

Review Article

Data analysis of malnutrition in India: a review of numerous factors

Sukanya Chakravorty*, Manisha

Department of Home Science, Banaras Hindu University, Varanasi, Uttar Pradesh, India

Received: 25 March 2023

Revised: 19 May 2023

Accepted: 02 June 2023

*Correspondence:

Dr. Sukanya Chakravorty,

E-mail: Su.chakravorty@bhu.ac.in

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Malnutrition is one of the most critical areas which needs government focus as it plays a crucial role in a country's economic and social development. In recent times, India is proving to be one of the fastest-growing countries in the South Asian region. Malnutrition and hunger rate is reduced to achieve The United Nation's second Sustainable Development Goal, Zero Hunger, to end world hunger by 2030. However, some states of India still serve as home to a more significant number of stunted and underweight children, especially in Bihar and Meghalaya, respectively. (NFHS-5) The current paper focuses on data analysis of malnutrition in India including several factors based on the qualitative research method. A systematic study was done to collect data by reviewing thousands of national-international journals and reports of 3rd, 4th and 5th NFHS and Globally hunger index of India, and WHO report on malnutrition in India. The government of India took the step of launching Poshan Abhiyan in 2017, which needs to be more focused on rural areas of India.

Keywords: Malnutrition, Children, Hunger, Stunted, India

INTRODUCTION

There are almost 6.3 million children below 5 years of age dying every year and 165 million are malnourished at worldwide level.¹⁻³ Situation in South Asia is a major public health challenge as 165 million children were stunted in 2015 along with 101 underweight and 52 million wasted. It is found that 50 per cent of the children in these regions do not meet their daily food requirements and are in undernourished conditions. Bangladesh, India and Pakistan are three countries in South Asia with many malnourished children.⁴⁻⁷ India is the second world's most populated country after China, with 1.21 billion people. Almost 26 million children are born here every year. According to the census of 2001 and 2011, there was an absolute increase of 181 million and a decrease of 5.05 million in the child population. The child population decreased by 3.1 per cent in 2011 compared to 2001.⁸ Infectious disorders such as malaria, pneumonia,

diarrhoea, HIV, and TB are particularly dangerous to children under five. Non-communicable illnesses, injuries, and war are substantial hazards to older children. Even though they are entirely avoidable and treated, common infectious illnesses continue to kill a high number of young infants. Pneumonia, diarrhoea, and malaria accounted for around 30% of all fatalities among children under the age of five in 2019.^{9,10} Apart from these infectious and several non-communicable diseases malnutrition remains the major problem with high rate in countries like India which is continuously achieving success in last two decades with increased economic growth and reduced money metric poverty.¹¹ Children's malnutrition is a public health issue in many developing nations. Low birth is one of the major indicators of malnutrition. It is a tremendous drain on the potential for growth in many countries, in addition to causing enormous physical and mental misery in academic achievement. Malnourished children demand more

attention from their parents and are less physically and mentally productive than adults. Malnutrition is a violation of a child's human rights as well.^{1,12,13}

Hunger and undernourishment are like cycle which is followed from generation to generation.¹⁴ With respect with Global Nutrition Report of 2016 and The United Nation's second Sustainable Development Goal, Zero Hunger, the states and world target is to end world hunger and malnutrition by 2030.^{8,15} While Global Nutrition Report of 2020 targets to achieve six index of nutrition by 2025 and aims to reduce stunting by 40% in children.¹⁶

But Zero Hunger by 2030 would be missed by a margin of around 660 million people, according to the State of Food Security and Nutrition in the World report.^{17,18}

Malnutrition refers to cellular imbalance between body's energy need and energy and nutrient for growth, excesses, or imbalances in a person's diet. According to WHO, Malnutrition refers to three different types of conditions: (1) Undernutrition: this class of malnutrition includes wasting (low weight-for-height), stunting (low height-for-age) and underweight (low weight-for-age) and underweight is the major reason for death in world. (2) Micronutrient-related malnutrition: This class includes micronutrient deficiencies (a lack of essential vitamins and minerals) or micronutrient excess. (3) Third class includes overweight, obesity and diet-related non-communicable diseases (such as heart disease, stroke, diabetes and some cancers).^{7,18,20,21}

Who is in danger?

Malnutrition affects every country on the planet in one way or another leading to number of deaths and illness. Combating malnutrition in all manifestations is one of the world's most pressing public health issues and a burden on developing countries.

Malnutrition is especially dangerous for Pregnant women, babies, children, and teenagers. Early nutrition optimization—from conception to a child's second birthday—ensures the greatest possible start in life, with long-term advantages.^{19,22}

Poverty increases the likelihood of malnutrition. Poor people are more susceptible to various kinds of malnutrition. Malnutrition also raises health-care expenses, lowers productivity, and slows economic growth, perpetuating a cycle of poverty and illness.¹⁹

Reasons for malnutrition and poor nutrition among girls and women and in rural areas

Overall, disparities harmed mothers, babies, and children in disadvantaged demographic subgroups; the poorest, least educated, and those living in rural regions had poorer health intervention coverage and worse health outcomes than those who were better off. In a small

number of cases, there were disparities in child health treatments or outcomes between boys and girls.^{23,24} India is a country where males are given more preference and provided with proper nutrition by parents from birth only in large and ruler family, which results in an edge in height and weight and a lower frequency of under nutrition than girls.²⁵⁻²⁸

The vast majority of nations indicated that rural regions have a higher under-five mortality rate than urban areas. The disparity between rural and urban regions surpassed 16 fatalities per 1000 live births in half of the nations.^{24,28,29}

Role of mother in poor nutrition

Child survival cannot be handled in isolation since it is closely tied to the mother's health, which is further impacted by her health and development as a teenager.³⁰⁻³²

Compared to children whose mothers had completed secondary school or above, the frequency of stunting in children under the age of five increased by as much as 39 percentage points in children whose mothers had no education. The education gap between these two segments was 15 percentage points or greater in half of the nations.²⁴

India is combating malnutrition by government initiatives like providing nutrition through schools, but still needs a clear vision to remove malnutrition from the country.³³ The paper aims to analyze data of malnutrition in India depending on numerous factors.

METHODS

This study is based on a qualitative research approach with data analysis of malnutrition in India: A review of numerous factors. A systematic approach was adopted to collect data from the 3rd, 4th and 5th National Family Health Survey conducted in India and the Global Hunger Index report of 2021. Apart from these, data were collected through research articles and papers published in journals at the National- International level between 2005-2021. The targeted group was children living in rural-urban India below 5 years of age.

Search

Online literature was conducted to collect data on Mendeley -cite, SCOPUS, Pub-MED, PMC, Web of Science, BMC, WHO virtual health library, National Family Health Survey Report, and Global hunger index report from 2005-2021.

The National Family Health Survey (NFHS) is a nationwide survey conducted nationwide throughout India based on household samples. The first NFHS was conducted during 1992-93, the second during 1998-99,

the third during 2005-06, the fourth during 2015-16 and the last and the fifth during 2019-20. The Global Hunger Index is a peer-reviewed yearly publication aimed at thoroughly quantifying and tracking hunger at the global, regional, and national levels. Each year, GHI scores are produced to monitor progress and setbacks in the fight against hunger.

The search begins with keywords like malnutrition in India, Reports of India on Malnutrition, the role of mother in malnutrition, rural India, urban India, Nutritional Status of Children etc.

Study selection

The study articles, journals and reports that included search terms including relevant abstracts were included in the study. The articles containing reports regarding child nutritional status, malnutrition rate in India, NFHS, WHO, and Global Hunger index reports were selected with a section containing child health and nutritional status of children below five years of age. We included studies from 2005 to 2022. The search came out with 150 journals and reports, of which only 53 were appropriate and used for the analysis.

Funding

Institute of Eminence, Banaras Hindu University is targeting to reduce malnutrition among children and this paper is being focused with finding out present situation of India in malnutrition. The present study will help the funding agency in developing appropriate product that can help in providing efficient nutrition to the children living in India. Funding for particular work was provided by Institute of Eminence.

RESULTS

This paper's result is basically based on the key finding of the National Family Health survey 3rd, 4th, and 5th report and India's global hunger index report.

In the world, approximately 52 million children below five years of age are suffering from waste. In a study, it was found that one in every four children in South Asia is born with low weight, while in the world, it is one in ten children. Almost 45% of deaths among children under five years of age are due to under nutrition. These data are often found in low- and middle-income countries where the obesity level associating with stunting and is rising alongside.^{34,35}

Significant causes of child mortality according to India SRS Statistical report 2010-13 and various other review paper: (1) prematurity and low birth weight (29.8%), (2) pneumonia (17.1%), (3) diarrheal diseases (8.6%), (4) other non-communicable diseases (8.3%), (5) birth asphyxia and birth trauma (8.2%), (6) injuries (4.6%), (7) congenital anomalies (4.4%), (8) Ill-defined or cause

unknown (4.4%), (9) Acute bacterial sepsis and severe infections (3.6%), (10) Fever of unknown origin (2.5%), (11) All other remaining causes (8.4%).^{10,29,30,36,37}

With respect to the Global hunger Index 2017, India stands at the 100th position out of 119 countries and in 2021 India ranks 101st out of the 116. The number of malnourished children in India is nearly double that in Sub-Saharan Africa, affecting the mortality rate, productivity rate and economic growth of India. Almost one million children die every year in India before completing one year of their age. Half the children population in India is affected by malnutrition. Of them, 43% are underweight, 48% stunted, and 3 out of every 10 children stunted.^{12,38,39}

Parental attitude towards malnutrition

According to the descriptive study of malnutrition in 2015 conducted in Karnataka, 29 (58%) of parents had adequate knowledge of malnutrition. The calculated mean value of learning on malnutrition was 8.64 with a standard deviation of 2.57, and 43 (86%) parents had a positive attitude. The calculated mean value of attitude on malnutrition was 32.84, with a standard deviation of 3.38. The concluded result predicts a robust positive correlation between knowledge and attitude regarding malnutrition among parents of under-five children ($r=0.097$.); therefore, if knowledge increases, the attitude also increases. There was a significant increase in the understanding of parents after giving health education on malnutrition.⁴⁰

National Family Health Survey

The National Family Health Survey (NFHS) is a nationwide survey conducted nationwide throughout India based on household samples.

The NFHS is collaboration between Mumbai, India's International Institute for Population Sciences (IIPS), Calverton, Maryland, USA's ICF, and Honolulu, Hawaii's East-West Center. The Government of India's Ministry of Health and Family Welfare (MOHFW) has selected IIPS as the main agency for NFHS coordination and technical advice. The United States Agency for International Development (USAID) financed NFHS with additional financing from the United Nations Children's Fund (UNICEF). For survey implementation, IIPS worked with various Field Organizations (FO). Each FO was in charge of performing survey operations in one or more of the NFHS's states. ICF and the East-West Center offered technical help to the NFHS.⁴¹

The first NFHS was conducted during 1992-93, the second during 1998-99, the third during 2005-06, the fourth during 2015-16 and the last and the fifth during 2019-20.⁴¹⁻⁴³

A view on NFHS-3

In developing countries like India, a high mortality rate of children under five years results from infectious diseases and neonatal deaths. Under nutrition has proven to be an important factor contributing to the death of young children. Malnutrition increases the risk of death from respiratory infections, diarrhea, malaria, measles, and other infectious illnesses in children. Malnutrition is responsible for more than half (54%) of all fatalities in India before age five. Mild to moderate malnutrition causes more fatalities (43%) in India.^{41,44}

Levels of malnutrition based on NFHS report

Figure 1 depicts the levels of malnutrition (stunting, wasting and underweight) based on the national family health survey of 2005, 2015 and 2020. From the graph, the decreasing rate of stunting is visible from 48% to 38% and then to 36% in the time of 15 years from 2005 to 2020. While the wasting rate is showing variable rate, i.e., during 2005 it was 20%, then it increased by 1% in 2015 and then again decreased to 19% in 2020. The underweight rate dropped from 43% to 35%, then to 32% in 2020.⁴¹⁻⁴⁵

If looking at Asia level the stunting has decrease of 15% between 2007 and 2012.^{6,46}

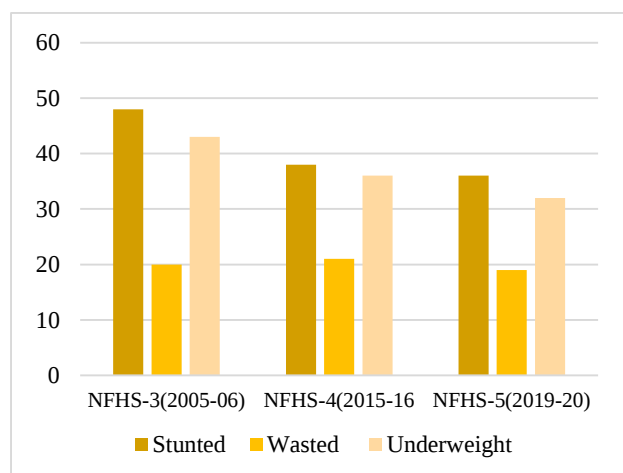


Figure 1: Levels of stunting, wasting and underweight.

Malnutrition in rural and urban Indian

Figure 2 represents the comparative data of stunting observed during the 3rd, 4th and 5th National Family and Health Survey. The stunting rate was highest during the 3rd national family and health survey in the rural area, i.e., 68% and it was found that it has reduced to 41% during the 4th survey and then to 37% during the 5th survey. The malnutrition rate is declining in rural and urban areas but has reduced to a large extent in rural areas, which is appreciable. During the 3rd survey it was 40% which then reduced to 31% in during 4th survey and

after that only 1% was reduced, i.e., 30% in the 5th survey. Still, proper nutrition is needed by India to reduce malnutrition ultimately.

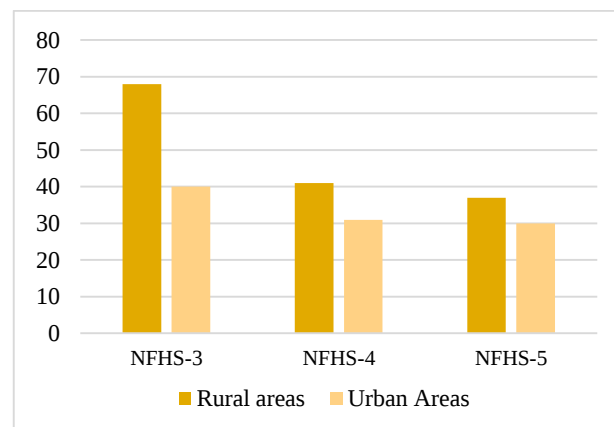


Figure 2: Stunting rate in rural and urban India.

Similarly, the three measures of malnutrition, stunting rate, underweight and wasting rate, were also calculated. During the 3rd survey, almost all children were underweight in rural India and one out of every five children was reported with wasting.⁴¹⁻⁴³

Stunting rate in some states of India

Figure 3 shows the varying result in some states of India.

Bihar has reduced malnutrition from 48% to 43% from 2015 to 2020. Opposite this, Meghalaya's stunting rate increased from 44% to 47% in 5 years. Similarly, the stunting rate has been reduced in Uttar Pradesh, Jharkhand, Puducherry and Sikkim, while it has increased for Kerala and Goa. While in 2005, in NFHS 3, it was reported that although the underweight rate was low in Mizoram, Sikkim and Manipur, more than one-third of children were stunted in the same state.⁴¹⁻⁴³

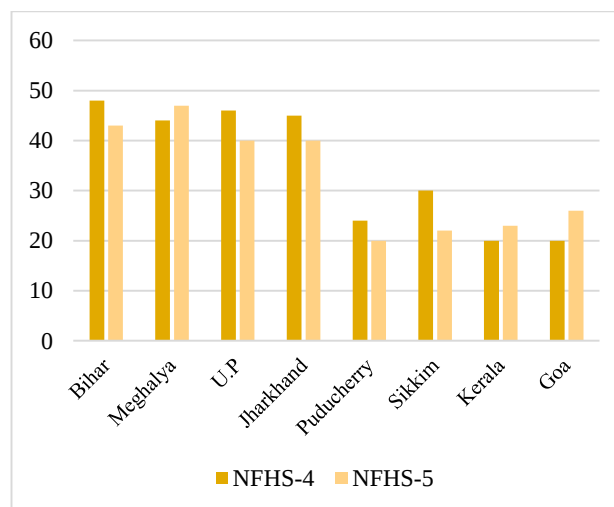


Figure 3: Rate of stunting in some states of India.

Rate of underweight in some states of India

According to the NFHS-5th report, Bihar has 41% of underweight children, while during the 4th National Family Health Survey, it was 48% in Jharkhand. At the same time, in the 3rd National Family Health Survey, it was 20 % in Sikkim and Mizoram, and the highest in Madhya Pradesh, i.e., 60% and more than half of children were reported in Bihar. A 40% rate was observed in Meghalaya, Chhattisgarh, Gujarat, and Uttar Pradesh. And Orissa.⁴¹⁻⁴³

Rate of wasting in some states of India

Maharashtra is the state with 26%, the highest wasting rate in the 2020 survey, while Jharkhand was during the 2015 Survey with 29% and during the 2005 survey, it was 35% in Madhya Pradesh, 32% in Jharkhand and 31% in Meghalaya.

Malnutrition among boys and girls

With NFHS-4th and 5th reports, it was found that boys and girls have almost the same under nutrition rate. Although the fact that females are marginally less well-fed than boys in all three areas.

Prevalence of malnutrition among children by mother's education

The nutritional status of children is associated with the mother's education. NFHS 3rd report found that 49% of mothers have never attended school, and only 9% completed 12 or more years of schooling. A mother's education plays a vital role in all three measures of malnutrition (Stunting, wasting and underweight). There is a negative correlation between both as the mother's education is increased, children's nutritional deficiencies decrease.

According to NFHS 3rd report, the percentage of underweight among children born to mothers with no education was three times higher than children born to mothers with 12 years of education. In NFHS 4th report, 41% of stunted and 47% of underweight children were born to mothers with no schooling compared to 24% of stunted and 22% of underweight children born to mothers with 12 or more years of education. In NFHS 5th report, it was found that 46% stunted and 42% underweight children were born to mothers with no education compared to 26% stunted children and 23% under nutrition children born to mothers with 12 or more years of schooling.^{41-43,47,48}

If there is a parallel change in the economical situations of women living in underdeveloped rural communities, increased maternal understanding of child care may have a major impact on children's nutritional status as found in Ghana.^{49,50}

Global hunger index

The Food and Agriculture Organization (FAO) of the United Nations, along with the International Food Policy Research Institute (IFPRI), construct the Global Hunger Index. The GHI assigns a score out of 100 to each nation.

Although neither of these extremes has been attained literally, zero is the best score (no hunger), and 100 is the worst. Each year, GHI scores are produced to monitor progress and setbacks in the fight against hunger. Hunger is correlation between food production and food supply. The GHI is intended to enhance awareness and knowledge of the fight against hunger, to give a tool to compare hunger levels across nations and regions, and to draw attention to parts of the globe where hunger levels are highest and where extra efforts to eradicate hunger are most needed. India's hunger profile is based on the Global Hunger Index 2021 data and information.

The four components of the GHI score are undernourishment, child wasting, child stunting, and child mortality. There are various advantages to using this combination of markers to gauge hunger.^{17,51}



Figure 4: Position of India.

Source: Global hunger index: report 2021, Concern Worldwide and Welthungerhilfe. 2021.

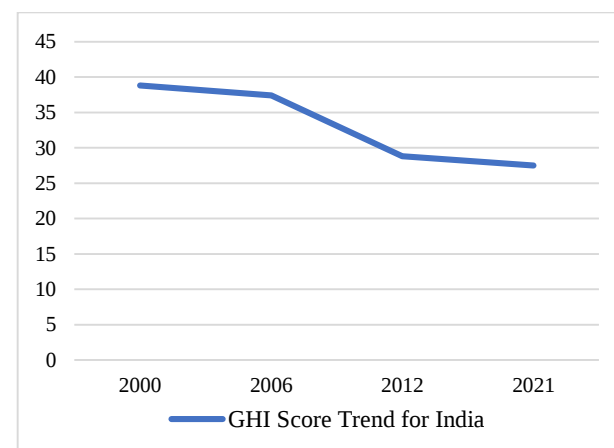


Figure 5: Global Hunger Index Score trend for India from 2000 to 2021.

The Global Hunger Index 2021 ranks India at 101st position out of the 116 countries, while in 2012 it ranks at 65 out of 79 countries and in 2010 ranks 67 out of 112 countries. Malnutrition in India is a major problem, especially among women and children. According to the Global Survey Report presented by Save the Children on

19 July 2012, India positioned at 112 among 141 nations in the Child Development Index (CDI).³⁸

Figure 5 shows the declining trend of Global Hunger in India. It has reduced from 38.8 per cent to 27.5%. India is improving its position by reducing the hunger rate and increasing economic and sustainable development.³⁸

DISCUSSION

This review based study to analyze present conditions of malnutrition among children in India is distinctive in providing information about malnutrition and its factors in country. Every one of the three individuals is malnourished at world rate and every country becoming the victim of malnutrition with serious public health challenges.⁸

India is the second world's most populated country after China, with 1.21 billion people. With reference to the census report there was an absolute increase of 181 million and a decrease of 5.05 million in the child population during 2001 to 2011. The responsible factor being the hunger, poor food security, the Global hunger Index 2017 demotes the 100th position out of 119 countries and in 2021 it ranks 101st out of 116. The increased population and increased malnutrition rate has led to high mortality rate, poor productivity rate and slow economic growth of India.

The subsequent National Family Health survey report of 2004, 2015, 2020 shows the decreasing rate of shows the decreasing rate of stunting from 48% to 38% and then to 36% in the time of 15 years from 2005 to 2020. While the wasting rate is showing variable rate, i.e., during 2005 it was 20%, then it increased by 1% in 2015 and then again decreased to 19% in 2020. The underweight rate dropped from 43% to 35%, then to 32% in 2020.^{41-43,45} The decreased level is due to the development of the nation, along with increased rate of education, nutritional awareness among mothers, improved food security, improved health sector. The falling rate in rural area is commendable but still the nation needs to develop more. Some of the studies predict almost 45% of deaths occurring among less than one year of age is due to under nutrition. These data are often found in low- and middle-income countries where the obesity level associating with stunting and is rising alongside.^{34,35} The Indian SRS Ststistical report 2010-13 and some other source reveal the other like prematurity and low birth weight, pneumonia, diarrheal diseases, other non-communicable disease, birth asphyxia and birth trauma, injuries, Congenital anomalies, Acute bacterial sepsis and severe infections, Fever of unknown origin and All other remaining causes.^{9,10,29,30,36,37}

Even in households that are financially secure, nutritional deficits are common. Poverty is a significant contributor to the poor nutrition status. It is challenging to make the necessary improvements in children's nutritional status

due to poor feeding practices, and nutrition projects have had little success in addressing these major nutritional issues. India had the highest frequency of underweight children compared to the other 40 countries, but it was only marginally higher than Bangladesh and Nepal. Stunting and underweight is more common in boys as compared to the girls.^{1,41}

The parental attitude is major contributing factor in malnutrition, result from a study of 2015 conducted in Karnataka shows the significant association between knowledge and attitude regarding malnutrition among parents of under-five children ($r=0.097$) and also finds significant increase in the understanding of parents after giving health education on malnutrition. If knowledge increases, the attitude also increases and will be eliminate malnutrition from the community.⁴⁰

The contributing factors for malnutrition are well defined as Environment, Illiteracy, large family size, late and early weaning, lack of exclusive breast feeding, and poverty were the factors responsible for malnutrition. The nuclear families possess great threat to wasting and stunting. Mother education has been proving to be a great positivity towards decreasing malnutrition. Absence of schooling, absence of vaccinations, teenage pregnancies were risk factors for child malnutrition.¹

CONCLUSION

India has been continuously achieving success in the last two decades with increased economic growth and reduced money metric poverty, but the malnutrition rate remains high. Although the present study shows the reduced rate of malnutrition in recent years, the government still took a step ahead to eradicate all measures of malnutrition. The National Family Health Survey Reports show a reduction in stunting, wasting and undernutrition. The wasting rate is being reduced to 19%, which is appreciable. But if we look at the hunger rate in India, it ranks 101 out of 116 countries.

There is an urgent need to focus on factors that can completely evict malnutrition from India. Therefore, every woman should be encouraged to get higher education so that future mothers can satisfactorily fulfil the nutritional need of their children.

The government needs to implement more schemes to educate parents living in rural and urban India, with a significant focus on rural India. The government step of launching Poshan Abhiyan in 2017 is good, but it needs to be more focused on ruler areas of India.

ACKNOWLEDGEMENTS

We are highly thankful to Matrade Private Limited, Private Limited Company Registered under Ministry of Corporate Affairs, GOI and certified by Department of Industrial Policy and Promotion, Government of India for

their collaboration and association with this research work and for their kind support to pursue this research work and we are also thankful to Institute of Eminence, Banaras Hindu University for their support in terms of funding.

Funding: Institute of Eminence, Banaras Hindu University

Conflict of interest: None declared

Ethical approval: Not required

REFERENCES

- Asim M, Nawaz Y. Child Malnutrition in Pakistan: Evidence from Literature. *Children* (Basel). 2018;5(5):60.
- Black RE, Victora CG, Walker SP, Bhutta ZA, Christian P, de Onis M, et al. Maternal and child undernutrition and overweight in low-income and middle-income countries. *Lancet*. 2013;382:427–51.
- Puri P, Khan J, Shil A, Ali M. A cross-sectional study on selected child health outcomes in India: Quantifying the spatial variations and identification of the parental risk factors, *Scientific Reports*. 2020;10:6645.
- Akhtar S. Malnutrition in South Asia - A Critical Reappraisal. *Critical Reviews in Food Science and Nutrition*. 2013;56:14.
- Jai DK. Malnutrition: A Global Problem, Chapter-Textbook of Pediatric Gastroenterology. *Hepatology and Nutrition*. 2015; 505–513.
- Jatinder GK. Child Malnutrition: Trends and Issues, *The Anthropologist*. 2010;12(2):131-40.
- Javed I. Malnutrition. *The Professional Medical Journal*. 2019;26(04):1-5.
- International Food Policy Research Institute. *Global nutrition 2016: from promise to impact: ending malnutrition by 2030*. Washington, DC: IFPRI, 2016.
- Child Diseases: report. UNICEF- For every child. Available at <https://www.unicef.org/health/childhood-diseases>. Accessed 11 June 2022.
- Singh A. Chapter- Childhood Malnutrition in India, *Perspective of Recent Advances in Acute Diarrhea*. 2019.
- Khan J, Mohanty SK. Spatial heterogeneity and correlates of child malnutrition in districts of India. *BMC Public Health*. 2018;18(1027):1-13.
- Narayan J, John D, Ramadas N. Malnutrition in India: status and government initiatives. *Journal of Public Health Policy*. 2019; 1-17.
- Report on Malnutrition: report 2019, Insight IAS, 2020. Available at: <https://www.insightsonindia.com/2019/09/21/report-on-malnutrition/> . Accessed 16 June 2022.
- Howard D, Wiesmann D, Sost AK, Schoeninger I. The challenge of hunger 2007: Global Hunger Index: Facts, determinants, and trends. *RePE*. 2007; 1-59.
- Sustainable Development Goal: Zero Hunger: report, National Geographic. Available at: <https://education.nationalgeographic.org/resource/sustainable-development-goal-zero-hunger>. Accessed 17 June 2022.
- India's Stand in Global Malnutrition :Report 2020. The CSR Journal, 2020. Available at: <https://thecsrjournal.in/india-global-malnutrition-report-2020/>. Accessed 16 June 2022.
- The burden of malnutrition at a glance. Country Nutrition Profiles: report 2020, global Nutrition Report, 2020. Available at: <https://globalnutritionreport.org/resources/nutrition-profiles/asia/southern-asia/india/>. Accessed 16 June 2022.
- UN report: Pandemic year marked by spike in world hunger: report 2021, World Health Organization, 2021. Available at: <https://www.who.int/news/item/12-07-2021-un-report-pandemic-year-marked-by-spike-in-world-hunger>. Accessed 15 June 2022.
- Malnutrition: report. World Health Organization. Available at: <https://www.who.int/news-room/fact-sheets/detail/malnutrition>. Accessed 15 June 2022.
- Walton E, Allen S. Malnutrition in developing countries. *Pediatrics and Child Health*. 2011;21(9):418-24.
- WHO. 2016. What is malnutrition? Report, 2016. Available at <http://www.who.int/features/qa/malnutrition/en/>. Accessed 12 June 2022.
- Müller O, Krawinkel M. Malnutrition and health in developing countries. *Canadian Medical Association Journal*. 2005;173(3):279–86.
- Malnutrition is a world health crisis: report. World Health Organization, 2019. Available at <https://www.who.int/news/item/26-09-2019-malnutrition-is-a-world-health-crisis>. Accessed 13 June 2022.
- State Of Inequality- Reproductive, maternal, newborn and child health: report. World Health Organization. Available at: https://cdn.who.int/media/docs/default-source/gho-documents/health-equity/state-of-inequality/state-of-inequality-reproductive-maternal-new-born-and-child-health.pdf?sfvrsn=f4034289_2. Accessed 15 June 2022.
- Agnihotri A, Viswanathan B. Gender Differences in Double Burden of Malnutrition in India: Quantile Regression Estimates. Working Paper 208/2021 Madras School of Economics. 2021.
- Alderman H, Nguyen PH, Tran LM, Menon P. Trends and geographic variability in gender inequalities in child mortality and stunting in India. *Maternal & Child Nutrition*. 2016; 17:3.
- Barcellos SH, Carvalho LS, Lleras-Muney A. Child gender and parental investments in India: Are boys and girls treated differently? *American Economic Journal: Applied Economics*. 2014;6:157–89.
- Pillai VK, Ortiz RJ. Child Malnutrition and Gender Preference in India: The Role of Culture. *Health Science Journal*. 2015;9(6):8.

29. Tripathi S. Child Malnutrition in India: Causes and Intervention Programmes. *International Journal of Multidisciplinary Approach and Studies*. 2016;3(2):74.
30. Child Health: report. National Health Mission. Ministry of Health & Family Welfare, Government of India. Available at: <https://www.nhm.gov.in/index1.php?lang=1&level=2&sublinkid=819&lid=219>. Accessed 13 June 2022.
31. Kumar M, Mohanty P. Does maternal over nutrition carry child undernutrition in India. *Plos One*. 2022.
32. Poverty, Mother's Health Behind Child Malnutrition In India: Article. (2015). Press Trust of India., 2015. Available at: <https://www.ndtv.com/health/poverty-mothers-health-behind-child-malnutrition-in-india-1256472>. Accessed 16 June 2022.
33. Smith C.L, Haddad L. Reducing child undernutrition: past drivers and priorities for the post-MDG era. *World Dev*. 2015;68:180–204.
34. Malnutrition is a world health crisis: report. World Health Organization, 2019. Available at <https://www.who.int/news/item/26-09-2019-malnutrition-is-a-world-health-crisis>. Accessed 13 June 2022
35. Martins VJB. Long-lasting effects of undernutrition. *The International Journal of Environmental Research and Public Health*. 2011;8(6):1817–46.
36. Bandi J, Mane Y. Prevalence of acute diarrhoeal diseases in children below 5 years of age in Indian settings. *European Journal of Molecular & Clinical Medicine*. 2022; 9(2).
37. Ugboko HU, Nwinyi OC, Oranusi SU, Oyewale JO. Childhood diarrhoeal diseases in developing countries. *Heliyon*. 2020; 6(4).
38. Global hunger index: report. Concern Worldwide and Welthungerhilfe, 2021. Available at: <https://www.globalhungerindex.org/pdf/en/2021/India.pdf>. Accessed 13 June 2022.
39. Sahu SK. Malnutrition among under-five children in India and strategies for control. *Journal of Natural Science, Biology and Medicine*. 2015;6(1):18–23.
40. Bagilkar V, Savadatti BB. A descriptive study on Malnutrition. *Asian Journal of Nursing Education and Research*. 2015;5:1.
41. National Family Health Survey (NFHS 3): report. Ministry of Health and Family Welfare, Government of India, 2006. Available at: http://rchiips.org/nfhs/nutrition_report_for_website_18sep09.pdf. Accessed 11 June 2022.
42. National Family Health Survey (NFHS-5): report. Ministry of Health and Family Welfare, Government of India, 2021. Available at: http://rchiips.org/nfhs/NFHS-5Reports/NFHS-5_INDIA_REPORT.pdf. Accessed 11 June 2022.
43. National Family Health Survey (NFHS 4): report. Ministry of Health and Family Welfare, Government of India, 2015. Available at <http://rchiips.org/nfhs/NFHS-4Reports/India.pdf>. Accessed 11 June 2022.
44. Pathaka PK, Singh A. Trends in malnutrition among children in India: Growing inequalities across different economic groups. *Social Science & Medicine*. 2011;73(4):576–85.
45. Singh S, Srivastava S, Upadhyay AK. Socio-economic inequality in malnutrition among children in India: an analysis of 640 districts from National Family Health Survey (2015–16). *International Journal for Equity in Health*. 2019; 18.
46. The falling rate of malnutrition in Asia: report. The Borgen Project. Available at: <https://borgenproject.org/malnutrition-in-asia/>. Accessed 15 June 2022.
47. Khattak UK, Iqbal SP, Ghazanfar H. The Role of Parents' Literacy in Malnutrition of Children Under the Age of Five Years in a Semi-Urban Community of Pakistan: A Case-Control Study. *Cureus*. 2017;9(6).
48. Global nutrition report 2021 – India's nutrition profile and how to meet global nutrition target: report 2021. Observer Research Foundation, 2021. Available at: <https://www.orfonline.org/expert-speak/global-nutrition-report-2021/>. Accessed 16 June 2022.
49. Dewey GK, Cohen JR. Does birth spacing affect maternal or child nutritional status? A systematic literature review. *Maternal Child Nutrition*. 2007;3(3):151–73.
50. Saaka M. Relationship between mothers' nutritional knowledge in childcare practices and the growth of children living in impoverished rural communities. *Journal of Health, Population and Nutrition*. 2014;32(2):237–48.
51. Sajid M, Ubale PV, Khan A. A Study of Hunger Situation in India Through Formulation of India State Hunger Index Using PCA, *Progressive Research: An International Journal*. 2021;16(2):130–4.

Cite this article as: Chakravorty S, Manisha. Data analysis of malnutrition in India: a review of numerous factors. *Int J Community Med Public Health* 2023;10:2629-36.