

Fathers Nutrition Knowledge and Child Feeding Practices Associated with Childhood Overweight and Obesity: A Scoping Review of Literature From 2000 to 2023

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Abstract

Objective. Childhood overweight/obesity is a serious global public health issue, demanding parental involvement to reverse trends. Despite fathers' crucial parenting roles, research on fathers and childhood overweight/obesity is limited. This scoping review examines the literature on fathers' nutrition knowledge and feeding practices with childhood overweight/obesity. **Methods.** Following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, and Arksey and O'Malley (2005) framework, multiple databases were searched. Eligible father-child related studies focused on fathers' nutrition knowledge, feeding practices, and childhood overweight/obesity. **Results.** Of 26 eligible articles, 52% originated from the United States, and 44% focused on father-child dyads. Most studies were cross-sectional (64%) and survey-based (68%). Further, 11.5% assessed fathers' nutrition knowledge, and child feeding practices (53.4%). **Conclusion.** Literature on fathers' nutrition knowledge and feeding practices concerning childhood overweight/obesity is limited. Scaling-up fathers' inclusion in childhood nutrition research is encouraged for the design of holistic interventions.

Keywords

father, overweight, obesity, feeding practices, nutrition knowledge, pediatric, scoping review

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Introduction

The World Health Organization (WHO) regards childhood obesity as one of the most alarming public health issues of the 21st century across the globe.¹ The rapid rise of overweight and obesity across continents has been of grave concern and aptly described by the World Bank as “a ticking time bomb,” as children across the globe are not spared.² Childhood overweight and obesity often leads into adulthood and could result in non-communicable diseases such as diabetes, cardiovascular diseases, and cancer.^{1,3}

It is reported that 39 million children below 5 years of age were overweight/obese in 2020, and this was attributed to unhealthy eating and little or no physical activity, as well as low socioeconomic status, food insecurity, food processing, and education.¹ According to Partnership for a Healthier America (PHA), 1 out of 3

children and adolescents in America were either overweight or obese, with the rate in the past 40 years among 6 to 11 year old children having quadrupled (4.2%-17.4%) across all racial, ethnic, social and economic groups.⁴ Also, the WHO reports that over 75% of overweight children live in developing countries and notes that in the last 20 years, the growing trend has almost doubled in Africa.⁵ These rising trends in the prevalence of childhood overweight or obesity are attributed

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to socio-economic status, fast-changing dietary practices, and an increasing sedentary lifestyle.^{6,7}

Childhood obesity is the outcome of a complex interaction of several factors such as biological, ecological environments, food insecurity, socioeconomic status, ethnicity, and family.^{8,9} Also, the development of the child starts with the family, and poor family functioning contributes to unhealthy parent feeding practices.¹⁰ Research has established the relationship between parent feeding behaviors and weight status, and child body mass index (BMI).¹¹

Further, the significance of fathers' nutrition knowledge on child nutrition in terms of diet diversity and nutrition practices is documented.¹²⁻¹⁴ That is to say, the higher the nutrition knowledge of the father the better the nutrition practices and child dietary diversity. In another study, sound nutrition knowledge of caregivers, including fathers, is linked with the prevention of child obesity and other metabolic disorders.¹⁵ Conversely, it is reported elsewhere that, children of parents with higher nutritional knowledge scores were more likely to be overweight or obese, and calls for further studies in the development of nutritional disorders among young children.¹⁶

Though child caregiving is traditionally thought to be the burden of mothers alone, practically, the involvement of fathers is crucial for the proper development of the child, as they also encourage healthy eating and physical activity.¹⁷ A study by Smith et al,¹⁸ indicates that fathers' presence was associated with decreased odds for overweight, with the mothers attesting that fathers encouraged healthier eating practices. The significant roles of fathers in modeling healthy diets for their children is further highlighted with a variety of paternal factors such as fathers' own dietary intake said to be associated with children's dietary intakes and weight outcomes.^{19,20}

Across different cultures of the world, a father's role in child feeding varies.²¹ For instance, in some cultures in Africa, fathers are mainly providers of food for the family, with primary caregiving and feeding of the child more the responsibility of the mother.¹² In the Nordic countries, such as Sweden and Norway, household food work and child feeding responsibilities are increasingly associated with fathers and are no longer exclusively that of mothers, though much still remains with mother.²² On the other hand, in developed countries such as the United States, fathers are reported to be more involved in child feeding, including preparing food and directly feeding the child.²³ The relative father involvement in child feeding, in terms of food purchasing, menu decisions, feeding, controlling, among others, is attributed to societal norms, gender roles, urban residential status, and high educational status among others.²⁴⁻²⁶ Also, mothers are more responsible for child feeding and care

at early the early stages (from birth to 2 years) than fathers, as these are periods of breastfeeding and complementary feeding.²⁷

Further, evidence from Sato et al showed that children whose fathers were highly involved in caregiving had decreased odds of overweight, and employed mothers with high paternal involvement in caregiving had a 30% reduced odds of childhood overweight or obesity.^{28,29} Thus, policies that leverage shared child caring could help families to raise children with healthy weight.^{28,30,31}

Despite the influence of fathers on child feeding practices and overall welfare of their children, little attention has been paid to their contribution,^{12,24} with research around fathers influence on childhood obesity being scarce.³²⁻³⁴ The limited studies around fathers' involvement in childhood overweight/obesity have led to the non-inclusion of fathers in interventions.³⁵ The otherwise inclusion of both mothers and fathers at the family level has shown to be successful in producing weight loss in the short and long-term.³⁶⁻³⁹

Therefore, this scoping review sought to examine the extent to which research has been conducted on fathers' nutrition knowledge and child feeding practices as determinants of overweight and obesity among children (2-18 years).

Materials and Methods

This scoping review was designed with reference to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines for scoping reviews,⁴⁰ as well as the Arksey and O'Malley's⁴¹ 5 stage framework. Therefore, our review identified the research question, identified relevant studies, selected eligible studies, charted the data, and collated, summarized, and reported the results. The protocol for this scoping review has not been registered.

Identifying the Research Question

The focus of our review was to examine the extent to which the association of fathers' nutrition knowledge and child feeding practices and child overweight/obesity have been studied. Our research question was what is the extent of literature available on fathers' nutrition knowledge and child feeding practices and the association with child overweight/obesity?

Identifying Relevant Studies

Our search strategy was to explore varied research databases,⁴⁰ in order to avoid or limit the tendency of missing out on relevant resources. A research Librarian from

the University of North Carolina at Greensboro was consulted, who guided and lead the search effort. We searched in PubMed, CINAHL, PsycINFO, and Health source consumer edition. In each of these databases we ensured that the search string contained the key words of the study title, featuring father (father or paternal or “male caregiver” dad) AND nutrition knowledge and feeding practices (nutrition knowledge, feeding pattern or feeding practices or feeding style or food habits or eating behavior) AND overweight/obesity (overweight or obesity or BMI or body mass index or weight status) AND child (child or children or childhood or pediatric) (Supplemental Table). For instance, with PsycINFO, we placed “fathers’ nutrition knowledge and feeding practices” in the first search space, followed by “feeding habits OR eating behavior” in the second space, and then “childhood overweight/obesity OR BMI” in the third search space. Filters were then used to select the date range (2000-2023) and scholarly peer-reviewed articles. Our decision to limit the search to the 2000 to 2023 range was to ensure that a substantial body of literature was included that was relevant to scholarly work and reflected nutritional trends of the 21st century. Fathers in this study referred to all male caregivers, including biological, and foster or adoptive fathers, as well as stepfathers and grandfathers.⁴²

A total of 2371 files were obtained from the search effort in all databases, which were exported into the Zotero referencing software for the removal of duplicates, and title screening. At this stage, 93 articles were retained for further screening and selection in line with the eligibility criteria (Figure 1).

Selecting Eligible Studies

Peer reviewed studies that were published from 2000 to 2023 were considered for inclusion. This scoping review was focused on studies that featured fathers only or both fathers and mothers in relation to nutrition knowledge, feeding practices and overweight/obesity of children (2-18 years). Studies that focused on father related childhood overweight/obesity determinants other than those of nutrition knowledge and child feeding practices were excluded. Systematic review, literatures review and other review articles were also not considered for inclusion.

The 2 authors applied the exclusion and inclusion criteria to screen the articles by reading the abstracts (Figure 1). The authors also read the full articles in some instances to arrive at the decision to include or to exclude a particular article. In these cases, authors read the full article to ensure that information not provided in the abstract was not missed.⁴³ The authors first did the

screening independently, after which they came together to compare their items and where there was disagreement, they deliberated to build consensus. As shown in Figure 1, 93 articles were retained after duplicate removal and title screening, and then after abstract and full text reading, 50 and 23 articles respectively, were eliminated, resulting in the retention of 20 articles. The authors then conducted an additional search, by reviewing the reference lists of the eligible articles, and suggested article headings upon opening related articles on journal pages. This process led to the inclusion of 6 extra articles, resulting in the final sample of 26 articles. The year range of this scoping review (2000-2023) coincided with the global COVID-19 pandemic, which emerged and peaked between 2019 and 2022, with human activities virtually brought to a halt. This could partly explain the number of eligible studies identified during the period of this scoping review.

Charting the Data

In line with standard procedure, data charting was jointly done by the authors,⁴⁴ with a clearly designed data charting form,⁴⁰ using an excel spread sheet. This form guided the extraction of relevant information from the selected articles. The form was used to focus the extraction on article demographics (title, year of publication, journal, country/region), participant characteristics (father focus or parent focus featuring fathers, age range of children, and race/ethnicity of participants), and study methodologies [research design and research methods (quantitative, qualitative, or mixed methods), and data collection methods (survey, focus groups, and interviews)].

The authors piloted the designed form on randomly selected studies of 4 each from the pool of articles included in the study.⁴⁵ Inconsistencies detected were deliberated, and the form was edited as needed and finalized for the extraction exercise. The selected files were then distributed among the authors to independently extract the relevant information. Regular meetings were arranged such that issues that needed attention from individual reviews, including decisions on what to consider or not, and appropriate classification of parameters such as race/ethnicity were deliberated.

Collating, Summarizing, and Reporting the Results

Data that were extracted on the excel spreadsheet was exported into SPSS version 28 for coding and management. The 2 authors independently coded the data and followed with comparing what they individually produced. This ensured an enhancement of the integrity

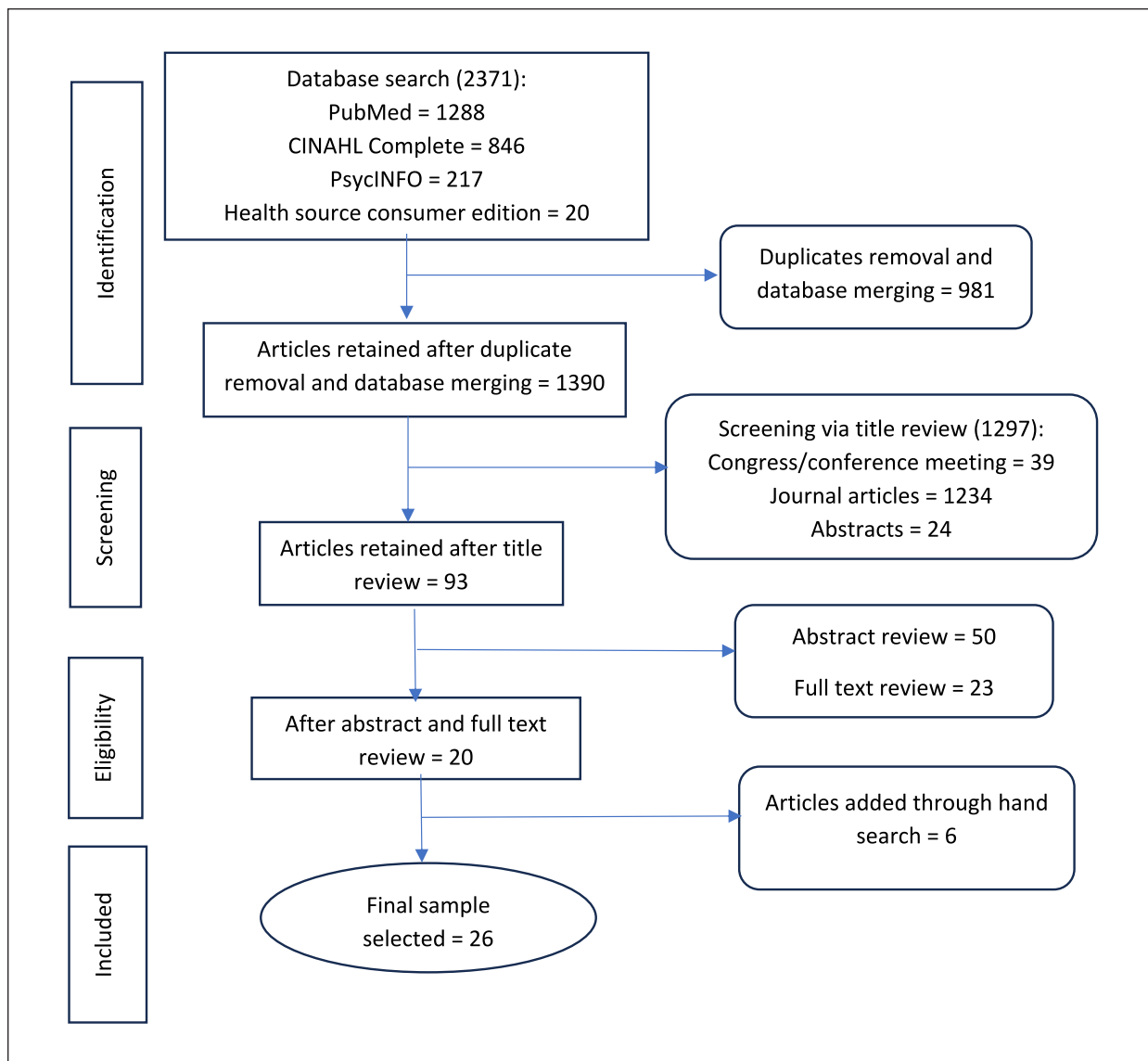


Figure 1. Flow diagram of the article selection and screening process.

of the findings, as discrepancies were discussed and resolved. Univariate analysis was then utilized to summarize the data in frequency tables, established patterns, and described the findings. Frequency tables were presented under the following headings, article demographics, participant characteristics, and study methodology. The authors also reviewed the findings of the studies, and extracted the key findings, which were also reported.

Ethical Approval and Informed Consent

This scoping review did not require ethical approval and informed consent.

Results

Our review included 26 studies published between the years 2000 and 2023 and met the eligibility criteria. We found that the year 2017 had the highest publications [4 (15.4%)], followed by 2015 and 2022, with 3 (11.5%) publications each. Also, 2 (7.7%) studies each were published in 2001, 2005, 2008, 2011 and 2023, and the least published years were 2013, 2014, 2016, and 2020, with 1 publication each (Table 1). The majority 13 (57.7%) of the studies originated from the United States, followed by Australia, with 3 (11.5%) publications. Also, Norway and UK had 2 (7.7%) publications each, and Canada, China, Costa Rica, Jamaica, and Vietnam had 1 publication each in the period of review (Table 1).

Table 1. Article Demographics—Year of Publication and Origin of Article.

Year	Frequency	Percentage
Year of publication		
2001	2	7.7
2005	2	7.7
2008	2	7.7
2011	2	7.7
2012	2	7.7
2013	1	3.8
2014	1	3.8
2015	3	11.5
2016	1	3.8
2017	4	15.4
2020	1	3.8
2022	3	11.5
2023	2	7.7
Total	26	100.0
Origin of article		
Australia	3	11.5
Canada	1	3.8
China	1	3.8
Costa Rica	1	3.8
Norway	2	7.7
United Kingdom	2	7.7
United States	15	57.7
Vietnam	1	3.8
Total	26	100.0

Further, of the 26 articles included in our study, the highest [4(16%)] were from *Appetite*, followed by the *Obesity* journal with 3(12%) (Table 2).

As shown in Table 3, 42.3% of the 26 studies were exclusively focused on fathers, while 57.7% were focused on both fathers and mothers. Also, 38.5% of the studies included children aged 2 to 5 years, while 34.6% had children 12 to 18-years, and 26.9% of the articles featured children aged 6 to 11 years.

We found that 15 out of the 26 articles reported the race/ethnicity of the respondents, and these articles were those that originated from the United States. Of the 15, only 3 (20%) of the articles included White Americans, while 10 (66.7%) included Hispanic or Latino groups, and similarly, 10 (66.7%) had Non-Hispanic or Non-Latino whites in their study. Also, 7 (46.7%) of the 15 articles that reported on ethnicity/race included Black or African Americans, while 5 (33.3%) had Asian or Asian American participants, and 5 (33.3%) of the articles included other racial or mixed ethnic backgrounds (Table 3).

Further, the methodologies of the articles were also considered, focusing on the study design, the research

methods, and the data collection methods (Table 4). The majority (65.4%) of articles were cross-sectional studies, followed by longitudinal studies (23.1%), and 7.7% were explorative and interpretative studies. Also, only 1 study was found to be a community-based intervention (Table 4). The vast majority (88.5%) of the selected articles used quantitative method studies, while 11.5% were qualitative (Table 4). Furthermore, upon a review of the data collection methods, most (69.2%) were surveys, whereas 2 (7.7%) studies each were interviews and semi-structured interviews respectively. The use of secondary data sources was found in 2 (7.7%) of the articles, while the use of focus group discussion, and survey/observation methods were found in 1 study each (Table 4).

We also reviewed the findings of eligible articles to ascertain their coverage of the main parameters of the research question (Table 5) including father nutrition knowledge, and father child feeding practices, as well as fathers BMI and involvement in child feeding, in relation to childhood overweight/obesity. Of the 26 articles in this study, 3 (11.5%) reported the involvement of fathers in child feeding and the influence on their child weight status.^{18,29,46}

Further, only 3 (11.5%) of the sampled articles reviewed assessed father nutrition knowledge and established the relationship with overweight/obesity.⁴⁷⁻⁴⁹ Fathers' child feeding practices in relation to the weight status of children from 2 years into adolescence was the focus of the majority (53.4%) of the studies.⁵⁰⁻⁶³ These studies focused on pressure to eat and restriction. For instance, several of the studies focused on pressure to eat and its association with childhood overweight/obesity.^{50,55-58} Some of the studies also looked at fathers restriction of children's food intake and how that could influence overweight or obesity of their children.^{50,51,59-61} Further, 23.1% of the articles focused on establishing the father BMI and Child BMI relationship^{44,47-49,55,56,62,63} (Table 5).

Discussion

Several studies note that fathers' involvement in child feeding practices and the changing role of fathers in childhood obesity is understudied.^{32,33,35} The rationale behind this scoping review was to assess the extent of literature on fathers' nutrition knowledge and their child feeding practices in relation to childhood overweight and obesity. Consistent with earlier reviews,^{26,35} our study found only 26 eligible studies, which were published between 2000 and 2023. We found a low rate of publications on fathers' nutrition knowledge and child feeding practices, and child overweight/obesity, across the period under review. The highest number of publications seen in

Table 2. Article Demographics—Journal of the Article.

Journal	Frequency	Percent
Appetite	5	19.2
Applied Physiology, Nutrition, and Metabolism	1	3.8
Australian Journal of Psychology	1	3.8
International Journal of Behavioral Nutrition and	1	3.8
International Journal of Obesity	2	7.7
International Journal of Qualitative Studies on He	2	7.7
Journal of Child Health Care	1	3.8
Journal of Family Issues	1	3.8
Journal of Nutrition Education & Behavior	1	3.8
Journal of the Academy of Nutrition and Dietetics	1	3.8
Journal of the American Dietetic Association	1	3.8
Maternal and Child Nutrition	1	3.8
Nutrients	2	7.7
Obesity	3	11.5
Pediatric Obesity	1	3.8
Plos One	1	3.8
Public Health Nutrition	1	3.8
Total	26	100.0

Table 3. Participant Characteristics.

Variable	Frequency (n=26)	Percentage
Focus of paper		
Father	11	42.3
Father/mother	15	57.7
Children's age category		
2-5 years	10	38.5
6-11 years	7	26.9
12-18 years	9	34.6
Ethnicity/Race (n=15) ^a		
White American	3	20
Hispanic or Latino	10	66.7
Non-Hispanic or Latino Whites	10	66.7
Black or African Americans	7	46.7
Asian or Asian Americans	5	33.3
Other or mixed race	5	33.3

^aRace/ethnicity was reported by 15 of the articles, and originated from the United States.

a single year (2017) was 4, with the majority of the years having only 2 publications each, while some of the years saw no publications at all. Our review was global in scope, and to arrive at this low rate reflects earlier concerns highlighted by Davison et al and Morgan et al. The years 2019 to 2021 saw the impact of the COVID-19 pandemic on all human activities across the globe.^{70,71} This could also have accounted for the 0 publications in 2019 and 2021, respectively, and only 1 in 2021. Of the publications identified, over 50% of them originated

Table 4. Study Methodology.

Variable	Frequency (n=26)	Percentage
Study design		
Community-based intervention	1	3.8
Cross-sectional	17	65.4
Explorative and interpretative	2	7.7
Longitudinal	6	23.1
Research method		
Quantitative	23	88.5
Qualitative	3	11.5
Data collection method		
Focus group discussion	1	3.8
Interview	2	7.7
Secondary data	2	7.7
Semi-structured interview	2	7.7
Survey	18	69.2
Survey/observation	1	3.8

from the United States, with the remaining spread across a few geographical areas, including Australia, Europe, North America, and Asia, with Africa and other parts of the globe missing out. This trend could be attributed to the fact that childhood overweight and obesity prevalence rates were generating much concern in the United States between the years 2000 and 2010, gaining the attention of researchers.⁷ The trends have persisted to date.⁷² The vast disparity in the number of studies between developing and developed countries, especially the United States, could be due to differences in societal

Table 5. Various Studies and Key Findings.

Study	Variable	Design/Sample/Instruments	Findings	N (%)*
Lindsay et al ⁴⁷	Fathers' nutrition knowledge	Qualitative study, 28 fathers and children 2-8years. 8 focus group discussions	Fathers expressed positive beliefs and attitudes about the importance of healthy eating for their young children, with majority said to be eating out and getting takeout, which are noted to have increased odds for children.	3 (11.5)
Salemonsens et al ⁴⁸	Fathers' nutrition knowledge	Qualitative study, 8 fathers of 10 children. Semi-structured interview used.	Fathers need guidance on how to talk to their children to prevent further weight gain, while at the same time emphasizing safeguarding the child's dignity	
Salemonsens et al ⁴⁹	Fathers' nutrition knowledge	Qualitative content analysis, 8 fathers of 10 children/adolescents. Semi-structured in-depth interviews	Feeling uncertain and struggling to understand their own responsibility for the child's overweight or obesity.	
Watterworth et al ⁵⁰	Feeding practices	Cross-sectional analysis. Fathers = 31	Both mothers' and fathers' involvement of children in meal preparation, and modeling healthy behaviors were associated with lower nutrition risk, while fathers' restriction and pressure-to-eat were associated with higher nutrition risk	
Penilla et al ⁵¹	Feeding practices	Mothers = 31. Adopted version of Comprehensive Feeding Practices Questionnaire.		
Zhang and McIntosh and McIntosh ⁵²	Feeding practices	174 fathers and 174 mothers. Children (8-10years). Parental Feeding Practices Questionnaire, 4 subscales: pressure, positive involvement, control behavior, and restriction	Fathers' pressure to eat ($P = .04$) and food to control behavior ($P = .02$) were associated with lower child BMI, and restriction ($P < .001$) was associated with higher child BMI, after accounting for mothers' feeding practices.	14 (53.8)
Tschann et al ⁵³	Feeding practices	Cross-sectional. Samples of 312 children (aged 9-11 and 13-15) and their parents analyzed.	Parental feeding practices reported to be associated with child weight status. Reported an equivalent role of maternal and paternal feeding practices in shaping children's weight status	
Taylor et al ⁵⁴	Feeding practices	2-year longitudinal study. Mothers (n = 322) and fathers (n = 182) and 18-year-old children. 55-item Parental Feeding Practices (PFF) Questionnaire used.	At year 1, restriction of food predicted by both mothers and fathers was associated with higher child weight status, and the effect in terms of fathers seen at year 2. Mothers' and fathers' pressure to eat predicted lower weight status in boys, but not girls, at year 1.	
Mobley et al ⁵⁵	Feeding practices	A nationally representative sample of 4423 children (4-7years) and their parents.	No influence of mothers' parenting on child BMI status was shown, and fathers' responsiveness was found to be predictive of increased risk for overweight/obesity.	
Birch et al ⁵⁶	Feeding practices	Father-child pairs (n = 45) enrolled in a community-based intervention in a Northeastern US state. Children were 3 to 5 years old. Comprehensive Feeding Practices, Healthy Kids, and the Cooking Matters program questionnaires.	Small to medium effect sizes were detected for improvements in fathers' feeding pressure ($P = .005$), large effect size detected in the increase of green salad consumption ($P = 0.1$) by fathers and a small effect size for frequency of children eating vegetables ($P = .07$).	
Brann and Skinner ⁵⁷	Feeding practices	Confirmatory factor analysis tested a 7-factor model. Sample of 394 mothers and fathers. Child Feeding Questionnaire (CFQ) used.	Perceived father/mother weight, child weight, and concerns about child weight were positively related to the child's weight status, and pressure to eat was negatively related to child's weight status	
Haycraft and Blissett ⁵⁸	Feeding practices	Sample of 49 fathers and 49 mothers, with boys (8-10years). Fathers and mothers interviewed with validated questionnaires.	Mothers and fathers of boys with a high BMI were more concerned about their weight ($P = .0001$, $P = .004$), and fathers ensuring that their sons of high BMI eating less often compared with those of average BMI ($P = .006$).	
Johannsen et al ⁵⁹	Feeding practices	23 Fathers and 23 mothers sampled with children 2-6 years. Child feeding questionnaire was used.	Both fathers and mothers had no significant differences in their child-feeding practices, with no significant association between children's BMI and maternal or paternal reported feeding practices.	
Vollmer et al ⁶⁰	Feeding practices	43 Mothers and 68 fathers, and children (3-5years). Three-Factor Eating Questionnaire and the Child Feeding Questionnaire used.	Girls with fathers who were more controlling had a higher percentage fat; these fathers were also more concerned about their daughters' future health.	
		Biological fathers (n = 150), one-time, one-on-one interview. Child Feeding Questionnaire, Caregiver Feeding Style Questionnaire, Child Eating Behavior Questionnaire, and 24-hour recall, Healthy Eating Index.	Father's feeding practices and feeding style were not associated with children's diet quality or weight status.	

(continued)

Table 5. (continued)

Study	Variable	Design/Sample/Instruments	Findings	N (%)*
Wehrly et al ⁶¹	Feeding practices	243 Children (4-6 years), biological parents (89% mothers and 8% fathers, and 3% step or grand-parent). Questionnaires used.	Body composition (BMI and percent body fat) was related to low pressure to eat, whereas the perceived child weight was related to restriction.	
Rica et al ⁶²	Feeding practices	Cross-sectional, adolescents (13-18 years old) enrolled in ten urban and eight rural schools (n = 18). Parenting style questionnaire used.	Risk of adolescent overweight/obesity and the paternal authoritarian style in rural areas ($P = .04$), and between risk of overweight or obesity and the paternal permissive style in male adolescents were associated	
Lora et al ⁶³	Father feeding practices and weight concerns	Fathers' (n = 110) and Preschoolers' (ages 2-5 years). Preschool Feeding Questionnaire (PFC) was used.	Concern about the child being underweight was inversely associated with child BMI percentile in Hispanics	
Brophy et al ⁶⁴	Father parenting practices	1147 Children (11-13 years) and fathers	In order of importance, the main risk factors for childhood obesity are being unfit, having an obese father, and being large at birth.	6 (23.1)
Burke et al ⁶⁵	Fathers BMI and family lifestyle	Longitudinal survey, 219 families with children (9-18 years). Food frequency questionnaire used	Obese fathers were associated with four times increased risk of obesity in children (18 years) with an independent eight times increased risk for daughters if mothers were obese.	
Freeman et al ⁶⁶	Fathers' BMI	Longitudinal Study of Australian Children (8-9 years) between 2004 and 2008. Two-parent families (N = 3285) with both parents included. Face-to-face interviews, self-report questionnaires, interviewer observation, direct child assessment and teacher/childcare worker questionnaires	An overweight or obese father, but a healthy weight mother, significantly increased the odds of child obesity, but the reverse scenario (overweight or obese mother with a healthy weight father) was not a significant predictor of child overweight or obesity.	
Linabery et al ⁶⁷	Fathers' BMI	A longitudinal study, involving 912 European American children born in 1928 to 2008 (1.5-3.5 years), anthropometry and questionnaires	Infant BMI was strongly associated with maternal than paternal obesity overall ($P < .0001$).	
Chen et al ⁶⁸	Fathers' BMI and family functioning	A cross-sectional survey utilizing a cluster sampling design. 937 participants (54.6% male), with an 87-item questionnaire used.	Father's BMI status ($P < 0.001$) was significantly associated with student BMI status. Students with non-overweight fathers had 2.8 higher odds of being non-overweight than obese in contrast to students with obese fathers.	
Mai et al ⁶⁹	Father BMI and parental dietary factors	221 Children (9-11 years) and both parents. Three 24-h dietary recalls were collected from 124 children and used to assess dietary patterns using principal component analysis (PCA).	Parental underestimation of child weight status, father's obesity, were reported to have a positive association with childhood obesity.	
Wong et al ²⁹	Fathers' involvement in child feeding	Longitudinal Study-Birth Cohort (ECLS-B). ~10700 children (2-4 years), and the primary caregiver (>95% being biological mothers), and resident fathers.	Increased father involvement in child physical activity decreased child's odds of obesity from age 2-4.	
Menning et al ⁴⁶	Fathers' involvement in child feeding	Sample was restricted to adolescents (N = 1983) and their non-resident fathers. National Longitudinal Study of Adolescent Health.	Among both males and females, greater involvement with fathers increases their risk of obesity. Among females, the effect of father involvement on obesity is even greater if her father is obese. Among males, greater father involvement is also associated with lower risk of underweight.	
Smith et al ⁸	Father involvement in child feeding practices	Six hundred and one mother and infant dyads were recruited at the 6 to 8-week postnatal visit from 39 child health centers, in Jamaica	Fathers' presence said to be associated with reduced risk of overweight, independent of socioeconomic status.	

N (%)*; Number of studies (percentage) that assessed the specific particular parameter.

norms and cultures in relation to fathers' roles in childhood feeding.⁵⁸ For instance, in most parts of Africa, fathers are less involved in child feeding,²⁴ and are mostly not included in child nutrition research.⁷³ We also found that close to 90% of the sampled articles were published in nutrition and public health related journals, and of these, 23.1% were found in obesity related journals. This is understandable, as the outcome variables of most of these studies had to do with overweight and obesity.

Eleven out of the 26 articles included in our study were focused on father-child dyads, while the rest were father/mother focused. This supports the evidence that fathers are understudied in terms of child nutrition and overweight/obesity.^{33,35} Our review focused on children in age groups of 2 to 5 years, 6 to 11 years, and 12 to 18 years. This is justified, as high overweight and obesity prevalence rates are reported among these child age groups.³ Also, all the 15 articles that originated from the US also reported on the ethnicity or race of the respondents, with the vast majority predominantly of the minoritized ethnic or racial groups, while just a few had White American participants. This is in contrast to the findings of an earlier review, with a higher percentage of articles found to have White Americans included compared with minority ethnic groups.⁷⁴ However, the high inclusion of ethnic minorities (Hispanic or Latino and Black or African Americans) in child obesity research is not surprising, as the highest prevalence of child obesity in the US is reported to be among these minority ethnic groups.⁷⁵

We found that the majority (65.4%) of studies were cross-sectional, with only 6 (23.1%) being longitudinal studies. This highlights the weaknesses of most literature which does not include more rigorous study designs.⁷⁶ The high cross-sectional studies versus less longitudinal studies recorded in our scoping review reflects the findings of other earlier reviews.^{77,78} Further, the vast majority (88.5%) of the articles included in this study employed quantitative methods, with the remaining few being qualitative, and none of them found to have employed mixed methods. This meant that the vast majority were expected to use surveys as data collection methods, with few to use qualitative data collection methods such as interviews and focus group discussion, thus missing out on richer, thicker descriptions of the role of fathers in child feeding. However, the findings of this study is in line with health research, which is said to be limited in the use of mixed methods,⁷⁹ despite its known strengths and benefits. In our review, none of the sampled articles used a randomized controlled trial (RCT) design, which further exposed weakness of current research in relation to fathers' nutrition knowledge and child feeding practices and childhood overweight/obesity. This is not particularly surprising though, as it is in alignment with an earlier systematic review report.³⁵

With regard to child feeding practices, 3 of the studies reported the involvement of fathers in childcare, feeding and physical activity, and established that fathers' involvement was associated with lower risk of childhood overweight and obesity. These suggest that interventions or social policies that target father-mother collaborated child feeding and caring could promote children with healthy weight.²⁸

On fathers' nutrition knowledge, our review indicates that it is a limited area of research as only 3 of the sampled articles had fathers' nutrition knowledge as a featured variable, expressed as a determinant of childhood overweight/obesity. Nutrition knowledge is recognized as an indicator of health literacy and said to relate to health outcomes.⁸⁰ Also, the significance of fathers' nutrition knowledge for child feeding is documented.^{12,13} Despite this, our review showed that studies around fathers' nutrition knowledge and childhood obesity are limited. In addition, the few studies enlisted here could not clearly establish the father's nutrition knowledge and the child's BMI relationship.⁴⁷⁻⁴⁹ These studies were qualitative in design, and could not statistically determine the association between fathers' nutrition knowledge and childhood BMI.

Out of the 26 eligible articles, the investigation of fathers' child feeding practices in relation to the weight status of children (2-18 years) was featured in 14. This aligns with the Khandpur et al⁷⁸ review of evidence on fathers' child feeding practices, which suggests that literature around this is limited. The focus of these studies has been pressure to eat and restrictive child feeding, with pressure to eat said to be associated with decreased child BMI by a number of studies.^{50,51,56,61} Whereas, some of the studies documented restrictive child feeding as being associated with increased child BMI.^{51,53}

Some of the studies also reported on fathers' BMI with child weight status. Almost all the studies that sought to establish the father's BMI and child's BMI relationship noted that increased father's BMI was positively associated with child's BMI.^{65,66,69} One of the studies also posited that the higher odds of the child's obesity was more related to the mother's BMI than the father's BMI.⁶⁷

The significance of fathers' influence on child feeding behaviors and the prevention of childhood obesity is highlighted though fathers are said to be underrepresented in research and interventions focusing on this area are scarce.⁷³ Based on current research on fathers' feeding practices and the influence on childhood overweight/obesity, the inclusion of fathers in early feeding interventions is encouraged as father/mother interventions proved to be more efficacious.^{77,81}

Further, with the few studies on fathers' nutrition knowledge and childhood BMI unable to establish clear

relationships, future studies to further explore this area are recommended. However, based on the current findings, nutrition interventions could focus on fathers, with the aim of improving their nutrition knowledge, feeding practices, and child nutritional outcomes.

It is important to recognize, however, that father's influence on child feeding likely varies across age ranges. For instance, while nutritional requirements change from childhood to adolescence, caregiver's influence on eating behavior may decline.^{27,82} This review found fathers to have significant influences on their children at specific age ranges 2 to 5 years,⁵⁴ 6 to 11 years,⁵¹ and 12 to 18 years.^{52,53} However, none of the studies assessed father's influence across various child age ranges to determine the relative influences of their involvement in child feeding, as such, this could be further explored in future research.

This scoping review, with a focus on fathers' nutrition knowledge and feeding practices in relation to childhood BMI, is the first of its kind to the best of our knowledge. It followed the existing protocols and standards⁴⁰ to unravel the extent of work on fathers' nutrition knowledge and feeding practices, and their relationships with child BMI. Thus, it brought to the forefront the need for more research in this area.

Despite its numerous strengths this study has some limitations. The approach of scoping reviews simply focuses on the documentation of the breadth and depth of available literature and does not come with a critical analysis of the quality of the studies. The publication period of 2000 to 2023 meant that studies that were published prior to 2000 and eligible could have been missed being added. The demands of the scoping review required teamwork to limit errors, especially when it comes to data screening and charting. The fact that only 2 authors were involved in this work brought with it the possibility of missing some studies or specific parameters of eligible studies that should have been extracted for analysis.

Conclusion

The focus of this scoping review assessed the extent of literature on fathers' nutrition knowledge and child feeding practices in relation to overweight/obesity of children aged 2 to 18 years. We conclude that this area of nutrition research designed to focus on father-child dyads is still limited, as only 26 related articles were found to have been published between the years 2000 and 2023. Most of these articles were cross-sectional in design. We recommend that fathers should be involved more in nutrition research, particularly more experimental designs. More evidence on fathers' influence on

childhood nutrition and obesity, would pave the way for the inclusion of fathers in household nutrition intervention programs.

Author Contributions

SGB and LH brainstormed and jointly conceived and designed this scoping review. SGB and LH collaborated to search and select articles, chart, and extract data from selected articles. SGB did the descriptive analysis of the data and commented on the results as well as the discussion. SGB drafted the manuscript, which was reviewed by LH. LH proofread the manuscript and gave final approval, and SGB agreed to be accountable for all aspects of the work, ensuring integrity and accuracy.

Availability of Data and Materials

All relevant data of this scoping review are incorporated in the report. The resource from which the findings of this review were generated can be made available upon request from the corresponding author.

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Supplemental Material

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References

1. WHO. Noncommunicable diseases: childhood overweight and obesity. World Health Organization (WHO) News Letter. Published 2021. Accessed July 11, 2023. <https://www.who.int/news-room/questions-and-answers/item/noncommunicable-diseases-childhood-overweight-and-obesity>
2. UNICEF. Prevention of overweight and obesity in children and adolescents UNICEF advocacy strategy and

- guidance. 2020. <https://www.unicef.org/media/92331/file/Advocacy-Guidance-Overweight-Prevention.pdf>
3. CDC. Division of Nutrition, Physical Activity, and Obesity, National Center for Chronic Disease Prevention and Health Promotion. Childhood obesity facts. Published 2022. Accessed June 21, 2023. <https://www.cdc.gov/obesity/php/data-research/childhood-obesity-facts.html#:~:text=From%202017%20to%20March%2020,percentile%20for%20age%20and%20sex>
 4. PHA. Facts about childhood obesity. Partnership for a Healthier America. Published 2023. Accessed June 21, 2023. <https://www.ahealthieramerica.org/articles/facts-about-childhood-obesity-102>
 5. WHO. WHO issues guidance on emerging double threat of childhood obesity and undernutrition in low- and middle-income countries. Global. Published 2013. Accessed March 16, 2024. <https://www.who.int/news/item/05-06-2013-who-issues-guidance-on-emerging-double-threat-of-childhood-obesity-and-undernutrition-in-low-and-middle-income-countries>
 6. Gupta N, Goel K, Shah P, Misra A. Childhood obesity in developing countries: epidemiology, determinants, and prevention. *Endocr Rev.* 2012;33(1):48-70. doi:10.1210/er.2010-0028
 7. Wang Y, Lim H. The global childhood obesity epidemic and the association between socio-economic status and childhood obesity. *Int Rev Psychiatry.* 2012;24(3):176-188. doi:10.3109/09540261.2012.688195
 8. Binks M. The role of the food industry in obesity prevention. *Curr Obes Rep.* 2016;5:201-207. doi:10.1007/s13679-016-0212-0
 9. Kaur J, Lamb MM, Ogden CL. The association between food insecurity and obesity in children-the national health and nutrition examination survey. *J Acad Nutr Diet.* 2015;115:751-758. doi:10.1016/j.jand.2015.01.003
 10. Warnick JL, Stromberg SE, Krietsch KM, Janicke DM. Family functioning mediates the relationship between child behavior problems and parent feeding practices in youth with overweight or obesity. *Transl Behav Med.* 2019;9(3):431-439. doi:10.1093/tbm/ibz050
 11. Warkentin S, Mais LA, Latorre MDRDO, Carnell S, Taddei JAAC. Parents matter: associations of parental BMI and feeding behaviors with child BMI in Brazilian preschool and school-aged children. *Front Nutr.* 2018;5:69-12. doi:10.3389/fnut.2018.00069
 12. Bilal SM, Dinant G, Blanco R, et al. The influence of father's child feeding knowledge and practices on children's dietary diversity: a study in urban and rural districts of Northern Ethiopia, 2013. *Matern Child Nutr.* 2014;12(3):473-483. doi:10.1111/mcn.12157
 13. Spronk I, Kullen C, Burdon C, O'Connor H. Relationship between nutrition knowledge and dietary intake. *Br J Nutr.* 2014;111:1713-1726. doi:10.1017/S0007114514000087
 14. Cai Z, Jiang K, Wang T, et al. Influence of adolescents' and parental dietary knowledge on adolescents' body mass index (BMI), overweight/obesity in 2004–2015: a longitudinal study. *Arch Public Health.* 2023;81(1):1-12. doi:10.1186/s13690-023-01197-x
 15. Woźniak D, Podgórski T, Dobrzyńska M, et al. The influence of parents' nutritional education program on their infants' metabolic health. *Nutrients.* 2022;14(13):1-12. doi:10.3390/nu14132671
 16. Mazurkiewicz A, Raczkowska E. The connection between knowledge and the nutritional behaviour of parents and the occurrence of overweight and obesity among pre-school children-a pilot study. *Nutrients.* 2024;16(1):174. doi:10.3390/nu16010174
 17. Garfield CF, Isacco AJ. Urban fathers' involvement in their child's health and healthcare. *Psychol Men Masc.* 2012;13(1):32-48. doi:10.1037/a0025696
 18. Smith JA, Rocke KD, Charles SM, et al. The role of fathers in overweight prevention: an analysis of a Caribbean cohort. *Glob Health Epidemiol Genom.* 2018;3:e15.
 19. Walsh AD, Cameron AJ, Hesketh KD, Crawford D, Campbell KJ. Associations between dietary intakes of first-time fathers and their 20-month-old children are moderated by fathers' BMI, education and age. *Br J Nutr.* 2015;114:988-994. doi:10.1017/S0007114515002755
 20. Papamichael MM, Moschonis G, Mavrogianni C, et al. Fathers' daily intake of fruit and vegetables is positively associated with children's fruit and vegetable consumption patterns in Europe: the Feel4Diabetes study. *J Hum Nutr Diet.* 2022;35(2):337-349. doi:10.1111/jhn.12945
 21. Roopnarine J. *Fathers Across Cultures: The Importance, Roles, and Diverse Practices of Dads.* 2015.
 22. Neuman N. Foodwork as the new fathering? Change and stability in men's housework by Fathers in Sweden — a gender-progressive narrative. *Culture Unbound.* 2020;12(3):527-549.
 23. Guerrero AD, Chu L, Franke T, Kuo AA. Father involvement in feeding interactions with their young children. *Physiol Behav.* 2016;40(2):221-230. doi:10.5993/ajhb.40.2.7
 24. Bogale S, Cherie N, Ketema E, Id B. *Fathers Involvement in Child Feeding and Its Associated Factors Among Fathers Having Children Aged 6 to 24 Months in Antsokia Gemza Woreda, Ethiopia: Cross-sectional Study.* 2022:1-18. doi:10.1371/journal.pone.0276565
 25. Bhattacharyya DS, Sarker T, Akter N, et al. Factors associated with fathers' involvement in infant and young child feeding and nurturing care in the urban slums of Bangladesh: a cross-sectional study. *Food Sci Nutr.* 2023;11(7):4020-4029. doi:10.1002/fsn3.3390
 26. Khandpur N, Charles J, Blaine RE, Blake C, Davison K. Diversity in fathers' food parenting practices: a qualitative exploration within a heterogeneous sample. *Appetite.* 2016;101:134-145. doi:10.1016/j.appet.2016.02.161
 27. Pérez-Escamilla R, Segura-Pérez S, Lott M. *Feeding Guidelines for Infants and Young Toddlers : A Responsive Parenting Approach.* 2017. <http://healthyeatingresearch.org>
 28. Sato R, Fujiwara T, Kino S, Kawachi I. The association between father involvement in caregiving and early childhood overweight or obesity. *Pediatr Obes.* 2020;15(9):1-7. doi:10.1111/ijpo.12652
 29. Wong M, Jones-smith J, Colantuoni E, et al. The longitudinal association between early childhood obesity and

- fathers' involvement in caregiving and decision-making. *Obesity*. 2018;25(10):1754-1761. doi:10.1002/oby.21902
30. Pope KJ, Whitcomb C, Vu M, et al. Barriers, facilitators, and opportunities to promote healthy weight behaviors among preschool-aged children in two rural U.S communities. *BMC Public Health*. 2023;23(1):53-13. doi:10.1186/s12889-022-14770-w
 31. Wilfley DE, Staiano AE, Altman M, et al. Improving access and systems of care for evidence-based childhood obesity treatment: conference key findings and next steps. *Physiol Behav*. 2017;25(1):16-29. doi:10.1002/oby.21712
 32. Jansen E, Harris H, Daniels L, Thorpe K, Rossi T. Acceptability and accessibility of child nutrition interventions: fathers' perspectives from survey and interview studies. *Int J Behav Nutr Phys Act*. 2018;15:1-12.
 33. Davison KK, Gicevic S, Aftosmes-Tobio A, et al. Fathers' representation in observational studies on parenting and childhood obesity: a systematic review and content analysis. *Am J Public Health*. 2016;106(11):e14-e21. doi:10.2105/AJPH.2016.303391
 34. Johnson CM, Sharkey JR, Gómez L. Latino fathers as catalistas (agents of change): strategies to support Latino fathers in childhood obesity prevention. *J Nutr Educ Behav*. 2021;53(6):540-545. doi:10.1016/j.jneb.2021.01.014
 35. Morgan PJ, Young MD, Lloyd AB, et al. Involvement of fathers in pediatric obesity treatment and prevention trials: a systematic review. *Pediatrics*. 2017;139(2):e20162635.
 36. Berge JM, Everts JC. Family-based interventions targeting childhood obesity: a meta-analysis. *Child Obes*. 2011;7(2):110-121. doi:10.1089/chi.2011.07.02.1004.berge
 37. Tomayko EJ, Tovar A, Fitzgerald N, et al. Parent involvement in diet or physical activity interventions to treat or prevent childhood obesity: an umbrella review. *Nutrients*. 2021;13(9):3227-3326. doi:10.3390/nu13093227
 38. Andriani H, Liao CY, Kuo HW. Parental weight changes as key predictors of child weight changes. *BMC Public Health*. 2015;15(1):1-8. doi:10.1186/s12889-015-2005-x
 39. Lee JS, Jin MH, Lee HJ. Global relationship between parent and child obesity: a systematic review and meta-analysis. *Clin Exp Pediatr*. 2022;65(1):35-46. doi:10.3345/cep.2020.01620
 40. Tricco AC, Lillie E, Zarin W, et al. PRISMA extension for scoping reviews (PRISMA-ScR): checklist and explanation. *Ann Intern Med*. 2018;169(7):467-473. doi:10.7326/M18-0850
 41. Arksey H, O'Malley L. Scoping studies: towards a methodological framework. *Int J Soc Res Methodol*. 2005;8:19-32. doi:10.1080/1364557032000119616
 42. Brabender VM, Fallon A. *Working with Adoptive Parents: Research, Theory, and Therapeutic Interventions*. (Virginia M. Brabender AEF, ed.). John Wiley & Sons; 2013.
 43. Badger D, Nursten J, Williams P, Woodward M. Should all literature reviews be systematic? *Eval Res Educ*. 2000;14(3-4):220-230. doi:10.1080/09500790008666974
 44. Lenzen SA, Daniëls R, van Bokhoven MA, et al. Disentangling self-management goal setting and action planning: a scoping review. *PLoS One*. 2017;12:e0188822-22. Published online 2017.
 45. Amić D, Davidović-Amić D, Bešlo D, Trinajstić N. Structure-radical scavenging activity relationships of flavonoids. *Croat Chem Acta*. 2003;76(1):55-61.
 46. Menning CL, Stewart SD, Susan DS. Nonresident father involvement, social class, and adolescent weight. *J Fam Issues*. 2008;29(12):1673-1700. doi:10.1177/0192513x08322930
 47. Lindsay AC, Wallington SF, Muñoz MA, Greaney ML. A qualitative study conducted in the USA exploring Latino fathers' beliefs, attitudes and practices related to their young children's eating, physical activity and sedentary behaviours. *Public Health Nutr*. 2018;21(2):403-415. doi:10.1017/S1368980017002579
 48. Salemonsens E, Langeland IO, Holm AL. Experiences of childhood weight management among Norwegian fathers of children with overweight or obesity - a qualitative interview study. *Int J Qual Stud Health Well Being*. 2023;18(1):2235116. doi:10.1080/17482631.2023.2235116
 49. Salemonsens E, Holm AL, Øen KG. Struggling with overweight or obesity in children - fathers' perceptions and experiences of contributing factors, role and responsibility. *Int J Qual Stud Health Well Being*. 2022;17(1):2093912. doi:10.1080/17482631.2022.2093912
 50. Watterworth JC, Hutchinson JM, Buchholz AC, et al. Food parenting practices and their association with child nutrition risk status: comparing mothers and fathers. *Appl Physiol Nutr Metab*. 2017;42(6):667-671.
 51. Penilla C, Tschann JM, Deardorff J, et al. Fathers' feeding practices and children's weight status in Mexican American families. *Appetite*. 2017;117:109-116. doi:10.1016/j.appet.2017.06.016
 52. Zhang L, McIntosh WA. Children's weight status and maternal and paternal feeding practices. *J Child Health Care*. 2011;15:389-400. doi:10.1177/1367493511414448
 53. Tschann JM, Martinez SM, Penilla C, et al. Parental feeding practices and child weight status in Mexican American families: a longitudinal analysis. *Int J Behav Nutr Phys Act*. 2015;12:1-10. doi:10.1186/s12966-015-0224-2
 54. Taylor A, Wilson C, Slater A, Mohr P. Parenting and child body mass index: longitudinal investigation of maternal and paternal influence. *Aust J Psychol*. 2011;63(4):198-206. doi:10.1111/j.1742-9536.2011.00024.x
 55. Mobley A, Gans K, Adamsons K, Huedo-Medina T. O17 healthy fathers, healthy kids: preliminary results of a father-focused childhood obesity prevention pilot program. *J Nutr Educ Behav*. 2020;52(7):S8-S9.
 56. Birch LL, Fisher JO, Grimm-Thomas K, et al. Confirmatory factor analysis of the child feeding questionnaire: a measure of parental attitudes, beliefs and practices about child feeding and obesity proneness. *Appetite*. 2001;36:201-210. doi:10.1006/appe.2001.0398
 57. Brann LS, Skinner JD. More controlling child-feeding practices are found among parents of boys with an

- average body mass index compared with parents of boys with a high body mass index. *J Am Diet Assoc.* 2005;105(9):1411-1416. doi:10.1016/j.jada.2005.06.005
58. Haycraft EL, Blissett JM. Maternal and paternal controlling feeding practices: reliability and relationships with BMI. *Obesity.* 2008;16(7):1552-1558. doi:10.1038/oby.2008.238
59. Johannsen D, Johannsen N, Specker B. Social and behavioral influence of parents' eating behaviors and child feeding practices on children's weight status. Published online 2006.
60. Vollmer RL, Adamsons K, Foster JS, Mobley AR. Association of fathers' feeding practices and feeding style on preschool age children's diet quality, eating behavior and body mass index. *Appetite.* 2015;89:274-281. doi:10.1016/j.appet.2015.02.021
61. Wehrly SE, Bonilla C, Perez M, Liew J. Controlling parental feeding practices and child body composition in ethnically and economically diverse preschool children. *Appetite.* 2014;73:163-171. doi:10.1016/j.appet.2013.11.009
62. Monge-Rojas R, Smith-Castro V, O'Connor T, Vargas-Quesada R, Reyes-Fernández B. Association between fathers' and mothers' parenting styles and the risk of overweight/obesity among adolescents in San José Province, Costa Rica. *Nutrients.* 2022;14(24):5328.
63. Lora KR, Hubbs-Tait L, Ferris AM, Wakefield D. African-American and Hispanic children's beverage intake: Differences in associations with desire to drink, fathers' feeding practices, and weight concerns. *Appetite.* 2016;107:558-567. doi:10.1016/j.appet.2016.09.012
64. Brophy S, Rees A, Knox G, Baker J, Thomas NE. Child fitness and father's BMI are important factors in childhood obesity: a school based cross-sectional study. *PLoS One.* 2012;7(5):e36597. doi:10.1371/journal.pone.0036597
65. Burke V, Beilin L, Dunbar D. Family lifestyle and parental body mass index as predictors of body mass index in Australian children: a longitudinal study. *Int J Obes.* 2001;25(2):147-157. doi:10.1038/sj.ijo.0801538
66. Freeman E, Fletcher R, Collins CE, et al. Preventing and treating childhood obesity: time to target fathers. *Int J Obes.* 2012;36:12-15. doi:10.1038/ijo.2011.198
67. Linabery AM, Nahhas RW, Johnson W, et al. Stronger influence of maternal than paternal obesity on infant and early childhood body mass index: the Fels longitudinal study. *Pediatr Obes.* 2013;8(3):159-169. doi:10.1111/j.2047-6310.2012.00100.x
68. Chen M, Yin W, Sung-Chan P, Wang Z, Jianwei S. The interactive role of family functioning among BMI status. Published online 2022.
69. Mai TMT, Tran QC, Nambiar S, Gallegos D, Van der Pols JC. Dietary patterns and child, parental, and societal factors associated with being overweight and obesity in Vietnamese children living in Ho chi Minh city. *Matern Child Nutr.* 2024;20(S2):e13514. doi:10.1111/mcn.13514
70. Gao J, Yin Y, Myers KR, Lakhani KR, Wang D. Potentially long-lasting effects of the pandemic on scientists. *Nat Commun.* 2021;12(1):6188-6211. doi:10.1038/s41467-021-26428-z
71. Sohrahi C, Mathew G, Franchi T, et al. Impact of the coronavirus (COVID-19) pandemic on scientific research and implications for clinical academic training - a review. *Int J Surg.* 2021;86:57-63. doi:10.1016/j.ijso.2020.12.008
72. Stierman B, Afful J, Carroll M, et al. National health and nutrition examination survey 2017-march 2020 prepandemic data files-development of files and prevalence estimates for selected health outcomes. *Natl Health Stat Rep.* 2021;2021(158). doi:10.15620/cdc:106273
73. Moura AF, Philippe K. Where is the father? Challenges and solutions to the inclusion of fathers in child feeding and nutrition research. *BMC Public Health.* 2023;23(1):1-9. doi:10.1186/s12889-023-15804-7
74. Davison KK, Haines J, Garcia EA, Douglas S, McBride B. Fathers' food parenting: a scoping review of the literature from 1990 to 2019. *Pediatr Obes.* 2020;15(10):e12654. doi:10.1111/ijpo.12654
75. Mejia de Grubb MC, Levine RS, Zoorob RJ. Diet and obesity issues in the underserved. *Prim Care - Clin Off Pract.* 2017;44(1):127-140. doi:10.1016/j.pop.2016.09.014
76. Caruana E, Roman M, Hernández-sánchez J, Solli P. Longitudinal studies. *J Thorac Dis.* 2015;7(V):537-540. doi:10.3978/j.issn.2072-1439.2015.10.63
77. Litchford A, Savoie Roskos MR, Wengreen H. Influence of fathers on the feeding practices and behaviors of children: a systematic review. *Appetite.* 2020;147:104558. doi:10.1016/j.appet.2019.104558
78. Khandpur N, Blaine RE, Fisher JO, Davison KK. Fathers' child feeding practices: a review of the evidence. *Appetite.* 2014;78:110-121. doi:10.1016/j.appet.2014.03.015
79. Wasti SP, Simkhada P, van Teijlingen E, Sathian B, Banerjee I. The growing importance of mixed-methods research in health. *Nepal J Epidemiol.* 2022;12(1):1175-1178. doi:10.3126/nje.v12i1.43633
80. Taylor MK, Sullivan DK, Ellerbeck EF, Gajewski BJ, Gibbs HD. Nutrition literacy predicts adherence to healthy/unhealthy diet patterns in adults with a nutrition-related chronic condition. *Public Health Nutr.* 2019;22(12):2157-2169. doi:10.1017/S1368980019001289
81. Daniels LA, Mallan KM, Jansen E, et al. Comparison of early feeding practices in mother-father dyads and possible generalization of an efficacious maternal intervention to fathers' feeding practices: a secondary analysis. *Int J Environ Res Public Health.* 2020;17(17):1-12. doi:10.3390/ijerph17176075
82. Faizan U, Rouster AS. *Nutrition and Hydration Requirements in Children and Adults.* StatPearls Publishing; 2024. Accessed August 5, 2024. <https://www.ncbi.nlm.nih.gov/books/NBK562207/>