Scripta
Spring 2026, Vol. 5, No. 1, 82-92
ISSN: 2769-9242

The Ability of Various Interventions to Combat Malnutrition in Developing Countries in Children

Shruti Desai *

Abstract

Chronic malnutrition, caused by a prolonged lack of micronutrients, over a significant period of time, increases a child's susceptibility to enteric infection, including foodborne and diarrheal illnesses. In addition, after a child with malnutrition contracts an enteric infection, that infection reduces the child's nutrient absorption capability, creating a perpetual cycle of malnutrition. This eventually causes stunting, low height for age, and wasting, low weight for height. After looking at journal articles and research studies, the following question was formulated: What are the effects of different internationally and United Nations-led malnutrition interventions on incidence rates of foodborne illness in developing countries among children? Complementary feeding methods, including supplementation and fortification, have been shown to reduce the prevalence of chronic malnutrition as well as foodborne and diarrheal illness. Furthermore, combining existing solutions with more modern solutions will ensure that interventions are able to reach vulnerable communities, since food distribution programs can address only undernutrition, and complementary feeding can address both undernutrition and malnutrition. This research will provide a perspective on what interventions will be most effective in developing countries to both prevent risk factors for malnutrition and foodborne illness.

Introduction

During a food crisis in Niger, water shortages became common, and a girl named Fatchima became infected with a diarrheal illness from contaminated well water and a contaminated food and water supply(Save the Children). She would have died without the proper access to nutritious, fortified food and minerals due to rapid dehydration, furthering the impact of her malnutrition (Save the Children). Social determinants result in situations like Fatchima's, and these determinants create conditions for foodborne illness to thrive. In underdeveloped regions, access to clean water and safe food is limited because of a lack of water filtration programs and food safety standards. Given the increased risk that children in developing countries have for foodborne and diarrheal illness or enteric infection, it is especially

*Junior Student, Fulton Science Academy.
Contact: sdesai@student.fsaps.org

concerning that children with malnutrition possess a higher susceptibility due to having a damaged intestinal lining from causes such as villus atrophy and the loss of gut integrity from reduced immune protein that lowers microbial diversity, all limiting the ability of the intestinal lining to absorb micronutrients (Kaferstein, 2010).

Malnutrition is a persistent issue in rural communities. Current interventions include breastfeeding in place of contaminated weaning food(what mothers use to ease their child off breastmilk), nutritional education programs, and dietary diversification (Muller and Krawinkel, 2005). Unfortunately, the nutrients provided are not enough to support a growing child, resulting in malnutrition. Supplementation through micronutrient tablets and fortification of staple foods have proven to be effective in reducing risk factors to malnutrition, including low birth weight and diarrheal illness (Menon et al., 2018).

With this information in mind, what are the effects of different internationally and UN-led malnutrition interventions on incidence rates of foodborne illness in developing countries, and which interventions prove to be the most effective? With research and investigation, the conclusion is that among international and UN-led strategies, micronutrient supplementation and food fortification have proven more effective at reducing foodborne illness incidence than general food distribution alone—especially when combined with breastfeeding programs to prevent malnutrition.

Literature Review

Existing literature on the topic focuses on the interventions most effective to prevent stunting and wasting, which lead to diarrheal disease; however, enteric infection is not explicitly discussed as a complication of malnutrition in a large portion of that literature. Current research has proven that supplementation and fortification show the lowest rates of complications related tolow birth weight, a risk factor for foodborne illness and malnutrition.

Impacts on Morbidity and Mortality

In low-and middle-income countries, malnutrition and foodborne illness are leading causes of child mortality. Nearly 45% of all child deaths result from malnutrition (Adepoju, 2019). 45% of all deaths in children in these countries are caused by complications of other illnesses exacerbating the effects

of malnutrition including growth restriction, stunting, wasting, micronutrient deficiencies, and foodborne illness from contaminated weaning food, as a result of early weaning(Adepoju, 2019). These are extremely prevalent problems in the developing world, as Adepoju states, in South Asia, "38.9% of under-fives are stunted". In Africa, even with the "rate of stunting" falling to "30.3%, 58.7 million children are affected by stunting.Wasting, similarly, "affects over 50 million children, with more than half" living in South Asia (p. 394, 2019). The high prevalence of these conditions in developing areas is highly correlated with the morbidity and mortality from malnutrition, since they are physical indicators of undernutrition, proving the severity of this issue across developing nations, regardless of region. Both stunting and wasting are caused by environmental and social factors. Notably, both indicate improper development and growth in children, and are a result of inadequate feeding, nutrient deficiencies, and repeat infection, eventually causing bowel inflammation and malabsorption (WHO, 2015). Although gut barrier weakening is not fatal in isolation, it can cause other complications. As a result of weakening, a child is more susceptible to repeat infection of foodborne illness because of reductive adaptation. During reductive adaptation, a malnourished person experiences less catabolic activity. All of these factors eventually result in multi-organ shutdown, proving fatal for many in developing countries (Kaferstein, 2005).

Social and Environmental Determinants

Malnutrition and foodborne illness are influenced by social landscapes, including poverty, limited healthcare access, and sanitation protocols, as well as the surrounding environment. Limited healthcare access prevents micronutrients from being provided within healthcare facilities. Improper sanitation protocols influence the development of foodborne illnesses, with these illnesses being more prevalent in areas where food safety protocols are not followed. Continued exposure to fecal matter or pollution can influence the capability of a malnourished child's immune system to respond effectively to foodborne illnesses. Micronutrient deficiencies, especially protein-energy malnutrition, are especially seen in food-insecure countries. Countries with improper sanitation protocols, a lack of a food safety program, and insufficient nutritional education are the most likely to experience foodborne and diarrheal illness. These conditions make for reservoirs of cholera in municipal water systems and improperly stored food, causing outbreaks,

devastating malnourished populations (Kaferstein, 2010).

Additionally, environmental exposures can impact susceptibility to enteric infection. For example, exposure to aflatoxin, a carcinogen and mutagen produced by Aspergillus molds, can result in endemic malnutrition. A host is exposed through inhalation of mold when crops are planted in high temperatures, high moisture, and decaying plant matter. In a descriptive epidemiology study conducted by researchers in pediatrics, nutrition, and public health that compared groups of African and South Asian children, sites of varying aflatoxin exposure and malnutrition were investigated, indicating a clear association between higher aflatoxin exposure and mortality, as well as malnutrition and mortality in both Africa and South Asia (Xia et al.) . Nutritious food will aid in solving malnutrition, but foodborne illness also most commonly appears in fresh foods from markets.

Cycle of Illness

In addition to the impact foodborne illnesses and malnutrition have on society, they have a permanent effect through immune suppression and repeated infection. When children with malnutrition are diagnosed with foodborne illness, malnutrition exacerbates due to malabsorption, damage to the lining of the intestines, and bowel inflammation (Polkinghorne et al., 2022). This cycle of illness is known as environmental enteric dysfunction. It has symptoms of inflammation, atrophy, mucosal leakage, and diarrhea. The aforementioned cycle is caused by foodborne contamination and results in impaired digestion and nutrient absorption. This dysfunction reduces gut bacteria diversity, a major risk factor for foodborne illness (Kaferstein, 2010). In conclusion, malnutrition and the complication of foodborne illness are among the most prevalent issues in developing countries. However, there is a lack of knowledge on how to implement solutions. Malnutrition stems from socioeconomic factors and lack of access to healthy food, while the associated complication of foodborne illness arises from a lack of food safety and clean water

This research uniquely focuses on how malnutrition interventions can prevent foodborne illness, while most research focuses on low birth weight, anemia, and pregnancy-related issues as complications, or how diarrheal illness causes malnutrition. Existing research states that malnutrition from diarrheal illness is caused by bowel inflammation, but there is limited research on what physiological processes result in increased susceptibility to

enteric infection. Existing research fails to address what unique strategies prove to be most effective in children who contract foodborne illness and have chronic malnutrition. Existing research tends to focus on specific countries. In this paper, Timor-Leste and Mali are explicitly mentioned, and most research on this topic is not comparatively recent. Finally, previous research on the topic is not able to explain why supplementation and fortification are effective, and mainly conducts statistical tests without analysis and interpretation.

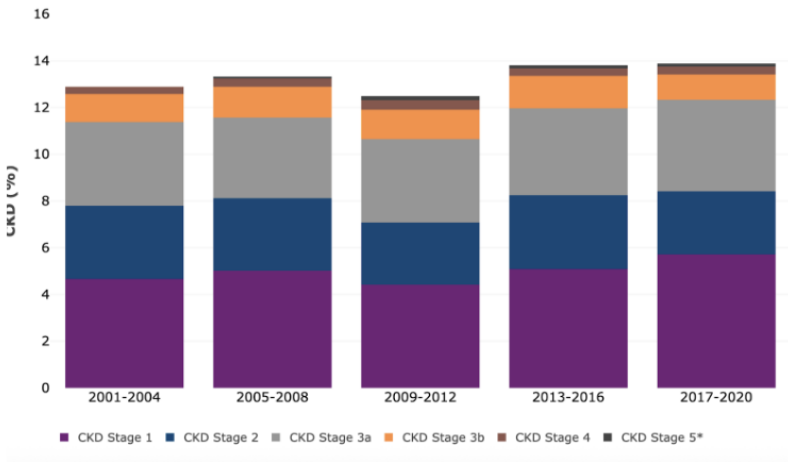

Figure 1: CKD prevalence and stage distribution in the U.S., 2001–2020.

Methodology

Searches were conducted on Google Scholar, PubMed, The Journals of Nutrition and Medicine, and the New England Journal of Medicine. I used research articles focusing on interventions for malnutrition or foodborne illnesses and studies focusing on developing countries. I used the search terms of "nutritional deficiencies," "foodborne illness," "UN initiatives on malnutrition," and "global micronutrient programs" to collect data on the effectiveness of programs in preventing malnutrition, incidence rates of foodborne illness, and the rates of mortality and morbidity from foodborne illness in children with malnutrition.

Since the research paper specifically focuses on what interventions are most effective in resolving the root cause of a lack of food in underdeveloped nations, I looked at both the interventions currently used and the

interventions that have proven to be most effective. Effectiveness of interventions was evaluated through feasibility of the solution in terms of cost and widespread usage and ability to reduce rates of malnutrition. First, the positive and negative impacts of the currently used interventions in developing countries will be discussed, and then the effectiveness of interventions of supplementation and fortification will be discussed while comparing them to standard practices today. In addition, I addressed counterclaims to these solutions. I implemented an outcome evaluation. In the outcome evaluation, I used statistical and comparative analyses between interventions to determine the success of each intervention. Secondary sources and journal articles were primarily used in the literature review and the research findings and analysis sections, while a primary source was utilized in the introduction. Data from the WHO was used for statistics on stunting and wasting. Overall, a total of 17 sources were used. Statistical analyses were utilized to quantitatively determine the effectiveness of each intervention, while research studies were utilized to qualitatively compare interventions against each other.

Introduction

During a food crisis in Niger, water shortages became common, and a girl named Fatchima became infected with a diarrheal illness from contaminated well water and a contaminated food and water supply(Save the Children). She would have died without the proper access to nutritious, fortified food and minerals due to rapid dehydration, furthering the impact of her malnutrition (Save the Children). Social determinants result in situations like Fatchima's, and these determinants create conditions for foodborne illness to thrive. In underdeveloped regions, access to clean water and safe food is limited because of a lack of water filtration programs and food safety standards. Given the increased risk that children in developing countries have for foodborne and diarrheal illness or enteric infection, it is especially concerning that children with malnutrition possess a higher susceptibility due to having a damaged intestinal lining from causes such as villus atrophy and the loss of gut integrity from reduced immune protein that lowers microbial diversity, all limiting the ability of the intestinal lining to absorb micronutrients (Kaferstein, 2010).

Malnutrition is a persistent issue in rural communities. Current interventions include breastfeeding in place of contaminated weaning food(what

mothers use to ease their child off breastmilk), nutritional education programs, and dietary diversification (Muller and Krawinkel, 2005). Unfortunately, the nutrients provided are not enough to support a growing child, resulting in malnutrition. Supplementation through micronutrient tablets and fortification of staple foods have proven to be effective in reducing risk factors to malnutrition, including low birth weight and diarrheal illness (Menon et al., 2018).

With this information in mind, what are the effects of different internationally and UN-led malnutrition interventions on incidence rates of foodborne illness in developing countries, and which interventions prove to be the most effective? With research and investigation, the conclusion is that among international and UN-led strategies, micronutrient supplementation and food fortification have proven more effective at reducing foodborne illness incidence than general food distribution alone—especially when combined with breastfeeding programs to prevent malnutrition.

S

Challenges in Pricing:

The pricing of PKD and CKD medications is influenced by economic and ethical factors. Each of those factors presents significant challenges. The most significant few is the high cost of research, development, and production of the medications. The process of developing a new medicine product is risky and capital intensive [1]. Industries estimated that the average cost of bringing a new drug to market can exceed a price of 2 billion dollars. In the case of PKD and CKD, a common disease, which means the medication will only face a small portion of the whole human population, the medications might not bring as much profit. Therefore, the pharmaceutical companies must set the price as high as possible so that they can generate profit on the investment on those medications [2]. In modern society, there are government factors in the market. They might set up price ceilings, which places an upper limit on how much a company can charge for a drug. The purpose of it is to protect consumers from spending an excessive amount of money. While it can be beneficial to the society, it can actually discourage innovation and investments if manufacturers feel like they are not making profit off their products. On the other hand, price floors may also be set. It is usually used to prevent underpricing that could destabi-

lize the economy. But it would usually not be the case when it comes to the medical field. Government intervention may also come in the form of compulsory licensing, subsidies, and inclusion of drugs on national essential medicines list, and all of those may have a significant impact on the pricing of the medical products [3].

Strategies to Balance Benefits for Companies and Patients:

Pharmaceutical companies and retailers must adopt innovative pricing strategies. One of the possible approaches is tiered pricing, which is commonly known as differential pricing. Under tiered pricing, companies charge higher prices in wealthier countries, and lower prices in less-developed countries or middle-income countries. [4] This strategy enables manufacturers to maximize revenue in developed markets while expanding access to medicines in regions where people might not be able to afford them. For example, medications for HIV/AIDS are priced using tiered pricing, where in the United States (a more developed country) it is sold for around $2,300-4,600$ a month, whereas in Ghana (a less developed country), they are sold for $200-300$ a month. This shows how tiered pricing could be an effective strategy when it comes to selling medicines for PKD and CKD. Another possible approach is valued- base pricing. This model ties the cost of the drug to the clinical outcomes it actually delivers. For PKD treatments that significantly delay the progression of kidney failure, a higher price may be justified since the medication has a substantial impact on the patient's health. [5] On the other hand, medications with limited outcomes may be set with a lower price. When patients are presented with multiple options at different price points, they can choose which medication they will take based on their condition and financial situation. Manufacturers also benefit from this approach, since developing effective medications is costly , and they can recoup research and development costs through higher prices for drugs that deliver greater clinical value.

Section 3: Role of Community Lawyers in Price Balancing

Community lawyers are public interest lawyers who use the law to address community issues. They work with community members to identify and solve problems in society before they reach the court system. There are several ways that community lawyers could be involved in the process of balancing drug pricing before taking legal action against rising medicine

costs. First, they could advocate for policy reform. If there are existing policies that permit excessive pricing of medicines, the lawyers can advocate for changes to those laws. For example, patent laws, or intellectual property laws allow pharmaceutical companies exclusive rights to produce and sell a new drug for a set period of time. During this period, competitors are prohibited from manufacturing generic versions of the drug. This allows the patent holder to set high prices without competition. In this situation, community lawyers can organize public campaigns to raise awareness about the harms of overly restrictive patent protections[6]. Specifically, they can organize forums about the relationship between patents and medicine costs. These events will be able to empower citizens to advocate for changes and rally around the cause. Besides advocating for policy reforms, organizing protests against unfair practices would also help create chances for people to access medicines more easily. Under former President Barack Obama's administration, the White House launched a petition website called "We the People" [7]. On this website, any petition with a minimum of 100,000 signatures will receive a formal response. In 2024, a poll from KFF found out "just over half (55%) of adults are worried about being able to afford their family's prescription drug costs, including a quarter (26%) who are 'very' worried." As of now, the U.S. population is more than 300 million, and 26percent of 300 million is approximately 78 million, which is 780 times more than the 100,000 signatures needed for a qualifying petition. This level of concern would likely attract attention from the government, and prompt serious consideration of the issue of high medicine prices.

Collaborate in Medical-Legal Partnerships

Medical- Legal Partnerships (MLPs) are defined as "a collaboration between a healthcare organization and a public interest law organization to address health-harming social needs that have civil law remedies" (National Library of Medicine). For individuals living with PKD and CKD, the existence of medical- legal partnerships could be life- changing. These patients often face a range of challenges beyond the clinical aspects of their illness - such as accessing consistent healthcare coverage and securing financial aid - and they can all impact disease progression and the overall quality of life. Community lawyers that work with healthcare professionals can help patients navigate public benefit systems, such as Medicaid, Medicare and Social Security Disability Insurance. They also play a crucial role in ap-

pealing insurance denials for medications, dialysis, and kidney transplant evaluations, which can help ensure patients receive timely and appropriate treatment. When discussing the benefits of medical- legal partnerships, it is impossible to neglect the positives MLPs can have on employment and housing stability. Many patients suffering from these kidney diseases experience frequent fatigue and mobility issues. In cases where patients have to undergo dialysis, there are time -consuming treatment schedules. Legal advocates can support these patients by ensuring their rights under the Americans with Disabilities Act (ADA). If the patients are wrongfully fired by their employers, the community lawyers can support them by defending against those termination.

Conclusion

In conclusion, the management of PKD and CKD relies heavily on targeted medications such as tolvaptan and SGLT2 inhibitors, which effectively alleviate symptoms and slow disease progression, although no cure exists for either condition. The persistent high prevalence of these conditions underscores the urgent need for accessible treatment options. Pharmaceutical manufacturers and retailers can adapt innovative pricing strategies like tiered and value- based pricing to balance profitability and global affordability. Community lawyers play a vital role by advocating for policy reforms, supporting medical- legal partnerships, and addressing social determinants such as employment and housing stability. Together, these strategies foster a sustainable healthcare model that prioritizes both industry viability and equitable patient access to treatment [8].

References

1. Yale Law Journal Forum. *Bind Us Together: Coalitional Public Policy Advocacy in Medical-Legal Partnerships* `https://www.yalelawjournal.org/forum/bind-us-together-coalitional-public-policy-advocacy-in-medical-legal-partnerships`. 2024.
2. National Organization for Rare Disorders. *Polycystic Kidney Disease, Autosomal Recessive* `https://rarediseases.org/rare-diseases/polycystic-kidney-disease-autosomal-recessive/`.

3. Network for Public Health Law. *Power Sharing, Capacity Building, and Community Leadership: Common Elements of Public Health Practice and Community Lawyering* https://www.networkforphl.org/news-insights/power-sharing-capacity-building-and-community-leadership-common-elements-of-public-health-practice-and-community-lawyering/. 2021.

4. MedlinePlus Genetics. *Autosomal Recessive Polycystic Kidney Disease* https://medlineplus.gov/genetics/condition/autosomal-recessive-polycystic-kidney-disease/.

5. MedlinePlus Genetics. *Autosomal Dominant Polycystic Kidney Disease* https://medlineplus.gov/genetics/condition/autosomal-dominant-polycystic-kidney-disease/.

6. Kaiser Family Foundation. *Public Opinion on Prescription Drugs and Their Prices* https://www.kff.org/health-costs/poll-finding/public-opinion-on-prescription-drugs-and-their-prices/. Aug. 2023.

7. Obama White House Archives. *Petitions* https://petitions.obamawhitehouse.archives.gov/.

8. Yu, A. S. L. *et al.* Tolvaptan in Later-Stage Autosomal Dominant Polycystic Kidney Disease. *New England Journal of Medicine* **379,** 2156–2167 (2018).