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A systematic review of parenting and feeding practices, children's feeding behavior and growth stunting in Asian countries

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ABSTRACT

This systematic review evaluates studies focusing on parenting and feeding practices, children's feeding behavior, and growth stunting in Asian countries. Eight electronic databases were searched to screen studies published between Jan 2015 and May 2021. There were contradictory findings related to gender differences in growth stunting and factors that reinforce/facilitate or inhibit acquisition of optimum growth in children. Theme of parenting practices showed that time spent on childcare, traditional beliefs about child-care feeding and responsive feeding were also contributing factors. Amidst economic improvement, political, social changes, and worldwide execution of various nutritional programs, stunting continues to be relentlessly persistent and widespread in Asia. Undernutrition disturbs areas of the mind involved in reasoning, reminiscence, locomotor skills and also an adverse influence on the physical and psychological growth of children and ensuing learning capabilities. Stunted children have more anxiety and depression and lower self-esteem than non-stunted children. A public health strategy is required to: (i) properly examine stunting with time through collaborated efforts of community members and various sectors, (ii) tackle malnutrition with steps to enhance maternal nutrition during pregnancy, infant feeding practices and (iii) involvement of effective multi-sectoral partnership programs for management of stunting.


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Introduction

According to findings of the United Nations Millennium Declaration, in 2000, approximately 190 countries were to reduce the incidence of underweight in children < 5 years old (Said-Mohamed et al., 2015; UN, 2015). Universally, stunting is considered a primary public health issue (Prendergast & Humphrey, 2014). It is shown to influence about 165 million children < 5 years old, of these 90% of them live in Asian and African countries (Bogale et al., 2018). Despite a reduction in the rates of stunting from 39.7% to 26.7% in 1990 and 2021 (de Onis et al., 2012; Raiten & Bremer, 2020), respectively, it is still a prevalent issue in these countries (Aychiluhm et al., 2021; Raiten & Bremer, 2020). This shows that stunting is a primary concern in developing countries compared to underweight or wasting. However, the two unique kinds of malnutrition cannot be separated from underweight; (1) linear growth delay (stunting) owing to continued poor health and undernutrition; and (2) wasting linked to serious nutrient deficiency (Chabra & Rokx, 2004; Fanzo & Pronyk, 2011). In this regard, it was suggested by the UN Standing Committee on Nutrition that ‘... progress towards the achievement of MDG1 should be reported against reductions in the prevalence of stunting [...], not just underweight’ (UN, 2008). According to the United Nations Children’s Fund (UNICEF), stunting means a height-for-age index of > 2 standard deviations less than the World Health Organization Child Growth Standard median (Espejo, 2007; UNICEF, 2013). Stunting is defined as the condition in which a child has low length or height compared to his age. According to WHO 2005 this condition can be measured by length or height below minus two standard deviations from the median standard of the child’s growth from WHO 2005. Stunting is actually having a height-for-age z score (HAZ) < -2SD. HAZ is calculated by subtracting an age- and sex-appropriate median value from a standard population and dividing by the SD of the standard population (WHO Expert Committee on Physical Status, 1995). Stunting, or being too short for one’s age, can also be defined as a height that is more than two standard deviations below the World Health Organization (WHO) Child Growth Standards median (World Health Organization WHO, 2022). Contributing factors of stunting are multi-faceted and primarily linked with the poor socio-economic status of family and diet scarcity, frequent infections in infants and maternal health from prenatal to postnatal period (Stevens et al., 2012). The stunting in children is considered as chronic nutritional illness produced by numerous issues with history of infectious illnesses, well-being facilities, immunization standing, exclusive breastfeeding, zinc and iron competence stages, maternal height < 150 cm, maternal age, parental schooling level, mother’s knowledge, family salary, food accessibility in family, food assortment, cleanliness, energy consumption level, duration of infectious illness history, birth weight, birth and genetics. From the above features, the most leading factors affecting stunting in children are special breastfeeding and satisfactory nutrition during pregnancy and after child birth (Soliman et al., 2021).

Past studies have linked stunting to reduced cognitive growth, diminished physical growth, reduced productivity, and a more chance of deteriorated health such as the onset of cardio-metabolic issues that may be passed to the descendant (Black et al., 2013; Victora et al., 2008). Such physical and psychological health consequences of stunting also impact families, and communities emphasizing the need to lessen its occurrence (WHO, 2014). In this regard, a meta-analysis of the cross-sectional and prospective in

low- and middle-income countries (LMICs) regarding a relationship of height-for-age z score (HAZ) with child growth suggested that per-unit rise in HAZ for children less than or equal to 2 years was linked to a 0.22-SD enhancement of intellectual and motor development at age of 5–11 years (Sudfeld et al., 2015). Nonetheless, stunting can be misapplied as an indicator of population health, as inadequate food level can impact the health, growth, and development of children whose linear growth is beyond the HAZ cut-off (Perumal et al., 2018). One of the WHO Global Targets for Maternal, Infant and Young Child Nutrition in 2012, is to lessen the population of stunted children by 2025 by 40% (De Onis et al., 2013a). This shows that stunting has profound consequences for population health and the achievement of the cognitive and financial output of Asian countries.

Parenting is a different and difficult work or responsibility that includes many important and specific behaviors that combine and work together or individually to affect a child (Nancy, 1999). The construct of parenting style is used to reflect normal alterations in parents' efforts to control and socialize their children (Baumrind, 1991). Classifying parents according to whether they are high or low on parental demandingness and receptiveness generates a typology of four parenting styles: indulgent, authoritarian, authoritative, and uninvolved (Maccoby & Martin, 1983). Parenting style has been found to forecast child well-being in the areas of social capability, academic routine, psychosocial development, and problem performance.

Parenting has three vital scopes: (1) providing maintenance that guards children from harm that contains limitations for the safety of the child and others, (2) parent-child communications that support growing, emotive and physical well-being and (3) enhancing a child's potential by serving parents to learn parenting approaches that enable actual growth and expansion. Parent feeding practices refer to the specific goal-oriented directives parents engage in when nourishing their children and define the behaviors in which parents feed their children (Blissett, 2011). Parent feeding is a self-motivated, give-and-take process in which how paternities feed their children depends on child behaviors and features, and child eating behaviors are prejudiced by parent activities (Afonso et al., 2016). Parent feeding practices denote the effect of parents on children's feelings and inclinations around diet and eating (Hoerr et al., 2009; Shloim et al., 2015; Ventura & Birch, 2008). It can be interpreted as a domain-linked implementation of various parenting styles (Hughes et al., 2005). Past empirical evidence has shown an inherent skill in toddlers and infants to self-monitor energy (Savage et al., 2007; Skinner et al., 2004) when they begin to eat small portions regularly (Peters et al., 2012; Skinner et al., 2004). Additionally, 3-year-old children frequently behave in accordance with the internal signals of fullness and stop eating irrespective of presence, while the 5 year olds, however, ignore these signals and go on eating in presence of acceptable food (Birch & Davison, 2001). Therefore, it is proposed that the reduction in self-monitoring can be due to using food as a reinforcer to manage behaviors of children which may impact food choices and eating in children. Eating behaviors have been expected to shelter nourishment assortment, consumption and guideline for eating (what, when, why), hedonics, food reward worth, food evasion/approach, responses to food prompts, frequency of eating, food and eating attitudes and views/cognitions, behaviors. (Baughcum et al., 1998; Russell et al., 2023). The practices of restricting foods based on their type or quantity seem to be the focus of empirical inquiries into parent feeding practices and child diet

(Peters et al., 2012). Studies have linked such practices with boosted eating without feeling hungry in absence of restrictions as well as lack of vicinity with the enforcer (Fisher & Birch, 2002; Fisher et al., 2002). Such restrictive food methods are usually linked with an authoritarian style of parenting (Hubbs-Tait et al., 2008) requiring children to respond to the parent, thus overlooking inner signals of hunger or fullness (Birch, 1999; Fisher & Birch, 2002; Peters et al., 2012). Such feeding methods can be ineffective (Faith et al., 2004) because foods used as contingencies lose their appeal, contrary to the reward foods which become more appealing (Birch, 1999; Newman & Taylor, 1992; Peters et al., 2012). Additionally, such methods eliminate the accountability/chance for children to self-monitor and regulate foods eaten (Faith et al., 2004; Fisher & Birch, 2002; Moens et al., 2007; Peters et al., 2012).

There are contradictory and mixed findings regarding the association of restricting methods with child food as well as their growth, perhaps due to variations in defining restrictive methods (Corsini et al., 2008; Peters et al., 2012). Few research studies have linked restrictive methods with better child health (Fisher & Birch, 2002; Spruijt-Metz et al., 2002) and improved eating of energy-dense foods (Fisher & Birch, 2000; Y. Lee et al., 2001). However, these findings are contradicting studies showing relationship between higher food restriction imposed by mothers and reduced consumption of energy-dense food and drinks in children who are 4–6 years old (Sud et al., 2010). It is shown that food restriction buffered against increased body mass index (BMI) in those who are five to six years old, though no influence was shown in elder children (Campbell et al., 2013). Likewise, a ‘pressure to eat’ has been adversely related with child weight, fat mass, and intake of fruits and vegetables (Birch & Davison, 2001; Y. Lee et al., 2001; Spruijt-Metz et al., 2002) and positively related with eating fat as well as energy-dense foods and child weight (Fisher & Birch, 2002; Fisher et al., 2002; E. J. Lee et al., 2002). These contradictory findings highlight the need to perform thorough and comprehensive investigation.

Psychological issues with the children

Linear growth failure (stunting) in childhood is the greatest predominant form of undernutrition universally. The argument endures as to whether children who become stunted before age 24 months can catch up in development and intellectual functions in their future lives. Undernutrition disturbs areas of the mind involved in reasoning, reminiscence, and locomotor skills (Prendergast & Humphrey, 2014). According to studies, stunting refers to an intellectual illness categorized by mental aptitudes that replicate previous nutritive status and a failure in development in children caused by long-lasting malnutrition. This can lead to stunted development in children which can have an adverse influence on the physical and psychological growth of children and ensuing learning capabilities (Rambe et al., 2023).

Stunted children shadowed longitudinally in Jamaica were found to have more anxiety and depression and lower self-esteem than non-stunted children at age 17, after regulating the age, gender, and social upbringing variables (Alderman et al., 2017). Research studies have linked knowledge related to health and nourishment in mothers with nutrition of younger children which has been shown to be mediated by the presence of food in homes (Blaylock et al., 1999; Campbell et al., 2013; Gibson et al., 1998; Peters et al., 2012). Concerning this, insufficient knowledge among mothers is shown to lead to

the presence of unhealthy food in homes resulting in heightened eating of foods that are dense in energy and but poor in nutrition (Birch & Davison, 2001; Boshoff et al., 2007).

Consequently, owing to the significance of initial years in optimal growth, this paper aimed to systematically review studies focusing on parent/guardian knowledge related parenting and feeding practices, children's feeding behavior, and growth stunting in Asian countries.

Methods

This systematic review follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) and PRISMA checklist (Moher et al., 2009) (see supplementary Table S1 showing PRISMA Checklist).¹

Information sources and search strategy

Initially, eight electronic online databases (i.e. Ovid MEDLINE, Ovid EMBASE, PsycInfo, ScienceDirect, PubMed, Ovid EmCare, Scopus, and ProQuest) were systematically explored to pick studies published from 1 January 2015 to 31 May 2021. A generic syntax was constructed which consisted of keywords from research articles. The keywords were: Parents/caregivers, parenting and feeding practices, children's feeding behavior, food intake or dietary behaviors, and growth stunting/growth faltering. Furthermore, variants of these keywords were formulated to devise syntaxes for the selected databases (see Table 1 showing Boolean search strategy used to extract included studies). Also, other relevant studies and literature were searched through the 'snowball method' (i.e. screening bibliography of relevant articles for more relevant articles).

Study selection

Studies were excluded from the search if they were written in a language other than English, were reviews or meta-analyses, did not focus on parenting and feeding practices, children's feeding behavior, and growth stunting in Asian countries or were clearly unrelated in any other way. Studies conducted on children with chronic illness such as congenital heart disease, chronic liver disease, cerebral palsy etc were also excluded. The

Table 1. Boolean search strategy used to extract included studies.

Concepts	Search Strings
Parenting styles	Parent* OR Style* OR Skill* OR Attitude* OR Practice* OR Authorita* OR Control* OR Restrict* OR Reward* OR Permissive OR Neglect* OR Indulg* OR Food specific OR Diet specific OR Feeding OR Knowledge OR Educat* OR uninvolved OR warmth OR Demandingness OR responsiveness OR parent practice*
Feeding styles/behavior	feeding OR feeding pattern* OR feeding style* OR permissive OR indulgent OR uninvolved OR responsive OR controlling OR restrictive OR forceful feeding OR eating patterns
Growth faltering	Stunt* OR Growth retardation OR Height OR Undernutrition OR Malnutrition OR underweight OR growth retardation OR nutritional deficiency
Parents/caregivers	mother OR father OR parent
food intake or dietary behaviors	snack intake OR sugar sweetened beverage intake OR fruit intake OR vegetable intake OR take away OR feeding method OR food intake OR feeding behaviour* or health-related behaviour*



PRISMA 2009 Flow Diagram

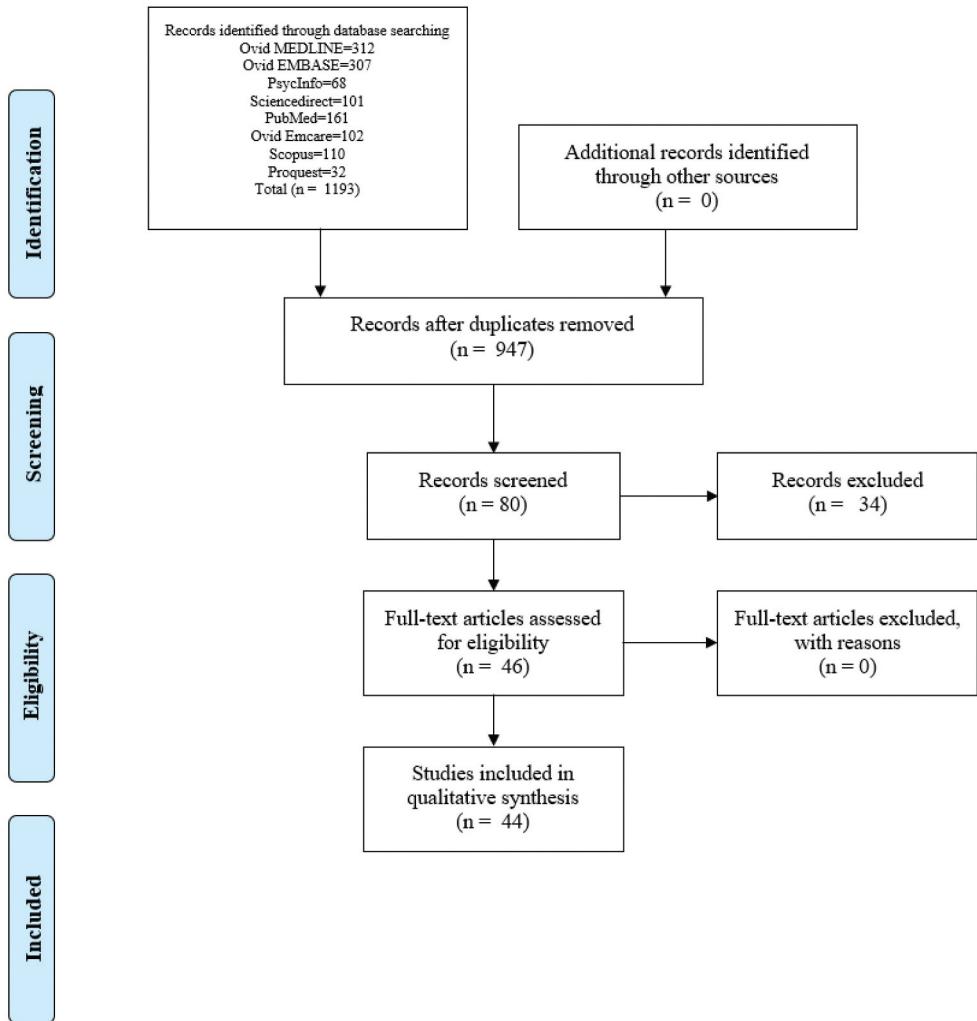


Figure 1. PRISMA flow diagram.

studies retrieved through electronic databases were copied to a reference management software package (EndNote). Duplicates were deleted followed by screening the titles and abstracts and removal of unrelated studies. The complete articles were screened by two authors (M.R and K.M) under supervision of one of the authors (F.M). All the disagreements pertaining to inclusion or relevance of data were settled through mutual consensus of all the authors (see [Figure 1](#): PRISMA flow diagram showing the process of study selection for inclusion in the systematic review).

PRISMA flow diagram showing the process of study selection for inclusion in the systematic review

Assessment of methodological quality

The 14 and 10 criteria checklists were used to assess methodological quality of qualitative and quantitative studies, correspondingly (Kmet et al., 2004). A total score ranging from 0 to 1 was given to each article; more scores corresponded to better quality. These checklists have been used in past systematic reviews to ascertain methodological quality of studies (Choudhry et al., 2019; Ishak et al., 2021; Munawar et al., 2018, 2020, 2021; Rahmanian et al., 2020). A minimum total score of 0.57 was obtained by both quantitative and qualitative studies. Additionally, the methodological quality of mixed-method studies was achieved through Mixed Methods Appraisal Tool (MMAT) (Hong et al., 2018). Two authors (M.R and K.M), autonomously evaluated the included studies. Subsequently, under supervision of one of the authors (F.M), these ratings were evaluated, and disagreements were settled through mutual consensus (please see Tables S2–S4).

Coding of Studies/Data extraction

The data were extracted in Excel by one of the authors (K.M) and pertinent information such as first author/year, country, study design, sample, sample size, age, gender, assessment measure, and outcome was noted. The extracted data were checked by M.R and F.M.

Analysis strategy

Analysis was performed based on standard methods for thematic analysis (Liamputtong & Ezzy, 2005). The findings were then categorized into superordinate and subordinate themes.

Risk of bias and heterogeneity

The meta-analysis was not conducted because of heterogeneity in the studies; hence, only thematic analysis was conducted. Furthermore, no further analysis (e.g. subgroup or sensitivity analyses) were performed as it was not the objective of this study.

Results

Our search resulted in a total number of 1193 of hits, of which 246 duplicates were removed. This resulted in a total number of 947 titles and abstracts. After screening titles and abstracts, 80 full-text articles were retained, assessed for eligibility and 44 were included in the analysis.

Study characteristics

The Table 2 describes the characteristics of the studies included. In total, 31 of the 44 studies (70.45%) were cross-sectional, 3 (6.81%) were based on Mixed method design, 4 (9.09%) were qualitative studies, 3 (6.81%) studies were based on different experimental



Table 2. Characteristics of included studies.

First Author/ Year	Country	Design	Sample	Sample size	Age	Gender	Assessment measure	Outcome
S. Srivastava and Kumar (2021)	India	Cross-sectional survey	Children	Child: 66277	6–59 months	Sex of the child Male: 35000 Female: 30227	National Family Health Survey (NFHS)	<p>It was revealed that the percentage of children who do not receive vitamin A supplementation was reduced from 85.5% to 42.1%, whereas in the case of iron supplementation (IS), the percentage reduced from 95.3% to 73.9% from 2005–06 to 2015–16, respectively. The child's age, mother's educational status, birth order, breastfeeding status, place of residence and empowered action group (EAG) status of states were the factors that were significantly associated with vitamin A supplementation and iron supplementation among children in India. Moreover, it was found the children who do not receive vitamin A supplementation and iron supplementation got more concentrated among lower socio-economic strata. A major contribution for explaining the gap for socio-economic status (SES) related inequality was explained by mother's educational status, household wealth status, and empowered action group status of states for both vitamin A supplementation and iron supplementation among children aged 6–59 months in India.</p>

(Continued)

Table 2. (Continued).

First Author/ Year	Country	Design	Sample	Sample size	Age	Gender	Assessment measure	Outcome
T. Rahman et al. (2021)	Bangladesh	Cross-sectional survey	Child and mothers	Child: 138 Mothers: 138	0–59 months	Sex of the child Male: 70 Female: 68	Structured questionnaire to collect demographic, anthropometric (involving stunting, wasting and underweight) and other information related to nutritional status.	Anthropometric data revealed, the prevalence of both stunting and underweight was more in female child, 29% and 41%, respectively, whereas the prevalence of wasting was more than 50% in both male and female. Qualitative analysis of mother's food intake revealed that, major portion of diet came from plant source whereas animal sources contributed trivial portion. Tendency to skip meal also reflected poor food intake both in quality and quantity Malnutrition rates in these children were lesser than national averages until 2 years of age. From baseline to end line, 48% reduction was observed in wasting within the first 6 months of age. Binary logistic regression reveals that age at registration (Odds ratio, OR = 0.94, p-value = 0.04) and area of residence (p-value = 0.00) are two most significant factors contributing to positive deviance in the child's nutritional status. Another univariate logistic regression on categorized breastfeeding score reveals that a higher score results in higher odds (OR = 1.561, p-value = 0.01) of positive deviance in nutritional status of the child.
Yaddanapudi et al. (2020)	India	Longitudinal/ Experimental	Children	Child: 4634	0–5 years			

(Continued)



Table 2. (Continued).

First Author/ Year	Country	Design	Sample	Sample size	Age	Gender	Assessment measure	Outcome
Viajar et al. (2020)	Philippines	Mixed-method study	_____	121 mother-/caregiver-child pairs	6-month to 2-year-old children	_____	_____	The intervention strategy contributed in the weight increase of children- participants and in the significant improvement in mothers'/caregivers' knowledge on nutrition, food, and health. Strong support, cooperation, and adherence of the local implementers and mothers'/caregivers on the (proposed) required steps to implement the intervention were the key factors in its efficient implementation.
Syam et al. (2020)	Indonesia	Qualitative study (case study approach)	26 people, consisting of families with stunting children aged 0–59 months in 2019 as many as 14 people, families who have stunting children aged 0–59 months in 2018 and are free from stunting as many as four people, one nutritionist, four Integrated Healthcare Center cadres, and three Community Leaders/Religious Leaders	People consisting of families with stunting children aged 0–59 months: 26 + 14 People consisting of families free from stunting: 4 Nutritionist: 1 Integrated Healthcare Center cadres: 4 Community Leaders/ Religious Leaders: 3	0–59 months	_____	_____	The reinforcers factors consisting of adequate health service support and family members provide support in caring for children and providing nutritious food. While the inhibiting factors consist of uncertain family income for the daily needs of family members, and irregular nutritional food intake is given in a day. The need for nutrition education for community stunting management was analyzed by the public health center and integrated health-care center through a program to improve the first 1000 days of life and increase family planning coverage.
Stiller et al. (2020)	India	Cross-sectional survey	_____	Child: 307 Mothers: 288	6–39 months	_____	Anthropometric and hemoglobin measurement. Semi-structured questionnaire. Face-to-face interviews	The maternal nutritional status was poor and showed interrelations with the nutritional status of the index child. Inadequate feeding and caring practices were common. In particular the younger age group (<12 months) was found at risk of being offered inadequate complementary feeding (CF)

(Continued)

Table 2. (Continued).

First Author/ Year	Country	Design	Sample	Sample size	Age	Gender	Assessment measure	Outcome
Soesanti et al. (2020)	Indonesia	Qualitative study	Mothers of stunted children under the age of two	Mothers: 12			Interviews, observations and documentation	The stunted children only consumed rice porridge until the age of one, which means that the food intake contains mostly carbohydrates. The mothers who have stunted children have argued that the children's intestines is not strong enough to digest food with coarser texture like eggs, fish, beef and chicken. Sea fish are given when the children can walk because there has long been a belief that fish contain worms. Not feeding fishes and other animal products that are good source of protein can affect their growth in a negative way. The feeding practice of stunted children under the age of two in Pasongsongan Village was strongly influenced by culture.
Sharma et al. (2020)	India	Quasi-experimental study	Mother-infant dyad (MIDs) with an infant in the age group of 4–6 months at enrollment	Mother-infant dyads (MIDs) in the intervention group: 202 Mother-infant dyads (MIDs) in the control group: 202	Infants in the intervention group: 5.4 months (±0.8)	Sex of infants intervention group: Male: 96, Female: 106 Control group: Male: 110, Female: 92	There was significant weight gain in intervention group infants and length from the baseline. Also, there was significant decline in the proportion of undernourished and wasted infants in the intervention group.	Community-based nutrition educational intervention delivered through the routine health services and digitized tracking of malnourished children can effectively improve the complementary feeding and growth of children six months to one year among vulnerable populations.
Tropan and Herdayati (2020)	Indonesia	Cross-sectional survey	Children under two years				Data from Indonesia's Basic Health Research 2010	Socioeconomic variable was statistically significant related to stunting with mother's education level and household expenditure per capita as strong indicators to predict household socioeconomic

(Continued)



Table 2. (Continued).

First Author/ Year	Country	Design	Sample	Sample size	Age	Gender	Assessment measure	Outcome
Prasetyo et al. (2020)	Indonesia	Cross-sectional survey	Mothers taking care of children with avoidant restrictive food intake disorder (ARFID)	Mothers: 245	_____	_____	Questionnaires of perceived seriousness and a managing eating disorder	Factors in respect of motherly skill of managing eating disorder included the feeling of fear of children's condition, feeling of failure to contribute when children suffered from malnutrition, serious condition, and the whole-life changes. The multiple-linear regression revealed that factors influenced motherly skill of managing eating disorder covered education, the number of children, and perceived seriousness.
Munawar et al. (2020)	India	Community-based cross-sectional study	Mothers of under five children having undernutrition	Child: 3671 Mothers:2929	Child: 2.38 years (± 1.136) Mothers: 24.25 years (± 6.37)	_____	questionnaire prepared and validated by a panel of experts	Overall prevalence of stunting among children under five was 45.9%, wasting was 17.1 and 35.4% children were underweight. Prevalence of wasting, stunting and underweight were more seen in an urban slum than a rural area. In the rural areas exclusive breast feeding ($p < 0.001$) and acute diarrhea ($p = 0.001$) were associated with wasting, children with birth order 2 or less than 2 were associated with stunting and exclusive breast feeding ($p < 0.05$) and low maternal education were associated with underweight. Whereas in the urban slums exclusive breast feeding ($p < 0.05$) was associated with wasting, sex of the child ($p < 0.05$) and type of family ($p < 0.05$) were associated with stunting, and low income of the family ($p < 0.05$) was associated with underweight.

(Continued)

Table 2. (Continued).

First Author/ Year	Country	Design	Sample	Sample size	Age	Gender	Assessment measure	Outcome
Inbaraj et al. (2020)	India	Community-based cross-sectional study	Father-child dyads	210	Child: 15.94 months (SD 4.85)	210 father – child dyads; 116 boys and 94 girls and their fathers	Caregiver's Feeding Styles Questionnaire, Anthropometry measurements	One-fourth of the fathers were illiterate and most of the families belonged to the middle class. Almost half of the fathers fed their children once a day (57.1%) and engaged them during feeding by telling stories (47.1%). The most common paternal feeding style was uninvolved (36%) followed by authoritative (29.5%). Prevalence of undernutrition, stunting, and wasting was 44.3%, 42.8%, and 9.5%, respectively. Religion, type of family, and per capita income were independently associated with uninvolved feeding style. There was no association between paternal child-feeding style and malnutrition ($p > 0.05$)
Houghton et al. (2020)	India	Cross-sectional survey	Mother/primary caregiver of eligible children	Child: 120 Mothers: 120	Child: 12–24 mo; 17.7 (3.6) mo Mothers: 26 (3.9) y	Child: Male:66, Female: 54	Child anthropometry, 2-d weighed food records ($n = 69$), and compliance to WHO and PAHO recommended feeding, caring, food safety, and hygiene practices	Of the children, 39% were stunted, 31% underweight, and 10% wasted; none were overweight. Despite 88% achieving minimum meal frequency (more than three to four meals daily, only 50% consumed at least four food groups (minimum dietary diversity), and 44% a minimum acceptable diet (composite score of minimum meal frequency and minimum dietary diversity). Consumption of iron-rich or iron-fortified foods, vitamin A – rich fruits and vegetables, and eggs was low (<25%) and flesh foods were negligible (1.4%), whereas consumption of both sugary and snack foods was > 60%. Reported compliance to responsive feeding indicators was generally ~50%, but there was a wide range (13–98%) for food safety and hygiene practices, which were not always consistent with home observations.

(Continued)

Table 2. (Continued).

First Author/ Year	Country	Design	Sample	Sample size	Age	Gender	Assessment measure	Outcome
I. U. Haq et al. (2020)	Maldives	Cross-sectional survey	Children aged 6–59 months and their mothers	Child: 800	6–59 months	Child Male: 399 Female: 401	Interviewing the children's mothers via pretested questionnaires; dietary information, anthropometric data	The prevalence of underweight, stunting, and wasting was 24.6%, 32.4%, and 16.3%, respectively. The mean child feeding index (CFI) scores (13.0) of children aged 6–8 months were better than those of children in other age-groups. In food groups, the intake of fish was higher among the respondents, whereas the consumption of vegetables and fruits was lower.
Bari et al. (2020)	Pakistan	Cross-sectional survey	Mother accompanying their children admitted for nutritional rehabilitation	Mother: 227	Child: 9.22 ± 6.05 months Mothers: 28.29 ± 5.30 years	Child: _____ Mothers: _____	Anthropometric measurements; Information about demographic profile, gender, breast feeding, top feeding type	Maternal malnutrition was significantly associated with severity of child's undernutrition and low rates of exclusive breast feeding practices.
Werdani, ?year	Indonesia	Observational with a case control approach	Mothers of children aged 6–60 months with malnutrition status	Case group: 54 mothers with toddlers (6–59 months) of malnutrition status Control group: 108 mothers with toddlers (6–59 months) good nutritional status	Child: 6–60 months Mother: 15–45 y	Sex of the child Case: Male: 21, Female: 33 Control: Male: 54, Female: 54	_____	The results showed that there was a correlation between the history of Low Birth Weight (LBW), infectious disease, early complementary feeding, and mother education with the incidence of malnutrition status in toddlers in Magetan

(Continued)

Table 2. (Continued).

First Author/ Year	Country	Design	Sample	Sample size	Age	Gender	Assessment measure	Outcome
Ravindranath et al. (2019)	India	Mixed-method study	Children under the age of five	N = 131	mean age: 31.7 months	Sex of the child Male: 61 Female: 70	Anthropometric measurements	(Undernutrition was highly prevalent among the children (N = 131): stunted (40.5%); wasted (22.1%); and underweight (50.4%). We found common factors across parents interviewed such as similar misperceptions of malnutrition, long hours of work and lack of childcare provision at the worksite which resulted in disrupted quality of care. While socio-cultural beliefs and lack of information influenced breastfeeding, other factors such as inability to take breaks or lack of space further impaired infant feeding practices more broadly. Lack of dietary diversity at home, poor hygiene and sanitation, and economic inability to seek healthcare further affected child nutritional status.)

(Continued)



Table 2. (Continued).

First Author/ Year	Country	Design	Sample	Sample size	Age	Gender	Assessment measure	Outcome
Mya et al. (2019)	Myanmar	Cross-sectional survey	Children	Child: 1,222	children age 6–23 months	Sex of the child Male: 658 Female: 564	Secondary data analysis using the 2015–16 Myanmar Demographic and Health Survey	Twenty percent were stunted and 43% were moderately anemic. Only 16% of children received a minimum acceptable diet, 25% received diverse food groups, 58% were fed with minimum meal frequency, 85% currently breastfed, and 59% consumed iron-rich foods. Breastfeeding reduced the odds of being stunted. Male sex, perceived small birth size, mother with short stature, and working mother were significant predictors of stunting. Iron- rich food consumption was inversely associated with moderate anemia. Male sex and maternal anemia were also significant predictors of moderate anemia.
Mishram et al. (2019)	India	Community-based cross- sectional study	Children aged <3 years and their mothers	Child: 4038	Child: 16.3 (SD 9.5) months	Sex of the child Male: 2095 Female: 1943	Anthropometric measurements; History of morbidity; Information on household socioeconomic and sociodemographic characteristics were collected using a pre-tested proforma	Undernutrition is an important public health problem in India and observed to be associated with low socio- economic status, illiteracy of mother, low birth weight and dietary diversity. Findings also showed dominance of stunting among male than female children.
S. Khan et al. (2019)	Pakistan	Cross-sectional study	Children (<5 years of age)	Child: 3071	Child: 0–59 months; 2.1 years (SD 1.4)	Sex of child Male: 1558 Female: 1513	Pakistan Demographic and Health Survey (PDHS) 2012–2013	The study suggests that most of the analyzed factors that accounted for malnutrition in Pakistani children (such as mother's age at marriage, educational level and mothers' nutritional status) are preventable. Findings also showed dominance of stunting among male than female children

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Table 2. (Continued).

First Author/ Year	Country	Design	Sample	Sample size	Age	Gender	Assessment measure	Outcome
Joshi and Raut (2019)	India	Cross-sectional study	Mothers of infants who visited the immunization clinic of a single hospital	_____	Mothers: 25.17 ± 3.39	Sex of child Male: 161 Female: 139	Interviewing each mother, Edinburgh Postnatal Depression Scale, anthropometry of infant	Maternal depression was shown to have higher odds for having undernutrition among infants especially stunting
Huynh et al. (2019)	Vietnam	Cross-sectional study	6-59-month-old outpatient children	Child: 225	Child: 6.0-59.0 months Mothers: 25.0-35.0 years old.	Sex of child Male: 116 Female: 109	Anthropometric measurements, blood test of children, structured questionnaire to collect mothers' and children's characteristics to examine associated risk factors	The prevalence of stunting, underweight, overweight, and anemia among children aged 6-59 months was 9.8%, 8.4%, 25.8%, and 30.7%, respectively. Underweight significantly correlated only to having breastfeeding in the first hour after birth, while stunting was related to age of starting complementary foods from equal to/ more than 6 months and normal birth weight.
Mistry et al. (2019)	Bangladesh	Experimental study	Mistry Children aged less than 5 years	3009 mother-child-dyads: comparison; n = 1452 intervention; n = 1557	Child: 0-59 months	Sex of child Essential health care; Male: 729; Female: 723 Essential health care + Nutrition: Male: 818; Female: 739	Pre-tested structured questionnaire to collect the household, mother, and child related information through face-to-face interview of the mothers; Anthropometric measurements of the children	The study revealed that the prevalence of stunting was significantly lower in areas where the intervention was delivered compared to the comparison area. Furthermore, after adjusting for administrative zone, household wealth quintile, child's age, gender, maternal age, education, occupation, cluster disparity, and variation between study groups, it was seen that the risk of stunting was 25% lower in the intervention areas compared to the comparison areas. Optimal child feeding practices were also more common among mothers from intervention areas than those of the comparison areas.

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Table 2. (Continued).

First Author/ Year	Country	Design	Sample	Sample size	Age	Gender	Assessment measure	Outcome
Hoq et al. (2019)	Bangladesh	Mixed-method matched case-control study	Caregivers of malnourished and well-nourished children	Children with acute malnutrition: 52 Children without acute malnutrition : 95	Child: 6–59 months Mothers Children with acute malnutrition: Male: 27; Female: 25 26.6 ± 7.1 Children without acute malnutrition: Male: 47; Female: 48 Mothers: 17-46y, 27.0 (6.4)	Sex of the child Children with acute malnutrition: Male: 27; Female: 25 Children without acute malnutrition: Male: 47; Female: 48 Sex of child Male: 179 Female: 211	Interviews, focus group discussions and informal group discussions; structured questionnaire	Caregivers perceived inappropriate feeding practice as a major cause of acute malnutrition whereas birth order (first child OR 0.3, 95% CI 0.09, 0.96), number of family members (OR 1.30, 95% CI 1.02, 1.65), illness in the last 2 weeks (OR 3.08, 95% CI 1.13, 8.42) and access to hygienic latrine (OR 0.25, 95% CI 0.07, 0.82) were also associated with acute malnutrition among children under five in Kurigram.
Hashmi et al. (2019)	Thailand-Myanmar border	Mixed-method study	Pregnant women and mother-infant dyads	390 mother-infant dyads			Maternal anthropometry, malaria, anemia, and demographics Infant variables: birth weight, birth length, preterm birth, and small-for-gestational-age	Refugee and migrant mothers demonstrated high rates of suboptimal breastfeeding and low rates of minimum dietary diversity and acceptable diet. Multivariable regression models showed infant stunting and underweight to have increased odds among migrants, while each 5 cm increase in maternal height had decreased odds of stunting and underweight. In addition, small-for-gestational-age adjusted for length of gestation, infant age and gender increased odds of infant's stunting and underweight. Findings also showed dominance of stunting among male than female children. Focus group discussions explained the cross-sectional findings in characterising attitudes, perceived norms, and personal agency as they relate to maternal nutrition, infant malnutrition, and infant feeding practices.

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Table 2. (Continued).

First Author/ Year	Country	Design	Sample	Sample size	Age	Gender	Assessment measure	Outcome
Anik et al. (2019)	Bangladesh, Nepal, Pakistan, and Myanmar	Cross-sectional study	Mother-child pairs	Bangladesh = 6478, Nepal = 2670, Pakistan = 5770, and Myanmar = 3541	0–59 months	Sex of child Bangladesh Male = 3382, Female = 3096 Nepal Male = 1454 Female = 1216 Pakistan Male = 2984 Female = 2786 Myanmar Male = 1845 Female = 1696	Data was extracted from the latest Demographic and Health Surveys (DHS) of the respective countries	Maternal and child age as well as poor breastfeeding were risk factors for Double Burden of Malnutrition at Household Level (DBMHL) with varying risk factors among countries; such as- secondary education of mothers was the risk factor for DBMHL in Nepal, whereas, higher education was the protective factor in Pakistan. Again, richer and richest wealth-index were found to be positively associated with DBMHL in Bangladesh and Pakistan. Media access at least once a week showed negative association with DBMHL in Nepal. Findings also showed dominance of stunting among male than female children.

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Table 2. (Continued).

First Author/ Year	Country	Design	Sample	Sample size	Age	Gender	Assessment measure	Outcome
Bhagwat et al. (2019)	India	Community-based cross-sectional study	mothers of 96 children who were between 12 and 23 months of age.	Mothers = 96	12–23 months	Sex of child Male = 41, Females = 55	(UNICEF) YCF questionnaire, Breastfeeding and complementary feeding information, Anthropometric measurements	All children had mean anthropometric measurements below the World Health Organization Multicentre Growth Reference Study (WHO-MGRS) standard (weight for age in males, $p = 0.009$, and females $p = 0.005$). A delay in the initiation of breastfeeding was observed in female children (54.5%), showing a significant reduction in their weight ($p = 0.020$) as compared to those initiated early. There was also a declining trend of continuation of breastfeeding from age 12 months to 23 months. The study revealed a high consumption of gripe water (68.8%) and bottle feeding (40.4%). A significant difference was found in children who consumed nutritious food, especially meat, with height ($p = 0.018$) and weight ($p = 0.011$), along with other foods.
Bari et al. (2019)	Pakistan	Descriptive study	children diagnosed as severe acute malnutrition (SAM) using what?	Child = 257	6–59 months; Mean age = 13.43, SD = 8.81 months	Sex of child Male = 135, Female = 122	Anthropometric measurements: measurement of MUAC (to the nearest 1 mm), Weight, Length/height information about demographic profile	Both mid upper arm circumference (MUAC) and weight for height (WHZ) showed fair degree of agreement to diagnose moderate and severe acute malnutrition among children aged 6–59 months

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Table 2. (Continued).

First Author/ Year	Country	Design	Sample	Sample size	Age	Gender	Assessment measure	Outcome
Riaz and Naeem (2017)	Pakistan	Cross-sectional study	Children visiting the Nawaz Sharif Social Security Hospital, Lahore, Pakistan	Child: 750	1–5 months	Sex of child Male = 366, female = 384	Researcher designed questionnaire	217(29%) were having mild malnutrition, 105(14%) were having moderate malnutrition and 71 (9.5%) were found to have severe malnutrition. Lack of exclusive breast feeding in first 6 months, lack of continued breast feeding till 2 years, eating non nutritious foods, delayed or inadequate weaning and female sex were important risk factors. Additionally, a higher prevalence of stunting and underweight among females as compared to males was found.
Qu et al. (2017)	China	Cross-sectional study	12,146 pairs of 6- to 35-month-old children and their mothers	n = 12,146 pairs of mothers and their children	6–53 months	Sex of child Male = 7011, Female = 5135	Malnutrition was assessed based on the WHO Child Growth Standards	Qualified Infant and Child Feeding Index (ICFI) was associated with lower risk of child malnutrition. As physical status worsened, the effects of qualified ICFI on children's length, weight, height for age (HAZ) and weight for age (WAZ) increased.
Ban, (2017)	China	Cross-sectional study	children left behind by rural-to-urban internal migrant parents	n = 6136	0–3 years	_____	UNICEF China's maternal and child health survey data	Left-behind status was not associated with stunting, yet children who were cared for primarily by their fathers had a 32% increase of stunting compared to children cared for by the mothers (adjusted odds ratio (aOR) = 1.32; 95% confidence interval = 1.04–1.67). Children with migrant mothers were less likely to receive age-appropriate breastfeeding (aOR = 0.04/0.02–0.10) and a minimum acceptable diet (aOR = 0.56/0.39–0.79) compared with non-left-behind children.

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Table 2. (Continued).

First Author/ Year	Country	Design	Sample	Sample size	Age	Gender	Assessment measure	Outcome
Chyne et al. (2017)	India	Community-based cross-sectional study	Children in Khasi in Meghalaya, North-East India	603 children ages 5 and under and 500 of their mothers	Age of their mothers	Gender	Anthropometric measurements, Dry blood spots, household socio-demographic particulars	The prevalence of underweight was 31%, stunting was 57%, and wasting was 10%. Undernutrition was higher among males as compared to female children. Nutrient intakes were below recommended levels. The prevalence of anemia among children ages 1–5 years old was 68%, and vitamin A deficiency was 59%, and they were 83% and 48%, respectively, among women. Hypertension was observed in 15% of women, whereas diabetes was less than 1%. Only about 20% of households were food secure, and this was associated with parental literacy, per capita income, and family size. Undernutrition was unacceptably high among the Khasis despite rich food biodiversity.

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Table 2. (Continued).

First Author/ Year	Country	Design	Sample	Sample size	Age	Gender	Assessment measure	Outcome
Ambadekar and Zodpey (2017)	India	Case-control study.	Under-five children in a rural part of India	n = 737 children having severe acute malnutrition (SAM) n = 737 normal controls	_____	_____	Researcher designed questionnaire	The odds of a child being in the severe acute malnutrition (SAM) category increased significantly if the family: was below the poverty line, have a kuccha house, have more children in the family, have less rooms in the house, have a working mother, has a mother with a lower level of education, have an unemployed father, did not use any water purification measure, did not always ensure parents washed their hands before feeding a child, did not wash hands with soap and water after defecation, have a father with any addictive habit like tobacco or alcohol consumption, have a maternal height <145 cm, have a lower age at marriage for mothers, had an institutional delivery, have the same food utilized more than once in a day, have no age-appropriate vaccination, give prelacteal feeds, have a lower frequency of breast feeding, do not use semisolid food during the weaning period, exclusively breast feed for less than four months or more than six months, had low birth weight, have five or more episodes of illness in the previous year, have ≤ 3 feeds per day apart from breast milk, and not initiation of breast feeding within 30 min of birth.
Diana et al. (2017)	Indonesia	Cross-sectional study	Under-five children	breastfed infants at 6 months of age (n = 230); and followed them at 9 (n = 202) and 12 months of age (n = 190)	Under 5 years of age	_____	Socio-demographic and anthropometric data and two-day in-home weighed food records	Stunting and underweight increased from 15.8% and 4.4% at 6 months to 22.6% and 10.5% at 12 months, respectively.

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Table 2. (Continued).

First Author/ Year	Country	Design	Sample	Sample size	Age	Gender	Assessment measure	Outcome
Yue et al. (2016)	China	Mixed-method study	Primary caregivers of children in the target age range (6–18 months of age) living in the sample villages	Large survey on child health and nutrition	_____	Infant caregiver Male = 48, Female = 52	Interviews	Complementary feeding practices are impeded by two constraints: absence of understanding topics related to infant health and nutrition under caregivers, as well as inadequate sources of information on these topics. Poverty does not appear to constrain child feeding practices.
Pulok et al. (2016)	Bangladesh	Cross-sectional study	Ever-married women aged 15 to 49 years and their children aged 0–59 months	n = 14,602 children	0–59 months	_____	Pooled data from the 2011 and 2014 Bangladesh Demographic and Health Survey	Stunting and underweight to be more concentrated among children from poorer households and born to less-educated mothers. Although the poverty level was low in the eastern regions, socioeconomic inequalities were greater in these regions compared to the western regions. The extent of socioeconomic inequality was the highest in Sylhet and Chittagong for stunting and underweight, respectively, while it was the lowest in Khulna. Regression results demonstrated the protective effects of socioeconomic status (SES) on child malnutrition. The regional differences in the effects of SES tend to diverge at the lower levels of SES, while they converge or attenuate at the highest levels.
Pokhrel et al. (2016)	Nepal	Cross-sectional study	mother – child pairs in rural Nepal	n = 400 mother – child pairs	6–23 months	Sex of child Male = 196 Female = 204	Nutritional Status, Infant and Child Feeding Index (ICFI), Sociodemographic Characteristics, Maternal Health Service Utilization, Household Food Security, Childhood Morbidity. What is the outcome of this study?	
Nisar et al. (2016)	Pakistan	Cross-sectional study	Pediatric population from birth up to five months belonging to poor socioeconomic areas	n = 294	0–5 months	Sex of child Male = 173, Female = 121	Researcher designed questionnaire to record 1) demographics; parents' level of education, monthly income, number of dependent household members, and birth interval; 2) anthropometric and personal history, birth history, and degree of malnutrition; 3) any secondary causes of malnutrition; and 4) feeding history.	Malnutrition in children is associated with poor breastfeeding practices. Children who were breastfed were less likely to suffer from malnutrition. More than one-third of the infants were not breastfed, mainly because of the personal preference of the mother and less amount of breast milk

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Table 2. (Continued).

First Author/ Year	Country	Design	Sample	Sample size	Age	Gender	Assessment measure	Outcome
Chowdhury et al. (2016)	Bangladesh	Cross-sectional study	Children of 6–23 months	n = 2,373 children	6–23 months	Sex of child Male = 1199, Female = 1174	Secondary data from the Bangladesh Demographic-Health Survey (BDHS) 2011	A high percentage of inadequate complementary feeding (CF) among children that could be the cause of malnutrition. Additionally, a higher prevalence of stunting and underweight among females as compared to males was found. Major non nutrition related factors found to be contributing towards malnutrition were lack of education, water scarcity, non-availability of food, drinking water and lack of basic health facilities.
Rani (2017)	Pakistan	Cross-sectional study	Mothers with children aged 1 month to 10 years	n = 200 children	1 month – 10 years; Mean age = 3.6 ± 2.8 SD years	Sex of child Male = 101, Female = 90	anthropometric measurements, Dietary intake data	Major non nutrition related factors found to be contributing towards malnutrition were lack of education, water scarcity, non-availability of food, drinking water and lack of basic health facilities.
D'Alimonte et al. (2016)	India	Qualitative study	Mothers enrolled in a community management of acute malnutrition (CMAM) program	n = 22 mothers			Semi-structured key informant interviews	Positive deviant mothers largely exhibited optimal infant and young child feeding practices explained by maternal information seeking behaviors; mothers acknowledging the importance of maternal health; and social support. The relationship between mother and health worker seemed to influence how well they listened to the health workers' recommendations. Across all households, the daily consumption of high-energy, processed foods was apparent.

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Table 2. (Continued).

First Author/ Year	Country	Design	Sample	Sample size	Age	Gender	Assessment measure	Outcome
Chaturvedi et al. (2016)	India	Qualitative study	Mothers and other key stakeholders	n = 509 in-depth interviews with mothers of undernourished and normal nourished children, policy makers, district level managers, implementer and facilitators	_____	_____	in-depth interviews, focus group discussions and non-formal interactions (509 IDIs, 66 FGDs and 72 NFIs)	Based on the perceptions of the mothers and other key stakeholders, a model evolved inductively showing core themes as drivers of under-nutrition. The most forceful emerging themes were: multitasking, time constrained mother with dwindling family support; fragile food security or seasonal food paucity; child targeted market with wide availability and consumption of ready-to-eat market food items; rising non-food expenditure, in the context of rising food prices; inadequate and inappropriate feeding; delayed recognition of under-nutrition and delayed care seeking; and inadequate responsiveness of health care system and Integrated Child Development Services (ICDS). The study emphasized that the persistence of child malnutrition in India is also tied closely to the high workload and consequent time constraint of mothers who are increasingly pursuing income generating activities and enrolled in paid labour force, without robust institutional support for childcare.

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Table 2. (Continued).

First Author/ Year	Country	Design	Sample	Sample size	Age	Gender	Assessment measure	Outcome
Wang et al. (2015)	China	Cross-sectional study	Children under 3 years old	n = 1370 children	Mean age 15.6, SD = 35.5 months	_____	questionnaire, anthropometrics and hemoglobin	Children under 2 years old, especially male children, are at high risk of anemia in these poor areas and that interventions are urgently required. The risk factors analysis indicates that breastfed infants whose mothers were anemic and young children with iron and vitamin B12 deficiency and lack of diversity in their diets are at greater risk for anemia.
Aguayo et al. (2015)	Bhutan	Cross-sectional study	Children 0–23 months old	n = 2085 children	0–23 months	Sex of child Male = 1080, Female = 1005	Data from Bhutan's Multiple Indicator Survey (BIMS)	27.5% of children were stunted and almost half (42.6%) of the stunted children were severely stunted. Children's mean height-for-age z-score deteriorated significantly with age (from -0.23 in infants 0–5 months old to -1.60 in children 18–23 months old) and levels of severe stunting were significantly higher among male children. Children from the Eastern/Western regions had a 64% higher odds of being stunted than children from the Central region; similarly, children from the two lower wealth quintiles had 37% higher odds of being stunted than children from the two upper wealth quintiles. Children whose mothers received three or fewer antenatal care visits during the last pregnancy had a 31% higher odds of being stunted while children whose mothers did not receive antenatal care from a doctor, nurse or midwife had a 51% higher odds of being stunted.

designs (i.e. longitudinal/experimental, quasi-experimental, and experimental), 2 (4.54%) were case-control studies, whereas 1 (2.27%) study was descriptive. Included studies were published between January 2015 to May 2021 with most conducted in India ($n = 14$), followed by Indonesia ($n = 6$), Pakistan ($n = 6$), Bangladesh ($n = 5$), and China ($n = 4$). Remaining studies were conducted in Bhutan, Nepal, Vietnam, Myanmar, Maldives, Philippines, Thailand-Myanmar border, and in more than one country: Bangladesh, Nepal, Pakistan, and Myanmar. Almost all articles ($n = 42$) had sample sizes greater than 100, ranging from 121 to 65 277 pairs of parent(s) and their children. Twelve of the articles had samples that included mother-child dyads, whereas six of the articles included only mothers. In thirteen of the included studies, the age of the children ranged from 0 to 59 months. There was a total of 175 890 males and 160 506 females. A thematic analysis of the included studies was performed by assembling and coding data into themes formulated from vocabulary mentioned in the reviewed literature.

Gender differences

The included studies identified a higher prevalence of stunting and underweight among females as compared to males (M. R. K. Khan et al., 2016; T. Rahman et al., 2021; Riaz & Naeem, 2017). Conversely, a study assessing feeding practices and associations with nutritional status of children aged 6–23 months in Myanmar showed that stunting and anemia were more prevalent among male than female children (Mya et al., 2019). Similar findings, in terms of dominance of stunting in males, were shown in other studies (Aguayo et al., 2015; Anik et al., 2019; Chyne et al., 2017; Hashmi et al., 2019; S. Khan et al., 2019; Meshram et al., 2019; Wang et al., 2015). It was found that sex of the child was an important determinant factor of stunting among under-five children (Murarkar et al., 2020), nevertheless, contradictory findings were shown in another study (Pulok et al., 2016).

Reinforcers/Facilitators of stunting

Various reinforcers/facilitators of stunting or growth faltering were identified in the included studies conducted across Asia.

Primary care Provider's education

The included studies frequently recognized the importance of maternal education and showed that mother's educational status served as a protective factor for supplementations for children (D'Alimonte et al., 2016; T. Rahman et al., 2021; S. Srivastava & Kumar, 2021). Additionally, it was shown that children obtained sufficient micronutrients due to better nutrition education among mothers/fathers (Bari et al., 2020; Mya et al., 2019; S. Srivastava & Kumar, 2021; Syam et al., 2020). Contrarily, a lack of awareness about nutritional requirements, lower level of education or illiteracy contributed to stunting or wasting among children (Ambadekar & Zodpey, 2017; Anik et al., 2019; Bari et al., 2019; Chyne et al., 2017; Hashmi et al., 2019; Hoq et al., 2019; Houghton et al., 2020; F. R. Khan et al., 2016; S. Khan et al., 2019; Meshram et al., 2019; Murarkar et al., 2020; Nisar et al., 2016; Pokhrel et al., 2016; Pulok et al., 2016; Ravindranath et al., 2019; Riaz & Naeem, 2017; Tiopan & Herdayati, 2020; Yue et al., 2016). A study identified the predictor factors

of motherly skill in managing Avoidant Restrictive Food Intake Disorder (ARFID) among children in Indonesia (Prasetyo et al., 2020). The authors showed that the educational background of mothers enhanced the skills in managing this eating disorder.

Furthermore, increasing nutritional knowledge has been shown to increase mothers'/ caregivers' knowledge about nutrition, food, and health. For instance, a study provided nutrition education lectures to mothers/caregivers through designed nutrition classes and showed that such classes substantially increased mothers'/caregivers' knowledge on perceptions associated to food safety, breast-feeding, complementary feeding and basic nutrition, and meal planning (Viajar et al., 2020). Another study evaluated the usefulness of a culturally appropriate nutrition educational intervention to enhance complementary feeding of infants in North India. The authors showed that community-based nutrition education intervention was effective in increasing the weight and length as well as reducing undernourishment and wasting among infants (Sharma et al., 2020). Similar findings about maternal nutrition counselling were shown in another study (Hossain et al., 2019).

Household economic status

The role of household wealth status was also a primary factor in clarifying the socio-economic status (SES) related inequality for micronutrients among children (Aguayo et al., 2015; Ambadekar & Zodpey, 2017; Bari et al., 2020; Chyne et al., 2017; Hoq et al., 2019; F. R. Khan et al., 2016; S. Khan et al., 2019; Meshram et al., 2019; Mya et al., 2019; Nisar et al., 2016; Pokhrel et al., 2016; Pulok et al., 2016; Ravindranath et al., 2019; S. Srivastava & Kumar, 2021; Syam et al., 2020; Tiopan & Herdayati, 2020; Yaddanapudi et al., 2020). Owing to the intergenerational transmission of poverty, children from the low-wealth-index families are likely to have a poor nutrition and health status (Stiller et al., 2020). Contrarily high-wealth-index was shown to be positively linked to malnutrition due to extreme consumption of processed energy-dense foods, absence of physical exercise, and soft drinks (Anik et al., 2019).

The importance of SES of the household is linked to numerous factors such as:

Access to nutritious food. It was shown that educated mother of children had health advantage owing to their higher SES (S. Srivastava & Kumar, 2021). Low levels of family income (Aguayo et al., 2015; Chaturvedi et al., 2016; Chyne et al., 2017; Hashmi et al., 2019; Hoq et al., 2019; F. R. Khan et al., 2016; M. R. K. C. S. R. M. H. Khan et al., 2016; Nisar et al., 2016; Pokhrel et al., 2016; Stiller et al., 2020; Syam et al., 2020) and considerable number of family members reduced attention to intake of nutritious food (Chyne et al., 2017; Hashmi et al., 2019; F. R. Khan et al., 2016; Nisar et al., 2016; Riaz & Naeem, 2017; Syam et al., 2020).

Adequate health service support

The health status of children was shown to improve with adequate provision of health services in the form of easy access to information as well as the provision of information in layperson terms (D'Alimonte et al., 2016; Syam et al., 2020). Access to medical care services and the costs of such services reduced parents' motivation to take their children for necessary health-check-ups (Aguayo et al., 2015; M. R. K. Khan et al., 2016; Ravindranath et al., 2019). Furthermore, the likelihoods of stunting were higher in

children whose mothers sought less than four antenatal consultations (Aguayo et al., 2015; S. Khan et al., 2019; Meshram et al., 2019; Pokhrel et al., 2016). Additionally, a study assessing the occurrence and risk factors of malnutrition among infants in Bangladesh, Nepal, Pakistan, and Myanmar showed that media access (e.g. access to watching TV, listening radio, and reading newspaper) in Nepalese households served as protective factors against malnutrition (Anik et al., 2019). Similar findings were shown in other studies (D'Alimonte et al., 2016; F. R. Khan et al., 2016), conversely, inadequate sources of information on topics related to infant health and nutrition was linked to stunting (Yue et al., 2016).

Support from family members in caring for children

The studies recognised the role of family support in prioritising provision of adequate and balanced nutrient density so that the physiological and immunological body of a toddler can return to normal and can increase body weight (Syam et al., 2020). Families have been shown to play a primary role in health and disease of children and protecting against stunting (Chaturvedi et al., 2016; D'Alimonte et al., 2016; Murarkar et al., 2020; Ravindranath et al., 2019). This happens by sharing resources and responsibilities amongst family members, reducing the economical and physical stress of parents and maximizing attention given to children (Murarkar et al., 2020). Interestingly, a study found that children whose fathers told stories during feeding were at less risk for malnutrition (Inbaraj et al., 2020).

Inhibiting factors

Exclusive breastfeeding

A study conducted to assess the nutritional status among underprivileged children (0 to 5 years), of slum areas in Dhaka city showed that only 62.7% mothers exclusively breastfed their children (T. Rahman et al., 2021) which contributed to stunting among children. Similar findings were shown in other studies (Aguayo et al., 2015; Ambadekar & Zodpey, 2017; Anik et al., 2019; Bari et al., 2019, 2020; Hashmi et al., 2019; Huynh et al., 2019; M. R. K. Khan et al., 2016; L et al., 2017; Pokhrel et al., 2016; Pulok et al., 2016; Riaz & Naeem, 2017; Stiller et al., 2020). Contrarily, adequately breastfed children had improved nutritional status (Bhanuja et al., 2019; D'Alimonte et al., 2016; Meshram et al., 2019; Murarkar et al., 2020; Nisar et al., 2016; Ravindranath et al., 2019; Yaddanapudi et al., 2020) and breastfeeding was shown to reduce the odds of being stunted (Hossain et al., 2019; Mya et al., 2019).

Misunderstanding of feeding practices

It was shown that inappropriate feeding practices were primarily caused by low literacy of the primary care provider. Inadequate feeding and caring practices were common (Chaturvedi et al., 2016; I. U. Haq et al., 2020; Hashmi et al., 2019; Hoq et al., 2019; F. R. Khan et al., 2016; M. R. K. Khan et al., 2016; Mahmudiono et al., 2016; Meshram et al., 2019; Mya et al., 2019; Pulok et al., 2016; Qu et al., 2017; Ravindranath et al., 2019; Riaz & Naeem, 2017; Stiller et al., 2020) and children were fed 1–3 times a day without considering their macro- and micro-nutrient requirements (Ambadekar & Zodpey, 2017; Houghton et al., 2020; Mya et al., 2019; Nisar

et al., 2016; Syam et al., 2020; Wang et al., 2015; Yue et al., 2016). Findings showed that uncertain family income for the daily needs of family members, and irregular nutritional food intake given in a day (I. U. Haq et al., 2020; Houghton et al., 2020; M. R. K. Khan et al., 2016; Murarkar et al., 2020; Pokhrel et al., 2016; Syam et al., 2020) played a pivotal role in growth stunting of children.

Lack of importance of complementary foods

The findings also showed that parents perceived milk as having higher nutritional value compared to complementary food, thereby, giving no importance to such foods (I. U. Haq et al., 2020; Mahmudiono et al., 2016; Mya et al., 2019). Even in the presence of awareness regarding complementary feeding practices, the foods given to children did not meet the WHO/UNICEF recommendations regarding portions, dietary diversity and frequency of servings (Aly et al., 2017; Sharma et al., 2020; Stiller et al., 2020). These eventually worsened the thriving of children and increased vulnerability to various micro-nutrient deficiencies (Houghton et al., 2020). Similarly, studies linked the prevalence of underweight and stunting with lack of age-appropriate complementary feeding practices as well as quantity and quality of complementary diets (Aguayo et al., 2015; Aly et al., 2017; Bhanuja et al., 2019; Hashmi et al., 2019; Huynh et al., 2019; F. R. Khan et al., 2016; M. R. K Khan et al., 2016; L et al., 2017; Meshram et al., 2019; Yue et al., 2016). A study identified inverse association between feeding practice measured with infant and young child feeding (IYCF) and stunting among children aged 6–23 months (Pokhrel et al., 2016).

Contrarily, a study documenting and assessing the application of an intervention plan for Filipino young children showed an increase in the mean weights-for-age scores of children who were given multivitamins as part of complementary feeding (Viajar et al., 2020). A study by Prasetyo et al. (2020) showed the substantial role of mothers in deciding complementary foods for their children suffering from eating disorder. In this regard, perceived seriousness of the disorder was shown to motivate mothers in practicing promotional and preventive measures to prevent severe malnutrition in children. Another study evaluating the importance of maternal nutrition counselling on the prevalence of stunting and feeding practices among Bangladeshi children aged less than 5 years showed improvements in dietary diversity of children (Hossain et al., 2019). Furthermore, mothers' exposure to media was shown to be associated with increased probability of providing adequate complementary foods, meal frequency and dietary diversity (Anik et al., 2019; D'Alimonte et al., 2016).

Poor food Habit/Low energy density foods/poor protein-based foods

Poor diet of mothers, primarily consisting of foods from plant-sources, suggested a poor quality of dietary protein among them. This subsequently contributed to impoverished growth and development both under-five children and their mothers (Houghton et al., 2020; Pulok et al., 2016; T. Rahman et al., 2021; Yue et al., 2016), whereas adequate maternal health contributed to well-nourished children (D'Alimonte et al., 2016). Also, a reduced consumption of protein-based foods coupled with fulfilling the dietary energy demand by consuming cereals resulted in no milk secretion of mothers (T. Rahman et al., 2021).

Underweight/Anemic mothers

A study conducted in West Bengal to evaluate the nutritional status of Adivasi mothers and child feeding patterns showed that the nutritional status of the child (i.e. anemia or any anthropometric failure) was related to the substantially underweight and anemic status of mothers (Stiller et al., 2020). Another study examining the relationship of maternal nutritional status with the nutritional status of malnourished children under two years of age showed similar findings (Bari et al., 2020). The chances of under-nutrition were higher in infants whose mother had not consumed iron-folic acid tablets during pregnancy (Meshram et al., 2019) or had low BMI/anemia (Chyne et al., 2017; Hashmi et al., 2019; S. Khan et al., 2019; Wang et al., 2015).

Recent illness

A recent episode of disease for instance, diarrhoea, anemia, and acute respiratory tract infection have been shown to be one of the many factors causing malnutrition (Ambadekar & Zodpey, 2017; Huynh et al., 2019; Murarkar et al., 2020; Pokhrel et al., 2016; Pulok et al., 2016; Riaz & Naeem, 2017; Wang et al., 2015; Yue et al., 2016). Studies showed that poor hygiene, inadequate provision of water, sanitation, and no access to hygienic latrine increased susceptibility to intestinal infections which subsequently contributed to undernutrition (Ambadekar & Zodpey, 2017; Hashmi et al., 2019; Hoq et al., 2019; Nisar et al., 2016; Ravindranath et al., 2019). Also, low-birth-weight babies are highly susceptible to infections and, consequently, undernutrition (Meshram et al., 2019).

Parenting practices

Time on childcare

It was found that mothers rarely had time left for childcare owing to high daily workload, satisfying other family members, engaging in income-generating activities, and other domestic works. These living conditions eventually contributed to undernourishment of children and their mothers (Ambadekar & Zodpey, 2017; Bhanuja et al., 2019; Chaturvedi et al., 2016; Hashmi et al., 2019; S. Khan et al., 2019; Mya et al., 2019; Ravindranath et al., 2019; Stiller et al., 2020). A lack of support from husbands due to several factors (e.g. lack of time, busy in job, tiredness, and shame in doing household chores) further reduced the time on childcare spent by mothers (Chaturvedi et al., 2016; Sharma et al., 2020).

Traditional beliefs about child-care feeding

It was shown that owing to the influence of elders, mothers had to adhere to traditional beliefs and discard the colostrum, eventually depriving the new-borns from colostrum (Meshram et al., 2019; Stiller et al., 2020). The authors highlighted the need to modify cultural habits, prioritized proper supervision, care, physical, cognitive-emotional stimulation of children by whole family (Stiller et al., 2020). Sharma et al. (2020) highlighted the role of cultural factors in the initiation of complementary foods.

Surprisingly, it was shown that the dietary diversity introduced by mothers comprised of single food groups with low energy density and the role of culture was significant in reinforcing such dietary diversity (Hashmi et al., 2019; Ravindranath et al., 2019; Wang

et al., 2015). Cultural taboos, in the form of prohibiting serving ocean fishes and solely giving porridge to children were common practices of feeding among stunted children in an Indonesian village (Soesanti et al., 2020). Similar findings were shown in other studies (Bhanuja et al., 2019; Hashmi et al., 2019; Hoq et al., 2019; L et al., 2017; Yue et al., 2016).

Responsive feeding

Responsive feeding was not frequently practiced or integrated in mother-child care and mother uses to sit behind the child, thus maintaining little eye-to-eye contact which reduced child's motivation to eat (Stiller et al., 2020). A recent study showed nutrition education intervention significantly improve responsive feeding of infants by mothers compared to threatening or bribing infants if they were not taking food in the intervention group (Sharma et al., 2020). Likewise, a study characterizing the feeding and caring practices of disadvantaged urban Indian children showed that half of the mothers could be categorized as responsive caregivers (Houghton et al., 2020). Furthermore, maternal depression was shown to be the cause of nonresponsive feeding (Joshi & Raut, 2019).

A study assessing the role of the father in child undernutrition classified majority of the fathers as uninvolved or authoritative in their feeding style (Inbaraj et al., 2020). The authors showed that fathers, especially from Muslim joint-families, were mostly uninvolved in child feeding due to the belief that mothers are responsible for the child's feeding.

Discussion

This paper reviewed 44 studies, published between 2015 to 2021, in Asian countries regarding parenting feeding practices, knowledge and behavior, to understand growth stunting among young children.

In term of gender differences on the prevalence of stunting under-five years old children, there were mixed findings between studies, though male children with stunting problems were reported more compared to females. This dominance of stunting in males challenges prevailing views within the nutrition community that females are more prone to undernutrition. The studies included in this review, though reported gender differences, did not acknowledge or explore them. Thus, due to absence of direct evidence related to gender differences, the reasons are discussed speculatively. The findings can be due to a higher rate of female child owing to certain diseases, parental caregiving behaviors, socioeconomic status, birth order as well as family composition (Kuntla et al., 2014). The empirical evidence around the globe has reported similar findings regarding presence of wasting, stunting and underweight among males (Díez-Navarro et al., 2017; Khara et al., 2018; Thurstans et al., 2020; Wamani et al., 2007; Wells, 2000).

Various reinforcers of stunting or growth faltering were identified across Asian population such as primary care provider's education, household wealth status, adequate health service support, and support from family members in caring for children. Primary care provider, specifically mother's education level is the principal factor influencing the nutritional status of children (I. Haq et al., 2021; Poda et al., 2017; Talukder, 2017), and a higher mother's education level is linked to lower rates of stunting in children (A. Srivastava et al., 2012; Talukder, 2021). Children from the rural or lower SES are found to be more stunted compared to their counterparts (Pradhan, 2010; M. Rahman & Sultana,

2019; Saadah et al., 1999). The reasons for such a dominance are complex and multi-fold, however the most substantial is sickness (e.g. diarrhoea and fever) (Fekadu et al., 2015; Poda et al., 2017).

Factors that inhibit stunting or adequate feeding practices are exclusive breastfeeding, misunderstanding of feeding practices/process, lack of importance of complementary foods, poor food habit/low energy density foods/poor protein-based foods, underweight/anemic mothers, and recent illness. These findings coincide with the studies conducted in Latin America, Asia, and Sub-Saharan Africa (Bhalotra & Rawlings, 2011; Cruz et al., 2017; Danaei et al., 2016; Kuchenbecker et al., 2015; Özaltın et al., 2010; Subramanian et al., 2009). Meanwhile, in terms of parenting availability, the data contributes a clearer understanding of three common reported practices which are (a) time on childcare (b) traditional beliefs about child-care feeding, and (c) responsive feeding. Specifically, in the low/middle-income countries (LMICs), the previous empirical evidence highlighted that presence of equal household status among males and females approximately reduced stunting by 13% (13.4 million) in South Asia and 3% (1.7 million) in Sub-Saharan Africa (Smith et al., 2003). This preliminary finding supports the importance of gender equality in childcare and child health. Overall, these findings are limited in their generalizability owing to absence of one growth standard to assess stunting, heterogenous sampling methodologies and data collection methods. Thus, recommendation is to lodge and archive national survey datasets with the respective departments of health so that these data can be re-analyzed if necessary in the future. Doing this would enhance thorough monitoring of malnutrition, recognition of susceptible communities and individuals, and improvement of national policies and local programs.

Various LMIC in rapid transition, for instance Brazil and India, have implemented a multi-sectoral strategy. This strategy involves the execution of interventions against stunting that are equity driven, nutrition sensitive and particular to the targeted populations. Such a multi-sectoral strategy has brought a substantial reduction in the rates of stunting. The success of the strategy has been owing to merging interventions into programs of various institutional divisions that are directly or indirectly associated to the management of stunting (for instance, governmental policies). Improvements at various levels such as the buying power of low-income families, education level of women, sanitation systems, access to primary healthcare, and active participation of the community has been shown to result in reduction in stunting (Ferreira et al., 2020; Said-Mohamed et al., 2015). Other strategies targeting individual-level factors, such as nutritional interventions, were also protective (Campos et al., 2020; Pearson et al., 2018). Nevertheless, such programs or nutritional interventions may not mitigate child stunting if they are isolated from other systems, such as involvement of a multi-disciplinary team comprising nutritionists, dietician as well as psychologists to improve child health and developmental outcomes.

Based on the present systematic review, to support these behaviors, at community and higher levels, policies and interventions must aim to implement the International WHO Code of Marketing of Breastmilk Substitutes as well as local legislation to limit hospital use of infant formula; increase paid maternity leave up to 6 months with appropriate support systems that enable breastfeeding maintenance to assist females working in the formal sector; execute means of maternity cash transfer to assist females working in the informal sector; enhance the training of healthcare providers to raise the standard of

services given to mothers and their children; permit food systems to give healthy and safe foods; and enhance involvement of psychologists/counsellors for breastfeeding, nutrition and pre-marital counselling, and dealing with concerns in this regard (Campos et al., 2020; Cumming & Cairncross, 2016; De Onis et al., 2013b; Hernández-Cordero et al., 2019; Pearson et al., 2018; Vilar-Compte et al., 2019).

Implications towards mental health, well-being and development

Well-adjusted and composed energy and protein supplementation, which offers coarsely 25% of the over-all energy supplement as protein, is a significant intrusion for the inhibition of adversative perinatal consequences in undernourished females. WHO endorses nutrition schooling and growing daily energy and protein consumption aimed at pregnant women in malnourished inhabitants, to decrease the jeopardy of low-birth-weight newborns (Child, 2015). Community-based podiums for nourishment schooling and raise are also very significant for mental health, well-being and development. Community healthiness workers are talented to gadget many of these developments and have potential to recover child health and food consequences among inhabitants that are problematic to reach (McGuire, 2015).

Government pledge and emphasis on even handedness will also play a vital part in monitoring child's stunting. A government's obvious and vigorous pledge to, as well as work on, equity is also an imperative factor that centrals to the application of intrusions that prevent and treat child stunting. Infectious diseases triggered by a deficiency of sterile conditions and clean water are vital elements of child stunting. It is important to monitor health discriminations (Chen et al., 2014). Additionally, various sectors other than health sector have role in reducing and nutrition-related strategies to manage stunting. For instance, the education sector can design strategies to prevent adolescent pregnancy and enhance higher education and empowerment of females, for instance (Higgins-Steele et al., 2016; Prentice, 2017). Participation of community is vital to recognizing pregnant women experiencing food insecurity and to relieve their access to health and social services; subsequently, community members can assist in the recognition of appropriate strategies for stunted children (Menon et al., 2016). Psychologists can offer pre-marital counselling to specially help the couples in proactively managing issues such as time constraints, maternal depression, absence of family support, and breastfeeding while working. The financial development sector may assist the health sector by encouraging community workers to monitor stunting; the communication sector is pertinent for observation and intersectoral alliance; empirical investigations reinforce the idea that the academic sector should also carry the duty of merging the knowledge on management of stunting (Hoddinott et al., 2016; Rueda-Guevara et al., 2021). Effective multi-sectoral partnership programs for the management of stunting to deal with it show that this public health issue can be prevented by multiple segments of society; by increasing public knowledge and involvement.

The management of stunting needs steps to enhance knowledge at individual, community, and governmental level regarding improving nutrition, giving health education specifically involving providing health literacy to both parents to optimize nutrient intake of mothers during pregnancy, maintenance of exclusive breastfeeding for infants as well

as pre-marital training, and giving appropriate complementary foods intake to toddlers as required.

The recommendations of this review are relevant at various levels. At governmental level, national information and monitoring systems should be developed to generate data to assist policy-makers manage the nutrition-related issues in due course. Statistics on inhibiting factors and their avoidance, nutritional programs, and multi-sectorial partnership should all be part of the monitoring and data-recording systems. Policymakers should enhance knowledge and educate health workers on the significance of antenatal follow-up and pre-marital counselling. It is significant to avoid or control stunting, since those who are agonized will be more vulnerable to illness and tend to change deteriorating illnesses and development catastrophe before the age of 12 months which disturbs figure in adulthood. In addition, it disturbs the children's aptitude level. Therefore, it is very imperative to study stunting elements and causes based on this organized review so that suitable intrusions can be done (Tahangnacca et al., 2020). Finally, further exploration from multi-sectoral collaboration perspective is needed.

Strengths and limitations of the study

The strengths of this review using a well-established PRISMA guidelines to perform a comprehensive and rigorous systematic search and guide the inclusion of literature, along with using existing tools of quality assessment. The present review's search comprised multiple and widely recognized electronic databases and consistent and reproducible data extraction through a predesigned checklist to minimise errors and bias (Moher et al., 2009). Furthermore, screening of abstract and full-text articles as well as data-extraction were executed by two authors and checked by third author to safeguard consistency.

This review also has some limitations. It included studies published only in international and peer-reviewed journals, thus, there is a possibility that important unpublished data, grey literature, local/internal reports or articles published in non-indexed journals may have been missed. This review may be limited as it included studies only published in the English language. Additionally, owing to absence of standardisation of measures of parental feeding practices, measures of stunting and dietary intake, this review is only based on a thematic analysis. Nevertheless, based on suggestions offered, meta-analysis can be conducted in future. Most of the included studies are based on cross-sectional design, hence, attributions of causality or bidirectionality of relationships cannot be made (Gerards & Kremers, 2015). As a child's development is moulded by shared relations between parent and child (Skouteris et al., 2012; Sleddens et al., 2011), identifying how parents react to child characteristics can assist in designing bi-directional longitudinal studies.

Implications for future research

A basic finding of this review is that child stunting in Asian is influenced by multiple factors. Nevertheless, the cross-sectional design of included studies has made inferring conclusions about directionality of the associations challenging. The association of factors such as literacy of primary care provider, feeding practices, poor diet, SES status,

breastfeeding, age and number of children in family, vaccinations, etc are multifaceted, multi-directional and complex. Hence, longitudinal analyses are suggested to investigate these variables and their interactions. This systematic review presented a preliminary step to an enhanced comprehension of gender differences in stunting and suggests the need to consider potential implications for policy and practice. Future empirical investigations should try to unveil the intricacies related to age, biological and social risks (such as gender norms) and the context. Specifically, it is mentioned that the reasons for the observed gender differences are discussed speculatively. Any hypotheses should be more directly investigated in future studies to develop proper understanding of gender differences in the context of stunting to establish the implications of such differences for programme staff and policymakers. Studies should also focus on thorough assessment of factors influencing outcomes for males and females for instance, epidemiological, demographic and social differences, investigate the causes of gender, age, behavioral differences in nutritional outcomes and mortality.

Additionally, the information related to temporal stability of feeding styles and practices is limited, and that parents may adjust the feeding-styles as children grow and adopt new eating patterns. This adds to the need to conduct longitudinal investigations in this area. Lastly, this study has brought forth adjustable factors, for instance, parenting and feeding practices, on children's stunting. While, in theory, feeding practices can be more resistant to modification compared to individual feeding practices, there is limited evidence supporting the rigidity of feeding practices. Contrarily, the findings of this review that highly educated mothers/primary caregivers have unique feeding practices than less educated mothers (D'Alimonte et al., 2016; T. Rahman et al., 2021; S. Srivastava & Kumar, 2021) indicate that environmental factors, possibly in involving nutritional and educational interventions, could impact parenting and feeding practices. Future research can investigate this line of inquiry by designing appropriate interventions.

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Data statement

All data generated or analyzed during this study are included in this published article (and/or its Supplementary Information files).

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