

IMPACT ANALYSIS OF NUTRITIONAL EDUCATION PROGRAMME ON FOOD CONSUMPTION AND NUTRITION ATTITUDE AMONG SCHOOL CHILDREN IN JAIPUR

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ABSTRACT

Childhood obesity is an emerging public health issue in developing countries like India, yet combating against under nutrition. An evident and effective strategy is required to tackle childhood obesity. The aim of nutrition education for schoolchildren is to acquire knowledge on nutrition to help them in order to form healthy nutritional habits. A school-based mass education programme for children can improve their awareness levels about the hazards of being overweight and the benefits of regular physical activity and right eating habits.

This research aims at establishing whether the nutrition education programme carried out at different schools in Jaipur influenced in enhancing children's nutrition knowledge, attitudes, and nutritional habits in order to combat the effect of obesity among them. An experimental study design was selected to provide the most reliable evidence for the nutrition education and health education intervention and the outcome as change in behaviour.

Pre-post experimental control design was used. To study the impact of nutrition education and health education intervention on selected subjects before and after type of experimental design was adopted among 332 selected school students of Jaipur. Through a questionnaire, the researchers established their attitudes to healthy eating and nutritional habits. Results proclaimed a statistically significant change among the nutritional Knowledge and attitude among school children but no significant change in practices was observed.

Results of the study states that nutritional education program improved the nutrition knowledge of children, but had no significant influence on their practices to healthy eating habits and their nutrition behavior immediately after the education was completed. To achieve goals of children's nutritional education, the researchers suggested an increased number of nutrition education hours, supported with the positive example of teachers and the school setting that ensures the availability of healthy food. So a mass awareness program coupled with special motivation sessions tailored for obese children could prevent imminent obesity epidemic.

Keywords: *Childhood Obesity, India, Mass Awareness Programme, Metropolitan City, Overweight, School Children.*

1. INTRODUCTION

Nutrition education assumes importance as a long-term strategy for the promotion of good health by bringing about desirable changes in the Knowledge, Attitude and Practice (KAP) of mothers. Nutrition education of mothers has improved the feeding practices of children. Strengthening women's education has the strongest influence on child malnutrition. Also, imparting nutrition education to children improves their knowledge and dietary habits.

The current research study is based on the principles of Social Learning Theory (SLT) and the concept of social learning theory as proposed by (*Bandura, 1977*). The Social Learning Theory (SLT) is "based on the idea that we learn from our interactions with others in a social context." SLT has become perhaps the most influential theory of learning and development (*Muro & Jeffrey, 2008*). Children's food preferences are also influenced by availability, accessibility, and familiarity to foods as well as parental modeling. Thus, if children are to learn to prefer and select healthy foods, they

need early, positive, repeated experiences with those foods (*Birch et al., 2009*). Early childhood development pertains to physical, mental and social growth and consists of various interventions, such as those involving the promotion of nutrition, health and mental and social development.

Children develop many food and nutrition- related attitudes, behaviours and preferences during their preschool years. Reduced physical activity, snacking between the meals, consuming calorie dense and nutrient deficient food, frequently eating out of house are ostensible contributors of childhood obesity especially among affluent families. With changing physical environment the preferences among young children have also changed. Lack of playing space, inadequate time for sports has increased the inclination towards screen time and simultaneous reduced their involvement in active outdoor sports. Moreover, media marketing, easy accessibility and affordability of unhealthy food choices have influenced the food preference; thus increasing pediatric obesity (*Giri&Nambir, 2016*).

Children also learn about food by observing the eating behaviours modeled by others. Therefore development of the family's dietary environment plays an important role in the health of the next generation. Parents have a strong influence on food availability and dietary practices from infancy through to adolescence. It is crucial that both children and parents are educated in good dietary practices when the children are in school age and good dietary habits because of behaviours formed at this time will persist and therefore benefit children until they fully grown. Parents and teachers play key roles in helping children to develop positive dietary behaviours (*Chuanlai, 2009*). The school environment can also help to teach children about dietary patterns and eating behaviours (*Birch et al., 2009*).

From this it can be interpreted that education related to Nutritional and behavioral aspect plays a vital role in bringing about a greater awareness of the value nutrition has in adopting a healthy lifestyle. Education is transformative, providing knowledge through instruction that first acts upon the attitudes of a person and then goes on to influence their behavior. The earlier this process begins, the more effective it is (*Hulya et al., 2015*). Parent and caregiver behaviour related to child feeding practices should be targeted by education, prevention and intervention efforts. Children's eating behaviours are susceptible to many external influences within their families, schools and communities. Currently, many of these influences promote dietary patterns that predispose to obesity. Fortunately, these influences can also act to promote healthy dietary practices (*Birch et al., 2009*).

Hence, public health interventions are warranted to combat this increasing epidemic. If the present trend of overweight/obesity continues, it may emerge as the single most important public health problem in children (*Giri & Nambir, 2016*). Furthermore, the evidence base for interventions aiming to prevent childhood obesity, particularly in community settings, is limited (*Wilson et al., 2008*).

This research aims at establishing whether the nutrition education programme carried out at different schools in Jaipur influenced in enhancing children's nutrition knowledge, attitudes, and nutritional habits in order to combat the effect of obesity among them. An experimental study design was selected to provide the most reliable evidence for the nutrition education and health education intervention and the outcome as change in behaviour.

2. LITERATURE REVIEW

In Indian children, overweight and obesity are common among middle- and low-income groups; however, in the developed nations, a higher prevalence of childhood obesity can be seen in the low socioeconomic group (*Fezeu et al., 2006; Goyal et al., 2010; WHO Report, 2013*). Moreover, there is an increasing trend in the prevalence of obesity among both adults and children throughout India with certain urban and rural differences (*Reddy et al., 2002*). Studies conducted in Chennai, Tamil Nadu (South India), among school children aged below 15 years have shown the increasing prevalence of obesity, from 6.8% in 1998 (*Subramanyam et al., 2003*) to 12% in 2009 (*Shabana & Vijay, 2009*). These studies have also reported that the prevalence was higher in the schools catering to children from affluent families compared to those from poor economic status, and overweight was more common among girls than boys (*Ramachandran et al., 2002*). Such studies implicate that childhood obesity is an emerging health problem among the affluent urban Indian children (*Subramanyam et al., 2003; Shabana & Vijay, 2009; Ramachandran et al., 2002*).

3. SUBJECTS AND METHODS

An interventional study was conducted in the four shortlisted private schools from urban area in Jaipur City were considered for the study. The students from class II to IV (7-9 Years) who had regular attendance in school were selected for the study. Simple Randomsampling method was used for the selection of subject.

All the students who fulfilled the inclusion criteria and are willing to participate were selected for the study.

Inclusion criteria

The target student's selection criteria were as follows:

- The students between 7-9 years of age.
- The students who were regular in school.
- Students who were free from any morbidities.
- Students who willingly cooperated for research.

Exclusion Criteria

The target student's omission criteria were as follows:

- Students residing in hostels.
- Parents who live in other cities.
- Students below 7 years of age.
- Students having any kind of illness or are on any medications.
- Those students who were not regular in school.
- After the exclusion process, a total 400 children enrolled from both experiment and control schools viz coded hereafter as **Experimental Group and Control Group** ; 200 children from the experiment group and control group respectively; to participate in the nutritional intervention programme

Table 1 : Selection of School Children in Experimental and Control Group

| | Experimental Group | Control Group |
|---|---------------------------|----------------------|
| No of Participants Data Collected for baseline survey | 200 | 200 |
| Biased or Not Fit for study (Outliner from Inclusion criteria of study) | 36 | 42 |
| No of School Children selected as final participants for the study | 164 | 158 |

Baseline information was obtained from all the students (both control and experimental category) however the students of school kept in control category just received education material to read but the students belonging to experimental category were enrolled in a formal 8 week Intervention Campaign. Experts from various departments such as Nutrition, Epidemiology, Psychology and Exercise and Yoga discussed and prepared educational material, addressing the burden of childhood obesity in India, its implications on current and future health and the causes of childhood obesity, using PowerPoint presentations to create awareness among children. It also emphasized the benefits of consumption of a balanced diet and enhanced physical activity to maintain an ideal BMI in a simple language with pictorial representations. We also included the benefits of certain habits like nutritional label reading in this programme. The research team identified the difficulties, if any, in understanding the questions by the children and addressed them adequately and incorporated those changes into the questionnaire. The field team administered the questionnaire to the selected study subjects and provided a code number to each child to maintain the anonymity. They conducted pre-test among the children using this questionnaire before implementation of the programme. The field team recorded the height, weight and gender details. They calculated BMI using the formula: weight in kilograms divided by squared height in meters. The researcher plotted the BMI in age- and gender-specific WHO charts and categorized the children with BMI between 85th and 97th percentiles as overweight and more than 97th percentile as obese (**WHO Growth**

Reference Chart, 2007). The Institutional Ethics Committee approved the study and informed consent was obtained from the parents of those children who participated in the pre- and post-test evaluation.

3.1 STATISTICAL ANALYSIS

SPSS 10.0 version software was used for statistical analyses. Continuous variables are reported as mean and standard deviation and categorical data are reported in proportions. A paired 't' test analysis was done using the pre- and posttest scores of the children. One-way ANOVA analysis was done as the test of significance for the pre-test score of different groups of nutritional status. P value of <0.05 was considered as statistically significant.

Points were attributed to the frequency of consuming a certain meal and the M (mean value) calculated for an individual meal. To calculate mean values, the following system of attributing points was applied: 6- "Every day", 5-"Four to six times a week", 4-"One to three times a week", 3-"Less than once a week", 2-"Once or less than once a month", and "1-Never". The average frequency of consuming foodstuffs was defined with following attribution of points: 6-"Several times a day", 5-"Once a day", 4-"Three to five times a week", 3-"Once to twice a week", 2-"Once a month or less", and 1-"Never".

The mean values were compared in reference to the time of the students' survey. The paired-samples t-test and one-way ANOVA (variance analysis) were applied.

The influence of education on the frequency of consuming meals and specified foodstuffs was examined through the partial correlation method. This served to eliminate the linear influence of nutrition knowledge at the beginning of the course on the correlation between variables of the knowledge at the end of the course and the frequency of consuming meals and specified foodstuffs.

Children's attitudes to healthy eating habits were evaluated by calculating the mean value in reference to the degree of agreement according to the 5-point Likert scale we applied. To calculate mean values, the same point awarding system was used: 1-"I absolutely disagree", 2-"I disagree", 3-"I neither agree nor disagree", 4-"I agree", and 5-"I absolutely agree".

Data analysis and statistical analysis were performed with the SPSS (Statistical Package for the Social Sciences) version 19. For statistical inference, the risk level 0.05 was taken into account.

4. RESULTS

The results as obtained from all the variables for both pre and post test are depicted in tables below:

Table 2: Pre and Post Intervention Assessment of Overall Knowledge score among Experimental and Control Group School Children's and their Statistical Findings

| S. No. | Knowledge Category | Experimental Group(n=164) | | Paired t test | Control Group (n=158) | | Paired t test |
|--------|--------------------|---------------------------|-------------------|----------------|-----------------------|-------------------|--------------------------|
| | | Pre Mean ± SD | Post Mean ± SD | | Pre Mean ± SD | Post Mean ± SD | |
| 1 | Balanced Diet | 8.2 ± 1.21 | 16.5 ± 4.24 | 0.009** | 9.4 ± 2.16 | 9.8 ± 1.99 | 1.23^{ns} |
| 2 | Food Safety | 7.1 ± 1.15 | 18.3 ± 3.22 | 0.014* | 9.5 ± 1.24 | 9.2 ± 2.21 | 1.45^{ns} |
| 3 | Health & Hygiene | 9.3 ± 2.16 | 17.4 ± 2.11 | 0.025* | 8.3 ± 1.90 | 9.0 ± 1.20 | 1.78^{ns} |
| 4 | Physical activity | 10.5 ± 2.25 | 19.7 ± 3.47 | 0.008** | 11.4 ± 3.26 | 11.8 ± 3.51 | 2.01^{ns} |
| 5 | Overall Score | 35.2 ± 5.23 | 71.9 ± 8.31 | 0.009** | 38.6 ± 7.41 | 39.12 ± 2.14 | 2.20^{ns} |

Paired' test Outcome (Between Pre and Post Data of Same Group):

ns= Non Significant; Level of Significant= *P≤0.05, **P≤0.001

Figure 1: Pre and Post Intervention Assessment of Overall Knowledge score among Experimental and Control Group School Children's and their Statistical Findings

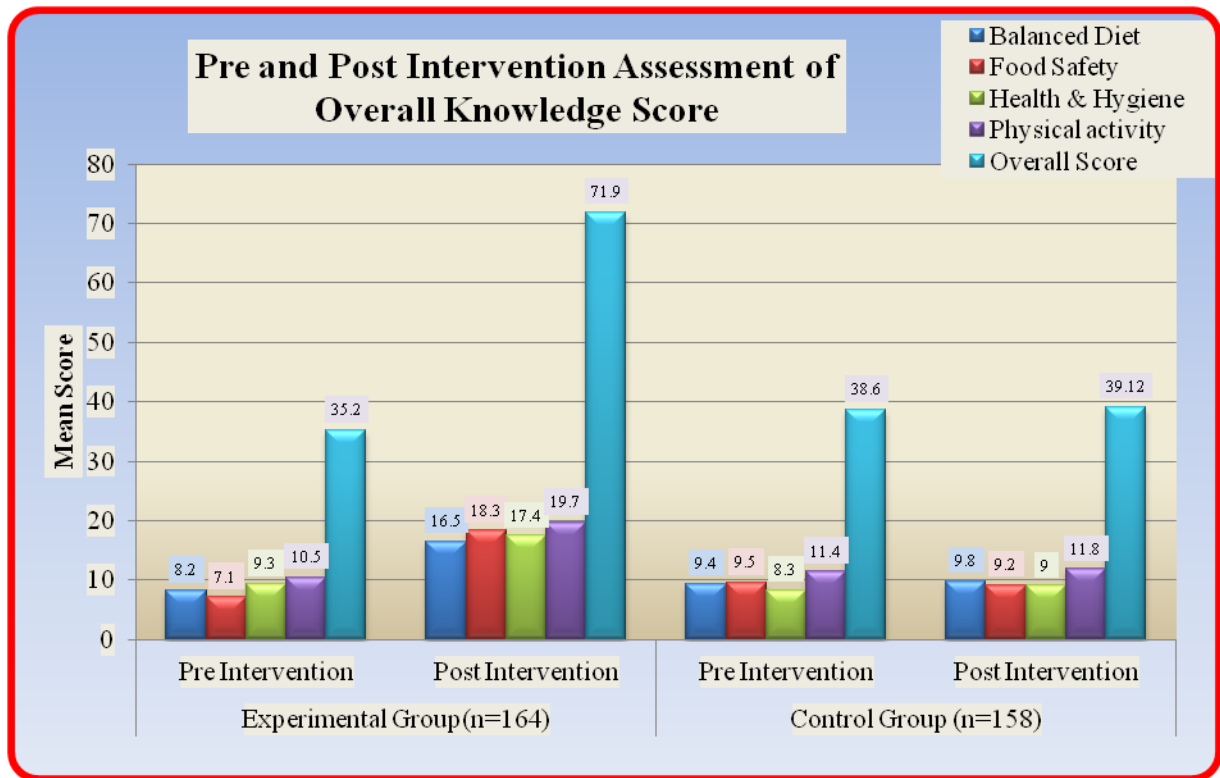


Table 3: Pre and Post Intervention Assessment of Overall Attitude score among Experimental and Control Group School Children's and their Statistical Findings

| S. No. | Attitude Category | Experimental Group(n=164) | | Paired t test | Control Group (n=158) | | Paired t test |
|--------|-------------------|---------------------------|----------------|---------------|-----------------------|----------------|--------------------|
| | | Pre Mean ± SD | Post Mean ± SD | | Pre Mean ± SD | Post Mean ± SD | |
| 1 | Balanced Diet | 8.8 ± 1.24 | 15.4 ± 3.21 | 0.009** | 8.4 ± 1.16 | 8.8 ± 1.12 | 1.34 ^{ns} |
| 2 | Food Safety | 8.5 ± 1.14 | 17.8 ± 2.24 | 0.011* | 9.0 ± 1.01 | 8.9 ± 1.85 | 1.30 ^{ns} |
| 3 | Health & Hygiene | 8.1 ± 4.14 | 18.5 ± 2.11 | 0.015* | 9.3 ± 1.94 | 9.8 ± 1.24 | 1.63 ^{ns} |
| 4 | Physical activity | 9.7 ± 3.11 | 18.4 ± 5.40 | 0.008** | 10.5 ± 2.24 | 10.8 ± 2.41 | 1.99 ^{ns} |
| 5 | Overall Score | 35.1 ± 6.22 | 70.2 ± 6.30 | 0.007** | 37.2 ± 4.54 | 78.3 ± 1.19 | 2.38 ^{ns} |

Paired' test Outcome (Between Pre and Post Data of Same Group):

*ns= Non Significant; Level of Significant= *P≤0.05,**P≤0.001*

Figure 2: Pre and Post Intervention Assessment of Overall Attitude score among Experimental and Control Group School Children's and their Statistical Findings

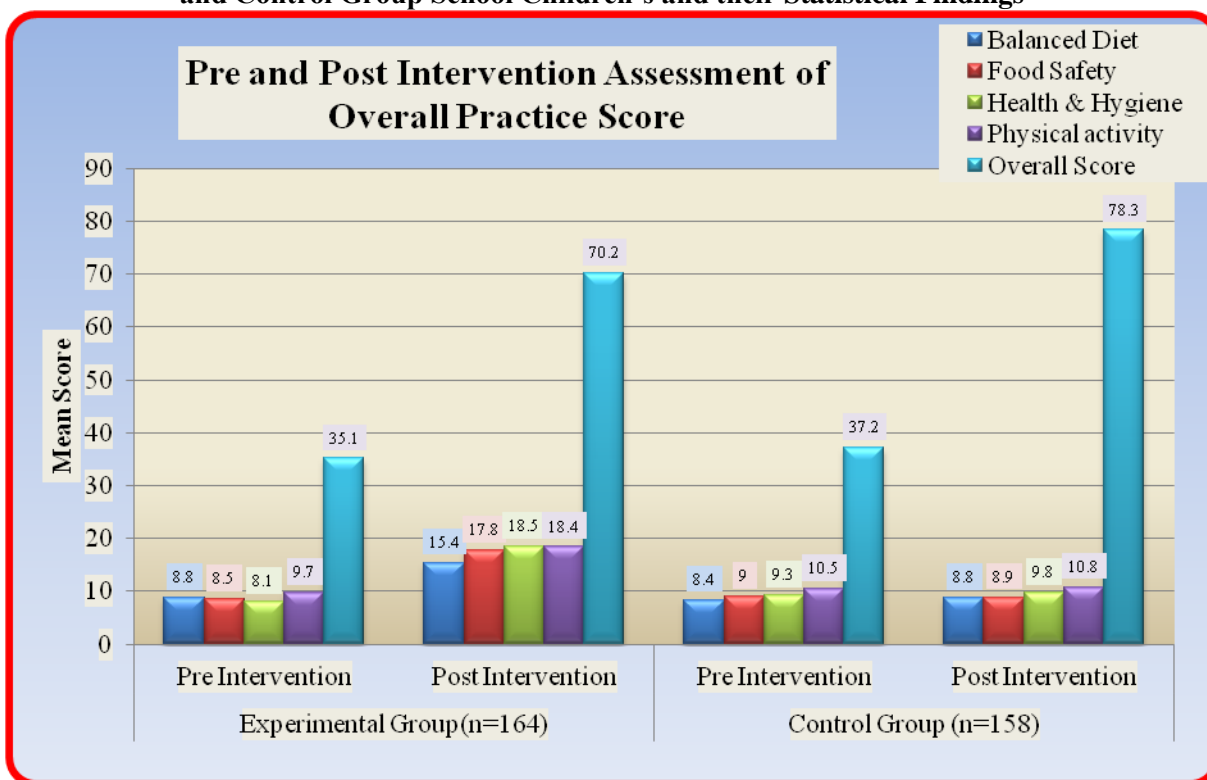


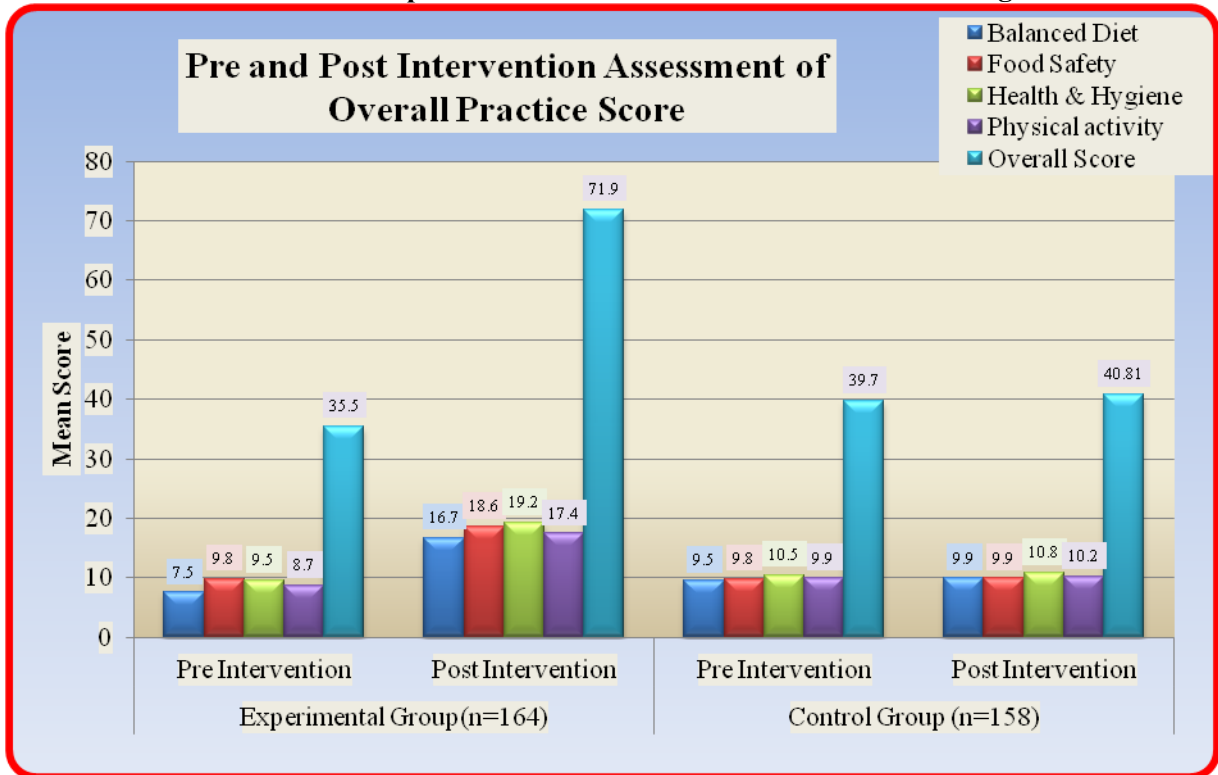
Table 4: Pre and Post Intervention Assessment of Overall Practice score among Experimental and Control Group School Children's and their Statistical Findings

| S. No. | Attitude Category | Experimental Group(n=164) | | Paired t test | Control Group (n=158) | | Paired t test |
|--------|-------------------|---------------------------|----------------|---------------|-----------------------|----------------|--------------------|
| | | Pre Mean ± SD | Post Mean ± SD | | Pre Mean ± SD | Post Mean ± SD | |
| 1 | Balanced Diet | 7.5 ± 2.28 | 16.7 ± 5.24 | 0.009** | 9.5 ± 1.14 | 9.9 ± 2.13 | 1.45 ^{ns} |
| 2 | Food Safety | 9.8 ± 1.19 | 18.6 ± 3.22 | 0.020* | 9.8 ± 2.22 | 9.9 ± 2.28 | 1.41 ^{ns} |
| 3 | Health & Hygiene | 9.5 ± 3.11 | 19.2 ± 5.10 | 0.005** | 10.5 ± 2.13 | 10.8 ± 2.26 | 1.63 ^{ns} |
| 4 | Physical activity | 8.7 ± 3.11 | 17.4 ± 5.40 | 0.004** | 9.9 ± 3.11 | 10.2 ± 3.17 | 1.99 ^{ns} |
| 5 | Overall Score | 35.5 ± 4.19 | 71.9 ± 5.16 | 0.008** | 39.70 ± 4.54 | 40.81 ± 1.19 | 2.38 ^{ns} |

Paired' test Outcome (Between Pre and Post Data of Same Group):

ns= Non Significant; Level of Significant= * $P \leq 0.05$, ** $P \leq 0.001$

Figure 3: Pre and Post Intervention Assessment of Overall Practice score among Experimental and Control Group School Children's and their Statistical Findings



Results of individual item and total score obtained from the Pre and Post Intervention Assessment of Knowledge among Experimental and Control Group School Children's obtained in table above indicates that there is a significant impact of IEC program conducted by researcher on Experimental group school students as individually Balanced diet mean score obtained in pre data was 8.2 which enhanced up to 16.5 mean score in post data with a significant difference of 0.0009 as obtained from Paired t test similarly for Food Safety Health & Hygiene and Physical activity the mean obtained score was nearly double from pre to post data and found to be significant in Paired t test. Overall knowledge score of pre data in experiment group was 35.2 whereas in post data was 71.9 with a significant difference obtained by Paired t test to be 0.0009, which clearly indicates the significant positive impact of IEC training on school children in experimental group students. On contrary the score obtained in control group of students where no IEC program was conducted by researcher the results in pre and post data scores are insignificant and there is no variation in score obtained. ***Thus, it can be concluded that IEC program has a significant positive impact on Nutritional knowledge of School students***

The mean pre-test scores for girls in the three domains remained higher than boys but the difference was not statistically significant. However, on considering the overall pre-test score, the awareness levels were higher among girls compared to boys and it was statistically significant (p=0.029).

The mean score of the post-test in each domain of the questionnaire was significantly higher than the pre-test scores secured by all the children (p<0.001). The results of the study emphasized that there was a significant increase in the knowledge levels of the children after attending the awareness programme on prevention of childhood obesity.

The pre- and post-test scores of the children in different nutritional grades. The mean pre-test score was significantly higher in the obese group compared to other groups (p=0.001). There was a significant increase in the awareness levels among children in all nutritional grades except the obese group (p=0.08).

5. DISCUSSION

The results of the present study have highlighted that knowledge regarding the hazards of obesity was generally low prior to the awareness programme. The higher pre-test score among the experimental group showed that the children were probably aware of this issue only after developing the problem. There was a significant increase in the awareness levels of the children in all the 3 components of research study i.e. Knowledge, Attitude and Practices for nutritional eating habits after attending this education programme. Similarly, a recent study reported a 4% reduction in BMI in students of 6th to 8th grades due to national-level awareness creation on childhood obesity (**Kaufman et al., 2011**). In another study, a considerable reduction in modifiable risk factors was noticed among school children followed by a structured education programme against primary prevention of diabetes. It was also concluded that school-level educational interventions through teacher-parent-child teams will definitely reduce the prevalence of diabetes (**Kameswararao & Bachu, 2009**). Consistent with these findings, the present educational programme also had increased the awareness levels of children on the prevention of childhood obesity. On the basis of the above mentioned findings, the researchers suggest that nutrition education should be carried out in an increased scope of hours and during the entire elementary school education system, which would influence quality and durability of the acquired knowledge and allow them to achieve goals connected to forming healthy eating habits. Planned and continuous nutrition education should also be carried out at secondary and tertiary levels of the education system, as it is important for the nutrition knowledge to be upgraded and form interdisciplinary connections. Nutrition education should become a national interest and contribute to increased quality of eating habits and living. Results proclaimed a statistically significant change among the nutritional Knowledge and attitude among school children but no significant change in practices was observed. The connection between the newly-acquired nutrition knowledge and consumption of meals and various foodstuffs was negligible. In the researchers' view, results of the study states that nutritional education program improved the nutrition knowledge of children, but had no significant influence on their practices to healthy eating habits and their nutrition behavior immediately after the education was completed. However, the researchers did establish that children formed positive attitudes towards healthy eating habits, although they were less frequently applied in practice. To achieve goals of children's nutritional education, the researchers suggested an increased number of nutrition education hours, supported with the positive example of teachers and the school setting that ensures the availability of healthy food. So a mass awareness program coupled with special motivation sessions tailored for obese children could prevent imminent obesity epidemic.

Further reinforcement by including the core concept of obesity and health in their educational curriculum and sustained motivation with the assistance of parents and school administration would have long-term benefits. In general, implementing mass awareness programmes to sensitise various high-risk groups would be a cost-effective measure in preventing the impending epidemic of noncommunicable diseases such as cardiovascular disorders and diabetes in middle- and low-income countries.

REFERENCES

- Allender, S., Lacey, B., Webster, P., Rayner, M., Deepa, M., Scarborough, P., et al. (2010). Level of urbanization and noncommunicable disease risk factors in Tamil Nadu, India. *Bull World Health Organ.*, 88, 297–304.
- Asian Development Bank. (2010) Key Indicators for Asia and the Pacific 2010. (41st ed.). The rise of Asia's middle class. Adverse consequences of rise of Asian middle class. (Chapter 6). Mandaluyong City, Philippines: Asian Development Bank. Available at: <http://www.adb.org/publications/key-indicators-asia-and-pacific-2010>. Accessed 25 October 2011.
- DiClemente, C.C., & Prochaska, J.O. (1982). Self change and therapy change of smoking behavior: A comparison of processes of change in cessation and maintenance. *Addict Behav.*, 7(2), 133–142.
- Ebrahim, S., Kinra, S., Bowen, L., Andersen, E., Ben-Shlomo, Y., Lyngdoh, T., et al. (2010). The effect of rural-to-urban migration on obesity and diabetes in India: A cross-sectional study. *PLoS Med.*, 7, e1000268.

- Fezeu, L., Minkoulou, E., Balkau, B., Kengne, A.P., Awah, P., Unwin, N., et al. (2006). Association between socioeconomic status and adiposity in urban Cameroun. *Int J Epidemiol.*, 35, 105–111.
- Freedman, D.S., Khan, L.K., Dietz, W.H., Srinivasan, S.R., & Berenson, G.S. (2001). Relationship of childhood obesity to coronary heart disease risk factors in adulthood. The Bogalusa Heart Study. *Pediatrics*, 100, 712–718.
- Goyal, R.K., Shah, V.N., Saboo, B.D., et al. (2010). Prevalence of overweight and obesity in Indian adolescent schoolgoing children; its relationship with socioeconomic status and associated lifestyle factors. *J Assoc Physicians India*, 58, 151–158.
- Haby, M.M., Vos, T., Carter, R., Moodie, M., Markwick, A., Magnus, A., et al. (2006). A new approach to assessing the health benefit from obesity interventions in children and adolescents: The assessing cost-effectiveness in obesity project. *Int J Obes (Lond.)*, 30, 1463–1475.
- Joffe, B., & Zimmet, P. (1998). The thrifty genotype in type 2 diabetes: an unfinished symphony moving to its finale? *Endocrine*, 9, 139–141.
- Kameswararao, A., & Bachu, A. (2009). Survey of childhood diabetes and impact of school level educational interventions in rural schools in Karimnagar district. *Int J Diabetes Dev Ctries.*, 29, 69–73.
- Kaufman, F., Hirst, K., Buse, J., Foster, G.D., Goldberg, L., Schneider, M., et al. (2011). Effects of secular trends on a primary prevention trial: The Healthy study experience. *Child Obes.*, 7, 291–297.
- Nikousokhan, A.K., & Rajab, A. (2003). Education and weight reduction control of type 2 diabetes. 18th International Diabetes Federation Congress.
- Ojofeitimi, E.O., Adeyeye, A.O., Fadiora, A.O., Kuteyi, A.O., Faborode, T.G., Adegbenro, C.A., et al. (2007). Awareness of obesity and its health hazards among women in university community. *Pak J Nutr.*, 6(5), 502–505.
- Ramachandran, A., Snehalatha, C., Vinitha, R., Thayyil, M., Kumar, C.K., Sheeba, L., et al. (2002). Prevalence of overweight in urban Indian adolescent school children. *Diabetes Res Clin Pract.*, 57, 185–190.
- Reddy, K.S., Prabhakaran, D., Shah, P., & Shah, B. (2002). Differences in body mass index and waist: hip ratios in North Indian rural and urban populations. *Obes Rev.*, 3, 197–202.
- Redmond, W.H. (2005). Misuse of marketing concepts: Marketing of seeming health package food. In P.M. Mark & R.P. Hill (Eds.). *Proceedings of 30th Macromarketing Seminar* (pp. 3–10). St. Petersburg: University of South Florida.
- Shabana, T., & Vijay, V. (2010). Chennai Slim and Fit Programme. Awareness and perceptions related to obesity among urban children and adolescents. *J Assoc Physicians India (Tamil Nadu State Chapter)*, 2, 19–23.
- Shabana, T., & Vijay, V. (2009). Impact of socio economic status on prevalence of overweight and obesity among children and adolescents in urban India. *Open Obes J.*, 1, 9–14.
- Stevens, J., Couper, D., & Pankow, J. (2001). Sensitivity and specificity of anthropometrics for the prediction of diabetes in a biracial cohort. *Obes Res.*, 9, 696–705.
- Subramanyam, V., Jayashree, R., & Raft, M. (2003). Prevalence of overweight and obesity in affluent adolescent girls in Chennai in 1981 and 1998. *Indian Paediatr.*, 40, 332–336.
- Tanas, R., Marcolongo, R., Pedretti, S., & Gilli, G. (2007). A family-based education program for obesity: A threeyear study. *BMC Pediatr.*, 7, 33.
- Veerman, J.L., Van Beeck, E.F., Barendregt, J.J., & Mackenbach, J.P. (2009). By how much would limiting TV food advertising reduce childhood obesity? *Eur J Public Health*, 19, 365–369.
- WHO growth reference Chart, 5-19 years. (2007). Available: http://www.who.int/growthref/who2007_bmi_for_age/en/index.html. Accessed 24 July 2010.

- WHO Report. (2003). Diet, nutrition and prevention of chronic diseases. WHO Technical Report Series 916. Available: [Whqlibdoc.who.int/trs/WHO_TRS_916pdf](http://whqlibdoc.who.int/trs/WHO_TRS_916pdf.pdf). Accessed 1 February 2012.
- World Health Organization Technical Report Series. (2010). Diet, nutrition and the prevention of chronic diseases. 916, i–viii, 1–149, back cover.