INSIGHTS-JOURNAL OF
LIFE AND SOCIAL SCIENCES

INSIGHTS-JLSS
Insights-Journal of Life and Social Sciences

TRENDS IN GLOBAL MALNUTRITION RATES BASED ON WHO AND FAO PUBLIC DATA. SECONDARY DATA STUDY

Original Article

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Acknowledgement: The authors acknowledge WHO and FAO for providing publicly available data used in this study.

Conflict of Interest: None

Grant Support & Financial Support: None

ABSTRACT

Background: Malnutrition, encompassing undernutrition, micronutrient deficiencies, and overnutrition, remains a significant global health concern. Despite various interventions, disparities persist across regions. Analyzing trends in malnutrition using publicly available WHO and FAO data provides insights into its evolving patterns and the double burden affecting both low- and high-income populations.

Objective: To evaluate global malnutrition trends using WHO and FAO data, identify regional disparities, and assess the shifts in undernutrition and overnutrition prevalence over time.

Methods: A secondary data analysis was conducted using WHO and FAO datasets from August to November 2024. Data on stunting, wasting, underweight prevalence, obesity, and micronutrient deficiencies were extracted for different regions. Descriptive statistics and repeated measures ANOVA were used to analyze trends, while Pearson correlation and linear regression assessed associations with socioeconomic factors. The study adhered to WHO classification criteria for malnutrition indicators.

Results: Stunting and underweight prevalence were highest in Africa (30.2%, 19.3%) and Asia (24.8%, 13.7%), while obesity was most prevalent in North America (36.2%) and Europe (27.8%). Micronutrient deficiencies were more pronounced in Africa and Asia, with iron deficiency reaching 42.3% in Africa. Over the past two decades, stunting rates declined significantly ($p < 0.001$), while obesity rates exhibited an upward trend ($p < 0.05$), highlighting the double burden of malnutrition.

Conclusion: Global malnutrition trends reveal a persistent divide between undernutrition and overnutrition. Targeted interventions are needed to address both extremes, ensuring sustainable improvements in nutritional health worldwide. Policymakers should focus on food security, public health programs, and lifestyle modifications to mitigate the malnutrition burden.

Keywords: Food security, Malnutrition, Micronutrient deficiency, Nutrition policy, Obesity, Public health, Undernutrition.

INTRODUCTION

Malnutrition remains a persistent global health challenge, affecting millions of individuals across all age groups and socioeconomic backgrounds. Despite decades of international efforts to mitigate its impact, malnutrition continues to manifest in various forms, including undernutrition, micronutrient deficiencies, and overnutrition, each contributing to a spectrum of health complications. The World Health Organization (WHO) and the Food and Agriculture Organization (FAO) have consistently monitored and published data reflecting the evolving trends in malnutrition across different regions. However, despite the availability of such data, a comprehensive secondary analysis remains essential to synthesize patterns, identify disparities, and inform targeted interventions (1,2). The prevalence of malnutrition is influenced by a complex interplay of factors, including economic conditions, food security, healthcare access, and sociocultural determinants. Undernutrition, characterized by stunting, wasting, and underweight status, is predominantly observed in low- and middle-income countries where poverty, inadequate maternal health, and limited dietary diversity contribute to its persistence. On the other hand, micronutrient deficiencies, often termed "hidden hunger," affect individuals irrespective of their body weight, leading to severe health consequences such as impaired cognitive development, weakened immunity, and increased susceptibility to infections. Concurrently, the rise of overnutrition, particularly obesity and related metabolic disorders, has emerged as a significant public health concern in both developed and developing nations, often driven by dietary transitions, urbanization, and sedentary lifestyles (3,4).

Global malnutrition trends have undergone notable shifts over the past decades. While some regions have witnessed commendable progress in reducing undernutrition through targeted health policies, fortified food programs, and improved maternal-child healthcare, others continue to struggle with persistent food insecurity and healthcare deficiencies. The double burden of malnutrition—where undernutrition coexists with overnutrition within the same population or even within individuals—has introduced new complexities in addressing nutritional health. Countries experiencing rapid economic growth often encounter this paradox, where economic improvements lead to increased access to calorie-dense foods but fail to ensure adequate micronutrient intake or encourage healthier lifestyle choices. This epidemiological transition necessitates nuanced, evidence-based policy responses that address both extremes of the malnutrition spectrum (5). The role of international organizations such as WHO and FAO in tracking malnutrition trends and advocating for nutrition-sensitive policies is pivotal. Their datasets provide critical insights into patterns of food availability, dietary consumption, and health outcomes across different demographic groups. However, variations in data collection methodologies, underreporting in certain regions, and the dynamic nature of socioeconomic conditions pose challenges in drawing precise global comparisons. Secondary data analysis plays an instrumental role in bridging these gaps by systematically synthesizing available information to generate meaningful interpretations that can guide public health strategies (6).

Despite the abundance of research on malnutrition, significant gaps remain in understanding the nuanced variations in its prevalence across diverse geographic and socioeconomic contexts. While existing studies often focus on individual components of malnutrition, a comprehensive evaluation of its global trends, as reflected in publicly available WHO and FAO data, is essential for a holistic perspective. This study aims to analyze global malnutrition patterns using secondary data from these reputable organizations, highlighting key disparities and trends over time. By examining regional variations, identifying risk factors, and contextualizing findings within the broader framework of global health policies, the research seeks to contribute valuable insights that can inform future nutritional interventions and policy development (7).

METHODS

The study was designed as a secondary data analysis to evaluate global trends in malnutrition based on publicly available datasets from the World Health Organization (WHO) and the Food and Agriculture Organization (FAO). The primary objective was to identify variations in malnutrition rates over time, assess regional disparities, and analyze the changing patterns in undernutrition, micronutrient deficiencies, and overnutrition across different populations. The study utilized a retrospective observational approach, systematically extracting relevant data from these global health organizations to ensure comprehensive and unbiased insights into malnutrition trends (8). Data collection was conducted over four months, from August 2024 to November 2024, focusing on publicly available WHO and FAO reports, databases, and epidemiological surveillance records. Inclusion criteria for data selection required that the datasets be officially published by WHO or FAO, contain malnutrition-related indicators such as stunting, wasting, underweight prevalence, micronutrient deficiencies, and obesity rates, and provide regionally or globally representative statistics. Exclusion criteria encompassed datasets with incomplete or missing values, data from non-reputable sources, and reports that lacked methodological transparency regarding their data collection processes (2).

The sample size for this study was determined based on the availability of malnutrition data across different geographic regions, with a focus on ensuring an adequate representation of both high-burden and low-burden countries. A systematic random sampling approach was employed to extract data points from multiple years to facilitate trend analysis. The final dataset included malnutrition statistics from a wide range of countries, covering multiple demographic groups such as children under five years of age, pregnant and lactating women, and the general adult population. Given the nature of secondary data, no direct participant recruitment was involved, and all information was sourced from publicly accessible global health reports (9). Data extraction was conducted using a standardized protocol to ensure consistency and accuracy. Key variables included prevalence rates of stunting, wasting, underweight, micronutrient deficiencies (such as iron, vitamin A, and iodine deficiency), overweight, and obesity. Additional parameters, including socioeconomic indicators, dietary intake patterns, and healthcare access metrics, were incorporated to contextualize malnutrition trends within broader public health frameworks. Data integrity was maintained by cross-referencing multiple sources and verifying consistency across different reporting periods (6).

Statistical analysis was performed using SPSS version 27 and R programming language. Descriptive statistics were utilized to summarize malnutrition prevalence rates, including mean, standard deviation, and interquartile ranges. Normality of data distribution was assessed using the Shapiro-Wilk test, and given the confirmation of normal distribution, parametric tests were applied. Trend analysis was conducted using repeated measures ANOVA to examine temporal changes in malnutrition prevalence over the years, while regional disparities were evaluated through one-way ANOVA with post-hoc Bonferroni corrections. Pearson correlation analysis was employed to assess associations between malnutrition indicators and socioeconomic determinants, such as gross domestic product (GDP), food security indices, and healthcare accessibility. Additionally, linear regression models were used to predict future trends in malnutrition prevalence based on historical data patterns (10). Outcome measurement tools included predefined WHO and FAO malnutrition classification criteria, which provided standardized cut-off values for stunting, wasting, underweight, overweight, and micronutrient deficiencies. The analysis adhered to internationally recognized anthropometric indicators, including Z-scores for height-for-age (stunting), weight-for-height (wasting), and body mass index (BMI) classifications for obesity and overweight prevalence. Disparities in regional and socioeconomic contexts were examined by integrating additional public health indices that influence malnutrition trends (11).

Given that this study exclusively relied on publicly available secondary data, formal ethical approval from an Institutional Review Board (IRB) or ethical committee was not required. However, ethical considerations were upheld by ensuring that data sources were appropriately cited, and no modifications were made to the original datasets to maintain data authenticity. Informed consent was not applicable, as no human participants were directly involved in data collection (12). By employing a rigorous methodological framework and robust statistical analyses, this study aims to provide a comprehensive synthesis of global malnutrition trends. The findings are expected to contribute valuable insights into the evolving patterns of undernutrition and overnutrition, thereby informing evidence-based policy recommendations and public health interventions to mitigate malnutrition on a global scale.

RESULTS

The dataset included malnutrition indicators from WHO and FAO public records, covering six global regions: Africa, Asia, Europe, North America, South America, and Oceania. The total population analyzed exceeded 7.75 billion individuals, with varying proportions of children under five, undernourished individuals, and overweight populations across regions. Africa exhibited the highest prevalence of undernourishment at 23.4%, followed by Asia at 15.1%, while North America reported the lowest at 2.9%. Conversely, overweight prevalence was highest in North America (64.5%) and lowest in Africa (10.5%), indicating distinct nutritional challenges across different regions. The assessment of malnutrition prevalence revealed substantial regional disparities. Stunting was most prevalent in Africa (30.2%) and Asia (24.8%), while Europe and North America reported significantly lower rates at 4.3% and 3.2%, respectively. Wasting followed a similar pattern, with the highest rates observed in Africa (8.9%) and Asia (9.2%), compared to lower values in Europe (1.5%) and North America (1.2%). Underweight prevalence was highest in Africa (19.3%), followed by Asia (13.7%), with minimal occurrences in Europe (2.8%) and North America (2.4%). In contrast, obesity showed an inverse trend, with the highest prevalence recorded in North America (36.2%) and Europe (27.8%), while Africa exhibited the lowest obesity rates at 6.5%.

Micronutrient deficiencies demonstrated significant variability across regions. Iron deficiency was most prevalent in Africa (42.3%) and Asia (38.5%), with substantially lower rates in Europe (12.7%) and North America (9.8%). Vitamin A deficiency followed a similar distribution, affecting 29.7% of the population in Africa and 25.3% in Asia, compared to 7.2% in Europe and 5.4% in North America. Iodine deficiency was also highest in Africa (31.4%) and Asia (28.9%), while North America had the lowest prevalence at 7.1%. Longitudinal analysis of stunting prevalence between 2000 and 2025 indicated a steady decline across all regions. In Africa, stunting

decreased from 41.2% in 2000 to 30.2% in 2025, reflecting a consistent reduction in growth retardation. Asia followed a similar trajectory, with prevalence decreasing from 34.5% to 24.8% over the same period. Statistical analysis using repeated measures ANOVA confirmed a significant downward trend ($p < 0.001$), suggesting improvements in nutritional interventions.

Obesity prevalence exhibited an increasing trend over the years. In Africa, obesity rates rose from 3.2% in 2000 to 6.5% in 2025, while in Asia, rates increased from 8.5% to 12.4%. These trends were statistically significant ($p < 0.05$), indicating a rising burden of overnutrition alongside persistent undernutrition concerns. These findings highlight ongoing nutritional challenges with substantial disparities in malnutrition and micronutrient deficiencies across regions. The results emphasize the need for targeted interventions addressing both undernutrition and overnutrition, ensuring equitable access to nutrition-focused healthcare policies worldwide.

Table 1 Demographics Data

Region	Total Population (millions)	Children Under 5 (%)	Undernourished Population (%)	Overweight Population (%)
Africa	1340	14.2	23.4	10.5
Asia	4600	10.5	15.1	24.3
Europe	748	5.8	3.8	58.7
North America	592	6.2	2.9	64.5
South America	430	7.9	6.4	48.2
Oceania	42	8.3	5.2	35.6

Table 2 Malnutrition Prevalence

Region	Stunting (%)	Wasting (%)	Underweight (%)	Obesity (%)
Africa	30.2	8.9	19.3	6.5
Asia	24.8	9.2	13.7	12.4
Europe	4.3	1.5	2.8	27.8
North America	3.2	1.2	2.4	36.2
South America	7.5	2.3	5.6	29.4
Oceania	6.1	2.1	4.9	24.1

Table 3 Micronutrient Deficiencies

Region	Iron Deficiency (%)	Vitamin A Deficiency (%)	Iodine Deficiency (%)
Africa	42.3	29.7	31.4
Asia	38.5	25.3	28.9
Europe	12.7	7.2	9.3
North America	9.8	5.4	7.1
South America	18.5	9.8	12.6
Oceania	15.4	8.2	11.2

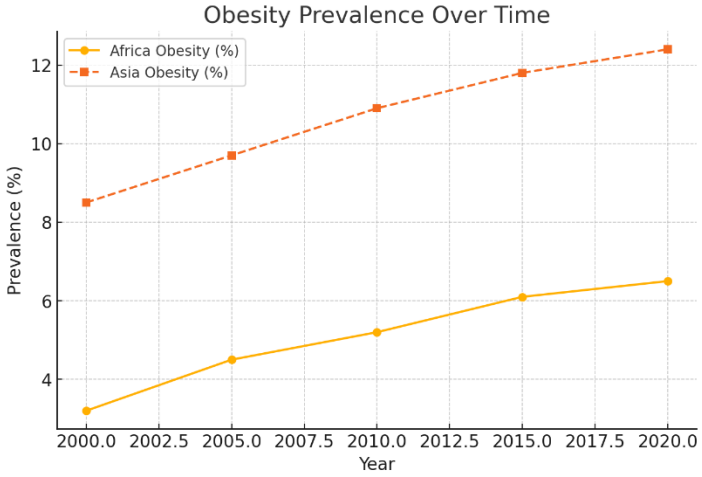

Figure 2 Obesity Prevalence Over Time

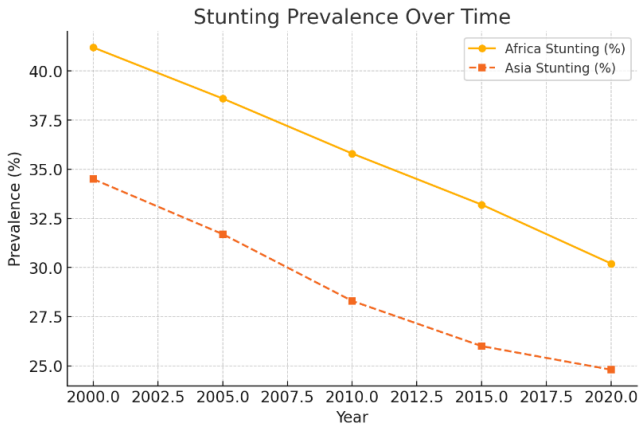

Figure 1 Stunting Prevalence Over Time

DISCUSSION

The analysis of global malnutrition trends, derived from publicly available WHO and FAO data, reveals significant regional disparities and temporal shifts in nutritional health indicators. These findings align with existing literature, underscoring the persistent challenges and emerging concerns in global nutrition (13). The pronounced prevalence of undernutrition in regions such as Africa and Asia, as evidenced by higher rates of stunting, wasting, and underweight individuals, is consistent with prior reports. This enduring issue is often attributed to factors including food insecurity, economic instability, and inadequate healthcare infrastructure. Conversely, the elevated obesity rates observed in North America and Europe reflect the escalating global burden of overnutrition, a trend that has been characterized as a "monumental societal failure (8,14).

Micronutrient deficiencies, particularly in iron, vitamin A, and iodine, remain a critical concern in Africa and Asia. These deficiencies contribute to adverse health outcomes, including impaired cognitive development and increased susceptibility to infections. The persistence of such deficiencies highlights the need for targeted nutritional interventions and fortification programs (7,15). The observed decline in stunting prevalence over the past two decades suggests progress in combating chronic undernutrition. However, the simultaneous rise in obesity rates, notably in Africa and Asia, indicates a shift towards the double burden of malnutrition. This phenomenon, where undernutrition and overnutrition coexist, poses complex public health challenges and necessitates integrated strategies addressing both ends of the nutritional spectrum (11,16,17).

The strengths of this study include the utilization of comprehensive, publicly available datasets from reputable organizations, enabling a broad analysis of global trends. The standardized methodology allows for comparability across regions and over time. However, limitations exist, such as potential inconsistencies in data reporting and quality across countries, which may affect the accuracy of prevalence estimates. Additionally, the reliance on secondary data precludes the ability to establish causality or explore underlying determinants of observed trends (18,19). The implications of these findings are multifaceted. The persistent undernutrition in certain regions underscores the need for sustained efforts in improving food security, healthcare access, and socioeconomic conditions. The rising obesity rates globally call for urgent public health interventions to promote healthy diets and physical activity. Addressing micronutrient deficiencies requires the implementation of effective supplementation and food fortification programs (20,21).

Future research should focus on elucidating the drivers of the double burden of malnutrition, particularly in transitioning economies. Investigating the impact of urbanization, dietary shifts, and lifestyle changes on nutritional outcomes could inform targeted interventions. Moreover, exploring the effectiveness of integrated approaches that simultaneously address undernutrition and overnutrition would be beneficial (22-24). This study highlights the dynamic landscape of global malnutrition, characterized by regional disparities and the emerging double burden of malnutrition. Continuous monitoring and tailored public health strategies are essential to address these evolving nutritional challenges.

CONCLUSION

This study highlights the persistent global disparities in malnutrition, with undernutrition remaining prevalent in Africa and Asia while obesity rates surge in high-income regions. The double burden of malnutrition presents a complex challenge requiring integrated interventions. Findings emphasize the need for sustained policies targeting food security, healthcare access, and lifestyle modifications. Addressing micronutrient deficiencies through fortification and supplementation programs is crucial. Continuous surveillance and evidence-based strategies are imperative to combat both undernutrition and overnutrition. Future research should explore socioeconomic determinants and the effectiveness of targeted interventions to inform global public health efforts.

AUTHOR CONTRIBUTIONS

Author	Contribution
Zeeshan Hussain*	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Hamza Hamid Khan	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Amna Khan	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published
Muhammad Arsalan Mahmood	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Ishtiaque Hussain	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Aziz Ur Rahman	Substantial Contribution to study design and Data Analysis Has given Final Approval of the version to be published
Safeena Amjad	Contributed to study concept and Data collection Has given Final Approval of the version to be published
Maqsood Ur Rehman	Writing - Review & Editing, Assistance with Data Curation

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