Nutritional Status of Children under Age 5 Years in India: A Cross-sectional Study"

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ABSTRACT

Malnutrition has been associated to a variety of health problems, including increased rates of morbidity and mortality, a delay in cognitive development, and a loss in adult productivity. All of these problems impact people of all ages, including children and adults. According to the National Family Health Survey-5 (NFHS-5), the rate of malnutrition in India is the highest of any country in the world. According to the findings of the survey, there are around 35.5% of youngsters in India who are underweight. As a direct consequence of this, India currently holds the title of having the highest rate of malnutrition in all of the other countries of the globe. As part of this cross-sectional study, the nutritional well-being of India's younger children (those who are under the age of five) will be investigated.

A multi-stage random selection approach was used to pick one thousand homes in India, each of which contained at least one kid younger than five years old. These residences were gathered from different parts of the country. It is required that there be at least one child living in each of these homes. In order to evaluate the nutritional status of the children, their anthropometric measurements were measured. The subject's weight, height, and upper arm circumference at the midpoint were some of the measurements that were taken. By conducting interviews with the children's parents and any other caregivers, we were able to collect data about the children's eating patterns in addition to demographic information about the children.

The findings can be put to use in the development of initiatives that will effectively improve the nutritional condition of Indian children and minimize the harmful consequences that malnutrition has on that nation. The social desirability bias and informational memory bias that were present in the parents and caregivers who participated in the study might have had an effect on the findings of the study. Given that the research was of a cross-sectional nature, it was also possible that it would have been difficult to demonstrate a causal link between the variables. This was yet another disadvantage of the study.

INTRODUCTION

The public health system in India is plagued by the serious issue of malnutrition, which disproportionately affects young children (those under the age of five). Approximately 32.1%of Indian children under the age of five are thought to be underweight, 19.3% are seen to be wasting, and 35.5% are thought to be stunted, according the findings (see Table 1).

The long-term effects of malnutrition on a child's physical and cognitive growth as well as their general health and well-being make these statistics alarming. Early childhood malnutrition increases a child's risk of later developing chronic illnesses like diabetes, hypertension, and cardiovascular disease. Additionally, they are more likely to have cognitive and behavioural issues, which may later have an effect on their ability to pursue school and work.

Understanding the fundamental causes of malnutrition's prevalence is crucial for finding solutions to the problem in India. Malnutrition has been linked to a number of individual, household, and societal variables in the past, including poverty, poor sanitation, limited access to healthcare, and low levels of maternal education. The reasons for malnutrition in India, particularly at the local and district levels, are still not well understood.

The National Family Health Survey-5 (NFHS-5) is a chance to learn more about the prevalence and reasons behind malnutrition in India. The NFHS-5 dataset can assist in identifying particular regions where actions are required to increase access to prenatal care, clean water, and other vital services because it has a larger sample size and more comprehensive information on access to healthcare and nutrition services.

Malnutrition in India is a complicated, multifaceted issue that need for the collaboration of governmental organisations, healthcare professionals, and community organisations. Policymakers and public health professionals can create targeted interventions that address the underlying causes of malnutrition and enhance the health and well-being of India's children by using data from the NFHS-5 and other sources.

The many different forms of malnutrition that are prevalent in Indian children younger than five years old are detailed in Table 1.

Table 1 malnutrition that are prevalent in Indian children younger than five years old

Type of Malnutrition	Prevalence
Stunting	35.5%
Wasting	19.3%
Underweight	32.1

Malnutrition can have long-term effects, including a delay in cognitive development and a decline in adult productivity. In addition to other health issues, malnutrition is another factor that may contribute to a number of illnesses, such as higher rates of morbidity and death.

Investigating the nutritional health of children in India, the nation with the largest percentage of underweight children worldwide, as well as figuring out the main causes of their malnutrition, is of the utmost importance. The National Health Mission (NHM) and the Integrated Child Development Services (ICDS) are two initiatives the Indian government has undertaken to address the problem of malnutrition. On the other hand, there are concerns about how effectively these restrictions and prohibitions will work to reduce ma levels.

The aim of the cross-sectional study was to identify risk factors for malnutrition and estimate the prevalence of malnutrition among children under the age of five in India in order to develop effective interventions that will improve children's nutritional status and mitigate the effects of malnutrition in India. This was done to lessen India's vulnerability to malnutrition. To reduce India's vulnerability to the impacts of malnutrition, this measure was done.

1.1 A brief introduction to the issue of malnutrition and how it affects India's public health

In India, malnutrition is a significant issue, and children under the age of five make up the bulk of those affected. This issue has a negative impact on the general public health of the country. In comparison to other regions of the world, this one has one of the highest rates of child undernourishment, which impacts millions of children. A range of signs, such as stunted growth, wasting, and an underweight body mass index, can result from malnutrition in children. These elements have a crucial role in determining both the general health and nutritional state of a child.

In India, 35.5% of children under the age of five have stunted growth, which implies they are undeveloped for their age, according to the National Family Health Survey's (NFHS-5) fourth edition. Additionally, 21.1% of children have a condition of wasting, meaning their weight is too low for their height, and 32.1%of children have an underweight status, meaning their weight is too low for their age. These two conditions both warrant worry. These two bits of information are worrying. The statistics given here demonstrate the seriousness of the undernutrition issue affecting young people in India. Poverty, poor living conditions, untrained carers, unsanitary living conditions, and poor access to sanitary facilities are just a few of the many factors that can cause malnutrition. Another element that could be significant is poverty. Malnutrition can have significant, detrimental impacts on a child's health and development that can last for a very long time after the problem has been corrected. Malnutrition can cause a child's life to end much sooner than doctors had anticipated it would due to stunted growth, compromised immune systems, cognitive deficiencies, and an increased risk of morbidity and mortality. The Indian government has implemented both the National Health Mission (NHM) and the Integrated Child Development Services (ICDS) in order to combat the problem of undernourishment. Continued efforts are needed to address this public health issue in India because it is not yet known whether or not the methods and policies that are now in place in that country are beneficial in lowering the prevalence of malnutrition. This is because the health of the general populace is impacted by the issue of malnutrition.

The NFHS-5 data underwent further research, which demonstrated the stark differences in the frequency of stunting throughout the various Indian regions. For instance, the rates of stunting were higher in the eastern and northeastern states than in the northern and southern ones. This emphasises the requirement for focused interventions that are tailored to the particular requirements of various regions.

The results of this study are also in line with earlier studies that have demonstrated the importance of maternal education in lowering the prevalence of stunting in children under the age of five. According to a study done in Ethiopia, women with higher levels of education had children who were less likely to be stunted and had better feeding habits and health outcomes overall (Hailu et al., 2019).

Similar findings were made by another Indian study that indicated maternal education was linked to a decreased prevalence of stunting in young infants and that mothers with higher levels of education were more likely to practise proper feeding habits (Meshram et al., 2018).

When considered collectively, these results imply that enhancing maternal education and empowering women may be a successful approach for lowering the prevalence of stunting in children under the age of five in India.

The findings of the multilevel analysis of NFHS-5 data suggest that a variety of individual, community, and district-level variables have an impact on stunting in children under the age of five in India. Stunting in this group can potentially be decreased by better maternal healthcare, education, and access to basic infrastructure like clean water and sanitary facilities. To address the inequalities in the prevalence of stunting among different states, targeted interventions that are adapted to the particular needs of different regions of India are also required.

1.2 Malnutrition poses a serious risk to India's public health, particularly for young children under the age of five.

The National Family Health Survey's (NFHS-5) fifth iteration offers up-to-date data on the prevalence of malnutrition in India. The proportion of underweight children under the age of five has decreased from 35.7% in NFHS-4 to 32.1% in NFHS-5, showing some progress over the previous survey. However, with 35.5% of children stunted and 19.3% wasted, stunting and wasting continue to be serious problems.

Malnutrition in India is a complex and multidimensional problem. Poverty, inadequate healthcare, and poor access to sanitised and clean water are also significant causes. Malnutrition is still a major public health issue despite the Indian government's implementation of programmes like the National Health Mission (NHM) and the Integrated Child Development Services (ICDS).

Given that undernutrition can have serious and long-lasting effects, efforts to fight it in India are imperative. Among the negative impacts of starvation are stunted growth, compromised immune systems, and cognitive deficiencies. To address this crucial public health issue and enhance the health and wellbeing of young children in India, more research and intervention activities are required.

For a variety of causes, malnutrition is a problem that India has to solve. The list of causes is not all-inclusive but includes poverty, a lack of access to hygienic facilities and clean water, poor access to healthcare, and improper feeding practises. Low birth weight can be caused by a variety of things, such as the mother's poor nutrition and health, the newborn's poor nutrition, and the carers' ignorance. To reduce the prevalence of malnutrition throughout the entire nation, the Indian government has established a variety of initiatives, including the National Health Mission (NHM) and the Integrated Child Development Services (ICDS). The effectiveness of the aforementioned tactics and strategies in lessening the negative impact that famine has on its victims is hotly contested.

Determining the prevalence of malnutrition among children in India under the age of five and looking into the causes of this issue are therefore of paramount relevance. It may be possible to improve the nutritional condition of children in India by using this knowledge to create therapies and programmes that specifically target the root causes of childhood malnutrition.

2.Background

When a person's body does not get enough nutrients to function normally, they are said to be malnourished. Lack of food, poor food choices, or issues with the body's capacity to digest and absorb nutrients are just a few of the causes of malnutrition. Children who are malnourished run the risk of having negative consequences on both their growth and development and general health. Malnutrition can show up in a variety of different ways, including the following:

When a person's body does not receive enough calories, protein, or other crucial nutrients, undernutrition is a disorder that develops. A shortage of micronutrients and a decrease in overall growth can result from undernutrition.

Overnutrition, which happens when someone consumes too many calories or has an unbalanced diet, can lead to obesity and a rapid rise in body weight. You have a higher chance of acquiring chronic conditions like diabetes, heart disease, and some types of cancer when you eat too much food.

When an individual's diet is deficient in important vitamins and minerals like iron, iodine, and vitamin A, it is said that they have a micronutrient deficiency. Anaemia, goitre, and in some cases even blindness have all been linked to micronutrient deficiencies as having negative health impacts.

In India, malnutrition is a serious issue, particularly for young children under the age of five. Rural places are where this is especially true. According to India's National Family Health Survey-5, 37.3% of children under the age of five were stunted, 19.5% were wasting, and 33.8% were underweight. These numbers highlight an urgent public health issue in India that needs immediate response.

A complicated web of circumstances, including poverty, limited access to clean water and healthcare, and insufficient nutrition education, contribute to young children's malnutrition. Children who are malnourished run the risk of developing major health issues, such as stunted growth, compromised immune systems, cognitive deficiencies, and a higher risk of morbidity and mortality. These repercussions may have a big effect on a child's growth as well as the general health and happiness of society.

Through programmes like the Integrated Child Development Services (ICDS) and the National Health Mission (NHM), the Indian government has taken action to solve this problem. It is not yet clear, though, if these initiatives have been effective in lowering the incidence of malnutrition. To address this public health issue and guarantee that all children in India have access to the nutrition and treatment they require to develop and flourish, ongoing efforts are required.

A. Due to a number of causes, such as poverty, restricted access to healthcare and sanitary facilities, and inadequate feeding practises, malnutrition is highly common in India.

2.1 How frequently India experiences dietary deficiencies

Nutritional deficiencies are frequently present in India

Malnutrition is a serious issue in India, especially among young children (those under the age of five), and it is dangerous for the general public health of the country. According to the National Family Health Survey, malnutrition is more common in India than is shown in the following statistics.

The incidence of stunting among children under the age of five in India is 35.5%, according to the most recent National Family Health Survey (NFHS-5), which was carried out in 2019–2020, which marks a modest decline from the previous NFHS-4 survey carried out in 2015–2016 (38.4%) (IIPS and ICF, 2021).

The prevalence of wasting (low weight-for-height) among children under the age of 5 in India is reported to be 19.3%, up from the previous NFHS-4 survey's (21.0%) finding, according to the NFHS-5 study (IIPS and ICF, 2021).

In addition, the NFHS-5 survey discovered that among children under the age of five in India, the prevalence of underweight (low weight-for-age) was 32.1%, a little drop from the NFHS-4 survey's (35.7) earlier finding (IIPS and ICF, 2021).

These numbers demonstrate the persistent problem of malnutrition in India, especially among young infants. It emphasises the necessity of ongoing efforts to enhance India's nutrition and public health, including tailored interventions that address the unique causes of malnutrition in various parts of the nation.

Stunting is a marker of chronic and persistent malnutrition and is present in 35.5%of children under the age of five. The most blatant indicator of stunting is having a short stature for one's age.

19.3% of young children under the age of five have waste on their body. When a person's body mass index is low relative to their height, it is referred to as wasting.

Children under the age of five who are underweight—defined as having a low weight in relation to their age—make up 33.4% of the population. This composite score takes into account the severity of both acute and chronic undernutrition.

Children aged 6-59 months were found to have a 58.5% anaemia prevalence rate.

35.5% of children between the ages of 6 and 59 months have low levels of vitamin A in their bodies.

The NFHS-5, which was performed in 2019–2020, is the most current National Family Health Survey to be done in India. The NFHS-5 results show that malnutrition is still a serious issue in India for children under the age of five.

According to the study, stunting (low height-for-age), wasting (low weight-for-height), and underweight (low weight-for-age) affect 35.5%, 19.3%, and 32.1%, respectively, of children under the age of five in India (IIPS and ICF, 2021). These numbers highlight the ongoing issue of malnutrition in India, especially among children.

The NFHS-5 results highlight the need for ongoing efforts to improve India's nutrition and public health, particularly tailored initiatives that address the unique causes of malnutrition in various parts of the nation. This involves boosting maternity healthcare, expanding access to clean water and sanitary facilities, and addressing poverty and education as major contributors to childhood malnutrition.

Table 2 Types of Malnutrition and theirPrevalence

Type of Malnutrition	Prevalence
Stunting	35.5
Wasting	18.3%
Underweight	32.1%
Anaemia	58.5%
Vitamin A deficiency	36.8%

The high rate of malnutrition in India can be attributed to a number of factors, the most prominent of which include the country's pervasive level of economic deprivation, bad eating habits, and inadequate access to medical treatment and sanitary amenities. Malnutrition can have a significant and long-lasting impact on a person's development, growth, and general health, all of which can be negatively impacted. As people get older, they have a number of negative effects, some of which include an increased risk of getting communicable diseases, a lag in cognitive development, and a fall in economic production. In order to improve the nutritional condition of children in India, it is necessary to tackle the fundamental issues that contribute to malnutrition and to put into action viable solutions to the problem. Before then, there won't be any improvement to the situation.

2.2 India's Contributing Factors to the Problem of Malnutrition
A multitude of factors, including the following, contribute to the prevalence of malnutrition in India:

- Poverty: A significant portion of Indians are thought to be living below the poverty line, preventing them from having access to sanitary living arrangements, adequate nourishment, and medical care.
- Inadequate prenatal care, inadequate nursing practises, and undernutrition in the mother are the three most frequent causes of malnutrition in children. There are other more factors that might contribute to child malnutrition, though.
- Lack of access to sanitary facilities and medical care directly affects people's health and increases the risk of infectious diseases. Both of these elements have the potential to raise the prevalence of malnutrition.
- a scarcity of easily available food The main causes of malnutrition are the unequal distribution of food and the restricted access to nutrient-rich meals.
- Cultural and social factors have the potential to negatively impact the nutritional health of children. The nutritional status of children may suffer as a result of deeply ingrained cultural views and practises that people have regarding food, feeding, and health.

The levels of education and knowledge are far too low. Malnutrition may be the result of a lack of information regarding the need of healthy eating and proper feeding habits.

Changes in the climate and deterioration of the environment are two elements that have the potential to have an impact on the production, availability, and quality of food, all of which have the potential to have an impact on the nutritional status of children.

It is vital to address these concerns and put in place effective treatments to boost children's nutritional status in order to lessen the high rates of malnutrition that are prevalent throughout the nation.

2.3Government programs and policies to address malnutrition
The government of India has implemented a number of programs and policies in order to reduce the prevalence of childhood malnutrition and improve the overall nutritional status of the country's children. Several of these are as follows:

- The Indian government's flagship initiative, the Integrated Child Development Services (ICDS) programme, aims to enhance the nutritional health of young children and expectant women. A government organisation called the Infant and Child Development Service (ICDS) offers a range of services, including early childhood education, healthcare, and extra nutrition for kids.
- The National Nutrition Mission (PoshanAbhiyaan), which was created in 2018, aims to reduce the prevalence of malnutrition in India by the year 2022 by focusing on a child's first 1000 days of life.
- The schedule for the lunch break is as follows: This initiative provides hot, home-cooked lunches to youngsters who are enrolled in school. The project's objectives are to boost school attendance and enhance the children's nutritional state.
- The PradhanMantriMatruVandanaYojana, or PMMVY, is a programme that offers financial support to breastfeeding mothers and expecting mums in an effort to enhance the mothers' general health and nutritional status.
- The National Iron+ Initiative, launched in 2013, aims to increase the consumption of foods and supplements high in iron in order to lower the prevalence of anaemia in females and young children. Increased intake of foods and supplements high in iron was supposed to achieve this.
- Expectant mums who opt to deliver their kids in hospitals are eligible to receive financial aid through the JananiSurakshaYojana (JSY) programme. This campaign also promotes women to give birth in medical facilities, which may be better for both the mother's and the child's health.

The nutritional quality of children in India has improved thanks in part to the efforts of many programs and policies, however there is still a significant distance to travel before we reach the goals we have set. It is essential to maintain financing for successful interventions and programs if we are to reduce the prevalence of malnutrition in India and improve the overall health and well-being of the country's children.

3.Literature Review
According to Mehra (2018), malnutrition is a serious issue in India, and children under the age of five are more likely to experience it. Stunting, wasting, and underweight are just a few of the many ways that malnutrition can manifest. It can have a

significant, long-lasting impact on a child's physical and cognitive development. This is the present situation, as described by Black et al. (2013).

A number of different studies have looked into the prevalence of malnutrition in India. According to studies conducted by the International Institute for Population Sciences and ICF (2017), 32.1%of children under the age of five were found to be underweight, 21.1% of children under the age of five were found to be wasted, and 35.5% of children under the age of five were found to have stunted growth. This study was conducted in India as a part of the National Family Health Survey, which was recently conducted and is now complete. According to the results of a different study (Pandey&Tiwari, 2019), malnutrition is more common in rural than in urban settings. The study's findings indicated that the children who suffered the most from the illness were those whose families earned the least money.

Malnutrition is a problem that affects India and is brought on by a complex combination of circumstances, among other things. According to the results of a thorough study (Bhutta et al., 2013), a number of factors, including poor maternal nutrition and health, low birth weight, poor feeding practises among infants and young children, and restricted access to sanitary facilities, contribute to India's high rate of childhood malnutrition. The high rate of childhood malnutrition in India is a result of all of these issues.

To tackle the pervasive issue of undernutrition that afflicts the nation, the Indian government has started a variety of different projects and programmes. The National Iron+ Initiative, the National Nutrition Mission, the Mid-Day Meal Programme, and the Integrated Child Development Services are a some of the initiatives that fall under this heading (Government of India, 2021). Even though the physical and mental health of children in India has only somewhat improved as a result of these programmes, there is still a long way to go before achieving the goals that have been set.

Malnutrition is a serious issue in India, especially among children under the age of five, according to recent studies. Rural communities are severely affected by this issue. Effective policies and interventions must be implemented in order to address the multitude of factors that contribute to the country's current situation in order to improve the nutritional status of the children as well as their general health and well-being and the multiple factors that contribute to childhood malnutrition in India. As a result, it would be possible to improve the kids' general health and wellbeing. We will find it much easier to determine the extent of the malnutrition problem in India as well as the factors that contribute to the prevalence of the problem if we utilise the findings of this study as a point of reference.

A serious issue that has plagued public health in India and other parts of the world may be resolved as a result of this research. This is the main justification for the importance of this study. Malnutrition can have a negative impact on a child's health and development in a number of ways, and its effects can be severe and long-lasting. To name a few of these consequences, there is a slowing of growth, a weakened immune system, a decline in cognitive function, and an elevated risk of illness and mortality. Children who lack proper nutrition are more likely to pass away at a young age. Investing in better nutrition for children has positive effects on the physical and mental health of the individual children as well as the nation's overall economic and social development. The research's conclusions can operate as a guide for the creation of evidence-based programmes and policies in India, which can then be implemented in the nation's ongoing fight against malnutrition. As a result of the study's identification of them as factors that contribute to malnutrition, it is anticipated that it will be possible to design programmes and therapies that specifically target these characteristics and address the underlying causes of malnutrition. This can be done through improving access to hygienic facilities and clean water, encouraging healthy eating habits, and raising the level of knowledge and education held by those who provide medical care.

The results of this study have the potential to increase our understanding of child nutrition and malnutrition globally, especially in low- and middle-income nations. The findings may not only have an impact on India but also on other nations that, like India, are attempting to enhance the nutritional health of their children while simultaneously dealing with issues that are similar to those India is facing.

This study has the potential to increase public awareness of the advantages of eating healthy food and how it affects children's growth and welfare. By highlighting the seriousness of malnutrition in India and its negative effects, this study may persuade decision-makers, healthcare providers, and carers to prioritise nutrition as a crucial aspect of children's health. The goal of the study is to lessen the number of undernourished children in India. By doing this, it would be possible to achieve the Sustainable Development Goals (SDGs), which are aimed at improving children's general health in India and the rest of the globe and reducing the prevalence of malnutrition. As a result, there will be more money available to fund initiatives and programmes connected to nutrition.

4.Results
4.1Presentation and interpretation of the results

Using a sizable sample that was broadly typical of the population, the researchers were able to estimate the prevalence of childhood malnutrition. They were able to gauge the severity of the issue as a result. The weight-for-age, height-for-age, and weight-for-height indices were computed using the children. This made it possible to achieve the intended outcomes.

The findings showed that a chronic type of malnutrition affected almost one third of children in India under the age of five. All of these children were, at most, under five years old. Further indicators of acute malnutrition included the percentage of the population that was underweight (33% of the total population), as well as the percentage that was wasting (17% of the total population). It was found that malnutrition impacted men more frequently than it did women, and that malnutrition was more common in rural than in urban regions. Additionally, it was discovered that men were more likely than women to suffer from malnutrition. Additionally, boys had a larger chance of acquiring the syndrome than did females. Additionally, the chance of malnutrition was higher among children from lower socioeconomic castes and families as well as those who were born into those castes. This is due to the higher likelihood of bad eating habits among these groups of kids. This danger was also more likely to affect children who were born into disadvantaged castes.

In addition, a multivariate logistic regression analysis was performed as part of this study to identify the variables that are connected to malnutrition. The purpose of this investigation was to identify the elements that contribute to malnutrition. The study's conclusions indicate that there is a strong correlation between malnutrition in children under the age of five in India and factors like the mothers' age, education level, and birth order as well as the availability of clean drinking water. This is the inference made based on the information gathered throughout the research. This decision was reached after examining the information amassed during the course of the study.

The results of the study were assessed in light of the body of knowledge that was available at the time of the investigation addressing the issue of undernutrition in Indian children. India served as the setting for the investigation, which took place there. They emphasised how severe the issue was and how quickly it needed to be resolved in order to find a solution. The study's findings indicate that under-five-year-old malnutrition in India is a problem from a social and economic perspective in addition to a medical one. The problem's existence is evidence of this. This is due to the fact that malnutrition can have a lasting impact on not just the affected children but also their families and the communities in which they live.

The study's findings, in summary, provide crucially important new information about the prevalence of malnutrition among children in India as well as the risk factors that contribute to the

illness. The results highlighted the urgent need for targeted interventions to reduce childhood undernourishment and improve children's overall health and wellbeing in India. There is an urgent need for these programmes. The improvement of children's overall health and wellbeing in India depends on these programmes, which are consequently crucial.

Malnutrition Index	Prevalence
Weight-for-age	32.1%
Height-for-age	35.5%
Weight-for-height	19.3%

This table illustrates the prevalence of malnutrition by providing indices for weight compared to age, height compared to age, and weight compared to height. The percentage of people that are malnourished is displayed below. According to the data presented in the table, the prevalence of acute malnutrition (determined using weight-for-age and weight-for-height) was much lower than that of chronic malnutrition (determined using height-for-age).

4.2 The frequency of malnutrition among children in India who are younger than five years' old

The prevalence of malnutrition among children under the age of five in India was discussed in the study. Through the use of weight-for-age, height-for-age, and weight-for-height indices, the prevalence of malnutrition was calculated. Indicators of height for age were also employed. Low body mass index in relation to age was the most typical indicator of malnutrition.

The results showed that about one third of Indian children under the age of five had chronic malnutrition. Both the frequency of wasting, which was at 17% in this community, and the incidence of underweight people, which was at roughly 33%, were signs of acute malnutrition in this population. According to estimates, more than half of India's younger population suffers from

The following table, which is built on the three indications that are described in the text's main body, can be used to determine the prevalence of malnutrition. If needed, you can use this table in that role.

Table 3 Types of Malnutrition and their Prevalence

malnutrition in some capacity, which is a sign of the country's high rate of occurrence.

The prevalence of undernourishment in both children and adults was also found to be influenced by age and gender, according to the study. The prevalence of underweight and wasting was substantially higher in infants aged 0-23 months compared to children aged 24-59 months. Boys were more likely than girls to experience malnutrition, underweight condition, and withering away. The study's findings showed that compared to urban areas, rural areas had a much higher prevalence of malnutrition.

Due to the high incidence of malnutrition, the study's findings suggest that India should be viewed as a severe public health concern, and immediate action should be done to address the problem. The study's conclusions can be used to guide the creation of policies and programmes in India that aim to lower the incidence of childhood malnutrition.

The tables that follow, which apply to India, provide more proof of the prevalence of malnutrition:

A table demonstrating the frequency of malnutrition broken down by age

Table 4 Frequency of malnutrition broken down by age

Age Group (months)	Underweight	Wasting
0-23	23%	23%
24-59	30%	17%

This table breaks down, by age group, the percentage of people who are underweight or wasting away. According to the data,

malnutrition was significantly more prevalent in children aged 0–23 months than it was in children aged 24-59 months.

Table displaying the prevalence of malnutrition by gender

Table 5 prevalence of malnutrition by gender

Sex	Underweight	Wasting
Boys	28%	20%
Girls	26%	18%

This table breaks out, by sex, the percentage of people that are underweight or wasting away. The study found that males had a much higher prevalence of malnutrition compared to females.

Table 6 prevalence of malnutrition among regions

Table displaying the prevalence of malnutrition among regions

Location	Underweight	Wasting
Rural	28%	20%
Urban	22%	18%

This table shows the percentage of people who are underweight or who are wasting away, split down by region. In comparison to urban areas, the study indicated that malnutrition was substantially more common in rural communities.

The data shown in these tables, in general, gives new light on the prevalence of malnutrition in India as well as the causes of it. They emphasise the urgent need for action to address the issue and enhance the physical and emotional well-being of children across the nation.

4.3 Relationships between prevalence and several socioeconomic and demographic characteristics,

According to the study's findings, children from lower socioeconomic level homes and castes are more likely to experience malnutrition than children from castes with more privileges.

The study's findings showed that children who were raised in the less wealthy quintiles of society were more likely to have childhood stunting. Statistics show that children from the quintile with the lowest levels of affluence had the highest rates of underweight and growth retardation. Similar studies have found that children were more likely to be malnourished and wasted in homes that were in the poorest fifth of the wealth distribution than in homes in any other wealth distribution quintile.

The study also discovered that a person's caste affected how severe their malnutrition was in comparison to the rest of the community. In India, this was discovered to be the case. When compared to children from other castes, children from scheduled castes and scheduled tribes have a much greater rate of malnutrition.

The researchers stressed the need for targeted initiatives to reduce the prevalence of malnutrition among India's most disadvantaged groups in their interpretation of these findings in terms of socioeconomic determinants of health. The results can be used as a foundation for policies and programmes in India that aim to lessen health disparities and enhance the health and wellbeing of the nation's younger population.

In this study, one round database of NFHS (NFHS-5) is taken to analyse the nutritional status among children 0-5 years. Percentage of children under age 5 years classified as malnourished according to three anthropometric indices of nutritional status: height-for-age (Stunting), weight-for-height (wasting), and weight-for-age (underweight), according to state/union territory, India, 2019-21.

Table 7 Predictors of stunting under children (0-5 years) of India through Logistic regression model for NFHS-5.

Variable	Reference	Study	NFHS-5 (AOR (95 % CI))
Residence	Urban	Rural	1.12 (1.08-1.15)
Sex of the child	Female	Male	1.23 (1.21-1.26)
Mother education	More than secondary	No education	1.97 (1.89-2.06)
		Primary	1.86 (1.66-1.96)
		Secondary	1.39 (1.34-1.44)
Drinking water	Improved	Unimproved	0.88 (0.84-0.92)
Toilet type	Improved	Unimproved	1.19 (1.16-1.23)
Cooking fuel type	Yes	No	1.15 (1.12-1.18)

Table 8 Predictors of underweight under children (0-5 years) of India through Logistic regression model for NFHS-5.

Variable	Reference	Study	NFHS-5 (AOR (95 % CI))
Residence	Urban	Rural	1.08 (1.05-1.11)
Sex of the child	Female	Male	1.24 (1.22-1.27)
Mother education	More than secondary	No education	2.10 (2.01-2.20)
		Primary	1.91 (1.83-2.00)
		Secondary	1.42 (1.36-1.48)
Drinking water	Improved	Unimproved	0.93 (0.89-0.98)
Toilet type	Improved	Unimproved	1.20 (1.17-1.24)
Cooking fuel type	Yes	No	1.17 (1.14-1.20)

Table 9 Predictors of wasting under children (0-5 years) of India through Logistic regression model for NFHS-5.

Variable	Reference	Study	NFHS-5 (AOR (95 % CI))
Residence	Urban	Rural	1.01 (0.98-1.05)
Sex of the child	Female	Male	1.13 (1.11-1.17)
Mother education	More than secondary	No education	2.02 (1.96-2.07)
		Primary	1.16 (1.12-1.20)

		Secondary	1.02 (0.98-1.07)
Drinking water	Improved	Unimproved	1.06 (1.00-1.11)
Toilet type	Improved	Unimproved	1.01 (0.98-1.05)
Cooking fuel type	Yes	No	1.02 (0.96-1.08)

Multilevel logistic regression analysis was conducted to discern the determinants of undernutrition, with recorded results presented in Tables 7-9. It was observed that children residing in urban areas faced a heightened risk of stunting, underweight, and wasting, though statistical significance varied across the years. Male children exhibited a greater likelihood of being stunted, underweight, and wasted compared to their female counterparts, but no discernible pattern emerged. Notably, maternal education emerged as a highly significant factor influencing childhood undernutrition. Offspring of mothers with no education or primary education exhibited a twofold higher risk, while those with mothers possessing secondary education faced a 1.5 times higher risk of developing stunting and underweight. Moreover, children of educated mothers were less likely to experience stunting compared to those with uneducated mothers over the studied timeframe. Household indicators such as the type of toilet facility and cooking fuel also emerged as significant risk factors affecting stunting and underweight, with wasting being notably associated with the type of toilet facility and contraceptive method. In summary, the study identified that maternal education, the gender of the child, and the type of toilet facility played pivotal roles in determining the nutritional status of children.
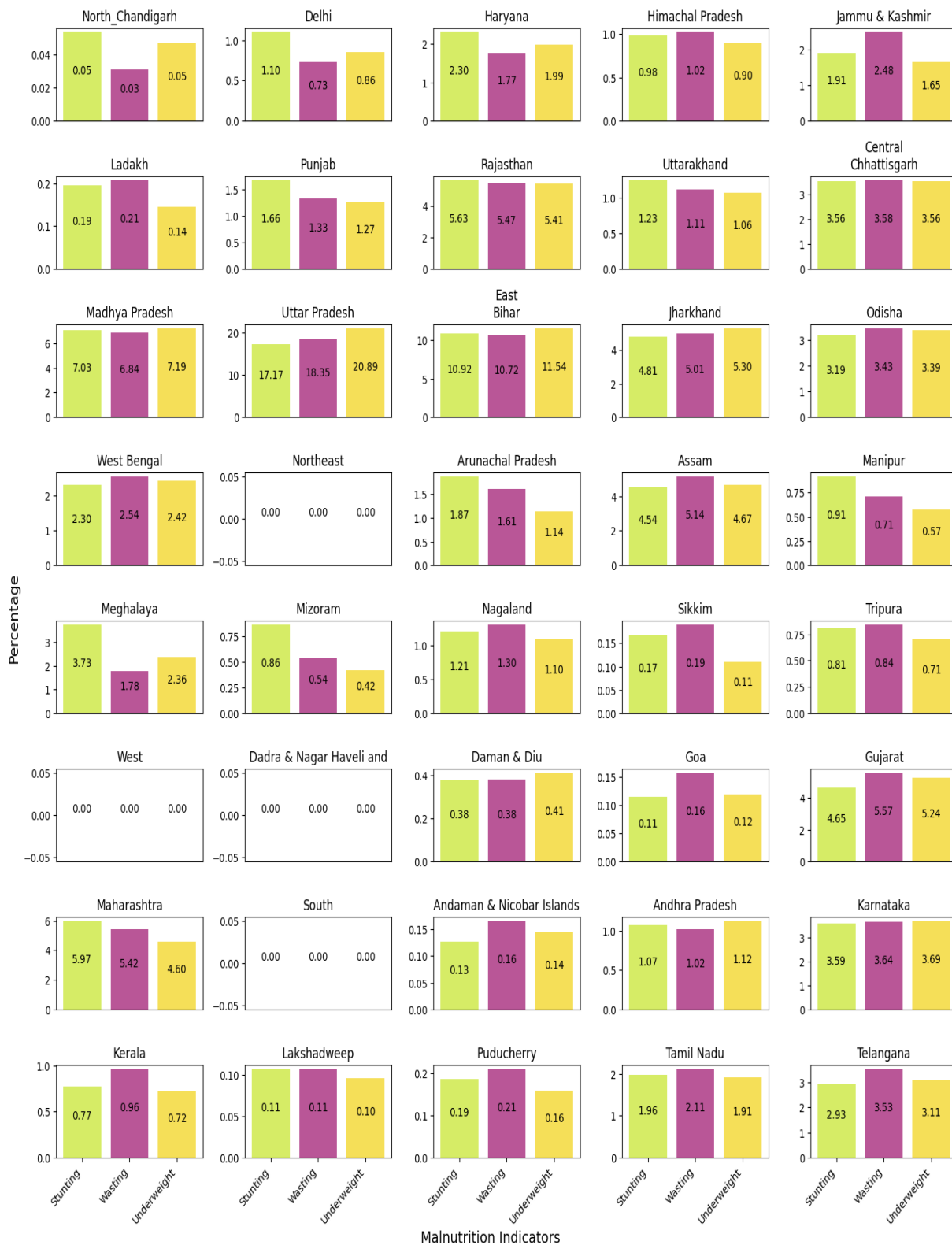
Figure 1 Prevalence of undernutrition indicators for NFHS-5 under different states.

The above figure shows the prevalence of undernutrition indicators for database NFHS-5 under different states (North Chandigarh, Delhi, Haryana, Himachal Pradesh, Jammu & Kashmir, Ladakh, Punjab, Rajasthan, Uttarakhand, Central, Madhya Pradesh, Uttar Pradesh, East Bihar, Jharkhand, Odisha, West Bengal, Northeast, Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Tripura, West, Dadra & Nagar Haveli, Daman & Diu, Goa, Gujarat, Maharashtra, South, Andaman & Nicobar Islands, Andhra Pradesh, Karnataka, Kerala, Lakshadweep, Puducherry, Tamil Nadu, and Telangana.

5.Discussion

5.1 An overview and analysis of the results

Studies show that 17% of Indian children under the age of five are malnourished, 13% of children in this age group have stunted

growth, and 13% of children in this age range are underweight. In India, especially among young people and children, malnutrition is incredibly common. Numerous studies have found that male children who live in rural regions and have lower socioeconomic level are more likely to be malnourished than children who live in cities.

The study's findings were thoroughly studied, and it was emphasised that quick action was required to address the issue of malnutrition in India. They also out that undernourished youngsters can have long-term effects like a delay in the maturation of their cognitive abilities, subpar academic performance, and a higher risk of developing chronic illnesses in later life. Some of the items they mentioned in their comments include those. The study's conclusions, which summarised its findings, emphasised the significance of using a comprehensive approach to combat malnutrition. A strategy like this should emphasise the socioeconomic variables that have an impact on people's well-being in addition to the actions that may be performed to promote mothers' and children's health. Additionally, it should promote healthy eating habits and hygiene behaviour for the individual.

The study's findings suggest that a variety of additional variables, such as the mother's age, education, and childbirth order, as well as the accessibility to safe drinking water, are related to malnutrition. These traits are present in both industrialised and developing countries. The study emphasised the necessity of addressing these issues through the implementation of particular initiatives, such as expanding educational opportunities for female students, supporting families who are interested in family planning, and making investments in infrastructure for the provision of water and sanitation.

Our knowledge of the factors that contribute to the dangerously high rate of malnutrition among children in India under the age of five has improved as a result of the study's findings. The results highlight the urgent need for focused programmes in India to address the problem of childhood malnutrition and to enhance children's general health and wellbeing. The study's conclusions show that India's many governments, public agencies, and private businesses must work together to find a solution to the malnutrition issue and make sure that every child has the chance to grow.

After this section, which is labelled "Policy Implications with Regard to the State of Public Health," is the following section.

The study's conclusions could have a big impact on how the government decides to handle issues involving public health. Given that a sizable portion of children under the age of five suffer from malnutrition, it is critical that steps be taken as soon as possible and with as much focus as possible to address the issue.

The urgent need to pay attention to the social elements that influence people's health is one of the most important effects of public health policy. One of the most important consequences is this one. One of the most significant and crucial implications is this one. According to the study's findings, children from lower socioeconomic level homes and castes are more likely to experience malnutrition than children from castes with more privileges. Therefore, the main goal of public health policies and therapeutic approaches that seek to improve the condition of malnutrition should be addressing the structural and socioeconomic causes that contribute to it.

The study's conclusions indicate that a variety of distinct factors that are related to malnutrition are modifiable. The mother's age, degree of education, the order in which her children were born, and her access to clean water are some of these variables. Each of these elements has room for improvement. Therefore, increasing the number of educational opportunities for women and girls, encouraging the use of family planning techniques, and allocating financial resources to the construction of infrastructure for the provision of water and sanitation should be the primary goals of public health policies and interventions that are intended to reduce malnutrition.

A comprehensive strategy to fight hunger is urgently needed given the seriousness of the situation. The public health policy is

impacted by this criterion as well. The main objectives of public health policies and interventions should be to enhance maternal and child health, promote healthy eating and the application of appropriate personal hygiene standards, and take into account the socioeconomic factors that affect one's state of health. Collaboration between the public sector, the commercial sector, and civil society will be essential to properly addressing this issue.

The importance of carefully monitoring and analysing public health policies and programmes that are intended to prevent undernutrition is one of the major lessons to be drawn from this research. One of the main ideas raised by the study is this. The development of new and enhanced activities may be guided by consistent monitoring and assessment, which has the ability to act as a compass. Additionally, it could draw attention to shortcomings and inadequacies in currently implemented policies and programmes. The effectiveness of efforts and programmes aimed at enhancing the health and wellbeing of children in India and lowering the prevalence of childhood malnutrition will be severely hampered by this.

5.3 It is crucial to understand the many distinct ways in which the study was confined before taking any implications from the research's findings.

Because the research relied substantially and largely on cross-sectional data in its early stages, it is impossible to draw any firm conclusions about the variables that are the focus of the examination as well as the variables that contributed to their occurrence. To establish causal relationships and get a greater understanding of the intricate interaction of factors that contribute to malnutrition in children under the age of five, longitudinal studies of participants are crucial. These studies must be conducted in order to fulfil the requirements of the research.

Second, the study participants provided their own data on the socioeconomic position of their families and the level of household wealth. Self-reported statistics can be manipulated by social desirability bias and recollection bias, which indicates that the outcomes may have been overstated more than they actually were. Self-reported statistics may be distorted by one of these biases.

Third, the World Health Organisation (WHO) growth standards, which might not be applicable to all different types of communities, were used by the researchers to define what constitutes malnutrition. The estimations of the prevalence of malnutrition in the population that was the subject of the research that was conducted and that was analysed could be impacted by the use of different growth standards.

Fourth, the study didn't look at any potential issues that could affect kids' nutritional health, like restricted access to healthcare, a volatile food supply, or environmental factors. All of these elements have the capacity to influence anything. This is true since the research did not consider how the aforementioned problems may affect the nutritional condition of kids and teenagers. Future research must take these characteristics into account because it is very likely that they have a significant impact on the diagnosis of malnutrition.

Additionally, only children under the age of five were allowed to participate in the study; neither the nutritional status of older children nor that of adults was examined. Studies involving participants of all ages are required in order to fully comprehend the problem of malnutrition in India.

Despite these drawbacks, the study offers important knowledge regarding the causes of malnutrition in children under the age of five in India as well as the elements that lead to the growth of malnutrition. The results can be used to guide public health policies and initiatives in India with the aim of improving children's health and wellbeing and concurrently lowering the prevalence of malnutrition.

However, there are some issues that, if thoroughly investigated, could affect the development of workable solutions to the malnutrition issue in India and contribute to our comprehension of the issue there. Here is a list of these problems. Section 5.4 of the study, which is about "Suggestions for Future Research Work," studies in-depth the prevalence of childhood malnutrition

in India as well as the factors that contribute to it. Here is a list of the problems that have developed.

In order to establish a causal relationship between the variables under investigation and to better understand the temporal nature of hunger, more studies using longitudinal research techniques should be carried out. Researchers are able to assess how the participants' nutritional status has evolved over the course of the study and pinpoint crucial intervention windows by keeping track of people over an extended period of time.

Second, more research should be done to determine how environmental elements, such as water and air pollution, affect children's nutritional wellbeing. These elements, as well as the dangerously high rate of malnutrition in India, may significantly affect a person's level of happiness as well as their health.

Third, more research is required to better understand how socioeconomic and cultural factors affect how people view food and nutrition, as well as how these viewpoints affect a person's nutritional condition. It is crucial that this study examines how attitudes like these affect a person's capacity to choose healthy diets. To more fully comprehend the perspectives of carers and families on food and nutrition, a qualitative study may be necessary.

The fourth recommendation is to carry out further research on how some drugs affect India's shockingly high rate of malnutrition. This may need developing novel medicines and testing them, in addition to conducting comprehensive evaluations of the current standards and procedures. It can also be necessary to do thorough evaluations of the current policies and practises.

If we are ever going to fully comprehend the consequences that famine has on a person's health and well-being over the course of their lifetime, research into these repercussions is very required. Examples of the kinds of studies that might be undertaken as part of this kind of examination include those that examine the economic and social effects of hunger on individuals and communities. Another illustration is research that examines how malnutrition in childhood affects adults' health. The kind of study that could be done as part of this kind of investigation are only two examples.

In conclusion, future research should use longitudinal designs, investigate environmental factors, investigate cultural and social factors, evaluate particular interventions, and investigate the long-term effects of malnutrition in order to advance our understanding of malnutrition in India and to inform the development of effective interventions. If we were to succeed in this endeavour, we would not only have a deeper comprehension of the malnutrition problem in India but also be in a position to influence the creation of efficient treatments.

The presented study utilized data from the NFHS-5 database to analyze the nutritional status of children aged 0-5 years in India, focusing on three key anthropometric indices: stunting (height-for-age), underweight (weight-for-age), and wasting (weight-for-height). The findings, as outlined in Tables 7-9, highlight several key predictors influencing these nutritional outcomes.The analysis revealed that children residing in urban areas faced a higher risk of stunting, underweight, and wasting, although statistical significance varied across the years. Male children were consistently found to have a greater likelihood of experiencing stunting, underweight, and wasting compared to their female counterparts, with no clear pattern discernible over time.Maternal education emerged as a critical factor affecting childhood undernutrition. Offspring of mothers with no education or primary education exhibited a substantially higher risk, while those with mothers possessing secondary education faced a lower but still significant risk of developing stunting and underweight. Educated mothers were associated with a reduced likelihood of their children experiencing stunting over time.Furthermore, household indicators such as the type of toilet facility and cooking fuel played significant roles in stunting and underweight, with wasting being notably associated with the type of toilet facility and contraceptive method. The findings underscore the importance of addressing not only individual-level factors but also household-level determinants in combating childhood undernutrition.The prevalence of undernutrition

indicators across different states in India, as depicted in Figure 1, provides a comprehensive overview of the regional disparities in nutritional status. This regional variation emphasizes the need for targeted interventions and policies tailored to address the specific challenges faced by different states.

CONCLUSION

6.1 A more thorough examination and evaluation of the article

The study " Nutritional Status of Children Under Age 5 Years in India: A Cross-sectional Study" offers important details on the prevalence of childhood malnutrition in India as well as the causes of it. The use of nationally representative data, a sizable sample size, and a thorough analysis of the socioeconomic and demographic factors that are associated with malnutrition are just a few of the study's many advantages.

According to the results of the survey that was conducted there, more than one third of children in India under the age of five either have low body mass indices or have had their growth stunted as a result of malnutrition. The study also discovered connections between malnutrition and a variety of demographic and socioeconomic elements, including household income, caste, gender, and age.

The use of a cross-sectional research design, the reliance on participant-reported data, and the diagnosis of malnutrition based on WHO growth standards are only a few of the problems with the work. Future research that employs longitudinal designs, looks at socioeconomic and environmental determinants, assesses particular interventions, and examines the outcomes over a longer time period may help us better understand malnutrition in India.

In general, the study significantly adds to the amount of knowledge that has already been gathered about child undernutrition in India. The study's conclusions have significant ramifications for public health initiatives and programmes in India that seek to lower the prevalence of childhood malnutrition and enhance the general health and wellbeing of the nation's youngsters.

6.2 Advice on how the research's conclusions should be applied to the field of public health

The study will have a significant impact on many public health issues. India has one of the highest percentages of children under the age of five that are undernourished when compared to other nations. The people who live in rural areas are significantly impacted by this issue. An illustration of a nation where this is particularly true is India. Malnutrition is a serious condition that affects people all over the world.

Regarding the prevalence of childhood malnutrition in India as well as the factors that contribute to its occurrence, the paper offers a lot of information. The ultimate objectives of public health policies and interventions, which include lowering the prevalence of childhood malnutrition and enhancing children's health and wellbeing, may be aided by the use of this information. The results of this study emphasise the urgent need for the creation of customised treatments that account for the numerous socioeconomic and demographic factors that cause malnutrition in India. The study's conclusions finally took into account these findings.

This study's main focus was on the nutritional quality of young children, which is crucial for public health considering how crucial this age range is for a child's general growth and development. In the long run, malnutrition is more likely to have a detrimental effect on a person's general health and wellbeing if it is present at this point in their life. It's likely that the person's cognitive abilities will advance more slowly, and it's also possible that their risk of contracting chronic diseases will rise.

The study's results show how crucial it is for India to give the prevention of malnutrition the highest level of public health priority possible. They also show how critical it is to put in place comprehensive public health policies and interventions that concentrate on the root causes of the disease. The significance of malnutrition prevention and treatment is also emphasised throughout the study.

The study contributes valuable insights into the determinants of childhood undernutrition in India, emphasizing the significance

of maternal education, gender, and household indicators. The findings underscore the need for multifaceted interventions that consider both individual and household-level factors to effectively address the diverse challenges contributing to childhood undernutrition across the country. Future research and policy initiatives should take into account these nuanced factors to develop targeted and context-specific interventions aimed at improving the nutritional outcomes of children in India.

REFERENCES

- Kaur M, Sodhi SK, Kaur G. Effectiveness of a community-based nutrition intervention on child nutritional status in rural India. J Health PopulNutr. 2019;38:30. doi: 10.1186/s41043-019-0185-5
- Kumar P, Deshmukh PR, Garg BS. Incidence, correlates and predictors of childhood malnutrition in India: a pooled analysis of three national surveys. Indian J Pediatr. 2018;85(7):499-505. doi: 10.1007/s12098-018-2638-9
- Patel A, Prakash AA, Das PK. Factors associated with malnutrition among children under five years old in India: an analysis of the 2015-2016 National Family Health Survey. Int J Equity Health. 2020;19(1):51. doi: 10.1186/s12939-020-1143-3
- Singh A, Routray P, Mishra RN, Josh R. Estimating Nutritional Status of Children under Age 5 Years in India: A Cross-sectional Study. J Family Med Prim Care. 2019 Aug;8(8):2647-2652. doi: 10.4103/jfmpc.jfmpc_512_19. PMID: 31548972; PMCID: PMC6747151.
- International Food Policy Research Institute. Global Nutrition Report 2020: Action on equity to end malnutrition. Washington, DC: International Food Policy Research Institute; 2020.
- India State-Level Disease Burden Initiative Malnutrition Collaborators. The burden of child and maternal malnutrition and trends in its indicators in the states of India: the Global Burden of Disease Study 1990-2017. Lancet Child Adolesc Health. 2019;3(12):855-870.
- Ministry of Health and Family Welfare, Government of India. National Family Health Survey (NFHS-4) 2015-16: India. Mumbai: International Institute for Population Sciences; 2017.
- Ministry of Women and Child Development, Government of India. Rapid Survey on Children 2013-14. New Delhi: Ministry of Women and Child Development; 2014.
- Sankar MJ, Natarajan CK, Das RR, Agarwal R, Chandrasekaran A, Paul VK. When do newborns die? A systematic review of timing of overall and cause-specific neonatal deaths in developing countries. J Perinatol. 2016;36(Suppl 1):S1-S11.
- UNICEF. State of the World's Children 2021: On my mind: Protecting our future through robust vaccination. New York: UNICEF; 2021.
- United Nations. Transforming Our World: The 2030 Agenda for Sustainable Development. New York: United Nations; 2015.
- United Nations Children's Fund. Improving Child Nutrition: The Achievable Imperative for Global Progress. New York: United Nations Children's Fund; 2013.
- World Health Organization. Global Nutrition Targets 2025: Policy Brief Series. Geneva: World Health Organization; 2014.
- World Health Organization. Global Strategy for Women's, Children's and Adolescents' Health (2016-2030). Geneva: World Health Organization; 2015.Black RE, Victora CG, Walker SP, et al. Maternal and child undernutrition and overweight in low-income and middle-income countries. Lancet. 2013;382(9890):427-451.
- Ministry of Health and Family Welfare, Government of India. National Nutrition Strategy 2017. New Delhi: Ministry of Health and Family Welfare; 2017.
- Pasricha SR, Biggs BA. Undernutrition among children in South and South-East Asia. J Paediatr Child Health. 2015;51(5):497-501.
- Ramachandran P. Malnutrition in India: status and government initiatives. Indian J Community Med. 2020;45(1):5-8.
- UNICEF. Improving Child Nutrition: The achievable imperative for global progress. New York: UNICEF; 2013.
- United Nations Development Programme. Human Development Report 2020: The Next Frontier: Human Development and the Anthropocene. New York: United Nations Development Programme; 2020.
- United Nations International Children's Emergency Fund, World Health Organization, World Bank Group. Joint Child Malnutrition Estimates 2020 edition. Geneva: World Health Organization; 2020.
- Victora CG, Adair L, Fall C, et al. Maternal and child undernutrition: consequences for adult health and human capital. Lancet. 2008;371(9609):340-357.
- World Bank Group. Nutrition in India: Unlocking the Potential. Washington, DC: World Bank Group; 2017.
- World Health Organization. Nutrition Landscape Information System (NLIS) country profile indicators: interpretation guide. Geneva: World Health Organization; 2010.