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## Review Article

# A COMPARATIVE STUDY OF NUTRITIONAL STATUS OF URBAN AND RURAL SCHOOLCHILDREN IN SELECTED DEVELOPING COUNTRIES: SYSTEMATIC REVIEW

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## ABSTRACT

**Background:** The health and nutritional status of schoolchildren are indicators of a country's commitment in the development of its future workforce. Malnutrition affects a child's physical and cognitive development, as well as their disease susceptibility, and has an indirect negative influence on the country's economic growth.

**Methodology:** A search was conducted through PubMed, Medline, Google school for articles that met the inclusion criteria. PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-analysis) guided the reporting of items.

**Result:** A high prevalence of poor nutrition status/malnutrition (70% & 65% undernutrition) was reported more in rural school children compared to the urban. Over nutrition (overweight & obesity) was more prevalent in Urban school children. Risk factors associated with nutritional status were low socio-economic status, parents' illiteracy, level of education and employment status

**Conclusion:** In contrast to their urban counterparts, our findings indicate that rural children are nutritionally deficient. This distinction highlights the importance of taking a unique approach to preventing malnutrition in both regions.

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## INTRODUCTION

At all stages of life, nutrition is a critical component of human life, health, and development. The school years are an important period in a child's physical and mental growth. According to study, nutritional deficiencies and poor health in primary school-aged children cause low enrolment, high absenteeism, early dropout, and poor classroom result.[1].

Childhood overweight and obesity has given malnutrition a new face. In the year 2000, there were just 8 million overweight children in the world. Today, there are almost 38 million overweight children. The growth of overweight and obesity has been influenced, at least in part, by industry marketing and greater access to processed foods, combined with lower levels of physical activity.[2]

In 2014, the World Health Organization, UNICEF, and the World Bank reported that 161 million children were stunted, 51 million were wasted, and 99 million were underweight. Furthermore, 41 million children under the age of five were projected to be overweight[3]. Nutritional disparities exist at

both the regional and national levels, with Asia bearing the brunt of childhood malnutrition.

According to UNICEF reports, Asia and Africa are home to 90% of the world's malnourished children, while India is home to 40% of the world's malnourished children.[4]. In the 2013 Global Hunger Index Report, India was ranked 16th, indicating an extreme hunger situation. According to the National Family Health Survey (NFHS), 43% of children under the age of five are underweight, while only 2% are obese. In any nation, school-aged children between the ages of 5 and 15 make up roughly 20% of the population.[5].

Malnutrition is a term that refers to both under- and over-nutrition. Inadequate food intake or low absorption (due to illness) cause undernutrition, which has a negative impact on growth and development.[6][7][8]. The most common form of malnutrition in developing countries is undernutrition, which involves stunting, thinning, and being underweight. [9]. Undernutrition is defined as a height for age, weight for age, weight for height, or body mass index for age that is less than 2 Z score of the mean value for age and sex.[10][11]. Over

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nutrition is considered when the BMI is greater than + 1 Z score for age and sex. [12].

A growing body of evidence suggests that malnutrition in childhood has long-term health effects. According to a new study, reduced beta cell development in stunted children is a risk factor for type 2 diabetes mellitus.[13]Systolic and diastolic blood pressure is higher in malnourished children and those who recovered from malnutrition after an average of 6 years. This may be a precursor to hypertension later in life.[14]. Stunted girls had a lower resting metabolic rate and a higher rate of weight gain, potentially leading to obesity later in life.[15].

UNICEF, WHO, and the World Bank data on global and regional child hunger indicate that we are still a long way from a world zero malnutrition. The joint estimates, which were published in May 2018, cover indicators of stunting, wasting, severe wasting, and obesity in children under the age of five, and indicate that progress toward the World Health Assembly's 2025 objectives and the Sustainable Development Goals (2030) is insufficient. [2].

Successful and long-term multi-sectoral nutrition programming is needed to improve children's nutrition over time, and many countries are making strides in this direction. In order to monitor and analyse national, regional, and global progress in the future, it is critical to collect data on a regular basis. Therefore, this review aims to compare nutrition status of school children in rural and urban areas in developing countries.

## METHODOLOGY

### Identification of research questions

As indicated earlier, the objective of this review is to compare nutrition status of school children in rural and urban areas and also evaluate factors associated to nutrition status. This study sought to compare nutrition status of school going children in rural and urban areas in developing countries. The primary research question was thus framed as “What is the nutritional status of rural and urban school children in developing countries? And what are the risk factors associated with nutrition status? As the secondary question

### Identification of studies relevant and related to the research questions

To answer the research questions, the research terms “*nutrition status*” “*school aged children*” “*associated factors*” “*rural& urban*” were identified, selected and then matched with “*India*” “*LMICS*” and “*developing countries*”. Using the stated search terms, a thorough search was conducted through google scholar, PubMed, and Medline for quantitative, qualitative and combined method studies.

### Inclusion and exclusion criteria

Studies published in any developing countries especially from 2015 to 2021, published in English, having school children aged 5 – 18 years, conducted from any developing country especially India and studies that focused on nutritional status assessment were considered. Studies published before 2015, conducted in Hindi or any other language besides English and studies assessing nutritional status conducted among elders

were excluded. Table 1 presents the inclusion and exclusion criteria used in selecting studies for this review.

**Table 1** Inclusion and exclusion criteria

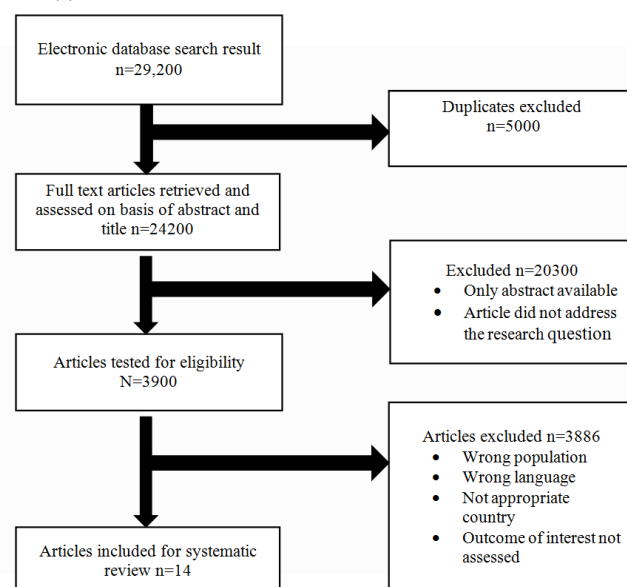
S/No	Criteria	Inclusion	Exclusion
1	Year of publication	2015 – 2021	Studies published before 2015
2	Language	English	Other languages apart from English
3	Study population	School children	Adults and preschool children
4	Age range	5 – 18 years	Under 5 years and above 18 year olds
5	Country	Developing countries	Developed countries
6	Study design	All	Non
6	Study focus	Nutritional status assessment	Other aspects of nutrition

### Primary outcome

The primary outcome of interest in this study is nutritional status of rural and urban school children. Measured in terms of over nutrition, under nutrition, stunting, thinness, overweight, underweight and obesity Reference lists of on-topic systematic reviews were also checked for in order to include all primary studies that met the inclusion criteria. The secondary outcome of interest is risk factors associated with nutritional status.

### Study selection and data extraction

All citations were screened, and any citation that was deemed suitable for full text review was retrieved. Full-text articles were reviewed for eligibility separately, and related result data and study information were extracted and entered under the headings. Authors, publication year, and country of origin, study design, sampling technique and sample size, results and author(s) conclusion.



**Fig 1** PRISMA diagram

### Data synthesis

The synthesis and reporting of the findings was directed by the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-analysis)[16].A brief narrative of the authors, years of publication, study design, sampling technique and sample size, study area, participants age. key findings (result), and conclusion was done and entered in table 2. Articles that assessed stunting, underweight, overweight, thinness and

obesity were included in qualitative synthesis. Percentages of each malnutrition indicators were extracted and risk factors were discussed under common themes that run through articles that assessed factors associated with malnutrition.

**Table 2** Descriptive table of studies included in the review

Author & Year of publication and Country	Study design	Sampling Technique & Sample size(N)	Area & Age	Result	Conclusion
1. Karak <i>et al.</i> , 2018 West Bengal	Observational cross sectional study design	N=80 Rural=40 Urban=40	16-18 years	The prevalence of underweight was substantially higher in rural school children than in urban school children. Underweight was found to be prevalent in 65 percent of the population.	Rural schoolchildren from lower socioeconomic backgrounds suffer from varying levels of malnutrition than their urban counterparts.
2. N. P. G. C. R. R. Naotunna <i>et al.</i> , 2017 Srilanka	Cross-sectional study design	Multi stage cluster sampling N=4469	Rural 5 – 10 years	The prevalence of extreme thinness, thinness, overweight, and obesity was 8.6% , 2.91%, 2.95% and 2.43% respectively. The prevalence of underweight and stunting, adjusted for survey design, was 25.93% and 43.92% percent) respectively.	There is severe malnutrition nutrition among rural school children
3. Mayuri <i>et al.</i> , 2020, India	Comparative study, cross sectional	Simple random sampling N=110	10-16 years	26 (47.27%) subjects in urban, were underweight, 39 (70.90%) in rural were underweight	The majority of female adolescents in rural areas were underweight and consumed less calories.
4. Yoko Horuichi <i>et al.</i> , 2018, Cambodia	Cross-sectional	Simple random sampling N=2020	6-17 years	Stunting was more prevalent in children living in rural (36.4%) areas than in those in urban (20.4%). Overweight and obesity was more common in urban (6.4%) children of all ages compared to those in rural (2.3%) areas	Overall, children's dietary intake did not meet local prescribed dietary allowances. .
5. Wafaa <i>et al.</i> , 2017, Egypt	Cross-sectional	Purposive sampling technique 736	6-17 years Rural area	Stunting, underweight, and wasting were found in 34.2%, 3.4%, and 0.9% of children, respectively, while obesity was found in 14.9 %. Obesity prevalence was substantially higher in the younger age group of 6–9 years compared to older age groups, and in males versus females in the 10–13-year-old age group. Stunting was linked to factors such as getting older, eating less poultry, and skipping breakfast. Obesity was associated with a younger age and the father's daily jobs.	Poor nutrition status
6. Adanna <i>et al.</i> 2020, Nigeria	Descriptive cross-sectional	Multi-stage sampling N=751	Rural and Urban 6-12 years	15.7 percent of people were undernourished, and 2.1 percent were over nourished. Underweight (8%), thinness (7.2%), and stunting (9.9%), overweight (1.4%), and obesity (9.9%) are the most common conditions (0.7 percent ). Males (8.7%), those who attended public schools (8.6%), and those who lived in rural areas of the city (14.3%) had a higher proportion of slim students than females (5.8%), private school students (1.9%), and city dwellers (4. 6 percent). prevalence of stunting was 19.3% among the pupils residing in rural areas and 5% among the pupils living in urban areas In rural areas, there was no evidence of overnutrition among students... Undernutrition and over nutrition were found to be prevalent in 22% and 16% of the population, respectively.	Both under and over nutrition exist in school children from both rural and urban
7. Soumit Roy <i>et al.</i> , 2020 West Bengal, India	Cross sectional	Random sampling N=142	Rural 96-120 months	<b>Factors associated</b> Food fussiness was associated with thinness. Enjoyment of food, satiety response was significantly associated with over nutrition. Food avoidance subscale was significantly associated with thinness and this subscale was protective for overweight.	There is association of BMI with child eating behaviour
8. Muluken <i>et al.</i> 2020 Ethiopia	Cross sectional	simple random sampling method N=505	Urban	Stunting, underweight, and thinness were found in 29.5 percent, 35.7 percent, and 29.5 percent of the population, respectively. Before going to school, 89.3% ate breakfast and/or lunch.	Nearly one-third of school-aged children were stunted, thin, and underweight.
9. Ali Jaleel Asser1 <i>et al.</i> , 2020 Babylon Governorate.	Cross sectional	simple random sampling method N=1013	6-15 years	47.4% have a normal BMI, 43.0% are underweight, 7.6% overweight, while 2.0% only have obesity. 76.4% has normal blood haemoglobin, 21.2% low blood hemoglobin and 2.4% increase blood hemoglobin	Just under half of children has a normal body mass index and about half of study sample have underweight this considered as a result of malnutrition of primary school children
10. Himashree Bhattacharyya., 2020. Meghalaya, India	Cross sectional	simple random sampling method N=510	6-12 years	The overall prevalence of underweight was 74 (18.7%) and stunting 68 (17.2%) in children 6- 9 years. The overall prevalence of thinness and stunting in children aged 10–12 was 38 (19.1%) and 46 (23.2%). The prevalence of nutritional deficiency syndromes was 192 (32.4%).	poor nutritional status was observed
11. Sunil <i>et al.</i> , 2017 Hyderabad Telerana India	Cross sectional	Simple random sampling N=412	Urban 6-11 years	The prevalence of underweight was 28.9%, overweight was 9.2% and obesity was 4.4%. Prevalence of stunted height was found among 21.8%.	The prevalence of underweight, Nutritional deficiencies were found to be significantly higher in children of illiterate parents' and similarly in unskilled worker fathers' and unemployed mothers.
12. Ajit Kumar <i>et al.</i> , 2017 Asam India	Cross-sectional study design	Simple random sampling N=216	Rural 6-15 years	53% stunted, 31% underweight and 11% thinness. Both univariate and multivariate analysis revealed different associated sociodemographic factors contributing to poor nutritional status of children such as low socioeconomic status and poor educational background of their parent.	Poor nutrition status
13. Tesfahun <i>et al.</i> , 2018. Ethiopia	Cross sectional study design	Multi stage sampling N=633	Rural 6-12 years	Prevalence of stunting was 57%, about, 3.5%, 27.3% & 26.4% severely, moderately and mildly stunted,	Stunting was prevalent
14. Rufina N. B <i>et al.</i> , 2018	Cross sectional	Multi stage sampling N=450	Rural 6-15 years	(18.2%), stunting (41.6%), thinness (20.0%), zinc (43.3%) and vitamin A (51.1%) deficiencies	Underweight, stunting, thinness, vitamin A and zinc deficiencies were prevalent

## RESULT

A total of fourteen articles (N=12,047) were included in this study. Six studies (Karak *et al.*, Soumit *et al.*, Himashree *et al.*, Sunil *et al.*, Ajit *et al.* and Mayuri *et al.* [17]) [18][19][20] were conducted in India. Two from Ethiopia (Muluken *et al.* [21], Tesfahun *et al.* [22]) and Nigeria Adanna *et al.* [23] & Rufina *et al.* [24]), One study each from Sri Lanka (N.P.G.C.R *et al.* [25]), Cambodia (Yoko *et al.* [26]), Babylon Governorate (Ali Jala *et al.* [27]) and Egypt (Wafa *et al.* [28]) respectively. All the studies assessed nutritional status of the school children and Four studies (Wafa *et al.*, Soumit *et al.*, Sunil *et al.* [29] and Ajit *et al.* [28][19][30])

assessed both nutritional status of the school children and risk factors associated with nutritional status. As indicated in table 3, Four studies included school children from both rural and urban areas, seven studies were conducted in rural areas only and three conducted from Urban area.

In the four comparative studies between school children in Urban and rural areas, both over nutrition and undernutrition was recorded. However, over nutrition and obesity was more prevalent in urban school children compared to their counterparts. In Karak *et al.*, overall underweight was 65% [18] and found higher in rural school children,. In Mayuri *et al.*, most of the females in rural (70%) areas were underweight

compared to urban (47.2%)[17]. Yoko *et al* reported more prevalence of stunting in rural area and high prevalence of 6.4% obesity among urban school children compared to rural school children[26] and lastly Adanna *et al* found a higher proportion of thinness among children in rural areas compared to the urban, 5% and 19.5% respectively[23].

**Table 3** Summary of study location and assessed status of Nutritional of the school children

Author(s)	Study location	Stunting (%)	Under-Weight (%)	Over-weight (%)	Thinness/Wasting (%)
Karak <i>et al.</i> , 2018	Rural & Urban	NA	65% overall	NA	NA
N.P.G.C.R <i>et al</i>	Rural	43.9%	25.9%	2.9%	8.6%-extreme & 2.9% thinness
Mayuri <i>et al</i>	Rural & Urban	NA	Urban-47.27% Rural-70.9%	NA	NA
Yoko <i>et al</i>	Rural & Urban	Urban-20.4% Rural-36.4%	NA	Urban-6.4% Rural-2.3%	NA
Wafaer <i>al</i>	Rural	34.2%	3.4%	14.9%	0.9%
Adanna <i>et al</i>	Rural & Urban	Urban-5%, Rural-19.3%	8%	1.4%/0%	7.2%
Soumit <i>et al</i>	Rural	NA	22%	16%	NA
Muluken <i>et al</i>	Urban	29.5%	NA	35.7%	29.5%
Ali Jalal <i>et al</i>	Urban	NA	43%	7.6% Obesity 2.6%	NA
Himashree <i>et al</i>	Rural	17.3%(6-9years) 23.3% (10-12years)	18.7%	NA	19.1%
Sunil <i>et al</i>	Urban	21.8%	28.9%	9.2% Obesity-4.4%	NA
Ajit <i>et al</i>	Rural	53%	31%		11%
Tesfahun <i>et al</i>	Rural	57%			
Rufina <i>et al</i>	Rural	41.6%	18.2%		20%

There is high prevalence of malnutrition recorded in the six studies conducted in rural areas. N.P.G.C.R *et al* reported severe malnutrition[25]. In Soumit *et al* under nutrition and over nutrition was 22% and 16% respectively[19]. Himashree also observed poor nutrition status with 18.7% and 17.2%, underweight and overweight children in age 6-9 years respectively. 19.1% thinness and 23.2% stunting among 10-12 year olds[20]. Tesfahun registered a high rate of stunting (57%)[22]. Ajit *et al* documented poor nutrition status in which 57% of the school children were stunted, 31% underweight and 11% thinness[30]. Rufina *et al* also recorded prevalence of malnutrition among the school with 18.2%, 41.6%, 20%, 21.1%, stunting, thinness, Zinc deficiency and vitamin A deficiency respectively[24].

In studies conducted among urban school children, prevalence of malnutrition was also documented. Muluken *et al* 1/3<sup>rd</sup> of the children were stunted, thin and overweight[21]. In Ali Jalal *et al*, only 47.4% have normal Body Mass Index (BMI) and 43% were underweight[27]. In Sunil *et al* 28.9%, 9.2%, 4.4% & 21.8% were underweight, overweight, obese and stunted respectively[29].

## DISCUSSION

The nutritional status of schoolchildren is a significant indicator of their growth. The aim of this study was to determine the nutritional status of school children in rural and urban areas. A high prevalence of low nutrition status/malnutrition was found in research comparing rural and urban school children (70% undernutrition in Mayuri *et al* [17] & 65% in Karak *et al* [18]) was reported more in rural school children compared to the urban. Similar results have been reported in studies by Lamba *et al.*, & Goyal *et al* that recorded a high prevalence of under nutrition[31][32]. This

review found a higher prevalence of overnutrition among school children in urban areas compared to rural areas, which contradicts findings by Sesikera *et al.* [33], Mehta *et al.* [34] & Deepa *et al* [35] Which document a high prevalence of overweight in both rural and urban areas.

Wafa *et al.* listed three risk factors associated with poor nutritional status: growing older, eating fewer poultry, and missing breakfast, both of which were linked to stunted development. [28]. In a study by Soumit *et al.*, food fussiness and avoidance were linked to thinness, whereas over nutrition was linked to food enjoyment. [19]. There were 22 percent of people who were undernourished and 16 percent who were over nourished, respectively. Low socioeconomic status has also been described as a risk factor for malnutrition. This finding is similar to that of [36]. This is due to the fact that money is needed to purchase foods with the required nutrient values. Parents' nutritional status was also linked to illiteracy, uneducated parents, education level, and employment status. These findings are in line with that of Maria *et al.*, [37] The lack of schooling of the mother/caregiver was the greatest predictor of malnutrition, with a 20.2-to-1 odds ratio. In comparison to the uneducated, who may have no idea about food values, it is thought that more educated parents are more likely to feed their children right food values. Education also opens doors to job opportunities, eradicating poverty, which is a major cause of inadequate nutrition in rural areas.

## CONCLUSION

In contrast to their urban counterparts, our findings indicate that rural children are nutritionally deficient. This distinction highlights the importance of taking a unique approach to preventing malnutrition in both regions. These results showed that urban schoolchildren are more likely than rural schoolchildren to suffer from over nutrition (overweight and obesity). In addition, it was discovered that, in contrast to urban schoolchildren, the majority of rural schoolchildren are undernourished.

### Limitations of the study

These review only included articles on nutritional status assessment conducted in developing countries. Articles excluded might have different results. Therefore, the results of this review cannot be used to generalized nutrition status of rural and urban areas in developed countries.

### Recommendation

We recommend different approaches to be used in preventing malnutrition in both urban and rural areas.

### Funding

There was no particular grant for this research from any funding agency in the public, private, or non-profit sectors.

### Availability of data and materials

Not applicable

### Declarations

Ethics approval and consent to participate

There's no need for ethical approval for this systematic review since no patient data will be collected.

## Competing interests

There are no potential conflicts of interest.

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