Dietary Habits and Impact of Good Nutrition in Children with Down Syndrome in Rivers State, Nigeria

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Abstract

The study assessed the dietary habit and impact of good nutrition on children with down syndrome in Obio Akpor Local Government Area in Rivers State. The study was guided by two research questions and two hypotheses. A descriptive survey design was adopted. All mothers with down syndrome children in Obio Akpor Local Government Area of Rivers State formed the population. Purposive sampling was used to select the sample size of 370 for the study. The instruments used for data collection were questionnaire, interview and focus group discussion. The instrument was face validated and the reliability determined using Cronbach Alpha, a reliability coefficient 0.68 was obtained. Data was collected using structured questionnaire and analyzed using the descriptive analysis (mean and standard deviation). The findings of the study showed that, mothers know the importance of good nutrition to the health of their children. The study also revealed that mothers are aware of nutrition can help enhance the health of the children, but they do not know the essential nutrient that are necessary for children with down syndrome. Based on the findings of the study the following recommendations were made: foods and nutrition counsellors should be recruited in various local government areas to enlighten the mothers of down syndrome children on the importance of nutrition, and how it improves proper functioning of development of the child. Government should sponsor awareness programmes that will assist the parents of the down syndrome children on how to go about the dietary habit of their children.

Keywords: ‘Dietary Habit’, Children, Down Syndrome.

Introduction

Nutrition is the scientific study of nutrients in food and how the body uses them, and the relationship between diet, health, and disease. Nutrition examines the relationship between food and drink and their effect on the body, it includes how nutrients are digested, absorbed, transported, metabolized, and eliminated, and how dietary factors can impact the risk of developing chronic diseases such as cardiovascular disease, diabetes, cancer, and special need conditions and how nutrition can be used to prevent or treat or manage the diseases. The risk of obesity in children with Down syndrome is high. Undoubtedly, proper nutrition plays an important role in the prevention of excess body weight and is associated with a reduction of metabolic complications. Children with Down syndrome and obesity, disturbances in lipid and oxidative stress parameters are observed. Abnormal eating habits in all children with Down syndrome regardless of their nutritional status were noted. Proper nutritional education, nutritional control, and management of metabolic problems are essential in this group of patients.

Hetman, Moreira, & Barg, (2022) indicate that nutrition plays a huge impact in the growth of children and special needs children. A child refers to anyone below the age of minority or some other age limit. The United Nations Convention on the Rights of the child defines child as “a human being
Dietary habits and impact of good nutrition in children with down syndrome by Bamson & Mundah

below the age of 18 years unless under the law applicable to the child, majority is attained earlier. According to Agomoh & Kanu, (2015) a special needs child is one that deviates from the ordinary child such that he/she requires special attention, special services and other areas that could make life more meaningful and worth living. A special needs child is one that has been determined to require special attention and specific necessities that other children do not (Kagan, 2021). Special needs children can be classified under the disabled, the disadvantaged and the gifted. Under the disabled, people who are visually impaired, hearing impaired, physically or health impaired, which includes autism, Down Syndrome and other behavioural disorders (Agomoh & Kanu, 2015).

Down Syndrome is a genetic condition that causes mild to serious physical and developmental problems. Most people have 23 pairs of chromosomes half from both parents for a total of 46. But a baby with Down Syndrome has an extra chromosome (47 instead of 46). This extra genetic material causes problems with the way their bodies develop. (WebMD: Children's health, 2022). However, for about every seven hundred (700) babies born one (1) is born with Down Syndrome. About 6000 babies are born with Down Syndrome every year. Down Syndrome is a lifelong condition (Nordstrom, et al, 2020), that cannot be cured though, but can be managed. This condition can be managed nutritionally with the use of dietary recommendations, which is like those of the general population. Children with Down Syndrome have nutritional problems with unknown implications besides increased potential for obesity. Early detection of down syndrome in children improves the quality of life they live and also aids caregivers on their nutritional needs. Down Syndrome can have many effects, and it’s different for each person, some grow up to live almost entirely on their own, while others need more helpers taking care of them. Children with Down Syndrome have widespread body frame abnormalities and impaired brain development and function; the latter leads to impaired intellectual development. Nordstrom, Retterstol, Hope, and Kolset, (2020) indicate excessive or deficient nutrient uptakes associated with making inappropriate foodstuff choices, food intolerance, (e.g., celiac disease) or malabsorption. Down Syndrome persons with overweight or obesity are linked with a slow metabolic rate, abnormal blood leptin concentrations and exhibit low levels of physical activity, Vitamin B group deficiencies and abnormal blood homocysteine levels decrease the rate of intellectual development in Down Syndrome cases. Zinc deficiencies result in short stature, thyroid function disorders and an increased appetite caused by excessive supplementation. Scientific advances in the research and diagnosis of Down Syndrome, as well as preventing any associated conditions, have significantly increased life expectancies of those with this genetic disorder. Early dietary interventions by parents or guardians of Down Syndrome children afford an opportunity for decreasing the risk or delaying some of the Down Syndrome associated conditions from appearing, thus beneficially impacting on their quality of life.

Down Syndrome or Down’s Syndrome is a congenital condition caused by the presence of an additional copy of chromosome 21 in a person’s cells (Hetman, et. al. 2022). This is also referred to as trisomy 21. Humans usually have 46 chromosomes in every cell, with 23 inherited from each parent. Due to the extra copy of chromosome 21, people with Down’s Syndrome have 47 chromosomes in their cells. This additional DNA causes the physical characteristics and developmental problems associated with the syndrome. People with Down Syndrome usually have an IQ (a measure of intelligence) in the mildly-to-moderately low range and are slower to speak than other children. Some common physical features of Down Syndrome include:

- A weak muscle tone (hypotonia) in infancy
- A flattened face, especially the bridge of the nose
- Almond-shaped eyes that slant up
- A short neck
- Small ears
- A tongue that tends to stick out of the mouth
- Tiny white spots on the iris (colored part) of the eye
- Small hands and feet
- A single line across the palm of the hand (palmar crease)
- Small pinky fingers that sometimes curve toward the thumb
- Poor muscle tone or loose joints
- Shorter in height as children and adults

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Types of down syndrome

Trisomy 21: About 95% of people with down Syndrome have Trisomy 21. It is by far the most common type. This type of Down Syndrome has cells and each cell in the body has 3 separate copies of chromosomes instead of the usual 2 copies. This is caused by abnormal cell division during the development of the sperm cell or the egg cell (Mayo clinic press, 2022).

Translocation Down syndrome: This type accounts for a small percentage of people with Down Syndrome (about 3%). This occurs when an extra part or a whole extra chromosome is present, but it is attached or “trans-located” to a different chromosome rather than being a separate chromosome. Three to four percent of babies born with Down Syndrome have translocation Down Syndrome. Whenever a translocation is found in a child, the parents’ chromosomes are studied to determine whether the translocation was inherited or not. If one parent has the translocation chromosome, then the doctor knows the baby inherited the translocation from that parent. When a person has a rearrangement of chromosome material, with no extra or missing chromosome material, he or she is said to have a "balanced translocation" or be a "balanced translocation carrier." (The children's hospital of Philadelphia, 2022). This means he or she has no signs or symptoms of Down Syndrome, but can pass an unbalanced translocation on to children, causing Down Syndrome in the children. Mosaic Down Syndrome: This type affects about 2% of the people with Down Syndrome. Mosaic means mixture or combination. For children with mosaic Down Syndrome, some of their cells have 3 copies of chromosome 21, but other cells have the typical two copies of chromosome 21. This is the rarest type of Down Syndrome. (center for disease control and prevention, 2021). This mosaic of normal and abnormal cells is caused by abnormal cell division after fertilization (Mayo clinic press, 2022). Babies born with mosaic Down Syndrome can have the same features and health problems as babies born with trisomy 21 or translocation Down Syndrome, where the extra chromosome material is present in all cells. However, it is possible that these babies may have fewer characteristics of the syndrome than those with other types of Down Syndrome (Children's National, 2022).

Trisomy 18: Trisomy 18 is much rarer than 21. It is more frequently identified prenatally on the basis of abnormal ultrasound findings of intrauterine growth retardation and an increased frequency of congenital abnormalities such as omphalocele and esophageal atresia. The characteristic triangular face, small mouth, short sternum, abnormal hand positioning, absent distal flexion creases, and nail hypoplasia aid in diagnosis of this disorder in the new born. Infants with this problem are almost always transferred to tertiary care centers because of problems in neonatal adaptation or because of congenital abnormalities.

Trisomy 13: Infants with trisomy 13 almost always die in the immediate neonatal period and the phenotype of such infants tend to be dominated by severe congenital abnormalities including bilateral cleft lip and cleft palate, congenital heart disease; microphalhalmia; and central nervous system defects, especially holoprosencephaly. The face is notably different from that of trisomy 18. The bulbous nasal tip is particularly distinctive that is also known as Patau's syndrome, (NHS, 2019).

At Birth: Down Syndrome is usually identified at birth by the presence of certain physical traits: low muscle tone, a single deep crease across the palm of the hand, a slightly flattened facial profile, and an upward slant to the eyes. Because these features may be present in babies without Down Syndrome, a chromosomal analysis called a karyotype is done to confirm the diagnosis. To obtain a karyotype, doctors draw a blood sample to examine the baby’s cells. They photograph the chromosomes and then group them by size, number, and shape. By examining the karyotype, doctors can diagnose Down Syndrome. Another genetic test called fluorescence in situ hybridization (FISH) can confirm a diagnosis in a shorter amount of time cimadomoby visualizing and mapping the genetic material in an individual's cells.

Possible Causes of Down Syndrome

There are various causes of down syndrome such as maternal age, biological aging hypothesis Genetic aging hypothesis Reduced meiotic recombination and its interaction with maternal age.

1. Maternal age: The effect of ‘maternal age’ remains as ‘black box’ for Down Syndrome
birth. Initially Penrose identified that advanced maternal age as risk for DS birth (Penrose cited in Ghosh, 2013) and postulated that the maternal age dependent increase in birth rate of Down Syndrome is in some way associated with the NDJ mechanism. In Nigeria, it has been discovered that the disease is prevalent because of the increasing maternal age at which more women in Nigeria now conceive. This follows the increasing strong desire to complete formal education before conception and the rising incidence of infertility. But this claim has been faulted, as it has recently been observed that 80% of children with Down Syndrome are born to mothers under the age of 35.

2. **Biological aging hypothesis**: The central idea of this hypothesis is that the increasing rate of meiotic errors and subsequent aneuploid birth is related to ‘biological aging’ of ovary not to the chronological age of women. Two different views do exist about how the biological aging is implicated for increased incidence of trisomic birth. The first view relates the suboptimal level of hormonal signal with higher rate of meiotic errors in aging ovary. The number of antral follicles at various stages of development also declines with increasing maternal age as the fact has been confirmed in (Rosen et al. 2010). This decline in antral follicle count, together with the accompanying decrease in total oocyte pool generates an imbalance in the hormonal environment in ovary (Warbuton cited in Ozmen. 2014) which predisposes the women for aneuploid conception. Among older women available antral follicles are limited and ovary has to compromise in selecting a suboptimal or erroneous oocyte for ovulation. The ‘biological aging’ can also be interpreted in terms of senescence associated degradation of ovarian protein components that are implicated in chromosome separation system in oocyte (Sherman cited in Loose et al, 2021). Interestingly, level of hundreds of transcripts, including cell cycle genes have been reported to decrease with increased maternal age in mice and women (Cimadomo, et al, 2018).

3. **Genetic aging hypothesis**: The ‘genetic aging’ hypothesis which was proposed (Kumar and Ghosh, 2011), states that some of the mothers who have Down Syndrome baby are genetically older than the mothers of same chronological age who have euploid baby (Kumar and Ghosh, 2011), and this genetic aging is the underlying cause of biological aging in ovary. In this analyses we estimated the telomere length (TL) of age matched controls and cases to get insight into the state of molecular aging, stratifying the mothers by stage of NDJ and their age of conception (young, <29 years; middle, 29-35 years; and old, >35 years). The results showed that all three groups (M1, MII & Control) have similar TL on average for younger mothers. As age increases, all groups show telomere loss, but that loss is largest in the meiosis II mother group and smallest in the euploid mother group with the meiosis I mother group in the middle. The results do not support the theory that younger women who have babies with Down Syndrome do so because they are ‘genetically older’ than their chronological age, but it was proposed that older mothers who have Down Syndrome babies are “genetically older” than controls, who have euploid babies at the same age. This finding, however, is consistent with the previous results, showing no difference in genetic age among young Down Syndrome mothers and young controls. The fact of telomere shortening among women with Down Syndrome children can be explained in several ways. Apparently, the result suggests a possible functional link between telomere maintenance system and chromosome segregating apparatus at molecular level. Degradation of this possible ‘molecular link’ with age may affect the both system simultaneously. Alternatively, the environmental factor that induces rapid telomere loss at advanced reproductive age might simultaneously affect the chromosome separation system. (Herbert et al. 2015, Mikwar et al., 2020).

4. **Reduced meiotic recombination and its interaction with maternal age**: Aside from maternal age, only single factor that has been identified unambiguously to be associated with maternal NDJ is altered pattern of meiotic recombination. Chiasmata are physical connections between homologous chromosomes at the site of recombination and they function to stabilize the paired homologues or tetrad at MI along with sister
chromatids and centromere cohesion. It aids in proper chromosome orientation on the meiotic spindle (Carpenter cited in Hirose et al., 2011) and ensure their proper segregation to opposite poles. Absence of chiasma formation left the homologous pair free to drift randomly to the poles and if they move together to same pole aneuploidy results. As far as chromosome NDJ is concerned, achiasmate meiosis is the major cause of reduction in recombination frequency (Kumar and Ghosh, 2011), although fall in double exchange frequency was reported too. In the analysis of etiology of DS birth in Indian cohort, there was a record recorded only ~22% detectable crossover on MI non-disjoined chromosome in maternal meiosis (Kumar and Ghosh, 2011). This observation was very consistent with the previous observation, who reported 45% achiasmate meiosis associated with MI NDJ of Chromosome in US population. With similar approach for Indian Down Syndrome population (Kumar and Ghosh, 2011), there was a score of 30.8cm map length of maternal MI non-disjoined Chromosomes, which further confirmed the fact that reduced recombination due to absence of chiasma or less recombination frequency in some way increases the risk of NDJ.

Nutritional Management of Diseases Associated with Children with Down Syndrome

Children with Down syndrome are at an increased risk for certain health problems. They can have a variety of complications, some of which become more prominent as they get older. However, each individual with Down syndrome is different, and not every person will have serious health problems. Many of these associated conditions can be treated with medication, surgery and can also be managed with the help of nutrition. Some of the conditions that occur more often among children with Down syndrome include:

Thyroid disease Studies have shown that 13-55 percent of people with Down Syndrome will develop thyroid issues at some point in their life. Symptoms of hyperthyroidism (an overactive thyroid) includes changes in sleep habits, changes in energy, feeling hot, or unexpected weight loss. Symptoms of hypothyroidism (an underactive thyroid) are lack of energy, fatigue, feeling cold, or unexpected weight gain. Recognizing these symptoms may be difficult to identify, but especially difficult in a child with Down Syndrome. Many nutrients are needed in optimizing thyroid function, however, Iodine (dairy products, sell-foods, Irish potato, etc.) Vitamin D (examples are mackerel, egg and yoghurt), Selenium (meat, sea-foods, sorghum, etc.), and Vitamin B12 (fish, oysters, etc.) are among the most beneficial.

Constipation People with Down Syndrome are at an increased risk of constipation due to low muscle tone and a sedentary lifestyle. Below are nutritional ways of preventing or treating constipation.

a. Drink fluids throughout the day, preferably water: 6–8-ounce glasses per day.

b. Increase the amount of dietary fiber consumed each day. Be sure to drink extra water when eating more food with dietary fiber and fruit, vegetables, and nut.

Diabetes: Diabetes is a condition where the immune system attacks and destroys the insulin producing cells in the pancreas (Down syndrome Association, 2018). It is common for a child with Down Syndrome to be diagnosed with type 1 Diabetes. Type 1 diabetes should be treated with diet and medication to get blood sugar to a normal level.

Celiac disease: Celiac disease is an autoimmune disorder that is characterized by sensitivity to gluten which is found in wheat, barley, and rye. When a person with celiac disease ingests gluten, an immune response is triggered that damages the lining of the small intestines. People with Down Syndrome are more likely to develop celiac disease that the general population. Treatment for celiac disease is a lifelong, gluten-free diet.

Gastroesophageal reflux disease (GERD): GERD is a condition where the stomach contents reflux back into the oesophagus causing several uncomfortable symptoms including heartburn, sore throat, regurgitation, chest pain and difficulty swallowing. GERD is a concern for children and adults with Down Syndrome and can interfere with nutrient intake (Giulia, 2021). This can be minimized by:

1. Eating small meals
2. Do not lie flat after meal.
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- Drink before or after meal, not during
- Avoid spicy foods, citrus, caffeine, chocolate, or diary. (Rania et al, 2022)

Heart defect
About 40-50 percent of babies born with Down Syndrome have a heart defect. Depending on the severity of the defect, a newborn may require nutrition support or a feeding tube. Throughout childhood to adulthood it is important to maintain a heart healthy diet full of fruits, vegetables, fiber and water while limiting processed foods, sweets and sugary beverages.

Feeding difficulty
People with Down Syndrome of all ages may have difficulty feeding, eating, drinking, or swallowing. These issues may improve with maturity and therapy. However, some issues may persist throughout the lifetime. It is common for people with Down Syndrome to be born with a narrow palate or small mouth, making their tongue seem enlarged. This can make chewing, swallowing, and speaking more difficult. A feeding therapy team can help make suggestions on ways to make it easy and safe to eat. Textures and skills may increase over time to a regular diet, or they may continue to be modified throughout the lifetime.

Obesity:
Individuals with Down Syndrome have a likelihood of being obese than their typically developing peers. Sometimes it is the result of hypothyroidism, a condition in which the thyroid doesn’t produce enough of certain hormones. Children with Down Syndrome are usually struggling with weight issues. They are characterized by fat mass correlated with thiobarbituric acid reactive protein product level. This can be corrected with proper nutritional education, nutritional control and management of metabolic problems.

It has also been suggested that people with Down Syndrome may have a lower level of metabolism, i.e. their bodies may burn fewer calories and store more. More generally, weight management issues in individuals with Down Syndrome are often due to the intake of too many calories in relation to the level of physical activity. Strategies for treating and preventing obesity include:
- Eating smaller portions sizes
- Using healthy ingredients that increase bulk (like fiber, fruits, and vegetables)
- Increasing water intake
- Eating fewer snacks before meals
- Not using food as rewards

Statement of Problem
Down Syndrome is a lifelong condition and a genetic disorder caused by abnormal cell division that results in an extra full or partial copy of chromosome. This extra genetic material causes the developmental changes and physical features of Down Syndrome. Children with Down Syndrome have distinct facial features such as: eyes, that slant up at the outer corner, small ears, flat noses, short neck, protruding tongue, and tiny white spots in the coloured part of the eyes. Down Syndrome varies in severity among individuals, causing lifelong intellectual disability and developmental delays. It’s the most common genetic chromosomal disorder that causes learning disabilities in children. It also causes other medical abnormalities, including heart, gastrointestinal disorders, diabetes, celiac diseases, constipation, thyroid diseases, and Gastroesophageal reflux diseases and obesity. More generally, though, weight management issues in children with Down Syndrome are often due to the intake of too many calories in relation to the level of physical activity. There is also a case of delayed feeding skills in children with Down Syndrome which could be because of inappropriate feeding practices in these children. In Rivers State most children with Down Syndrome are seen struggling with medical abnormalities and poor feeding habits which can be managed with good dietary habits. Hence this study seeks to examine the dietary habits and impact of good nutrition in children with down syndrome in Obio Akpor Local Government Area of Rivers State.

Purpose of study
The general aim of this study is to critically examine the dietary needs and impact of good nutrition of children with Down Syndrome. Specifically, the study sought to:
1. ascertain the importance of good nutrition to children with Down Syndrome.
2. evaluate the nutrients necessary for the health of a child with Down Syndrome.

Research Questions

The following questions were raised for this study;
• What is the importance of good nutrition to children with Down Syndrome?
• What are the nutrients that are essential for the health of the child with Down Syndrome?

Methodology

Design of the study: The design of this study is a field survey design

Area of Study: The area of the research study is Obio-Akpor local government area of Rivers state. Obio-Akpor is a local government area in the metropolis of Port Harcourt, one of the major centers of economic activities in Nigeria and one of the major cities of the Niger Delta, located in Rivers State. The local government area covers 260 km2 and at the 2006 Census held a population of 464,789. Obio-Akpor has its headquarters at Rumuodomaya.

Population of Study: The population of Obio-Akpor Local government area is 464,789 as at 2006 census. It is expected that this population has increased since the last census. This study therefore investigates a population of only 4,855 mothers in two communities in Obio-Akpor.

Sample and Sampling Technique: A Purposive or judgmental sampling were used to select these parents from Rumuolumeni and Rumuigbo in Obio-Akpor local government area in Rivers State because purposive sampling is a technique in which units or sections of a population are selected because they have characteristics that are needed in the sample. Due to the large size of the target population, the Taro Yamen formula were used to arrive at the sample population of the study. The sample size of 370 were used for the study. 185 women were picked from two communities.

Research Instrument: Questionnaire was used for data collection. Twenty-four (24) questions were developed from two research questions and questionnaire form were distributed to the public. The questionnaire comprises of two sections. The first section sought the demographic data of the respondents while the second section was comprise of questions that are aimed at obtaining information about the nutritional needs of children with Down Syndrome. The response was four point Gotham scale of Strongly Agree (SA) =4; Agree (A) = 3; Disagree (D) = 2 and Strongly Disagree (SD) = 1.

Method of Data Collection: The administration of questionnaire was shared through mails and person to person interaction. The nature of the questionnaire was explained to the parents and were assured full confidentiality of their information.

Validation of Research Instrument: The questionnaire used as the research instrument was subjected to face validation in the Department of Home Economics, Hospitality and Tourism in Ignatius Ajuru University of Education, Rivers State. The face validation was done by two lecturers of the Department of Home Economics, Hospitality and Tourism and one from the department of Educational Psychology, Guidance and Counselling all in Ignatius Ajuru University of Education, Rivers State.

Results:

Research question 1: What is the Importance of good nutrition to children with Down Syndrome?

<table>
<thead>
<tr>
<th>S/N</th>
<th>Items</th>
<th>SA</th>
<th>A</th>
<th>D</th>
<th>SD</th>
<th>Mean (X)</th>
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</table>

Table 1: Importance of good nutrition to children with Down Syndrome.
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Table 1 shows that all the items were above 2.0, which shows that the respondents agreed with the researcher on the importance of nutrition to the health of children. The item which says healthy children are more productive has a high score of 3.97, showing that the mothers believe that healthy children tend to achieve a lot in life.

Research question 2: What are the nutrients that are essential for the health of children with Down Syndrome?

From table 2, comparing the values to the criterion mean, it is seen that some of the items 2, 5 and 6 had lower mean, which is below the criterion mean, this shows that most respondents believe that cereals are not mainly breakfast options for children, also the item that says carrot and other vegetables promote good vision has a mean of 1.91 which is below the criterion mean of 2.0, this shows that only few respondents are aware that carrot and other orange vegetables promote good vision. The remaining items have a mean value greater than criterion mean and were all accepted.

Discussion of Findings

The findings are that mothers know the importance of nutrition to the health of the children; they are aware of how nutrition can enhance the health of their children. According to Wernio, et al (2022) Good nutrition is the bedrock of child survival and development. Well-nourished children can grow, learn, play, and participate in their community. It is observed that mothers have the knowledge of good nutrition that will enhance the health and growth of the child, and this supports the report of (UNICEF) 2019 that says children need the right food at the right time to grow. Children with down syndromes needs food rich in dietary fiber from vegetables and whole cereal meal, such as Iodine (dairy products, sell-foods, Irish potato, etc.) Vitamin D (mackerel, egg, and yoghurt), Selenium (meat, sea-foods, sorghum, etc.), and Vitamin B12 (fish, oysters, etc.) which is in line with the report of National center on Health, physical activity, and disability (2012). They also suggest and advised that they should avoid spicy foods citrus, fruit, gluten diet, and cholat as they are likely to react to them, this finding supports. Children with Down syndrome prefer food with a crispy, oily mouthfeel and don't like brittle or gooey foods. But those preferences can lead to a less nutritious diet as reported by Wernio, et al (2022),also supported the findings of the study. The study also discovered that although mothers are aware of how nutrition can help
enhance the health of children, they do not know the essential nutrients that are necessary for children with Down Syndrome. According to United Nations Children's Fund (UNICEF) 2019, children need the right food at the right time to grow. The mothers should be able to know what the diet of their children should be made up of, this is to enable proper functioning of the body.

Conclusion

The study concluded that the mothers are aware of the importance of nutrition to the health of their children generally but the mothers who have children with Down Syndrome do not know the type of nutrients that are essential for improving the quality of life of their children.

Recommendation

Based on the findings and discussion made above, the researcher recommends as follows;

- Counsellors should be recruited to various Local Government Areas to enlighten the mothers of Down Syndrome children on the importance of nutrition and how it improves proper functioning and development of the child.
- Government should sponsor awareness programs that will assist the parents of the Down Syndrome children on how to go about improving the dietary habits of their children.
- Mothers and Caregivers should go for nutrition education and dietary habit training from recognized institution to assist them have a better understanding on how to manage the down syndrome with the appropriate nutrition.
- Home Economists need to include it in their curriculum of foods and nutrition the appropriate foods and diet that are healthy and necessary for the management of down syndrome.

References


Mosaic Down syndrome


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