

Whole Grain Consumption among Adolescents (13-14 years) in Kuala Lumpur, Malaysia

Shanthi .D ¹⁺, Low Choon Hui ¹, Lim Shan Di ¹, and Lor Jia Ping ¹

¹ Department of Nutrition & Dietetics, School of Health Sciences, International Medical University, Kuala Lumpur, Malaysia

Abstract. The aim of the study is to find out the whole grain consumption among adolescents (13 -14 years) in Kuala Lumpur, Malaysia. Methods: Data was collected from 105 adolescents aged 13-14 years from a national school in Kuala Lumpur and were categorized in to low, medium and non whole grain consumers. Dietary intake was estimated through 3 day food record. Original Healthy Eating Index (HEI) was used to determine the diet quality of the subjects. Anthropometry measurements were used to find out their BMI and a questionnaire was administered to access lifestyle factors and socio-demographic status of the subjects. Results: Only 26 % of subjects consume whole grain food products and the mean intake was 0.20 ± 0.34 servings per day. Sixty three percent of non whole grain consumers engaged in physical activity and consume multivitamin respectively. The subjects who consumed more servings of whole grains achieved a higher HEI score. HEI score and dietary fibre intake was positively correlated with whole grain intake of subjects and there was significant association between parents educational level and taste preference of whole grain. Conclusion: The mean intake of whole grain among adolescents (13-14years) was much lesser than the recommended intake by Malaysia Dietary Guidelines 2010.

Keywords: whole grain consumption, adolescents, Healthy Eating Index

1. Introduction

The epidemiological research have demonstrated a reduced risk for developing cardiovascular disease, Type 2 diabetes mellitus, metabolic syndrome, obesity and certain forms of cancer with high intakes of whole grain foods due to the presence of the various nutrient in whole grains[1]. The components and nutrients in whole grain are believed to improve the diet quality and nutrients of an individual [2]. According to the research carried out in the United State (US) among children and adolescent, 72.7% of the 4,802 adolescent consume whole grains every day. However, the average of whole grain consumed by adolescents was about 0.8 - 1.0 serving which was below the recommendation of whole grain intake by the US [3]. The 2010 Malaysian Dietary Guidelines recommended that the Malaysians consume at least half of the grain products from whole grains. But the Malaysian Adult Nutrition Survey (MANS) 2003, showed the intake of grain products among the Malaysian population was 9.9 servings/day [4].

2. Methods

Adolescent students of aged 13-14 years were recruited from urban school through convenience sampling. The inclusion criteria were healthy and present during data collection day not on any specialized diet or restricted diet. Those who were consented were given a two-page information sheet about the study. However, consent from their parents was obtained verbally prior to the participation in this study. The study protocol was reviewed and approved by International Medical University Research & Ethics Committee. Ministry of Education (MOE) and Wilayah Persekutuan Education Department and the head of secondary school.

⁺ Corresponding author. Tel.: + 0060327317302.
E-mail address: shanthidhandapani@imu.edu.my.

Dietary intake was determined using self-reported 3-day food record. It represents the food intake of subjects for 2 weekdays and 1 weekend. Participants were given 2 weeks to complete the 3-day food record. The dietary intake was analyzed by using Nutrient Composition of Malaysian Foods [5], Nutritionist Pro Diet Analysis software (version 2.0). The Original Healthy Eating Index (HEI) developed by USDA [6] was used to assess the diet quality of the participants after adjusting the scoring criteria based on the Malaysian Food Pyramid in order to use it in Malaysia setting [7] [8]. The self reported questionnaire was administered to find out their lifestyle factors such as physical activity level, and the food habits.

3. Statistical Analysis

The data was analyzed by using Statistical Package for the Social Sciences (SPSS) version 18.0 , percentages, means, standard deviations, median. Analysis of variance was used to compare the mean difference of daily energy intake, macro- and micro-nutrient intake and HEI score with the amount of whole grain consumed. Pearson's correlation was used to find out the correlation. The association between whole grain consumption with lifestyle factor was analyzed using chi square test.

4. Results

4.1. General Characteristics of Subjects

Completed questionnaires were obtained from 105 subjects were included in all subsequent analyses. The age of the subjects was 13-14 years and male and female subjects were 33% and 67 % respectively. Majority of the parents who were non-whole grain consumers done schooling at secondary level. The total family income of most of the subjects was RM1500 to RM3500 per month. The mean BMI of the subjects (61%) was 20.84 kg/m² which was under the category of normal range for sian BMI values .

Table 1. Diet quality, dietary intakes based on whole grain consumption (n=105)

Nutrients	Total subjects (n =105)	Whole grain consumption group (servings/day)			P value
		0 serving (n=68)	>0 to <1 (n= 33)	≥1 to <2 (n=4)	
	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	
Whole grain servings	0.20 ±0.34	0.00 ±0.00	0.50 ±0.23	1.25 ±0.35	0.000
HEI	54.8 ±7.9	53.0 ±6.4	57.5 ±9.5	61.9 ±7.1	0.004 ^{a,*}
Energy (kcal)	1430 ±436	1430 ±452	1460 ±419	1200 ±244	0.534 ^a
Protein (g)	58.5 ±19.8	58.1 ±20.5	59.5 ±10.1	56.4 ±16.5	0.925 ^a
Carbohydrates (g)	172.0 ±56.1	172.4 ±61.1	174.4 ±47.1	146.2 ±31.3	0.638 ^a
Total fat (g)	56.8 ±20.9	56.9 ±21.1	58.3 ±21.2	43.3 ±10.5	0.401 ^a
Cholesterol (mg)	217 ±114	230 ±116	200 ±113	155 ±49	0.256 ^a
Dietary fibre (g)	8.9 ±4.1	8.2 ±4.1	10.0 ±3.8	10.7 ±3.6	0.070 ^a
Thiamine (mg)	1.1 ±0.6	1.0 ±0.6	1.2 ±0.7	1.2 ±0.3	0.271 ^a
Riboflavin (mg)	1.1 ±0.4	1.0 ±0.4	1.2 ±0.5	1.3 ±0.1	0.079 ^a
Niacin (mg)	9 ±5g	8 ±4	10 ±6	12 ±6	0.290 ^a
Sodium (mg)	2033 ±888	1934 ±896	2260 ±848	1869 ±932	0.106 ^a
Iron (mg)	10 ±4	10 ±4	10 ±4	11 ±4	0.931 ^a
Phosphorus (mg)	790 ±312	782 ±337	820 ±273	698 ±97	0.707 ^a

^a ANOVA was done to compare means between whole grain consumption groups
SD, standard deviation; HEI, Healthy Eating Index

* Statistical significant for P < 0.05

4.2. Diet Quality and HEI Scores

The mean intake of whole grain by the subjects was 6.11±10.2 gram serving size was 0.20±0.34 gram and total percentage was only 3.6% per day. The Table 1 elicits the mean HEI scores were statistically significant. The mean HEI score for non whole grain intake group (53.0 ± 6.4) was significantly different from low whole grain intake group (57.5 ± 9.5; P = 0.014). HEI scores (r = 0.341, P < 0.001) and fibre intake(r = 0.215, P < 0.028) has shown the positive correlation(Table 2)

4.3. Lifestyle Factors of Selected Subjects

The result showed that 43% of non-whole grain consumer engaged in physical activity. Among the subjects, 42% of low whole grain consumers were multivitamin users. Majority of the subjects from all categories ate outside once or twice per week and 3% of non-whole grain consumers ate fast food more than five times per month. Majority of the subjects took sweet food like ice cream, sweets and chocolate once or twice per week. Seventy five of medium intake of whole grains consumers liked the taste of whole grain. The association between the whole grain intake with taste preference showed statistical significance.

Table 2. Correlation of HEI, daily energy and nutrient intake with daily whole grain servings consumption among participants

	Whole grain servings/ day	
	R value	P value
HEI	0.341	0.000*
Energy (kcal)	- 0.073	0.457
Protein (g)	- 0.073	0.460
Carbohydrates (g)	- 0.022	0.821
Total fat (g)	- 0.079	0.422
Dietary fibre (g)	0.215	0.028*
Riboflavin (mg)	0.191	0.051
Iron (mg)	- 0.040	0.688
Phosphorus (mg)	- 0.035	0.721

Analysis of normally distributed data by Pearson correlation test statistical significant $P < 0.05$

5. Discussion

The mean take of whole grain by the male subjects is 0.14gms and female subjects were 0.24 gram servings/day. These results suggested that the whole grain consumption among adolescents was much below than the recommended intake by Malaysian Dietary Guidelines 2010 [6]. Although the present study revealed the overall whole grain consumption was low, increased consumption of whole grain was significantly associated with better diet quality and higher dietary fibre intake. The subjects who consumed more whole grain had higher scores in HEI. The mean HEI score of the subjects of moderate intake (≥ 1 to < 2) of whole grain was ranged from 55 to 69, compared with non intake and low intake (> 0 to < 1) group. The study showed the positive association between whole grain intake and taste preference.

6. Conclusion

In conclusion, the present study showed the consumption of whole grain among adolescents aged 13 to 14 years was low and it is far below the recommendation from Malaysian Dietary Guidelines 2010.. The study also showed the parents who were educated eat more whole grains and thus influence the children also will consume more whole grains. The interventions are needed to raise awareness of the importance of whole grain intake among adolescents in Malaysia.

7. References

- [1] Joanne Slavin, Whole grains and human health. Nutrition Research Reviews 2004; 17:0-12.
- [2] O'Neil et al., Consumption of whole grains is associated with improved diet quality and nutrient intake in children and adolescents: Public Health Nutrition. 2010 July 14; 14(2): 347-55.
- [3] Haas.P et al., Effectiveness of whole grain consumption in the prevention of colorectal cancer: meta-analysis of cohort studies. International Journal of Food Science Nutrition 2009;Mar 21:1–13.
- [4] Norimah AK, Safiah M, Jamal K, Siti Haslinda, Zuhaida H, Rohida S et al. Food Consumption Patterns: Findings from the Malaysian Adult Nutrition Survey(MANS). Mal J Nutr: 25-29, 2008.
- [5] Kennedy ET, Ohls J, Carlson S, Fleming K. The Healthy Eating Index: Design and application. Journal of American Dietetic Association. 1995; 95(10): 1103-8
- [6] Karupaiah T, Chee Wss, Liew Sy, Ng Bk, Chinna K. Dietary Health Behaviours of Women Living in High Rise

Dwellings: . J Community Health. 2012.

- [7] National Coordinating Committee on Food and Nutrition, Ministry of Health. Malaysian Dietary Guidelines 2010. Malaysia
- [8] Loo YY. Whole grain consumption and beliefs about whole grain foods amongst female adults aged 19 to 50 years [dissertation]. Kuala Lumpur: International Medical University. 2012.