

Factors Associated With Child Undernutrition In Pakistan: A Systematic Review

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Abstract

Evidence suggests that undernutrition among children remain high in Pakistan. The aim of this systematic review of literature was to determine the prevalence of undernutrition and its factors associated with children under five years in Pakistan. A systematic review was carried out by using the most relevant published studies between 2000 to 2019 by different electronic databases searching engines, namely Science direct, PubMed, Scopus, CINAHL, Embase and PsycINFO. The research articles consist child undernutrition related data in Pakistan were assessed. Searching key words were “under-nutrition”, “malnutrition,” “wasting,” “stunting,” “under 5 years,” “Pakistan,” “associated factors,” “children,”. A total of the 608 preliminarily retrieved articles, 14 were met with study included criteria. The most consistence emerging themes on child undernutrition literature review were; low birth spacing, low family income, child age group, gender, small birth size, early marriages, large family size, mother’s education and lack of breastfeeding. There is a need for mixed method and qualitative studies to understand an insight into the factors associated with child undernutrition in Pakistan. To achieve a sustainable improvement, there is a need for community-based holistic multi-strategy method that targets the child undernutrition associated factors, therefore, the WHO global nutrition target to 2025 can also be achieved.

Keywords Children undernutrition, malnutrition, factors, prevalence, Pakistan, systematic review, developing country

Introduction

Undernutrition is determined as a nutritional state in which energy deficiency, protein, clinical outcome, as well as other nutrients lead to measurable but adverse effects on body form (size, composition and shape), tissue and function (Abizanda et al., 2016). Undernutrition around the world has led to around half of the morbidity and mortality among children under the age of five and with over six million deaths accruing

each year (Binagwaho et al., 2020). In addition, undernutrition impaired children’s physical and mental growth (Black et al., 2013), as well as results poor educational achievements (Stewart et al., 2013). It’s can also compromise with multiple diseases as well as weaken immune system and growth failure in the later life (Herrador et al., 2014). Child undernutrition still remains a major concern for public health in developing countries. Africa and Asia extensively contribute to the all

type of child undernutrition, while Asia remains home to even more than half all over stunting children in world as well as more than two-thirds all over wasting children (FAO, 2018). Globally, 2017 statistics shows that about 50 million and 159 million under five children were wasted and stunted and one third overall child deaths which is unnecessary loss of about 3 million young lives a year (WHO, 2017). Undernutrition had both (long- and short-term) effects on children's health, and negatively impacts on nations' economic growth (Franke and Barrett, 1975). In Pakistan undernutrition remains the main cause of mortality and morbidity among under five children and in world country was ranked 22nd for child mortality under five years of age (UNICEF, 2016; Bhutta et al., 2011). Stunting underweight and waste are one of the commonly used anthropometric indicators to measure child undernutrition below five years of age from the population (Zemenu et al., 2017). World Health Organization (WHO) classified underweight stunting and wasting is less than -2 standard deviations to Z-scores of weight for age, height for age and weight for height, respectively (WHO, 2009). Stunting and waste show chronic and acute nutritional deficiency exposures, respectively. In contrast, underweight show both chronic and acute nutritional deficiencies for chronic condition (You et al., 2011). Undernutrition annually caused as at least for half of all child deaths under five years of age (Liu et al., 2015). World Health Organization (WHO) reported that in 2016 at least 99, 52 and 155 million children under five years of age were underweight, wasted and stunted respectively worldwide (WHO, 2016; Black et al., 2013). Evidence suggests that understanding the determinants of child undernutrition is essential. Hence, this systematic review aimed to identify determinants of undernutrition in under five children. Pakistan is among the countries with the highest rates of child undernutrition in the world, and all its development in child health

and nutrition continues poorer than that of other countries of South Asian regions (Bhutta et al., 2013; Black et al., 2013).

SEARCH METHODS

Search strategy

Undernutrition topic as public health problem included several databases namely Medline, PubMed, Scopus, social science citation index, NCBI and Google Scholar. A number of terms and key words such as undernutrition “determinants of malnutrition” “factors of child undernutrition < 5 years in Pakistan”, “child malnutrition < 5 years”, “children nutritional status < 5 years”, “undernutrition and children health”, and “under five years children health condition, databases were searched with a combination of all terms and with AND, OR.

Anthropometric Indicators

Undernutrition is widely regarded as malnutrition unless and until that is not specified (Shetty, 2006). In this systematic review three anthropometric indicators underweight, wasting and stunting were retained. Furthermore, weight-for-age “underweight” indicator stands for a compound index of weight-for-height and height-for-age. It includes the both into account without any distinguish, stunting as chronic undernutrition and wasting as acute undernutrition. Weight-for-Height “wasting” indicator access current nutritious status and body mass with height. Height-for-age “Stunting” is a measurement to retardation in linear and cumulative growth among children. This study focuses on child Z-score < - 2 standard deviations of WHO reference population (WHO, 2006).

Inclusion and Exclusion Criteria / Study Eligibility and Selection

In this review article included studies were if they (1) were conducted in Pakistan; (2) were most relevant published papers in between 2000 -

2019; (3) examined child undernutrition type as underweight, wasting and stunting associated factors; (4) focused on under five years children (5) were only cross-sectional researches (case studies, qualitative studies, policy briefs, thesis and books were not included) and (6) in this study, debates searching was limited to journal articles and English language (letters to the editors, review papers and case studies were not included). Inclusion criteria for this study was association between child undernutrition and socioeconomic factors, child undernutrition prevalence, determinants as risk factors. On the other side, various papers were examined as double burden of malnutrition, obesity and malnutrition in primary school children were discarded.

Results

At the first stage, using medical subject heading different search Engines, by different keywords 235 papers were searched. At the second stage, screening article were based through the titles and abstracts furthermore, irrelevant and duplicate papers (such as opinion, review papers letter to editor and reports) were excluded. At the third stage, to review the title 70 articles were selected and from these selected articles full abstracts were studied and screened. At the fourth stage, exclude or include decision for paper was done based on whole article. At the six and final stage, in this review paper 14 relevant articles were included and selected to accomplish the study. Figure for search strategy.

For study selection articles can be showed as under.

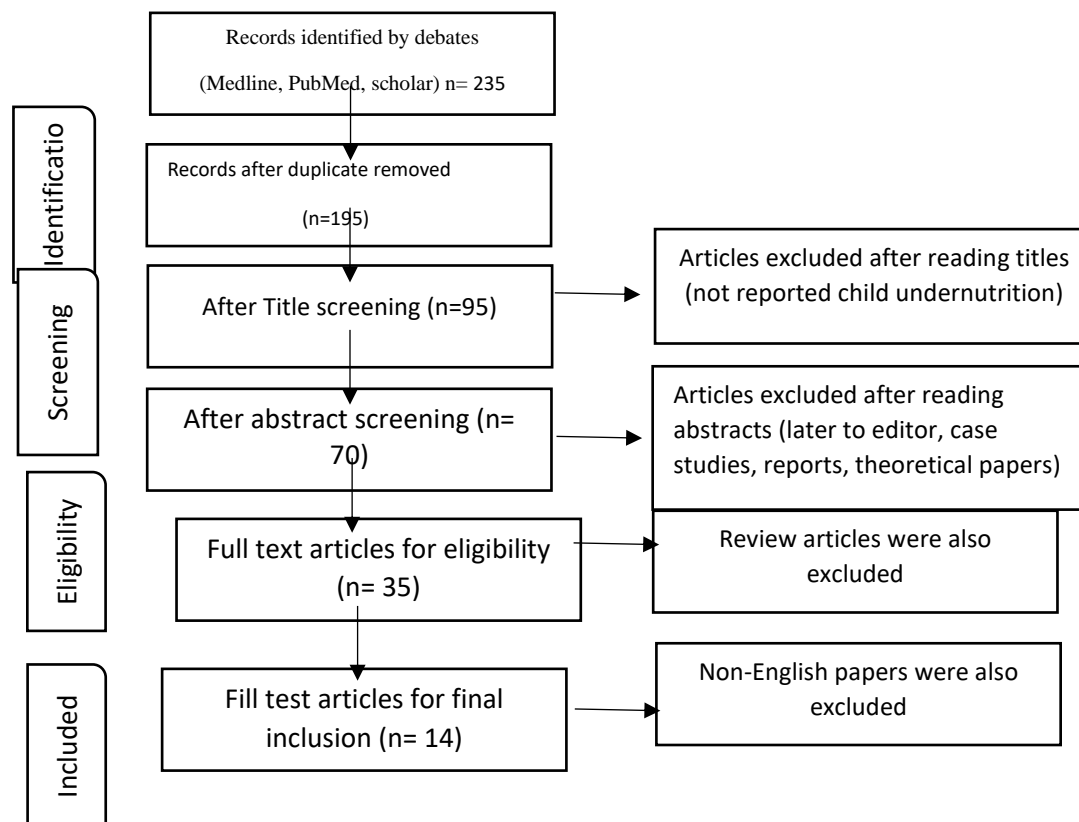


Figure 1. The study selection process

Characteristic of study

The included review studies summary is presented in (Table 1). However, all cross-sectional design studies were included in this research. The included studies sample size ranged from 100 (Mahmood et al., 2016) to 3964 (Khan et al., 2016). All included studies were conducted with under five years age group. Nine studies were conducted with participant age < 5 years (Kumar, et al 2019; Khan et al., 2019, Abbasi et al., 2018, Mahmood et al., 2016, Khan et al., 2016; Achakzai and Khan 2016; Hasnain et al., 2010; Hasnain and Hashmi, 2009; Ansari et al.,

2006). Two studies were conducted with the age of 6-59 (Ali et al., 2015, Ahsan et al. 2017), one study was 0-35 age (Nuruddin and Hadden, 2015), one study was < 2 years (Tariq et al. 2018) and one study was < 3 years studies (Shah et al., 2003). Among all studies, eight were conducted in rural areas, two studies were carried out in urban settings and four were conducted in both (urban and rural) settings. All studies were cross-sectional and using WHO/NCHS criteria for the classification of undernutrition (Table 1).

Table 1. Description of selected studies.

Name	Data type	Subject	Sample size	Population	Undernutrition assessment	Study design	Urban/rural	Geographical Region
Kumar, et al 2019	Secondary data from MICY	Children	24042	< 5 years	WHO z score	Cross-sectional	Urban/rural	Punjab, Pakistan
Khan et al., 2019	Secondary data from DHS	Children	3071	< 5 years	WHO z score	Cross-sectional	Urban/rural	Pakistan
Abbasi et al., 2018	Secondary data from DHS	Children	3071	< 5 years	WHO z score	Cross-sectional	Urban/Rural	Pakistan
Tariq et al., 2018	Secondary Data from DHS	children	984	< 2 years	WHO z score	Cross-sectional	Urban/Rural	Pakistan
Ahsan et al., 2017	Community based	Children	304	6-59 Months	WHO z score	Cross-sectional	Rural	Tharparkar, Sindh
Mahmood et al., 2016	Hospital based	Children	100	<5 years	WHO z score	Cross-sectional	Urban	Rawalpindi, Punjab
Khan et al., 2016	Community based	children	3964	<5 years	WHO z score	Cross-sectional	Rural	Thatta and Sujawal, Sindh
Achakzai and Khan 2016	Community based	Children	104	<5 years	WHO z score	Cross sectional	Rural	Quetta, Baluchistan
Ali et al., 2015	Community based	Children	446	6-59 Months	WHO z score	Cross-sectional	Rural	Nowshera, KPK
Nuruddin and	Secondary data from DHS	children	1051	0-35 Months	WHO z score	Cross-sectional	Rural	Thatta, Sindh

Hadden,2015								
Hasnain et al., 2010	Community based	Children	800	< 5 years	WHO Z score	Cross-sectional	Rural	Dadu, Sindh.
Hasnain and Hashmi, 2009	Community based	Children	800	< 5 years	WHO Z score	Cross-sectional	Rural	Dadu, Sindh.
Ansari et al., 2006	Community based	Children	399	<5 years	WHO Z score	Cross-sectional	Urban	Karachi, Pakistan
Shah et al., 2003	Community Based	Children	1878	<3 years	WHO Z score	Cross-sectional	Rural	Sindh

DHS, Demographic and Health Survey; MICY, Multiple Indicator Cluster Survey; KPK, Khyber Pakhtunkhwa; WHO Z score, World Health Organization standard score

Topographical coverage of region with undernutrition

Mostly child undernutrition studies conducted in Sind provinces and then in Punjab provinces. More than half of the Pakistan's population found Punjab. However only two researches were carried out in Punjab. One research was conducted in central Punjab, Rawalpindi, while another study conducted the in all Punjab by Multiple Indicator Cluster Survey 2014 (MICY) using secondary data analysis. To understand the severity of problem yet many divisions and districts of Punjab have not to be studied still. Five studies were conducted in the province, Sind, which all were conducted in the rural areas of Sind. However, only one study has been conducted in KPK, Nowshera on child under nutrition. One study was conducted in Quetta, Baluchistan and one study were conducted in Karachi. There was no study was conducted in Federally Administrated Tribal Areas (FATA), Azad Jammu Kashmir and Gilgit Baltistan related to child undernutrition.

Child Gender

Gender is a vital indicator for child undernutrition. A study reported that gender was important determinant which contribute to underweight prevalence in under five years children. The boys have more probability of being underweight then that of girls (kumar et al., 2019). Same results found by Nuruddin and Hadden, (2015) that girls had significantly greater risk of underweight as compare to boys as well as stunting. Many other studies, including Khan et al. (2016) and Shah et al (2003), determined that stunting was higher in boys as compare to girls. Same results found by Furthermore, Ansari et al. (2006), reported that boy child were 3 times less likely to have stunting than that girls. As same results were found by Pakistan Demographic and Health Survey 2017-18, that the child underweight prevalence was high in boys 24% then to girls 22.1% as well as girls have slightly lower 37.1% in stunting than to boys 38.2 % (NIPS and ICF, 2019).

Undernutrition and child Age

In different studies severity of child undernutrition was highlight in a particular age group. Kumar, et al. 2019 assessed that 12 - 23 months children were one and half times more

likely to have underweight, however, 36 - 47 months children were two and half times more likely to have underweight. Abbasi et al. 2018 and Ahsan et al. 2017 assessed that child age > 2 were highly associated with underweight and stunting. Tariq et al. 2019 also found underweight, stunting and wasting prevalence was also increased with the children age. While, Nuruddin et al. 2006 found that child underweight, wasting and stunting prevalence also decreased with the child age less than 2 years.

Discussion

Stunting wasting and underweight consistent associated factors are presented in (Table 2). Such as, child age, gender (female), less child birth weight, mother less education, age of mother, father less education, small size at birth, large family size, low breastfeeding, poverty, no toilet facility, source of drinking water (unimproved), higher birth order, rural residence, diarrhea and low information access. Some other associated factors were also reported such as lack of vaccination, multiple births, short birth interval, presence of disable member in family, and absence of exclusive breast feeding (EBF).

Table 2. Key findings of under reviewed studies

Undernutrition prevalence (%)				Child undernutrition associated factors
Authors name	Stuntin g	Wastin g	Underweig ht	
Kumar, et al 2019			33	Child Gender, age, diarrhea, birth order and child birth size was major determinant which contribute for prevalence of underweight among children. Girls are more underweight then boys. The risk to being underweight also increased between 12-23 and 36-47 months of child age.
Khan et al., 2019	44.4	10.7	29.4	Children lived in urban areas, mothers less than 3 times antenatal visited during pregnancy and mothers aged ≤ 18 years at marriage were more likely to be stunted. child's small size at birth, short height, mother's low educational level, and low BMI were associated factors of underweight among children. Mothers no education were found highly associated factor of children wasted
Abbasi et al., 2018	45.1	10.4	26.7	Older age of mother, small birth size child age > 2 years, ≥ 5 birth order, diarrhea, mother education, rural residence and no toilet facility were highly associated with underweight and stunting. However, diarrhea mothers no education Sindh and Baluchistan regains were affecting indicators for wasting.
Tariq et al., 2018	28.3	12.1	27.9	The incidence of being underweight, wasting and stunting higher with the children age. Higher birth order, low BMI of mother, no vitamin A consumption low information access, lack of toilet facility, rural

				residence, and father's education increased the risk of underweight and stunting. No breastfeeding in children increased odds of wasting.
Ahsan et al., 2017	38	19.1	33.2	Within second year of child's age undernutrition were found significantly. Predictors associated with child stunting were found as large family size, mothers' illiteracy, >4 pregnancy, child mortality within 6 months, no breastfed to child and vaccination status
Mahmood et al. 2016			32	Mothers illiteracy and presence of disable member in family significant association with child malnutrition.
Khan et al., 2016	48.2	16.2	39.5	Stunting was higher in males as compare to females. Stunted, wasting and underweight risk highly increased with poorest households. Diarrhea was found as a risk factors for child underweight.
Achakzai and Khan, 2016	48.1	9.7		Results shows that wasting and stunting significantly associated with child health related factors, maternal health factors and socio-demographic factors.
Ali et al., 2015	8.5	4.0	11.4	According this study contributing factors of child undernutrition were as early and late child weaning, Father's Illiteracy, large number of family size, poverty and absence of exclusive breast feeding (EBF).
Nuruddin and Hadden, 2015	52.9	22.9	46.5	Girls had significantly greater risk of underweight and stunting, as compare to boys. Maternal literacy significant associated with underweight and stunted. Sick children had greater risk of wasting.
Hasnain et al., 2010	61%			Stunting associated factors was birth interval < two years two years and ethnicity.
Hasnain and Hashmi, 2009			54.3	Many factors for child underweight were consanguinity, low birth weight and lack of breastfeeding.
Ansari et al., 2006	22.1	9.6	23.9	Lack of feeding knowledge in mothers, child health care practices and food insecurity were the highly contributory factors toward child stunting. Girls were found three times more stunted as compare to boys.
SHAH et al., 2003	55	26		children belong to overcrowded families, poverty and lack of mother education were responsible factors of stunting. Males more like to have stunting than female child.

Evidence from reviewed studies

Epidemiology of child undernutrition

The prevalence of undernutrition in Pakistan's different regions is presented above (Table 2). Studies have been carried out in different parts of Pakistan, there is no national study yet. Latest Pakistan demographic and health survey 2017-18 reported that under five years of age 38% of children were stunted, 7% children were wasted and 23% children were underweight (NIPS and ICF, 2019). While, according Pakistan National Nutrition Survey 2018, four in ten 40.2% were stunted, 17.7% were wasted and one out of three 28.9% were underweight under the age of five years children (Government of Pakistan and UNICEF, 2019). In both national studied, undernutrition as stunted wasting and underweight is widely varied. Similar results were presented in under review researches, in this study. United Nations International Children's Fund (UNICEF) reported that global rate of wasting is 7 %, stunting is 23% and underweight is 16% among under five years children. keeping in mind, the worldwide burden of undernutrition, Pakistan always faced the greater burden of from all types of malnutrition in all of the previously published studied in this review. The government will introduce policy initiatives to reduce the all forms of child malnutrition burden in Pakistan. In this study, the under reviewed researches due to different geographic areas, sample size, method of studies, and specific measuring techniques for undernutrition, all types of child undernutrition prevalence are varied in each study. According this study, the prevalence of undernutrition is shown in Table 2.

Prevalence of child undernutrition

In term of underweight, wasting and stunting different cross-sectional regional researches show different results due to different geographical area and sample size. According to the under reviewed studies, the prevalence of

undernutrition among children is presented in Table 2. In a study Khan et al., 2019 found that stunted children were 44.4%, wasted were 10.7% and underweight were 29.4%. Similar finding was also presented by the Abbasi et al., 2018 that 45.1% children were stunted, 10.4% were wasted and 26.7% were underweight. A study by Tariq et al. 2018 evaluated that underweight, wasting and stunted children under five years of age were 27.9% 12.1% and 28.3% respectively. Another study in Tharparkar, Sindh assessed that stunted child were 38%, wasted were 19.1% and underweight 33.2% at under five years age (Ahsan at al., 2017). Another study conducted by Khan et al 2016 found that 48.2, 16.2 and 39.5 children were stunted, wasted and underweight in Sindh. The reported rate of undernutrition is widely varied; the highest rate of undernutrition as stunting, wasting and underweight was 61, 54.3, and 26 respectively (Hasnain et al., 2010; Hasnain and Hashmi, 2009; Shah et al., 2003). Among all regions, under reviewed studies the highest underweight, wasting and stunting prevalence was reported in Sindh. Furthermore, in KPK, Nowshera the lowest undernutrition prevalence was such as underweight wasting and stunting was 11.4, 4.0 and 8.5, respectively (Ali at al., 2015).

Factors associated with child undernutrition

Many researchers emphasized that demographic, socioeconomic, and lifestyle related factors remain responsible for child undernutrition. In all under review studies factors associated with undernutrition are described in (Table 2). According a study, urban areas children were found more stunting. From under reviewed studies above-mentioned factors have a strong association with child undernutrition as stunting, wasting and underweight. According to Kumar et al. 2019 child gender, age, diarrhea, birth order and child birth size was major determinant of underweight among children. A study conducted

by Hasnain and Hashmi, (2009) found that consanguinity, low birth weight and lack of breastfeeding are the main factors of child being underweight. Another study was shown that mother's illiteracy and presence of disable member in family were significant associated factor of child undernutrition as underweight (Mahmood et al., 2016). Khan et al. 2019 stated that children lived in urban areas, mothers less than 3 times antenatal visited during pregnancy and mothers aged ≤ 18 years at marriage were more likely to be stunted. child's small size at birth, short height, mother's low educational level, and low BMI were associated factors of underweight among children. Mothers no education were found highly associated factor of children wasted. In Pakistan, people rapid urbanization for better living conditions and work can be the reason of increased stunting incidence in urban areas. This high stunting trend in urban settlement can due to the reflective of urban life style and due to dietary choices. Abbasi et al. 2018 pointed out that older age of mother, small size at birth, child age > 2 years, ≥ 5 birth order, diarrhea, mother education, rural residence and no toilet facility were highly associated with underweight and stunting. However, diarrhea mothers no education Sindh and Baluchistan regains were affecting indicators for wasting. Tariq et al. 2018 stated that the incidence of stunting, wasting and underweight increased with the age of child. Mother's BMI, higher birth order, rural areas, low information access, unimproved toilet and father's education increased the risk of underweight and stunting. No breastfeeding in children increased the risk of being of wasting. Ahsan et al. 2017 stated that predictors associated with child stunting were found as large family size, second year of child's age mothers' illiteracy, > 4 pregnancy, child mortality within 6 months, no breastfed to child and vaccination status. Khan et al. 2016 found that underweight, stunted and wasting risk highly increased with poorest households and diarrhea

was found as a risk factors for child underweight. According to Ali et al. (2015), early and late child weaning, father's illiteracy, large number of family size, poverty and absence of exclusive breast feeding (EBF) were associated factors of child underweight. undernutrition is directly connected with mother's illiteracy, poverty and large family size. In Pakistan, almost six members per household remain the typical size of family and for the whole family only a person is fulfilling the social, biological and economic necessities. Nuruddin and Hadden, 2015 pointed out gender and maternal literacy associated with child underweight and stunted while sick children had greater risk of being wasting. Ansari et al. 2006 stated that lack of feeding knowledge in mothers, food insecurity and health care practices were the major factors of stunting in children. Achakzai and Khan, 2016 found that there is a strong association with maternal health factors, socio-demographic factors and child health factors with child stunting and wasting. Shah et al. 2003 pointed out that mother's illiteracy, child gender, poverty, children in overcrowded houses were highly associated factors with stunned. Households with large family size and low income tend to have uneducated parents where for food families having no enough money to spend and that's are prerequisites for child nutrition and health. Parent due to lack of education also have not adequate knowledge and awareness toward initiation of complementary feedings and exclusive breastfeeding of child that's leads to child growth failure. Hasnain et al. 2010 found that birth interval < 2 years two years and ethnicity were associated factors of child stunting. However, most of the indicators was associated with stunting and underweight and only few factors were wasting were identified with wasting.

Limitation and strength of study

This study has some limitation because previously research papers were published with

different study nature, varied population type, small sample size, varied child age group and different time spans. Under reviewed studies had two type of population categories i.e., hospital-based and community-based studies. Both groups of studies have very much variation in results, therefore to draw conclusion was very difficult about the associated factors toward child undernutrition. Most of under reviewed studies had small sample size, and their results cannot be generalized. Almost one fourth studies done with secondary data analysis, there is need for conducted studies with primary data analysis. Hence, it is recommended that studies needed to be clear in term of study nature, type, target population and sample size of the research, for better understand the problem being investigated. To know the child undernutrition real current situation, there is a need for more studies conducted with more homogeneous approaches in demographic and socio-cultural context. However, this study reviewed previously published paper and found the widely applied technique to measure undernutrition among child and neglected research regional areas in Pakistan. This study can help researchers in future for target the population and design methodology and also highlighted the mostly used method to measuring the child undernutrition, geographical areas, methodological gaps, varied study and designs. In this study, it is important to note that no validity measurements for child undernutrition were included in all the reviewed studies; no food insecurity assessments and nutritional assessments were included or made in all studies.

Conclusion

Undernutrition related causes are interdependent and multifactorial. In Pakistan, the all type of undernutrition prevalence identifies higher than the world verge rate. Results shows that undernutrition starts from child early age and remain at later age. Although, child age group between 6-23 is the most vulnerable which was

utterly neglected for in-depth study to infant and young child feeding (IYCF) practices. Mostly researchers working with anthropometric indicators as underweight, wasting and stunting according the WHO/NCHS guidelines to measure nutritional status of children. It was found that in rural areas of Pakistan child undernutrition higher intensity prevails. Keeping view the geographical area, most of the researches was carried out in Sindh then Punjab and Baluchistan, however by researchers largely neglected areas were Federally Administrated Tribal Areas (FATA), Gilgit Baltistan, and Azad Kashmir. Low family income, large family size, lack of birth spacing with high fertility rates and no breastfeeding and lack of exclusive breastfeeding (EBF) were found to be the main factors of undernutrition among children. Therefore, there is a need to adopt the community-based multi-strategy approach which addresses the immediate, underlying and basic factors that to child undernutrition. These interventions must include counseling sessions to mothers for strengthen breastfeeding and maternal nutrition practices, public health strategies to promote awareness of the importance of proper health and hygiene practices. Additional initiatives to address child undernutrition will also emphasis on cash transfer programs aimed at reducing hunger and increased food accessibility. Such interventions will bring about more sustainable progress improvement in child nutrition in Pakistan, hence regional background the pathway to achieving the WHO global nutrition target by 2025.

Suggestion for further studies

It is highly suggested that to highlight and understand the lifestyle and culture associated factors with child undernutrition in Pakistan mix method and qualitative studies should be conducted. It is recommended that to identified the factors associated with child undernutrition future studies focus on the type of diet which

given to child by mothers. There is also a need to utilized recall technique of dietary diversity (DD) to identified the preferred food given to child by mothers. Therefore, it is recommended that future studies must be conducted with the infancy stage undernutrition associated factors to highlight the neglected areas problem and also strengthen the child nutritional status. This study found the complete absence of the micronutrition deficiency component, it is highly suggested that further studies focus on micronutrient assessment to exploring the factors associated with all type of child undernutrition. This research suggested as a need's assessment indicator for future studies to explore child undernutrition associated factors with the particular sub-regions within its population.

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