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Madagascar, Malnutrition

Madagascar: Maternal and Neonatal Benefits of Multimicronutrient Supplementation

Madagascar is an island country located off the southeast coast of Asia. The population, in a July 2021 estimate, is roughly around 27,534,354 people. The island is predominantly poor and rural, with only 38.5% of the population being urban and the other 61.5% rural ("Madagascar", 2021). Somewhat like the United States, Madagascar has a semi-presidential republic government, with the addition of having both a president and a prime minister who share duties.

The geography is mainly plateaus and mountains inland with a narrow coastal plain. The weather is “tropical along coast, temperate inland, arid in south” (“Madagascar”, 2021). Because of the terrain being mostly mountainous, only 5% of the country is farmed. However, despite the small percentage of land being used, “as much as 80% of Madagascar’s population” is involved with farming and agriculture (Rarison, 2018). Most rural families own farmland of about 1.2 hectares, or roughly the size of 2 football fields. The varied land temperature from the coast inland makes for a variety of crops to be grown. Agriculture is Madagascar's largest industry, with the majority of their exports being composed of “coffee, vanilla, shellfish, sugar, and fiber” (“Madagascar”, 2021). Yet agricultural production still remains fairly low due to “limited access to agricultural productive assets, credit and markets; gender inequality limiting women and girls’ access to land; poor post-harvest techniques; inadequate natural resources management; and lack of adequate access to markets for smallholder farmers” (“Madagascar - World Food Program USA”, 2020).

Most farm families practice subsistence agriculture, which is when “one family grows only enough to feed themselves” (“What is Subsistence Farming? – Africa Development Promise”, 2021). While this method is cheap and convenient, the family can be very susceptible to troubles with finding food if there are problems with the farm, like drought, floods, or a bad harvest (“What is Subsistence Farming? – Africa Development Promise”, 2021). A staple food that is grown and eaten on most farms is rice. A typical family meal “contains one main dish of meat, poultry or fish with a side dish of vegetables, accompanied by a bowl of ro (a mix of herbs, leaves and rice)” (“Madagascar Food and Drink”, 2020). Malagasy people do not get much protein in their meals, as the typical person per family “eats 3.5kg meat per year compared to 19.5kg per year in 1961 (and compared to 40+kg for an American” (Frost, 2007). All in all, families, communities, and villages heavily rely on their local farmers for food when it becomes unavailable to buy it with their already fragile money budget.

The average family in Madagascar is moderate sized at around 4.6 people, tending to be more on the higher side in rural areas and lower in urban areas. Houses are typically made with materials they already have, like “mud and wattle or woven matting supported by poles” or “interlaced split bamboo... thatched with palm”. With most of Malagasy’s living in poverty and in poor villages, some amenities are hard to come by. In rural areas, as much as 83% of the population does not have access to electricity (“Madagascar - Local government”, 2021). The situation for the internet is even worse as “only 2% of the population had constant access to it in 2012”. As the weather in Madagascar can also become unstable, many unpaved roads “[become] impassable in the rainy season” (Sipi, 2021). This makes it hard to access food, let alone healthcare.

Even though healthcare is free in the country, there are many obstacles that make it difficult to get to it. People in rural areas are often too far from the nearest health center to be able to get there, with “over 60 percent of Madagascar's people live more than 5 kilometers from a health center, often in very remote and

difficult to reach areas without roads or communications” (“Global Health | Madagascar | U.S. Agency for International Development”, 2021). Even at the health centers, medical personnel are unevenly spread out throughout the country and drug and medical supplies are low. However, there are many problems in Madagascar that a single visit to a healthcare center can fix.

Because the food income is so unstable in Madagascar, it is often hard for families to get the proper nutrition needed. Food scarcity is largely attributed to the climate in Madagascar; much of the country relies on their own farms and harvest to get their food. Natural disasters regularly hit the island with “cyclones, drought, floods and locust invasions” which bring with them upcoming food shortages (“Global Health | Madagascar | U.S. Agency for International Development”, 2021). Rice, their main staple food from harvesting, is made up of mostly carbohydrates with little source of other vital vitamins needed in a diet. Meat and fish, holding many of the other vitamins needed in a diet, can be scarce to come by in a quantity large enough to fulfill these micronutrient and vitamin needs. Lacking enough food and nutrition has largely affected the whole of Madagascar’s population as “the country has the fourth-highest malnutrition rate in the world”(“Madagascar | Hunger Relief in Africa”, 2021). Trends have only been worsening with the “widespread poverty and political instability – and now the COVID-19 pandemic – push already vulnerable people to the brink” (“Madagascar | World Food Programme”, 2021). Much of this starts and begins from birth and conception, as the mothers lack the proper nutrients to get to the fetus, and many babies are born with low birth weight. This heightens and speeds up the effects of malnutrition and possibly stunting if the child continues to not get the necessary nutrients and food needed.

Adequate nutrition is vital to a child’s growth and development, and when these needs are not being met, stunted growth called stunting happens. Stunting is a common problem in developing countries that “reflects chronic undernutrition during the most critical periods of growth and development in early life”. The effects of stunting are critical on both the child at that age with “increased morbidity and mortality, reduced physical, neurodevelopmental and economic capacity and an elevated risk of metabolic disease into adulthood” (Abeway, Gebremichael, Murugan, Assefa & Adinew, 2018). Stunting is also considered a cyclical process because studies have shown that women who were stunted themselves as a child are more likely to have stunted children as well. This is something that affects generation after generation, child after child. This is why it’s as important as possible to try and stop or delay it from the start. Something that largely affects malnutrition and then affects the number of children with stunted growth is micronutrient levels in diets.

Micronutrients “are vital to healthy development, disease prevention, and wellbeing” and unlike most things in our body, micronutrients are not produced by it and need to be consumed from an outside source, like our diets (“Micronutrient Facts”, 2020). A deficiency of these micronutrients during pregnancy and in the early years of a child's life have been shown to lead to increased risk of stunted growth in the individual. Stunting is “one of the main forms of the widespread shortage of micronutrients in the diet”. The main micronutrients needed in pregnancy and lactation are folic acid, iron, calcium, vitamin D, DHA, and iodine. Folic acid is a “B vitamin that every cell in your body needs for healthy growth and development” (Branca & Ferrarri, 2002). Iron is a mineral the body needs to create hemoglobin; twice the amount of this is needed during pregnancy. Calcium is a “mineral that helps your baby’s bones, teeth, heart, muscles and nerves develop”, while vitamin D helps the body to absorb the calcium. DHA, or Docosahexaenoic acid, is an omega-3 fatty acid that helps with growth and development. Lastly, iodine is a mineral the body needs to make thyroid hormones, and also helps the fetus’s nervous system develop (“Vitamins and other nutrients during pregnancy”, 2020). The effects of deficiencies with these vital minerals and vitamins can be detrimental to the fetus’s life, impacting bodily growth, neurological development, and can cause higher likelihood of certain diseases.

A solution to help prevent stunting and low birth weight is to provide a micronutrient supplementation program for both pregnant mothers. In these women specifically, it is especially important that they receive the necessary amount of vitamins and minerals. When taking vitamin supplements to adjust levels to normal or higher, there have been substantial neonatal effects. During pregnancy, more micronutrients are actually needed than normal. This is why it's so important to keep the levels up. When using micronutrient supplementation to boost those levels, there are many effects that have been proven to happen, one of the most common being preventing low birth weight, also referred to as LBW. One of the most commonly found and research is that micronutrient supplementation has proven that "women using supplements containing iron, folate, zinc, calcium since the second trimester had reduced risk of preterm delivery, LBW and very LBW" (Branca & Ferarri, 2002). The numbers of these have decreased the risk from a "approximately a sevenfold reduction in risk of VLBW with first trimester supplementation and a sixfold reduction with supplement use in the second trimester" (Scholl et al., 1997). Therefore, administering and taking the supplements in the first trimester is preferable compared to the second trimester as getting these nutrients into the body and fetus as soon as possible is vital in showing results in the weight and health of the baby when born.

With the micronutrient supplements taken during pregnancy, these effects and benefits are shown on both the baby and the mother. Taking these supplements would be a vital step to stopping and preventing malnutrition and stunting before it starts. As said before, stunting is generational; meaning if the mother was stunted, her child is more likely to be stunted as well. This is why it's so important to stop this process before it gets even more serious and even more of a widespread issue throughout the country. As time goes on and without help, the trends of malnutrition and stunting will only continue to worsen. If proper nutritional levels are not able to be met for the mother and child, there needs to be some other programs in its place to help some things out. With the COVID-19 pandemic, food insecurity is only rising in Madagascar making it harder, especially for rural families and mothers, to get the proper nutrition they need. This is seen as more of a problem in rural areas as compared to urban areas in Madagascar, as rural people have more trouble getting access to the amount of healthcare and food like urban areas are able to. Urban areas also have more support and help available for pregnant mothers, like programs already set up in cities whereas rural areas do not.

A plan to implement micronutrient supplementation for pregnant and expecting mothers requires multiple steps. First, there would need to be an organization to run, operate, fund, and help raise awareness for the program. This organization should be a NGO, a non-government organization. Some examples of organizations who can lead and manage the project are Nutrition International, World Health Organization, and Micronutrient Initiative. In fact, the World Health Organization has actually been a part of projects implementing micronutrient usages in expectant mothers in developing countries before, so they have both background and funding for this. Secondly, the culture and villages in rural areas in Madagascar show that they often do not trust foreign people coming into their communities and telling them what to do. To accommodate for this assumption, there would be centers set up in urban areas to teach and train certain individuals from each community on nutrition and more specifically, the importance of nutrition and micronutrients on an expectant mother. There may be a need for a way of transportation for the village trainee's, like a bus picking up those from the rural areas to bring them to the urban areas as many villages are miles away. These individuals would also be sent home with shipments of micronutrient supplements and information to be given to pregnant mothers in the community. If at a point supplies run out, the trained individuals can come back to urban areas to pick up another shipment to bring back. The individuals that were trained would go back to the communities, discuss learnings, and be responsible for giving out the supplements to pregnant women living there.

The cost of this program would be relatively low, as micronutrient supplements are low in cost in both small and large supplies. If the project were funded by an NGO, it could get support from various sources. The NGO could receive most funding by getting the government involved and applying for grants. In

these grants, no money would have to be repaid and the payoff for the country and economy as a result of healthier women and children is substantial. Moreover, donations from both individuals and charities could help alleviate costs. The goal would be to keep the supplements and the program as little to no cost possible, so money would not be an issue to those involved and taking the supplements, as many people in Madagascar live in poverty already and cannot afford above their basic necessities to survive. If desired results from the supplementation are seen in women and newborns, this could entice more funding or donations from the government, charities, and individuals for continuation of the program. Each of the micronutrient supplements would have the same composition and percentage of milligrams in each container as this would allow for mass production and cheaper costs for supply. This would also be a great addition to give back to the country's economy, as these supplements would help to stop stunting before it begins in pregnancy and help with malnutrition. The more healthy children and people in the country, the more able individuals and workers that can help benefit the economy in turn.

Implementing a prenatal micronutrient supplementation program in Madagascar would help with their huge problem of malnutrition which is very evident and seen in the country. The effects of malnutrition have been huge in the past, present, and will most definitely continue to affect the country and people's future. With the addition of micronutrient supplements into pregnant women, they would birth healthier, stronger, and more nutrient nourished children. As the cost is relatively low, and the long term payout large, this is a very worthwhile investment for all parties involved.

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