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Effects of the MyBFF@school obesity intervention program with nutrition education intervention on nutrition knowledge and attitude of secondary schoolchildren: a cluster randomized controlled trial

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Abstract

Background The increasing global and national prevalence of childhood obesity particularly among schoolchildren has warranted a more viable school-based obesity intervention. Apart from physical activity, nutrition is important in any obesity intervention package. This study examined the effects of the MyBFF@school program with nutrition education intervention (NEI) on nutrition knowledge and attitude of overweight and obese secondary schoolchildren.

Methods This is a cluster randomized controlled trial which involved schoolchildren aged 13, 14 and 16 years old from 15 out of 415 government secondary schools in central Peninsular Malaysia which were randomly assigned into six intervention ($N = 579$ schoolchildren) and nine control ($N = 462$ schoolchildren). The intervention group was given NEI consisting of a nutrition education module carried out by trained personnel for 24 weeks on top of the existing curriculum while the control group only followed the existing school curriculum by the Ministry of Education. The primary outcomes were the nutrition knowledge and attitude score. The mixed effect model taking into consideration the cluster effect was used to assess the changes of nutrition knowledge and attitude scores from baseline until 6 months.

Results Overall, there was



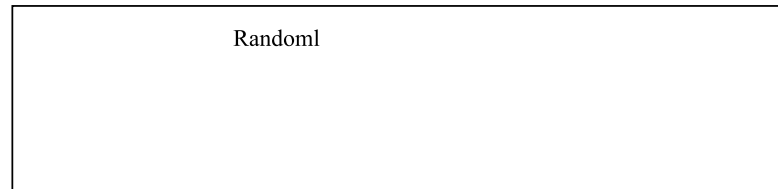
Conclusion MyBFF@school with NEI resulted with no significant improvement for nutrition knowledge and attitude among older schoolchildren. Therefore, to effectively impart the nutrition knowledge and change their nutrition attitude requires an in-depth study and multi-pronged and customized approach.

Trial registration Clinical trial number: NCT04155255, November 7, 2019 (Retrospective registered). National Medical Research Register: NMRR-13-439-16563. Registered July 23, 2013. The intervention program was approved by the Medical Research and Ethics Committee (MREC), Ministry of Health Malaysia and Educational Planning and Research Division (EPRD), Ministry of Education Malaysia. It was funded by the Ministry of Health Malaysia.

Keywords Nutrition education intervention, Childhood obesity, Secondary schoolchildren, School-based intervention, Cluster randomized controlled trial

Background

Childhood obesity is a global public health concern. Among children and adolescents aged 5–19 years, global trends reported in World Health Statistics 2018 have observed a significant increase in obesity from 0.8% in 1975 to 6.8% in 2016 [1]. In 2022, more than 390 million children and adolescents aged 5–19 years were overweight including obesity with increasing prevalence from 8% in 1990 to 20% in 2022 [2]. In Malaysia, the obesity prevalence among adolescents has notably increased. Findings from the National Health and Morbidity Survey showed that the prevalence of overweight Malaysian adolescents aged 10–17 years was 14.6% in 2012, but had increased to 15.6% in 2017. The prevalence of obesity increased from 12.3% to 14.8% over the same time period [3, 4]. Overweight and obese adolescents frequently suf-



to combat obesity among Malaysian school children). Written informed consent was obtained from parents or guardians prior to the study. Schools selected for intervention underwent the MyBFF@school with NEI,

whereas control schools followed only the regular school health education syllabus. Schools involved in other obesity intervention programs were excluded from the study (Mokhtar AH, Wan Mohd Zin RM, Yahya A, Md. Zain F,

Selamat R, Ishak Z, Jalaludin MY: Rationale, design and methodology of My Body is Fit and Fabulous at School (MyBFF@school) Study: A multi-pronged intervention program to combat obesity among Malaysian school children).

Anthropometric measurements

Body impedance analyzer (InBody 720, Korea) was used

Table 1 Module for Nutrition Educational Intervention (NEI) for secondary schoolchildren

Topic	Sub-topic	Objective	Activity Included
Topic 1: Wake up Call/ Time To Act	Unit 1: Are You at Risk	To create awareness among the target groups (parents, teachers and students) on unhealthy food intake	Class teaching
	Unit 2: Challenges In Body Weight Loss and Management	To expose the target groups (parents, canteen operators, teachers and students) on challenges of weight loss management	
	Unit 3: Time To Act	To provide exposure to parents on nutrition intervention sessions that must be taken by students in MyBF@school program	
Topic 2: My Body Weight/ Know My Body Weight	Unit 1: My Body Weight/ Know My Body Weight	1. To perform anthropometric measurements (height and weight) 2. To calculate Body Mass Index (BMI) and plotting the data on growth charts 3. To interpret results of BMI-for-age	Practical session on weight and height measurement, calculation and interpretation of BMI using the growth chart
	Unit 1: A Balancing Act/ Count To Be Fit	1. To know the concept of energy balance 2. To know the sources and total energy intake 3. To know the total energy consumption	Interactive game on getting to know the Food Pyramid and physical activity pyramid
	Unit 2: Fill In My Plate/ Healthy Eating Plan	1. To understand and apply the concept of the Malaysian Food Pyramid/Malaysian Healthy Plate 2. To understand menu planning	Practical session on how to have meal intake with the Malaysian Healthy Plate
Topic 3: Eat Well, Be Well	Unit 3: Awesome Fruits and Veggie	1. To know the importance of daily fruits and vegetable consumption 2. To know the way to consume fruits and vegetables 3. To understand the benefits of fruits and vegetables	Management of fruits and vegetables using the Malaysian Healthy Plate

Table 1 (continued)

Topic	Sub-topic	Objective	Activity Included
Topic 5: MyBFF Smart Shopping, Preparing Meal Together and Eating Out	Unit 1: Smart Shopping	1. To provide guidance to the students on	

group ($n=462$). A slight majority of the respondents were girls (58.7%) living in urban areas (64.1%). There were significant differences in the distribution of the children by location ($\chi^2=28.39, p<0.001$), age groups ($\chi^2=16.23, p<0.001$), and ethnicity ($\chi^2=26.17, p<0.001$). There were no significant differences between the intervention and control groups in any anthropometric measures (body weight, body height, BMI-for-age z-score, skeletal muscle mass, body fat mass, and body fat percentage).

Grading of nutrition KA at baseline and after 6 months of MyBFF@school with NEI

Our study indicated that the majority of schoolchildren in both the intervention and control groups had fair nutrition knowledge at baseline, albeit slightly higher in the intervention group (Table 3). At baseline, there was a significant difference in nutrition knowledge between

Table 3 Grading nutrition KA scores in the intervention and control groups

68.43% ± 14.85 after 6 months in the intervention group. Among boys, nutrition knowledge scores dropped in the intervention group whereas the nutrition knowledge score slightly increased in the control group from baseline to 6 months but this change was not significant in either group. Table 4 also shows significant decreases in nutrition knowledge from baseline to 6 months for boys and rural schoolchildren in the intervention group. As noted in Table 5, although there was an increase on the adjusted mean difference (AMD) of nutrition knowledge score in the overall group, girls, urban, rural and Malays, these increases were however not significant after controlling for the nutrition knowledge score at baseline, ethnicity, location and gender while for boys and non-Malays, there was no significant reduction of AMD of nutrition knowledge score.

The result of our study also showed that there was only a significant reduction of nutrition attitude score for boys from mean ± SD: 65.08% ± 8.8 at baseline to 63.85% ± 7.35, $p = 0.02$ after 6 months without controlling for the nutrition attitude score at the baseline, ethnicity, gender and location (Table 4). However, after controlling for the nutrition attitude score at baseline, ethnicity, gender and location as well as taking into account the cluster effects, there was no significant reduction of nutrition attitude among boys while there was no significant increase on the AMD of nutrition attitude score in the overall, girls, location (urban vs rural) and Malays (Table 5). The non-significant reduction of AMD in the nutrition attitude score was also noted among boys and non-Malays.

Nutrition KA by item

After 6 months of participation in the MyBFF@school with NEI, correct responses for each item in the nutrition knowledge domain indicated that the highest correct scores were on the following items: 1) intake of vegetable can help in controlling body weight, 2) between six and eight glasses of water should be consumed each day, and 3) carbonated drinks (e.g., canned drinks) are not recommended because they contain a lot of sugar. On the other hand, the lowest correct scores (<

However, after controlling for the nutrition knowledge score at baseline, ethnicity, location and gender as well as taking into consideration the cluster effects, the findings of our study showed that among these older school-children, the NEI incorporated into the MyBFF@school intervention had no significant increase on the AMD of nutrition knowledge score in the overall, girls, urban,

taken to combat obesity, including inculcation of positive attitude among older adolescents, continuous multi-pronged strategies and involvement from various sectors are required. A need for NEI inclusion in schools has been acknowledged.

Abbreviations

AMD	Adjusted mean difference
ICC	Intraclass/cluster correlation Coefficient
NEI	Nutrition education intervention
MDG	Malaysian Dietary Guidelines
NHMS	National Health and Morbidity Survey
IPH	Institute for Public Health
MyBFF@school	My Body is Fit and Fabulous @ school

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About this supplement

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Authors' contributions

RS contributed to conception and design, data analysis, interpretation, preparation of draft manuscripts and providing critique. JR, NAAA, NZ, ANI, WNAWM, and AAZ contributed to the conception and design, interpretation, preparation of draft manuscripts. MYJ, FMZ, ZI, and AHM contributed to conception and design, interpretation, preparation of draft manuscripts, providing critiques. AY contributed to the conception and design, data analysis, interpretation and preparation of draft manuscripts. All authors have read and approved the final manuscript.

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Data availability

All relevant data are within the paper.

Declarations

Ethics approval and consent to participate

This study was approved by the Medical Research and Ethics Committee (MREC), Ministry of Health Malaysia (NMRR-13-439-16563). Written informed consent was obtained from parents or guardians, and assent form was signed by participating child.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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