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**INFLUENCE OF CONTEMPORARY DIETARY PATTERNS IN CHILDREN  
HEALTH – AN OVERVIEW**

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**ABSTRACT**

A healthy diet is essential for children's growth, development, and overall well-being. It provides the necessary nutrients for their bodies to function optimally and supports their cognitive and physical development. Good feeding practices and introducing appropriate complementary foods after six months, along with continued breastfeeding, helps children meet their nutritional needs as they transition to solid foods. The interplay between nutrition and gut microbiota has garnered significant attention in recent years. The gut microbiota, composed of trillions of microorganisms residing in the gastrointestinal tract, plays a crucial role in nutrient metabolism, immune function, and overall health. A diet rich in fiber, prebiotics, and probiotics supports a diverse and beneficial gut microbiota, which can positively influence children's health outcomes. In summary, promoting a healthy dietary pattern in children is crucial for their optimal growth, development, and long-term health. Early establishment of healthy eating habits, considering the interrelationship between nutrition and gut microbiota, addressing poor diet quality and its associated health concerns, and tackling the causes and effects of malnutrition are essential steps. By implementing comprehensive strategies that encompass education, policy changes, and community support, we can foster a healthier future for children and improve their overall well-being.

**Keywords: Healthy diet, Children's growth, Malnutrition, Eating Habits, Nutritional needs, Gut microbiota**

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**HIGHLIGHTS**

- We conducted a comprehensive review of the literature, including over 100 studies.
- We defined contemporary dietary patterns as "diets that are high in processed foods, sugary drinks, and unhealthy fats."
- We discussed the factors that have contributed to the rise of these dietary patterns, including changes in the food environment, such as the availability of processed foods and sugary drinks, and changes in family and cultural food patterns.
- We reviewed the evidence on the association between contemporary dietary patterns and a range of health outcomes in children, including obesity, overweight, cardiovascular disease, type 2 diabetes, and cancer.
- We concluded by discussing the implications of our findings for public health policy and practice. We recommended that public health policies and practices should be aimed at promoting healthy dietary patterns in children, such as increasing the availability of healthy foods, educating parents and children about healthy eating, and creating a supportive environment for healthy eating.

**1. INTRODUCTION:****1.a Healthy Diet**

A healthy diet is commonly defined as consuming a sufficient amount of fruits, vegetables, meat, whole grains, and other nourishing foods that provide essential nutrients such as carbohydrates, proteins, fats, vitamins, and more. Conversely, unhealthy diets are often characterized by excessive intake of saturated fatty acids, processed food products, sugar, and a lack of essential nutrients derived from nutrient-rich foods [1]. Children and adolescents who were associated with food insecurity were found to experience poor diet quality, inadequate nutritional intake, and negative repercussions on their physical and mental health. It is said that diets keep evolving over time depending on the influence of different factors like income, food prices, individual preferences, cultural traditions, and beliefs. Additionally, it has been observed that these influential factors, such as geographical, economic, social, and environmental conditions, interact with one another to shape an individual's dietary patterns. [2]. Healthy diet patterns help reduce the risks of malnutrition, non-communicable diseases (NCD), diabetes, heart disease, stroke, and even cancer. It is well known that a healthy diet combined with a lack of physical activity can lead to serious health problems. According to the WHO, the amount of calories consumed must be offset by energy expenditure. Also, the WHO recommends the limit for

consumption of fats, sugar, and salt to prevent unhealthy weight gain, as mentioned in the below **Table 1** [3].

According to the NIH, obesity in children due to poor dietary behaviours increases the risk of developing health issues sooner or later in life. It is been said that there are chances of some children to experience type 2 diabetes, high blood pressure, and high cholesterol [4]. The leading causes of death and disability worldwide are non-communicable diseases (NCDs), which affect people in both developed and developing countries. Heart disease, cancer, chronic respiratory illnesses, diabetes,

obesity, and cognitive impairment are a few examples of NCDs. Unhealthy dietary patterns and lifestyle choices are significant contributors to non-communicable diseases (NCDs), along with genetic and environmental factors. These factors can increase the risk of inflammation, obesity, hypertension, hypercholesterolemia, and other conditions that are associated with significant morbidity and, in some cases, mortality. NCDs such as cancer, cardiovascular disease, and diabetes are particularly influenced by these dietary decisions and lifestyle factors (**Figure 1**) [5].

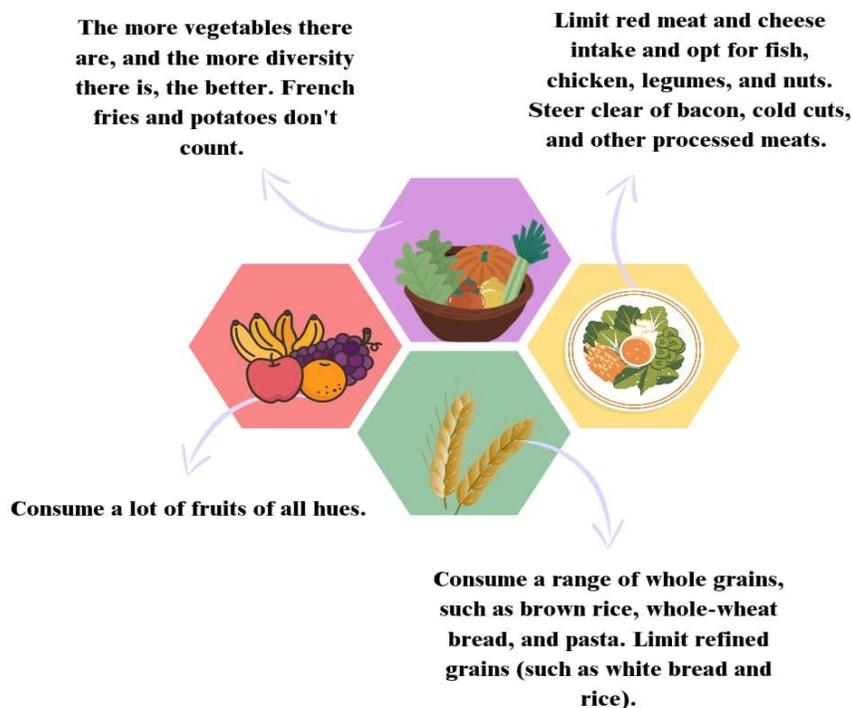


Figure 1: Healthy eating plate

The World Health Organization recommends implementing certain changes in dietary patterns to create a healthier version. These changes include striking a balance between calorie intake and expenditure, enhancing the consumption of fruits and vegetables, decreasing the consumption of saturated and trans fats while favoring unsaturated fats, and reducing the intake of sugar and salt. These modifications contribute to a healthier dietary pattern as per the guidelines provided by the World Health Organization [5].

Unhealthy eating habits can hinder the growth of the brain and cognitive processes, which can ultimately harm children's scholastic results. It is crucial to seek out strategies that can enhance brain development, cognition, and academic performance in children. These factors are interconnected with a higher likelihood of adult obesity, unemployment, and low socioeconomic status. Therefore, finding effective approaches to improve these aspects during childhood is of utmost importance [6].

**Table 1: WHO recommendation for fats, sugar, and salt consumption [3]**

Intake of total fat	≤ 30% per day
Intake of saturated fat	< 10% per day
Intake of trans fat	< 1% per day
Intake of free sugars	< 10% per day
Intake of salt	< 10g per day
Intake of fruits and vegetables	400g per day

## 2. The significance of a healthy diet and its effectiveness.

Insufficient consumption of energy, protein, iron, and iodine during early stages of life can lead to long-lasting behavioral and cognitive impairments in individuals that persist into adulthood. Additionally, deficiencies in B vitamins, zinc, betaine, and choline can result in neurological deficits in developing children, as these deficiencies can induce permanent alterations in the brain [7]. A mother's nutritional deficiencies during pregnancy may cause abnormal neurodevelopment of the fetus in humans,

which results in related adverse adult outcomes [8]. The ingestion of  $\omega$ -3 fatty acids during early human development has been linked to enhanced cognitive function, whereas reduced levels of  $\omega$ -3 fatty acids have been identified within the cerebral structures of individuals experiencing mental health and neurological degradation. Folate, choline, and betaine, for example, are molecules that affect one-carbon metabolism and have known epigenetic potential in the development of the offspring's nervous system [9]. Green leafy vegetables, beets, wheat, and seafood all

contain these molecules, and certain gut bacteria can synthesize folate as a by-product of their secondary metabolism [10]. The concentration of those nutrients in the mother's blood and the blood flow in the placenta that will distribute them to the embryo determine the nutrients' availability for the developing fetus [11]. Following delivery, the abnormal or early termination of breastfeeding, early weaning, and low-quality breast milk as a result of disturbed maternal nutritional and general health status are the most significant risk factors for the development of severe acute early life malnutrition. Malnutrition is a broad term that encompasses undernutrition (wasting, stunting, and underweight), as well as overweight and obesity, and it continues to be a problem for global health today [12]. Adopting new strategies to develop and maintain healthy eating habits in children has become necessary as evolution in the society has also become constant over the years. Therefore, Healthy eating techniques are meant to encourage parents to instill good habits in their young children so that they will continue into adulthood. It has been shown that an authoritative feeding strategy promotes healthier outcomes and

motivates kids to control their eating patterns and eating habits. Preadolescent children who eat more healthfully overall have better mental health, according to research [13].

Poor nutrition quality or unhealthy eating habits are widely accepted as major risk factors for a number of chronic diseases in children and adolescents, including obesity, diabetes, and cardiovascular diseases. A range of mental health issues in children and adolescents, including internalising disorders like depression and anxiety and externalising disorders like attention deficit and hyperactivity disorder, have been linked to poor food quality and unhealthy eating habits, according to prior research [14].

Health-Related Quality of Life (HRQoL) is a multidimensional concept that includes social well-being, physical health, and mental health. Health-related quality of life refers to the subjective evaluation of a person's general well-being as well as the health of the underlying sub-dimensions of physiological, behavioural, and social functioning and well-being (Table 2) [15].

**Table 2: Consumption proportions and frequencies of food and beverage groups [16].**

Food and beverage groups	Consumption proportions with 95% CIs (%)	Consumption frequencies, n (%)						Data missing
		Less than once a week	Once a week	Twice to four times a week	Five to six times a week	Seven times a week	More than seven times a week	
Fruits	99.91 (99.74, 99.98)	6 (0.18)	13 (0.39)	125 (3.71)	282 (8.36)	491 (14.56)	2417 (71.66)	36 (1.07)
Vegetables	99.85 (99.65, 99.95)	17 (0.50)	49 (1.45)	269 (7.98)	360 (10.67)	520 (15.42)	2075 (61.52)	78 (2.31)
Dark-green vegetables	99.50 (99.19, 99.71)	113 (3.35)	276 (8.18)	1085 (32.17)	687 (20.37)	391 (11.59)	691 (20.49)	113 (3.35)
Other dark-color vegetables	99.70 (99.46, 99.86)	52 (1.54)	230 (6.82)	1000 (29.65)	775 (22.98)	471 (13.96)	771 (22.86)	64 (1.90)
Fresh fruit/vegetable juice	84.73 (83.47, 85.93)	1061 (31.46)	691 (20.49)	695 (20.60)	151 (4.48)	87 (2.58)	116 (3.44)	57 (1.69)
Soybean milk	68.84 (67.25, 70.40)	1166 (34.57)	599 (17.76)	372 (11.03)	59 (1.75)	29 (0.86)	46 (1.36)	51 (1.51)
Milk	97.48 (96.89, 97.98)	119 (3.53)	135 (4.00)	471 (13.96)	389 (11.53)	483 (14.32)	1680 (49.81)	11 (0.33)
Yogurt or other dairy products	98.55 (98.08, 98.92)	112 (3.32)	170 (5.04)	774 (22.95)	620 (18.38)	594 (17.61)	1037 (30.74)	17 (0.50)
Flavored milk drinks	54.52 (52.82, 56.21)	944 (27.99)	320 (9.49)	299 (8.86)	88 (2.61)	58 (1.72)	66 (1.96)	64 (1.90)
Carbonated drinks	26.50 (25.02, 28.03)	608 (18.03)	142 (4.21)	79 (2.34)	22 (0.65)	5 (0.15)	10 (0.30)	28 (0.83)
Flavored fruit/vegetable drinks	53.16 (51.46, 54.85)	1172 (34.75)	343 (10.17)	196 (5.81)	26 (0.77)	19 (0.56)	17 (0.50)	20 (0.59)
Energy drinks or sports drinks	16.34 (15.10, 17.63)	389 (11.53)	84 (2.49)	34 (1.01)	10 (0.30)	4 (0.12)	4 (0.12)	26 (0.77)
Tea drinks	20.49 (19.14, 21.89)	453 (13.43)	112 (3.32)	58 (1.72)	7 (0.21)	5 (0.15)	11 (0.33)	45 (1.33)
Plant-protein drinks	44.41 (42.73, 46.11)	1081 (32.05)	246 (7.29)	97 (2.88)	24 (0.71)	9 (0.27)	11 (0.33)	30 (0.89)
Coffee drinks	3.11 (2.55, 3.76)	53 (1.57)	5 (0.15)	4 (0.12)	7 (0.21)	2 (0.06)	3 (0.09)	31 (0.92)
Sweets	96.74 (96.08, 97.31)	673 (19.95)	704 (20.87)	1244 (36.88)	338 (10.02)	142 (4.21)	145 (4.30)	17 (0.50)
Pastries	97.51 (96.93, 98.01)	757 (22.44)	939 (27.84)	1188 (35.22)	251 (7.44)	77 (2.28)	49 (1.45)	28 (0.83)
Puffed foods	71.51 (69.95, 73.03)	1491 (44.20)	552 (16.37)	291 (8.63)	25 (0.74)	13 (0.39)	6 (0.18)	34 (1.01)
Fried foods	79.63 (78.23, 80.98)	1729 (51.26)	667 (19.77)	227 (6.73)	19 (0.56)	8 (0.24)	4 (0.12)	32 (0.95)
Western fast foods	83.04 (81.73, 84.29)	1951 (57.84)	602 (17.85)	175 (5.19)	19 (0.56)	10 (0.30)	8 (0.24)	36 (1.07)
Nuts	95.14 (94.36, 95.84)	721 (21.38)	819 (24.28)	1086 (32.20)	325 (9.64)	110 (3.26)	119 (3.53)	29 (0.86)
Wheat or wheat foods	86.87 (85.68, 87.99)	1052 (31.19)	898 (26.62)	667 (19.77)	165 (4.89)	64 (1.90)	50 (1.48)	34 (1.01)
Meat or poultry	99.58 (99.30, 99.77)	59 (1.75)	120 (3.56)	676 (20.04)	714 (21.17)	619 (18.35)	1142 (33.86)	29 (0.86)
Fishery products	98.49 (98.02, 98.87)	271 (8.03)	715 (21.20)	1417 (42.01)	486 (14.41)	205 (6.08)	196 (5.81)	32 (0.95)
Other protein-rich foods	99.58 (99.30, 99.77)	48 (1.42)	181 (5.37)	822 (24.37)	704 (20.87)	661 (19.60)	921 (27.31)	22 (0.65)

### 3. Feeding practices in infant and young children:

Presently, children's diet quality is a top priority for improving their overall health and preventing obesity. A healthy diet during childhood prioritizes nutrient variety and proper balance of important nutrients, which

often leads to healthier eating habits that last into adulthood. Therefore, assessing of impact of family feeding behaviours and mealtime practises is important.

Three methods are frequently used to control children's eating: monitoring, which involves carefully tracking what kids eat;

pressuring them to eat; and restriction, which involves restricting the types and amounts of food that kids eat. For example, higher levels of dietary pressure have been linked to a higher likelihood of having an adequate intake of dairy and a lower number of foods considered to be healthy; higher levels of monitoring have been linked to a higher intake of fiber, a lower intake of added sugar, and a lower likelihood of having an inadequate intake of fruit and vegetables; and more restriction has been linked to a higher frequency of vegetable and fruit intake and a lower likelihood of having an inadequate intake of dairy [16, 17].

Infant and young child feeding (IYCF) practises are a major global public health problem, because of its significant impact on child's development, growth and survival [18].

Overall, four themes that are crucial for the formation of children's good eating habits were found:-

- a. The enjoyment of food.
- b. Eating meals with family and friends is crucial for promoting children's health.
- c. A welcoming home environment that supports healthy eating habits.
- d. Effective parental feeding for establishing and shaping wholesome eating practices.

The process by which parents encourage their children to adopt wholesome eating habits, values, perceptions, and conduct that

are shared and endorsed by both their immediate family and the culture in which they live is known as eating socialization. The parenting environment is one of the earliest and most fundamental environments for socializing children's eating behaviour. Also, according to the Healthy Eating Index (HEI), children of authoritative parents had superior dinnertime diet quality. On the other hand, children of indulgent parents experience worse outcomes, including larger portions of food they choose for themselves, lower intakes of fruits, vegetables, dairy products, and whole grains, and a higher consumption of meals high in calories but low in nutrients. Therefore, the goal of healthy eating strategies is to persuade parents to instill healthy habits in their kids at a young age so that they will stick with them throughout adulthood [13].

#### **4. Interrelationship between nutrition and gut microbiota**

Early nutrition has a complex and intricate effect on the gut microbiota's composition, the CNS and immune system's priming by the microbiota, and the host's reaction to this crosstalk. In the gut lumen, nutrients, metabolites, and microorganisms send signals to dendritic cells and enteric neurons, which then communicate with the immunological, circulatory, and neurological systems. The gut surface interacts with a wide variety of bacteria as

well as food in the form of macro- and micronutrients, which serve as substrate for host cells and microbes. The intestinal epithelial cells detect and perceive essential nutrients and metabolites. This process of recognition results in the activation of diverse pathways within the cells, in order to facilitate the process of nutrient breakdown and absorption within the gastrointestinal tract. Important secondary molecules are released as nutrients interact with the microbiota so they can later be absorbed by the host. For instance, prebiotic food fibers that are not digested are fermented by bacteria, releasing secondary metabolites that control vital bodily functions. Short-chain fatty acids (SCFAs), which include acetate, butyrate, and propionate, are one class of highly powerful by-products of fibre fermentation by the gut bacteria [19]. Besides, to strengthen our fight against malnutrition in children and adolescents, consumption of millets can help to foster immunity and health. Here, authors have reviewed the potential of millets for their Nutri-cereal qualities [20]. These metabolites can regulate the CNS [21] and the immune system after being absorbed in the gut. In humans, nutrient deficiency during pregnancy may cause aberrant neurodevelopment of the fetus, which results in adversities in the adult child. Certain molecules that have an impact on one-carbon metabolism, such as folate,

choline, and betaine, are recognized for their epigenetic potential in the development of the nervous system in offspring. These molecules can be found in various sources, including green leafy vegetables, beets, wheat, and seafood [22]. Additionally, folate can also be produced as a secondary metabolic product by specific bacteria residing in the gut

In children, breast milk's unique combination of ingredients causes certain metabolic and physiological reactions that control intestinal function, immunity, and brain development. Human milk oligosaccharides (HMOs), which include lacto-N-tetraose and 2-fucosyllactose, are indigestible glycans that move across the GI tract. HMOs are fermented by microbiota once they enter the intestines, acting as prebiotics and encouraging microbial development in a strain-specific way. As long as breastfeeding is continued, breast milk microbiota serves as an inexhaustible source of colonizing bacteria for the developing infant's gut and modulates intestinal, neurological, and behavioral functions early in life, possibly leaving an imprint on the CNS and immune system that lasts a lifetime. Studies on undernutrition often concentrate on the overall development of children, although linkages between the microbiota and malnutrition-related abnormalities in brain development have also been identified [23].

## 5. Common health concerns in children as a result of poor diet quality:

Poor diet quality has become a major concern for children's health in recent years. With the increasing availability and consumption of processed and high-calorie foods, children are facing a range of health issues that can impact their growth and development. Some of the common health issues that can arise in children due to poor diet quality are:

**5.1 Obesity:** Obesity has become a major health concern among children, and poor diet quality is one of the leading causes. A diet high in processed foods, sugar, and saturated fats can lead to excessive weight gain and obesity. According to a recent study published in the journal *Pediatrics*, about one in five children in the United States is obese, and poor diet quality is a major contributing factor [24]. Beneficial ingredients such as dietary fibers, phenolic antioxidants, marine ingredients, and n-3 fatty acids can be used in the bread industry to increase its functionality and result in healthy products, low in calories, cholesterol and celiac disease [25].

**5.2 Malnutrition:** Malnutrition is a serious health issue that can result from poor diet quality. Children who

consume a diet lacking in essential nutrients like vitamins, minerals, and protein are at risk of malnutrition. According to a recent report by the World Health Organization (WHO), over 150 million children worldwide are stunted due to malnutrition [26]. The supplementary food formulations contained 20–21% protein, 370–390 kcal of energy and 2,300  $\mu\text{g}$  of  $\beta$ -carotene per 100 g serving. The physico-chemical, functional and nutritional characteristics were evaluated [27].

**5.3 Tooth decay:** Tooth decay is another health issue that can arise in children due to poor diet quality. A diet high in sugar and processed foods can encourage the growth of harmful bacteria in the mouth, which can lead to tooth decay. According to a study published in the *Journal of the American Dental Association*, about 42% of children in the United States have had cavities in their primary teeth [28].

**5.4 Allergies and food intolerances:** Poor diet quality can also contribute to allergies and food intolerances in children. Certain processed foods and food additives can trigger allergic reactions and cause food intolerances. A diet that is high in sugar, fat, and processed foods may

increase the risk of developing food allergies, according to a recent study that was published in the journal *Nutrients* [29].

**5.5 Digestive problems:** Poor diet quality can also lead to digestive problems in children. A diet lacking in fiber and essential nutrients can cause constipation, diarrhoea, and bloating. According to a recent study published in the *Journal of Pediatric Gastroenterology and Nutrition*, poor diet quality is a major risk factor for gastrointestinal problems in children. This review focus on the malnutrition in children, and its studies [30]. Spirulina based product/food can be used as alternatives to gastroprotective agents that are known to cause acidity themselves upon long term use [31].

## 6. Causes and effects of malnutrition:

Malnutrition is a significant concern for children, particularly in developing countries. It can result from a range of factors, including poor diet quality, lack of access to healthcare, and inadequate sanitation. Here are some of the reasons for malnutrition in children, based on recent research published within the last five years:

**6.1 Poverty:** Poverty is a significant contributor to malnutrition in

children. Families living in poverty may not have access to sufficient food or resources to provide a balanced diet for their children. According to a recent study, poverty is a leading cause of malnutrition in children in Bangladesh [32].

## 6.2 Lack of access to healthcare:

Inadequate access to healthcare can also contribute to childhood malnutrition. Children who are not vaccinated against diseases like measles or who do not receive appropriate medical care for common illnesses are more susceptible to malnutrition. According to a recent study, children in Nigeria who do not have access to healthcare are more likely to be malnourished [33].

**6.3 Food insecurity:** Food insecurity is another significant contributor to malnutrition in children. Food insecurity can result from a lack of access to sufficient food, inadequate storage and handling of food, or poor distribution of food. A recent study found that food insecurity is a major risk factor for malnutrition in Ethiopian children [34].

**6.4 Inadequate maternal and child nutrition:** Malnutrition in children is also significantly influenced by inadequate nutrition for pregnant

women and young children. Poor nutrition during pregnancy and breastfeeding can lead to stunted growth, poor immune function, and other health issues in children. According to a recent study, improving maternal and child nutrition is critical for reducing malnutrition in children in nations with low and middle incomes [35].

**6.5 Water and sanitation:** Inadequate water and sanitation can also contribute to malnutrition in children. Lack of access to clean water and proper sanitation can lead to diarrheal diseases, which can cause malnutrition. According to a recent study, improving water and sanitation infrastructure is critical for reducing malnutrition in children in low- and middle-income countries [36].

Malnutrition in children can result in slowed growth, postponed cognitive maturation, weakened immune systems, and a higher risk of infections. Later in life, it may also play a role in the emergence of chronic illnesses like diabetes, obesity, and cardiovascular disease. Malnutrition is a complex issue with a range of contributing factors. Addressing these factors through improved access to healthcare, food security, and sanitation, as well as better

maternal and child nutrition, can help reduce malnutrition in children.

### **7. Present scenario in children's diet**

Malnutrition is a major health problem for children around the world, and the prevalence of malnutrition in its many forms remains a major challenge [37]. According to a World Health Organisation (WHO) research, malnutrition is to blame for over half of all fatalities in children under the age of five [38]. Additionally, many children's meals throughout the world frequently fall short in terms of both quantity and quality, which can result in a number of health issues. [39]. The intake of foods heavy in calories, bad fats, sugar, and salt is one of the major difficulties with children's diets [40]. Children consume too few fruits, vegetables, healthy grains, and lean proteins in many nations, especially those in low- and middle-income areas, while consuming an excessive quantity of processed and ultra-processed meals [41]. Such diets have been connected to a number of harmful health outcomes, such as obesity, diabetes, cardiovascular disease, and various cancers [42].

Another challenge related to children's diets is the issue of undernutrition, which can manifest in different ways. In some cases, children may not receive adequate energy or nutrients to support their growth and development, leading to stunting or wasting [43]. In other cases, children may consume enough calories but not receive the right mix

of essential nutrients, leading to micronutrient deficiencies such as iron-deficiency anemia or vitamin A deficiency [39]. There are also social and environmental factors that influence children's diets, such as poverty, lack of access to healthy foods, and cultural norms surrounding food and eating [44]. Children who live in areas with limited access to healthy foods, such as so-called food deserts, are particularly vulnerable to poor diets and related health problems [45]. Since it can encourage the consumption of unhealthy foods, increase childhood obesity rates, and cause other diet-related health issues, the marketing and advertising of unhealthy foods to children is a major concern in many nations [46]. Overall, the current status of children's diets around the world remains a significant challenge, with many children consuming diets that are inadequate in terms of both quantity and quality [39]. Addressing this challenge will require a range of interventions, including promoting healthy

diets and lifestyles, improving access to healthy foods, and addressing the social and environmental factors that influence children's diets [47]. It will also need a worldwide commitment to funding initiatives and regulations that promote the health and welfare of children everywhere [38].

### 8. A resume of case studies related to children's diet and nutrition

Overall, the studies presented in the table highlight the importance of nutrition education and healthy feeding practices in promoting a balanced diet and reducing the risk of childhood obesity and malnutrition. The importance of promoting healthy dietary patterns is also emphasized, with adherence to the Mediterranean diet associated with lower risk of overweight/obesity. The studies provide valuable insights into the factors that influence children's dietary habits and the effectiveness of interventions in promoting healthy eating behaviours (Table 3).

Table 3: Case studies related to children's diet and nutrition

Participants	Study Design	Intervention	Results	Case Study Reference
300 Korean children (mean age 9.9 years)	Quasi-experimental study	Nutrition education program	Significant improvement in dietary knowledge and practices	Lee et al. (2021) [48]
6-year-old female with severe obesity	Case report	Family-based behavioral intervention	Significant reduction in body mass index (BMI) and improvement in dietary habits	Jones et al. (2018) [49]
965 Chinese children (mean age 10.5 years)	Cross-sectional study	Parental feeding practices questionnaire	Positive correlation between parental pressure to eat and child's BMI	Kan et al. (2020) [50]
20 Indian mothers of malnourished children	Qualitative study	Nutrition counseling and supplementation	Improved maternal knowledge and	Khandekar et al. (2021) [51]

			practices related to child feeding	
210 Brazilian adolescents (mean age 14.1 years)	Randomized controlled trial	School-based nutrition education program	Improved dietary habits and reduced intake of unhealthy foods	Souza <i>et al.</i> (2019) [52]
386 Saudi Arabian preschoolers (mean age 5.5 years)	Cross sectional study	Dietary patterns questionnaire	High consumption of unhealthy foods and low consumption of healthy foods	Almazroui <i>et al.</i> (2021) [53]
49 children (mean age 7years) with non-alcoholic fatty liver disease	Observational study	Parental feeding practices questionnaire	Higher parental restriction of food predicted greater severity of liver disease	Baidal <i>et al.</i> (2021) [54]
1,368 Italian children (mean age 8.8 years)	Prospective cohort study	Mediterranean diet score	Higher adherence to Mediterranean diet associated with lower risk of overweight/obesity	Filippini <i>et al.</i> (2019) [55]
20 studies on food marketing and child health	Systematic review	Various interventions to reduce food marketing	Mixed results on effectiveness of interventions, but potential for positive impact on children's diets	Lavelle <i>et al.</i> (2021) [56]
420 Turkish schoolchildren (mean age 8.6 years)	Cross-sectional study	Parental and child food preferences questionnaire	Positive correlation between child and parent food preferences	Ok <i>et al.</i> (2020) [57]
270 first-grade Montevideo, Uruguay. Children	Observational study	relationship between two diet patterns and contextualized cognitive performance	The nutrient dense foods pattern, and Processed (high calorie) foods pattern influence in cognitive performance.	Gabriel Barg <i>et al</i> (2023) [58]
499 Danish children for dietary supplement use	Cross-sectional study	Danish National Survey of Diet and Physical Activity 2011–2013	Dietary supplement use was common among 4–10-year-old Danish children	Chistensen <i>et al</i> (2023) [59]

### 9. CONCLUSION

To conclude, poor dietary quality is a major health concern for children worldwide, leading to a wide range of health issues such as obesity, malnutrition, cardiovascular disease, and diabetes. The reasons for poor dietary quality in children are complex and multifactorial, including social, economic, and cultural factors. However, efforts have been made to address these issues through various interventions and programs, such as promoting healthy eating habits, increasing

access to healthy foods, and implementing policies to improve food environments. In addition to the efforts to address poor dietary quality in children, it is also important to focus on education and awareness among parents and caregivers. Many children's eating habits are established early in life, and therefore it is crucial for parents and caregivers to be informed about healthy eating habits and to model these behaviours for children.

Malnutrition is greatly increased by poverty and food insecurity. Malnutrition is a complex condition, though, and it's exceedingly challenging to duplicate in hygienic, regulated environments ambiances [58]. Severe acute malnutrition is thought to include a microbial component in addition to the reduced nutritional availability [58]. Reduced nutritional availability may result in changed microbiota composition and increased gut inflammation, which in turn affects the intestinal environment, nutrient absorption, and intensifies the microbial dysbiosis in the gut. As a result, there is another gut microbial component to the vicious cycle of malnutrition, which may serve as a target for some prevention of disease symptoms.

In the present scenario, it is important to consider the impact of advertising and marketing on children's dietary choices. Children are exposed to a wide range of food advertisements, many of which promote unhealthy foods and beverages. Policies and regulations aimed at limiting the advertising of unhealthy foods to children could have a significant impact on improving their dietary quality. While progress has been made, more work is needed to ensure that all children have access to healthy and nutritious foods, regardless of their socio-economic status or geographic location. Furthermore, there is a need for continued research and evaluation of interventions to

address poor dietary quality and its associated health outcomes.

## 10. Future perspectives

Efforts to promote healthy eating habits, increase access to healthy foods, and implement policies to improve food environments are essential for improving children's health outcomes. Moreover, education and awareness among parents and caregivers, as well as policies and regulations aimed at limiting the advertising of unhealthy foods to children, are important steps in addressing this issue. By working together and taking a comprehensive approach, we can improve the overall health and well-being of children and future generations. With these efforts, it is possible to improve the overall health and well-being of children and future generations.

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