ORIGINAL ARTICLE

Prevalence and Determinants of Food Insecurity and Association with Malnutrition of under Five Children in Aligarh

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Abstract

Background: Food security has always been a major determinant behind development of malnutrition among the under 5 children of India. Even after sustained efforts to alleviate this problem, we are still way behind in achieving our targets. **Aims and Objectives**: To assess the prevalence and determinants of food security, and find association of food security with stunting and wasting of children less than five years of age. **Materials and Methods**: This study among under five children was conducted in field practice areas of Department of Community Medicine, Jawaharlal Nehru Medical College, Aligarh Muslim University, Aligarh. Food security was assessed through Household Food Insecurity Access Scale (HFIAS) while stunting and wasting were assessed by parameters defined by World Health Organization. **Statistical Analysis**: Done using IBM SPSS 20.0 version. **Results**: 41.1% children were found to have low food security and among these 1.8% children have very low food security. Overall, statistically significant association was found between food security and malnutrition among the children ($p<0.05$). Significant association was also found between place of residence, caste, type of family, father's education, father's occupation and mother's education. **Conclusion**: New health policies should be introduced, and already existing programs need to reinforce to curb this menace.

Keywords

Food Security; HFIAS; Malnutrition; Stunting; Wasting.

Introduction

Food insecurity is a measure which can be readily assessed through analysis of non-availability of food, lack of access, improper utilization and instability over a certain time period, it basically measures hunger (1). India ranks 94th out of 117 countries in Global Hunger Index 2020 and has a GHI of 27.2, which comes under 'serious' category (2). Household food insecurity has been regarded as important factors in Indian children, particularly those living in communities with lower socio economic status, for chronic malnutrition. The fundamental causes of food insecurity are not still known, due to inadequate data on the extent and severity of food poverty in Indian houses(3). Food insecurity can also have a high economic impact if households have to spend most of their income on food. (4) India's nutrition levels stands at 15.3% according to recent 2018-2020 estimates by FAO (6). Measurement of stunting is the best overall indicator of children's well-being and provides an accurate marker of inequalities in human development (5, 6) and is a cross-cutting problem calling for a multi-sectoral response (7,8). Wasting is a marker of acute malnutrition and is reversible (4).

Aim & Objectives

1. To determine the prevalence and determinants of food insecurity.
2. To find out the association of food security with linear growth of children less than five years of age.

Material & Methods

This community based cross sectional study based on household survey was conducted in the field practice areas of Rural and Urban health training centres of Department of Community Medicine, Aligarh Muslim University, Aligarh in children aged 0 to 59 months among the registered families of aforementioned areas. The study period was one year i.e. from September 2018 to August 2019. The study was conducted among all the children between the ages 0 to 59 months, while those children in whom exact age could not be elicited, caregivers did not give consent, who were not residing in previously mentioned areas and who were suffering from chronic diseases and congenital malformations were excluded from the study. Simple Random Sampling using lottery method was done to draw the desired sample from each area after obtaining respective sample sizes to be drawn from each of the registered areas under RHTC and UHTC by Probability Proportion to Size (PPS). The sample size for study was calculated using prevalence of wasting i.e. 14.6 percent in Aligarh District as per NFHS4 data (9).Sample size was calculated using following formula:

$N = 1.96^2 PQ / l^2$

Where, N is sample size, P is prevalence Q is 100 – P, l is Absolute error (2.5%),

Taking confidence limit of 95% and substituting the values, the sample was calculated to be 766. Taking 5% non-response rate, the sample size comes out to be 804.3 which were rounded off to 810. Line listing of children under five years of age, in each area was done. Sample to be drawn from each area was calculated according to PPS. From the list, participants were selected and by Simple Random Sampling. If the participant was not found when approached, a second attempt was made. If still not found, participant from next house was taken. Structured questionnaire with close ended questions was used to obtain required information. A pilot study was conducted and required necessary modifications were made in the questionnaire. A questionnaire consisting of closed ended questions was used during the interviews. The questions were asked in Hindi language that is understood and well-spoken in the area. Response rate was boosted by establishing rapport, by repeated contacts and participant persuasion. The questionnaire collected information about the socio-demographic determinants among the study population along with environmental characteristics, information about the child and food security.

Assessment of household food insecurity: Food security of child is measured by Household Food Insecurity Access Scale (HFIAS), which has a recall period of four weeks. It constitutes a series of 9 questions that detect the level of concern and the lack of access to, variety and/or quantity of food. They reflect 3 different domains of food insecurity: 1) Anxiety or uncertainty; 2) Insufficient quality and 3) Insufficient quantity. Participants, for example, were asked whether they worried about not having enough food for household, and answered 'yes' or 'no' from the respondents. If any participants responded in affirmative to any of the 9 conditions, frequency (sometimes, often or rarely) was also enquired (10). The HFIAS score is calculated by Sum of the frequency-of-occurrence during the past four weeks for the 9 food insecurity-related conditions and then by calculating the average of the Household Food Insecurity Access Scale Scores. Houses are classified as four levels of food insecurity in the HFIA indicators as food secure, mild, moderate and severely food insecure. As the households provide more positive responses, their score for food insecurity increases. The questionnaire has shown good internal validity for conducting studies in Indian settings (11). Anthropometry was done using weight for age, height for age and weight for height as parameters for assessment of stunting and wasting (5). In case of children less than 2 years, length was recorded instead of height. Mid upper arm circumference was measured by enwrapping measuring tape around arm at mid-point between elbow and tip of shoulder.

Ethical Considerations: Ethical clearance for the study was obtained from the Institutional Ethics Committee (IEC). Mother of child was informed about the purpose of the visit and the study and informed consent was obtained to participate in study after ensuring full confidentiality of the participant.

Statistical analysis: Data entry and analysis was done using being IBM SPSS software version 20.0. Anthropometric data were entered in WHO Anthro (version 2, 2005) software and converted into two nutritional indices. Z scores of "Height/length for age"(HAZ) and " Weight for height" (WHZ) were computed. Z-scores which were outside the WHO flags i.e. WHZ −5 to 5 and HAZ −6 to 6 were excluded from the data set. Descriptive statistical tests were applied to indicate the prevalence of household food security, stunting and wasting as frequencies and percentages. Bivariate analysis was done using Chi- square test, to find association between quantitative variables. A value of $p < 0.05$ was taken as significant.

Results

The mean age of children participating in the present study was 26.1 ± 16.1 month. Out of 815 children, there were male 50.1% were males and 49.9% were females. Most of the children were found to belong to rural area (60.6%) than urban area (39.4%).

In our study, overall out of 815 children father's age was found to be equally distributed between 20- 30 years (47.4%) and 30-40 years (47%). However, there were 5.6% of children whose father's age was above forty years. In our study, we found 81.7 % of fathers to be literate. Out of this, 18.3% of fathers had completed their primary education. Almost 48.5% of fathers were found to have completed education up to middle school, high school or intermediate. We found that 13.4% fathers were either graduate or postgraduate. In our study 19.9% of fathers were found to be illiterate. (Table 1) also depicts that majority of fathers were pursuing skilled work i.e. 41.3% followed by that 31.4% were doing unskilled work. Almost, 9.6% of father's were doing professional job and 17.4% of them were doing business or were self employed. In our study, only 0.5% of fathers among study participants' parents' were found to be unemployed. The study revealed that overall 52.6% of mothers were literate which is slightly less than the estimated literacy rate for women (58.9%) as per NFHS-4 survey (9). Out of this, 13.4% had completed their primary education, 29.9% of mothers had completed their middle school, high school or inter mediate education. Almost 9.5% of mothers were found to have completed their graduation and higher studies. 47.4% of the mothers were found to be illiterate. Majority of mothers (99%) in our study were found to be home maker. Only 1% of them were involved in work outside the home.

The study population was classified in five social classes according to Modified BG Prasad Classification 2018. It was observed that majority of children (68.7%) belonged to lower socioeconomic classes (IV & V) followed by middle class III (18.9%) and class II (9.2%). Only 3.2% of children belonged to social class I.

In our study it was observed that overall, 41.1% children had low food security, and 1.8% children were found to have very low food security. Majority, 57.1% of the study population has high/ marginal food security (Figure 1) & (Table 2).

The prevalence of stunting was found to be 45.2 % which is regarded as "Very high prevalence" according to WHO definition of cut-off values for public health significance of stunting at population level. The prevalence of wasting was found to be 13.4 % which is "Serious" according to WHO definition cut-off values for public health significance of wasting at population level (12). As observed in the table above, that food security is significantly associated with stunting among under five children ($p<0.001$). Majority of the children have 'very low' food security among whom stunting is also present (66.7%). Only 39.6% children are such that they have 'high/ marginal' food security but are still stunted. Similarly in case of wasting, the highest number of wasted children have 'low' food security (17.9%). (Figure 2)

From (Table 3) it can be observed that there is a highly significant association between place of residence, caste, type of family, father's education, father's occupation, and mother's education ($p<0.05$). Apart from this, religion among the study population showed no such statistically significant association between food security and linear growth retardation ($p>0.05$).

As from the (Figure 3), it can be determined that socio economic status also had statistically significant association between food security and malnutrition among under 5 children ($p<0.05$)

From (Table 4) it can be seen that almost less than half of the study population suffering from stunting were beneficiaries of supplementary nutrition provided at Anganwadi centres. This association was not found to be statistically significant. ($p>0.05$).

Discussion

It was observed in our study that children who had "low" or "very low" food security were found to be more stunted and wasted than among those who had "high" or "marginal" food security. This distribution was statistically significant. Our finding were supported by, another study in which it was reported that households who reported moderate and severe food insecurity were 1.37 times and 1.67 times more likely to be stunted than those who reported high or marginal food security respectively (13) . In a similar observation conducted in Bangladesh, the results were found to be similar to the current study in which significant associations were found between food security and stunting and wasting. Along with this, significant association was also found between mother's education, father's education and occupation ($p<0.05$). It has been shown that education of both the parents has a prominent impact on nutritional status of children, especially in case of mothers. Educated mothers are more motivated to make better food choices for their children(14).

In another study done among eight countries, findings similar to current study were observed as statistically significant association was found between household food security and child malnutrition. Determinant like sex of the child had significant association with food security, while in contrast; maternal education did not have significant association with household food security. On the other hand, age and maternal education had significant impact on nutritional status while sex of the child had no association with linear growth retardation among the study population (15).

As with the case of socio economic status among families in rural Bangladesh, significant association was found among food security and families falling in second, fourth and highest quintile which was in concordance to the findings of current study. The reason could be the families belonging to higher socio economic status are capable of securing higher food security as compared to families belonging to lower economic status (16). In a similar study conducted in India, it was stated that families with lower

per capita income were found to have statistically significant association with lesser food security.(17). This finding was concordant as compared with the present study as statistically significant association was found between the two variables. A plausible explanation regarding food insecurity and socio economic status could be the increasing inflation of commodities and food items of daily usage, which in turn compromises the quantity as well as the quantity of food obtained. Along with this, uncertainty regarding food security has become so common among poor families that they do not worry about it anymore(17).

Regarding receiving supplementation among under five children from Anganwadi centres, it was observed in our study that almost half of the children not receiving supplementary nutrition had faltering in their linear growth which means that stringent measure should be applied in oreder to provide full benefits of the supplementary nutrition scheme. A similar finding was observed in another study conducted in Bengal wherein it was observed that the rate of stunting increased progressively as the age increases which emphasizes the previously discussed point pertaining to increased monitoring of beneficiaries accepting the supplementary nutrition(18).

Conclusion

Our study highlights the importance of improving food security to curb the prevalence of stunting. There is need to addresses the basic causes of malnutrition, like improving literacy and employment generation, more in marginalized section and areas of society. This research provides insights into the prevalence and factors associated with food insecurity among households in peri-urban area of Aligarh.

Recommendation

Through this study it can be put into perspective that there is an immediate requirement to strengthen those existing infrastructure which are first point of contact like aganwadi centres and subcentre. There should be uninterrupted regular supply of rations at aganwadi center, and supply of drugs and vaccines. Also, Children should be given proper education regarding nutrition, hand washing practice in their schools. Mother's should be provided group counseling and educated with help of pictorial IEC materials, regarding nutrition, nutritive value of food and basic idea of food groups, so that they can come over myths and misconception and make healthy choices, which will bring positive change in whole community. Policy-makers need to reconsider access to food programmes in light of the level of food insecurity and its short- and long-term consequences. Also, further studies are needed to monitor levels of food insecurity in households and the strategies that they adopt for coping with the problem. There is need to addresses the basic causes of malnutrition, like improving literacy and employment generation, more in marginalized section and areas of society. Along with this, the Public Distribution System should be made more aware of the increasing demands of food items and call upon improvement of the same. More research should be done in this area so that the problem of food insecurity can dealt with in a proper manner.

Limitation of the study

The cross-sectional nature of the data limits our ability to draw any causal conclusions. HFIAS also cannot identify vulnerable members in household. Assessment of dietary intake or other indicators of nutritional status were not possible in the frame of the present study.

Relevance of the study

This study is an attempt to fill the research gap regarding food insecurity and growth of under five children. There have been a lot of research regarding factors and determinants of stunting and wasting among children in various parts of the country but the same has not been studied enough in case of North Indian states.

Authors Contribution

AJA: conception and design, or analysis and interpretation of data; final approval of the version to be published. AM: conception and design, acquisition of data, analysis and interpretation of data. SA: conception and design, acquisition of data, analysis and interpretation of data. SM: conception and design, or analysis and interpretation of data; final approval of the version to be published. AA: conception and design, or analysis and interpretation of data; final approval of the version to be published

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Tables

TABLE 1 SOCIO DEMOGRAPHIC CHARACTERISTICS OF THE STUDY POPULATION

		Frequency (n)	Percentage (%)
Child Sex	Female	407	49.9
	Male	408	50.1
Place of Residence	Rural	494	60.6
	Urban	321	39.4
Religion	Hindu	349	42.8
	Muslim	466	57.2
Caste	General	224	27.5
	SC	182	22.3
	OBC	409	50.2
Type of Family	Nuclear	321	39.4
	Joint	494	60.6
Father's Age (years)	20 - <30	386	47.4
	31-40	383	47.0
	40 and above	46	5.6
Father's education	Illiterate	162	19.9
	Primary	149	18.3
	Middle to Inter mediate	395	48.5
	Graduate and above	109	13.4
Father's occupation	Professional	78	9.6
	Skilled	337	41.3
	Unskilled	254	31.2
	Business or Self employed	142	17.4
	Unemployed	4	.5
Mother's age at delivery (in years)	<20	26	3.2
	20 - 30	676	82.9
	31 -40	111	13.6
	40 and above	2	.2
	Total	815	100.0
Mother's education	Illiterate	386	47.4
	Primary	109	13.4
	Middle to intermediate	243	29.9
	Graduate and above	77	9.5
Mother's occupation	Homemaker	807	99.0
	Working	8	1.0

TABLE 2 PREVALENCE OF STUNTING AND WASTING AMONG STUDY POPULATION

Prevalence of stunting (Height/ Length)	Frequency (No.)	Percentage (%)
Normal (± 2SD)	447	54.8
Stunting (< - 2SD)	368	45.2
Severe Stunting (< - 3SD)	141	17.3
Prevalence of wasting	Frequency (No.)	Percentage (%)
Normal (± 2SD)	706	86.6
Wasting (< - 2SD)	109	13.4
Severe Wasting (< - 3SD)	25	3.1

TABLE 3 ASSOCIATION TABLE BETWEEN FOOD SECURITY AND VARIOUS DETERMINANTS AMONG STUDY POPULATION

	Characteristics	Food secure	Food insecure	Chi-square; df;p value
Place of residence	Rural	248(50.2%)	246(49.8%)	24.03; df=1; p =<.001
	Urban	217(67.6%)	104(32.4%)	
Religion	Hindu	199(57.0%)	150(43.0%)	.000; df=1 ; p=.986
	Muslim	266(57.1%)	200(42.9%)	
Caste	SC/OBC	287(48.6%)	30451.4%	63.3; df=1 ; p= <.001
	General	178(79.5%)	46(20.5%)	
Type of family	Nuclear	150(46.7%)	171(53.3%)	23.04; df=1; p=<.001
	Joint	315(63.8%)	179(36.2%)	
Father's education	Literate	420(64.3%)	233(35.7%)	70.73; df=1;p <.001
	Illiterate	45(27.8%)	117(72.2%)	
Father's occupation	Professional	76(97.4%)	2(2.6%)	99.27;df= 3;p= <.001
	skilled	182(54.0%)	155(46.0%)	
	Unskilled	103(39.9%)	155(60.1%)	
	Self employed	10473.2%)	38(26.8%)	
Mother's education	Literate	311(72.5%)	118(27.5%)	88.11; df=1; p= <.001
	Illiterate	154(39.9%)	232(60.1%)	

TABLE 4 DETERMINANTS OF WITH LINEAR GROWTH RETARDATION AND NUTRITIONAL SUPPLEMENTATION AMONG STUDY POPULATION

Children receiving supplementary nutrition at AWC		
	Stunting present	**Absent**
Yes	139 (46.3)	161 (53.7)
No	229 (44.5)	286 (55.5)
p value	$_{\chi}2$=.267; df=1 ;p value=.605	

Figures

FIGURE 1 PREVALENCE OF CHILD FOOD SECURITY AMONG STUDY POPULATION

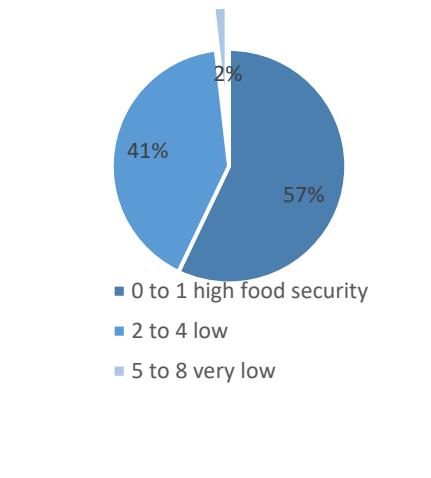
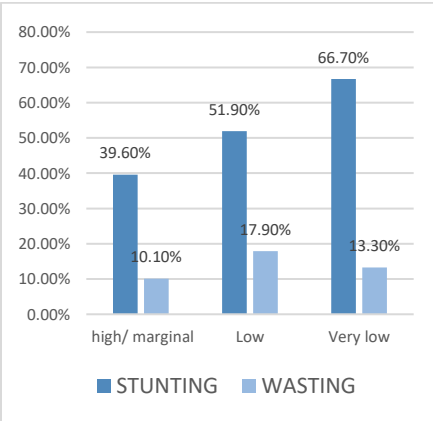


FIGURE 2 ASSOCIATION BETWEEN CHILD FOOD SECURITY AND MALNUTRITION AMONG STUDY POPULATION



Stunting: χ2=14.88; df=2; p value=.001 ;
Wasting : χ^2= 10.23; df=2; p value=.006

FIGURE 3 ASSOCIATION BETWEEN SOCIO ECONOMIC STATUS AND FOOD SECURITY AMONG STUDY POPULATION