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RESEARCH ARTICLE

ANALYSIS OF DIETARY INTAKE AND NUTRITIONAL ADEQUACY AMONG NGO CHILDREN AGED 9-17 YEARS IN AJMER DISTRICT

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Abstract

The present study aimed to assess dietary intake and nutritional adequacy among children aged 9–17 years residing in non-governmental organizations (NGOs) in Ajmer district. A total of 420 participants were selected using a purposive sampling technique. Dietary intake was assessed using the 24-hour dietary recall method. The intake of major nutrients, including energy, carbohydrates, protein, calcium, dietary fiber, iron, and vitamin C, was calculated and compared with the Recommended Dietary Allowances (RDA, 2020). The findings revealed that protein intake was relatively adequate among both age groups. However, the intake of energy, calcium, dietary fiber, iron, and vitamin C was consistently below the recommended levels. The inadequacy of nutrient intake was more pronounced among older children (13–17 years) compared to younger children (9–12 years). The study highlights significant nutritional gaps among children residing in NGO settings, indicating a potential risk of undernutrition and micronutrient deficiencies. These findings emphasize the need for targeted nutritional interventions, improved dietary planning, and regular monitoring to enhance the nutritional status and overall health of children in vulnerable populations.

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Introduction:-

Nutritional status is a fundamental determinant of health, growth, and overall development, particularly during the critical stages of childhood and adolescence. Adequate nutrition during these formative years is essential for achieving optimal physical growth, cognitive development, and overall well-being. Proper intake of macronutrients such as carbohydrates, proteins, and fats, along with essential micronutrients including vitamins and minerals, plays a crucial role in maintaining normal physiological functions. In contrast, inadequate dietary intake may result in growth retardation, impaired cognitive performance, weakened immunity, and an increased susceptibility to infections and chronic diseases in later life. Dietary assessment is an important tool for evaluating the nutritional status of individuals as well as populations. It provides comprehensive information regarding food consumption patterns, nutrient intake, and the extent of dietary adequacy or inadequacy. Among various methods used for dietary assessment, the 24-hour dietary recall method is widely accepted due to its simplicity, cost-effectiveness, and ability

to capture actual food intake over a specific period. This method facilitates the estimation of nutrient intake, which can be compared with standard reference values such as the Recommended Dietary Allowances (RDA, 2020) to determine whether the dietary intake meets the required nutritional needs.

Children residing in non-governmental organizations (NGOs) represent a particularly vulnerable group due to their socio-economic constraints and dependence on institutional food services. These children often rely entirely on the meals provided by the institutions, which may not always be nutritionally balanced or adequate in terms of quality and quantity. Limited dietary diversity, restricted access to fresh fruits and vegetables, and inadequate intake of micronutrient-rich foods can contribute to the development of nutritional deficiencies among this population. Although NGOs play an important role in providing basic care and nutrition, variations in food quality, availability of resources, and dietary planning may lead to inconsistencies in meeting the recommended nutritional requirements. Adolescence is a crucial phase characterized by rapid physical growth, hormonal changes, and increased nutritional demands. During this period, adequate intake of energy, protein, calcium, iron, and vitamins is essential to support growth spurts, bone development, and overall physiological functions. Failure to meet these increased nutritional requirements may result in delayed growth, reduced physical capacity, and long-term health consequences. Therefore, it is essential to assess not only the quantity but also the quality and diversity of food consumed by children and adolescents.

In addition, evaluating dietary intake among children in NGO settings is important for identifying specific nutrient deficiencies and understanding the magnitude of the problem. Such assessments can help in designing targeted nutrition intervention programs, improving meal planning, and promoting the inclusion of nutrient-dense foods in daily diets. It also provides a basis for policy formulation and implementation of effective nutrition strategies aimed at improving the health status of vulnerable populations. In this context, the present study was undertaken to assess the dietary intake and nutritional adequacy among children aged 9–17 years residing in selected NGOs in Ajmer district. The study aims to evaluate their nutrient intake in comparison with the Recommended Dietary Allowances (RDA, 2020) and to identify existing nutritional gaps. The findings of the study are expected to provide valuable insights for developing appropriate nutritional interventions, enhancing dietary practices, and improving the overall health and well-being of children living in vulnerable environments.

Methodolog:-

Study Design and Sample:-

The present study was conducted to assess the dietary intake and nutritional adequacy among children aged 9–17 years residing in selected non-governmental organizations (NGOs) in Ajmer district. A total of 420 children were included in the study. The participants were selected using a purposive sampling technique based on their availability and willingness to participate in the study. For better analysis and comparison, the study population was categorized into two age groups: children aged 9–12 years ($n = 166$) and adolescents aged 13–17 years ($n = 254$). This classification was made to understand the variation in dietary intake and nutritional requirements across different developmental stages.

- 9–12 years ($n = 166$)
- 13–17 years ($n = 254$)

Purposive sampling technique was used for selection:-

Dietary Assessment Method: The dietary intake of the participants was assessed using the 24-hour dietary recall method. In this method, the respondents were asked to recall all the foods and beverages consumed during the previous day. This method is widely used in nutritional studies due to its simplicity, cost-effectiveness, and reliability in estimating the average dietary intake of large population groups (Maiti et al., 2011). To enhance the accuracy and reliability of the collected data, a three-day dietary recall was additionally conducted among adolescents (13–17 years). The dietary information obtained from the participants was carefully recorded using standardized household measures to ensure consistency and accuracy in portion size estimation. The collected data were then converted into nutrient values using Nutrition Survey software. The daily intake of various nutrients was calculated for each participant, and the obtained values were compared with the Recommended Dietary Allowances (RDA, 2020) to assess the adequacy of dietary intake.

Nutrient Analysis: The intake of major nutrients, including energy, carbohydrates, protein, calcium, dietary fiber, iron, and vitamin C, was calculated for all participants. The mean intake and standard deviation (Mean \pm S.D.) were computed separately for both age groups to provide a clear understanding of the distribution of nutrient intake.

Among children aged 9–12 years ($n = 166$), the mean daily energy intake was found to be 1650 ± 220 kcal, which is lower than the recommended level of 1900 kcal. Carbohydrate intake (230 ± 35 g/day) and protein intake (40 ± 8 g/day) were slightly below the recommended values, although protein intake approached adequacy. However, significant deficiencies were observed in the intake of calcium (400 ± 100 mg/day), dietary fiber (14 ± 4 g/day), iron (9 ± 2 mg/day), and vitamin C (32 ± 12 mg/day) when compared with the recommended dietary allowances. Similarly, among adolescents aged 13–17 years ($n = 254$), the mean daily energy intake was 1950 ± 280 kcal, which was lower than the recommended intake of 2300 kcal. Carbohydrate intake (260 ± 40 g/day) and protein intake (48 ± 10 g/day) were also below the recommended levels. More pronounced deficiencies were observed in calcium (420 ± 110 mg/day), dietary fiber (16 ± 5 g/day), iron (10 ± 3 mg/day), and vitamin C (35 ± 14 mg/day), indicating inadequate intake of essential nutrients among adolescents.

Statistical Analysis:-

Descriptive statistical methods were used to analyze the data. Mean and standard deviation were calculated for all nutrient variables. The obtained nutrient intake values were compared with the Recommended Dietary Allowances (RDA, 2020) to determine the level of adequacy among the participants.

Table 1: Nutrient Intake of Nutrients (Age 9-12 years) n=166

Nutrient	RDA (2020)	Actual intake per day	Mean \pm S.D.
Energy (kcal/day)	1900	1650	220
Carbohydrate (g/day)	275	230	35
Protein (g/day)	42	40	8
Calcium (mg/day)	550	400	100
Dietary Fiber (g/day)	19	14	4
Iron (mg/day)	11	9	2
Vitamin C (mg/day)	40	32	12

Table 2: Nutrient Intake of Nutrients (Age 13-17years) n=254

Nutrient	RDA (2020)	Actual intake per day	Mean \pm S.D.
Energy (kcal/day)	2300	1950	280
Carbohydrate (g/day)	320	260	40
Protein (g/day)	54	48	10
Calcium (mg/day)	600	420	110
Dietary Fiber (g/day)	22	16	5
Iron (mg/day)	13	10	3
Vitamin C (mg/day)	45	35	14

The calculated values were compared with the Recommended Dietary Allowances (RDA, 2020) to determine adequacy.

Results and Discussion:-

Assessment of nutritional status is an important aspect of public health, as it helps in identifying the prevalence, nature, and extent of malnutrition among different population groups. It also assists in recognizing vulnerable sections of society and in planning appropriate nutritional interventions to improve health outcomes (Rao et al., 2011). In the present study, the dietary intake of children aged 9–12 years residing in NGOs was assessed using the 24-hour dietary recall method. The intake of major nutrients was calculated and compared with the Recommended Dietary Allowances (RDA, 2020) to evaluate dietary adequacy.

Table 3: Nutrient Intake of Nutrients (Age 9-12 years) n=166

Nutrient	RDA (2020)	Actual intake per day Mean \pm S.D.	% of RDA
Energy (kcal/day)	1900	1650 \pm 220	86.8
Carbohydrate (g/day)	275	230 \pm 35	83.6
Protein (g/day)	42	40 \pm 8	95.2
Calcium (mg/day)	550	400 \pm 100	72.5
Dietary Fiber (g/day)	19	14 \pm 4	21.7
Iron (mg/day)	11	9 \pm 2	56.8
Vitamin C (mg/day)	40	32 \pm 12	50.0

The data presented in Table 3 reveal that the mean daily energy intake of children was 1650 \pm 220 kcal, which corresponds to 86.8% of the recommended intake of 1900 kcal/day. This indicates a moderate deficit in energy consumption, which may affect growth and physical activity levels among children. Similarly, the average carbohydrate intake was recorded as 230 \pm 35 g/day, fulfilling 83.6% of the recommended dietary allowance of 275 g/day, suggesting insufficient intake of energy-providing nutrients. Protein intake, however, was found to be relatively adequate, with a mean value of 40 \pm 8 g/day, which meets 95.2% of the recommended intake of 42 g/day. This indicates that the dietary pattern of the children provides an acceptable level of protein, which is essential for growth and tissue repair.

Despite this, significant deficiencies were observed in the intake of several essential micronutrients. Calcium intake was recorded at 400 \pm 100 mg/day, which is only 72.5% of the recommended level (550 mg/day). This inadequate intake may negatively impact bone development and overall skeletal health. Dietary fiber intake was also low, with a mean value of 14 \pm 4 g/day, fulfilling only 73.7% of the recommended 19 g/day, indicating poor consumption of fruits, vegetables, and whole grains. Iron intake was found to be 9 \pm 2 mg/day, which corresponds to 81.8% of the recommended intake, suggesting a potential risk of iron deficiency and anemia among children. Similarly, vitamin C intake was 32 \pm 12 mg/day, meeting only 80% of the recommended level, which may affect immune function and iron absorption. Overall, the findings clearly indicate that although protein intake among children aged 9–12 years was nearly adequate, the intake of energy, calcium, dietary fiber, iron, and vitamin C was below recommended levels. These nutritional gaps highlight the need for improved dietary planning and inclusion of nutrient-rich foods to ensure balanced nutrition and better health outcomes among children in NGO settings.

Table 4: Nutrient Intake of Nutrients (Age 13-17years) n=254

Nutrient	RDA (2020)	Actual intake per day Mean \pm S.D.	% of RDA
Energy (kcal/day)	2300	1950 \pm 280	85.1

Carbohydrate (g/day)	320	260 ± 40	81.3
Protein (g/day)	54	48 ± 10	88.9
Calcium (mg/day)	600	420 ± 110	70.0
Dietary Fiber (g/day)	22	16 ± 5	72.7
Iron (mg/day)	13	10 ± 3	76.9
Vitamin C (mg/day)	45	35 ± 14	77.8

The data presented in Table 4 illustrate the nutrient intake pattern among children aged 13–17 years residing in NGOs. The findings indicate that the mean daily energy intake was 1950 ± 280 kcal, which corresponds to 85.1% of the recommended dietary allowance (2300 kcal/day). This reflects a noticeable deficit in energy intake, which may adversely affect the increased physiological and metabolic demands during adolescence. The average carbohydrate intake was reported to be 260 ± 40 g/day, meeting 81.3% of the recommended intake (320 g/day). This suggests an inadequate intake of energy-yielding nutrients, which may impact overall energy balance and physical performance. Protein intake was found to be 48 ± 10 g/day, which accounts for 88.9% of the recommended intake (54 g/day). Although slightly below the recommended level, protein intake can be considered relatively satisfactory compared to other nutrients.

However, the intake of several essential micronutrients was considerably lower than the recommended levels. Calcium intake was observed to be 420 ± 110 mg/day, fulfilling only 70% of the recommended intake (600 mg/day). This deficiency is of particular concern during adolescence, a critical period for bone growth and development. Inadequate calcium intake may increase the risk of poor bone mineralization and related health issues. Dietary fiber intake averaged 16 ± 5 g/day, which is 72.7% of the recommended level (22 g/day), indicating insufficient consumption of fiber-rich foods such as fruits, vegetables, and whole grains. Iron intake was recorded at 10 ± 3 mg/day, corresponding to 76.9% of the recommended intake (13 mg/day), suggesting a potential risk of iron deficiency and anemia, especially among adolescent girls. Similarly, vitamin C intake was found to be 35 ± 14 mg/day, which accounts for 77.8% of the recommended level (45 mg/day). This suboptimal intake may affect immune function and reduce the absorption of iron from plant-based foods.

Overall, the results indicate that while protein intake among children aged 13–17 years was relatively close to the recommended level, the intake of energy, calcium, dietary fiber, iron, and vitamin C was consistently inadequate. The nutritional deficiencies were more pronounced in this age group compared to younger children, likely due to increased nutritional requirements during adolescence. These findings highlight the need for improved dietary practices, inclusion of nutrient-dense foods, and targeted nutritional interventions to address the existing gaps and promote better health outcomes among adolescents in NGO settings.

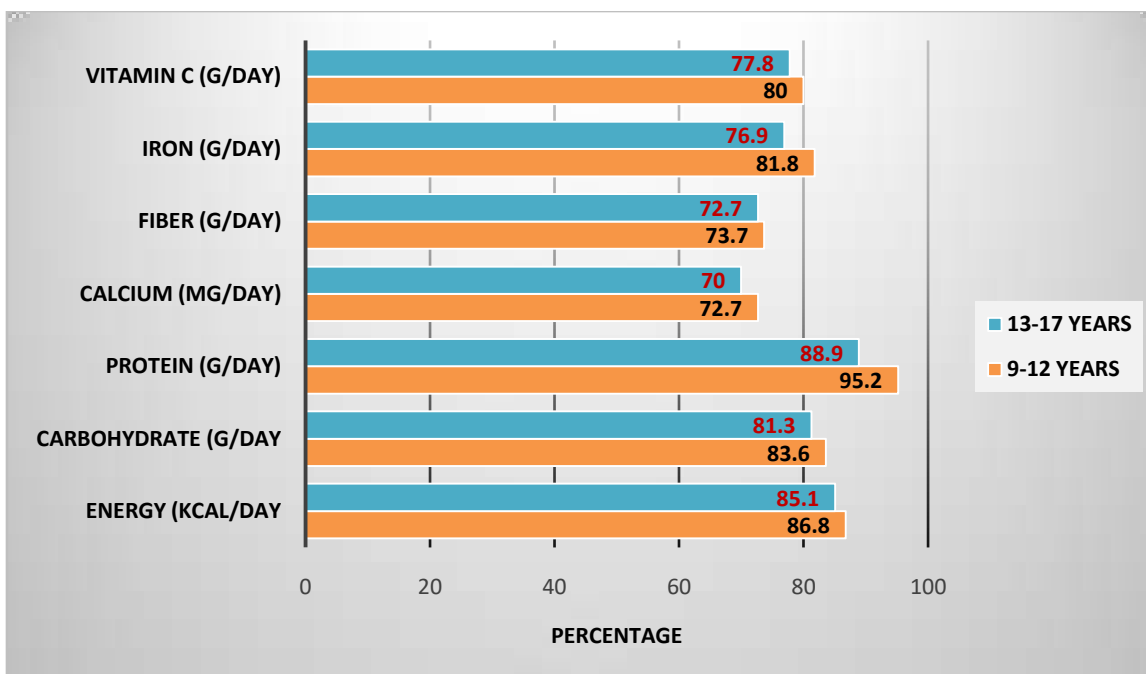


Fig 1: Nutrient Intake Of Nutrients Percentage Of Rda By The Respondents

The present study concludes that children aged 9–17 years residing in NGOs exhibit noticeable inadequacies in their dietary intake. The intake of essential nutrients such as energy, calcium, dietary fiber, iron, and vitamin C was found to be consistently below the recommended levels in both age groups. However, protein intake was relatively adequate among the participants, indicating that while certain components of the diet are sufficient, the overall dietary quality remains inadequate and imbalanced. The findings clearly indicate that children living in NGO settings are at a higher risk of nutritional deficiencies, which may adversely affect their physical growth, cognitive development, immunity, and overall health status. Inadequate intake of micronutrients such as iron and vitamin C may increase the risk of conditions like anemia and reduced resistance to infections. The problem was more pronounced among older children (13–17 years), possibly due to increased nutritional requirements during adolescence, which are not being sufficiently met through their daily dietary intake.

These results emphasize the urgent need for appropriate and effective measures to improve the nutritional status of children in such vulnerable environments. This can be achieved through the implementation of well-structured nutrition education programs targeting both caregivers and children, promoting awareness about balanced diets, and encouraging healthy eating habits. Additionally, the inclusion of diverse and nutrient-dense foods such as fruits, vegetables, dairy products, and iron-rich foods in daily meal plans is essential. Furthermore, the development and implementation of targeted supplementation and intervention strategies can play a crucial role in addressing specific nutrient deficiencies. Regular monitoring and evaluation of dietary intake and nutritional status should also be carried out to ensure continuous improvement. Overall, improving dietary intake among children in NGO settings is essential to support optimal growth, prevent nutritional deficiencies, enhance overall well-being, and ensure a healthier future for this vulnerable population.

Conclusion:-

The present study concludes that children aged 9–17 years residing in NGOs exhibit noticeable inadequacies in their dietary intake. The intake of essential nutrients such as energy, calcium, dietary fiber, iron, and vitamin C was found to be consistently below the recommended levels in both age groups. However, protein intake was relatively adequate among the participants, indicating that while some aspects of the diet are sufficient, overall dietary quality remains suboptimal. The findings clearly indicate that children living in NGO settings are at a higher risk of nutritional deficiencies, which may adversely affect their physical growth, cognitive development, immunity, and overall health status. The problem was more pronounced among older children (13–17 years), possibly due to increased nutritional demands during adolescence, which are not being adequately met through their daily diet.

These results emphasize the urgent need for appropriate and effective measures to improve the nutritional status of children in such vulnerable environments. This can be achieved through the implementation of nutrition education programs aimed at caregivers and children, the inclusion of diverse and nutrient-dense foods in daily meal plans, and the development of targeted supplementation and intervention strategies to address specific nutrient deficiencies.

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