Indian Journal of
Nutrition

Open Science Publications

Volume 12, Issue 1 - 2025

www.opensciencepublications.com

Comparative Analysis and Relationship between Nutritional Status and Physical Efficiency among the Rural and Urban Children

Research Article

Arora D[1], Das A[2] and Mahata H[3]*

[1]*Department of Physiology, Shri Shankaracharya Institute of Medical Sciences, Bhilai, India*

[2]*Department of Physiology, Vidyasagar College for Women, Kolkata, India*

[3]*Department of Physiology, Midnapore College (Autonomous), Midnapore, West Bengal, India*

***Corresponding author:** Hiranmoy Mahata, Department of Physiology, Midnapore College (Autonomous), Midnapore, West Bengal, India. Email Id: hiranmoymahata27@gmail.com

Article Information: **Submission:** 12/12/2024; **Accepted:** 02/01/2025; **Published:** 04/01/2025

Abstract

Introduction: In developing countries like India, the children, irrespective of their community or societal background, do not have a proper or normal growth rate. The growth of a child mainly depends upon the nutritional status. Physical efficiency can easily be determined by the individual capacity for maximal energy output, muscular strength, coordination and movement.

Aim: The primary goal of this research was to assess whether any association between nutritional status and physical efficiency of rural and urban children exists. One Hundred twenty children were chosen at random from Medinipur districts (Purba and Paschim) of West Bengal for this study.

Methodology: All the children (6-9 yrs) were measured for various physical fitness components and nutritional status which was evaluated using different nutritional indices and 24-Hrs recall method. The motor function of the children was measured with the help of reaction time measurement (stick drop test). Modified push-up test was used to evaluate the endurance of the children. Sit and reach test was then used to assess the flexibility among the children.

Results: The results revealed that the rural children have significantly higher endurance ($p<0.001$) in push up and flexibility ($p<0.001$), than the urban children. But the urban children showed a significantly ($p<0.05$) better reaction time than the rural children. The correlation between protein intake and reaction time ($p<0.05$) and push-up test was significant in case of rural children. Other nutritional parameters are not significantly correlated with physical fitness.

Conclusion: The study found that children in rural areas were more physically fit than in urban areas. These findings demonstrate the impact of living environment has the ability to prop-up an active lifestyle that improves physical fitness. Rural children were more engaged in both scheduled and unstructured (tree climbing, cycling, swimming and helping in household chores and agricultural activities) physical activities which may be overall emphasizing their physical fitness.

Keywords: Children; Rural-Urban; Nutrition; Physical Activity; BMI; Endurance; Flexibility; Reaction Time; Sit and Reach Test; Push-Up Test

ISSN: 2395-2326

Introduction

Nutritional status and physical efficiency are critical determinants and fundamental pillars of a child's health, which directly or indirectly influence their growth, cognitive development, and long-term well-being that ultimately affect their overall growth, development, and potential for a healthy adulthood. However, disparities in these essential health indicators persist between rural and urban areas, reflecting broader socio-economic and environmental inequalities. While urbanization has brought improved access to healthcare and nutrition services for some, rural communities continue to face unique challenges, including limited resources, inadequate infrastructure, and cultural barriers. Rural children often face heightened vulnerability to malnutrition, stunting, and reduced physical fitness.

The nutritional status of children is a critical determinant of their physical and cognitive development, with long-term implications for health and wellbeing. Adequate nutrition is essential for the growth, development, and maintenance of optimal health, while nutritional deficiencies can lead to impaired growth, increased susceptibility to infections, and reduced cognitive function.

Physical efficiency, encompassing cardiovascular endurance, muscular strength, and flexibility, is equally important for child health outcomes. Regular physical activity has been shown to improve cardiovascular health, reduce the risk of obesity and chronic diseases, and enhance mental wellbeing. Physical fitness is an important measure of a child's (or adolescent's) health and a reliable indication of health in their adulthood [1]. Throughout human history, maintaining physical fitness has been considered a crucial component of daily living. For the most part, the people of ancient times relied on their own strength and energy to survive [2]. It involved being proficient in several core abilities, including strength, endurance, speed and agility for running, jumping, and climbing, among other abilities needed to get their livelihood. Urbanization has led to a shift towards more sedentary lifestyles, characterized by reduced physical activity and increased reliance on processed foods. In contrast, rural areas often face challenges related to food insecurity and limited access to nutrient-dense foods, reduced access to healthcare services, health education and higher rates of poverty and socioeconomic disadvantage.

In India, there is an immense financial gap between rural and urban regions. The majority of Indians (about 70%) live in villages. In India, there are notable distinctions between rural and urban areas. The disparity in people's living standards between rural and urban locations is one of the most significant distinctions that can be very well observed. Many individuals prefer to live in rural areas because of its peaceful atmosphere. Compared to metropolitan regions, rural places are not so fast-paced, polluted, or highly inhabited. Rural places are less crowded, less dirty, and slower moving. The atmosphere is cleaner and fresher in rural places [3]. But still, people living in urban areas enjoy a better standard of living due to their economic status [4].

The present comparative analysis aims to investigate the rural-urban disparities in nutritional status and its effect on physical efficiency among children, exploring the complex interplay of factors contributing to these differences and informing targeted interventions to bridge the gap and ensure equitable health outcomes for all leading to development of targeted interventions and public health strategies.

Material and Methods

Selection of study area and subjects

The study consists a total of 120 subjects who were children (aged 6 to 9) and picked randomly from various villages (rural) and town (urban) of both Medinipur districts (Purba and Paschim) of the Indian state of West Bengal. Sixty children from rural and sixty children from urban area were selected randomly, irrespective of their gender.

Inclusion criteria

- Aged between 6-9 years
- Both genders
- Standard growth with ideal health
- Capable of understanding basic instructions

Exclusion criteria

- The study excluded children with known endocrine disorders, respiratory illnesses, musculoskeletal disorders, and neurological disorders
- Children who do not cooperate or understand the instructions
- Any type of nerve damage in the upper limb, including an open wound, recent fracture, contracture, or other injury
- Any other condition that prevents the children from performing the tests

Ethical Consideration

Prior to commencing the study, the mandatory nature and objectives of the research were thoroughly explained to the children, ensuring their comprehensive understanding. To maintain confidentiality and protect the participants' identities, their names and personal information were kept strictly private throughout the research process.

Anthropometric Measurements

Height (in cm.): Before measuring the vertical distance from the floor to the subject's highest point (vertex), or largest bulging section of the head, the subject was first instructed to stand straight on a flat surface barefoot. An anthropometric rod was used to measure height with an accuracy of 0.1 cm. By averaging three measurements, the final measurement was calculated.

Weight (in Kg.): A portable flour-type weighing machine (Libra) was used to determine the weight of subjects. Children were asked to stand straight on the weighing machine in minimum clothing and reading was taken from the scale of the machine with an accuracy of 0.1 Kg.

Nutritional Assessment

Body Mass Index (in Kg. / m^2): The Body Mass Index (BMI)

Citation: Arora D, Das A, Mahata H. Comparative Analysis and Relationship between Nutritional Status and Physical Efficiency among the Rural and Urban Children. Indian J Nutri. 2025;12(1): 305.

indicates the degree of adiposity of body weight to characterize variation in body composition. From the measured height and weight of the subjects, the BMI was computed using the following standard equation [5,6]

$$BMI = \text{weight (kg.)}/\text{height}^2 \text{ (m)}$$

Head Circumference (in cm.): A measuring tape was used to measure the maximum circumference of the head above the attachment of the ears. The tape was placed slightly above the ridges of the eyebrows and wrapped around the back of the head [7].

Mid Upper Arm Circumference (MUAC) (in cm.): When the arm is relaxed, the maximum circumference of the right arm at the biceps was measured using a non-stretchable tape positioned perpendicular to the upper arm's long axis [8,9]. The figure is upright, facing forward, with relaxed upper limbs and shoulders and hands toward the sides [7].

Diet Survey (24Hrs. recall method)

The dietary survey of 24-hour recall method consists of a detailed interview in which the food intake from the previous day is reported. The 24-hour recall method is commonly used in dietary surveys and research due to its low burden on respondents, as it does not require literacy and allows for customization based on the individual's food knowledge. It was noticed how the subjects estimated portion sizes using food models or photos, or how much each meal weighed on average. The approach depends on the subject's recollection. The percentage of calories, protein, fat, and carbohydrate was then computed from the collected data [10].

Study of Physical Efficiency

Reaction Time (in sec.) by Ruler Drop Test: Reaction time (RT) is measured using the ruler drop method [11]. A flat, horizontal table surface was used, and the subject was instructed to sit with their dominant side elbow bent to a 90-degree angle, their mid-pronated forearm resting on it, and their dominant hand open at the edge of the surface. According to Aranha and his coworkers [11], the examiner positioned the ruler vertically such that the lower end would line up with the web space, or five centimetres, between the child's thumb and index finger. The thumb and index fingertips were then positioned horizontally. The child was instructed to grab the ruler as soon as it was freed from the examiner's hold. The participant was instructed to aim at the falling stick rather than the tester's hand or not to raise or lower your hand to try to grab the falling stick. Before each drop, there was a ready or preliminary command. Children were required to see a demonstration of the test procedure and take part in two practice runs in order to become accustomed to it [12].

Score: Twelve trials were taken, the slowest three and the fastest three readings were rejected and the middle six were recorded as the scores. Then mean of these six scores were used for the analysis.

The distance the ruler travelled from starting 5 cm was recorded. Then this distance was converted into time by using the following formula: $T = 2d/g$, where 'd' was the distance traveled by the ruler and 'g' was the gravitational constant (9.8 m/s).

Endurance Test by Modified Push-Up test

The performer lowers their body towards the floor until their chest reaches it while keeping their knees bent and lying on the ground and their hands precisely beneath their shoulders. They were then instructed to push themselves back to the beginning position. Throughout the trial, it is imperative that the body must remain in a straight line from the knees to the hips to the shoulders, without sagging [13,14]. The arms remained extended, shoulder-width apart, and perpendicular or straight angle to the body. The subject was asked to maintain this posture while lowering their upper body to allow their elbows to bend to a 90-degree angle [15]. The subject was instructed to do as many repetitions as possible without rest [15].

Score: The score was the number of correct modified push-ups continuously executed by the subject without any rest. Scoring was terminated if performed stopped to rest. If the chest does not touch the mat or if the arms are not extended on an execution, the trial is not been counted.

Flexibility Test by Sit and Reach Test

The sit and reach test was selected to assess flexibility because it is a widely used method for evaluating flexibility in children and teenagers [16,17]. The subjects were instructed to take off their shoes. Next, they were asked to take a seat on the floor with both legs extended straight in front so the soles were pressed flat on the box and both the knees were kept locked and pressed flat against the floor. A helper could support the knees downward. The palm was kept pointing downwards. Hands were positioned side by side or on top of one another.

The person whose flexibility was to be assessed tries to reach as far forward as possible with both hands along the box's measuring scale [18,19].

Statistical Analysis

For the representation of data, percentages and frequencies were used for categorical data; for continuous variables, mean and standard deviation were used while for categorical variables, the Chi-square test. The statistical software IBP SPSS (version 2.0) and Microsoft Office Excel (2019) were used for all statistical analysis.

Results

Anthropometric dimensions of urban and rural children are given in (Table 1). Urban children showed significantly higher values for height ($p<0.01$), weight ($p<0.001$), head circumference ($p<0.001$), and BMI ($p<0.05$) in comparison to rural children. However, rural children had significantly greater ($p<0.001$) MUAC than the urban children.

In rural children, carbohydrate, protein, and calorie intake were significantly higher ($p<0.001$) than the urban children (Table 2). But, fat intake in urban children is significantly higher ($p<0.001$) than the rural children.

Table 3 represents the physical efficiency of rural and urban children. In modified push-up and flexibility test, the rural children performed significantly better ($p<0.001$) than the urban children.

Citation: Arora D, Das A, Mahata H. Comparative Analysis and Relationship between Nutritional Status and Physical Efficiency among the Rural and Urban Children. Indian J Nutri. 2025;12(1): 305.

Table 1: Physical variation among rural and urban children

Physical Dimensions	Urban (n = 60)	Rural (n= 60)	t-value
Age (Years)	7.46±0.88	7.52±1.01	0.347
Height (cm.)	122.74±6.43	117.54±8.31	3.833**
Weight (Kg.)	20.53±3.74	17.92±3.57	3.910***
Head Circumference (cm.)	48.93±1.22	48.01±1.35	3.916***
Mid Upper arm Circumference (cm.)	13.21±1.57	14.92±2.05	5.129***
BMI (Kg. /m²)	14.86±2.54	13.82±2.78	2.139*

w.r.t urban *p<0.05; **p<0.01; ***p<0.001

Table 2: Nutrient and calorie consumption among the children of rural and urban area

Nutrients	Urban (n = 60)	Rural (n= 60)	t-value
Carbohydrate (gm./ day)	164.62±17.06	175.54±16.78	3.42*
Protein (gm./day)	24.46±3.81	42.51±5.72	20.02***
Fat (gm./day)	16.86±3.57	12.36±1.61	8.95***
Calorie (Kcal.)	1712.50±56.40	1782.20±45.79	7.33***

w.r.t urban *p<0.05; ****p<0.001

Table 3: Variation of different physical efficiency parameters between rural and urban children

Physical efficiency Parameters	Urban (n = 60)	Rural (n= 60)	t-value
Push-up Test	6.16±1.06	7.53±2.17	4.30***
Reaction Time (Sec.)	0.209 ±0.007	0.235±0.009	17.89***
Flexibility Test (by Sit and Reach test) (cm.)	24.51±1.32	26.79±1.34	9.17***

w.r.t urban ***p<0.001

Table 4: Correlation coefficient of different physical efficiency parameters with nutritional parameters

Nutrients	Urban (n=60)	Rural (n=60)
	r-value	r-value
Push up test		
Carbohydrate	0.113	0.213
Protein	-0.186	-0.319#
Fat	0.030	0.273#
Calorie	0.012	0.125
Reaction time		
Carbohydrate	0.026	0.150
Protein	-0.172	-0.081
Fat	0.001	-0.202
Calorie	0.051	-0.014
Flexibility test		
Carbohydrate	-0.135	0.182
Protein	0.085	-0.098
Fat	-0.107	0.115
Calorie	0.110	-0.099

w.r.t urban #p<0.05

But in reaction time test, urban children had significantly better performance than rural children.

The fitness parameters were assessed for their association with nutrient and calorie intake. The current study observed (Table 4) that there was no significant correlation between any physical efficiency parameter and the consumption of calories, proteins, fats, and carbohydrates in both rural and urban children. In the case of rural children, perhaps there was very little association between the push-up test and the consumption of protein.

Discussion

Machado-Rodrigues and his team [20] reported that in urban children, increased height, weight, and BMI were caused by their sedentary lives, access to a more diverse diet, and processed foods. Rao and his team [21] highlighted that limited healthcare and lower-quality diets contribute to lower height and weight among rural children compared to their urban counterparts, where healthcare is more accessible, resulting in better overall growth indicators. Mai and his colleagues [22] studied that urban child benefit from higher family income and parental education, leading to better nutritional intake, which supports growth in height and weight compared to rural areas. Ramana and his coworkers [23] found that urban children were more likely to be overweight or obese due to sedentary behaviors and reduced physical activity. This contributes to higher BMI than rural children, who often engage in more outdoor and physical activities [24].

Barman's team (2024) observed that rural children had higher MUAC compared to urban children, with rural children engaging in more physical labor and outdoor activities that support muscular development. Urban children, on the other hand, were found to be more sedentary, which can result in higher fat stores but lower muscle mass, reflected in MUAC [26]. Ramanujam and his colleagues [27] conducted a study that also found that rural children had higher MUAC than their urban counterparts. This was largely attributed to the fact that rural children had more physically active lifestyle and diets consisting of protein-rich pulses and dairy (such as lentils and locally available milk products), contributing to greater muscle development. The researchers [28] attributed this to regular consumption of nutrient-dense foods such as pulses, legumes, and locally sourced vegetables, which may support muscle development in rural children. Studies [29,30] also suggest that higher physical activity levels and traditional diets (rich in pulses, grains, and local vegetables) may contribute to higher lean body mass, reflected in higher MUAC values in rural children.

Khed and Saravanakumar [31] found that rural children had higher intake of carbohydrates and calories compared to urban children. Rural diets emphasized staples like rice and chapati with added protein from lentils and pulses. The researchers noted that rural families often eat meals based on traditional foods that are high in both carbohydrates and protein to meet the high energy demands of rural lifestyles. Nabdi's team [32] noted that rural children consumed higher amounts of carbohydrates and overall calories, primarily from staple foods like wheat and millet. This was attributed to the agricultural lifestyle in rural areas, where energy-dense foods are

Citation: Arora D, Das A, Mahata H. Comparative Analysis and Relationship between Nutritional Status and Physical Efficiency among the Rural and Urban Children. Indian J Nutri. 2025;12(1): 305.

prioritized to support physically demanding tasks, both for children and adults.

Arya and Dubey [33] highlighted those urban children in India consume higher levels of dietary fat due to the increased consumption of fast food, snacks, and processed foods, which are more accessible in urban areas. Studies suggest that urban children are more exposed to calorie-dense and high-fat foods than rural children, who consume more traditional, lower-fat diets [34]. The increased availability of processed foods and fast foods rich in saturated fats in urban areas contributes significantly to higher fat consumption among urban children [35].

Researchers [36,37] pointed that involvement of rural children in activities like carrying water, working on farms, and walking long distances was cited as a primary factor contributing to their increased upper body strength and muscular endurance in comparison to their urban counterparts. Raghav [38] and Kumari [39] stated that rural children's higher physical activity levels were identified as a major factor, whereas urban children's sedentary lifestyle (due to screen time and indoor activities) was linked to lower muscular strength and endurance [39].

Emerging research [40,41] indicates that rural children's higher level of physical activity, including unstructured outdoor play and chores that require frequent bending, lifting, and stretching which often involve movements that enhance flexibility, which are commonly part of rural daily routines. The authors [42,43] highlighted that urban child spend more time on sedentary activities, such as using digital devices and watching television.

Reigal and his research team [44] pointed that urban children's participation in organized sports and games that improve reaction time, such as badminton and tennis, was a significant contributing factor to the improvement of hand-eye coordination, neuromotor skills and reflexes [45]. But such activities are less common in rural areas. Researchers [46] attributed this to lifestyle differences, suggesting that urban children are more likely to engage in activities requiring fast responses, such as video games and interactive sports and digital tools, which are more accessible in urban settings in comparison to rural area [47].

High protein intake might lead to a reduction in carbohydrate consumption. Carbohydrates are the primary source of energy for high-intensity, short-duration activities like push-ups [48,49]. A lack of sufficient carbohydrates could impair performance despite high protein consumption. Carbone and Pasiakos [50] stated that dietary protein is essential for muscle repair and growth, it does not directly enhance physical performance without a well-balanced diet. Adequate carbohydrate intake is necessary to provide energy during exercise.

Conclusion

Hence, from the present study, it may be concluded that children in rural areas tend to be more physically fit than in urban areas. This may be due to the direct impact of their living standard and environment, which contributed to their active lifestyle that ultimately improves physical fitness. Rural children were more engaged in both scheduled and unstructured physical activities which may be overall emphasizing their physical fitness. But their reaction time might be due to a slower reflex as they do not spend more time in online or playing video games which somehow contributed to the faster reaction time seen in urban children.

Acknowledgment

We would like to express our deepest gratitude to the children who participated in the present study and all the other stakeholders.

References

1. Shivakumar S, Gajanana PB, Prakash SM (2014) Influence of regional disparity on physical fitness of urban adolescent girls. International Journal of Engineering and Sports Science 1:1-4.
2. Gill M, Deol NS, Kaur R (2010) Comparative study of physical fitness components of rural and urban female students of Punjabi University, Patiala. Anthropologist 12: 17-21.
3. Singh KM (2017) Comparative study of physical fitness parameters among 12 years old rural and urban children. European Journal of Physical Education and Sport Science 3: 188-197.
4. Dettwyler KA (1992) Nutritional status of adults in rural Mali. American Journal of Physical Anthropology 88: 309-321.
5. WHO, Physical Status (1995) The Use and Interpretation of Anthropometry. Report of a WHO Expert Committee, World Health Organization Technical Report Series 854: 1- 452.
6. Park K (2021) Park's text book of preventive and social medicine. 25th ed. Jabalpur: M/S Banarsidas Bhanot Publishers.
7. Lohman TG, Roche AF, Martorell R (1988) Anthropometric Standardization Reference Manual, Human Kinetics Books, Chicago.
8. Hayes J, Quiring M, Kerac M, Smythe T, Tann CJ, et al. (2023) Mid-upper arm circumference (MUAC) measurement usage among children with disabilities: A systematic review. Nutrition and Health. 20: 2601060231181607.
9. Nkhoma O, Chipili G, Ukegbu PO (2024) The Relationship between Dietary Practices and Nutritional Status of Children Aged 24-59 Months in Chitokoloki Ward, Zambezi District, Zambia. Indian Journal Nutration 11: 286.
10. Ferozi S, Taneja AG, Bakshi N (2024) Assessment of nutritional status, physical fitness and physical activity of school going adolescents (12–15 years) in Delhi. BMC Pediatrics 24: 331.
11. Aranha VP, Samuel AJ, Joshi R, Sharma K, Kumar SP (2015) Reaction time in children by ruler drop method: A cross-sectional study protocol. Pediatric Education and Research 3: 61.
12. Angel Latorre-Roman P, Robles-Fuentes A, García-Pinillos F, Salas-Sánchez J (2018) Reaction times of preschool children on the ruler drop test: a cross-sectional study with reference values. Perceptual and Motor Skills 125: 866-878.
13. Ortega FB, Artero EG, Ruiz JR, España-Romero V, Jiménez-Pavón D, et al. (2011) Physical fitness levels among European adolescents: the HELENA study. British Journal of Sports Medicine 45: 20-29.
14. Morrow JR, Mood D, Disch J, Kang M (2015) Measurement and evaluation in human performance, 5E. Human kinetics.
15. Castro-Piñero J, González-Montesinos JL, Mora J, Keating XD, Girela-Rejón MJ, et al. (2009) Percentile values for muscular strength field tests in children aged 6 to 17 years: influence of weight status. The Journal of Strength & Conditioning Research 23: 2295-2310.
16. Cornish K, Fox G, Fyfe T, Koopmans E, Pousette A, et al. (2020) Understanding physical literacy in the context of health: a rapid scoping review. BMC Public Health 20: 1-19.
17. Ming JW, Alali AA, Abd Malek NF, Madarsa NI, Baki MH, et al. (2023) The

Citation: Arora D, Das A, Mahata H. Comparative Analysis and Relationship between Nutritional Status and Physical Efficiency among the Rural and Urban Children. Indian J Nutri. 2025;12(1): 305.

Impact of Hand Grip and Sit-and-Reach Exercises in Children Aged 6 to 7 Years. Journal of Coaching and Sports Science 2: 86-92.

18. Miguel-Etayo D, Gracia-Marco L, Ortega FB, Intemann T, Foraita R, et al. (2014) Physical fitness reference standards in European children: the IDEFICS study. International Journal of Obesity 38: S57-S66.

19. Arena S, Riley L, Schilz G, Schultz E, Watterworth B, et al. (2018) Fitness Measures Among Boy Scouts Completing the Personal Fitness Merit Badge. Cureus 10: e2538.

20. Machado-Rodrigues AM, Padez C, Rodrigues D, Dos Santos EA, Baptista LC, et al. (2024) Ultra-Processed Food Consumption and Its Association with Risk of Obesity, Sedentary Behaviors, and Well-Being in Adolescents. Nutrients 16: 3827.

21. Rao VG, Yadav R, Dolla CK, Kumar S, Bhondeley MK, et al. (2005) Undernutrition & childhood morbidities among tribal preschool children. Indian Journal of Medical Research 122: 43-47.

22. Mai TMT, Tran QC, Nambiar S, Gallegos D, Van der Pols JC (2024) Dietary patterns and child, parental, and societal factors associated with being overweight and obesity in Vietnamese children living in Ho Chi Minh city. Maternal & Child Nutrition 20: e13514.

23. Ramana BV, Prasad Yerrabadi R, Devchand N, Reddy MRS (2024) Examining the influence of socioeconomic factors on childhood obesity rates in urban vs. Rural communities: an observational study. International Journal of Medicine and Public Health 14: 234-238.

24. Prasad KS, Patruni M, Sumalatha B, Premarajan KC, Kumar SG (2024) Prevalence of Overweight and its Associated Factors among Children Aged 13□60 Months in Urban and Rural Puducherry. Research Journal of Medical Sciences 18: 514-521.

25. Barman P, Vijayalaxmi KG, Patil RB, Surendra HS (2024) Nutritional Status of Adolescents in the Kamrup-metropolitan District of Assam, India: A Comparative Study between Rural and Urban. European Journal of Nutrition & Food Safety 16: 67-77.

26. Olumakaiye MF, Nzeagwu OC, Otitioola OC, Ariyo O, Abe J, et al. (2024) Region, location, and age-specific comparison of nutritional status of in-school adolescent girls (10-19 years) in Nigeria. World Nutrition 15: 124-133.

27. Ramanujam K, Mergu N, Kondeth H, Reddy GVR, Venkata PU, et al. (2023) Chronic illness, nutritional status, and factors associated with malnutrition among various age groups residing in urban areas of Telangana and rural areas of Andhra Pradesh. Nutrients 15: 4470.

28. Didinger C, Thompso, H (2020) Motivating Pulse-Centric Eating Patterns to Benefit Human and Environmental Well-Being. Nutrients 12: 3500.

29. Chatterjee R, Dey U, Biswas S (2021) Anthropometric assessment of nutritional status of school going children in urban and rural India - a systematic review and meta-analysis. Human Biology Review 10: 152-177.

30. Sanni TA, Elegbede OE, Adewoye KR, Durowade KA, Ipinnimo TM, et al. (2024) Nutritional status of primary school children and their caregiver's knowledge on malnutrition in rural and urban communities of Ekiti State. Southwest Nigeria. Plos one 19: 303-492.

31. Khed VD, and Saravanakumar V (2019) Rural - Urban Divide in Diet Diversity and Nutritional Security: Some Insights from Karnataka State. Indian Journal of Agricultural Economics 74: 489-505.

32. Nabdi S, Boujraf S, Benzagmout M (2022): Evaluation of rural-urban patterns in dietary intake: A descriptive analytical study – Case series. Annals of Medicine and Surgery 84: 104972.

33. Arya C, Dubey N. (2024): Fast-food consumption among Indian adolescents and associated factors. International Journal of Community Medicine and Public Health 11: 4546-4553.

34. Nurwanti E, Hadi H, Chang JS, Chao JC, Paramashanti BA, et al. (2019) Rural-Urban Differences in Dietary Behavior and Obesity: Results of the Riskesdas Study in 10-18-Year-Old Indonesian Children and Adolescents. Nutrients 11: 2813.

35. Vilar-Compte M, Burrola-Méndez S, Lozano-Marrufo A, Ferré-Eguiluz I, Flores D, et al., (2021): Urban poverty and nutrition challenges associated with accessibility to a healthy diet: a global systematic literature review. International Journal for Equity in Health 20: 1-19.

36. Patel AC, Oza H, Patel NK (2019) Comparative study of upper body strength among rural and urban students. International Journal of Physical Education, Sports and Health 6: 196-198.

37. Raghav SP (2015) Comparative assessment of physical fitness in rural and urban students. International Journal of Sports, Health and Physical Education 5: 88-91.

38. Ghosh P,Goon KA (2015) Comparison of Physical Fitness Level Urban and Rural School Going Female Student. International Journal of Social Science and Humanities Research 3: 313-316

39. Kumari R, Nath B, Singh Y, Mallick R (2024) Health-related physical fitness, physical activity and its correlates among school going adolescents in hilly state in north India: a cross-sectional survey. BMC Public Health 24: 401.

40. Karkera A, Swaminathan N, Pais MS, Vishal K, Rai S (2014) Physical Fitness and Activity Levels among Urban School Children and their Rural Counterparts. The Indian Journal of Pediatrics. Indian Journal of Pediatric 81: 356-361.

41. Vieira D, Gomes EC, Negrao AS, Thuany M, Gomes TN (2023) Movement Behaviour and Health Outcomes in Rural Children: A Systematic Review. International Journal of Environmental Research and Public Health 20: 2514.

42. Varadarajan S, Govindarajan Venguidesvarane A, Ramaswamy KN, Rajamohan M, Krupa M et al. (2021) Prevalence of excessive screen time and its association with developmental delay in children aged <5 years: A population-based cross-sectional study in India. PLoS One 16: e0254102.

43. Qu G, Hu W, Meng J, Wang X, Su W et al. (2023) Association between screen time and developmental and behavioral problems among children in the United States: evidence from 2018 to 2020 NSCH. Journal of Psychiatric Research 161: 140-149.

44. Reigal ER, Barrero S, Martín I, Morales-Sánchez V, de Mier JR, et al. (2019) Relationships Between Reaction Time, Selective Attention, Physical Activity, and Physical Fitness in Children. Frontiers in Psychology 10: 2278.

45. Asar S, Ezabadi RR, Baghini SA, Maleksabet N (2022) The Relationship Between Reaction Time, Eye-Hand Coordination with Visual Field in Elite Tennis Tennis Players. Asian Journal of Sports Medicine 13: e115787.

46. Gkintoni E, Vantaraki F, Skoulidi C, Anastassopoulos P, Vantarakis A (2024) Promoting Physical and Mental Health among Children and Adolescents via Gamification—A Conceptual Systematic Review. Behavioral Sciences 14: 102.

47. Hou CY, Rutherford R, Chang H, Chang FC, Shumei L et al. (2024). Correction: Children's mobile-gaming preferences, online risks, and mental health. Plos one 19: e0308315.

48. Mata F, Valenzuela PL, Gimenez J, Tur C, Ferreria D (2019) Carbohydrate Availability and Physical Performance: Physiological Overview and Practical Recommendations. Nutrients 11: 1084.

49. Burke LM, Loucks AB, Broad N (2006) Energy and carbohydrate for training and recovery. Journal of Sports Sciences 24: 675-685.

50. Carbone JW, Pasiakos SM (2019) Dietary protein and muscle mass: translating science to application and health benefit. Nutrients11: 1136.

Citation: Arora D, Das A, Mahata H. Comparative Analysis and Relationship between Nutritional Status and Physical Efficiency among the Rural and Urban Children. Indian J Nutri. 2025;12(1): 305.