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Role of Dietary Diversity Scores in Predicting Malnutrition Among Pre-School Children- A Qualitative Study

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Abstract

Background-This study aims to delve into the socio-demographic factors influencing a child's nutritional status and explore the relationship between children's dietary diversity scores and their nutritional well-being. It's a community-based qualitative study.

Methodology- Data was collected using questionnaires.

Results-The study was conducted in Pedakakani anganwadi centers of Guntur district in Andhra Pradesh, encompassing 156 children aged 1 to 5 years .The prevalence of underweight, and stunting were 91.6% and 84.6%, respectively. The prevalence rates for IDDS were found to be less than 9 (20.5%), between 10 and 11 (57.05%), and more than or equal to 12 (22.4%).

Conclusion-This study is poised to offer reliable insights into the dietary habits and nutritional status of young children in the study area. By identifying inappropriate diets at an early stage, we can proactively mitigate the immediate causes of malnutrition and reduce the risk of subsequent diseases. Furthermore, understanding the underlying factors contributing to malnutrition, such as food accessibility and availability, will aid in planning nutritional services for underserved communities and rural populations. If Dietary Diversity Scores prove to be predictive of malnutrition among children, this study has the potential to serve as a pilot study, paving the way for larger investigations to confirm this association. The simplicity and comprehensibility of Dietary Diversity Scores make them a valuable tool that can be readily employed by village-level health workers, including ASHA, Anganwadi workers, and school teachers, facilitating early recognition of malnutrition at the household and village levels.

Keywords: Malnutrition, Dietary Diversity, Anthropometric Data, Preschool Children, Under Nutrition, India

Introduction

Malnutrition has been defined as "a pathological state resulting from a relative or absolute deficiency or excess of one or more essential nutrients". It comprises of four forms; undernutrition, over nutrition, imbalance and specific deficiency. The term undernutrition encompasses stunting (chronic malnutrition), wasting (acute malnutrition) and underweight. Over 800 million people worldwide suffer from hunger and two billion do not meet their micronutrient requirements (Global Nutrition Report, 2016). In India, according to the National Family Health Survey 2015-16 (NFHS-4), 38 % of children under age five years are stunted (too short for their age). This is a sign of chronic undernutrition. Twenty one percent of children under age five years are wasted (too thin for their height) which is a sign of

acute undernutrition while 36 % of children under age five years are underweight, and 2 % of children are overweight.

Dietary Diversity: Children represent the most vulnerable segment of the population, and they are highly susceptible to the adverse effects of malnutrition. Inadequate nutrient intake during childhood significantly hinders physical growth, cognitive development, and subsequently, their ability to learn and perform well throughout their lives. This can lead to a lifetime of challenges. Malnutrition among children often stems from an imbalanced diet and a lack of diversity in their food choices.To evaluate dietary diversity, we employ two key indicators: the "Individual Dietary Diversity Score" (IDDS) and "Minimum Dietary Diversity" (MDD). These indicators serve as valuable proxies for assessing the nutritional quality of an individual's diet.

Methodology:Materials And Methods

- Type of study: Observational study
- Study design: Cross sectional
- Study Setting: Anganwadi Centers present in the rural field practice area of a medical college.
- Study Population: Pre-school children attending the Anganwadi Centers.
- Sample Size: The sample size for the present study was calculated using the “Adequacy of Sample Size In Health Studies” A Practical manual by World Health Organization Formula used in the manual to calculate sample size [3].

n = z^2[P(1-P)/d^2]

Where by assuming-

- Anticipated population proportion (P) as = 0.33 (33.1%)

- Confidence interval = 95%%

- Z value at 95% Confidence interval = 1.96

-Absolute Precision = 7%

- The sample size was calculated as 178 [3].

- At a non-response rate of 10%, the sample size for the study = 178 +18 = 196 and rounded to 200.

Selection Criteria:

- Step 1: Selection of Anganwadi centers.

- Thirty Anganwadi centers were present in the field practice area, 10 out of the 30 were selected randomly (double blinded)

- Step 2: Deciding number of children from each Anganwadi center.

- From each center 20 children will be included in the study.

- Step 3: Selection of children from each Anganwadi center.

- From each center 20 children will be selected randomly.

Inclusion Criteria:

Pre-school children of age between 1-5 years attending Anganwadi Centers

Exclusion Criteria:

Parents who are not willing to give consent for the study are excluded.

Data collection procedure & Instruments Used: Data will be collected using questionnaires utilized in the Nutrition Baseline Survey India For the Global Programme Food and Nutrition Security, Enhanced Resilience, 2016.

Questionnaire contains two parts-

Part A: Socio-demographic details of the participants like age, gender, parent's education, occupation and annual income.

Part B: Questions regarding dietary diversity scores and anthropometric data.

- For Dietary diversity Scores:

Diet intake information of children will be collected by conducting a 24 hour recall method where mothers will be asked about the different types of food their children had eaten during the prior the interview. Only foods consumed in the minimum quantity of >15g (around one tablespoon) were considered. The different consumed food items are assigned to predefined food groups and used to calculate "Individual Dietary Diversity Score" (IDDS) and Minimum Dietary Diversity (MDD).

QUESTIONNAIRE:

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PART A

ID NUMBER :

AGE :

SEX:

ADDRESS :

CONTACT INFORMATION :

PARENTS EDUCATION :

PARENTS OCCUPATION :

ANNUAL INCOME :

MIGRATION BACKGROUNDS :

ETHNICITY :

PART B

ID NUMBER :

AGE :

SEX :

ADDRESS :

CONTACT INFORMATION :

NUMBER OF MEALS THE CHILD TAKES PER DAY :

CONTENTS TAKEN IN THE MEAL:

BREAKFAST:

1. PLANT SOURCE -
2. ANIMAL SOURCE-
3. LIQUIDS -

LUNCH:

1. PLANT SOURCE -
2. ANIMAL SOURCE-
3. LIQUIDS –

DINNER:

1. PLANT SOURCE -
2. ANIMAL SOURCE-
3. LIQUIDS -

HEIGHT:

WEIGHT:

BMI (BODY MASS INDEX):

WEIGHT/ AGE PERCENTAGE:

(Weight of the child / weight of normal child of same age * 100)

HEIGHT / AGE PERCENTAGE:

(Height of the child / height of normal child of same age * 100)

WEIGHT / HEIGHT PERCENTAGE:

(Weight of child / weight of normal child at same height * 100)

Measurement Of Circumferences:

1. MID ARM CIRCUMFERENCE -
2. WAIST -
3. HIP-

Results

This study was conducted in Pedakakani anganwadi centers of Guntur district in Andhra Pradesh. The present study includes 156 children aging between 1 to 5 years out of which 68 are females and 88 are males. There are 22 children of 1 year of age, 20 children of 2 years of age, 27 children of 3 years of age, 43 children of 4 years of age, and 44 children of 5 years age. The parents of these children are uneducated and are unskilled laborers whose family income is approximately 75,000 rupees annually which falls below the poverty line. The children are sent to anganwadi centers for free mid-day meals and also are given some free necessary materials provided such as basic rations. In our study, we observed a total of 143 underweight children, accounting for 91.6% of the sample. Additionally, 132 children exhibited stunted growth, representing 84.6% of the study population. It's worth noting that a small percentage of children, 3.8%, were found to be overweight, while 4.4% of the children exhibited taller than average height for their age. Another significant finding was the prevalence of mid-arm circumference wasting, which affected a substantial 80.1% of the children, while only 6.4% had a normal mid-arm circumference.

In Table 1, we present the mean measurements for the children in our study. The mean weight of the children is 12.44, the mean height stands at 89.9, and the mean BMI is 15.69. Additionally, we found the mean weight/age percentage to be 31.62, the mean height/age percentage to be 39.54, and the mean weight/height percentage to be 41.09. Furthermore, we observed the mean mid-arm circumference for the

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right and left arms to be 13.25 and 13.36, respectively. The mean waist circumference is 41.09, and the mean hip circumference is 45.86.

Table 2 provides the corresponding standard deviations (SD) for these measurements. The SD for children's weights is 2.45, for heights is 10.58, for BMI is 2.23, for weight/age percentage is 39.51, for height/age percentage is 44.30, and for weight/height percentage is 49.19. In addition, the SD for mid-arm circumference for the right and left arms is 2.59 and 2.64, respectively. Lastly, the SD for waist circumference is 9.71, and for hip circumference, it is 9.38.For dietary diversity we have taken 7 basic food groups they are

1. grains, roots and tubers
2. legumes and nuts
3. dairy products
4. meat
5. eggs
6. vitamin A rich fruits and vegetables
7. other fruits and vegetables

Diet intake information of children was collected by conducting a 24-hour recall method. Where mothers were asked about the different types of food their children had eaten prior the interview. Individual Dietary Diversity Score (IDDS) is calculated by the number of different food groups that the child had eaten and number of servings were considered. Each serving of a particular food group is considered as one score. The scores range between 0 and 15. Thirty-two children have a score less than or equal to 9, eighty-nine children have a score between 10 and 11, and thirty-five children have a score more than or equal to 12. In our study, we determine the Minimum Dietary Diversity (MDD) by assessing how many different food groups each child consumes daily. The MDD score in our study falls within a range of 0 to 7. Specifically, we found that 35 children have MDD scores equal to or less than 4, while 121 children have scores ranging between 5 and 7. Additionally, we calculated the mean Individual Dietary Diversity Score (IDDS) for the children, which is 10.55, and the mean MDD, which is 1.31. The standard deviations (SD) for IDDS and MDD are 5.28 and 1.14, respectively. To further illustrate, we observed that 20.5% of the children have IDDS scores less than 9, while 57.05% fall within the range of 10 to 11. Moreover, 22.4% of the children exhibit IDDS scores equal to or greater than 12. For MDD, we found that 22.4% of the children have scores equal to or less than 4, whereas a substantial 72.5% fall within the range of scores between 5 and 7. These statistics provide valuable insights into the dietary diversity and nutritional patterns among the children in our study.

TABLE 1- Table showing means of 1-5 years children in different anthropometric measurements.

	MEANS
Age	3.42
Weight	12.44
Height	89.18
BMI	15.69
Wt/age%	31.62
Ht/age%	39.54
Wt/ht%	41.09
Right mid arm circumference	13.25
Left mid arm circumference	13.36
IDDS	41.09

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MDD	45.86

TABLE 2- Table showing standard deviation (SD) of 1-5 years children in different anthropometric measurements

	SD
Age	1.83
Weight	2.45
Height	10.58
BMI	2.23
Wt/age%	39.51
Ht/age%	44.30
Wt/ht%	49.19
Right mid arm circumference	2.59
Left mid arm circumference	2.64
IDDS	9.71
MDD	9.38

Discussion

A cross-sectional analysis of baseline data from a cohort study was conducted with parents/caregivers of children aged 2-6 years from 21 preschool centers in Kurunegala District, Sri Lanka. The children had a mean Dietary Diversity Score (DDS) of 4.56, with 91.1% consuming rice as the most common food. Lentils were consumed more frequently than any meat or alternative food groups across all DDS levels. This study examines the role of the dietary diversity score in predicting malnutrition among preschool children in Pedakakani anganwadi centers in Guntur district, Andhra Pradesh. The sample size included 156 children from 9 anganwadi centers, with ages ranging from 1 to 5 years. The Mean Dietary Diversity (MDD) score was 1.14, with 22.4% scoring below 4 and 77.5% scoring above 4. Notably, children consumed more rice than wheat, lentils and milk and eggs were regularly consumed due to provision by the anganwadi centers [4]. Similarly, a cross-sectional study was conducted for 379 preschool children in the North West Province of South Africa. The DDS was calculated by counting each of the 12 food groups, classified as low (≤4), medium (5-8), and high (9-12). The prevalence rates were 61% for low DDS and 39% for medium DDS. Cereals (100%) were the primary food group consumed, with fish and other seafood (17%) being the least consumed. This study's focus on dietary diversity score's role in predicting malnutrition among preschool children was also carried out in Pedakakani anganwadi centers of Guntur district, Andhra Pradesh. MDD is calculated by counting 7 different food groups which are classified less than 4 and between 5 to 7. The prevalence of less than 4 is 22.4% and that of between 5-7 is 77.5% respectively. The findings revealed a preference for rice consumption, lentils and milk and eggs were consumed daily, while meat products were not consumed regularly [5]. A further study with a population of 6,468 children aging between 6-59 months conducted by Nazia Binre Ali in rural areas of Bangladesh. The prevalence of stunting, wasting and underweight among children aged 6-59 months were 36.8%, 18.2% and 37.7% respectively. Findings revealed that almost all children ate any form of starch followed by consumption of milk or milk products (76%) and fleshy meat /fish (61%) respectively. The mean DDS among children was

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3.93(SD-1.47). This study investigating the role of dietary diversity score in predicting malnutrition among preschool children is done in Pedakakani anganwadi centers of Guntur district in Andhra Pradesh with Sample sizes 156 children aging between 1 to 5 years. The prevalence of stunting and underweight is 84.6% and 91.6% respectively. In this study findings revealed that almost all the children ate rice(starch) followed by consumption of milk products, and eggs which are provided by anganwadi centers daily and meat products are consumed less. The MDD mean is 1.31 and SD is 1.14 [6]. In another study, 512 mother-child pairs with children aged 6-59 months were randomly selected. The mean scores of weight-for-height/lengths, height/length-for-age, weight-for-age, and BMI-for-age Z-scores were 1.35, -1.89, 0.05, and 1.39 respectively. The standard deviations (SD) of weight-for-height/length, height/length-for-age, weight-for-age, and BMI-for-age Z-scores were 2.03, 1.79, 1.54, 2.06 respectively. Stunting and overweight/obesity rates were 43% and 42%, respectively. This study's exploration of dietary diversity score's role in predicting malnutrition among preschool children was conducted in Pedakakani anganwadi centers of Guntur district, Andhra Pradesh. The prevalence rates for stunting and underweight were 84.6% and 91.6%, respectively. The mean scores for weight/height%, height/age%, weight/age%, and BMI were 41.09%, 39.54%, 31.64%, and 15.69%, with standard deviations of 49.19, 44.30, 39.51, and 2.23, respectively [7]. Another study conducted in Burkina Faso by Ali Sie' with the study population is of 251 children aged between 6-59 months. The prevalence of stunting, wasting and underweight were 20.6%, 10.0% ,13.9% respectively. There was no association of DDS and wasting in this study. The study of the role of dietary diversity score in predicting malnutrition among preschool children is done in Pedakakani anganwadi centers of Guntur district in Andhra Pradesh. Sample size is 156 children. The children are between 1 and 5 years old. The prevalence of stunting and underweight is 84.6% and 91.6% respectively. For dietary diversity 7 food groups are considered. MDD score <4 is 35 children of percentage 22.4% and scores between 5 to 7 there are 121 children of percent 77.5%. MDD mean is 1.31 and SD is 1.14. There is an association of DDS and wasting [8]. A study conducted in Tanzania with the study population of 2960 children aging between 6 to 23 months tells the prevalence rates for stunting, wasting, and underweight were 31%, 6%, and 14%, respectively. Among all children, 51% were female, and 49% were male. The majority (74%) of children did not meet the Minimum Dietary Diversity (MDD) requirement. The most commonly consumed foods were grains, roots, and tubers (91%), and vitamin A-containing fruits and vegetables (65%), eggs (7%), meat and fish (36%), milk and dairy products (22%), legumes and nuts (35%), and other vegetables (21%) were consumed less frequently. This study's investigation into dietary diversity score's role in predicting malnutrition among preschool children was also conducted in Pedakakani anganwadi centers of Guntur district, Andhra Pradesh. The prevalence rates for stunting and underweight were 84.6% and 91.6%, respectively. Among the children, 43.5% were female, and 56.4% were male. A total of 22.4% of children didn't meet the MDD. The most commonly consumed foods were grains, roots and tubers, legumes, nuts, and other vegetables, as well as milk and eggs, were consumed due to daily provision by anganwadi centers while vitamin A-containing fruits and vegetables, meat, fish were consumed less frequently [9]. A study conducted in India by Jacob P Beckerman-Hsu with a study population of 67,247 children aged 6-23 months. Nationally, 80.3% of children experienced dietary failure, and 53.7% had at least one anthropometric failure. This study exploring dietary diversity score's role in predicting malnutrition among preschool children was conducted in Pedakakani anganwadi centers of Guntur district, Andhra Pradesh. The prevalence of stunting and underweight was 84.6% and 91.6%, respectively. Additionally, 86.6% of children had at least one anthropometric failure [10]. Furthermore, this study conducted by Jessica M Perkins in Sri Lanka encompassed children aged 6 months to 59 months, assessing child dietary diversity based on 24-hour recall across seven food groups. The minimum dietary diversity score required a score of four or above. The prevalence rates for stunting, wasting, and underweight were 15%, 21%, and 26%, respectively. The prevalence of inadequate dietary diversity was 9%. It is found that there is association of dietary diversity score with malnutrition for age 24 to 59 months. This study investigating dietary diversity score's role in predicting malnutrition

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among preschool children was conducted in Pedakakani anganwadi centers of Guntur district, Andhra Pradesh. The prevalence rates for stunting and underweight were 84.6% and 91.6%, respectively. The MDD score was calculated for 7 food groups and scores <4 were 35 children with percentage of 22.4% and scores between 5-7 were 121 children with percentage of 72.5%. There is an association of dietary diversity score with malnutrition [11]. A study conducted in Nigeria by Ukegbu Patrica Ogechi and Ogu Victoria Chilezie by assessment of Dietary Diversity Score - recall of the child's food consumption during the previous 24-h was used to calculate individual dietary diversity score (DDS) by counting each of the 12 food groups and the scores were divided into percentiles low= ≤4, medium=5 - 8, and high= 9 - 12. Results are that the average age of the children was 4.2±0.7years, with 51.8% being males, and 48.2% females. Stunting, wasting and underweight were 11.5%, 5.4% and 2.7%, respectively. Mean DDS for all food groups was 6.04±4.18 This study exploring the role of dietary diversity score in predicting malnutrition among preschool children is done in Pedakakani anganwadi centers of Guntur district in Andhra Pradesh. The assessment of DDS was done by 24hr recalling method and calculated by counting 7 different food groups and scores are divided by- less than 5 and between 4-7. The mean age is 3.42 years with the prevalence of stunting and underweight is 84.6% and 91.6% respectively. Among the children 43.5% are females and 56.4% are male. The mean MDD is 1.31 with SD of 1.14 [12].

Conclusion

In summary, this study stands as a valuable source of insights into the dietary patterns and nutritional status of the young children within our study area. Its ability to detect inappropriate dietary practices early on holds the promise of playing a pivotal role in averting the immediate triggers of malnutrition and the subsequent onset of associated health issues. Furthermore, our examination of the underlying causes of malnutrition, including aspects like food accessibility and availability, sets the stage for the development of targeted and effective nutritional interventions, particularly aimed at marginalized communities and rural populations. Moreover, if this study establishes a solid connection between Dietary Diversity Scores and childhood malnutrition, it could serve as a vital stepping stone, paving the way for more extensive confirmatory research. The user-friendly nature of Dietary Diversity Scores renders them readily applicable by grassroots health workers, including ASHA, Anganwadi workers, and school teachers, enabling early identification of malnutrition both at the household and village levels. Furthermore, our findings underscore the protective influence of increased maternal education and higher household wealth against childhood stunting and undernutrition. Additionally, they suggest that the promotion of dietary diversity could serve as an effective strategy in mitigating the prevalence of stunting and chronic malnutrition among the youngest members of our communities.

Declaration Of Patient Consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity.

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