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HEALTH CONSEQUENCES OF NUTRITION IN CILHOOD AND EARLY INFANCY: A SYSTEMATIC REVIEW

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Abstract

Background: *Nutrition affects health even in the womb. Early diet impacts metabolism and body composition. Feeding habits—the cornerstone of nutrition—are influenced by personal and familial behaviors, maternal education, social status, and culture. Breast milk, formula, and supplements nourish babies and toddlers.*

Aim: *The goal of this study is to showed health consequences nutrition childhood early infancy.*

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 48 articles, whereas the results of our search on SagePub brought up 22 articles. The results of the search conducted for the last year of 2013 yielded a total 18 articles for PubMed and 7 articles for SagePub. In the end, we compiled a total of 12 papers, 8 of which came from PubMed and 4 of which came from SagePub. We included six research that met the criteria.*

Conclusion: *Length affects LAS, MUAC and WLZ body composition relationships differently. Study consist showed WLZ is a good tissue mass marker regardless of length. The MUAC combines tissue mass and length to measure inadequate growth.*

Keyword: *Body composition; Childhood; infancy; Health; Nutrition*

INTRODUCTION

Global child malnutrition persists. 19 million African and Southeast Asian pre-schoolers may be malnourished.[1] Malnutrition is a leading cause of child mortality worldwide. Malnourished youngsters die nine times more often.[2] 35% of the 7.6 million deaths in children under 5 years old are caused by dietary issues, 4.4% by malnutrition.[1,2] Nutrition affects health even in the womb. Early diet impacts metabolism and body composition. Feeding habits—the cornerstone of nutrition—are influenced by personal and familial behaviors, maternal education, social status, and culture. Breast milk, formula, and supplements nourish babies and toddlers.[3]

Breastfeeding has been shown to benefit both mothers and babies for decades. The main benefits are disease prevention and better weight growth.[4] Even in the intrauterine stage, nutrition determines a person's health. Early nutrition may affect metabolism and body composition.[5] Personal and familial behaviors, maternal education, social level, and cultural context affect feeding habits, which are the foundation of nutrition. Infants and young children get their nutrients from breast milk, formula, and supplemental foods. Breastfeeding has been shown to benefit both mothers and babies for decades. The main benefits are disease prevention and better weight growth.[6,7]

The World Health Organization recommends exclusive breastfeeding for the first 6 months of age, while the European Society of Pediatric Gastroenterology Hepatology and Nutrition Committee on Nutri tion recommends the introduction of complementary foods at 4−6 months of age.[8,9] Fewer research have been conducted on the effects of supplemental feeding, both in terms of their various forms and the order in which they should be introduced, in comparison to those that have focused on breastfeeding. The purpose of this study is to analyze and synthesize the short-term and long-term health consequences of nursing, as well as the optimal timing for introducing complementary foods and the types of foods that should be introduced.[10]

The purpose of this research is to demonstrate the effects that poor nutrition can have on a person's health during childhood and early infancy.

METHODS

In accordance with the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020 criteria, the author of this study confirmed that it was up-to-date and adhered to all applicable standards. This phase is crucial because it ensures the accuracy of the investigation's findings. This study discovered a correlation between breastfeeding exclusively and childhood malnutrition. Reviewing previous research on the subject is the most time-efficient method for attaining this goal. Given the purpose of the essay, this section will emphasize the relevance of the stated topics.

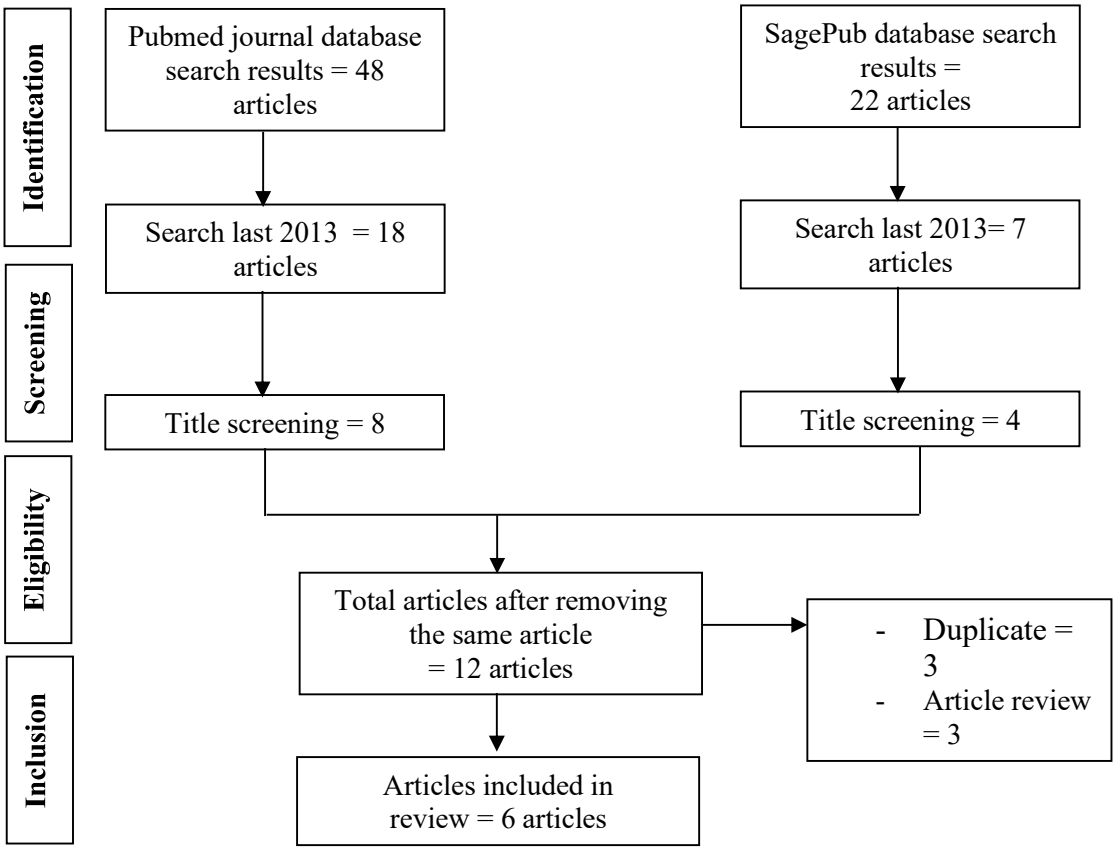

Figure 1. Article search flowchart

Researchers were asked to produce documentation that they met the following standards in order to participate in the investigation: 1) The paper must be written in English and demonstrate the health repercussions of diet in childhood and early infancy in order to be eligible for publication. 2) Works published after 2013 but before the evaluation period are eligible. Examples of research that cannot be published include editorials, applications without a DOI, previously published review articles, and submissions that are almost identical to previously published journal articles.

We used between "health consequences"; "nutrition"; "childhood"; and "early infancy" as keywords. The search for studies to be included in the systematic review was carried out from June, 1st 2023 using the PubMed and SagePub databases by inputting the words: *("health"[MeSH Terms] OR "health"[All Fields] OR "health s"[All Fields] OR "healthful"[All Fields] OR "healthfulness"[All Fields] OR "healths"[All Fields]) AND ("consequence"[All Fields] OR "consequences"[All Fields] OR "consequent"[All Fields] OR "consequently"[All Fields] OR "consequents"[All Fields]) AND ("nutrition s"[All Fields] OR "nutritional status"[MeSH Terms] OR ("nutritional"[All Fields] AND "status"[All Fields]) OR "nutritional status"[All Fields] OR "nutrition"[All Fields] OR "nutritional sciences"[MeSH Terms] OR ("nutritional"[All Fields] AND "sciences"[All Fields]) OR "nutritional sciences"[All Fields] OR "nutritional"[All Fields] OR "nutritionals"[All Fields] OR "nutritions"[All Fields] OR "nutritive"[All Fields]) AND ("childhood"[All Fields] OR "childhoods"[All Fields]) AND "early"[All Fields] AND ("infancy"[Journal] OR "infancy"[All Fields])* used in searching the literature.

We examined both the abstract and the title to determine the validity of the study. They examined a larger number of historical documents. Multiple investigations employing the same methodologies support this conclusion. Commenting requires the use of previously unpublished English. Only those works meeting the predetermined inclusion criteria were included in the systematic review. Fewer search results are displayed. Insufficient research and analysis. This section contains an evaluation. In the research paper, the subjects, authors, date, location, topic, and parameters are all specified. The article contains the author's name and the publication date. Endnote eliminated any duplicates it discovered.

Two evaluators examined the titles and abstracts of the articles submitted. Their extensive articles were reviewed to determine whether the research could be conducted and to generate data. In addition to GWAS, other health issues have been the focus of conferences and research. The evaluators came to the conclusion. Before deciding which papers to investigate, each author considered the abstracts and titles of each study. Then, all articles that meet the inclusion criteria and are therefore eligible to be included will be evaluated. After completing the instruction on fundamentals, we will select review topics. This method is used to select research and review articles.

RESULT

In the PubMed database, the results of our search brought up 48 articles, whereas the results of our search on SagePub brought up 22 articles. The results of the search conducted for the last year of 2013 yielded a total 18 articles for PubMed and 7 articles for SagePub. In the end, we compiled a total of 12 papers, 8 of which came from PubMed and 4 of which came from SagePub. We included six research that met the criteria.

Konyole, et al (2023)[11] showed breastfeeding dropped from 99% to 87%, stunting rose from 13% to 32%, and wasting stayed at 2% to 3% between 6 and 15 months in 499 children. Stunted children had a 1.12 kg (95% CI = 0.88-1.36; P < 0.001) lower fat-free mass (FFM) at 6 mo and 1.59 kg at 15 mo, corresponding to 18% and 17% disparities, respectively, compared to length-for-age (LAZ) > 0. Fat-free mass index (FFMI) deficits were less than proportionate to children's height at 6 mo (P <0.060) but not at 15 mo (P > 0.40). Stunting reduced fat mass (FM) by 0.28 kg (95% CI = 0.09-0.47; P = 0.004) at 6 months. Stunting was never related with FMI, and this connection was not significant at 15 mo. At 6 and 15 months, FM, FFM, FMI, and FFMI were lower with lower WLZ. FFM, but not FM, increased with time, while FFMI did not alter and FMI declined.

Table 1. The litelature include in this study

Author	Origin	Method	Participant	Result
Konyole, 2023[11]	Kenya	Randomised Controlled Trial (RCT)	499 infants	Overall, low length-for-age (LAZ) and weight-for-length (WLZ) were associated with less lean tissue in early Kenyan children, which may have long-term implications for their health.
Skau, 2019[12]	Denmark	Randomised Controlled Trial (RCT)	419 infants	This suggests that children who are undernourished maintain a higher percentage of body fat at the expense of fat-free tissue, which may have long-term implications for both their health and their ability to function.
Njunge, 2019[13]	Canada	Case control study	241 infants	A sepsis-like profile is related with a child's future death from Severe Acute Malnutrition (SAM), even though the child's clinical condition appears to be stable. This could be because of a persistent bacterial infection, bacterial products that have been translocated, or

				an abnormal immunological response that occurred during nutritional recovery.
Savanur, 2016[14]	India	Case control	Three hundred and thirty children aged 2-4 years	It was observed that stunting led to an increase in the propensity of early children to save body fat. If this behavior pattern is carried on through later childhood and into adolescence, it can raise the likelihood of becoming obese and developing non-communicable diseases.
Grijalva, 2015[15]	Ethiopia	Cohort prospective study	595 healthy Ethiopian infants	Both the midupper arm circumference (MUAC) and the WLZ are associated with body composition in unique ways, and length has a diverse range of effects on these ways of being associated. According to the findings of our study, the WLZ appears to be a reliable marker of tissue masses irrespective of length. The MUAC functions more as a composite indicator of inadequate growth, indexing together tissue masses and length.
Bartz, 2014[16]	United State of America (USA)	Cross sectional study	Seventy-seven patients	Low levels of the adipose tissue hormone leptin are associated with, and may be able to predict, death prior to and during treatment for acute malnutrition. Fatty acid metabolism plays a critical role in the adaptation process to acute starvation.

Skau, et al (2019)[12] showed 98% of 419 enrolled infants were breastfed at 6 months, 15% stunted, and 4% wasted. 78% of 15-month-olds were breastfed, 24% stunted, and 11% wasted. Non-breastfed babies showed decreased FMI at 6 months but not 15 months. Stunted children had lower FM and FFM at 6 and 15 months than children with length-for-age z > 0. Stunting did not affect height-adjusted FMI or FFMI. Wasted children had lower FM, FFM, FMI, and FFMI at 6 and 15 months than those with WLZ > 0. Age-WLZ interactions enhanced FFM and FFMI deficits while decreasing FM and FMI deficits. FFM deficits were -099 (95% CI = [-1.26]-[-0.72]) kg at 6 months and -1.44 (95% CI = [-1.69]-[-1.19]) kg at 15 months (P <0.05), while FMI deficits were -2.12 (95% CI = [-2.53]-[-1.72]) kg/m^2 at 6 months and -1.32 (95% CI = [-1.77]-[-0.87]) kg/m^2 at 15 months (P <0.05).

Njunge, et al (2019)[13] showed mortality was associated with increased levels of calprotectin, von Willebrand factor, angiotensinogen, interleukin (IL)-8, IL-15, IP-10, and tumor necrosis factor (TNF), and decreased levels of leptin, heparin cofactor 2, and serum paraoxonase. Cases were enriched for acute phase responses, cellular responses to lipopolysaccharide, neutrophil responses to bacteria, and endothelial responses. In children with Severe Acute Malnutrition (SAM) who appear clinically stable, a sepsis-like profile is associated with subsequent mortality. This may be the result of an ongoing bacterial infection, the translocation of bacterial products, or an immune disorder during nutritional rehabilitation.

Savanur, et al (2016)[14] showed change in weight standard deviation, duration of breast-feeding, age at initiation of complementary feeding, and income, stunted children had substantially higher body fat, WHtR, and BMI than non-stunted children (P <0.001). The stunted and non-stunted children were categorized based on the standard deviation of their weight change. Stunted children with no change in weight standard deviation had higher mean body fat, BMI (P <0.001), and WHtR (P <0.005) than non-stunted children. In the growth catch-up group, stunted children had a higher BMI and WHtR than non-stunted children (P <0.0001). In the growth catch-up group, stunted children had a higher BMI than their non-stunted counterparts (P <0.0001).

Grijalva, et al (2015)[15] showed length consistently demonstrated significant positive correlations with the MUAC but not the WLZ across all ages. Adjustment for length decreased the observed correlation coefficients of FM and FFM with the MUAC, whereas it increased the correlation coefficients for the WLZ. Both length-adjusted FM and FFM showed an independent association with the WLZ and MUAC at all ages, with the WLZ having higher regression coefficients. On the other hand, length had higher regression coefficients for the MUAC. At all ages, the MUAC was found to be more influenced by FM variability relative to FFM variability than the WLZ.

Bartz, et al (2014)[16] conducted a cross sectional study. Seventy-seven patients were enrolled in the study, and a subset of them were followed from the hospital to the outpatient clinic. Inpatient and outpatient therapies significantly altered the levels of fatty acids, amino acids, acylcarnitines, inflammatory cytokines, and numerous hormones, including leptin, insulin, growth hormone (GH), ghrelin, cortisol, insulin growth factor (IGF)-I, and glucagon-like peptide-1. The major

biochemical factor predicting mortality was a low level of leptin (P = 0.0002), a marker of adipose tissue reserve and an essential immune function modulator.

DISCUSSION

Nutritional status is defined as health status resulting from a balance between nutritional needs and inputs.[17] The World Health Organization (WHO) defines malnutrition as a cellular imbalance between the supply of nutrients and energy and the body's need for them to ensure growth, maintenance and certain functions.[18] Nutrient-vulnerable groups exist. For instance, 6-23-month-olds are less likely to be stunted than 24-59-month-olds. Exclusive breastfeeding for six months may protect against early stunting. When infants shift from exclusive nursing to complementary foods, improper food supplementation can raise the risk of stunting in children under 5 years old.[19]

The nutrition study and practice community has mostly adopted these practices, and there are now a lot of reports that show how many children are too thin or not tall enough.[3] But more and more people are realizing that this "either/or" approach isn't real, because some children can be both stunted and wasted at the same time, and each trait makes it more likely that the other will happen in the future. The basic model of body composition divides mass into two parts: fat-free mass (FFM) and fat mass (FM). This helps us understand the physical effects of not getting enough food.[5,12] Each of these parts is interesting, even though there isn't a lot of proof that each is linked to the chance of surviving in early life.

Exclusive breastfeeding is very close to reducing the incidence of malnutrition in children. Therefore, children who are not exclusively breastfed are at risk of malnutrition. Two recent analyzes suggest that babies who are weaned before they are 6 months old are more at risk of malnutrition. Breastfeeding at the age of 0-5 months will contribute to reducing the incidence of malnutrition in children, a study in Ethiopia showed that children who were breastfed <2 years had a 3.2 times risk of experiencing malnutrition. Research in Indonesia shows that those who do not get breast milk are at risk of malnutrition.[20]

First, when there isn't enough protein or amino acids in the food, proteins from muscle mass can help the immune system work. Simple signs of a lack of muscle mass have been linked to a higher chance of dying. Few people have thought about how undernutrition might affect FFM parts that aren't muscles. It's possible that organs are protected at the cost of muscle. However, a smaller thymus has been linked to a weaker immune system.[21] Second, FM gives the immune system energy and metabolic precursors, which is important because immune activity has high metabolic costs. Also, FM makes leptin, which is a hormone that helps the defense system work. Low amounts of leptin in children with severe-acute undernutrition have been linked to death in two studies.[16]

A cross-sectional research in India found that stunted children aged 2–4 had increased total and central body fat.[14] Stunted kids were 10 cm shorter in both sexes. After controlling for birthweight and weight z-score change between birth and follow-up, stunted children's "elevated body fat" became obvious. According to the authors' statistical modeling, stunted children would have more adiposity than non-stunted children if they had acquired the same amount of weight since birth. Stunted children gained significantly less postnatal weight than non-stunted children. Stunted children are shorter and lighter, indicating a significant FFM deficit. This deficiency caused statistical changes to increase percentage fat and waist-for-height.

In children aged 6–23 months living in low- and middle-income countries, nutrition education and complementary feeding interventions both had a small but substantial impact on linear growth, while complementary feeding interventions also had an impact on ponderal growth. Both of these types of growth were affected by the interventions. Users will be able to estimate the effects of changes in intervention coverage on both malnutrition and wasting thanks to the new version of the Lives Saved Tool (LiST) model, which will enhance efforts to plan and evaluate nutrition programs.[22]

CONCLUSION

Length affects LAS, MUAC and WLZ body composition relationships differently. Study consist showed WLZ is a good tissue mass marker regardless of length. The MUAC combines tissue mass and length to measure inadequate growth.

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