



# Effectiveness of Nutrition Education vs. Non-Nutrition Education Intervention in Improving Awareness Pertaining Iron Deficiency among Anemic Adolescents

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(Received 23 Sep 2012; accepted 12 Feb 2013)

## Abstract

**Background:** This study was carried out to compare the effect between nutrition education intervention and non-nutrition education intervention on awareness regarding iron deficiency among schooling adolescents in Tanah Merah, one of rural district in Kelantan, Malaysia.

**Methods:** This study which was started in year 2010 involved 280 respondents (223 girls, 57 boys, age: 16 yr) from schools in Tanah Merah. The selection criteria were based on hemoglobin level (Hb = 7 – 11.9 g/dL for girls; Hb = 7 – 12.9 g/dL for boys). They were divided into 2 groups. The first group received nutrition education package (Nutrition education, NE), whereas another group was entitled to receive non-nutrition education intervention (Non-Nutrition Education, NNE) (supplement only). Both interventions were implemented for 3 months. The changes in awareness among respondents of both groups were evaluated using multi-choices questionnaire.

**Results:** Nutrition education receiver group (NE) demonstrated improvement in awareness at post-intervention. No substantial improvement was demonstrated by the counterpart group (NNE).

**Conclusion:** Multimedia nutrition education program conducted at school setting was in fact practical and effective in improving awareness on iron deficiency among anemic adolescents.

**Keyword:** Nutrition education, Adolescents, Iron deficiency

## Introduction

In Malaysia, up to 60% of schooling adolescents suffer from different degrees of anemia based on hemoglobin concentration (1). In respect to the escalating trend of anemia among adolescents in this country, and scanty data on this nutritional problem among this age group, more studies particularly, which targeting at improving iron status need to be conducted. Thus, this interventional study was carried out aiming at comparing the effectiveness between a multimedia nutrition education intervention and non-nutrition educa-

tion intervention (provision of supplement alone) in improving awareness level regarding iron deficiency among anemic adolescents. The awareness components assessed include the causes, symptoms and preventive measures of iron deficiency.

## Materials and Methods

This study was carried out in 2 phases; but this paper includes results of those obtained from the intervention phase only. In the first phase, 855

adolescents from 8 secondary schools in rural areas of Tanah Merah were sampled using multistage cluster sampling technique. The assessment which took place in early 2010 resulted in 59.6% (n=510) of anemia prevalence (1).

The second phase of the study was a trial, in which only those who met the specified hemoglobin cut-off points (7 to 11.9 g/dL (female) and 7 to 12.9 g/dL (male) were recruited. Two hundred and eighty anemic adolescents were finally recruited and randomly assigned into 2 groups; Nutrition Education receiver (NE, n=156) and Non-Nutrition Education receiver (NNE, n=124). During the 3 months trial, the NE respondents attended scheduled nutrition education activities for one hour per week. The education consisted of introduction to iron deficiency anemia and its prevention via healthy nutrition. The topics covered were “Iron Deficiency Anemia: An Introduction”, “Iron Deficiency Anemia: Symptoms and Risk Factors”, “Iron Deficiency Anemia: Prevention and Treatment” and “Prevent Iron Deficiency Anemia Nutritionally”. The activities comprised of lecture with question and answer session, video viewing and group discussions.

In addition, they were also provided with brochures of similar topics as conveyed via lectures and videos once weekly. Whereas in the NNE group, the respondents were given capsule form supplement containing 250 mg ferrous gluconate, 1 mg folic acid and 50 mg vitamin C once daily. The compliance of supplementation was observed using a calendar-like consumption reminder sheet self-ticked by respondents and handed over at the end of intervention period.

The evaluation of the respondents' awareness level was done using a self-developed multiple choices questionnaire at pre- and post-intervention. The questionnaire comprised of 50 knowledge questions with “Yes” and “No” answer options. It has been tested for reliability and validity prior usage.

As part of reliability testing process, a pilot test was conducted involving 30 adolescent students from a school located in other district. The stu-

dents were asked to answer the questionnaire and give comment on the appropriateness, clarity and interpretability of the questionnaire. Cronbach ( $\alpha$ ) value of 0.9762 was obtained showing the internal consistency of the questionnaire (2). Each knowledge question carried one mark each, giving a total score of 50. The knowledge item analysis was then carried out by computing the percentage of correct responses, whereby the effectiveness of intervention on awareness level was compared between the two groups (NE vs. NNE) using One-way ANOVA analysis.

## Results

Majority of respondents were Malays (n=254) followed by small number of Chinese (n=22) and Indian (n=4). Fifty-three percent of them lived with 5 to 8 family members. As regards to economic status, more than half (68%) were earning below the poverty line (monthly income of  $\leq$  RM720) (3), with most of the fathers were self-employed, while the mothers were predominantly housewives. Majority of parents attained primary to secondary education level.

More than 50% of total respondents had correctly defined anemia, with 87% of them agreed that iron deficiency anemia is the commonest type of anemia. Besides, over 70% correctly recognized anemia symptoms as tiredness, dizziness and pale complexion. Among the source of information on anemia reported by respondents were electronic media (51%), health provider (31%), peer (27%), mass media (20%), teacher or school (18%), family (15%) and hospital or clinic (11%).

Table 1 illustrates the between-group comparison (NE vs. NNE) of correct response percentage at pre and post-intervention. One-way ANOVA results in Table 2 reveals significant differences in mean of knowledge scores between both groups. It shows that mean knowledge score of NE group had outperform NNE group (NE – NNE = 18.3,  $P < 0.001$ ) at post-intervention.

**Table 1:** Item analysis of correct response (%) given by study respondents (n=280) at pre and post-intervention

Item	Statement	Percent of correct response (%)			
		NE		NNE	
A.	Causes, risk and effect of IDA	Pre	Post	Pre	Post
	Causes of anemia				
	Low iron content of food consumed	87.8	100	90.3	90.3
	Low absorption of iron	59.6	100	70.2	70.2
	Excessive blood loss	55.8	100	42.7	42.7
	High risk group				
	Pregnant mother	64.7	100	68.5	68.5
	Male adolescent	60.3	100	54.0	46.0
	Female adolescent	92.3	100	87.9	87.9
	Infant	32.1	100	24.2	24.2
	Elderly	31.4	100	18.5	16.1
	Female adolescents loss approximately 20 mg of iron via menstruation	60.9	100	58.1	58.1
	Detrimental effects of iron deficiency anemia				
	Impaired physical & mental development	81.4	100	82.3	70.2
	Reduced work productivity	78.8	100	72.6	69.4
	Reduced immunity	64.7	100	69.4	68.5
	Impaired academic performance	80.8	100	50.0	50.0
B.	Iron and nutrition				
	Iron				
	can be obtained from food	94.2	100	95.2	90.3
	important for hemoglobin synthesis	87.2	100	83.9	83.1
	can be obtained from the recycle process of red blood cells	17.3	100	21.0	21.0
	Iron –rich food				
	Red meat	55.8	100	52.4	52.4
	Fish	77.6	100	68.5	63.7
	Liver	66.0	100	52.4	49.2
	Seafoods	42.3	100	50.0	0.0
	Dried fruits	60.3	100	56.5	54.0
	Green leafy veggies	94.9	100	94.4	94.4
	Wheat germ	39.7	100	33.9	17.7
	Cereals	69.9	100	73.4	60.5
	Vitamin C – rich foods				
	Citrus fruits	10.3	100	12.9	25.0
	Tomato	26.3	100	23.4	71.0
	Guava	60.3	100	34.7	46.8
	Tea and coffee inhibit iron absorption	78.8	100	75.8	69.4
	Vitamin C enhance iron absorption	78.2	100	86.3	27.4
D.	Prevention of IDA				
	Increase the intake of food rich in iron	87.2	100	88.7	83.9
	Take iron supplement	85.9	100	88.7	98.4

**Table 2:** Comparison of awareness between groups (based on knowledge score)

Group	Knowledge score (mean)		Mean Difference
	Pre	Post	
NE	33.3	48.6	18.3*
NNE	32.8	30.3	- 0.5

\*The mean difference is significant at level of 0.05;  
 NE – nutrition education receiver (n=156);  
 NNE – non-nutrition education receiver (n=124)

## Discussion

This study indicated that most of the respondents (87.9%) agreed with the statement “IDA is preventable through intakes of iron-rich food/diet”. Yet, quite a few of them failed to identify local foods, which are rich in iron and vitamin C. As regards to role of iron inhibitor and enhancer, up to 77.5% of them agreed that tea and coffee are not good for iron absorption. Other knowledge on iron deficiency anemia prevention strategies such as iron supplementation was quite high among these respondents (87.2%). Between 71 to 91% of the respondents had correctly identify at least three signs or symptoms of anemia, whereas 50%, 64.3%, and 88.9% of them could specify the causes of anemia as insufficient dietary iron intake, reduced iron absorption, and excessive blood loss respectively. Besides, greater part of respondents (90.4%) agreed that adolescent particularly the females are at risk of iron deficiency anemia. Poor awareness on iron deficiency has been also reported among adolescents elsewhere (4, 5).

The electronic media primarily the internet has become the most important medium for information transmission in this country and much effort in education has been focused on making the nation IT-literate, beginning in school setting (6). According to the World Development Indicators presented by World Bank (7), the internet users as percentage of population in Malaysia in 2009 were 57.6%. This figure was the third highest in

comparison to neighboring countries. The rising trend in internet usage in this country is consistent with the finding where electronic media was ranked the highest information source among study respondents. Therefore, more health and nutrition promotional efforts should be addressed via this medium.

The nutrition education package provided to the respondents in NE group has been evidenced to enhance effectively the respective respondents' awareness level (Pre 33.3 vs. Post 48.6). Comparable results have been reported (8) among primary school children in Selangor and Kuala Lumpur, where not only awareness improved but also their practice on healthy eating (8). In an earlier study done among overweight schoolchildren in Kuala Lumpur, video viewing has been proven effective in educating overweight children about obesity (9). This was supported by a study done in Indiana, USA (10) which indicates that the addition of video to a nutrition education lesson enhances nutrition knowledge due to its attractiveness and attention captivating properties. Besides, the potential of video as effective nutrition education tool has been also evidenced in enhancing young people's health and physical fitness (11), as well as for education and management of specific diseases or health problems such as diabetes (12), renal disease (13) and metabolic syndrome (14).

## Conclusion

The nutrition education package utilized in study had effectively enhanced awareness among anemic adolescents towards iron deficiency anemia and the role of healthy dietary practice as preventive measure. We may propose the health authority to incorporate nutrition education intervention along with the supplementation program since both play important role, particularly in correcting iron status and preventing reoccurrence of iron deficiency among adolescents.

## Ethical considerations

Ethical issues (Including plagiarism, Informed Consent, misconduct, data fabrication and/or

falsification, double publication and/or submission, redundancy, etc) have been completely observed by the authors.

## Acknowledgement

We are so grateful to the kindness and cooperation given by the schools' staff and students involved. Appreciation also goes to Universiti Sains Malaysia Short-term Research Grant (304/PPSP/6141611). The authors declare that there is no conflict of interest.

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