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Role of game based nutrition education in improving the nutritional knowledge of students of upper primary classes (6th to 8th standard) in state government schools of district Sitapur

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Abstract

School age is a period of rapid growth in human development when nutritional demand is increased and dietary habits is established. Nutrition of school age children has not only direct and short term influence on physical and mental growth during that period but also indirect and long term influence on the continuing growth and health of the students and the health during the lifetime, and thus the importance of nutrition in school age children has been emphasized because malnutrition and other diseases during this period can decrease not only physical and mental developments but also the learning ability of children. Common belief is that acquiring nutritional knowledge will itself lead to improved dietary practices. Nutritional knowledge can be gained by means of nutrition education. Nutrition Education has been recognized as a crucial factor in promoting children's nutritional knowledge. The purpose of the study was to determine the change in nutritional knowledge of students of upper primary schools after receiving a game based nutrition education intervention. A validated questionnaire was used to assess knowledge at pre and post intervention. The result showed that there was significant improvement in students' knowledge. The findings support the importance of providing nutritional knowledge to children to promote healthy dietary behaviors.

Keywords: Game, nutrition education, nutritional knowledge, students, school

Introduction

School age is a period in which the need for fine nutrient elements increases significantly depending on physical growth and development Chang & Kim, 2006 [1]. Nutrients are small chemical components of food capable of performing functions related to body's ability to work, grow, develop and maintain good health. Improving children's nutritional habits not only ensures the protection of physical health but also decreases the disease susceptibility and contributes to cognitive development and hence increases academic achievement Lee 2002 [2]. Especially, years of upper primary classes are the period in which the most important changes occur in students nutritional habits.

School-age children may choose unhealthy food on their own. Beginning from their birth, children are generally prone to desserts, candies and sweet cereals which they are used to and they tend to consume such kind of food. In order to help children to form healthy nutritional habits for lifelong, nutrient should be provided by introducing various kinds of foods with high sustenance. Schools are the best places for nutrition education. Children have at least one or two of their meals at school. School environment is the environment that affects nutritional habits of children. Teachers and other adults at school, food suppliers, service personnel, classmates, peers etc. are effective in the formation of children's nutritional and eating habits. Formation and improvement of healthy nutrition habits should be evaluated in the frame of environmental factors.

Nutrition Education is defined as 'any set of learning experiences designed to facilitate voluntary adoption of eating and other nutrition related behavior conducive to health and well being Contento I.R.1995 [3].

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Nutrition education should be included in school. Nutrition and eating habits gained during childhood are very important because it affects adolescence, adulthood and old ages. Nutrition education is the most valuable investment for the future. For the formation of healthy nutritional habits during school age, adequate and balanced nutrition and physical activity should be assessed together Story 1994 [4], Choi 2008 [5] & Kucukkomuler 2013 [6].

Game is a planned activity of playing, most often carry out for entertainment and enjoyment but sometimes used as an educational tool. It is used as a fun way of learning about a topic and can be used for topics on health, hygiene, nutrition, etc. The aim of game based nutrition education in upper primary education should be to motivate children about healthy nutrition. To ensure an efficient nutrition education, characteristics of children and problems related to nutrition should be well understood. In developed countries, nutrition education takes place intensively in upper primary education Dixey *et al.*, 1999 [7].

In the light of above mentioned background a study was carried out to adjudge the effects of game based nutrition education on nutritional knowledge of the selected students of upper primary classes.

2. Material and Methods

2.1 Sampling and Design of study

The study was conducted on a representative group of 427 upper primary classes' students of age range 11-15 years from the four State Government schools of District Sitapur. Samples were selected purposively and schools were selected by random sampling technique in urban area of District Sitapur.

2.2. Tool of the Study

1. A questionnaire was created considering the important aspects of Nutrition. For assessment of Nutritional Knowledge the questions asked were under the following headings-

S. No.	Title of the Heading	No of Questions
1	Nutrient	6
2	Sources of Nutrient	13
3	Functions of Nutrients	13
4	Deficiency Diseases of Nutrient	13
5	Overdose result of Nutrient	7
Total No. of Question 52		

2. In this study second tool was games, developed by researcher. Researcher developed Picture card and Spinner Board game for imparting nutrition education.

2.3 Monitoring the effects of Nutrition

Level of pre- nutritional knowledge of students was assessed by researcher through pre-tested questionnaire. After pre assessment of nutritional knowledge, game based nutrition education was imparted. To study the impact of game based nutrition education on students nutritional knowledge was assessed through pre-used Questionnaire.

2.4 Statistical Analysis of Data

Statistical analysis for collected data was performed by using SPSS Software (ver.16.0).

3. Findings and Discussion of the Study

Table no 1. represent the comparison of pre and post knowledge score regarding Nutrients. Result revealed that knowledge score of Nutrient, No. of total nutrient, Energy and power providing Nutrient, Body protective nutrient, and water, post test were not significant as compared to the pre test while Body Building nutrient aspect score of post test was significant compared to pre test scores.

In the study it was found that Students nutrient score in pre and post test was approximately similar and no significant difference found after intervention. On the other hand, in the study of Ikorok 2012 [8] found that all students' nutrient knowledge score was 100%. Number of total Nutrients, students mean score was 2.38 in pre test and 2.66 in post test depicted that the difference was not significant because C.R. Values were less than the table value 1.97 at degree of freedom 426.. It showed that students was too much confused about total no of nutrients but in the study of Ikorok 2012 [8] revealed that 66.9% students had knowledge about total no of nutrients. Body building Nutrient score was significant in pre and post test, Ikorok 2012 [8] same study revealed that 72.4% students' answers were right. Energy and power providing Nutrient, result was not significant even post test mean score was much higher than pre test score. It showed that students did not understand the content of Energy and power providing Nutrient. Same result was found in the study of Ikorok 2012 [8]. Body Protective Nutrients, students scored were not significant; Ikorok 2012 [8] study revealed that only 23.3% students had knowledge about Body Protective Nutrients. Last in the first part of questionnaire was water nutrient. In the study it was found that students' score was not significant, whereas 100% students answered right in the study of Ikorok 2012 [8].

Table 1: Comparison of pre and post knowledge regarding Nutrient

Aspects	Pre Test N-427		Post Test N-427		Std. Error Mean	CR-Value
	Mean	Std. Deviation	Mean	Std. Deviation		
Nutrient	2.06	.890	2.04	.565	.036	.385
No. of total Nutrient	2.38	1.007	2.66	.769	.044	-6.423
Body Building Nutrient	2.09	1.070	1.55	.917	.053	10.118*
Energy and power providing Nutrient	2.34	1.075	3.05	1.180	.058	-12.100
Body Protective Nutrients	2.50	1.090	2.82	.800	.045	-6.922
Water	2.77	1.005	2.95	.635	.044	-4.180

Table no 2. represents the comparison of pre and post scores regarding Sources of Nutrients. Result showed that the comparison of pre-and post scores of Vitamin A, Vitamin B, Vitamin C, Vitamin K, Calcium, Iron and Iodine Sources depicted that the difference between the two groups (pre and post) was significant because C.R. Values were much higher

than the table value 1.97 at degree of freedom 426. Result also showed that the comparison of pre-and post scores of Protein, Carbohydrate, Fat, Vitamin D, Vitamin D and Pure Water source depicted that the difference between the two groups (pre and post) was not significant because C.R. Values were less than the table value 1.97 at degree of freedom 426.

The study result showed that students had less knowledge about Sources of Protein, it was found that Students' protein sources score in pre and post test was approximately similar and no significant difference found after intervention. Contrary result was found in the study of Ikorok 2012 [8] which revealed that 97.9% students had knowledge about Sources of Protein. In the study of Kostanjevec 2011 [9] found that only 11% students had knowledge regarding protein sources in pre test

but after intervention 22.5% students had knowledge regarding protein sources. It showed that intervention was effective in improving nutrition knowledge.

Current study showed that students had less knowledge about Fat sources even post test score was higher than pre test. It showed students did not understand the content even they were misguided, so CR value was negative. Similar result found in the study of Kostanjevec 2011 [9].

Table 2: Comparison of pre and post knowledge regarding Sources of Nutrients

Aspects	Pre Test N-427		Post Test N-427		Std. Error Mean	CR-Value
	Mean	Std. Deviation	Mean	Std. Deviation		
Protein Sources	1.91	.779	1.99	.523	.033	-2.389
Carbohydrate Sources	2.28	.939	2.65	.733	.041	-9.1000
Fat Sources	2.36	1.777	2.70	1.216	.095	-3.508
Vitamin A Sources	1.56	.949	1.40	.851	.047	3.383*
Vitamin B Sources	2.11	.971	1.96	.610	.043	3.506*
Vitamin C Sources	1.95	.948	1.45	.795	.046	10.869*
Vitamin D Sources	2.28	1.967	2.11	.595	.093	1.891
Vitamin E Sources	2.21	1.039	3.01	1.194	.062	-12.922
Vitamin K Sources	2.43	1.122	2.28	.906	.046	3.339*
Calcium Sources	1.55	.858	1.39	.768	.038	4.275*
Iron Sources	2.41	.943	2.16	.722	.040	6.210*
Iodine Sources	2.01	1.244	1.62	1.069	.059	6.606*
Pure Water Sources	2.41	1.268	3.13	1.214	.062	-11.720

The third table showed about Functions of Nutrients. It was found that Functions of Fat, Vitamin A, Vitamin B, Vitamin C, Vitamin D, Vitamin E, Vitamin K, Calcium, Iron, Iodine and Water showed the descriptive data and CR value for the score of the nutritional knowledge pre and post test. The influence of the pre-test scores on the post test was excluded and the learning achievements between the two groups were significantly different. The mean score of pre test while that of the post test, revealed that learning achievements of the post test was significantly higher than that of the pre test, showing that game based Nutrition Education can effectively promote

students' knowledge. In this table the pre and post scores regarding Protein and Carbohydrate Functions when compared was not significant.

Present study showed that CR value was negative in protein functions opposite result found in the study of Kostanjevec 2011 [9]. This study revealed that 71.9% students knew about Protein functions in pre test and 75.4 % students had knowledge post test.

In this study, students' knowledge about functions of calcium was significantly improved after intervention. Similar result found in the study of Kostanjevec 2011 [9].

Table 3: Comparison of pre and post knowledge regarding Functions of Nutrient

Aspects	Pre Test N-427		Post Test N-427		Std. Error Mean	CR-Value
	Mean	Std. Deviation	Mean	Std. Deviation		
Protein Functions	2.28	1.369	3.32	1.176	.071	-14.731
Carbohydrate Functions	2.28	1.205	2.77	.835	.049	-10.041
Fat Functions	2.27	1.070	1.63	.981	.052	12.262*
Vitamin A Functions	1.78	1.015	1.37	.784	.049	8.332*
Vitamin B Functions	2.33	.958	3.23	1.071	.053	16.944*
Vitamin C Functions	2.19	1.218	3.15	1.238	.064	14.885*
Vitamin D Functions	2.51	1.139	2.80	.820	.046	6.209*
Vitamin E Functions	2.31	1.144	2.63	.855	.048	6.763*
Vitamin K Functions	2.47	.972	2.73	.715	.041	6.483*
Calcium Functions	2.07	1.039	1.59	.939	.056	8.504*
Iron Functions	2.54	1.088	1.79	1.069	.060	12.565*
Iodine Functions	1.97	1.166	1.51	.925	.056	8.365*
Water Functions	2.44	1.270	3.27	1.168	.063	13.118*

Fourth table represent the comparison of pre and post score of Deficiency Diseases of Nutrient. Result showed that Vitamin A, Vitamin E, Vitamin K, Calcium, Iron and Iodine Deficiency Diseases scored of post test were significant as compared to

the pre test while Protein, Carbohydrate, Fat, Vitamin B, Vitamin C, Vitamin D and Anemia Disease score of post test was not significant compared to pre test scores.

Table 4: Comparison of pre and post knowledge regarding Deficiency Diseases of Nutrient

Aspects	Pre Test N-427		Post Test N-427		Std. Error Mean	CR-Value
	Mean	Std. Deviation	Mean	Std. Deviation		
Protein Deficiency Diseases	2.16	1.102	2.66	.756	.052	-9.694
Carbohydrate Deficiency Diseases	2.47	1.060	2.75	.756	.046	-6.209
Fat Deficiency Diseases	2.42	1.065	2.72	.788	.046	-6.402
Vitamin A Deficiency Diseases	1.91	1.134	1.36	.785	.053	10.504*
Vitamin B Deficiency Diseases	2.38	.966	2.64	.754	.041	-6.244
Vitamin C Deficiency Diseases	1.93	1.097	2.94	1.299	.063	-15.881
Vitamin D Deficiency Diseases	2.47	1.114	3.23	1.072	.057	-13.320
Vitamin E Deficiency Diseases	2.26	1.061	1.71	1.020	.052	14.565*
Vitamin K Deficiency Diseases	2.35	1.027	1.59	.923	.052	14.565*
Calcium Deficiency Diseases	1.79	.979	1.41	.746	.046	8.463*
Iron Deficiency Diseases	2.68	1.093	2.26	.814	.047	9.033*
Iodine Deficiency Diseases	1.91	1.010	1.57	.928	.052	6.479*
Anemia Disease	2.76	1.160	3.29	1.070	.054	-9.839*

Table no. 5 represents the comparison of upper primary classes' students' pre and post score about knowledge of overdose of nutrient. Finding showed that the comparison of pre-and post test scored of Overdose Result of Carbohydrate, Fat, Vitamin A, Vitamin D, Calcium Vitamin K and Water

depicted that the difference between the two groups (pre and post) was significant because C. R. Values were much higher than the table value 1.97 at degree of freedom 426.

Table 5: Comparison of pre and post knowledge regarding Overdose Result of Nutrient

Aspects	Pre Test N-427		Post Test N-427		Std. Error Mean	CR-Value
	Mean	Std. Deviation	Mean	Std. Deviation		
Overdose Result of Carbohydrate	2.27	1.465	3.15	1.221	.079	11.221*
Overdose Result of Fat	2.37	1.375	1.77	1.160	.084	7.077*
Overdose Result of Vitamin A	2.53	1.320	2.00	1.345	.081	6.526*
Overdose Result of Vitamin D	2.81	1.386	2.17	1.407	.084	7.585*
Overdose Result of Vitamin K	2.73	1.269	2.12	1.450	.085	7.243*
Overdose Result of Calcium	2.38	1.225	2.01	1.380	.083	4.468*
Overdose Result of Water	1.84	1.095	2.55	1.202	.080	8.879*

*significant

The current study presented evidence that students' change in nutritional knowledge was possible in the context of game based nutrition education program. The positive effect of this intervention was obvious on the nutritional knowledge which became clear by the post test score, as intervention classes of 6th, 7th and 8th graders had got higher knowledge scored than their pre-test. Generally, the increase in knowledge score add support to other studies, which showed improvement in nutritional knowledge among children between baseline, intervention and post test [10, 11, 12, 13, 14] demonstrating that favorable effect that a game based nutrition education can be on the cognitive performance of school children.

5. Conclusion

The study aimed at investigating the learning achievements of the students in nutrition education via game-based learning. The results revealed that game-based learning can improve the learning achievements and learning attitudes of students also it was found that the game-based learning approach is helpful for students in terms of nutrition knowledge, learning attitudes and food and drink habits.

Although the findings of this study are quite positive, longer experiments with larger samples need to be conducted in the future to further investigate the effectiveness of the game-based learning approach for nutrition education. It is expected that the innovative approach not only improves the students' nutrition knowledge, but also fosters their food and drink habits in their daily lives. In addition to the nutrition courses, this approach can be applied to other courses in the future.

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