Malnutrition: A Cause for Change

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Malnutrition

Malnutrition is a silent and harmful condition that affects many children in the United States. *Malnutrition* is often defined as when a person receives inadequate amounts of energy needed for daily life (Malnutrition, n.d.). This also includes when there are inadequate amounts of vitamins and minerals in the body. Not having enough vitamins and minerals in the body may lead to deficiencies, which can have many adverse side effects on one's well-being. There are multiple types of malnutrition that are common in the United States among children. Some of the most common types of malnutrition are undernutrition, overnutrition, and vitamin and mineral deficiencies. Children need to have a healthy, fulfilling, and well-balanced diet for proper growth and development.

Without having a well-balanced, healthy diet, many children fall under the category of being malnourished. Being undernourished often happens when there is more energy output than intake. This occurs when there are not enough calories consumed in the diet. Being undernourished often leads to children being underweight, which can cause severe and dangerous consequences. On the opposite end of the spectrum, there is overnutrition. *Overnutrition* is defined as when there is a higher intake of energy than there is an output. Having an excess of calories often leads to being overweight or obese. Obesity among children has become a growing concern in America, as roughly 20% of children are obese, according to the CDC (Childhood obesity facts, 2017). Both undernutrition and overnutrition often lead to an inadequate amount of vitamins and minerals. This is dangerous because vitamins and minerals are essential for improving many functions in the body. Malnutrition is a significant concern for many children in the United States of America because it can negatively affect overall well-being.

Effects of Malnutrition

10,000, that is roughly how many children die a day from undernutrition-related problems (United et al.). While starvation is more common in third-world countries, it is not something that should be overlooked in the United States. Many children go hungry every day due to food insecurity and food deserts. Children suffering from malnutrition are often more prevalent among families in the lower economic class and lower-income communities (Stein, 2009). Finding healthy, affordable, well-balanced meals for these children can be exhausting and unattainable. The health effects that follow undernutrition can become a life-long struggle. Some of the health effects that can be a result of undernourishment in children include kwashiorkor, marasmus, and anemia. Undernutrition can also make it hard for many children to gain weight or build muscle due to a lack of calories and nutrients (Barker et al., 2011). This can become a

significant issue as it is vital that children start to develop muscle and bone mass in order to have a healthy development. Another issue that can arise from being undernourished is becoming more vulnerable to viruses and disease. Not having enough nutrients in the diet can cause children to have a weakened immune system. This often leads to more children being hospitalized for other issues, such as the flu or the cold, because of their weakened immune systems due to insufficient nutrients in their diet. Another issue that is common among undernourished children is the stunting of growth. Studies have shown a direct correlation between not getting enough nutrients and delayed or shortened periods of growth.

While undernutrition causes many health issues, it can also affect learning abilities, which could become a lifelong problem for the child. There are many reasons that undernutrition is linked to a child having lowered learning abilities. It is often problematic for children to focus on their schoolwork when worrying about having enough food to get throughout the day. This is often prevalent among children from lower-income families. In addition, there has been a direct link between nutrition and brain function. The brain needs proper nutrients and fuel to function at its fullest ability. This is why children in lower-income communities need to have accessible healthy meals for breakfast and lunch while they are at school. Studies have also found a correlation between the "Western" diet and ADHD. A study done following 1799 children from birth until the age of 14 showed that 115 of the children were diagnosed with ADHD (Howard et al., 2010). The majority of these children followed a Western diet that was high in refined sugar, sodium, and fat. Having a highly unhealthy and empty calorie-based diet can also lead to difficulties in learning as it has an effect on behavior mechanisms.

Obesity is a significant problem that affects many children all over the United States. Obesity is becoming more prevalent as access to junk food and fast food is increasing. Over the past few decades, there has been a dramatic increase in children who struggle with obesity. Often, with obesity, there is an increased risk of childhood type 2 diabetes (Sanyaolu et al., 2019). This is because as children eat large amounts of unhealthy food, the body's leptin reduces, causing the body to continue to feel hungry. As children continue to eat and gain weight, the pancreas may stop producing enough insulin for the body's needs, causing type 2 diabetes. As well as diabetes, being obese causes lots of stress on the body and brings up more health issues as children age. One of the main concerns for children who struggle with obesity is an increased risk of cardiovascular disease, fatty liver disease, and kidney disease. The number of obese children most likely will continue to rise if there is not a strong push for healthy eating both at home and in schools.

When children suffer from childhood obesity, there is often an increased chance that the child will have physiological effects. Many children, especially adolescents, struggle with their weight and often feel insecure because of it. Many studies have found a correlation between obesity and depression, anxiety, sleeping disorders, and lower self-esteem. One study that was conducted from 1997-2207 showed a causal relationship between obesity and depression. The

study found that for every 1 unit of BMI increased, the number of depressed days per month increased by 0.3. The number of depressed days a month increased from roughly 3.1 to 3.4 days a week from 1997 to 2007 as the average BMI increased from 25.75 to 27.5 (Ha et al., 2017). This correlation links overnutrition to an increased risk of depression. This is important as children are very vulnerable and can suffer greatly when struggling with depression and obesity.

Both undernutrition and overnutrition often lead to inadequate vitamins and minerals in the body. Having inadequate amounts of vitamins and minerals in the body leads to vitamin deficiencies, which can affect every aspect of a child's life. Vitamins and minerals are often the most lacking part of a child's diet. The most common vitamin deficiencies are iron, vitamin A, iodide, zinc, B vitamins, and selenium. These vitamins are essential for overall health and well-being and can cause significant problems when children are deficient. Vitamins also play a crucial role in many body functions. Without calcium, it can cause growth problems for many children, and they may have weakened bones. Without vitamin A, children could have increased problems with their vision. These are just a few of the many vitamins that are lacking in many children's diets who suffer from malnutrition.

Malnutrition in the food web

The food web is a complex system that follows food from production to consumers eating the products that were produced. So, how does malnutrition affect the food web? One of the significant ways that malnutrition affects the food web is a decrease in productivity (McDonald and Matthew, 2009). A lack of enough nutrients can cause people to feel tired and limit their abilities. This can affect children's work ethic in schools as well as their overall learning abilities. This can affect the food web as these children grow and start their lives in the workforce when they become adults.

Another way that malnutrition affects the food web is in the country's agricultural practices (Steiner, 2019). Low-income communities or food deserts often find that food can be scarce at times, mainly depending on the climate. This makes it essential for these communities to focus on producing large quantities of fulfilling food rather than a diverse array of foods. Many problems can arise with monocultural farming. There can be problems in the land and, more importantly, the soil if the crops are not rotated on a regular basis. This can cause soil degradation, poor soil, and stress to the agricultural community. This can decrease the quality of the crops over a few years. White growing large quantities of fulfilling foods can limit some of the other nutrients needed in the body. Oftentimes, grains are heavily grown in lower-income communities because they help with food insecurity. This often limits the amounts of fruits and vegetables that can be locally grown, causing them to be important in that community and becoming more unaffordable.

Solutions

Solving malnutrition has been an ongoing process for many decades. However, while many things have been implemented to stop or lower the number of people suffering from malnutrition, nothing has been a perfect solution. One of the more notable solutions that was in place in the early 2000s was "golden rice." Golden rice was widely used in many places in America and worldwide to help solve the problem of vitamin A deficiency. Golden Rice is a type of rice infused with beta-carotene to help increase the absorption of vitamin A. However, this was ineffective because many countries were concerned about the safety of modified rice. More testing needs to be done to move forward with using "golden rice" and other modified grains. Another major problem that comes up for many solutions regarding malnutrition is funding. It would cost roughly 60 million dollars a year to help fight against two vitamin deficiencies (McDonald and Matthew, 2009). Many solutions require large sums of money to have a widespread impact on malnutrition.

Other solutions that have been put in place to help solve malnutrition in children are nutrition education in schools and school meal programs such as NSLP or the National School Lunch Program. The NSLP is a program that has been implemented since 1946 in many schools all over the United States (USDA, n.d.). This program works by giving children in low-income households lunch for free or at a reduced cost. This program is efficient for allowing children to eat whose families may not be able to afford lunch for them. This program ensures that no child goes hungry while at school. However, while this program is very important for the United States school systems it is not a perfect solution to malnutrition. This program is a very expensive federal program that needs billions of dollars a year to run efficiently. As well as this, this solution only works while children are in school. This means that many children may still go hungry over the summer or at night when this program is not available.

However, there is an advanced technology that could be of significant use when it comes to eradicating malnutrition. Technologically, improving the value and nutrients of our food can be a probable solution to help make food affordable, higher in nutrients, and more economically sustainable. After many decades of research and improvement, an invention called CRISPR-Cas has become available. CRISPR, which stands for "clustered regularly interspaced short palindromic repeats" (Smith, n.d.). This technology advances both plants and animals using a genome editing process. CRISPR is able to take specific DNA and RNA sequences from plants and animals and edit them to improve their qualities. This was initially used as a way to modify bacteria to help them cure diseases, but it has shown promise in enhancing food (Pickar-Oliver & Gersbash, 2019). It is also essential to understand that CRISPR technology is not considered genetically modified, meaning that the food produced using CRISPR will not be considered a GMO or genetically modified organism. This opens up a whole new world for the growth of new and improved foods. With CRISPR, scientists have already been working on projects such as making wheat gluten-free and different types of nut allergen-friendly.

As more testing is done on CRISPR, more ideas and experiments are being done to show how much this technology can advance the food world. CRISPR could play a significant role in improving malnutrition and increasing product yield. This technology could help improve the nutritional value of many foods that are used around the country. Removing parts of plants that produce lots of waste or removing parts of relatively unhealthy food could maximize the amount of crops we use. In addition, CRISPR could play a vital role in maximizing nutrients in plants and animals that are currently lost or not in food production. Another valuable improvement CRISPR has in crops is increasing product yield. Recent findings have concluded that by using genome editing in crops, the overall yield of a harvest can improve by 2.4% annually (Brandt & Barrangou, 2019). Having a way to increase the yield without increasing the amount of land available can help make products more readily available and help lower the cost of healthy meals around the country.

Implementing CRISPR technology throughout the country is estimated to be relatively low-cost. Experts have concluded that it would take approximately $10.5 million dollars over the course of 5 years to have CRISPR used for agricultural use across the country (Lassoued et al., 2019). While 10.5 million dollars may seem like a substantial amount, it is relatively cost-efficient compared to many other solutions currently being used to help abolish malnutrition. There is a tremendous price difference if we compare CRISPR technology to the school lunch programs being put in place. School lunch programs cost roughly 8 billion dollars per year. While these programs play a vital role in helping undernutrition in the United States, more cost-effective foods produced by CRISPR technologies could reduce the billions of dollars currently being used for these programs.

CRISPR could be highly valuable in the United States school system. By improving the quality and nutrients in the foods that are given to children at school it could have a vital impact on malnutrition as a whole. Since most kids in the United States go to some education program, this would be beneficial nationwide and could help children who suffer from malnutrition in low-income communities. It is also crucial for children to understand nutrition and get basic nutrition information so they can help make informed decisions about their overall health and well-being (Shapu et al., 2020). CRISPR, with the help of an implemented nutrition education program in every school across the country, has the possibility to lower malnutrition levels.

Conclusion

Malnutrition is a devastating condition that is prevalent all over the United States. Whether children are suffering from overnutrition or undernutrition is a cause for concern, as every child should have the right to a healthy, well, balanced diet. When children are unable to get the nutrients they need, their health can be affected by devastating factors. These impacts, whether physical or psychological, could last a lifetime and could even lead to death. Malnutrition affects not only people but also the food web as a whole. Malnutrition can impact

workforce productivity and crop diversity and can even lead to soil degradation. This is important because our crop production feeds much of the United States. These crops can be genetically enhanced by a technology called CRISPR, which enhances many food items eaten daily across the country. Scientists can provide healthier and more nutritious diets by modifying the animal or crop DNA. Malnutrition has been an issue for decades in the United States. It is time for malnutrition numbers to substantially decrease and for children to have a well-balanced and healthy diet.

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