

Original article

Dietary Diversity, Food Selectivity, And Family Meal Practices Among Preschool Children in Tripoli, Libya

Eman Derbi*, Hager Abugrain, Manal Abuagela

Department of Public Health, Faculty of Medical Technology, University of Tripoli, Tripoli, Libya

Email: e.derbi@uot.edu.ly

Keywords:

Preschool Children, Dietary Diversity, Food Selectivity, Family Meals, Feeding Practices; Libya.

ABSTRACT

Preschool diets influence nutrient adequacy and the establishment of eating patterns that may persist into later childhood. Evidence describing dietary variety and family feeding practices among young children in Libya remains limited. This study was conducted to describe dietary diversity, food selectivity, breakfast habits, family meal participation, and consumption of major food groups among preschool children in Tripoli. This secondary analysis used data from a kindergarten-based cross-sectional study conducted in selected municipalities of Tripoli between November 2025 and April 2026. The analytic sample included 131 children aged 24–60 months with completed anthropometric and parent/caregiver questionnaires. Descriptive statistics were used to summarise demographic characteristics, number of food groups consumed daily, weekly food-group frequency, family eating routines, food selectivity, and dietary supplement use. Dietary-diversity information was available for 129 children. Fewer than three food groups per day were reported for 21.7%, three to five groups for 61.2%, and more than five groups for 17.1%. Daily consumption was highest for dairy products (67.9%) and protein-rich foods (64.1%), followed by vegetables (59.5%), fruits (42.7%), and cereals or starches (41.5%). Regular breakfast consumption was reported for 89.1% of children. Most children always (74.8%) or often (17.6%) ate with their families; nevertheless, food selectivity or food refusal affected 41.1%. Most children received no dietary supplements (71.8%). The children were typically well organised to eat on a schedule, although food variety was moderate as compared to ideal and food selectivity was also commonplace. The interventions must be based on a combination of practical dietary diversity education and responsive feeding approaches as well as family-based counselling. Population-based research in which validated preschool dietary instruments are used is justified.

Introduction

The quality of diet in the preschool years is significant as this phase is characterised by both rapid physical growth and the establishment of food preferences, eating habits, and caregiver-child feeding relationships. Even though the nutritional needs vary beyond infancy, young children still must receive diverse, high-energy diets of animal origin or an equivalent that contain fruits, vegetables, pulses, dairy products, and staple foods in the desired ratios. The World Health Organisation (WHO) has placed dietary diversity and responsive feeding at the centre of focus in the context of complementary feeding, whereas UNICEF has also pointed out that a lack of access to diverse diets is one of the most significant nutritional deprivations in early childhood [1,2]. Dietary diversity is a commonly applied practical measure of diet quality since eating a variety of food groups enhances the probability that a child will obtain a sufficient mixture of protein, essential fatty acids, vitamins, and minerals. There is no pure food group that will give all the nutrients needed to achieve healthy development. Diets that are characterised by the preponderance of a few foods can thus provide enough energy but are deficient in iron, zinc, calcium, vitamin A, vitamin D, vitamin B12, or other nutrients [1,3].

Food selectivity can be likened to picky eating or food refusal, which can decrease dietary variety despite food presence in the home. Selective eating may involve unwillingness to sample new foods, aversion to certain textures, tastes, or acceptance of certain foods that come down to a limited number of favourable foods, or an unreliable appetite. It occurs during early childhood and can represent developmental neophobia, sensory preferences, prior feeding experiences, temperament, caregiver responses, or family routines. The continuing selectivity can be worrisome among parents and could be linked to the reduced consumption of fruits and vegetables and other foods rich in nutrients [4–6]. The environment where exposure and acceptance of food are formed is the family eating practices. Frequent family meals may provide repetition of exposure to foods, modelling, and scheduled routines.

Breakfast intake can also be a part of the dietary daily make up. But family meals can be good or bad depending on what is eaten and the emotional tone of the meal; pressure, bargaining, distraction or force-feeding can escalate the conflict during mealtime and strengthen refusal. Responsive feeding rather invites caregivers to feed children with appropriate foods and organisation and leave children to their hunger and satiety signals [1,7,8]. Libya has had economic instability, fluctuation of food prices, displacement of population, and unequal access to health and nutrition services. However, in

the modern world, there is little contemporary evidence regarding preschool feeding patterns of the urban Libyan people. The parent study provided extensive data on food-group intakes, family meals, breakfast, food selectivity, supplements, and family characteristics in kindergarten children in Tripoli. The current analysis employs these data to give a detailed description of dietary variety and the family feeding environment, with impaired linear growth being the most important outcome. This research aimed to describe: (1) how many food groups were taken each day; (2) how many times vegetables, fruits, protein-rich foods, dairy products, and cereals or starches were taken; (3) breakfast and family meal practices; (4) the prevalence of food selectivity or food refusal; and (5) the prevalence of dietary supplement use among preschool children in Tripoli. Figure 1 is a summary of the conceptual relationships to be taken into account in the interpretation of these domains.

Methods

Study design and setting

The current paper is a secondary descriptive analysis of data gathered in the context of a cross-sectional, kindergarten-based study in Tripoli, Libya. The fieldwork was carried out in the period between November 2025 and April 2026 in the chosen municipalities. The operational sampling frame was kindergartens since they enabled organised access to the preschool children and enabled communication with parents or primary caregivers.

Participants

The population of the study was a group of children between the ages of 24 and 60 months of age who are enrolled in some kindergartens. The children were chosen based on the presence of the exact age within the given range, parental/guardian consent in writing, anthropometric measurements, and the parent/caregiver questionnaire was provided, and the information was supplied, which was necessary to analyse it. Children were excluded when age was outside the eligibility range, essential data were missing, or a congenital anomaly, genetic syndrome, severe chronic illness, physical deformity, or acute condition could interfere with reliable assessment. Of 701 children screened, 382 questionnaires were returned, and 131 children met the age and completeness criteria for the final dataset.

Data collection

Parents or primary caregivers completed a structured questionnaire covering child demographics, breastfeeding and complementary-feeding history, current dietary practices, number of food groups consumed, weekly consumption frequency of major food groups, breakfast habits, family meal participation, food selectivity or refusal, supplement use, morbidity, and household characteristics. Child age was calculated from the date of birth and the date of measurement. The questionnaire was piloted among 20 children from a kindergarten not included in the main study.

Dietary variables

Daily dietary diversity was represented by the reported number of food groups consumed and categorised as fewer than three groups, three to five groups, or more than five groups. Weekly consumption of vegetables, fruits, protein-rich foods, dairy products, and cereals or starches was classified as does not consume, one to two days, three to six days, or daily. The study instrument used a seven-food-group concept; however, the published WHO minimum dietary-diversity indicator is designed primarily for children aged 6–23 months. Therefore, the categories in this paper are interpreted descriptively and are not presented as a validated WHO cut-off for the 24–60-month age group [1,3].

Family meal and feeding variables

Regular breakfast was defined in the parent study as breakfast consumption on at least five days per week. Family meal participation was recorded as never, rarely, sometimes, often, or always. Food selectivity or food refusal was recorded as a binary caregiver-reported variable. Dietary supplement categories included no supplement, omega-3, vitamin D, iron, or another supplement.

Statistical analysis

Data were analysed descriptively using IBM SPSS Statistics version 26.0 in the parent study. This paper reports frequencies, percentages, means, standard deviations, and ranges available in the final thesis dataset. Denominators are stated when variables contained missing responses. Because the objective is descriptive and individual-level cross-tabulations were not available for every feeding domain, no causal interpretation is made, and no unreported association tests are introduced.

Ethical considerations

Data collection was preceded by ethical approval from the Scientific Research Ethics Committee of the University of Tripoli. Informed consent was obtained through written informed consent of parents or legal guardians. Participation was voluntary, personal identifiers were kept separate from research data, and each child was given a study identification

code.

Results

Participant Characteristics

The sample to be analysed consisted of 131 children aged 26-60 months; the mean age was 49.30 ± 8.28 months. The sex distribution was balanced: 65 boys (49.6%) and 66 girls (50.4%). The average family size is 5.40 ± 1.25 persons, and the average number of children per household is 3.42 ± 1.23. The educational attainment of mothers was relatively good, with 67.2% having a university education and 17.6% having postgraduate education. These attributes suggest that the kindergarten-based sample can be a reflection of families with more education and service access as compared to the broader preschool population.

Characteristic	Value	Notes
Sample size	131	Children aged 24–60 months
Age (mean ± SD)	49.30 ± 8.28 months	
Sex	49.6% male, 50.4% female	
Family size (mean ± SD)	5.40 ± 1.25 persons	
Maternal education	67.2% university, 17.6% postgraduate	

Daily dietary diversity

Dietary-diversity information was available for 129 children. Twenty-eight children (21.7%) consumed fewer than three food groups per day, 79 (61.2%) consumed three to five groups, and 22 (17.1%) consumed more than five groups. Thus, most children had moderate diversity, while approximately one in five had a notably narrow daily food range (Figure 1).

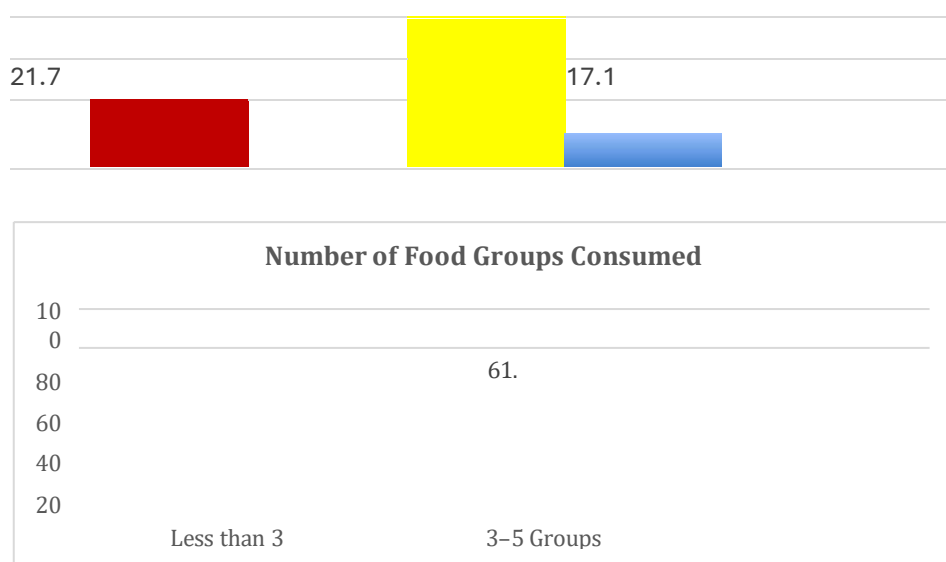


Figure 1. Distribution of daily food-group diversity among children with available data (n = 129).

Consumption Frequency of Major Food Groups

(Table 1) presents the weekly frequency of consumption of five major food groups. Daily consumption was reported most frequently for dairy products (67.9%) and protein-rich foods (64.1%). Vegetables were consumed daily by 59.5%, whereas fruit was consumed daily by 42.7%. Cereals and starches were reported daily by 41.5% and on three to six days per week by 43.8%. The lower daily frequency of fruits relative to vegetables, protein-rich foods, and dairy products suggests a potential target for practical nutrition education (Figure 2).

Table 1. Weekly frequency of major food-group consumption (n = 131).

Food group	Does not consume	1–2 days/week	3–6 days/week	Daily
Vegetables	3.8%	13.0%	23.7%	59.5%
Fruits	0.0%	22.9%	34.4%	42.7%
Protein-rich foods	3.1%	9.9%	22.9%	64.1%
Dairy products	5.3%	6.9%	19.8%	67.9%
Cereals and starches	0.8%	13.8%	43.8%	41.5%

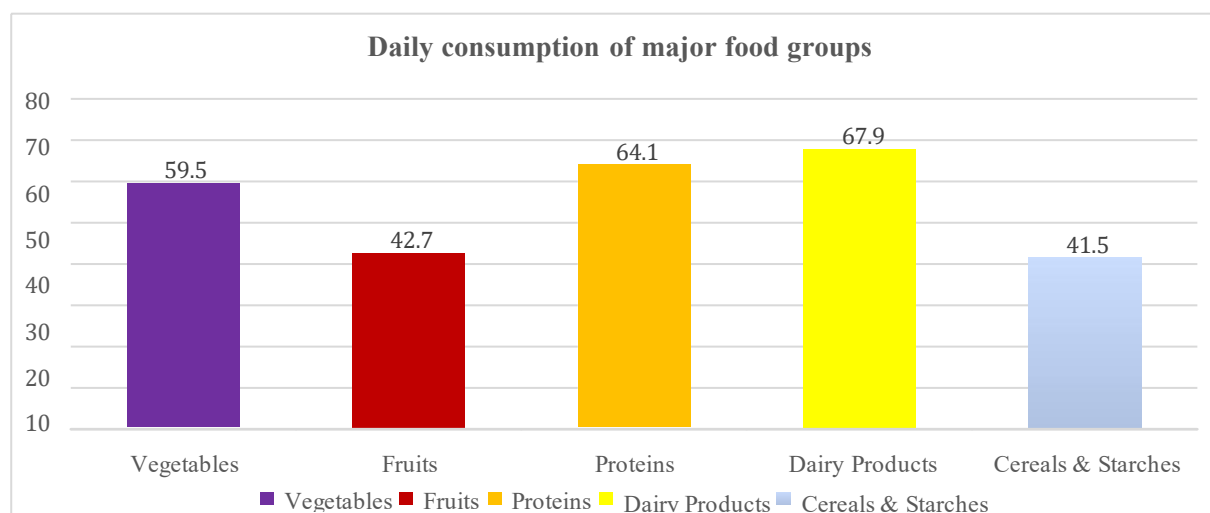


Figure 2. Percentage of children reported to consume each major food group daily (n = 131).

Breakfast and Family Meals

Regular breakfast consumption on at least five days per week was reported for 115 children (89.1% of respondents). The number of family meals attended was also typical: 74.8% of the time ate with the family, 17.6% said they did this often, 6.1% said they did it occasionally, and 1.5% said they never did it; none of the children said that he/she never ate with the family. These observations demonstrate that the majority of children had a regular eating schedule and often shared meals.

Food Selectivity and Dietary Supplements

This behaviour was reported to be exhibited by 53 children (41.1% of the respondents), and 58.9% of the respondents were not reported to exhibit food selectivity or food refusal. Although family meals and breakfast are high, the selectivity suggests that the structure of meals is not a sure determinant of extensive food acceptance. The largest group of children was not on dietary supplements (71.8%). Vitamin D was reported for 19.8%, omega-3 for 5.3%, iron for 2.3%, and another supplement for 0.8% (Table 2).

Table 2. Meal routines, food selectivity, and supplement use.

Domain	Category	n	%
Regular breakfast (≥5 days/week)	Yes	115	89.1
	No	14	10.9
Family meals	Always	98	74.8
	Often	23	17.6
	Sometimes	8	6.1
	Rarely	2	1.5
Food selectivity/refusal	Never	0	0.0
	Yes	53	41.1
	No	76	58.9
Dietary supplements	None	94	71.8
	Vitamin D	26	19.8
	Omega-3	7	5.3
	Iron	3	2.3
	Other	1	0.8

Household food context

Most households reported monthly income of 1,000–2,000 Libyan dinars (65.1%), while 32.5% reported more than 2,000 and 2.4% reported less than 1,000. The percentage of households with food insecurity in the last month has never been reported by 85.3, rarely by 9.3, sometimes by 2.3, and often by 3.1. None of the households reported food or social

assistance dependence. These results indicate that the limited dietary diversity in this sample cannot be explained by limited household food availability alone; rather, preferences, food availability, affordability, caregiver practices, and the food environment at large may be all factors.

Discussion

This paper gives an elaborate account of food variety and family feeding habits among pre-school children in the selected kindergartens of Tripoli. There are three findings that are significant. First, the majority of children (3-5 food groups per day) ate more than five groups (17.1%), and fewer than three (21.7%). Second, the daily intake of fruit and cereals or starch was not as frequent as the daily intake of dairy and protein-rich foods. Third, 41.1% of food selectivity occurred despite prevalent breakfast and family meal attendance. The dietary-diversity pattern implies that numerous children were exposed to a wide variety of food groups but failed to regularly eat a wide variety. Guidelines for younger children recommend foods of animal origin, fruits, vegetables, and regular pulses, nuts, and seeds, as these sources are rich in nutrients that could be scarce in the starch-based foods [1].

Even though the WHO minimum dietary diversity indicator, as it stands, should not be directly imposed on preschool children without further validation, the principle of increased variety raising the likelihood of micronutrient adequacy nonetheless applies [3,9]. Protein-rich foods and dairy products were the most consumed foods. This can help in obtaining protein, calcium, vitamin B12, iron, and zinc, in accordance with the particular foods and quantities consumed. But frequency data is not sufficient to tell about nutrient adequacy since they lack quantity, preparation method, fortification, and bioavailability. The fact that fruits and vegetables are sources of vitamins, minerals, fibre, and various sensory experiences is important since the daily consumption of fruits is relatively low. Early exposure to such foods in childhood might affect subsequent acceptance [1,5].

Approximately two out of every five children were said to be food selective. This percentage is in keeping with the understanding that picky or selective eating in preschool years is common, but prevalence is wide-ranging depending on the definition and method of measurement [4-6]. Particular developmental selectivity is normal, particularly at the age when children are wary of new foods. The clinical and nutritional significance is based on persistence, severity, growth, intake of nutrients, family distress, and avoidance of entire food groups. The family meals and the high level of food selectivity should be interpreted closely. Shared meals can offer structure and modeling which is determined by the interactional climate. Repeated pressure, bribing, or force of the caregiver on a reluctant child can unwittingly result in resistance, but calm, repeated exposure and responsive feeding can assist in acceptance over the long run [1,7]. Persuasion, bargaining, repeated prompting, and force feeding among mothers with feeding difficulties as described in the qualitative component of the parent thesis further support the necessity of counselling that involves a focus on both food choice and caregiver response. Frequent breakfast was prevalent, implying that the issue of skipping meals was not a prevailing issue in this sample. However, there is no indication of nutritional quality by the frequency of breakfast. A breakfast consisting of a large amount of sweetened beverages, refined cereals, or snacks with low nutritional value is vastly different to a breakfast that includes dairy, eggs, whole grains, fruit, or other high-nutritional foods. Subsequent studies should thus indicate meal composition besides frequency. The majority of children often dined with their families, which can be a good starting point for interventions.

Observational studies have associated the frequency of family meals with healthier eating habits in children and adolescents, but a large number of such studies have been systematic reviews, and family meals can also be indicative of the larger organisation of the household as well as socioeconomic resources [8,10]. Family-focused interventions in Tripoli might leverage the pre-existing routines of sharing meals to provide repeated exposure to vegetables and fruits, enhance the appropriateness of portions, and lessen coercive feeding. The domestic results also indicate that low diversity is possible without high levels of reported food insecurity. The child food poverty framework developed by UNICEF emphasises that children of both poor and non-poor households are exposed to poor diets, which can be caused by food prices, commercial food settings, knowledge of caregivers, lack of time, and the high prevalence of unhealthy, inexpensive foods [2]. Therefore, programs based on nutrition do not only need to look at the lack of food, but also need to consider food choice and preparation, child intake, and marketing and convenience of processed snacks. Patterns of supplement need to be interpreted with caution. The majority of children were not provided with any supplement, and the most recurring product was vitamin D. Supplements can be recommended based on particular deficits or national guidelines but should not be used as an alternative to diverse diets. WHO advice also highlights the importance of fortified products and supplements being supplemented with a wider feeding support and clarifies that they should not substitute a wide range of mildly processed foods [1].

In terms of public health, the findings justify evidence-based, family-based strategies. Kindergartens and primary-care nutrition counselling might educate caregivers on how to create affordable meals using various food groups, to eat fruits and vegetables more often, to expose children to unfamiliar foods repeatedly, and to be aware of warning signs that might need a professional evaluation. Healthy snack standards, water availability, and age-based food education can help to strengthen such messages in Kindergarten food policies. The paper has strengths. It covers a poorly researched group of people in Libya, incorporates several aspects of the feeding environment, and offers a hand for preschool nutrition

programs. It also differentiates day-to-day and food-group weekly frequency and takes family routines and pickiness into account as opposed to anthropometry. Limitations should also be acknowledged. The sample was kindergarten-based and may underrepresent children who do not attend preschool, including socially disadvantaged groups. The cross-sectional design prevents temporal or causal conclusions.

Dietary variables were caregiver-reported and may be affected by recall or social-desirability bias. The food-group measure was not a validated dietary-diversity score specifically designed for children aged 24–60 months, and portion sizes and total energy intake were unavailable. Food selectivity was recorded as a single binary item rather than through a validated multidimensional instrument. Finally, the present descriptive analysis cannot determine whether individual children with food selectivity had lower dietary diversity because the required individual-level cross-tabulation was not available for this manuscript. Future research ought to incorporate population-based sampling, repeated 24-hour dietary recalls, preschool picky-eating scale validation scales and direct measurement of household food environments. Longitudinal studies might help us understand whether persistent selectivity is predictive of reduced dietary diversity or micronutrient insufficiency and may test the hypothesis that responsive-feeding interventions enhance food acceptance. Observing caregivers and kindergarten staff in their natural environment would assist in adjusting recommendations according to the Libyan food culture and household limitations.

Conclusion

In this sample of Tripoli, it is typical that the children of preschool age ate breakfast regularly and family meals, although there was an average level of dietary diversity and widespread food selectivity. Approximately one in five children consumed fewer than three food groups daily, and fewer than half consumed fruit every day. These findings suggest that improving preschool nutrition requires more than ensuring regular meals. Family-centred programs should promote a wider range of nutrient-dense foods, repeated and non-coercive exposure to fruits and vegetables, and responsive strategies for managing food refusal. More representative studies using validated dietary assessment tools are needed to guide national and local preschool nutrition policy.

Acknowledgments

The authors thank the participating children, parents, caregivers, kindergarten administrations, and field staff who supported data collection.

Author Contributions

E.M.D. contributed to conceptualisation, interpretation, supervision, and manuscript revision. H.A.A. conducted the parent study, curated the data, and contributed to analysis and drafting. M.A. contributed to supervision, methodological review, interpretation, and critical revision. All authors approved the final manuscript.

Funding

The authors received no specific funding for this work.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability

The data supporting this secondary analysis are held by the research team and may be made available by the corresponding author subject to ethical and institutional requirements.

Ethics Approval and Consent to Participate

The parent study was approved by the Scientific Research Ethics Committee of the University of Tripoli. Written informed consent was obtained from parents or legal guardians.

References

1. World Health Organisation. WHO guideline for complementary feeding of infants and young children 6–23 months of age. Geneva: World Health Organization; 2023.
2. United Nations Children's Fund. Child food poverty: Nutrition deprivation in early childhood. New York: UNICEF; 2024.
3. World Health Organization, United Nations Children's Fund. Indicators for assessing infant and young child feeding practices: Definitions and measurement methods. Geneva: World Health Organization and UNICEF; 2021.
4. Taylor CM, Wernimont SM, Northstone K, Emmett PM. Picky/fussy eating in children: Review of definitions, assessment, prevalence and dietary intakes. *Appetite*. 2015;95:349–59.
5. Dovey TM, Staples PA, Gibson EL, Halford JCG. Food neophobia and "picky/fussy" eating in children: A review. *Appetite*. 2008;50(2–3):181–93.
6. Carruth BR, Ziegler PJ, Gordon A, Barr SI. Prevalence of picky eaters among infants and toddlers and their caregivers' decisions

- about offering a new food. *J Am Diet Assoc.* 2004;104(Suppl 1):s57–64.
7. Satter E. The feeding relationship: Problems and interventions. *J Pediatr.* 1990;117(2 Pt 2):S181–9.
 8. Hammons AJ, Fiese BH. Is frequency of shared family meals related to the nutritional health of children and adolescents? *Pediatrics.* 2011;127(6):e1565–74.
 9. Kennedy G, Ballard T, Dop MC. Guidelines for measuring household and individual dietary diversity. Rome: Food and Agriculture Organization of the United Nations; 2011.
 10. Dallacker M, Hertwig R, Mata J. The frequency of family meals and nutritional health in children: A meta-analysis. *Obes Rev.* 2018;19(5):638–53.
 11. Black RE, Victora CG, Walker SP, et al. Maternal and child undernutrition and overweight in low-income and middle-income countries. *Lancet.* 2013;382(9890):427–51.
 12. Birch LL, Fisher JO. Development of eating behaviors among children and adolescents. *Pediatrics.* 1998;101(Suppl 2):539–49.
 13. Fiese BH, Schwartz M. Reclaiming the family table: Mealtimes and child health and wellbeing. *Soc Policy Rep.* 2008;22(4):3–20.
 14. World Health Organization. Infant and young child feeding. Geneva: World Health Organization; 2023.
 15. Arimond M, Ruel MT. Dietary diversity is associated with child nutritional status. *J Nutr.* 2004;134:2579–85.
 16. Scaglioni S, De Cosmi V, Ciappolino V, et al. Factors influencing children's eating behaviours. *Nutrients.* 2018;10:706.
 17. Ventura AK, Birch LL. Does parenting affect children's eating and weight status? *Int J Behav Nutr Phys Act.* 2008;5:15.
 18. Rampersaud GC, Pereira MA, Girard BL, et al. Breakfast habits and nutritional status in children and adolescents. *J Am Diet Assoc.* 2005;105:743–60.
 19. Monzani A, Ricotti R, Caputo M, et al. A systematic review of skipping breakfast and weight in youth. *Nutrients.* 2019;11:387.
 20. Taylor CM, Emmett PM. Picky eating in children: causes and consequences. *Proc Nutr Soc.* 2019;78:161–9.
 21. Black MM, Aboud FE. Responsive feeding is embedded in a theoretical framework of responsive parenting. *J Nutr.* 2011;141:490–4.
 22. Keats EC, Rappaport AI, Shah S, et al. Effective interventions to address maternal and child malnutrition. *Lancet Child Adolesc Health.* 2021;5:367–84.
 23. UNICEF. The State of the World's Children 2019: Children, food and nutrition. UNICEF; 2019.
 24. El Taguri A, et al. Nutritional status of Libyan children. *Libyan J Med.* 2008;3:13–9.
 25. von Elm E, Altman DG, Egger M, et al. STROBE statement. *PLoS Med.* 2007;4:e296.
 26. Roba KT, et al. Dietary diversity and health outcomes in children. *Nutrients.* 2024;16:1234.