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Research Article

Nutritional of School Children

Nutritional Status of School Children and Efficacy of Awareness Intervention in Their Nutritional Knowledge – A Prospective Experimental Trial.

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Abstract: Malnutrition is a severe health problem that impacts young children's development and growth. An accurate measure of a child's health is their nutritional state. Malnutrition affects a child's ability to grow physically and mentally, weakens their immune system, and makes them more susceptible to infection. By 2030, one billion school-aged children will have developmental delays in their physical and mental health due to malnutrition, primarily undernutrition, which already affects more than 200 million children of school age. On the other hand, stronger immunity, better health, and increased productivity are all benefits of proper nutrition. The study's main aim was to assess the nutritional status of school-going children belong Puducherry. The purposive sampling technique was done after the purposive sampling method. The 8-Interview schedule was administered to the selected 30 samples of middle school-going children in Puducherry. After a preliminary inquiry, an interactive awareness session was conducted. This program was conducted by the same team, which is well-versed in doing the same.Regarding the frequency and percentage of nutrition status, among middle school students, a majority (57 percent) of the 30 students interviewed suffered from underweight and cold intolerance. Forty-three percent of people were anemic, tired, have diffuse hyperpigmentation, and loss of appetite. Regarding other problems, 37 percent claimed to have lost their sense of taste. Twenty-five percent of students had an adequate intake of cereals, but the variety in cereal ingestion was rare. According to the analysis of the dietary assessment. 40 % of samples only had a good intake of pulses, 83 % had a poor intake of vegetables and green leafy vegetables, and most of the students were taking only less quantity of milk, nuts, fruits, egg, fish, and meat probably because they belong to a low economic category and a lack of awareness. On analyzing the type of exercise the selected samples did, frequent cycling (40 %), walking (17%), and a paltry 10 % participated in the sport. After the awareness session, the students gained adequate knowledge about nutritional status.

Keywords: Nutritional Status, Malnutrition, School, Children, Awareness, Teaching,

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1. INTRODUCTION

One-fifth of the population is enrolled in school, and they will be the country's future, and their nutrition will have a wide-ranging impact on global health[1]. According to the census, India has the world's second-largest child population, with 263.9 million children[2]. Malnutrition is a severe health problem that affects the development and growth of young children[3]. Children under the age of 15 are the most vulnerable to malnutrition. Nutritional status is an accurate indicator of a child's health. Nutrition education in schools that is effective could force children to reconsider their eating habits and establish new models. Nutrition education in schools can significantly improve children's health through improved physical activity and nutrition in school and at home. Teaching children, parents, and teachers about eating healthy is an urgent need and an answer to our country's growing issue of overweight, physically inactive, and malnourished children and adolescents. Malnutrition impairs a child's physical and mental development, weakens their immune system, and makes them more susceptible to infection. Malnutrition will cause developmental delays in both physical and mental health for one billion school-aged children by 2030. Stronger immunity, better health, and increased productivity are all benefits of proper nutrition[4]. School age is a dynamic time for a child's physical and mental development[5]. This complex illness frequently lowers well-being, productivity, and immunity, contributing to more significant mortality and morbidity. Several recognized and unexplored factors influence the development of undernutrition. It hinders a child's ability to grow, weakens their mental capacity, and significantly strains the health system[6]. About 90% of the world's population of children aged between 5 to 15 reside in low- and middle-income groups, based on the World Health Organization (WHO) report. In a 2011 report, the United Nations Children's Fund (UNICEF) stated that adolescence offers a second window of opportunity to improve children's nutritional condition and prevent the long-term health effects of undernutrition. Through this age range, mental and physical development continues, and people can address any nutritional deficiencies to avoid slowing down growth, development, and cognitive success[7] The nutritional status of children is significantly influenced by their nutrition awareness. Children who were uninformed about nutrition were much more prone to consume excessive fat and cholesterol. Additionally, children's nutritional health is significantly impacted by both parents and kids' knowledge of nutrition. Research has demonstrated that parental and child nutrition education can enhance the nutritional status of children. For obvious reasons, anthropometry is widely regarded as the most helpful tool for assessing children's nutritional status. MUAC (mid-upper arm circumference), weight for age, height for age, weight for height, and Quetlet's body mass index are the anthropometric indicators used. The majority of these indicators require the use of specific reference tables. For example, tables from the National Centre for Health Statistics (NCHS) can be used to interpret data. With this background, we designed the study with the objectives as follows:

1. To assess the anthropometric assessment of middle school children: 2. To observe and note the clinical symptoms and analyze their related disorders: 3. To analyze the dietary pattern of the middle school children: 4. To find out the way of their physical activity.5To find out the usefulness of awareness program on the level of knowledge about nutrition among children

2. METHODOLOGY

2.1 Study primer

The study was conducted in Arjuna Suburaiyar Naiker Govt—Middle School of Mudaliarpet at Puducherry of South India. The Institutional Ethical Committee approved the study. (1/BGCW/RC/017/2018) The research work was done in accordance with the declaration of Helsinki. As there were no interventions, the ICMR 2017 minimal risk category was used as the ethical score of the study.

2.2 Sampling

Among the middle school samples selected purposively, thirty students were selected to be interviewed and observed at random. Thus homogenous sampling technique was done after the purposive sampling method.

2.3 Inclusion and exclusion criteria

2.3.1 Inclusion

Middle school children aged 11-13 years and willing to participate in the study. Parental consent and permission from the school are possible.

2.3.2 Exclusion

Students and parents who were unwilling to participate, any systemic illnesses like diabetes and cardiorespiratory diseases. Mentally disabled children who cannot understand the questions and proforma

2.4 Data collection

The study was conducted using the following tools. First, the interview schedule was administered to the selected 30 samples.

2.5 Demographic variables

The interview schedule had the following headings. They are demographic details, anthropometric assessment, clinical assessment, dietary assessment, the prevalence of physical activity, and creating awareness among school children on nutrition.

2.6 School support

Manuals and books on nutrition were distributed. In addition, schools received display boards, posters, electronic scales, and sports equipment.

2.7 Educational curricula

In, offline lectures were given five times. Topics covered include "obesity prevention," "child malnutrition and lifestyle," "diet and health," and others. The plan was to give children a thorough

understanding of undernutrition, overweight, and obesity from various perspectives.

2.8 School environment support

There are several ways in which schools can support nutrition knowledge awareness programs.

1. Offer nutrition education as part of the curriculum: Schools can include nutrition education as part of their regular lesson plans, so students can learn about the importance of a healthy diet and how to make healthy food choices.
2. Host nutrition-themed events and activities: Schools can organize cooking demonstrations, taste testing, and farm-to-school programs to educate students about nutrition.
3. Promote healthy eating habits: Schools can encourage students to eat healthy by offering various nutritious options in the school cafeteria and making healthy snacks available during breaks.
4. Partner with community organizations: Schools can work with local organizations such as farmers' markets, health clinics, and community gardens to promote nutrition education and access to healthy food.
5. Educate parents and guardians: Schools can provide resources and information to parents and guardians to help them support their children's healthy eating habits at home.

By implementing these strategies, schools can help raise awareness about nutrition's importance and promote healthy eating habits among students.

2.9 Family involvement

1. There are many ways families can support their children's nutrition:
2. Model healthy eating habits: Children learn by example, so parents and guardians need to model healthy eating habits at home. This includes eating a variety of nutritious foods, controlling portion sizes, and limiting sugary drinks and snacks.
3. Involve children in meal planning and preparation: Allowing children to help plan and prepare meals can make them more interested in trying new foods and teach them valuable cooking skills.
4. Limit unhealthy food options: Parents and guardians can help to promote healthy eating by keeping unhealthy foods such as chips, candy, and sugary drinks out of the house or limiting their availability.
5. Educate children about nutrition: Teaching children about the importance of nutrition and the role that different foods play in maintaining a healthy diet can help them make more informed food choices.
6. Encourage physical activity: Regular physical activity is essential to a healthy lifestyle. Encourage children to be physically active by participating in activities together or providing opportunities for them to engage in sports and other physical pursuits.

2.10 The control conditions

Control conditions are typically used in randomized controlled trials and are considered the gold standard for evaluating the effectiveness of interventions. In these studies, participants are randomly assigned to either the experimental group (receiving the intervention) or the control group (not receiving the intervention). It helps to ensure that any differences between the two groups are not due to preexisting differences between the participants but rather to the intervention itself.

2.11 Outcome variables and measurements

Outcome variables in children's nutrition programs are measures used to assess the program's effectiveness in improving children's nutritional status. These variables may include measures of malnutrition such as weight-for-age, height-for-age, and weight-for-height, as well as biochemical indicators of nutrient status such as hemoglobin levels and serum vitamin levels. Other outcomes include improvements in food security, dietary diversity, and caregiving practices.

2.12 Definition nutritional status

Nutritional status refers to an individual's overall health and well-being as their diet and nutrition influence it. In the context of a children's nutrition awareness program, it refers to children's physical and mental development as their diet and nutrition affect it. It is typically assessed through the measurement of malnutrition indicators such as weight-for-age, height-for-age, and weight-for-height, as well as biochemical indicators of nutrient status such as hemoglobin levels and serum vitamin levels. In addition, a children's nutrition awareness program may aim to improve the nutritional status of participating children through education and interventions to improve diet and nutrition.

2.13 Nutrition knowledge of children

Children require a balanced diet that includes various foods from all food groups, including fruits, vegetables, grains, protein sources, and dairy products. In addition, children need to consume adequate amounts of essential nutrients such as vitamins, minerals, and healthy fats, as well as sufficient energy to support their growth and development. Therefore, children should avoid processed and sugary foods instead of whole, nutrient-rich options. It is also essential for children to stay hydrated by drinking plenty of water throughout the day.

2.14 Nutrition intervention

The study's second phase involves creating awareness among the children on nutrition. The investigator prepared a chart to explain the need for a protein and calcium-rich diet to middle school children, exhibited the chart, and had an interactive session. An individual description is also detailed in the results section under each heading. A pre-explanation unvalidated ranking score was observed on a scale of 1 – 10, and the same was also analyzed after the explanatory sessions.

3. STATISTICAL ANALYSIS

As the primary outcome measure was the difference in knowledge after an intervention the sample size calculator epi tools were used. A sample size of thirty was found with an alpha error of 0.05 and a beta error of 0.8. The purposive sampling technique includes a minimal bias in the study. The nutritional

data were collected in an excel sheet and spread over SPSS software (version 16 – IBM – USA). The descriptive analyses were made for the routine data, and the student t-test was used to analyze the changes in awareness after an intensive course.

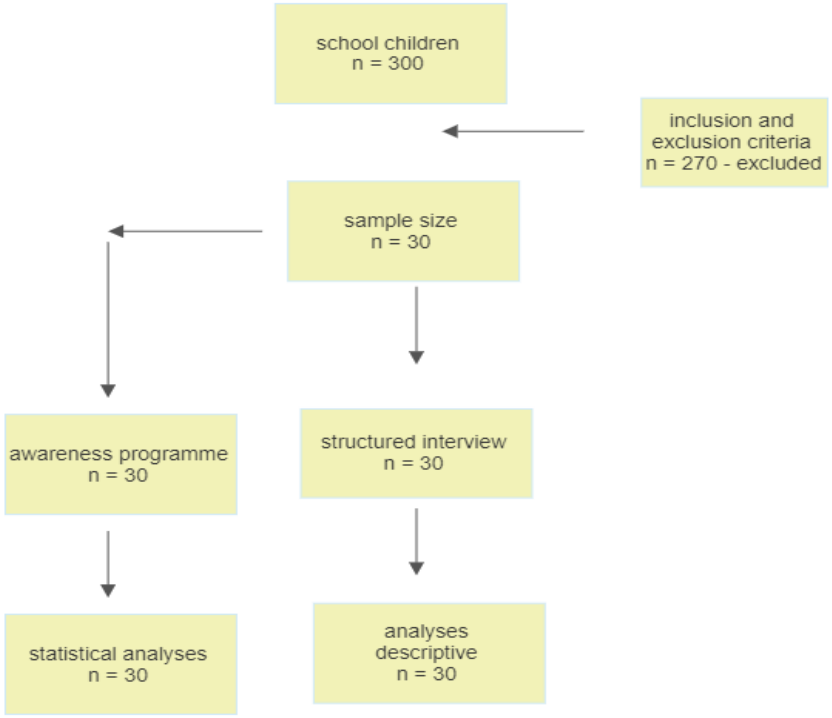

Fig 1: showing study flow chart

4. RESULTS

The results section can be subclassified to detail each variable, as seen below.

I. DEMOGRAPHIC DETAILS
II. ANTHROPOMETRIC ASSESSMENT
III. CLINICAL SYMPTOMS
IV. DIETARY ASSESSMENT
V. PATTERN OF PHYSICAL ACTIVITY

4.1 DEMOGRAPHIC DETAILS

The demographic details of chosen sample explaining the age, religion, gender, family size, family type, educational qualification of father and mother, type of employment of father and mother, and family income were noted as follows. (Table 1) Most of the 30 students evaluated were between the ages of 13 and 17, and the majority were female. The majority of students (26%) were Hindus and 22% were from nuclear families. Regarding father and mother educational qualifications, most of them only had school studies 22(74%) and were laborers 19(63%). Most students' families had a monthly income of Rs.6,000 to 10,000.

Table 1: Frequency and Percentage Distribution of Demographic Variables of the subjects (N=30)

S.no	Demographic variables	Frequency (n)	Percentage (%)
1	**Age (in years)**		
	11 years	05	17
	12 years	09	30
	13 years	16	53
2	**Gender**		
	Male	11	37
	Female	19	63
3	**Religion**		
	Hindu	26	87
	Christian	3	10
	Muslim	1	3

4	**Type of family**		
	3-4	22	73
	4-5	7	23
	3 >5	1	04
5	**Educational qualification of Father and Mother**		
	Illiterate	7	23
	School	22	74
	UG	1	3
6	**Type of employment of Father and Mother**		
	Laborer	19	63
	Administration	3	10
	unemployment	8	27
7	**INCOME OF FAMILY**		
	1000-5000	12	40
	6000-10000	13	43
	11000-15000	3	10
	16000-20000	2	07

4.2 *ANTHROPOMETRIC ASSESSMENT*

The findings projected the distribution of the subjects' anthropometric assessment among school-aged children. Most of the 30 students evaluated were between the height range of 140 - 155 cm. The weight in Kg is tabled in Table 2

Table 2: Frequency and Percentage Distribution of Anthropometric assessment of the subjects Nutrition table (N=30)

S.no	Demographic variables	Male	Female	Frequency (n)	Percentage (%)
	Height				
1	Minimum (<140 cm)	-	3	3	10
	Normal (140-155 cm)	8	14	22	73
	Over (>155 cm)	3	2	5	17
	Weight				
2	Minimum (<30 Kg)	4	13	17	57
	Normal (30-45 kg)	7	6	13	43

4.3 *CLINICAL SYMPTOMS*

Clinical assessment is a way of diagnosing and planning treatment for an individual.

4.4 GENERAL SYMPTOMS AND APPEARANCE

The general health condition of an individual could be assessed by observing certain signs and symptoms such as fatigue, loss of appetite, pica, loss of taste, etc., which could be associated with an individual's health status. Therefore, around seven general symptoms were analyzed to identify the general health status of the selected samples, and it was found that 57 percent of the samples had cold intolerance due to being underweight. In addition, 43 percent had a pale appearance due to anemic and loss of appetite. Furthermore, 37 percent stated that they had a loss of taste, 7 percent indicated that they had a loss of height4, and a percentage each stated that they had fatigue and diffuse hyperpigmentation.

Table 3: Frequency and Percentage Distribution of General symptoms of the Students (N=30)

S.no	Demographic variables	Frequency (n)	Percentage (%)
1	**General Symptoms**		
	Fatigue	1	4
	Loss of Appetite	13	43
	Loss of taste	11	37
	Cold intolerance	17	57

	Pale appearance due to anemia	13	43
	Diffuse hyper pigmentation	1	4
	Loss of height	2	7

4.5 *DIETARY ASSESSMENT*

The diet history of the sample about this is recorded and analyzed. There are various methods for dietary assessments; among them 24-hour recall method of the simplest and most prevalent one. First, a recall of a one-day diet is given to the samples, with five meal patterns recorded.

Table 4: Frequency and Percentage Distribution of Dietary Assessment of the Students (N=30)

S.no	Food Group	Good		Fair		Poor	
		N	%	N	%	N	%
1	Cereal	25	83	5	17	-	-
2	Pulses	12	4	11	37	7	23
3	Vegetables	3	1	2	7	25	83
4	Green Leafy Vegetables	-	-	5	17	25	83
5	Milk	04	13	07	23	19	63
6	Nuts	-	-	01	03	29	97
7	Fruits	-	-	03	10	27	90
8	EGG	09	30	-	-	21	70
9	Fish	07	23	01	03	22	73
10	Meat	-	-	-	-	30	100

On analyzing the dietary assessment of the selected samples, it was found that the four majorities of 25 % had a good intake of cereals, but the varieties were very few. With regard to the pulse intake, it was found that only 40 % had good information about pulses, 83% each had a poor intake of vegetables and green leafy vegetables and a very high % of samples had less intake of milk, 63% of nuts 97% fruits 90% egg 70 % fish 73% meat 100 %. As most of the selected samples belonged to the low-income category, the consumption of green leafy vegetables, milk, nuts, and fruits were inferior. Therefore, the only food they consume as a good source is cereal and as fair as pulses.

4.6 *EXERCISE*

Physical activity plays a vital role in the health status of an individual. Thus, it was essential to analyze the type of physical activity prevalent in the selected samples.

Table 5: Frequency and Percentage Distribution of Exercise of the Students (N=30)

SI.NO	RANGE	TOTAL	PERCENTAGE
1	Walking	5	17
2	Cycling	12	40
3	Skipping	3	10
4	sports	3	10
5	No exercise	7	23
	TOTAL	30	100

On analyzing the type of exercise the selected samples did, it was found that 40% did cycling, 17 % did waking .10 % of each of the samples participated in sports and skipping. It was interesting to note that 7 % of the samples never did any exercise. The post-explanation score improved considerably, with a p-value of 0.001.

4.7 Education, awareness, and intervention

There is a significant improvement in the awareness scores and knowledge after education (p-value – 0,001)

Table 6 The awareness scores before and after the intervention.

	Awareness score – pre-intervention	Awareness score – post-intervention	P value *
N = 30	3.25± 0.8	5.65± 1.2	**0.001**

Table 7 - Associations of changes in nutrition knowledge scores of children and their parents with changes in children's body mass index (BMI)and other variables

Factors	Correlation	Significance
Age	0.1	Not significant
sex	0.15	Not significant
Parental education	0.3	Not significant
Income status	0.34	Not significant
BMI	0.36	Not significant

Even though our results have shown significant improvement in nutrition knowledge among students, individual influencing factors play a minor role. However, income status and BMI were close to essential, and they played a significant role.

5. DISCUSSION

According to a survey of 2000 children on nutritional habits, the occurrence of underweight children is around 72.4%, which requires immediate attention. Obesity is less common. The key influences are socioeconomic status, dietary indulgences in fast foods, and a lack of activities such as playing games with schoolchildren. Even though children in private schools are better fed, the underweight rate remains at 58.6%. They are comparable to children from government schools regarding playing times, dietary habits, and sleeping patterns[8]. It is critical to promote sports among children of all socioeconomic backgrounds. A complete ban on fast food items on school grounds is urgently needed. Our study goes along with these results with a high incidence of malnutrition. In yet another study, metabolic syndrome was found in 5.2% of college students. When only two variables were considered instead of three, the prevalence rate increased to 22.3%. One of the seventy-six people tested positive for diabetes. There is a definite correlation between metabolic syndrome variables[9], which agrees with previous research findings. A routine metabolic syndrome screening for college students and programs to control it regularly is recommended. There is a significant transition of malnutrition, fast food intake, and the incidence of metabolic syndrome in the community. Hence, we wanted to project the state of malnutrition to promote definite steps for controlling it. In our study, we have found a short explanatory session is enough to improve awareness about nutrition. The analyses of the longevity of their memory are not tested for different times in our study. Nutrition knowledge is much less in the educated section of society, like teachers. It was proved by Suchitra et al. [10]. Our study population is only school students. Hamulka et al. [11] have suggested that preventive health care aimed at promoting average growth and development of children and lowering the risk of diet-related diseases in adulthood can be achieved by developing appropriate dietary and lifestyle habits early. As an important public health action in the future, well-tailored education programs for teenagers can be developed. Sood et al., after an awareness program[12], have described that the maximum gain in knowledge was 33.95% and the minimum was 25.85% in the age group of 16-17 years for boys and 10-12 years for girls. Girls aged 16-17 had the highest altitude gain of 30.04%, while girls aged 10-12 had the lowest score of 25.68%. Nutrition education can be used to teach children healthy eating habits and improve their nutritional status. Under our results, we had a score that enhanced by around 40 %. Maiti et al. did a school-based detailed nutritional program that considerably influenced cognitive and attitudinal parameters, increasing knowledge and encouraging sustainable dietary behaviors. The most significant limitation of our study is the limited sample size and a single-center study. A modified Delphi consensus [14] was used to develop the Pedi-R-MAPP nutrition awareness tool. This tool aims to provide a structured strategy for completing a faraway nutrition-focused assessment and recognize the occurrence of follow-up and even those youngsters who may require an in-person evaluation. Developing such tools in India may go a long way in detecting and decreasing nutrition-associated disorders. According to the findings[15], individuals who received nutrition education in middle and elementary school exhibit a more positive attitude to nutritional knowledge. Furthermore, family food conversations during elementary school positively affect nutritionally complete eating habits in adults. The above aspect of long-term follow-up is not an art of our protocol. Nutrition educators[16] can encourage healthier diet habits in children by changing core beliefs about their food and educating them on how children can feed the same foods as adults. Situating the social construct of kids' food within a social-ecological context, for example, may aid in identifying and leveraging modifiable factors to contest assumptions about the kids' food character type and promote better food quality for children. The application of nutrition education for children in a massive way can change the social construct regarding nutritional health in children.

6. CONCLUSION

In this combined prospective descriptive and epidemiological study of nutrition level among middle school students, out of the selected 30 students, 57% of the samples were underweight and had cold intolerance. In addition, 43% were found to have pale appearances due to anemic, fatigue, diffuse hyperpigmentation, and loss of appetite. In addition, 37% stated that they had a loss of taste. On analyzing the dietary assessment of the selected children, it was found that a majority of 25 % of the students had a good intake of cereals. Still, the variety of grains could be consumed more. On the other hand, 40 % only had good information about pulses, 83 % had a poor intake of vegetables and green leafy vegetables, and most of the students were taking only less quantity of milk, nuts, fruits, egg, fish, and meat because they belong to the low economic category, on analyzing the type of exercise done by the selected samples

cycling (40 %), waking (17%). Moreover, only 10 % participated in sports; after the awareness session, the students gained more knowledge about nutritional status.

7. AUTHOR CONTRIBUTION STATEMENT

Ranjitha B and Rajiny C H conceptualized and gathered the data collection and design, manuscript and communication

8. CONFLICT OF INTEREST

Conflict of interest declared none.

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