Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(2), 960-975 | ISSN:2251-6727

The Impact of Mobile Learning on Mother Behavior in Completing Children's Nutritional Needs

Daniel Akbar Wibowo[1], Yulia Lanti Retno Dewi[2], Nur Hafidha Hikmayani[3], Dini Nurbaeti Zen[4]

[1]Doctoral Student of Public Health Sciences, Faculty of Medicine, Sebelas Maret State University, Surakarta, Indonesia

[2]Faculty of Medicine, State University of Sebelas Maret, Surakarta, Indonesia

[3]Faculty of Medicine, State University of Sebelas Maret, Surakarta, Indonesia

[4]Faculty of Health Sciences, Galuh University, Ciamis, Indonesia

*Corresponding Author

(Received: 07 January 2024 Revised: 12 February 2024 Accepted: 06 March 2024)

KEYWORDS

Child food intake, Parents, Nutrition, Digital, Mobile applications,

ABSTRACT:

Introduction: Proper nutrition is essential for the overall health and development of individuals, particularly children under the age of five, school-age children, and pregnant women. In Indonesia, both malnutrition and overnutrition have detrimental effects on growth potential. Nutritional concerns arise due to economic constraints, limited nutrition understanding, and unbalanced food choices. Interventions in education, digital health, and mobile learning have the potential to improve children's diets and boost parental nutrition. This study aims to conduct a thorough analysis of the use of mobile learning in the domains of nutrition education or parental education.

Method: This study used a scoping review strategy to identify a wide range of literature from diverse sources and research techniques. The study utilizes five established databases, including Pubmed, ScienceDirect, and Google Scholar, spanning the years 2013 to 2023. The inclusion criteria consist of the following: Population (limited to children without autism or cerebral palsy or disability), Intervention (specifically Nutrition Education or Nutrition Intervention), Comparison (none specified), Outcome (none specified), Research Type (including Randomized Control Trial, Single Group Pretest-Posttest, Longitudinal, Quantitative Pre-experimental with Pre and Post-test, Single Group Intervention with Pre and Post-test, Two Group Design with One Assessment Before and After Treatment, Experimental Control Group Design, Quasi-experiment, and Qualitative). Additionally, articles published before 2013, articles not written in English, and articles not available in full text are excluded..

Results: The analysis examined 212 publications, leaving behind 91 papers and 50 articles with inaccessible full text. The selection method included characteristics related to population, intervention, and research type. The research revealed that the use of online nutrition education media may enhance mothers' attitudes and actions about their children's food consumption. Nevertheless, sustained engagement is essential for achieving the best possible outcomes. Incorporating certified information, interactive elements, individualized content, and feedback is essential for effective digital nutrition promotion.

Conclusion: Utilizing digital nutrition education media has the potential to enhance children's dietary habits, specifically addressing public health issues. For best outcomes, it is crucial to have sustained engagement and tailored content.

Introduction

The progress of a nation relies on the existence of exceptional human capital, including robust physical and mental attributes, outstanding health, and remarkable accomplishments (Burhan *et al.* 2023). The nutritional state is of paramount importance for both individual well-being and the overall advancement of a country. Children below the age of five, children of school-going age, and maternity women are populations that are more susceptible to nutritional deficiencies and

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(2), 960-975 | ISSN:2251-6727

thus need to be given extra consideration owing to the adverse effects of malnutrition (UNICEF 2021).

Early intervention and supervision are crucial for promoting optimal health development, particularly during the school-age period when children quickly transition into adulthood (Black *et al.* 2017). In Indonesia, children of school age are susceptible to malnutrition and overnutrition, which have a detrimental effect on the country's capacity for growth (Lowe *et al.* 2021). Insufficient nourishment may result in growth and developmental abnormalities such as malnutrition, impaired growth, and cognitive impairments. Several variables influence undernutrition. Hence, it is important to tackle these concerns at an early stage (Soliman *et al.* 2021).

Inadequate nutrition is responsible for forty-five percent of all fatalities that occur in children. Children who are stunted or underweight have a mortality rate that is more than three times greater than well-nourished children. The likelihood of this happening is increased by a factor of twelve in children who are underweight, stunted, and wasted. Since death rates are greater in children who are stunted and underweight, this underscores the need to take into consideration both wasting disorders and stunting conditions while managing malnutrition (Prendergast dan Humphrey 2014).

Insufficient nutrient intake in children can reduce immune systems, increasing susceptibility to infectious diseases and malnutrition. Growth and development disorders may also occur, negatively impacting health, intelligence, and productivity in later life. Impaired immune function is believed to be the main cause of this vulnerability. Most research on malnutrition's impact on host defense involves protein-energy malnutrition in children or animal models (Ibrahim *et al.* 2017) .

The etiology of the many nutritional status issues is multifactorial. The primary causes of nutritional issues are mostly economic challenges, insufficient comprehension of nutrition, imbalanced dietary choices, and inadequate awareness of health matters (Kiani *et al.* 2022). Malnutrition issues often arise from parental ignorance about children's dietary requirements and the provision of nourishing complementary meals.

When it comes to both men and women, the act of becoming a parent is characterized by significant shifts in social roles that coincide with physiological changes (Reid dan Taylor 2015; Corder *et al.* 2019). The comprehension and awareness of parents, particularly mothers, about balanced nutrition has significant importance, considering the role of mothers as food administrators within the household. Mothers who lack comprehension of balanced nutrition are prone to provide their children with nutritionally imbalanced meals that fail to fulfill their dietary requirements (Yuliantini *et al.* 2015). Food taboos and cultural beliefs differ from society to society, which affects the diets of both adults and children. At the age of five months, children are exposed to foods that are in the family's diet, with a limited intake of fruits and animal proteins. A repetitive diet consisting of meals centered on maize and vegetables is followed by both mothers and children nowadays. During pregnancy, cultural ideas continue to exist, which causes nutrients to be lost. Consequently, educational activities are required to promote awareness about the health of mothers and children (Lokossou *et al.* 2021).

Therefore, educational interventions that are anticipated to be effective in encouraging health behaviors must strive to address not just intrapersonal elements, such as the knowledge, attitudes, and beliefs of people, but must also take into consideration the factors that are present in the environment and in interpersonal relationships. The intervention can be explained by using the theory of planned behavior, which states that the likelihood that an individual will adopt a new behavior is determined by his or her "intention" to perform that behavior, which in turn is influenced by his or her attitude, subjective norms, and perceived behavioral controls. This theory can be used to explain how the intervention works (Arikpo *et al.* 2018).

When it comes to ensuring that every kid fulfills their full potential in terms of creativity and productivity as an adult, the early years are of the utmost importance (1, 2). Families must fulfill numerous requirements to offer effective nurturing care. These needs include psychological and social stimulation, health care, nourishment, and environmental and economic security responsibilities.

Their family and home surroundings influence the early health habits of individuals. Parents significantly impact the development of their children's nutrition and physical activity behaviors. This is because parents decide what foods are accessible in their homes and provide chances for their children to engage in physical exercise (or lack thereof) (Karmali *et al.* 2019).

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(2), 960-975 | ISSN:2251-6727

Digital health provides a means to enhance the nutritional quality of children's diets via the provision of remote, interactive, and context-specific assistance to parents. Possessing internet connectivity, digital health treatments may effectively target consumers in their search for knowledge. These interventions are easily expandable and can reach a wide range of people. The widespread use of digital health therapies in both public and published literature makes it a significant platform for investigating efficacy and user satisfaction (Pollard *et al.* 2015). Hence, it is crucial to foster and facilitate the cultivation of beneficial behaviors within the family structure, while equipping parents with tools and information to advocate for these salubrious practices. Parents of children between the ages of two and fifteen prefer low-intensity interventions such as the sending of mail or emails, but telephone and internet-based services are considered to be intense and engaging forms of assistance. This preference for treatments with low intensity is mirrored in the desire for focused interventions for children who range in age from two to fifteen years old (Karmali *et al.* 2019).

Since many parents still lack knowledge about balanced nutrition, it is crucial to educate them about it, particularly through mobile learning. This will help parents and other caregivers apply balanced nutrition in their daily lives, which will improve their children's nutritional intake. Hence, it is important to provide parents with education on diet and health awareness. Education delivered to parents should be engaging and presented straightforwardly to ensure effective comprehension and application of the material. Considering this situation, the objective of this research is to provide a comprehensive analysis of the use of mobile learning in the field of nutrition education or parental education.

Method

Research Design

This study adopts a scoping review design, a methodology used to find extensive literature derived from several sources and research methodologies, all of which are relevant to the research issue. The analysis used five published databases, including Pubmed, ScienceDirect, and Google Scholar, covering the period from 2013 to 2023.

Inclusion and Exclusion Criteria

The inclusion criteria used in this scoping review were determined using the PICOS format, namely Population (Children, not autism, not cerebral palsy, not disability), Intervention (Nutrition Education or Nutrition Intervention), Comparison (-), Outcome (-), Research Type (Randomized control trial, single group pretest-postest, longitudinal, quantitative pre-experimental with pre and post-test, single group intervention with pre and post-test, two group design with one assessment before and after treatment, experimental control group design, quasi-experiment, and qualitative). Exclusion criteria included articles published before 2013, the language used was not English and articles were not available in full text.

Search Strategy

The search process was facilitated by using keywords and boolean operators (AND, OR, NOT, or AND NOT) to search for articles in electronic databases. The search strategy includes the terms "Parents" OR "Caregiver" AND "Online Nutritional Education" OR "Mobile-based Intervention". The keywords included in this scoping study have been aligned with the Medical Subject Heading (MesH) system. Using the specified keywords, a total of 402 publications were found in three databases: Pubmed (142 articles), Sciencedirect (112 articles), and Google Scholar (149 articles). A total of 212 publications were eliminated due to their lack of relevance to the study's subject or title, resulting in 91 remaining papers. Additionally, 50 articles were deleted because their complete text was not accessible. The selection process included applying inclusion criteria to the population (resulting in the exclusion of 14 articles), intervention (resulting in the exclusion of 5 articles), and study type (resulting in the exclusion of 10 pieces), ultimately resulting in the identification of 12 papers that fulfilled all the requirements.

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(2), 960-975 | ISSN:2251-6727

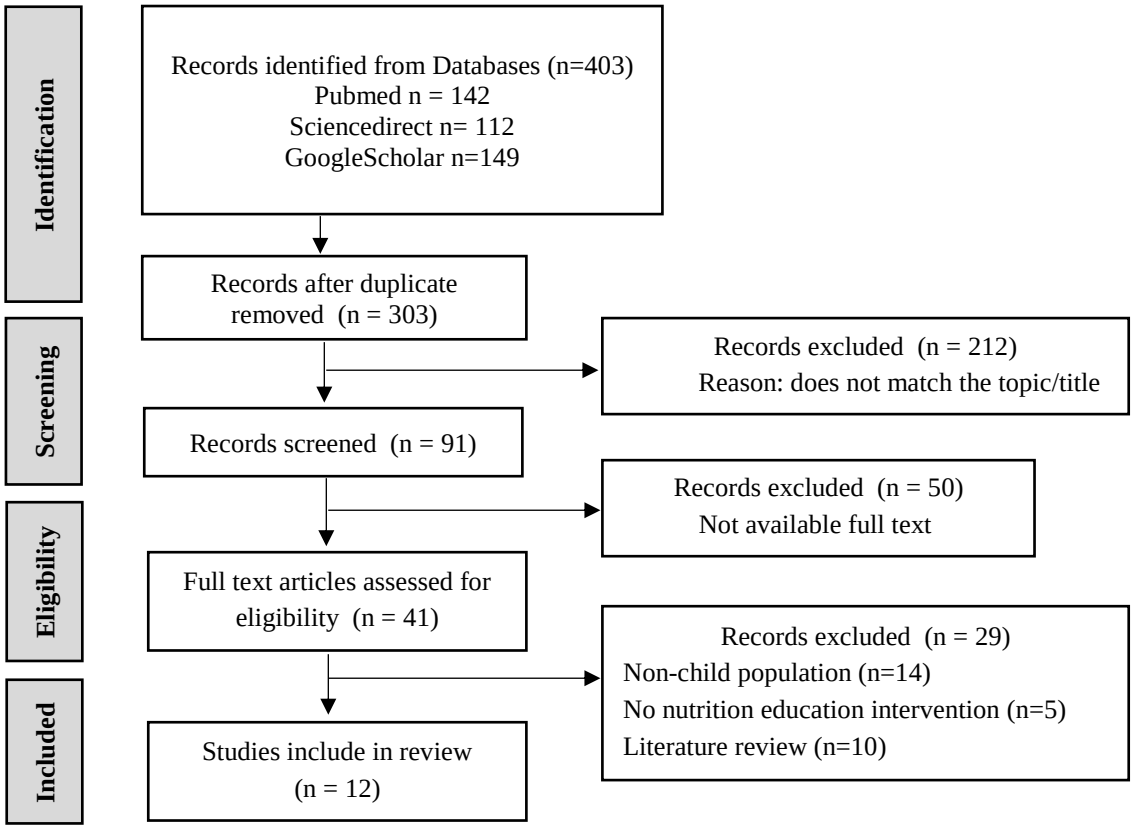

Figure 1.Prism Flow Diagram Literature Review

Results

Based on the findings of the literature study, it was determined that the bulk of research, as shown by 12 articles, was carried out in the United States of America (USA). Specifically, 5 publications focused on research performed inside the USA, while the other 6 articles explored research conducted in different countries, including Indonesia. The bulk of the publications examined consisted of 10 studies using a randomized controlled trial methodology, while there was one article that used a quasi-experimental research design, and one observational study.

The research papers evaluated have used a mobile learning/e-health/telemedicine-based intervention as a nutrition education technique. This intervention has the potential to modify mother's behavior related to child feeding and alter child consumption patterns. The provided text presents a concise overview of the findings derived from the literature review of the 12 chosen papers, as displayed in table 1.

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(2), 960-975 | ISSN:2251-6727

Table. 1 Summary of Content Analysis Results of Selected Articles (n=12)

No	Articles	Author	Country	Design	Participants	Media	Detail	Instrument	Result
1	Family Home Food Environment and Nutrition-Related Parent and Child Personal and Behavioral Outcomes of the Healthy Home Offerings via the Mealtime Environment (HOME) Plus Program: A Randomized Controlled Trial	Fulkerson et al. (2017)	Minneapolis/St Paul, MN	Randomized controlled trial	160 parents	Mobile phone	The intervention team engaged in goal-setting telephone conversations, lasting between 10 to 20 minutes, using motivational interviewing methods. This approach enabled parents to choose practical and precise objectives for each contact.	Home Food Inventory, Validated Parent Personal and Behavioral Factors questionnaire, and Child Personal and Behavioral Factors questionnaire	The intervention group of parents shown a substantial increase over time in their self-efficacy ratings for selecting acceptable portion sizes. This improvement was seen both immediately after the intervention (P=0.002) and over the follow-up period (P=0.01). The children who received the intervention were less inclined to drink at least one sugar-sweetened beverage per day after the intervention compared to the children in the control group (P=0.04).
2	The Effect of Educational Intervention Based on Theory of Planned Behavior Approach on Complementary Feeding: A Randomized	Rachmah et al. 2023	Indonesia	Randomized controlled trial	155 ibu	digital-nutrition education (WhattApp)	Ten sessions were purposely developed based on information needed during complementary feeding which was retrieved from the 10 WHO complementary feeding	Theory of Planned Behavior Construct and Nutrition Knowledge questionnaire	A 10-day nutrition education and counselling program resulted in significant improvements in a mother's knowledge and psychological factors, such as attitude, subjective norm, perceived behavioral control, self-efficacy, and intention to offer healthy supplemental feeding. The use of WhatsApp for nutrition education shown efficacy in enhancing these facets.

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(2), 960-975 | ISSN:2251-6727

	Controlled TrialAdolescent Girls: A Cluster Randomized Controlled Trial						principles. classes were started at 8 am every day during the 8-day session		
3	Online and In-Person Nutrition Education Improves Breakfast Knowledge, Attitudes, and Behaviors: A Randomized Trial of Participants in the Special Supplemental Nutrition Program for Women, Infants, and Children	Au, et.al (2016)	Los Angeles	Randomized controlled trial	Five hundred ninety WIC participants	The online lesson utilized photograph visuals of tired and energetic children, hot and cold breakfasts, and MyPlate visuals to discuss breakfast challenges and healthy breakfast options.	The online breakfast lesson emulated the in-person group material by using text, prompts, and visual pictures. Each question was shown on a separate screen, and participants were encouraged to provide open-ended replies to foster discussion.	Surveys evaluating knowledge, attitudes, and behaviors related to breakfast were given to participants before and after receiving instruction, as well as during a follow-up period of 2 to 4 months.	The study found that both parents (p=0.00007) and children (p=0.01) experienced greater increases in the frequency of eating breakfast due to reduced barriers such as time constraints and preparation difficulties.
4	The effect of an online video intervention 'Movie Models' on specific parenting practices and parental	Lepeleere et.al (2017)	Meksiko	Quasi Experimental	238 parents	Online video intervention	intervention group were invited to watch the online parenting videos on a secured website over 4 weeks	Specific parenting practices, parental self-efficacy, PA, screen-time and healthy	Intervention effects were most significant for complex parenting practices, with older parents having more impact on PA, screen-time, and healthy diet, while younger parents had stronger effects on parental self-efficacy.

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(2), 960-975 | ISSN:2251-6727

	self-efficacy related to children's physical activity, screen-time and healthy diet: a quasi experimental study							diet of the child.	
5	One-Year Efficacy Testing of Enabling Mothers to Prevent Pediatric Obesity Through Web-Based Education and Reciprocal Determinism (EMPOWER) Randomized Control Trial	Knowlden and Sharma (2015)	Ohio	Randomized controlled trial	57 participants	five modules, with one module devoted to each child behavior	10- to 15-minute audiovisual presentation, an interactive worksheet, and a discussion board post	five maternal-facilitated SCT constructs and four child behaviors	At the age of 1 year, the findings indicated a general rise of 1.847 cups of fruits and vegetables (with a 95% confidence range of 1.207-2.498) in the experimental group ($p < .001$). The analysis indicated that changes in the home environment, promoted by the mother, were responsible for 13.3% of the variation in the child's change in fruit and vegetable intake..
6	Two-Year Outcomes of the Enabling Mothers to Prevent Pediatric Obesity Through Web-Based Education and	Knowlden and Conrad (2018)	Ohio	Randomized controlled trial	57 participants	five modules, with one module devoted to each child behavior	10- to 15-minute audiovisual presentation, an interactive worksheet, and a discussion board post	five maternal-facilitated SCT constructs and four child behaviors	An substantial interaction between group and time was seen for the intake of fruits and vegetables by children, as well as for the environmental aspect of the self-control theory (SCT), in the EMPOWER cohort. The experimental group showed a significant increase of 1.613 cups of fruits and vegetables (95% confidence interval = [0.698, 2.529]), compared to the active control group. The score analysis revealed that alterations

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(2), 960-975 | ISSN:2251-6727

	Reciprocal Determinism (EMPOWER) Randomized Control Trial								in the home environment were responsible for 31.4% of the variation in kid fruit and vegetable consumption in the experimental group.
7	An Internet-Based Childhood Obesity Prevention Program (Time2bHealthy) for Parents of Preschool-Aged Children: Randomized Controlled Trial	Hammersley et.al (2019)	Australia	Randomized controlled trial	86 participants	The intervention, consisting of six modules, aimed to improve various behaviors by incorporating reading materials, videos, activities, quizzes, and goal-setting components.	The intervention over 11 weeks	BMI, parent-reported food questionnaire,	The intervention group demonstrated a decrease in the frequency of consuming discretionary foods (estimate −1.36, 95% CI −2.27 to −0.45; P=.004). Additionally, parents in the intervention group exhibited improvements in their child feeding practices related to pressure to eat (−0.30, 95% CI 0.06 to −0.00; P=.048) and their confidence in their ability to provide proper nutrition (0.43, 95% CI 0.10 to 0.76; P=.01).
8	A Smartphone App for Families With Preschool-Aged Children in a Public Nutrition Program: Prototype Development and Beta-Testing	Hull et al. (2017)	USA	observational design	63 mothers	App Users	The app is programmed to make the messages appear on the phone via push notifications per a predetermined schedule	mothers provided sociodemographic information about themselves, the preschool-aged child, and the family. At follow-up,	Several moms also conveyed their excitement and contentment with the snack gallery, expressing their like for it, its usefulness, their children's enjoyment of it, and its convenience and affordability. An often cited obstacle for the snack gallery was the need for its expansion to include a greater variety of dishes. Additionally, one mother expressed her preference to use it on an alternative gadget rather than her phone.

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(2), 960-975 | ISSN:2251-6727

								mothers responded to a series of items about their experiences with the CHEW app prototype (perceived benefits)	
9	Mobile-based intervention intended to stop obesity in preschool-aged children: the MINISTOP randomized controlled trial1	Nyström et.al (2017)	Sweden	Randomized controlled trial	315 healthy 4.5 year old children and their parents	The MINISTOP intervention was delivered via a smartphone application for 6 mo to the parents	The MINISTOP application, compatible with iOS and Android, offers a comprehensive program for healthy eating and physical activity in preschool-aged children. It includes 12 themes, including healthy foods, breakfast, small meals, physical activity, and snacks, with a new theme introduced biweekly. Parents can	fat mass index (FMI), whereas the secondary outcomes were intakes of fruits, vegetables, candy, and sweetened beverages and time spent sedentary and in moderate-to-vigorous physical activity	The study found no significant intervention effect on FMI between the intervention and control group. However, the intervention group increased their composite score from baseline to follow-up, particularly among children with an FMI above the median (4.11 kg/m2). The odds of increasing the composite score for six dietary and physical activity behaviors were 99% higher for the intervention group than the control group (P = 0.008).

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(2), 960-975 | ISSN:2251-6727

							access information anytime.		
10	A 12-month follow-up of a mobile-based (mHealth) obesity prevention intervention in pre-school children: the MINISTOP randomized controlled trial	Nyström et.al (2018)	Sweden	Randomized controlled trial	315 healthy 4.5 year old children and their parents	The MINISTOP intervention was delivered via a smartphone application for 6 mo to the parents	The MINISTOP application, compatible with iOS and Android, offers a comprehensive program for healthy eating and physical activity in preschool-aged children. It includes 12 themes, including healthy foods, breakfast, small meals, physical activity, and snacks, with a new theme introduced biweekly. Parents can access information anytime.	fat mass index (FMI), whereas the secondary outcomes were intakes of fruits, vegetables, candy, and sweetened beverages and time spent sedentary and in moderate-to-vigorous physical activity	After a period of twelve months, it was observed that there was no statistically significant difference between the intervention and control groups in terms of FMI ($p = 0.57$). Additionally, there was no maintained effect for the change in composite score (mean ± standard deviation for the intervention and control group: + 0.53 ± 1.49 units and + 0.35 ± 1.27 units respectively, $p = 0.25$ between groups).
11	The impact of a family web-based nutrition intervention to increase fruit, vegetable, and dairy intakes:	Drapeau et al. (2022)	Quebec	RANDOMISED CONTROL TRIAL	Forty-three families with children aged 8–16 years	Family Nutriathlon	Family Nutriathlon is an eight-week nutrition program designed for families, aiming to motivate parents and	vegetables The research evaluated nutrient consumption, the quality of the diet, and	The intervention significantly impacted children's dietary protein (DP), total sugar, potassium, magnesium, and calcium levels, as well as parents' DP, V/F juice, carbs, total sugar, saturated fat, protein, and calcium levels. Children saw a surge in DP consumption immediately after the intervention, but this intake

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(2), 960-975 | ISSN:2251-6727

	a single-blinded randomized family clustered intervention						children to enhance their intake of fruits, vegetables, and dairy products.	the influence of family intervention on BMI by analyzing meal records, socio-demographic questionnaires, and the Nutrient-Rich Foods index..	reduced throughout the follow-up period. No impact was observed on visceral fat, food quality, or BMI.
12	Fidelity and acceptability of a family-focused technology-based telehealth nutrition intervention for child weight management	Chai et al. 2019	California, USA	RANDOMISED CONTROL TRIAL	Forty-six families	telehealth nutrition intervention	Telehealth intervention arm 1 provided semi-structured consultations, access to website, Facebook group, and online video consultations for parents, while arm 2 added evidence-based SMS for both parents.	The Back2Basics Family programme aimed to improve dietary intakes and weight outcomes of children using a 12-week technology-based nutrition programme	Telehealth consultations by trained dietitians were effective, with parents finding the program easy to understand, improving their family/child eating habits, and wanting to continue using and recommending it to others.

DISCUSSION

Education about nutrition is a method that aims to improve knowledge and behavior about the consumption of nutritious foods, with the ultimate goal of achieving optimum nutritional status. The organization uses a wide range of media, including as print, electronic, gaming, social, visual, audio, and mixed media, to disseminate health information and to support good eating habits. This is done to enhance the student's comprehension and motivate them to make

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(2), 960-975 | ISSN:2251-6727

well-informed decisions about their food (Perdana *et al.* 2017; Raodah dan Handayani 2022).

Researchers have shown that parents' level of nutrition knowledge has a substantial impact on the eating habits and food preferences of their children Many educational programs provide brief nutrition courses for parents, as well as activities that encourage the adoption of good eating habits (Purba *et al.* 2020; Kostecka 2022). Luesse et al. conducted a focus group discussion in New York City and showed that although parents showed a strong desire to maintain good health, they faced significant obstacles in creating a healthy food environment at home. Utilizing various forms of media, such as seminars, flyers, and text messaging, may be beneficial in promoting the exchange of information to mitigate conflicts between intentions and achieving desired health objectives. Certain parents believed that information obtained via text messaging might be readily disseminated and serve as a credible source of authority to facilitate changes in child behavior (Luesse *et al.* 2018).

Home Food Environment Outcomes

Family dinners at home provide parents with an opportunity to foster good eating behaviors by serving as positive examples, which is essential for children's growth and progress. Nevertheless, obstacles to maintaining a nutritious diet include limited time availability, children's taste preferences, and disagreements arising from differing food choices. Initiatives that encourage the creation of nutritious home food situations and foster social connections have the potential to enhance the dietary quality of children (Martin-Biggers *et al.* 2014). Role modeling and modest restriction are two examples of parenting techniques that have a substantial impact on children. This suggests that greater parental encouragement and decreased parental pressure might have a good impact on the food habits of their children (Mahmood *et al.* 2021).

It has been shown that interventions that affect aspects of the home food environment may enhance children's intake (Wyse *et al.* 2015). Because the home food environment might have an effect on the development of dietary behaviors in children, it is important to take this into consideration . The research revealed that parents in the intervention group exhibited higher levels of self-efficacy in discerning suitable portion sizes for both themselves and kids, comprehending serving sizes, and approximating suggested serving sizes for different meals in comparison to the control group. The HOME Plus program led to a 92% increase in parental awareness of portion proportions. These findings, together with data indicating the rise in portion sizes over the years, the difficulty children and parents have in accurately gauging portion sizes, and the desire to acquire knowledge in this area, indicate that this should be a primary focus for health promotion efforts aimed at families (Fulkerson *et al.* 2018).

Dietitians who were trained to provide telehealth consultations were successful in achieving 83% adherence. The intervention was simple to grasp for the parents (87-100%), had a positive impact on the eating patterns of their family and children (93%), and the parents expressed a desire to continue utilizing telehealth and the website. Additionally, they suggested the program to other parents (90-91% of the families). According to the findings of the research, 97 percent of the parents were female and had a body fat index of 30% (Chai *et al.* 2021). The goal of the SMS intervention was to encourage healthy eating practices within families by capitalizing on the significant role that parents and their partners play in determining the health outcomes of their children and their families (Chai *et al.* 2019).

Behavior Change

Research revealed that providing 10 sessions of nutrition education and counselling during an 8-day period resulted in significant improvements in a mother's knowledge and psychological factors, such as attitude, subjective norm, perceived behavioral control, self-efficacy, and intention to provide healthy supplemental feeding. The use of WhatsApp for nutrition education had positive results in enhancing the mother's understanding and actions in offering nourishing supplemental meals. The findings indicate that this method has the potential to greatly enhance mother health and overall well-being (Rachmah *et al.* 2023)**.** Au et al. found that using online nutrition education with conventional in-person group instruction may effectively encourage healthy breakfast habits among WIC participants (Au *et al.* 2016).

According to the research, parents who received intervention showed a substantial increase in their child's participation in domestic tasks after 1 month, as compared to the control group. Nevertheless, there were no notable intervention effects seen for parenting behaviors related to the intake of fruits, vegetables, water, soft drinks, and snacks. Following 4 months of

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(2), 960-975 | ISSN:2251-6727

observation, parents who received the intervention shown a small although statistically significant improvement in their self-confidence to encourage their kids to consume veggies and provide them with greater independence in consuming water.(De Lepeleere *et al.* 2017).

Research revealed that the involvement of mothers in promoting physical activity and self-control in children has a substantial influence on their intake of fruits and vegetables. The setting provided by the mother for these activities showed a strong interaction between the groups and time, with changes seen from the first assessment to the follow-up after the intervention. The EMPOWER group demonstrated a collective rise of 1.943 units on the environment scale. The influence of the maternal-facilitated environment explained 13.3% of the change in child fruit and vegetable eating between the pretest and follow-up periods (Knowlden dan Sharma 2016).

Dietary Intake

A research was conducted to evaluate the efficacy of a web-based nutrition program called Family Nutriathlon on the consumption of vegetables/fruits and dietary protein, nutrient intake, diet quality, and anthropometric parameters in Quebec (Drapeau *et al.* 2022). The results of the study indicated that The intervention had a substantial effect on the levels of dietary patterns, total sugar, potassium, magnesium, and calcium in both children and parents. Subsequent analysis showed that children in the intervention group saw a significant rise in their intake of DP immediately after the intervention. However, there were no significant changes seen in the amounts of DP, V/F juice, carbohydrates, total sugar, saturated fat, protein, and calcium among the parents.. It was shown that effective treatments were often more intense, that they included dairy foods, and that they were administered in a variety of venues to a wide range of main targets. The use of taste exposure and promoting practice proved to be crucial for effective interventions (Hendrie *et al.* 2013).

Several research provided varying outcomes when using mobile learning for nutrition instruction. A study done by Nyström et al. in Swedia showed the impact of the intervention that was seen on the composite score at the 6-month follow-up was not sustained at the 12-month follow-up, and there was no effect on FMI detected at either of the follow-up measures (Delisle Nyström *et al.* 2018). Nevertheless, this investigation demonstrated a notable enhancement of 0.36 units in the composite score of the seven components, in contrast to the control group which exhibited no alteration.. For the intervention group, the odds ratio for improving the composite score for all seven components was 1.49, which was significantly higher than the odds ratio for the control group. A greater probability of improving the composite score for the six dietary or exercise habits, except for FMI, was seen among the children who were part of the intervention group. It was the consumption of fruits and vegetables that was the primary contributor to improvements in the composite score that were statistically significant (Nyström *et al.* 2017).

During the early stages of childhood, parents exert influence on their children's dietary intake, responses to novel goods, and attitudes about food (Shloim *et al.* 2015). Therefore, parents need to have accurate nutritional understanding. The child's overall calorie intake is mostly determined by parents' comprehension of newborn hunger and satiety signals, as well as their knowledge of appropriate eating guidelines (Silva *et al.* 2016; Shloim *et al.* 2017). It is crucial to cultivate children's precise awareness of hunger and fullness and establish proper eating habits by offering them appropriate portions of food at the appropriate times (Vaughn *et al.* 2016). Studies to investigate whether parents of children aged four to 18 years would be interested in a healthy lifestyle program that would be directed at the family unit and delivered using technology conducted by Burrows et al. showed a healthy living program that is simple to use, non-structured, and accessible online is something that 93.3% of parents of children between the ages of four and 18 are interested in. Parents are more likely to support a program that is not just useful but also interesting and supported by a reliable source. They should be able to directly include their children in the program, and it should be flexible enough to allow for individual customization (Burrows *et al.* 2015). A meta-analysis study showed that digital nutrition interventions targeting parents have shown effectiveness in improving nutrition outcomes, self-efficacy, and knowledge. User-testing studies identified the need for informative content and interactive features. Parents desire evidence-based information, practical tools, engaging content, and connections with health professionals (Zarnowiecki *et al.* 2020).

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(2), 960-975 | ISSN:2251-6727

Conclusion

Online nutrition education media may improve moms' attitudes and behaviors regarding their children's food intake. Health information services are seeing a growing trend in the use of web-based programs and smartphone applications. These digital initiatives for promoting nutrition may effectively target the public health concern of enhancing children's dietary habits. Nevertheless, maintaining long-term involvement is essential for achieving optimal results. To enhance nutrition-related results, digital nutrition promotion should include accredited information, interactive features, personalized content, and customized feedback. These treatments are cost-effective and have the potential to increase their reach.

REFERENCE

1. Arikpo D, Edet ES, Chibuzor MT, Odey F, Caldwell DM. 2018. Educational interventions for improving primary caregiver complementary feeding practices for children aged 24 months and under. *Cochrane Database Syst Rev*. 2018(5). doi:10.1002/14651858.CD011768.pub2.
2. Au LE, Whaley S, Rosen NJ, Meza M, Ritchie LD. 2016. Online and In-Person Nutrition Education Improves Breakfast Knowledge, Attitudes, and Behaviors: A Randomized Trial of Participants in the Special Supplemental Nutrition Program for Women, Infants, and Children. *J Acad Nutr Diet*. 116(3):490–500. doi:10.1016/j.jand.2015.10.012.
3. Black MM, Walker SP, Fernald LCH, Andersen CT, DiGirolamo AM, Lu C, McCoy DC, Fink G, Shawar YR, Shiffman J, *et al.* 2017. Advancing Early childhood Development:From Science Through The Life Course. *Lancet*. 389(10064):77–90. doi:10.1016/S0140-6736(16)31389-7.Advancing.
4. Burhan NAS, Sabri MF, Rindermann H. 2023. *Cognitive ability and economic growth: how much happiness is optimal?* Volume ke-70. Springer Berlin Heidelberg.
5. Burrows T, Hutchesson M, Chai LK, Rollo M, Skinner G, Collins C. 2015. Nutrition interventions for prevention and management of childhood obesity: What do parents want from an ehealth program? *Nutrients*. 7(12):10469–10479. doi:10.3390/nu7125546.
6. Chai LK, Collins CE, May C, Brown LJ, Ashman A, Burrows TL. 2021. Fidelity and acceptability of a family-focused technology-based telehealth nutrition intervention for child weight management. *J Telemed Telecare*. 27(2):98–109. doi:10.1177/1357633X19864819.
7. Chai LK, May C, Collins CE, Burrows TL. 2019. Development of text messages targeting healthy eating for children in the context of parenting partnerships. *Nutr Diet*. 76(5):515–520. doi:10.1111/1747-0080.12498.
8. Corder K, Winpenny EM, Foubister C, Guagliano JM, Sluijs XMH, Love R, Astbury CC, Van EMF. 2019. Obesity Reviews - 2020 - Corder - Becoming a parent A systematic review and meta-analysis of changes in BMI diet and.pdf. *Obes Rev*., siap terbit.
9. Delisle Nyström C, Sandin S, Henriksson P, Henriksson H, Maddison R, Löf M. 2018. A 12-month follow-up of a mobile-based (mHealth) obesity prevention intervention in pre-school children: The MINISTOP randomized controlled trial. *BMC Public Health*. 18(1):1–7. doi:10.1186/s12889-018-5569-4.
10. Drapeau V, Harvey AA, Jacob R, Provencher V, Panahi S. 2022. The impact of a family web-based nutrition intervention to increase fruit, vegetable, and dairy intakes: a single-blinded randomized family clustered intervention. *Nutr J*. 21(1):1–14. doi:10.1186/s12937-022-00825-6.
11. Fulkerson JA, Friend S, Horning M, Flattum C, Draxten M, Neumark-Sztainer D, Gurvich O, Garwick A, Story M, Kubik MY. 2018. Family Home Food Environment and Nutrition-Related Parent and Child Personal and Behavioral Outcomes of the Healthy Home Offerings via the Mealtime Environment (HOME) Plus Program: A Randomized Controlled Trial. *J Acad Nutr Diet*. 118(2):240–251. doi:10.1016/j.jand.2017.04.006.
12. Hendrie GA, Brindal E, Baird D, Gardner C. 2013. Improving children's dairy food and calcium intake: Can intervention work? A systematic review of the literature. *Public Health Nutr*. 16(2):365–376. doi:10.1017/S1368980012001322.
13. Ibrahim MK, Zambruni M, Melby CL, Melby PC. 2017. Impact of childhood malnutrition on host defense and infection. *Clin Microbiol Rev*. 30(4):919–971. doi:10.1128/CMR.00119-16.
14. Karmali S, Ng V, Battram D, Burke S, Morrow D,

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(2), 960-975 | ISSN:2251-6727

Pearson ES, Tucker P, Mantler T, Cramp A, Petrella R, *et al.* 2019. Coaching and/or education intervention for parents with overweight/obesity and their children: Study protocol of a single-centre randomized controlled trial. *BMC Public Health*. 19(1):1–12. doi:10.1186/s12889-019-6640-5.

15. Kiani AK, Dhuli K, Donato K, Aquilanti B, Velluti V, Matera G, Iaconelli A, Connelly ST, Bellinato F, Gisondi P, *et al.* 2022. Main nutritional deficiencies. *J Prev Med Hyg*. 63(2):E93–E101. doi:10.15167/2421-4248/jpmh2022.63.2S3.2752.
16. Knowlden A, Sharma M. 2016. One-Year Efficacy Testing of Enabling Mothers to Prevent Pediatric Obesity Through Web-Based Education and Reciprocal Determinism (EMPOWER) Randomized Control Trial. *Heal Educ Behav*. 43(1):94–106. doi:10.1177/1090198115596737.
17. Kostecka M. 2022. The Effect of the "Colorful Eating Is Healthy Eating" Long-Term Nutrition Education Program for 3-to 6-Year-Olds on Eating Habits in the Family and Parental Nutrition Knowledge. *Int J Environ Res Public Health*. 19(4). doi:10.3390/ijerph19041981.
18. De Lepeleere S, De Bourdeaudhuij I, Cardon G, Verloigne M. 2017. The effect of an online video intervention 'Movie Models' on specific parenting practices and parental self-efficacy related to children's physical activity, screen-time and healthy diet: a quasi experimental study. *BMC Public Health*. 17(1):1–15. doi:10.1186/s12889-017-4264-1.
19. Lokossou YUA, Tambe AB, Azandjèmè C, Mbhenyane X. 2021. Socio-cultural beliefs influence feeding practices of mothers and their children in Grand Popo, Benin. *J Heal Popul Nutr*. 40(1):1–12. doi:10.1186/s41043-021-00258-7.
20. Lowe C, Kelly M, Sarma H, Richardson A, Kurscheid JM, Laksono B, Amaral S, Stewart D, Gray DJ. 2021. The double burden of malnutrition and dietary patterns in rural Central Java, Indonesia. *Lancet Reg Heal - West Pacific*. 14:100205. doi:10.1016/j.lanwpc.2021.100205.
21. Luesse HB, Paul R, Gray HL, Koch P, Contento I, Marsick V. 2018. Challenges and Facilitators to Promoting a Healthy Food Environment and Communicating Effectively with Parents to Improve Food Behaviors of School Children. *Matern Child Health J*. 22(7):958–967. doi:10.1007/s10995-018-2472-7.
22. Mahmood L, Flores-Barrantes P, Moreno LA, Manios Y, Gonzalez-Gil EM. 2021. The influence of parental dietary behaviors and practices on children's eating habits. *Nutrients*. 13(4):1–13. doi:10.3390/nu13041138.
23. Martin-Biggers J, Spaccarotella K, Berhaupt-Glickstein A, Hongu N, Worobey J, Byrd-Bredbenner C. 2014. Come and get it! A discussion of family mealtime literature and factors affecting obesity risk. *Adv Nutr*. 5(3):235–247. doi:10.3945/an.113.005116.
24. Nyström CD, Sandin S, Henriksson P, Henriksson H, Trolle-Lagerros Y, Larsson C, Maddison R, Ortega FB, Pomeroy J, Ruiz JR, *et al.* 2017. Mobile-based intervention intended to stop obesity in preschool-aged children: The MINISTOP randomized controlled trial. *Am J Clin Nutr*. 105(6):1327–1335. doi:10.3945/ajcn.116.150995.
25. Perdana F, Madanijah S, Ekayanti I. 2017. Pengembangan media edukasi gizi berbasis android dan website serta pengaruhnya terhadap perilaku tentang gizi seimbang siswa sekolah dasar. *J Gizi dan Pangan*. 12(3):169–178. doi:10.25182/jgp.2017.12.3.169-178.
26. Pollard CM, Pulker CE, Meng X, Kerr DA, Scott JA. 2015. Who uses the internet as a source of nutrition and dietary information? An Australian population perspective. *J Med Internet Res*. 17(8). doi:10.2196/jmir.4548.
27. Prendergast AJ, Humphrey JH. 2014. The stunting syndrome in developing countries. *Paediatr Int Child Health*. 34(4):250–265. doi:10.1179/2046905514Y.0000000158.
28. Purba IE, Purba A, Sembiring R. 2020. Factors associated with nutritional status of children under the age of 5 years in the working area of Sadabuan Public Health Center. *Enferm Clin*. 30(2019):140–143. doi:10.1016/j.enfcli.2019.11.040.
29. Rachmah Q, Astina J, Atmaka DR, Khairani L. 2023. The Effect of Educational Intervention Based on Theory of Planned Behavior Approach on Complementary Feeding: A Randomized Controlled Trial. *Int J Pediatr (United Kingdom)*. 2023. doi:10.1155/2023/1086919.
30. Raodah, Handayani L. 2022. Media Sebagai Edukasi Intervensi Promosi Kesehatan Masyarkat

di Indonesia. *Media Publ Promosi Kesehat Indones*. 5(2):123–133. doi:10.56338/mppki.v5i2.2039.

31. Reid KM, Taylor MG. 2015. Social support, stress, and maternal postpartum depression: A comparison of supportive relationships. *Soc Sci Res*. 54:246–262. doi:10.1016/j.ssresearch.2015.08.009.
32. Shloim N, Edelson LR, Martin N, Hetherington MM. 2015. Parenting styles, feeding styles, feeding practices, and weight status in 4-12 year-old children: A systematic review of the literature. *Front Psychol*. 6 DEC. doi:10.3389/fpsyg.2015.01849.
33. Shloim N, Vereijken CMJL, Blundell P, Hetherington MM. 2017. Looking for cues – infant communication of hunger and satiation during milk feeding. *Appetite*. 108:74–82. doi:10.1016/j.appet.2016.09.020.
34. Silva GAP, Costa KAO, Giugliani ERJ. 2016. Alimentação infantil: além dos aspectos nutricionais. *J Pediatr (Rio J)*. 92(3):S2–S7. doi:10.1016/j.jped.2016.02.006.
35. Soliman A, De Sanctis V, Alaaraj N, Ahmed S, Alyafei F, Hamed N, Soliman N. 2021. Early and long-term consequences of nutritional stunting: From childhood to adulthood. *Acta Biomed*. 92(1):1–12. doi:10.23750/abm.v92i1.11346.
36. UNICEF. 2021. *Social Behaviour Change Communication Strategy : Improving Adolescent*. Jakarta: UNICEF Indonesia.
37. Vaughn AE, Ward DS, Fisher JO, Faith MS, Hughes SO, Kremers SPJ, Musher-Eizenman DR, O'Connor TM, Patrick H, Power TG. 2016. Fundamental constructs in food parenting practices: A content map to guide future research. *Nutr Rev*. 74(2):98–117. doi:10.1093/nutrit/nuv061.
38. Wyse R, Wolfenden L, Bisquera A. 2015. Characteristics of the home food environment that mediate immediate and sustained increases in child fruit and vegetable consumption: Mediation analysis from the Healthy Habits cluster randomised controlled trial. *Int J Behav Nutr Phys Act*. 12(1):1–9. doi:10.1186/s12966-015-0281-6.
39. Yuliantini E, Kusdalinah K, Yuliani AP. 2015. Hubungan Pemahaman Ibu Tentang Pesan Gizi Seimbang Dengan Status Gizi Anak Prasekolah Di Tk It Auladuna Kota Bengkulu. *Gizi Indones*. 38(2):137. doi:10.36457/gizindo.v38i2.187.
40. Zarnowiecki D, Mauch CE, Middleton G, Matwiejczyk L, Watson WL, Dibbs J, Dessaix A, Golley RK. 2020. A systematic evaluation of digital nutrition promotion websites and apps for supporting parents to influence children's nutrition. *Int J Behav Nutr Phys Act*. 17(1):1–19. doi:10.1186/s12966-020-0915-1.