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# Effect of an Educational Intervention on Dietary Diversity Practices among Public School Students

Binod Kumar Aryal,<sup>1</sup> Anita Mahotra,<sup>1</sup> Ambika Thapa Pachya,<sup>1</sup> Durga Prasad Pahari<sup>2</sup>

## ABSTRACT

**Background:** Poor dietary diversity leading to malnutrition among children and adolescents is a serious public health problem in Nepal. Though nutrition education intervention has been effective in changing the dietary intake habits of individuals in school settings, the contextual educational intervention has not been tested in our study area. This study is aimed at assessing the effect of dietary diversity education based on the Health Belief Model among secondary level students in selected schools of Siddhicharan Municipality, Okhaldhunga.

**Methods:** Quasi-experimental study design was employed during the intervention study. Our study was conducted in 3 phases: Phase I, Baseline Study; Phase II, Education Package Development; and Phase III- Intervention Study (Implementation and evaluation of the package). The data was collected for getting baseline that was used to develop package, pre-intervention assessment and after intervention assessment, using a self-administered structured questionnaire based on constructs of Health Belief Model (HBM). Study participants were students from grade 7 and 8. The collected data was analyzed using SPSS version 21.

**Results:** After the education intervention, dietary diversity knowledge and practice in the intervention group increased from 16.4% to 54.2% and 32.8% to 48.6% respectively. Significant association ( $P<0.001$ ) was noted between knowledge of dietary diversity with intervention in post-test. Similarly, the mean score of the Health Belief Model construct was significantly improved and showed an association ( $P<0.001$ ) with nutrition education after the intervention.

**Conclusions:** Nutrition education based on the Health Belief Model showed a positive impact on knowledge and practice of dietary diversity among school students. Hence, such education intervention should be promoted by educational institutions, the Ministry of Education, Ministry of Health and Population, NGOs and INGOs.

**Keywords:** Adolescent; dietary diversity; education intervention; health belief model school

## INTRODUCTION

School-aged children and adolescents are highly vulnerable to malnutrition.<sup>1</sup> Good nutrition in this period is crucial for overall physical and cognitive development.<sup>2,3</sup> Dietary diversity (DD) is highly recognized as a key element of high-quality diets by nutritionist.<sup>4,5</sup>

Several studies have associated dietary diversity with energy and nutrient intake among both adults and children in developed and developing countries.<sup>6-9</sup>

Malnutrition especially undernutrition among children is a major public health concern in Nepal.<sup>4</sup> National guidelines for dietary diversity has recommended at least four different food groups to be consumed in each meal.<sup>10,11</sup>

Nutrition education and intervention have been identified as an effective means to improve food intake practices and the nutrition status of children.<sup>12-14</sup> This study aims to identify students' practice of dietary diversity, conduct education intervention based on baseline study. Also, it assesses the effect of the educational package based on the construct of HBM.

## METHODS

The study was conducted for 6 months in Siddhicharan Municipality of Okhaldhunga district as a dietary diversity education intervention implying the constructs of the Health Belief Model (HBM). This intervention study was designed in three phases: Phase I, Baseline study; Phase II, Design of study package; and Phase III, Intervention study (Implementation and evaluation of the package). At first, baseline data was collected based on which

**Correspondence:** Mr Binod Kumar Aryal, Partnership for Social Development (PSD) Nepal Maharajgunj-3 Kathmandu Metropolitan City, Kathmandu, Nepal. Email: [binodaryal36@gmail.com](mailto:binodaryal36@gmail.com), Phone: +9779851027269

education package was developed. After the development of the education package, a pre-intervention assessment was done among the intervention and control group and an education package was provided to the intervention group only. Post-intervention data were collected among both the intervention and control group.

A cross-sectional quantitative method was carried out to identify the practices of dietary diversity. A total of 277 students of grade seven and eight from four schools were selected randomly as a study population. A self-administered structured questionnaire was employed to obtain the information on socio-demographic characteristics, knowledge of dietary diversity, practice on dietary diversity adopted from FAO dietary diversity score and HBM constructs. The questionnaire was pretested among the 28 students of grade seven and eight in Siddhicharan Municipality from school not selected in the actual study. The sequences of question were changed, and the questionnaire was modified after the pretesting in order to maintain the flow of information. Baseline data was collected during the month of October. Cronbach's alpha was calculated for questions based on HBM constructs which were above 0.6 for all subscales. Students who were severely ill and not able to attend school were excluded from the study.

The dietary diversity education package was developed based on the findings from the baseline study. Findings from the study were utilized for situation analysis, audience analysis, media analysis and stakeholders' analysis. Further, program analysis was carried out to identify the statement of the problem. Based on the findings and review of existing materials, the necessary content of the education package for dietary diversity designed was developed. Pretesting of the package was done in school, which was not involved in the baseline and intervention study. Health Belief Model (HBM) was used as a theoretical framework to design and develop the message while nutrition experts and dietetics were consulted to validate the education package.

Duration	Content	Methods and Media
15 minutes	Concept of nutrition and health	Discussion and chart paper
15 minutes	Concept of dietary diversity	Discussion with mini-lecture and posters on malnutrition
30 minutes	Malnutrition problems due to poor dietary diversity practices	Discussion with mini-lecture

15 minutes	Benefits of adopting dietary diversity	Discussion with mini-lecture
15 minutes	Maintaining dietary diversity with locally available foods	Demonstration
10 minutes	Conclusion	Discussion
10 minutes	Review of the session	Discussion

An interventional study was conducted in Siddhicharan Municipality among grade seven and eight students. Quasi-experimental (pretest-posttest control group) design was adopted for the intervention study. The quantitative method was used in the study.

Assuming the change in desired dietary behaviour, sample size for each group (intervention and control) was  $2(1.96+0.8)^2 / (0.3)^2 = 174.22-175$ . Considering a 10% non-response rate, the final sample was calculated as 193.

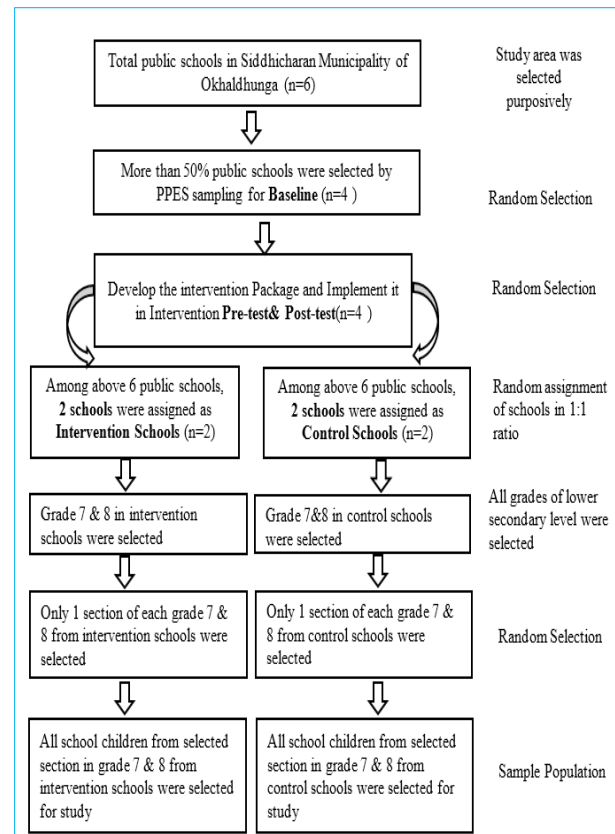


Figure 1. Sampling Technique.

As indicated in figure 1, Siddhicharan Municipality was selected purposively, which is a semi-urban area of Okhaldhunga district. From the list of the total 6 middle secondary level public schools, more than 50 percent schools, i.e., four public schools, were selected based

on Probability Proportional to Enrolment Size (PPES) sampling method for the study. Among these four schools, two schools were randomly assigned as intervention schools and two schools as control schools in a 1:1 ratio. Grade seven and eight of lower secondary level in all interventional and control schools were selected. Only one section of each grade seven and eight from intervention and control schools was selected randomly. All school children from a selected section in grade seven and eight from intervention and control schools were selected as the sample population.

Data were collected using a structured questionnaire used in the baseline study. After the development of the intervention package, pretest data collection was conducted by using a structured questionnaire in both intervention and control groups in January. The designed educational package was provided on the same day only in the intervention group. After four weeks of the intervention, post-test was conducted in both intervention and control group.

HBM was used as the theoretical framework for this study. Rosenstock 1974, describes the HBM as a psychological model that attempts to explain and predict health behaviors. The HBM is a method used to evaluate and explain individual differences in preventative health behavior. Four constructs of HBM were used in this study viz. perceived susceptibility, perceived severity, perceived benefit, and perceived barrier.<sup>23,24</sup>

Data was entered in Epi Data (3.1 version) and analyzed using SPSS (version 17). Pre-test and post-test data was analyzed using descriptive analysis to assess change in the variables. The difference in pre-test and post-test scores of knowledge, HBM constructs, practice of dietary diversity and difference in difference between post-test and pretest scores of knowledge and practice between intervention and control was compared by applying Mann Whitney U test. P-value of <0.05 was considered to be significant where confidence interval (CI) for odds ratio (OR) was set for 95%.

Ethical approval was obtained from the institutional review board (IRB) of Institute of Medicine (IOM). Authorized letter from the Department of Community Medicine and Public Health, Maharajgunj Medical Campus, IOM was obtained. Authority letter was received from DEO and it was produced to the school during the data collection, which eased the process of data collection.

## RESULTS

A total of 277 respondents participated in the baseline study. Majority of participants (81.9%) were below average in terms of having knowledge on dietary diversity and only 18.1% had knowledge equal to or above average knowledge. Among the participants, around one third of them had good food diversity practice with food diversity score more than 4 while two third of them had poor dietary diversity. (Table 2) The mean and standard deviation of dietary diversity knowledge and practice score of participants was  $4.09 \pm 2.6$  and  $3.43 \pm 1.2$  respectively. In regards to HBM construct, the mean and standard deviation of Perceived Susceptibility, Perceived Severity, Perceived Benefits and Perceived Barriers were  $6.2 \pm 1.5$ ,  $6.26 \pm 1.52$ ,  $6.74 \pm 1.62$ , and  $16.49 \pm 1.42$ , respectively. Participants were found to have median less than 50 percent of the total score for perceived severity, perceived susceptibility and had a median score of more than 75 percent of total score of perceived barrier. The difference in dietary diversity practice with HBM constructs; perceived susceptibility, perceived severity, perceived benefit, and perceived barrier is shown in table. The difference was seen using Mann-Whitney U Test. Perceived susceptibility, severity, benefit and barrier has been found to be no significant with the dietary diversity practice. (Table 3)

Table 2. Baseline score of knowledge and Practice of dietary diversity.

Knowledge and Practice	Category	Number/ Percent	Mean $\pm$ SD	Median (Q1, Q3)
Knowledge (Reference for Average Score = 6)	Below Average	227 (81.9)	4.09 $\pm$ 2.6	3.00 (2,5)
	Equal to or above average	50 (18.1)		
Practice	Food diversity below 4 (poor dietary diversity)	170 (61.8)	3.43 $\pm$ 1.2	3.00 (3,4)
	Food diversity above 4 (good dietary diversity)	107 (38.6)		

During the intervention study, among the total participants of 177 in each control and intervention group, dietary diversity practice in the intervention group increased from pretest 32.8% to 48.6% in post-test

and students' core of knowledge increased from 16.4 % to 54.2%. (Table 4)

**Table 3. Baseline HBM Construct.**

Variable	Dietary diversity practice		p-value	Mean±SD	Odds Ratio (95%CI)
	Good (= > 4) Median (Q1, Q3)	Poor (<4) Median (Q1, Q3)			
Perceived susceptibility	6 (5,8)	6 (5,7)	0.171	6.2± 1.5	1.127 (0.958-1.326)
Perceived severity	6 (5,8)	5 (6,7)	0.689	6.26± 1.52	1.032 (0.880-1.210)
Perceived benefit	7 (5,8)	7 (6,8)	0.760	74± 1.62	0.968 (0.834-1.124)
Perceived barrier	17 (16,18)	17 (15,18)	0.603	16.49± 1.42	1.034 (0.872-1.226)

**Table 4. Changes in percentage of knowledge and practice on dietary diversity and its association before and after intervention.**

Variables	Group	Pretest (%)	Posttest (%)	Change (%)	Difference in difference
Knowledge on dietary diversity	Control (177)	28 (15.8)	32 (18.1)	3.7	<0.001
	Intervention (177)	29 (16.4)	96 (54.2)	37.8	
Practice of dietary diversity	Control (177)	52 (29.7)	63 (35.6)	5.9	<0.001
	Intervention (177)	58 (32.8)	86 (48.6)	15.8	

**Table 5. Comparison of mean and standard deviation of HBM construct before and after intervention.**

HBM Construct	Group	Before Intervention		After Intervention	
		Mean (SD)	p value	Mean (SD)	p value
Perceived susceptibility	Intervention Group	6.9 (1.35)	0.203	11.95 (1.13)	<0.01
	Control Group	6.5 (1.1)		7.0 (1.2)	
Perceived severity	Intervention Group	6.67 (1.29)	0.213	11.8 (1.14)	<0.01
	Control Group	6.8 (1.2)		7.2 (1.5)	
Perceived benefit	Intervention Group	7.19 (1.38)	0.496	12.13 (1.24)	<0.01
	Control Group	7.2 (1.4)		7.7 (1.5)	
Perceived barrier	Intervention Group	14.18 (2.09)	0.05	7 (1.55)	<0.01
	Control Group	15.5 (2.1)		15.5 (1.9)	

The HBM construct showed significant changes after educational intervention (Table 5). Thus, nutrition education significantly changed the beliefs of students regarding dietary intake. The scores of HBM construct

significantly increased in the intervention group, as compared with control group significantly in perceived susceptibility (<0.001), perceived severity (<0.001), perceived benefit (<0.001) and perceived barrier (<0.001).

**DISCUSSION**

The findings of our study highlight the effectiveness of nutrition intervention in improving knowledge and practice of dietary diversity based on the HBM construct of increased perceived severity, susceptibility, benefits and decreased perceived barrier. Similarly, our study assessed dietary diversity practice, identified the knowledge on dietary diversity, and examined the association of between participants' knowledge and practice of dietary diversity. Our findings also indicate the change in mean score of students during baseline and after education intervention.

During baseline, the percentage of students with knowledge and practice of dietary diversity were 18.1% and 38.6% respectively. While after education intervention, the figure increased to 54.2% and 48.6% respectively in the intervention group. The findings show agreement with several studies done before showing significant increment in knowledge and practice score in the intervention group after nutrition education.<sup>1, 15-18</sup>

The findings of our study signify that health education package based on dietary diversity can be effective in changing the knowledge and practice of students.<sup>15,19,20</sup> It may be due to the well-developed education package contextualized based on findings of the baseline study and its effective delivery. This also signifies that the developed educational package was suitable for the participants to sensitize and absorb the information being provided and participatory interaction with the participants in the intervention group during the implementation of the educational package.

There is a similar increase in the practice of the dietary diversity among the participants in the intervention group by 15.8% while that in the control group increased by 5.9%. The change in practice in the intervention group is not as exciting as their change in knowledge, which can be explained with cognitive dissonance on one hand and the lack of control of the participants over what is being cooked at home.<sup>21,22</sup>

In the present study, it was found that there was a significant association of participants' knowledge

and practice of dietary diversity with educational intervention. This is practical evidence of the effectiveness of nutrition education when linked with research, theory, and practice as advocated in a review article of nutrition education by Contento in 2008.<sup>23-27</sup> Similarly, series of previous studies have indicated that nutrition education can be as effective in changing the knowledge, beliefs and behaviors among students in schools.<sup>1,15,18,28</sup> The use of similar educational interventions can bring about changes in dietary diversity knowledge and practices in similar settings.<sup>1,15,17</sup>

Our study used HBM constructs (perceived susceptibility, severity, benefits, and barriers) integrating Nutrition Education. This is similar to the study done among students where dietary behaviors were studied based on health belief model constructs and it was found that this model can relate the students' perception of diet intake and their risks of being vulnerable to chronic diseases and malnutrition.<sup>15,29</sup> Several other studies have used this model with education program, which suggests the increased perceived susceptibility among the study population. Our findings are similar to the study conducted before. Similarly, the mean score of perceived severity has also increased after the intervention. The students might have perceived the seriousness of the consequences of non-compliance with proper eating behaviors. There has been a significant increase in the mean score of perceived benefits in the intervention group after intervention.<sup>15,17,24,29,30</sup> This explains the benefits as the only determinant that motivates healthy eating behavior as opposed to a barrier. The mean score of perceived barrier is decreased which is consistent with the previous studies conducted.<sup>15,17,30</sup>

Long-term impact of the intervention on students' knowledge and practice could not be assessed. The study was carried out in school setting. So, the findings couldn't be generalized to other settings. The time gap between the intervention and posttest was only four weeks.

## CONCLUSIONS

The health education package on dietary diversity was found to be effective in increasing perceived susceptibility, perceived severity, perceived benefits, and decrease perceived barriers on dietary diversity. It was observed that there was a significant association of participants' knowledge and practice of dietary diversity with educational intervention.

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## Author Affiliations

<sup>1</sup>Partnership for Social Development (PSD) Nepal

<sup>2</sup>Central Department of Public Health, Institute of Medicine, Tribhuvan University, Nepal.

**Competing interests:** None declared

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