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### NUTRITIONAL STATUS ASSESSMENT AND EVALUATION OF EDUCATIONAL EFFECTIVENESS OF NUTRITIONAL GAMES APPROACH IN ADOLESCENTS

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#### ABSTRACT

**Objective:** To study the nutritional status and to evaluate the educational effectiveness of nutritional games in school going adolescents at Anantapur. **Method:** The study was a 2 to 2 1/2 months school based intervention for 8<sup>th</sup> and 9<sup>th</sup> grades (n=240). The study design was a multi- factorial with repeated measures of nutrition knowledge at three points in time, of dependent samples from control and intervention group. A sample of two schools each in experimental and control groups were selected by multi stage random sampling. The study groups are independent and treated as a random unit. Data was collected using a pretested, semi- structured schedule. Anthropometric measurements were taken as per the standards. **Results:** Prevalence of under nutrition was observed (grade -I, grade -II, grade-III) for boys 15.7%, 14.9%, 42.1% and girls 17.6%, 14.3%, 24.5% respectively. Over all 64.6% of study samples were under nourished and attempt was made using nutritional games for imparting education. A significant improvement in knowledge level of intervention group was observed compared to control group (p<0.01). Significant decrease (p<0.05) in knowledge levels was not observed after 4 to 5 weeks indicating retention of knowledge acquired through nutrition games. **Conclusion:** The developed nutrition games tool was effective in imparting nutrition education for adolescents.

#### KEYWORDS

Body Mass Index, Under nutrition and Intervention.

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#### INTRODUCTION

Knowledge of nutrition is important for one and all be it illiterate/ literate, girl/boy, young/old to eat right kind of food at the right time in right quantities to maintain good and optimum health and wellbeing. It also helps to develop right kind of attitude towards food and helps to build sound eating habits. Adolescence period is marked with rapid growth spurt

and nutritional needs are higher than any other period during the life cycle, which places adolescents into a nutritionally vulnerable group with unhealthy dietary habits that do not meet the daily recommended dietary allowances (Barbara *et al*, 2001, Savieje *et al*, 2007)<sup>1,2</sup>. Adolescents face various challenges like independence, Conscious of physical appearance, identity crisis and exposed to mixed messages through mass media (Sebastian *et al*, 2008)<sup>3</sup>. Nutritionally sound adolescents reflect the nation's human resource potential and countries future greatly depends on them.

Consumption pattern of adolescents revealed very few fruits and vegetable in take (US Dept. of Health and Human Service, Healthy People, 2010; Booth *et al*, 2001)<sup>4,5</sup>. This could be due to factors like parental style, food choices, barriers, knowledge, religion, subjective factors and found significant predictions of fruit and vegetable in take (Leslie *et al*, 2003)<sup>6</sup>. Adolescents do not think and visualise about the beneficial effect of healthy eating in the long term. They indulge in poor and limited food choices consists of soft drinks, fast foods , frequent snacking and leaves less chance for having balanced meals rich in optimum and adequate nutrients. Skipping meals can contribute to consumption of energy dense, nutrient poor diets that may add to malnutrition (Keast *et al*, 2010)<sup>7</sup>. Research studies in various disciplines have brought out the importance of games in the mental development of child (Short *et al*, 2011)<sup>8</sup>. Games helps in cognitive development and consolidates the skills, action and meanings acquired through play way of teaching (Verenikina *et al*, 2003)<sup>9</sup> by creating a broader zone of proximal development. Games are challenging, delightful, imaginative and exhibit clear rules to imbibe while playing (Garris *et al*, 2002; Cheng *et al*, 2013)<sup>10,11</sup>. Hence this study attempts to study the nutritional status of adolescents and to evaluate the educational effectiveness of nutritional games approach in adolescents.

## **MATERIAL AND METHODS**

### **Study design and data collection**

The study design was a multi-factorial with repeated measures at three points in time, of dependent samples

from control and experimental groups. A structured interview schedule was used to determine the nutrient intake of adolescents and anthropometric measurements were taken and BMI was calculated using standard method as recommended by WHO. A pretested knowledge assessment questionnaire consists of multiple choice questions on various aspects of nutrition and health was administered to adolescents. All answers were coded and fed to computer and analysed using SPSS package version 20. Before intervention base line data was obtained from the schools to find out the homogeneity and the study samples were found independent. Experimental group was given intervention through games which was developed based on the knowledge level at base line for a period of 2 to 21/2 months. After a period of 4 to 5 weeks, intervention -2 (Retest) was implemented to know the retention of the concepts taught through intervention. Control group was not given any treatment. For the purpose of analysis, each right answer was assigned one mark and the wrong answer was given a zero. The questionnaire was administered to get the base line data was re-administered twice to analyse the impact of two interventions separately for experimental and control group.

### **Selection of schools and sample size**

A list of schools was obtained from the district Education officer, Anantapur. Among the schools, four schools were selected by multistage random sampling technique and the principles/ correspondents of each schools were explained about the purpose of the study and consent was obtained. Purposive sampling method was adopted to select 8<sup>th</sup> and 9<sup>th</sup> class children as study subjects. Within the class disproportionate random sampling technique was used to select 30 students consists of both gender from each class apportioned on 50-50%. Consent was obtained from study samples. Two schools were randomly assigned as control and remaining two as experimental group. A total of 240 school going adolescents consists of 121 boys and 119 girls formed the study sample.

### **Inclusion criteria**

Adolescents of both sex, studying in class 8<sup>th</sup> and class 9<sup>th</sup> between 13 to 15 years who were not ill and

present during the study period and was willing to participate were included in the study.

#### **Exclusion criteria**

Students of 8<sup>th</sup> and 9<sup>th</sup> class who were seriously ill or absent during the study period or non-willing to participate were excluded from the study.

#### **Statistical analysis**

The physical growth data obtained from school children was processed and analysed by comparing with standards. Data from the nutrition knowledge and evaluation questionnaire were entered and analysed with the statistical Program for the Social Sciences, version 20. Post hoc analysis was conducted using RM Anova (repeated measure anova) to compute the effect size of actual difference in nutrition knowledge between and within control and intervention group at initial, intervention -1 (post-test) and intervention -2 (retest) levels.

## **RESULTS AND DISCUSSION**

### **Nutritional status**

The best indicator of adolescents' well-being is growth which acts as a single measurement that best defines the nutritional and health status of children and helps to estimate the quality of life of population at large in the community. BMI of adolescents by gender and group is given in Table No.1.

From the table it is evident that 42.1% of boys suffer from severe thinness, 14.9% from moderate thinness, 15.7% from mild thinness and only 24.8% were within the normal range and 1.7% suffer from overweight and 0.8% from grade-II obesity among boys. Among the girls 24.5% suffer from severe thinness, 14.3% from moderate thinness, and 17.6% from mild thinness. However 39.5% were within normal limits and 2.5% suffer from overweight and 1.6% from grade I obesity. The study indicated 64.6% of the study sample were under nourished and only 32.1% were within the normal range and 3.3% were above the normal range. Therefore a need was felt to provide intervention strategies for adolescents to make them aware of good eating practices. Gaming approach was used to make the learning effective, efficient and interesting. The study groups were independent and the gain in knowledge levels were

studied to evaluate the efficiency of nutritional games compared to control group not exposed to treatment. Nutrition education intervention programs are multifaceted and on-going (Contento, 1995, 2008)<sup>12</sup> and found effective when behaviorally focused based on appropriate theory and prior research rather than knowledge alone. Sound understanding of nutrition and healthy life style help people to make better food selection and to overcome myths about food and protect people from obesogenic environment (Wardle *et al*, 2000)<sup>13</sup>. The information and methods of teaching can be boring and tedious for adolescents who show lack of interest in nutritional topics (Croll *et al*, 2001)<sup>14</sup>.

Games can provide as an effective medium for presenting educational information on nutrition to children. Educational games combine both learning new skills and concepts more fun, and attractive (Silk *et al*, 2008<sup>15</sup>; De Freitas and Levene, 2004<sup>16</sup>).

The descriptive data about nutritional knowledge score for adolescents are shown in Table No.2, Figure No.1.

The study samples are independent in nature. Base line data of school children in Control and experimental schools (gaming approach) differed significantly in their initial nutritional knowledge level ( $13.12 \pm 3.29$  and  $18.55 \pm 5.74$ ). This could be due to the care taken to select different schools for control and experimental groups so that effect of experimental treatment does not influence control group. Post intervention results showed that there was a statistically significant improvement in nutrition knowledge score of experimental group exposed to games ( $38.44 \pm 5.88$ ) and control group increased from  $13.12 \pm 3.29$  to  $13.19 \pm 3.19$  Increment in knowledge levels of pre and post test period in control group showed a slight increment in knowledge score which was found statistically not significant. A repeat test (intervention-2) was conducted to know the retention levels in mean knowledge score in control group children not exposed to any treatment after a period of 4 to 5 weeks revealed a slight increment in mean knowledge level from  $13.19 \pm 3.19$  to  $13.64 \pm 3.60$  found statistically not significant. This could be due to non-exposure of control group to any treatment.

Experimental group exposed to gaming approach showed a marked increment in mean knowledge score from  $18.55 \pm 5.74$  to  $38.44 \pm 5.88$  and found significant ( $p < 0.01$ ). A repeat test (intervention -2) was done after a period of 4 to 5 weeks to know the retention levels of the subjects exposed to treatment. The scores of post-test (intervention-1) compared to retest (intervention-2) showed statistically not significant ( $p < 0.01$ ) indicating the effective and efficient learning by the study subjects through gaming approach.

The initial knowledge scores of children may be due to exposure to science subjects as part of the course work for children. The findings of the study indicate gaming approach as useful tool for imparting nutritional knowledge to children. The positive effect of the intervention was obvious on the nutrition knowledge score after the first session (post-test/ intervention -1) on experimental group compared to control group not exposed to any treatment. This was in accordance to Bonos *et al* (2013)<sup>17</sup> who observed online game 'ETOBE mates' designed to improve the children's knowledge was found effective compared to traditional paper pencil (pamphlet) mode of information. However both groups increased their scores for nutritional knowledge which was found small (experimental group 4.8% average and control 1.7% as average). The interaction between group x time was found statistically significant. Children found serious games platform to be useful medium for improving their nutritional knowledge and can act as effective method of delivery of information. Similarly Kreisel (2003)<sup>18</sup> compared a web site, a serious game (The Fantastic Food Challenge) and traditional method of teaching nutrition by pamphlet and found web site performed better for female group only in the areas of attention, understanding and intent to use information and no difference in knowledge retention was observed. The games like my pyramid for kids (French *et al*, 2006)<sup>19</sup> and Squire's Quest (Baranowsky *et al*, 2003)<sup>20</sup> proved effective at increasing nutritional knowledge of subjects.

Silk *et al* (2008)<sup>15</sup> compared three modalities for delivery of nutritional information namely a computer game (the fantastic Food challenge) a web site and a

pamphlet and observed that after two weeks information interactive computer games did not confer greater benefits than traditional method, but the web site was found more effective with girls.

The impact of nutrition education program for non-nutrition students in the University of Hail was studied by Fatima *et al* (2013)<sup>21</sup> and observed knowledge of nutrition plays an important role in food choices towards improving better health using handouts on selected instructional materials. A significant changes in nutrition knowledge of participants was observed between the correct responses obtained from the pre-test and post-test for 93% of the questions asked and a poor significance for 7% of the questions indicating a high impact of the education imparted through the method.

Ram Rao (2013)<sup>22</sup> studied the impact of nutrition education in the knowledge, attitude and behaviour of 240 adolescent girls of 11-15 years about reproduction, health care and nutritional awareness and observed that majority of the girls had either poor or fair levels of awareness and after training for a period of two months, significant improvement was noticed in their awareness and behaviour in respect to the components in training.

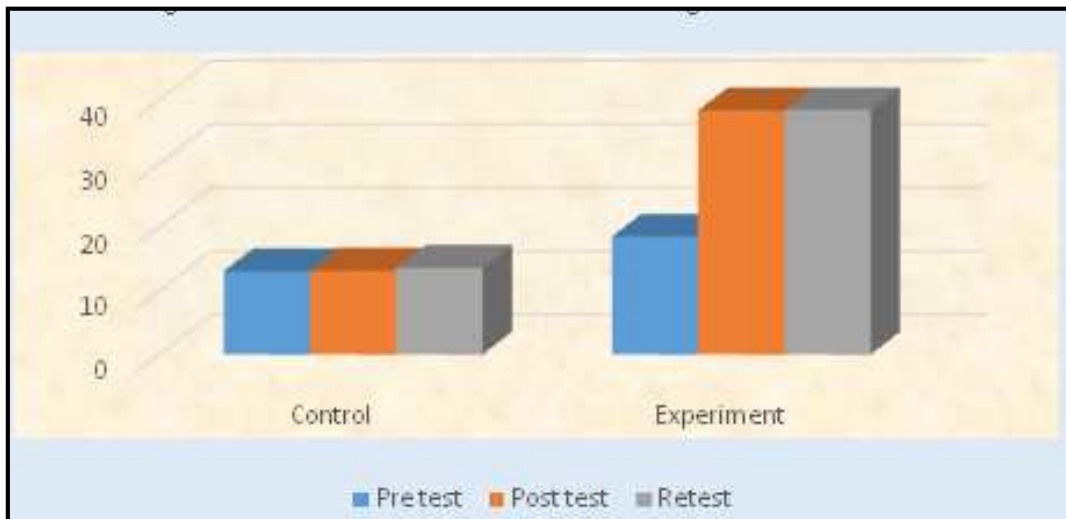
However Contento<sup>23,24</sup> stated three essential components to nutrition education as a motivational component to increase awareness and enhance motivation by addressing beliefs, attitudes through effective communication strategies, an action component to facilitate people's ability to take action through goal setting and cognitive self-regulation skills and an environmental support for action and all components needs to be based on appropriate theory and research to bring effective changes in the community and supported the study by Fatima *et al*, (2013)<sup>21</sup> in bringing an increment in the knowledge and awareness among young adults who display a strong enthusiasm for learning new concepts for their betterment at mass level.

**Table No.1: Distribution of body mass index of adolescents by gender and group**

S.No	BMI Classification	Group												Total					
		Experimental group						Control group						Boys		Girls		Total	
		Boys		Girls		Total		Boys		Girls		Total		Boys		Girls		Total	
		n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
1	Severe thinness	25	41.7	17	28.3	42	35	26	42.6	12	20.3	38	31.7	51	42.1	29	24.5	80	33.3
2	Moderate thinness	8	13.3	11	18.3	19	15.8	10	16.4	6	10.2	16	13.3	18	14.9	17	14.3	35	14.6
3	Mild thinness	9	15	9	15	18	15	10	16.4	12	20.3	22	18.4	19	15.7	21	17.6	40	16.7
4	Normal	16	26.7	19	31.7	35	29.2	14	23	28	47.5	42	35	30	24.8	47	39.5	77	32.1
5	Over weight	2	3.3	3	5	5	4.2	0	0	0	0	0	0	2	1.7	3	2.52	5	2.1
6	Grade-1 obesity	0	0	1	1.7	1	0.8	0	0	1	1.7	1	0.8	0	0	2	1.6	2	0.8
7	Grade-2 obesity	0	0	0	0	0	0	1	1.6	0	0	1	0.8	1	0.8	0	0	1	0.4
8	Total	60	100	60	100	120	100	61	100	59	100	120	100	121	100	119	100	240	100

**Table No.2: Mean score for nutritional knowledge of adolescents**

S.No	Group	Pre-test score Mean ± SD	Post test score Mean ± SD	Retest score Mean ± SD
1	Control	13.12 ± 3.29	13.19 ± 3.19	13.64 ± 3.60
2	Experimental-1	18.55 ± 5.74	38.44 ± 5.88	38.48 ± 5.73



**Figure No.1: Mean Score for nutritional knowledge of adolescents**

**CONCLUSION**

The study revealed majority of study sample (64.6%) were suffering from under nutrition. The gaming approach as intervention strategy was found effective for imparting nutrition education for adolescents.

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## CONFLICT OF INTEREST

We declare that we have no conflict of interest.

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