Nutritional Status Of Socio-Economically Disadvantaged Preschool Children In India: A Review

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Abstract
Undernutrition is a major public health problem leading to child morbidity and an underlying cause for more than half of child deaths worldwide, particularly in low socio-economic communities and in developing countries. Poverty is a key determinant of under nutrition, through the unhealthy physical environment, domestic stress.India is a big country having varied geography, climatic conditions, socioeconomic distribution, religion, culture, and food habits. Thus, the prevalence of undernutrition differs substantially between states, districts and communities.The aim of this review is toaim is to identify, describe,synthesize andsummarize online available published studies on assessment of nutritional status of preschool children conductedin various socioeconomically disadvantaged areas of India. A total of 21 scientific papers were considered for this study. In the considered papers the sample sizes ranged from 30 to 1032 children. The data for this paper was collected from original published research articles searched through Goggle Scholar, PubMed, Medline, Scopus and Science Direct database. The study showed that undernutrition in the form of underweight, stunting and wasting was found to be widely prevalent among preschool children. Several risk factors associated with underweight, stunting and wasting of preschool children were identified. Childhood underweights, stunting and wasting are consistently associated with male sex, age, family size and other socio-economic characteristics.The study found that children below 5 years from low socio-economic strata had a higher risk of being undernourished and confirmed the vicious cycle of acute illness and undernutrition.Nutrition, health education and good access and utilization of healthcare can be very effective interventions which could result in substantial reduction in undernutrition prevalent in socio-economically disadvantaged preschool children. Nutrition education should be imparted to mothers to improve quality of food provided to the children. Continuous monitoring and surveillance of Anganwadi centres could identify underlying factors of malnutrition, thus help in the planning of preventive strategies.

Keywords: pre-school children, nutritional status, underweight, wasting, stunting, low socio-economic status

INTRODUCTION

Nutrition may be defined as "the science of food and its relationship to health". It is primarily concerned with the role played by nutrients in body's physical growth, development and their maintenance. Good nutrition means "to maintain nutritional status which helps us for our growth and to enjoy good health"**(Rai,*et al.,* 2021)**. Nutritional status of children is a measure of the level of development and future prospects of the community. The nutritional status of preschool children is of particular concern since the early years of life are crucial for optimal growth and development and may lead to high level of illness and disability in adult life**(Badake, *et al*, 2014)**. Identifying the trend of early childhood nutritional status is critical for prevention of nutrition-related chronic diseases**(Yan,*et al*., 2018)**.

Nutrition of preschool child is of primaryconcern, because the basis for life time health, strength and intellectual activity is laid during that period. Insufficient food intake negatively affects the growth and nutritional status of growing children particularly those from underprivileged sections of the community. Being the most vulnerable segment of the population, the preschool children are at greatest risk of malnutrition since the growth demands high intake of calories and proteins **(Fahmi, 2016)**. Malnutrition in the entirety of its structure, incorporates under-nutrition, deficient vitamins or minerals, overweight, obesity, and resulting diet-related and non-communicable diseases**(Hossain,*et al*., 2020)**.

Undernutrition can be categorized as underweight, stunting and wasting. Stunting is described by low height-for-age (HAZ) and is the consequence of long-term nutritional deficiency. Wasting is low weight-for-height (WHZ), which shows short-term low nutritional status. On the other hand, underweight is a low weight-for-age (WAZ) that indicatesdepleted public situations in both the long and short term. Undernutrition has both short-term and long-term outcomes**(Aynalem,*et al.,* 2022**).Undernutrition is a major public health problem leading to child morbidity and an underlying cause for more than half of child deaths worldwide, particularly in low socio-economic communities and in

developing countries **(Galgamuwa,*et al.*, 2017)**. Poverty is a key determinant of under nutrition, through the unhealthy physical environment, domestic stress and fatigue-related early stopping of the mother's milk also contributes to malnutrition along with the lack of education of mothers. WHO estimates that, in the world, 27 percent of the children fewer than five years of age have less than the normal weight-for-age, and that most of these children live in the developing countries**(Rahaman,*et al.*, 2019)**. The Joint Malnutrition Estimates (JME) released in April 2021 reveal insufficient progress to reach the World Health Assembly (WHA) targets set for 2025 and the Sustainable Development Goals (SDGs) set for 2030**(UNICEF,2021)**.

In an economically dynamic country like India, major challenges in nutrition status of the children have been witnessed**(Kumar,*et al.*, 2022)**. Undernutrition in preschool years of children continues to be one of India's major human development challenges **(Natekar & Mhaske, 2015)**.Despite advancements in the health sector in India, the problem of under-nutrition and nutritional deficiency in children has constantly remained high. Further, if segregation of Rural and Urban India be studied, undernutrition is a major health problem in rural regions of India**(Suri,*et al.*, 2022)**.despite the strong role of neighbourhood and community level effects found in various national contexts disparities in child height and weight at smaller spatial scales within nations have been studied to a lesser extent.The necessity to do so is specificallyvisible in a country like India. Regardless of recent advances, Indian children are still shorter than anywhere in the developing world at equivalent levels of economic development**(Striessnig & Bora, 2020).**Globally, 149.2 million children under 5 years of age are stunted, 45.5 million are wasted and 38.9 million are overweight. As per this report over 17% of Indian children under 5 years of age are wasted and over 34% of children under 5 years of age are stunted **(GNR, 2021)**.

India is a vast territory with a mixed geography, climatic conditions, socioeconomic distribution, religion, culture, and food habits. Thus, the prevalence of undernutrition differs substantially between states and districts**.** To date, several studies have assessed the nutritional status of preschool children in various socio-economically disadvantaged areas of India but to my best knowledge there is no overview to summarize the results of these studies. The aim of this review is to summarize online available published studies on assessment of nutritional status of preschool children conducted in socioeconomically disadvantaged areas of India.

MATERIALS AND METHODS

This study is conducted in India, which has become the most populous country in the world surpassing China, with anestimated population of 1.4billion people which is equivalent to 17.76% of total population and area coverage of2,973,190 Km^2. Of the total population, a large section of population is socio-economically disadvantaged and are living below the poverty line. Due to poverty and low socio-economic status the section of the population which gets affected mostly are the children in the pre-school age as they are more susceptible to nutritional deficiencies. Asper the NEP (National Education Policy) 2020 the formal school structure in India is 5+3+3+4, consisting of the Foundational Stage (in two parts, that is, three years of Anganwadi/pre-school + two years in primary school in Grades one to two; both together covering ages 3-8 years). In India children are supposed to enrol in Anganwadi/Pre-school/Balvatika at the age of 3 years which is the Preparatory Stage and will comprise three years of education building on the discovery, play and activity-based pedagogical and curricular mode of the Foundational Stage.Thus, pre-school children in India range from 3 to 6 years of age. Therefore, most studies included in this review and were conducted on the pre-schoolchildren at the age of 3-6 years belonging to socio-economically disadvantaged areas of India.

The data for this paper was collected from original published research articles searched through Goggle Scholar, PubMed, Medline, Scopus and Science Direct database using keywords pre-school children, nutritional status, underweight, wasting, stunting, and India. Articles containing the prevalence of stunting, wasting/ thinness, grade of malnutrition and associated risk factors along with age range of students, total study population, and study area were included for this systematic review. After initial review, articles were further scrutinized to short out more appropriate research articles keeping the purpose of present review. Eventually articles for main review were categorized based on criteria like location of the study should be in India and it must focus on socio-economically disadvantaged preschool children as study population. However, in certain cases few articles were considered for review in which the nutritional status was assessed on the basis under-nutrition or malnutrition. After applying these criteria, 25 papers were particularly found to be suitable for review and results. Though, another50 papers on nutritional status of preschool children in general were reviewed to understand the background of the problem. These articles were analysed thoroughly in order to comprehend the nutritional status of socio-economically disadvantaged preschool children in India. Nutritional studies conducted on preschool children, specific groups (only female or male students), patients, reports form review papers, or conference abstracts were excluded from this review.

RESULTS

A total of 21 scientific papers were considered for this study. In the considered papers the sample sizes ranged from 30 to 1032 children. In majority of the studies, the age of the children was less than six years. Only one study used participants older than six years.All the included studies were cross-sectional studies and obtained data from both males and females. The included studies are all from socio-economically disadvantaged areas. Table 1 shows that the studies included in this review are conducted in rural areas, urban slums, tribal areas and hilly areas in various parts of India.

Table 1 shows the comparative prevalence ofundernutrition, underweight, stunting and wasting of the preschool children under study. It appears from this table, that in the Indian subcontinent, the prevalence of underweight, stunting and wastingwas 64% among the Tribal children of Maharashtra, 64.37% among rural belt of Southern Rajasthan, 43% Tribal

children in Kerala respectivelywhich were observed to be the highest among all the reviewed populations from India. Based on the study, it appears that undernutrition in the form of underweight, stunting and wasting was found to be widely prevalent among preschool children.

S.no.	Author and year of publication	Study area	Sample size/ Age group/ Type of study	Findings of the study
1.	Meshram *et al.* (2012)[24]	Tribal children of Maharashtra	120/ 1-5 years/ Community based and cross-sectional study	Nutritional status was assessed using new WHO Growth Standards. The prevalence of underweight, stunting and wasting was 64%, 61% and 29% respectively
2.	Mandal *et al.* (2014)[23]	Slum of Chetla, Kolkata	120/ 0-14 years/ Community based cross-sectional analytical study	The overall prevalence of under-nutrition was found to be 54 (45%). Among 1-5 years aged children, 18 (30.5%) were underweight, 17 (28.8%) were stunted, 17 (28.8%) were wasted.
3.	Silva and Silva (2015)[34]	Rural area in Goa	782/ 6 months to 6 years/ Cross-sectional study	The overall prevalence of underweight, wasting, and stunting in the study population was found to be 33.4%, 24%, and 31.5%, respectively.
4.	Arjun and Kumar (2017)[4]	Tribal children in Kerala	469/ 3-6 years/ Descriptive cross-sectional study	The prevalence of underweight, stunting and wasting was 62%, 41% and 43% respectively.
5.	Usharani and Nandini (2018)[40]	Kalvarayan Hills of Villupuram district, Tamil Nadu	50/ below 5 years/ Cross-sectional study	Maximum numbers of children were underweighted (67.9%) were between 24 and 36 months, followed by 37-48 months (58.8%), and 49-60 months.
6.	Suklaand Borkar (2018)[37]	Rural areas Raigarh, Chhattisgarh	400/ 1-5 years/ observational cross-sectional study	Out of total, 36% were underweight, 35.5%were stunted and 28.5% were having wasting. More than 50% of girl children were underweight and stunted.
7.	Camala and Kamala (2018)[5]	Kethireddipalli village, Moinabad Mandal, Telangana	30/ under 5 years/ Descriptive cross-sectional study	According to WHO Z score, 3(10%) were having mild wasting, 5(16.66%) were having moderate and severe wasting respectively. 7(23.33%) under five children were having mild stunting and only three (5%) were having moderate and severe stunting respectively. 7(23.33%) under five children were underweight and 3(10%) were moderately underweight and 7(23.33%) were severely underweight.
8.	Senthilkumar *et al.* (2018)[33]	Tribal community of Coimbatore district, Tamil Nadu	206/ 0-5 years/ Cross-sectional study	Overall prevalence of malnutrition found to be 51%. These 51% (105) malnourished children consisted of 41.3% underweight, of which 11.2% were severely underweight. Prevalence of stunting was 32.5%, of which 6.3% were severely stunted. About 21.8% children were wasted and 6.8% were severely wasted among them.
9.	Roychoudhury *et al.* (2019)[31]	Slum of Kolkata, West Bengal	129/ under 5 years/ Observational cross-sectional study	According to standard anthropometric indices such as weight-for-age, and mid upper arm circumference, 17.8% were underweight, 9.3% were wasted, 16.3% were stunted and 14% were undernourished respectively.
10.	Sinha *et al.* (2019)[35]	Tribal villages of Bastar, Chhattisgarh	140/ under 5 years/ Community based cross-sectional study	As per the WHO categorization of anthropometric measurements 40.7 % children were found to be stunted 29. 3% found to have wasting and around 44.3% were found underweight.
11.	Vasudevan and Udayashankar (2019)[42]	Rural area of Pondicherry	224/ below 5 years/ Community based cross-sectional study	The prevalence of underweight, stunting and wasting in the study population was 18.3%, 31.6% and 20.1% respectively.
12.	Das *et al.* (2020)[9]	Hill Korwa Tribe of Jashpur district, Chhattisgarh	106/ 2-6 years/ Cross-sectional study	The age-sex combined overall prevalence of undernutrition of the studied population is 54.7%. Comparatively girls are more undernourished (62.2%) than boys (49.2%).
13.	Kumar *et al.*	Rural belt of	629/ under 5 years/	The magnitude of moderately and severely

	(2020)[19]	Southern Rajasthan	Cross-sectional descriptive study	underweight children was 32.63% and 7.49% in tribal communities. With respect to stunting and Body Mass Index was 64.37% and 63.47%.
14.	Samdarshi *et al.* (2020)[32]	Rural area in Haryana	1032/ 1-5 years/ Community based cross-sectional study	Our study results revealed 21.5% children as underweight, 30.2% children as stunted and 8.9% children as wasted according to WHO recommended indices. The prevalence of under-nutrition in studied children according to CIAF was found to be 43.7%.
15.	Chandra *et al.* (2021) [7]	Rural area in West Bengal	68/ under 5 years/ Community based cross-sectional study	A total of 30.8% children were stunted, 30.8% were wasted, and 14.7% were both stunted and wasted.
16.	Chowdhury and Gupta (2021) [8]	Urban slum of Mumbai, Maharashtra	88/ under 5 years/ Community based cross-sectional study	The prevalence of wasting was found in 48.9% of the population in this study, of which 25.0% had severe acute malnutrition and 23.9% had moderate acute malnutrition. Stunting was found in 39.7% of the population, of which 29.5% were moderately stunted and 10.2% were severely stunted.
17.	Naik and kumar(2021) [25]	Rural field practice area of Adichunchanagiri Karnataka	770/ 1-6 years/ Community based cross-sectional study	Overall prevalence of underweight, stunting and wasting was 37.4%, 36.82% and 22.52% respectively.
18.	Jayalakshmi and Kannan (2022) [17]	Low socioeconomic households of Kerala	477/ 6-60 months/ Cross-sectional study	The prevalence of stunting, underweight, and wasting among the study children were 25.6%, 24.4%, and 14.4%, respectively.
19.	Patel *et al.* (2022) [28]	Seloo and Deoli areas of Swangi, Wardha, Maharashtra	30/ 1-6 years/ Cross-sectional study	In Seloo, almost 56.6% of children are underweight. In Deoli, almost 50% of children are underweight. The overall prevalence of undernutrition in the study population was assessed, and severe undernutrition was found.
20.	Gupta *et al.* (2022) [15]	Rural area of Rohtak district, Haryana	600/ 1-5 years/ Cross-sectional study	Around 41.3% of the study participants had stunting as their nutritional status, while taking composite index of anthropometric failure (CIAF) for nutritional status into consideration, nearly 54.4% were undernourished.
21.	Nirmalson and vijayakarthikeyan (2022) [27]	Rural area of Southern India	330/ under five years/ Community based cross-sectional study	Around 16.4%, 26.4% and 32% of under 5 children were underweight, wasted and stunted respectively.

Associated factors of underweight, wasting and stunting

The results of this review revealed that the other factors which were associated with the underweight, wasting and stunting are age and sex of the child, family size, meal frequency, mother education, family income, presence of other infections and other nutritional deficiency diseases. Households facing limitations in social and economic developmentmost probably face issues in physical growth due to consumption of poor food, illness scenario, sanitation insufficiency, pitiable hygienic practice and inadequate safe water access. The economic status of households is one of the important factors and with improvement in economic status child nutrition status usually improves. Socioeconomic factors such as poverty, education, gender inequality and access to water and sanitation, are important determinants of health outcomes in many developing and underdeveloped countries. The relationship between the nutritional statuses of mothers and children shows the susceptibility of multiple members from poor households to be malnourished.

DISCUSSION

Child malnutrition is a wide spread public health problem having preschool children. India is one of the few countries in the world where poor nutritional status among preschool children is detrimental to their health outcome. India is home to more than three out of every ten stunted children worldwide. More than one third of the world's children who are wasted live in India **(Sukla and Borkar, 2018)**. Nutritional status indicators like wasting, stunting, low birth weights, breast feed availability and vitamin A deficiency are also still high in India compared to the USA and China **(Mahalakshmi and Padmaja, 2017).** Nutrition is the cornerstone of socioeconomic development. The nutritional problems are multifactorial with roots in the sectors of education, demography, agriculture and development. Poor and inadequate nutrition leads to malnutrition, morbidity and mortality among children in India **(Desai, 2018)**.

In the present study, a review was carried out, which, to our knowledge is first to highlightthe nutritional status of preschool children in various socio-economically disadvantaged areas of India. Based on the in-depth analysis it was found that the preschool children in these areas are suffering from various forms of malnutrition. Among these forms of malnutrition underweight, wasting and stunting were mostly studied by the scholars (table 1).The indicators of the nutritional status of children, viz. stunting, underweight and wasting show that there is growth failure in the study population **(Jayalakshmi and Kanan, 2022)**. The highest prevalence of undernutrition was found among those children who were practicing open defecation **(Das,*et al.*, 2020).**

Majority of studies in this review has associated poor nutritional status of preschool children with low socio-economic characteristics of the family. Wasting was found to be highly correlated with the age of the child and the age of the mother, whereas stunting was found to be highly correlated with the child, the age of the mother and complementary feeding **(Chowdhury and Gupta, 2021)**. Maternal education and care and infants and child feeding practices have a bearing on the nutritional status of the children **(Roychoudhury,*et al.*, 2019)**. Sociodemographic factors like total number of family members exceeding four, mother's educational status, father's educational status, mother's occupational status, socio-economic status and mother's nutritional status were found to be significantly associated with malnutrition **(Senthilkumar,*et al.*, 2018)**. The proportion of underweight children was found to be the highest in lower class, lowest in upper class and a statistically significant association between socio-economic class and nutritional status was found **(Silva and Silva, 2015)**.

In order to overcome this challenge of underweight, wasting and stunting and overall malnutrition among the children including socio-economically disadvantaged preschool children Government of India has launched ICDS programme on 2nd October 1975 with an aim to improve the nutritional status of preschool children. Today ICDS represents one of the world's largest and most unique programmes for early childhood development, which is better known as Anganwadi's **(Bhandari, *et al.*, 2020)**. The objective of this programme was to provide immunization, health care, supplementary nutrition and growth monitoring to preschool children **(Kumari and Thomas, 2013)**. Despite this massive programme nutritional status is still low in India especially in socio-economically disadvantaged areas and among preschool children. Further, there is a need to examine the effectiveness of several government policies aimed to reduce the burden of undernutrition. For example, sufficient studies are unavailable to inspect the impact of Poshan Abhiyan (India's flagship programme to reduce nutritional deficiency among children, adolescent girls and boys, pregnant and lactating mothers), National Food Security Mission and Mid-Day Meal programme as these are particularly aimed to decrease the burden of malnutrition among children and adolescent. Moreover, community specific programme and their participation is needed to enhance nutritional deficiency. For active implementation of this kind of programme required properly trained manpower (like ASHA, Anganwadi workers), appropriate infrastructure, regular food supply in tribal areas and development of logistic arrangement.

According to research done dietary inadequacies not only damage children's physical and mental development, but also cause the deaths of 14 million children worldwide**(Sing, *et al.*, 2022)**. Children from low socio-economic class were significantly malnourished, and similar findings were reported by majority of studies. Malnutrition was observed to be considerably greater in children with illiterate moms in our study.Numerous more research also demonstrate the connection between low parental education and illiteracy. Higher knowledge of literate parents and higher income of families with higher education are two interconnected factors.Income is obviously one of the most essential variables in giving access to health care, education, and nutrition facilities, and thus one of the reasons that precipitates malnutrition.Furthermore, knowledge combined with adequate money can enhance the nutritional status of the family, although many illiterate parents are unable to do so.Finally, reflections of poor nutritional status were also observed through high prevalence of protein energy malnutrition, vitamin A and B complex, and other nutritional deficiencies.

CONCLUSION

This study revealed that more than large number ofpreschoolchildren are still underweight, stunted or wasted in India. The present study identified several risk factors associated with underweight, stunting and wasting of preschool children in the country. Childhoodunderweights, stunting and wasting are consistently associated with male sex, age, family size and other socio-economic characteristics.The study found that children below 5 years from low socio-economic strata had a higher risk of being undernourished and confirmed the vicious cycle of acute illness and undernutrition. The children below five years are most vulnerable to under nutrition and its adverse effects. Most of the studies have showed that health status of preschool children is at sub optimal level. This stage of life is an intense anabolic phase when all nutritional requirements are increasing. This stage of life also determines their life time health, strength and intellectual vitality. From literature, it is found that the lownutritional status of preschool children is because of low socioeconomic status, pattern of father's occupation and low education of parents.

Nutrition, health education and good access and utilization of healthcare can be very effective interventions which could result in substantial reduction in undernutrition prevalent in socio-economically disadvantaged preschool children. Nutrition education should be imparted to mothers to improve quality of food provided to the children. Though the ICDS scheme is taking measures to combat this problem, India's progress in reducing child malnutrition has been slow. However, continuous monitoring and surveillance of Anganwadi centres could identify underlying factors of malnutrition, thus help in the planning of preventive strategies.

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