International Journal of Community Medicine and Public Health
*Siriwardhane JMCKB et al. Int J Community Med Public Health. 2024 Jun;11(6):2175-2183*
http://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040

DOI: https://dx.doi.org/10.18203/2394-6040.ijcmph20241474

**Original Research Article**

# A case study on the relationships between the dietary patterns and the nutritional status of school children in Galkadapathana village in Sri Lanka

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**Received:** 24 March 2024
**Revised:** 11 May 2024
**Accepted:** 13 May 2024

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## ABSTRACT

**Background:** Nutritional status is an important indicator in measuring the quality of life of children. Galkadapthana is a rural agricultural village in the Nuwara Eliya district, Sri Lanka. Villagers confront difficulties regarding their nutritional status due to low income, inadequate education and poor infrastructure facilities. This study was undertaken to identify the relationships between the nutritional status of school children in Galakadapathana village and their dietary patterns.
**Methods:** A community-based cross-sectional study was carried out using a deductive approach. A total of 85 households with 137 school children aged 6-18 years were randomly selected. Data was collected using structured surveys and conducting face-to-face interviews. The nutritional status of children was assessed through anthropometric measurements.
**Results:** A severely stunted condition was observed in 5.8% of children, while 7.3% represent severely underweight conditions according to the WHO growth references, 2007. The maximum number of 6 was scored in the Individual Dietary Diversity Score (IDDS) by 24.8% of the population. The maximum number of 7 in the Household Dietary Diversity Score (HDDS) was scored by 21.2% of the population. There was no significant (P>0.05) relationship between the BMI-for-age status and the aggregate level of education of the breadwinner, birthweight of the child, IDDS, and HDDS. However, the amount of starchy food intake significantly (P<0.05) impacted the BMI-for-age status.
**Conclusions:** The amount of starchy food intake showed a significant impact on the prevalence of wasting (P<0.05), but not the aggregate level of education of the breadwinner, birthweight of the child and dietary diversity.

**Keywords:** Dietary diversity, Malnutrition, Nutritional status, Stunting, Underweight

## INTRODUCTION

According to Sinha (2003), undernutrition and overnutrition are both forms of malnutrition. Overnutrition deals with ingesting excessive nutrients and their effects, whereas undernutrition focuses on nutrient deficiencies and their impacts.[1] Malnutrition harms an individual's physical health and obstructs medical interventions. It also raises the cost of healthcare and reduces the quality of life.[2,3] Nutritional problems related to children's malnutrition are complicated because they are influenced by several different psychological, social, economic, and cultural aspects.[4] Some other subjective factors are also associated with malnutrition, such as diseases, issues with swallowing and chewing, reduced appetite, loneliness, poor hospitalizations, and poor self-reported health.[5-9]

Most of the qualitative research on malnutrition focuses on populations in hospitals or other institutional settings.[10,11] However, according to the World Health Organization (WHO), inadequate food intake, the presence of diseases, or the combination of these two variables will result in malnutrition.[12] Child malnutrition is a burning issue in the world; it is damaging both children and the whole nation.[13] Malnutrition accounts for a significant portion of young children's deaths worldwide. Hence, measures to address the problem should be a priority of policymakers.[14]

Sri Lanka is a developing nation undergoing significant changes in its socioeconomic and demographic environments, which have caused major problems for health and nutrition. The coexistence of overnutrition, undernutrition, and deficits in micronutrients characterizes the nation's nutritional transition.[15] Moreover, non-communicable diseases are more prevalent.[16,17] United Nations Children's Fund (UNICEF) conducted a telephone survey in May 2022 in Sri Lanka, and it was published in Sri Lanka Appeal on Humanitarian Action for Children. According to the report, children are disproportionately impacted by Sri Lanka's developing economic crisis. As a result, Sri Lanka has the second highest rate of acute malnutrition among children under 5 in South Asia. At least 17% of children are suffering from chronic wasting.[18] Moreover, Nuwara Eliya district has the highest percentage of the stunted population.[19]

Galakadapathana village in Nuwara Eliya district is gifted with natural resources and a suitable environment for farming activities. If the villagers consume what they produce, healthy dietary patterns with a balanced diet could be maintained. Many programs are conducted by NGOs and government organizations to improve the nutritional status of the villagers. If there are any relationships between dietary patterns and nutritional status, necessary actions can be taken to maintain a proper nutritional status. Therefore, the objectives of this research were to find out the relationships between the dietary patterns and the nutritional status of school children in Galkadapathana.

## METHODS

### *Study design*

The study design was a descriptive cross-sectional analytical design with a deductive approach where quantitative and qualitative data were collected. The unit of analysis was household, and the units of observation were households and the 6-18 years old school children. The study site was Galakadapathana village in the Galkadapathana Grama Niladhari division. The inclusion criteria of the sample were age, geographic location, availability and accessibility of individuals. Also, individuals with cognitive impairments and individuals who do not speak the language in which the survey is conducted were excluded from the sample.

### *Sample size determination*

There were 362 households within the Galakadapathana village. The target population was households with 6-18 years old school children, and there were 108 households, according to the electoral register. Cochran sample size formula was used at first and the Cochran's sample size recommendation was 385. However, the sample size was modified using the formula below as the selected population was smaller.[20]

$$n = \frac{n_0}{1 + \frac{(n_0 - 1)}{N}}$$

Where $n_0$ is Cochran's sample size recommendation, N is the population size, and n is the new, adjusted sample size. The adjusted sample size was 85 households. Then, 108 households were alphabetically listed by the head's last name, and a number from 1 to 108 was assigned to each. The random lottery method was used to select 85 households from 108.

### *Data collection and analysis*

The data collection and analysis took place from October to December 2022.The researcher, a native speaker of Sinhalese, contacted the selected households and explained the research through conversations. Moreover, households were invited to participate in the study. A participant information sheet was attached to the survey format, which explained the purpose of the research, the researcher's information, the highly voluntary nature of respondents' participation, and the confidentiality of the information provided. It was also clearly explained to the participants at the beginning of the interview. The researcher emphasized that there were no right or wrong answers to avoid biases. Primary data was collected through a questionnaire survey and physical measurements. The questionnaire survey was guided by a pre-tested structured questionnaire. It was pre-tested by providing it to 10 households in the nearby village known as Rupaha, and the data collection process and validation were simulated. These questionnaires were structured questionnaires, and they included several open-ended questions that provided information on the general characteristics of the household. The questionnaire had three main sections. The first section was used to collect general information about the respondent's household, such as the number of members in the family, the number of children (<18 years) in the family, the education level of the breadwinner, and information about their agricultural practices. The second section of the questionnaire was designed to collect data on dietary patterns and the nutritional intake of the household. The third section focused on nutritional intake and anthropometric measurements of each child in the household. The anonymity of participants was maintained by avoiding any information revealing the identity of the participants in the questionnaire. A separate questionnaire was designed to gather general information on the village. It was filled with the details collected through the resource profile of Galkadapatahana Grama Niladhari division, 2021. Data were collected through face-to-face interviews, and anthropometric measurements were entered into Google Forms in real time. Quantitative techniques and qualitative techniques were used to analyze the data. The data were analyzed using WHO AnthroPlus software, Minitab 20 Statistical Software, and 2007 WHO growth reference data charts.

A qualitative and quantitative 24-hour recall of all the foods and beverages ingested by the respondent (at an individual level) was used to collect information on dietary patterns. The selected respondent was initially asked to mention all the foods and beverages eaten the day before the interview (within 24 hours). After the respondents recalled, one score was given to each food group if the respondent had consumed at least one food from the group. If the respondent mentioned a mixed dish, all the dish's ingredients were recorded. Collecting information at the individual level was also followed at the household level. The survey was not conducted during holidays or other events when food consumption was expected not to represent a usual diet. The IDDS and the HDDS were measured according to the FANTA Household Dietary Diversity Score Indicator Guide.[21]

Question numbers and related food categories which were used to calculate IDDS are as follows; 1-2: starchy staples (cereals and white roots/tubers), 4: dark green leafy vegetables, 3,6: other vitamins-A rich fruits and vegetables, 5,7: other fruits and vegetables, 8: organ meat consumption, 9-11: meat and fish consumption, 10: eggs, 12: legumes, nuts, and seeds and 13: milk and milk product consumption. Question numbers and related food categories which were used to calculate HDDS were also approximately similar to that of IDDS.[21]

The anthropometric measurements of the children were recorded in terms of height and weight. The whole sample of 137 children was separated based on gender, and then their Body-Mass Index (BMI), height, and weight values were plotted within the BMI-for-age and height-for-age 2007 WHO reference graphs. Furthermore, the girls and boys of the sample between 6 and 10 years old were separated and plotted their weight values in Weight-for-age 2007 WHO reference graphs.

## RESULTS

The sample comprised 66 (48.2%) female and 71 (51.8%) male respondents. The selected sample encompasses individuals of both genders aged 6 to 18, ensuring comprehensive representation across the entire spectrum of school children. The educational background analysis of breadwinners in 85 households indicated that 44.18% completed education up to ordinary level (O/L), 40.69% completed advanced level (A/L), and 5.81% were university graduates, and a smaller proportion, 2.32%, completed education only up to the primary level.

Figure 1 shows the histogram of the birth weights of respondents. Birth weight was recorded from each child's health and development records. According to the WHO, if the birth weight is lower than 2.5kg, it is considered a low birth weight [22] and 21.16% of the sample showed a low birth weight. The means of the birth weight of the female and male groups were 2.66 and 2.89. The means of the birthweight of both samples were significantly different from 2.5 at the 95% confidence interval (CI) and were above the cutoff level of low birthweight.

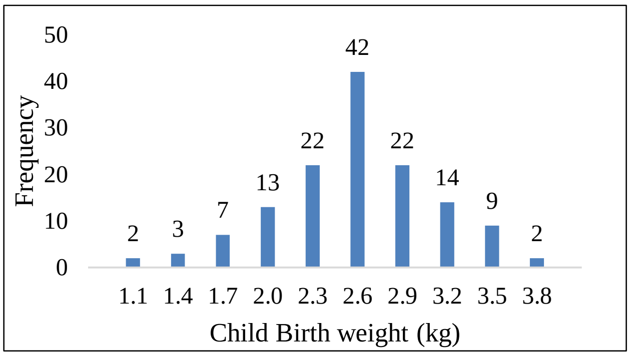


**Figure 1: Distribution of birth weight of the respondents.**

According to the WHO growth references (2007), for children aged 5-19 years old, only 72.3% were in the normal BMI-for-age Z Score (BAZ) category, while 7.3% were severely underweight, as shown in table 1. Only 36.5% among 137 children represented the normal Height-for-age Z score (HAZ) category, while 5.8% were in the severely stunted HAZ category, as shown in Table 1. Analyzing the Weight-for-age Z score (WAZ) in female respondents aged 6 to 9 years, the prevalence of underweight was 87.5%, 25.0%, 12.5%, and 25.0%, respectively. Specially 25% of the 9-year-old female respondents were in the severely underweight category. The underweight percentages for male respondents in the same age categories were 25.0%, 40.0%, 40.0%, and 83.3%, respectively.

In Figure 2 (a), the distribution of IDDS percentages is depicted. The highest score, 8, was observed in 5.1% of the sample, while the lowest score, 2, was represented by 5.8%. In Figure 2 (b) which illustrates HDDS, the maximum score of 12 was recorded by 1.2% of the population. Notably, the majority, comprising 21.2%, fell into the category of score 7 in HDDS. When considering the intake of vitamin-A-rich foods, 89.8% have consumed vitamin-A-rich foods. As the source of vitamin A, 5.7% of the individuals consumed only animal-based food sources, 47.2% consumed both animal and plant-based food, and 47.2% consumed only plant-based foods. Organ meat, flesh meat, fish, and seafood were taken as animal-based iron-rich foods by 67.9% of the respondents.

**Table 1: BMI-for-age Z score (BAZ) and height-for-age Z score (HAZ) categories of the respondents.**

| Category | Female % | Male % | Overall % |
|---|---|---|---|
| **Baz category** | | | |
| Obese | 4.5 | 0.0 | 2.2 |
| Overweight | 4.5 | 2.8 | 3.6 |
| Normal weight | 68.2 | 76.1 | 72.3 |
| Underweight | 15.2 | 14.1 | 14.6 |
| Severely underweight | 7.6 | 7.0 | 7.3 |
| **Haz category** | | | |
| At the risk of gigantism | 1.5 | 0.0 | 0.7 |
| Normal height | 34.8 | 38.0 | 36.5 |
| At the risk of stunting | 43.9 | 40.8 | 42.3 |
| Stunted | 12.1 | 16.9 | 14.6 |
| Severely stunted | 7.6 | 4.2 | 5.8 |

BMI-for-age status and the aggregate level of education of the breadwinner at the confidence interval (CI) of 95%, as the P-value was 0.763 (P>0.05). Similarly, there was no significant relationship between the BMI-for-age status and birthweight (P=0.208) at the CI of 95%. There was no statistically significant difference between the mean values of IDDS of normal-weight individuals and IDDS of underweight/severely underweight individuals (P=0.657) at the 95% CI according to the two-sample t-test. Similarly, there was no statistically significant difference between the mean values of HDDS of normal-weight individuals and HDDS of underweight/severely underweight individuals (P=0.443) at the 95% CI. However, there was a statistically significant difference between the mean values of the usual proportion of rice consumption per day by normal-weight individuals and individuals in the underweight/severely underweight categories at the 95% CI in the 6 years (P=0.01),7 years (P=0.006), 9 years (P=0.005), 10 years (P =0.029), 12 years (P=0.009), 13 years (P=0.007), 14 years (P= 0.013) old age groups as given in Table 2. No individuals were reported to be underweight or severely underweight in other age groups in the sample.

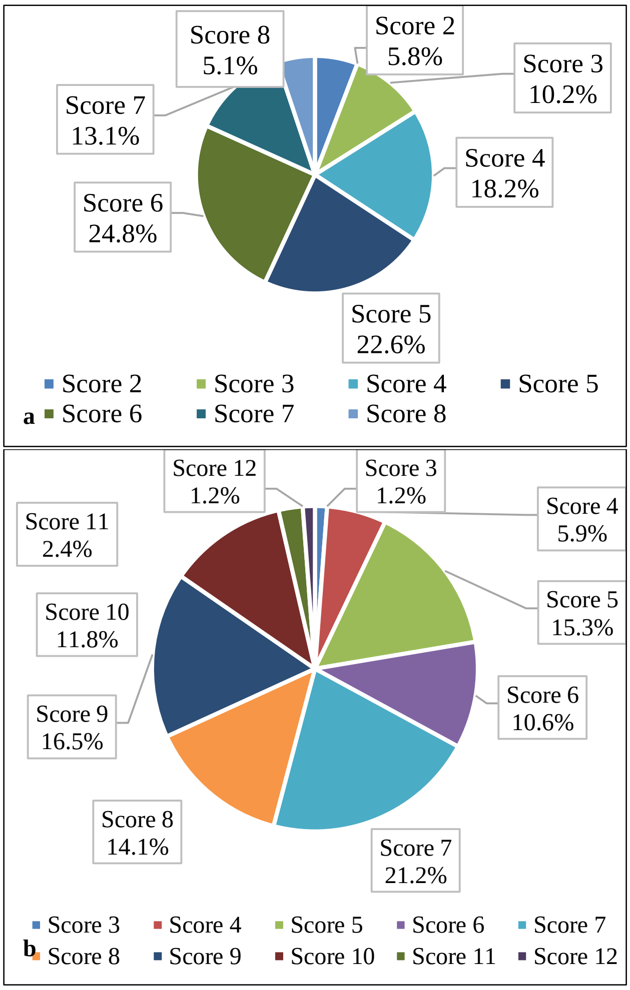


**Figure 2: (a) Percentages of Individual Dietary Diversity Score (IDDS), (b) Household Dietary Diversity Score (HDDS).**

**Table 2: Analysis of various relationships in the study.**

| Variables | Analysis type | P value | Result |
|---|---|---|---|
| **BMI-for-age status and the aggregate level of education of the breadwinner** | Pearson's chi-square test for the association | 0.763 (p>0.05) | No significant relationship |
| **BMI-for-age status and birthweight** | Pearson's chi-square test for the association | 0.208 (p>0.05) | No significant relationship |
| **Mean values of IDDS of normal-weight individuals and IDDS of underweight/severely underweight individuals** | Two sample t-test | 0.657 (p>0.05) | No significant difference between the mean values |
| **Mean values of HDDS of normal-weight individuals and HDDS of underweight/severely underweight individuals** | Two sample t-test | 0.443 (p>0.05) | No significant difference between the mean values |

Continued.

| Variables | Analysis type | P value | Result |
|---|---|---|---|
| **Mean values of the usual proportion of rice consumption per day by normal-weight individuals and underweight/severely underweight individuals** | Two sample t-tests (done for each age group separately) | 6 years (p= 0.01)<br>7 years (p= 0.006)<br>9 years (p= 0.005)<br>10 years (p= 0.029)<br>12 years (p=0.009)<br>13 years (p=0.007)<br>14 years (p= 0.013) | There is a significant difference between the mean values |

## DISCUSSION

The education level of the breadwinner may affect the knowledge of child nutrition, income level, and knowledge of children and other family members. Therefore, it plays a significant role in the dietary patterns of the household. Then, the education level of the household breadwinners was categorized according to the aggregate levels of education presented in the International Labour Organization's (ILO) statistical database (ILOSTAT), which is in concordance with the International Standard Classification of Education-1997 (ISCED-97). However, there was no statistically significant (P>0.05) relationship between BMI-for-age status and the aggregate level of education of the breadwinner in this study. Low birth weight children in developing nations are particularly vulnerable to malnutrition at one year of age. Then, by the age of four or five, they might be the victims of an infection-malnutrition cycle, which worsens physical stunting and impairs growth and development. Unfortunately, the increased risks of infant and child mortality affect many low-birth-weight infants who survive. These issues persist into adulthood, where the person may become disabled that he or she is unable to contribute to the development of the economy and society.[22] But there was no statistically significant (P>0.05) relationship between BMI-for-age status and birth weight of the individuals in this study. These results regarding the breadwinner's education level and birth weight are similar to the conclusions of Peiris and Wijesinghe (2010). According to them, parental educational status was not associated with the prevalence of underweight or low birth weight in children in the Weeraketiya DS Division of Sri Lanka.[23]

The distribution of the BMI-for-age values of both female children and male children is shown in the figure 3 and 4, respectively. These statistics provide insights into the nutritional status of each gender group. According to the WHO growth reference charts, the majority (68.2%) of the female children sample falls within the normal BMI-for-age range. This analysis indicates that many female children have a healthy weight relative to their age, which is a positive sign for their overall nutritional well-being. A smaller but still significant proportion (7.6%) of female children are classified as severely underweight. This category indicates a more critical level of undernutrition, potentially associated with severe health risks and nutritional deficiencies. The male children sample has a higher percentage (76.1%) in the normal BMI-for-age category. This suggests that male children have a healthy weight relative to their age compared to female children. Similarly, 7.0% of male children are classified as severely underweight. This category represents a subgroup with a higher risk of malnutrition-related health issues. The presence of severely underweight individuals highlights the importance of addressing malnutrition, especially in specific vulnerable groups. Galkadapathana village belongs to Nuwara Eliya district and when considering the whole population, it is evident that Nuwara Eliya district has the highest incidence of malnutrition as measured by stunting. It is below (-2) SD by 32.4% and below (-3) SD by 10%, respectively.[19]

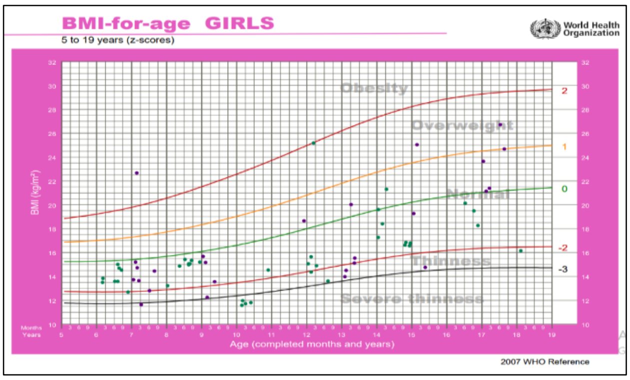


**Figure 3: BMI-for-age distribution of female respondents on WHO reference graph.**

*Overweight: (+1SD < BAZ< +2SD) *Obesity: (BAZ > +2SD) *Normal weight: (+1SD > BAZ > -1SD) *Underweight: (-3SD < BAZ <-2SD) * Severely Underweight: (BAZ <-3SD)

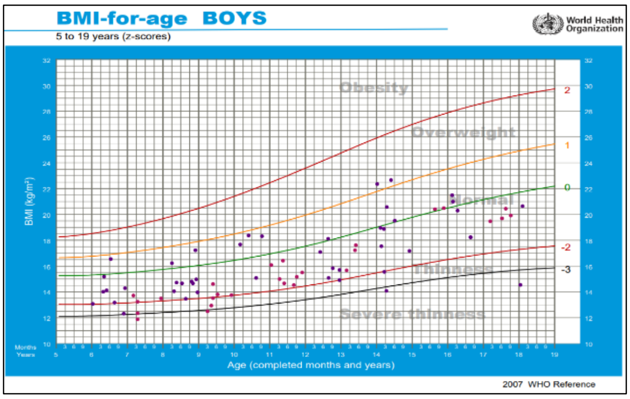


**Figure 4: BMI-for-age distribution of male respondents on WHO reference graph.**

*Overweight: (+1SD<BAZ<+2SD) *Obesity: (BAZ> +2SD) *Normal weight: (+1SD>BAZ>-1SD) *Underweight: (-3SD < BAZ<-2SD) * Severely Underweight: (BAZ < -3SD)

The distribution of the height-for-age values of both female and male children are depicted in the figure 5 and 6, respectively. About 34.8% of the female children sample falls within the normal height-for-age Z score (HAZ) category. A further subset (7.6%) of female children is classified as severely stunted, indicating a more critical degree of height deficit. About 38.0% of the male children sample falls within the normal HAZ category. Hence, the proportion of male children with heights within the normal range for their age is comparable to that of female children in the same category. A smaller proportion (4.2%) of male children are classified as severely stunted, indicating a more critical degree of height deficit. These statistics collectively highlight the importance of addressing height-related nutritional challenges, promoting adequate nutrition, and providing proper healthcare to ensure optimal growth and development for both female and male children.

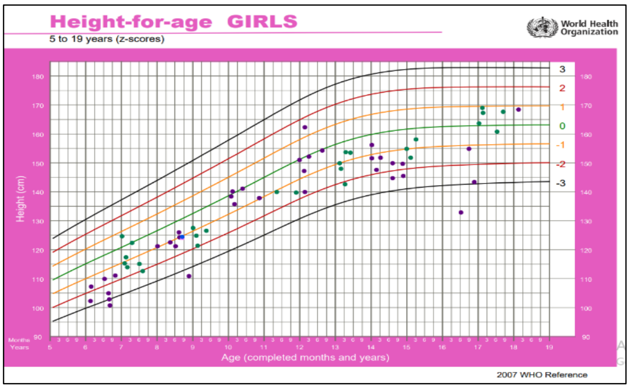


**Figure 5: Height-for-age distribution of female respondents on WHO reference graph.**

*At the risk of gigantism: (+1SD<HAZ<+2SD) *Normal height: (+1SD >HAZ >-1SD) *At the risk of stunting: (-1SD<HAZ<-2SD) *Stunted : (-3SD<HAZ<-2SD) *Severely stunted: (HAZ<-3SD)

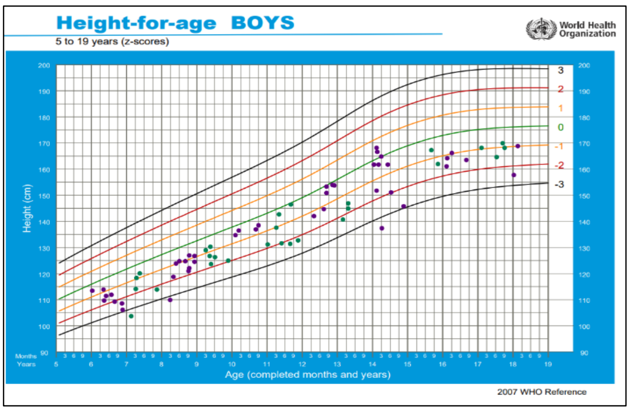


**Figure 6: Height-for-age distribution of male respondents on WHO reference graph.**

*At the risk of gigantism: (+1SD<HAZ<+2SD) *Normal height: (+1SD >HAZ >-1SD) *At the risk of stunting: (-1SD<HAZ<-2SD) *Stunted : (-3SD<HAZ<-2SD) *Severely stunted: (HAZ<-3SD)

The distribution of the weight-for-age values of both female children and male children are shown in figures 7 and 8, respectively. As per the classification based on the weight-for-age Z score (WAZ), underweight status is notable among both genders, particularly in younger age groups. This underweight status underscores the existence of potential nutritional challenges. The presence of individuals at risk of becoming overweight or underweight in certain age groups emphasizes the importance of monitoring weight-related trends and providing appropriate interventions. These statistics highlight the need for nutrition-focused interventions, health education, and healthcare support to address weight-related challenges among children in different age groups. Early identification and targeted interventions are crucial for ensuring healthy growth and development.

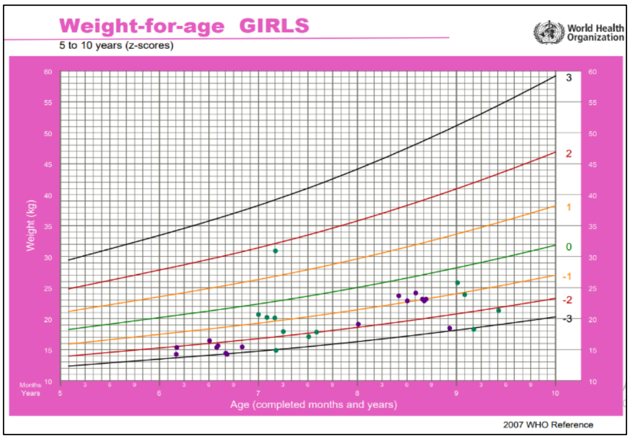


**Figure 7: Weight-for-age distribution of female respondents on WHO reference graph.**

*At the risk of overweight: (+1SD<WAZ<+2SD) *Normal weight: (+1SD > WAZ > -1SD) *At the risk of becoming underweight: (-1SD<WAZ<-2SD) *Underweight: (-3SD<WAZ<-2SD) * Severely Underweight: (WAZ<-3SD)

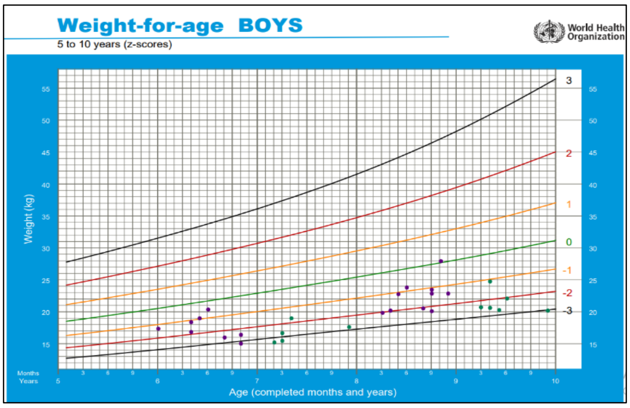


**Figure 8: Weight-for-age distribution of male respondents on WHO reference graph.**

*At the risk of overweight: (+1SD<WAZ<+2SD) *Normal weight: (+1SD > WAZ > -1SD) *At the risk of becoming underweight: (-1SD<WAZ<-2SD) *Underweight : (-3SD<WAZ<-2SD) * Severely Underweight : (WAZ<-3SD)

Dietary diversity is commonly used as an indicator for the assessment of healthy dietary habits. Generally, it measures the number of items included in a food basket. It can be characterized as the range of foods found outside and within food groups that enable adequate nutrient intake to support a healthy lifestyle.[24,25] Numerous factors affect the dietary diversity of its people. Such as the region's agricultural biodiversity and farming systems, the population's historical patterns of consumption, regional traditions, and the level of technology used in food production, processing, and storage, the economic levels of the inhabitants and household socioeconomic and demographic characteristics.[26-32]

The objective of the IDDS is to represent nutrient adequacy. Studies in various age groups have demonstrated a relationship between an individual's dietary diversity score and the number of nutrients in their diet. Dietary diversity scores have been verified for age and sex groups as proxies for dietary adequacy in macro and micronutrients. The proper micronutrient density of supplemental diets for infants and young children has been significantly correlated with scores.[33] Respondents are individuals from 6 to 18 years old. All foods eaten by the individual of interest, consumed inside or outside the home, irrespective of where foods were prepared, are considered. A maximum IDDS of 8 among 5.1% of the population suggests that a small subgroup of children have a high dietary diversity score. This percentage implies that these individuals consume various foods from different food groups, indicating potentially better nutritional intake. The lowest IDDS of 2 among 5.8% of the population indicates that another subgroup has lower dietary diversity. This might suggest that these individuals consume a narrower range of foods, potentially leading to deficiencies in essential nutrients. Therefore, this subgroup may benefit from nutritional education and interventions to encourage the consumption of a wider variety of foods. Then, 22.6% of the sample had an IDDS of 5, indicating that many children consume a moderately diverse range of foods. They likely have a balanced mix of food items from different food groups.

The level of HDDS is an indirect measurement of the quality of a household's diet and household economic access to food (dietary energy). The respondent was the person who was responsible for food preparation for the household on the previous day. Foods prepared in the home and consumed in or outside the home, purchased or gathered outside and consumed in the home are included in calculating HDDS. However, foods that are purchased and consumed outside the home are excluded. Diets with food groups representing more significant variations are associated with better energy and nutrient intake.[34-36] Family food budgets are already constrained, with 70% of households reporting reduced food consumption.[18] Sri Lanka is second in South Asia regarding wasting among children under five.[37] The HDDS aims to provide a snapshot of a household's financial capability to access a range of foods. Studies have demonstrated that socioeconomic position and household food security are related to increased dietary diversity.[38,39] The maximum HDDS recorded as 12 (1.2%) of the population indicates a small subgroup with a highly diverse diet. These households likely consume a wide range of foods from various food groups, which can lead to better nutritional intake and potential health benefits. Households with the lowest HDDS (3) could face challenges accessing diverse foods. Lower HDDS values might be due to limited resources, food availability, or cultural preferences. Addressing this subgroup's dietary limitations could be beneficial for their nutritional well-being. Generally, in Galkadapathana every household consumes plant-based foods. However, economic and physical accessibility for animal-based foods is low, with their low-income levels and poor transport facilities.

In a Sri Lankan agricultural village, where rice is a staple food and a significant component of the local diet, the observed statistically significant difference in rice consumption between normal-weight individuals and those in the underweight/severely underweight categories across various age groups holds considerable significance. Rice is a primary source of carbohydrates, energy, and essential nutrients in the Sri Lankan diet. The difference in rice consumption between normal-weight and underweight individuals underscores potential disparities in nutritional intake. It suggests that underweight individuals may not be getting adequate calories and nutrients from their diet, which can contribute to their underweight status and potentially impact their overall health. This finding highlights the need for targeted interventions and policies. Efforts could be directed towards improving access to nutritious foods, education on balanced diets, and addressing socioeconomic disparities within the village. This might involve community-based programs, nutritional education initiatives, or support systems to ensure that underweight individuals have access to sufficient and varied sources of nutrition. Over time, tracking these consumption patterns can provide insights into whether the observed differences persist or change. Monitoring long-term trends can help evaluate the effectiveness of interventions and policies and understand the impact of changes in the village's socioeconomic landscape on nutrition.

The study has a few limitations as it mainly depends on the food-recalling method. Several limitations may arise during a food recall such as difficulty of the respondents in accurately recalling details about consumed food products and providing answers that they believe are socially acceptable or expected rather than truthful. This can lead to overestimating or underestimating the severity of the recall's impact. Furthermore, this study does not provide means to measure micronutrient deficiencies.

## CONCLUSION

According to the BAZ categorization of the whole sample, 72.3% were normal in weight, and 21.9% were underweight. Furthermore, only 36.5% were normal in height, while 20.4 % were experiencing stunted growth.

When considering the WAZ categorization of 6-10 years individuals, only 19.3% were in the normal-weight category. IDDS and the HDDS of the majority were 6 and 7, respectively. The amount of starchy food intake showed a significant impact on the prevalence of wasting ($P<0.05$). However, the dietary diversity, birthweight, and aggregate level of education of the breadwinner did not significantly impact the prevalence of wasting. These findings highlight high rates of underweight and stunting, emphasizing the impact of starchy food intake on wasting. This finding underscores the need for public awareness of balanced nutrition and informs targeted interventions to improve health outcomes.

## ACKNOWLEDGEMENTS

We would like to thank the Department of Food Science and Technology and the Department of Agricultural Extension, Faculty of Agriculture, University of Peradeniya, for facilitating this research study. The authors would also like to acknowledge Grama Niladhari in Galkadapathana Grama Niladhari division and the villagers who supported and participated in the survey during the data collection period.

*Funding: No funding sources*
*Conflict of interest: None declared*
*Ethical approval: The study was approved by the Institutional Ethics Committee of Faculty of Agriculture, University of Peradeniya, Sri Lanka under the approval number of ECC/2022/E/038*

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**Cite this article as:** Siriwardhane JMCKB, Samarakoon ERJ, Jayaweera A. A case study on the relationships between the dietary patterns and the nutritional status of school children in Galkadapathana village in Sri Lanka. Int J Community Med Public Health 2024;11:2175-83.