

ORIGINAL ARTICLE

School-Based Self-Care Model for the Assessment of Nutritional Status: A New Strategy for Prevention

Shobha S. Karikatti, Praveena R. Gunagi, Sunanda Halki

ABSTRACT

Introduction: Nutritional status of children is a critical determinant of child's health. The challenges of malnutrition among schoolchildren are due to lack of nutrition education, nutrition policies, public health capacity for assessment, and timely intervention of malnutrition. This calls for a need to improve the capacity of schoolchildren in nutrition care. The study aimed to assess the effectiveness of "School-Based Self-Care intervention Model" among schoolchildren. **Methodology:** A non-randomized trial was planned in schools with the required sample size of 240 in each study and control groups. Study group received intervention in which students were trained in nutrition assessment and monitoring. Outcomes were analyzed using descriptive and inferential (paired *t*-tests and Chi-square tests of independence) statistics. **Results:** The knowledge improved after the intervention about body mass index (BMI) (30.4–83.8%), the calculation of BMI (24.2–86.7), monitoring of weight (65.8–70.0%), and monitoring of height (44.6–61.3%). The proportion of students having adequate skill score (score >4) increased for weight (27.1–85.9%), height (21.5–89.6%), and waist measurement (10–76.7%). Most of children (98%) could calculate BMI, classify, and interpret the nutritional status. **Discussion and Conclusion:** The present "School-Based Self-Care Intervention Model" was effective in empowering the schoolchildren with basic health skills and the model enable children to assess nutrition status among themselves, their friends, and adult members. It is one of the cost-effective models which can be used at primary level.

Key words: Anthropometry, intervention model, monitoring, nutrition status, school-based approach, self-care model

INTRODUCTION

Nutritional status of children is one of critical determinants of child's health. Despite all efforts by health programs, India continues to suffer from malnutrition problems. NFHS-5 reports, 32.9% under-five children are underweight, 35.4% are stunted and tend to suffer from malnutrition as they grow old.^[1] Most of health problems in primary school-age children are due to malnutrition, poor immunity, infections causing significant growth and cognitive impairments, and early dropouts. The nutritional status of schoolchildren are at suboptimal level and not satisfactory which reflect child's poor health and efficiency of the health-care system.^[2] The proportion of underweight among primary schoolchildren ranges from 22.2% to 63% in various states of India including Karnataka (26–56%).^[3] A phenomenal rise has been observed in the prevalence of overweight and obesity (10–30%) among Asians and Indian

adolescents as well as in Karnataka (8.4% and 4.1%).^[4-7] Developing countries are at risk of double threat of diseases as they are witnessing both undernutrition and overnutrition issues.^[8]

Malnutrition is multifactorial condition resulting from faulty nutrition, poor dietary habits, lack of education, sociocultural factors, etc. The nutrition challenges in schools are due to lack of nutrition policy, nutrition education, poor public health capacity to assess malnutrition, and timely intervention of malnutrition.^[9,10] This calls for a need to improve the capacity of schoolchildren toward nutrition education, nutrition assessment, and monitoring. Many health programs (ICDS

Correspondence: Dr. Shobha S. Karikatti, Department of Community Medicine, Belagavi Institute of Medical Sciences, Belagavi, Karnataka, India. E-mail: drshoba_koti@yahoo.com

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Department of Community Medicine, Belagavi Institute of Medical Sciences, Belagavi, Karnataka, India

and NHM) have trained grass root level workers (8th standard qualification) to provide basic health services in community. Skill-based training among grass root workers have shown improvement in the knowledge and health skills such as recording temperature, anthropometric measurements, and certain clinical skills.^[11] Anthropometric measurement is one such simple, cost-effective tool for nutrition assessment and monitoring, which can be taught among children and community volunteers for early intervention.

Many school-based programs such as child-to-child and healthy buddy program have proved that schoolchildren can play an important role in health promotion.^[12,13] The CATCH and Wellness, Academics and You program employed school-based intervention in curriculum showed improvements in diet habits, physical activity levels, and change in nutrition status.^[14-16] There is a need to encourage such innovative school-based strategies to reinforce curriculum frameworks for nutrition education, physical health assessment, and health education. Schools can provide such primary level solutions in prevention of malnutrition and related health issues. With this context, the present study was planned and conducted to evaluate school-based self-care model approach for nutrition assessment.

METHODS

The present study was conducted in Belagavi, which is one of the fast developing city attracting youngsters for education who are at risk of Unhealthy dietary practices and less focused toward their nutrition health. A non-randomized controlled community trial was planned and conducted in selected schools with aim to assess the effectiveness of a self-care model. Ethical approval was obtained from the Institutional Ethical Committee and study approval was taken from school authorities. The present study was carried out for a period of two school academic years from 2017 to 2019.

Schools were selected as study units. Based on the pilot study with expectation of $(p = p_1 [25\%] + p_2 [45\%] = 32.5\%)$ 15% increase in the proportion of students acquiring adequate skill, we derived 240 samples in each group considering the dropout rate of 15% ($n = 2[Z\alpha + Z\beta] 2pq/d^2 = 2*[1.96 + 1.28]^2 * 32.5 * 67.5/152 = 205$ in each group + 35 = 240). Ten schools were selected randomly and divided as study units and control units. Written informed consent was obtained from 8th to 9th schoolchildren and were included in the study. The schoolchildren from study units received intervention.

School-Based Self-Care Intervention Model

School-based self-care approach is a new approach, in which schoolchildren were trained in assessment of nutrition status using various tools of assessment.

Components of “School-Based Self-Care Model”

First component

Assessment of knowledge about assessment and monitoring of nutritional status.

Second component

Enable every schoolchild in acquisition of anthropometric measurement skill.

Third Component

Educate them to calculate, classify, and interpret nutritional status of schoolchildren as well as of adults.

The intervention was given in four sessions over a period of 4 weeks.

Session I

Sensitization was carried out regarding the purpose of the project. The baseline survey was conducted to collect the sociodemographic data and pre-test was given to assess the basic knowledge of schoolchildren regarding the nutrition risk factors, nutrition monitoring, and nutrition assessment methods using pre-structured self-administered questionnaire.

Session II

Basic health skill in anthropometric measurements was assessed by direct observation method using checklist with five key steps. Each student was asked to measure the anthropometry of fellow student and was observed. Girls were separately assessed in different classroom.

Session was conducted to explain all anthropometric measurements (weight, height, and waist) using a five scientific steps. Example of weight: (1) How to place electronic weighing scale, (2) adjust the scale to zero, (3) barefoot with minimum cloth, (4) standing on scale straight facing forward and keeping arms on the sides, and (5) recording of weight in kilograms nearest to 100 g. Each step was demonstrated by the trainer and children were asked to demonstrate the same among batch mates. Reinforcement was done to ensure the understanding of five key steps by group activity of arranging the sequence cards. The post-test was conducted using the same structured observation checklist.

Session III

Lecture was conducted on importance of nutrition status, risk factors, and tools of nutrition assessment. Discussion and group activities were carried out about the classification and interpretation of nutritional status among children as well as of adults. Problem solving exercises were given to assess the nutritional status (body mass index [BMI] of self,

BMI of fellow child) of children as well as adults using given parameters.

The control group did not receive any intervention. The post-test data were collected using same questionnaire from both groups either at the end intervention (study group) or at the end of the study (control group).

Session IV

Health education session was given regarding balanced diet, healthy dietary habits, physical activities, importance of nutrition status assessment, and monitoring for both groups at the end of study.

Statistical Analysis

The data were analyzed using the SPSS Version 22. The students’ knowledge was assessed using scoring system and each item was scored as 2 for correct answer; scored as 1 if did not answer/do not know, and incorrect answer was scored 0. Skill scores were given for all candidates according to observation checklist. Each correct step was scored 1 and incorrect step was scored 0 and candidate was scored total out of 5. Score wise proportions and mean scores were calculated and compared. Descriptive (means and standard deviations) and inferential (paired *t*-tests and Chi-square tests of independence) statistics were used to test significant differences before and after intervention. A level of significance of $P < 0.05$ or <0.01 was used for all inferential analyses.

RESULTS

The profile of students, improvement in knowledge score, and skill scores were analyzed and results are presented as follows.

The knowledge about prevalent non-communicable diseases in relation to malnutrition was assessed among study population. Among the study group, 181 (75.4%) had heard about malnutrition and 221 (92.1%) knew at least one NCDs (IHD, DM, obesity, and hypertension) associated with malnutrition. The knowledge improved after the intervention as 222 (92.5%) became to know about malnutrition and

232 (96.7%) became to know about at least one NCDs. In control group, 157 (65.4%) students knew about malnutrition at the beginning of the study which remained almost same at the end of the study. Whereas, 10 (4.2%) did not know any NCDs. The knowledge regarding assessment and monitoring of nutritional status was analyzed and the results are shown in Table 1.

The difference in mean knowledge scores about BMI and it’s calculation and monitoring of weight and height were compared with and without intervention among groups. The difference was statistically significant ($P < 0.01$) among study group except for monitoring of weight ($P = 0.09$), whereas in the control group (BMI $P = 0.06$; BMI calculation $P = 0.2$; weight $P = 0.85$; height $P = 0.64$). the difference was not statistically significant.

The proportions of anthropometric skill scores of students were compared with and without intervention among groups. The proportion of students having adequate skill score (score >4) increased from 27.1% to 85.9% for weight measurement, from 21.5% to 89.6% for height measurement. and it increased from 10% to 76.7% for waist measurement at the end of intervention, whereas no much improvement was observed in the control group. The mean scores of anthropometric skills were compared among study and control groups and results are shown in Tables 2 and 3.

The adequate mean score attained by the study group for all parameters ranged from 4.1 ± 1.0 to 4.6 ± 0.8 ; whereas control group did not attain adequate skill score as it ranged from 1.9 ± 1.3 to 2.6 ± 0.8 . The mean scores were compared and test of significance was applied using Mann–Whitney U-test. There was significant difference ($P < 0.01$) observed between the groups for all the anthropometric parameters (weight, height, and waist).

The study found that 203 (84.6%) students among intervention group could calculate and interpret the BMI and were able to grade the nutritional status of children as well as adults. The students from control group did not receive any intervention were excluded from the analysis. The nutritional status was assessed among whole study population using various parameters and as per the BMI, 268 (55.8%) were underweight, 72 (15.0%) were overweight, 32 (6.7%) were

Table 1: Impact of intervention on knowledge of assessment and monitoring of nutritional status among study groups

Knowledge of assessment of nutritional status	Study group <i>n</i> =240			Control group <i>n</i> =240		
	Pre-test	Post-test	<i>P</i>	Pre-test	Post-test	<i>P</i>
	No. (%)	No. (%)		No. (%)	No. (%)	
BMI	73 (30.4)	201 (83.8)	<0.01	38 (15.8)	61 (25.4)	<0.01
Calculation of BMI	58 (24.2)	208 (86.7)	<0.01	35 (14.6)	51 (21.3)	>0.05
Monitoring weight	158 (65.8)	168 (70.0)	>0.05	150 (62.5)	142 (59.2)	>0.05
Monitoring height	107 (44.6)	147 (61.3)	<0.01	120 (50.0)	117 (48.8)	>0.05

BMI: Body mass index

Table 2: Mean anthropometric skill score of students for nutritional assessment among study groups with and without intervention

Skills	Study group n=240			Control group n=240		
	Pre-test	Post-test	P value*	Pre-test	Post-test	P value*
	Mean (SD)	Mean (SD)		Mean (SD)	Mean (SD)	
Weight	2.4 (1.4)	4.4 (0.7)	<0.001	1.8(1.0)	2.6(0.8)	<0.05
Height	2.3 (1.5)	4.6 (0.8)	<0.001	2.5(1.2)	2.9(1.4)	<0.05
Waist	1.5 (1.2)	4.1 (1.1)	<0.001	1.5(1.2)	1.9(1.3)	<0.05

*P value (z test) at 0.05 level both groups showed significant difference

Table 3: Post-test mean skill score attained by students at the end of the study with and without intervention

Skill parameters	Study group n=240	Control group n=240	P value
	Post-test Mean (SD)	Post-test Mean (SD)	
Weight	4.4 (0.7)	2.6 (0.8)	<0.01
Height	4.6 (0.8)	2.9 (1.4)	<0.01
Waist	4.1 (1.1)	1.9 (1.3)	<0.01

obese, and as per the waist circumference, 124 (25.8%) were having central obesity.

DISCUSSION AND CONCLUSION

In the present study, knowledge improved after the intervention about BMI (30.4–83.8%), the calculation of BMI (24.2–86.7%), monitoring of weight (65.8–70.0%), and monitoring of height (44.6–61.3%). The study results showed 77%–90% of schoolchildren acquired adequate skill to assess the nutritional status. The proportion of students having adequate skill score (score >4) increased for weight (27.1–85.9%), height (21.5–89.6%), and waist measurement (10–76.7%). In the study, almost all (98%) children could calculate their BMI and classified the nutritional status. The present “School-Based Self-Care Intervention Model” was effective in empowering the schoolchildren with basic health skills and enabled children to assess nutrition status among themselves.

In Delhi study, 10–35% of students had knowledge about BMI and significant proportion of students acquired knowledge of BMI after intervention.^[17] In our study, the knowledge of BMI improved from 75.4% to 92.5% after the intervention. Another study conducted to assess the effectiveness of skill training among ASHAs showed a significant improvement in knowledge score after training and 80% of ASHAs acquired skill of hand washing, recording temperature, and applying eye ointment whereas 50–60% acquired all essential skills of newborn care (weighing newborn and preventing baby from cold, etc.).^[11] In our study, 77%–90% of students learned adequate skill of measuring anthropometry. Compared to ASHAs schoolchildren with same education status learned better and acquired these health skills.

A study conducted to know the effectiveness of first aid training among primary schoolchildren i

n Singuru showed high impact of training (Cohen’s d = 5.14) as there was a significant change in the knowledge scores for injuries and management 1.5 ±0.47 to 6.53±1.3. The study concluded that first aid training in school curriculum can be fruitful and will ensure proper and timely management of injuries.^[18] In our study, the adequate mean scores attained by students ranged from 4.1±1.1 to 4.6±0.8 for all parameters (weight, height, and waist) showing high impact among study groups. Similar study conducted in Chandigarh showed an improvement (32.1–41.5%) in knowledge and skill score among Group A students regarding illnesses and injuries and it increased from 28% to 48.2% among Group B students. There was a significant rise in post-intervention scores for the known diseases such as upper respiratory tract infections, diarrhea, and fever compared to emergencies such as carbon monoxide gas poisoning, respiratory tract obstruction, poisoning, burns and electric shock, and minor injuries. The study recommends effective training for schoolchildren will enhance the skill toward the emergency management of injuries and transfer the message to community.^[19] In our study, skill improved from minimum of 10% to 27.1% to maximum of 76.7–89.6% for anthropometric measurements at the end of intervention. The impact in our students was more compared to Chandigarh study. This could be due to children regularly observe and involve themselves in anthropometric measurements in schools.

Another study by Sutono to assess the effectiveness of first aid training in cardiopulmonary resuscitation among high school students in Indonesia showed improvement in the knowledge as well as in skill among three groups lecture (P = 0.000), poster (P = 0.000), and audiovisual (P = 0.000) groups. The training in emergency management among schoolchildren was effective and could prepare them in handling emergencies.^[20] In our study, mean score improvement was observed in both groups (P < 0.05) with high significance in intervention group (P < 0.001).

The present “School-Based Self-Care Intervention Model” approach was effective in empowering the schoolchildren with basic health skills and the model enables children to

assess risk factors among themselves, their friends, and family members. Thus, this model appears to be one of the effective self-care models for the prevention of childhood malnutrition, nutrition problems, and adulthood health issues by halting the whole process of metabolic disharmony and reduces the risk for many communicable and non-communicable diseases. The study recommends to frame school curriculum with such school-based self-care approaches which empowers children with health skills. The study also recommends the curriculum reforms in schools toward health education and certain health skills which can bring huge changes in public health.

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