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COMORBIDITIES IN LOW AND MEDIUM INCOME COUNTRIES OF CHILD MALNUTRITION: A SYSTEMATIC REVIEW

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ABSTRACT

Background: Malnutrition or malnourishment is a condition that results from eating a diet in which nutrients are either not enough or are too much such that the diet causes health problems. Not enough nutrition is called undernutrition or undernourishment while too much is called over nutrition. According to the World Health Organization (WHO), malnutrition essentially means “bad nourishment” and can refer to the quantity as well as the quality of food eaten.

The aim: This study aims to show the comorbidities in low and medium income countries of child malnutrition.

Methods: By comparing itself to the standards set by the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020, this study was able to show that it met all of the requirements. So, the experts were able to make sure that the study was as up-to-date as it was possible to be. For this search approach, publications that came out between 2013 and 2023 were taken into account. Several different online reference sources, like Pubmed and SagePub, were used to do this. It was decided not to take into account review pieces, works that had already been published, or works that were only half done.

Result: In the PubMed database, the results of our search brought up 576 articles, whereas the results of our search on SagePub brought up 130 articles. The results of the search conducted for the last year of 2013 yielded a total 361 articles for PubMed and 81 articles for SagePub. The result from title screening, a total 41 articles for PubMed and 20 articles for SagePub. In the end, we compiled a total of 10 papers. We included five research that met the criteria.

Conclusion: Childhood nutrition is an integral component of a multifocal relationship with health, economic, social developments, and political system of the country. Child malnutrition under the age of 5 years has a great influence on the cultural, social, economic and community food practices.

Keyword: Malnutrition, Child, comorbidities.

INTRODUCTION

Child malnutrition (CM) is still one of the leading causes of mortality among under-5 children. Malnutrition can be defined as nutritional deficiency developing from inadequate consumption of healthy balanced food that enables optimal health; this included severe acute malnutrition, undernutrition, stunting, underweight, and being wasted. The effects of CM are devastating and exert a heavy load on low- and medium-income countries as they suffer unstable economies, lack of access to health care, political will, and social inequalities. In 2019, 144 million under-5 children globally were reported to be stunted (too short for age), and a further 47 million children were wasted (too thin for height).¹

Malnutrition is a health condition resulting from eating food that contains either insufficient or too many calories, carbohydrates, vitamins, proteins or minerals. It is a state of under- or overnutrition, evidenced by a deficiency or an excess of essential nutrients. Good nutrition is the basic need for children to thrive, grow, learn, play and participate. Access of every child to sufficient food may be the responsibility of parents and child to determine the fulfilment of this right. Malnutrition often steals dreams from their young lives and hangs their future in the balance. It remains a major public health concern for children under the age of 5 years in many low- and middle-income countries because it is still the leading underlying cause of child mortality in these countries. Children are more vulnerable to macro- and micronutrient deficiencies caused by high demand for food during their years of growth. The effects of malnutrition in children under the age of 5 years include underweight, stunting, wasting with or without oedema (previously known as marasmus and kwashiorkor, respectively) and even death.²

Childhood malnutrition of every form, including undernutrition (wasting, stunting and underweight), micronutrient deficiencies, as well as overweight and obesity, consists a triple burden of disease, especially for low- and middle-income countries, and is one of the leading causes of poor health and a major impediment to personal development and achievement of full human potential worldwide. Globally in 2019, 149 million children under the age of 5 years were stunted, almost 50 million wasted, 340 million suffered from micronutrient deficiencies and 38,2 million were overweight and obese. The nutritional needs of children and adolescents are unique and poor availability or limited access to food of adequate nutritional quality leads large population groups to undernutrition, poor nutritional status, overweight and obesity. These malnutrition forms often exist simultaneously and are interconnected.³

METHODS

Protocol

By following the rules provided by Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020, the author of this study made certain that it was up to par with the requirements. This is done to ensure that the conclusions drawn from the inquiry are accurate.

Criteria for Eligibility

For the purpose of this literature review, we compare and contrast of the comorbidities in low and medium income countries of child malnutrition. It is possible to accomplish this by researching or investigating comorbidities in low and medium income countries of child malnutrition. As the primary purpose of this piece of writing, demonstrating the relevance of the difficulties that have been identified will take place throughout its entirety.

In order for researchers to take part in the study, it was necessary for them to fulfil the following requirements: 1) The paper needs to be written in English, and it needs to determine about the comorbidities in low and medium income countries of child malnutrition. In order for the manuscript to be considered for publication, it needs to meet both of these requirements. 2) The studied papers include several that were published after 2013, but before the time period that this systematic review deems to be relevant. Examples of studies that are not permitted include editorials, submissions that do not have a DOI, review articles that have already been published, and entries that are essentially identical to journal papers that have already been published.

Search Strategy

We used "Comorbidities in low and medium income countries of child malnutrition" as keywords. The search for studies to be included in the systematic review was carried out using the PubMed and SagePub databases by inputting the words: (*"Malnutrition"[MeSH Subheading] OR "prevalence of malnutrition"[All Fields] OR "Incident of malnutrition"[All Fields]*) AND (*"Malnutrition in low income countries"[All Fields] OR "Malnutrition in medium income countries "[All Fields]*) AND (*"Comordities of malnutrition"[MeSH Terms] OR ("Complications of malnutrition"[All Fields]) OR ("Child malnutrition [All Fields])*) used in searching the literature.

Data retrieval

After reading the abstract and the title of each study, the writers performed an examination to determine whether or not the study satisfied the inclusion criteria. The writers then decided which previous research they wanted to utilise as sources for their article and selected those studies. After looking at a number of different research, which all seemed to point to the same trend, this conclusion was drawn. All submissions need to be written in English and can't have been seen anywhere else.

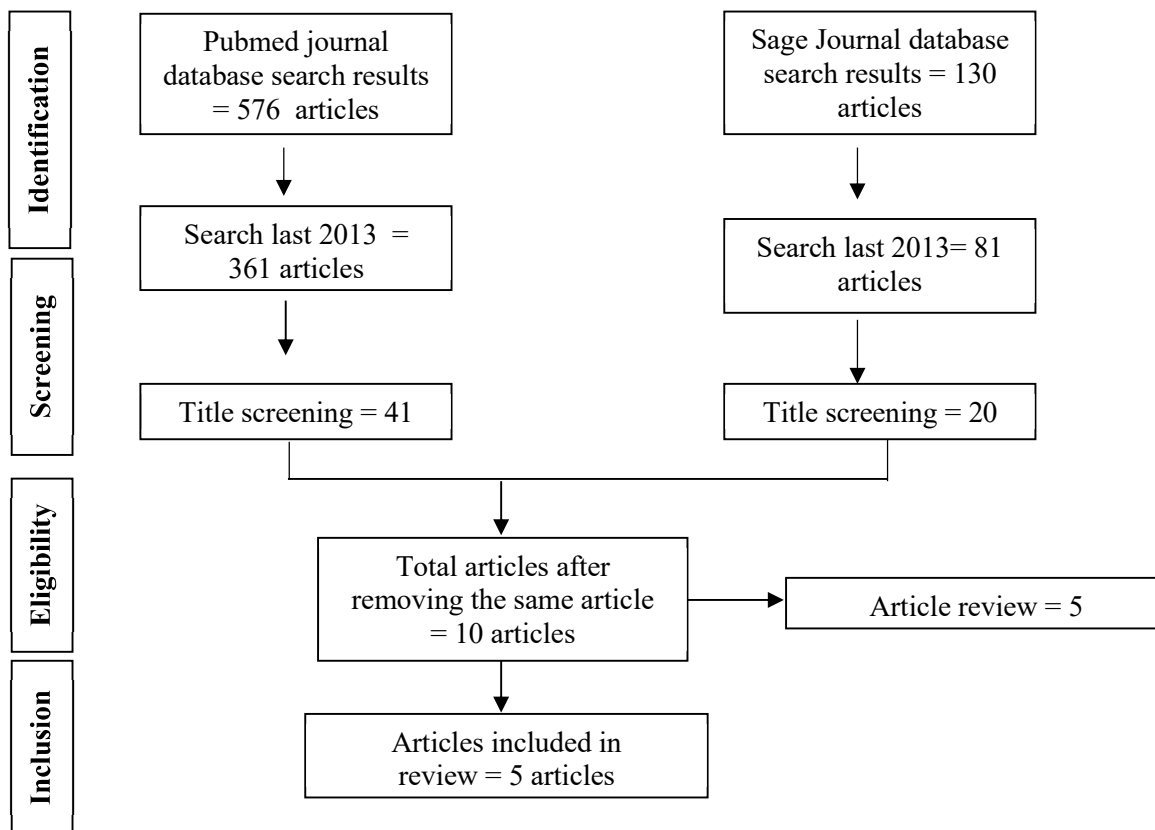


Figure 1. Article search flowchart

Only those papers that were able to satisfy all of the inclusion criteria were taken into consideration for the systematic review. This reduces the number of results to only those that are pertinent to the search. We do not take into consideration the conclusions of any study that does not satisfy our requirements. After this, the findings of the research will be analysed in great detail. The following pieces of information were uncovered as a result of the inquiry that was carried out for the purpose of this study: names, authors, publication dates, location, study activities, and parameters.

Quality Assessment and Data Synthesis

Each author did their own study on the research that was included in the publication's title and abstract before making a decision about which publications to explore further. The next step will be to evaluate all of the articles that are suitable for inclusion in the review because they match the criteria set forth for that purpose in the review. After that, we'll determine which articles to include in the review depending on the findings that we've uncovered. This criteria is utilised in the process of selecting papers for further assessment. In order to simplify the process as much as feasible when selecting papers to evaluate. Which earlier investigations were carried out, and what elements of those studies made it appropriate to include them in the review, are being discussed here.

RESULT

In the PubMed database, the results of our search brought up 576 articles, whereas the results of our search on SagePub brought up 130 articles. The results of the search conducted for the last year of 2013 yielded a total 361 articles for PubMed and 81 articles for SagePub. The result from title screening, a total 41 articles for PubMed and 20 articles for SagePub. In the end, we compiled a total of 10 papers. We included five research that met the criteria.

Nass, SS *et al* (2021)⁴ showed the presence of comorbidities was significantly associated with mortality. Severely malnourished children with comorbidities had 4 times higher mortality risk than severely malnourished children admitted without comorbidities. Clinicians and health workers should give due emphasis to the early detection and effective management of comorbidities in children with severe acute malnutrition.

Chilot, D *et al* (2022)⁵ about 1 out of 10 households suffer from the triple burden of malnutrition in low-income and middle-income countries. This study revealed that several maternal, child, household and community-level factors have a significant impact on the triple burden of malnutrition among mother-child pairs.

Table 1. The literature include in this study

Author	Origin	Method	Sample Size	Result
Nass, SS <i>et al.</i> , 2021 ⁴	Nigeria	A prospective observational cohort	201 children	The log-rank test showed significant differences in the probability of death between categories of diarrheal status (logrank statistic =9.760, P =.021) and presence of existing disease (comorbidity) (log-rank statistic =5.338, P =.021). The study identified that severely malnourished children admitted with comorbidities showed significant association with time to event (death) (AHR: 4.109, 95% CI: 1.51, 32.60). The estimated mean time until death was 57.9 days (±3.0) for children without comorbidities and 20.1 (±3.0) days for children with comorbidities. The median survival time was 18 days for children with comorbidities.
Chilot, D <i>et al.</i> , 2022 ⁵	Ethiopia	Cross-sectional study.	116795 mother-child pairs	The pooled prevalence of the triple burden of malnutrition among mother-child pairs was 11.39%. It showed statistically significant positive associations with mothers aged ≥35 years (AOR 2.25, 95% CI 2.08 to 2.44), family size >10 (AOR 1.17, 95% CI 1.08 to 1.26), delivery by caesarean section (AOR 1.93, 95% CI 1.83 to 2.03), the richest household (AOR 1.72, 95% CI 1.56 to 1.88), grand multiparous (AOR 1.62, 95% CI 1.46 to 1.81), age of child 36-47 months (AOR 1.77, 95% CI 1.64 to 1.90), at a p<0.05. Whereas breast feeding (AOR 0.94, 95% CI 0.89 to 0.99), married mothers (AOR 0.87, 95% CI 0.78 to 0.96), female children (AOR 0.88, 95% CI 0.84 to 0.92), improved toilet (AOR 0.23, 95% CI 0.17 to 0.29), improved source of drinking water (AOR 0.28, 95% CI 0.21 to 0.35), rural residents (AOR 0.66, 95% CI 0.62 to 0.69) had a contrasting relationship with the triple burden of malnutrition.
Gamal, Y <i>et al.</i> , 2023 ⁶	Egypt	A prospective case-control study	504 patients	All under-five children diagnosed with pneumonia who were admitted to Assiut University Children's Hospital (AUCH) from January 1st to December 31st, 2021, were

				<p>enrolled. Based on their nutritional assessment, the studied participants were classified into 2 groups: (1): Children with pneumonia and with nutritional deficiency considered as cases, and (2): Children with pneumonia and without nutritional deficiency considered as controls. Three hundred-fifty cases and 154 control subjects were enrolled, respectively. 93.4%, 31.1%, and 61.7% of the cases had underweight, stunting, and wasting, respectively. Among those cases, there were significant differences between survivors and non-survivors with regard to some clinicodemographic factors, laboratory parameters, and anthropometric parameters. Lack of compulsory vaccination, presence of sepsis, and blood transfusion (OR 2.874, 95% CI 0.048 – 2.988, $p = 0.004$, 2.627, 0.040 – 2.677, $p = 0.009$, and 4.108, 0.134 – 3.381, $p < 0.001$, respectively) were significant independent predictors for mortality among malnourished children with pneumonia.</p>
Banga, D et al., 2020 ⁷	Uganda	Prospective cohort study	338 children	<p>Of the 338 children under 5 years of age enrolled, 49 (14.5%) died, although the majority of children were diagnosed with dehydration, 128 (37.9%); pneumonia, 127(37.6%); and malaria, 87(25.7%). Anemia (aRR = 2.9, 95% CI: 1.23-6.62, $p = 0.01$), bacteremia (aRR = 10.0, 95% CI: 3.62-29.01, $p = 0.01$), HIV (aRR = 4.8, 95% CI: 1.42-16.30, $p < 0.01$), TB (aRR = 4.3, 95% CI: 1.28-14.49, $p < 0.02$), and shock (aRR = 60.9, 95% CI: 9.05-410.28, $p < 0.01$) were the comorbidities significantly associated with a likelihood of mortality.</p>
Vonaesch, P et al., 2021 ⁸	France	A case-control study	375 participants	<p>Formal maternal education lowered the risk of being stunted and restricted access to soap, suffering of anaemia and low birth weight were associated with higher risk of stunting. Short maternal stature, household head different from parents, diarrhoea and coughing were associated with an increased</p>

				<p>risk and continuing breastfeeding was associated with a lower risk of stunting in Antananarivo. Previous severe undernutrition and dermatitis/fungal skin infections were associated with higher and changes in diet during pregnancy with lower risk of stunting in Bangui.</p>
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Gamal, Y *et al* (2023)⁷ showed malnutrition has a high prevalence in under-five children with pneumonia in our locality. It has adverse effects on the outcomes and in-hospital mortality of those children. Lack of compulsory vaccination, presence of sepsis, and blood transfusion were significant independent predictors of mortality in malnourished children with pneumonia. Larger multicenter studies are warranted.

Banga, D *et al* (2020)⁷ showed the proportion of death among children under 5 years admitted in the nutritional unit of Jinja Regional Referral Hospital was 14.5% and higher than the national average. The most important comorbidities associated with mortality were anemia, bacteremia, HIV, TB, and shock. Based on the findings, it is recommended that health care providers should encourage caregivers of children with SAM to seek for care in time, particularly those with comorbidities. The clinicians are recommended to follow-up closely patients with severe acute malnutrition and to focus on the critical comorbidities identified and also avoid unnecessary medical interventions.

Vonaesch, P *et al* (2021)⁸ showed maternal education, antenatal care, iron supplementation and simple WASH interventions such access to soap and infection control and breastfeeding (Antananarivo) or better nutrition (Bangui) as specific interventions in the two study settings. Our results are an important milestone for these countries, as they provide a locally adapted roadmap for the implementation of targeted intervention and prevention strategies against childhood stunting.

DISCUSSION

Child malnutrition remains a serious public health challenge. Globally, undernutrition rates have been falling, yet in 2015, 156 million children under-five were chronically undernourished. While levels of undernutrition remain unacceptably high, levels of overnutrition among under-fives have been increasing. In 2010, 38 million of the 43 million overweight under-fives were living in low and middle income countries (LMICs) and it is in these countries where the prevalence rates of overweight are increasing at the fastest rates. LMICs are said to be facing a ‘double burden of child malnutrition’ (DBCM). Children in these populations are at risk from either undernutrition or overnutrition; this has severe consequences for the affected individuals and for the long-term health of the country's population. However, these risks are not necessarily separate across individuals. In all LMICs, there are individual children affected by both undernutrition and overnutrition; these children are referred to in this paper as ‘stuntedoverweight’. This DBCM, at the individual-level, is an important public health problem and has notable implications for measurement, policy and interventions concerned with malnutrition.⁹

Nutrition status is primarily assessed through the measurement of a child's height (or length in the youngest children) and weight and comparing the child to the standard metrics. Stunting (height-for-age z-score below – 2 standard deviations (SD) from the global median, as defined by the 2006 World Health Organization Child Growth Standards), wasting (weight-for-height z-score below – 2 SD from the global median) and underweight (weight-for-age z-score below – 2 SD from the global median) are indicators of a child’s undernutrition. These anthropometric measures on a country level are updated regularly through the demographic and health surveys (DHS) program, which collects nationally representative health data to monitor and evaluate population health and nutrition programs in low- and middle-income countries (LMICs). Stunting, wasting and underweight have been assessed in SSA, and stunting and wasting estimates are regularly updated by the United Nations’ Food and Agriculture Organization reports. However, we are unaware of prior studies of the combined influence of human development index (a country-specific composite index based on life expectancy, literacy, access to education and per capita gross domestic product) on all three undernutrition forms, at the global, regional and country-level.¹⁰

Malnourished children often have a concomitant acute or chronic illness at the time of diagnosis, and similarly many children who present for medical care due to an acute illness are often found to be malnourished, unbeknown to their caretakers. The identification and diagnosis of malnourished children should thus ideally occur as part of an integrated health system rather than as a stand-alone service for acute malnutrition alone. An assessment for acute malnutrition, to include at least measuring MUAC and assessing for kwashiorkor, should occur as part of the general medical assessment of all children presenting for care in LMICs. In hospital settings, this should be part of the Emergency Triage Assessment and Treatment system, as the diagnosis of SAM will affect the therapies (such as the amount and speed of fluid resuscitation) given for the primary presenting symptom. In outpatient settings, similar assessments for acute malnutrition should occur as part of the Integrated Community Case Management framework.¹¹

CONCLUSION

Childhood nutrition is an integral component of a multifocal relationship with health, economic, social developments, and political system of the country. Child malnutrition under the age of 5 years has a great influence on the cultural, social, economic and community food practices. Unlike adults, the nutritional status of children is directly influenced by maternal health during pre-pregnancy, pregnancy and breastfeeding.

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