention, by decreasing complication of co-morbidities associated with childhood obesity later in life (Pandita et al., 2016). In recent years, health organizations have implemented a variety of childhood obesity interventions to promote healthy eating behaviors and lifestyle; yet they have had limited impact. Their lack of impact might be attributable to insufficient understanding of dietary practices, the influence of geographic location (Micha et al., 2010) and programmes (Shepherd, Raats, & Egham, 2007) that need to be implemented, which are developmentally appropriate.

The aims of the present study were to (1) examine the level of knowledge, attitudes and practices (KAP) toward whole grains consumption, (2) investigate the association between these variables and (3) determine the associations between KAP toward whole grains consumption with nutritional outcome among schoolchildren in Negeri Sembilan, Malaysia. A better understanding of KAP toward whole grains in children is necessary to develop an effective whole grains intervention, to positively influence eating behaviors and manage childhood obesity (Koo et al., 2016a). Previous research has reported that texture, taste, availability, convenience and cost to be the major barriers toward sustainable whole grains intake (Kuznesof et al., 2012). But other factors such as limited knowledge of wholegrain foods, lack of knowledge of health benefits and personal preferences have also been noted (McMackin, Dean, Woodside, & McKinley, 2013). The inability to compare previous studies may be attributed to several issues including conceptualization, measurement, analysis and research design (Rosen, Burgess-Champoux, Marquart, & Reicks, 2012). A study from Kuala Lumpur, Malaysia has assessed the KAP towards whole grains consumption (Koo, Poh, & Ruzita, 2015). However, Kuala Lumpur is a highly urbanize region and is dissimilar compared to the rest of the country. Ambiguity remains regarding the KAP towards whole grains consumption and their association with BAZ among Malaysian schoolchildren. This includes those from other states such as Negeri Sembilan, as Negeri Sembilan is less urbanize compared to Kuala Lumpur. The determination of KAP toward whole grains consumption among schoolchildren in Negeri Sembilan in relation to BAZ is important as this state was one of the higher rates of childhood obesity prevalent states in Malaysia (12.5%) (IPH, 2015). This finding may be helpful to identify gaps in knowledge in this population and help to explain their behavior toward whole grains which in turn will guide the development of childhood obesity interventions in Negeri Sembilan, Malaysia. We hypothesized that whole grains knowledge would be associated with attitudes toward whole grains consumption. Furthermore, whole grains consumption would potentially lower BAZ among schoolchildren in Negeri Sembilan, Malaysia.

## 2. Methods

### 2.1. Subjects and study design

A cross-sectional survey was conducted from July 2016 to December 2016 involving Malaysian schoolchildren aged 9–11 years from selected national primary schools in Negeri Sembilan, Malaysia. Negeri Sembilan is a state in Malaysia which lies on the western coast of Peninsular Malaysia. Negeri Sembilan is not as

developed as compared to the capital city of Kuala Lumpur. There are 188 national primary schools in seven zones of Negeri Sembilan. Six national primary schools were randomly selected to participate in this study. Schoolchildren were eligible for inclusion in the study if they were: Malaysian schoolchildren, male or female, from all ethnic groups (Malay, Chinese, Indian, Bumiputra Sabah, bumiputra Sarawak and other bumiputra), aged 9–11 years, were able to write, read and understand Bahasa Malaysia. Schoolchildren were excluded if they had mental disabilities or were unable to read Bahasa Malaysia. All the schoolchildren who fulfilled the inclusion criteria from the six randomly selected national primary schools were invited to take part in the survey. Using Krejcie and Morgan (1970)'s formulation, the estimated sample was based on a total of 23,225 schoolchildren aged 9–11 years in Negeri Sembilan, a 95% confidence level, a relative precision of 5% and predicted prevalence of 50%. The estimated sample was 378; however, after adjusting for the 10% drop out rate, a sample of 416 was required to meet the criteria. Ultimately, data from 380 respondents were analyzed.

The objective of the present study was to examine the linkages between the KAP towards whole grains consumption with BAZ; but not to claim the causality. Ethical clearance was granted by the ethnic committee of Management and Science University. Permission to carry out data collection was granted by Ministry of Education, Malaysia and Negeri Sembilan Education Department. Parental consent was obtained for all schoolchildren prior to participation. Verbal assent was obtained from the schoolchildren before the study began in order to enable us to administer the questionnaires and acquire anthropometric measurements. Self-administered questionnaires potentially protect the anonymity and privacy of the schoolchildren contributing to schoolchildren's confidentiality. Anonymity was ensured by separating questionnaires from identifiable individual's written consent form. In addition, questionnaires were not numbered.

### 2.2. Study questionnaire

Data on whole grains knowledge, attitudes and practices of the respondents were obtained using a validated guided self-administered questionnaire and collected in Malaysian national language (Bahasa Malaysia) with the assistance of trained interviewers. The details of the questionnaire, as well as the development, validation and establish of reliability procedures have been previously published (Koo, Poh, & Ruzita, 2016b). However, for the sake of completeness, a brief description is provided here. The questionnaire was composed of four parts. The first part contained sociodemographic characteristics of subjects. The second part was composed of 15 nutrition and whole grains knowledge-related questions with 2-point scale (0 = wrong or "not sure" response, 1 = correct response). Knowledge points were expressed as percentages of total point-12. The sum point of knowledge outcome was assessed based on Bloom's cut off point (Bloom, 1956) and classified into low level knowledge (less than 60%; 0–8 points), moderate level knowledge (60–80%; 9–11 points) and high level knowledge (80–100%; 12–15 points).

The third part of questionnaire included 15 items measuring attitudes toward whole grains consumption, using a 5-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree). To determine whole grains consumption attitudes of subjects, the negative phrases were recorded and allocated points accordingly (5 = strongly disagree, 4 = disagree, 3 = neutral, 2 = agree, 1 = strongly agree). Attitudes points were expressed as percentages of total points-75. Points were classified into positive attitudes (80–100%; 60–75 points), neutral attitudes (60–80%; 45–59 points) and negative attitudes (less than 60%; 15–44 points). The fourth part of the questionnaire comprised 10 items on

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