



## HOUSEHOLD FOOD INSECURITY AND ITS ASSOCIATION WITH NUTRITIONAL STATUS OF UNDER-5 CHILDREN ATTENDING TERTIARY CARE HOSPITAL OF NAGPUR: A CROSS SECTIONAL STUDY.

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**ABSTRACT** **Introduction:** India's Global Hunger Index has worsened in ranking from the year 2016 to 2017. Chronic household food insecurity still continues to be a major adverse effect responsible for ill health.

**Aims and objectives:** To estimate the proportion of household food insecurity among under 5 children & to find the association between the household food insecurity and their nutritional status.

**Methodology:** A cross sectional study was conducted among the under- five children attending IPC in OPD of a tertiary care hospital in Nagpur from September to December 2017.

**Results:** The proportion of household food insecurity was 76.7%. Household food insecurity was associated with stunting and underweight status of the children ( $p < 0.05$ ).

**Conclusion:** We found a high proportion of children having families with household food insecurity. Household food security is an important factor that affects the nutritional status of the children.

**KEYWORDS :** Household Food insecurity; Under 5 Children; Nutritional status

### Introduction:

Under nutrition is a major public health problem in low and middle income countries'. In Asia, an estimated population of 35.9 million children less than 5 years are wasted, of which 12.6 million are severely wasted. Further, 15.1 million children less than 5 years are affected by stunting<sup>2</sup>. India has one of the highest proportions of under-nutrition among children and women in the world. There are many factors in the cascade of etio-pathogenesis of malnutrition, notably medical reasons like worm infestations, less dietary intake, genetic diseases etc. and social problems like low socioeconomic status, illiteracy, etc'. One of them is food security status of the family. In earlier decades, food availability and stability were considered as good measures of food security'. Over the years, India was successful in achieving self-sufficiency by increasing its food production, but it still has not been able to solve the problem of chronic household food insecurity<sup>5</sup>.

Based on the Global Hunger Index, 52 countries among 119 countries listed have serious, alarming and extremely alarming levels of hunger. Of these, India is one of the countries with Global Hunger Index of 31.2. This rate has worsened from the rates reported in the year 2016<sup>6</sup>. Keeping this view in background, we conducted this study with the objective of studying the burden of food security and its association with the nutritional status among under five children attending the tertiary care hospital in Nagpur.

### Methodology:

A cross sectional study was conducted among the under-five children attending immunisation practice clinic (IPC) in out-patient department (OPD) of a tertiary care hospital in Nagpur from September 2017 to December 2017. Before the start of the study necessary permission was sought from the institutional ethics committee. The selection of the subjects was done by convenience sampling. The children and the mothers/guardians accompanying the child during this period were enrolled in this study. A written consent and ascent was obtained from the parents of the children before actual initiation of the study. Data was collected by using a pretested and predesigned case record form. An interview technique was adopted for data collection. Those mothers who denied consent were excluded from the study.

Case record form comprised of three sections. The first section consisted of socio demographic data of the subjects like age of the

child, gender of the child, educational status of the mother, occupation of the mother, socio economic status, place of residence etc. Educational status of the mother was classified using the guidelines provided by the Ministry of Human Resource Development, Government of India.<sup>7</sup> The socio economic status was classified based on modified Kuppaswamy classification as per the consumer price index of the study period.<sup>8</sup> Second section had anthropometric parameters of the child like height and weight. These were measured using standard guidelines and the children were classified into stunted, wasted and underweight based on the charts provided by World Health Organisation guidelines.

The third section had a Household Food Insecurity Access Scale (HFIAS), developed by the food and nutrition technical assistant (FANTA) project. It is an adaptation of the approach used to estimate the prevalence of food insecurity in the United States (U.S.) annually. The method is based on the idea that the experiencing food insecurity (access) causes certain reactions and responses which can be captured and quantified through a survey and summarized in a scale. The questionnaire consists of nine occurrence questions which represent a generally increasing level of severity of food insecurity (access), and nine "frequency-of-occurrence" questions that are asked as a follow-up to each occurrence question to know how often the condition occurred in the last 4 weeks.<sup>29</sup> This section was translated to the local language and each item was validated by three departmental expert personnel. Piloting was done on 30 subjects. It was administered to the mothers/guardians. After necessary alteration in original version of the form considering the feasibility of study population finally, the form was finalised by a team of experts from the Department of Community Medicine. Final version of the form was used for collection of data. The families were further categorised into food secure, mild insecurity, moderate insecurity and severe insecurity based on the standard guidelines. A food secure household experiences none of the food insecurity (access) conditions, or just experiences worry, but rarely. A mildly food insecure (access) household worries about not having enough food sometimes or often, and/or is unable to eat preferred foods, and/or eats a more monotonous diet than desired and/or some foods considered undesirable, but only rarely. A moderately food insecure household sacrifices quality more frequently, by eating a monotonous diet or undesirable foods sometimes or often, and/or has started to cut back on quantity by reducing the size of meals or number of meals, rarely or sometimes. A severely food insecure household has

graduated to cutting back on meal size or number of meals often, and/or experiences any of the three most severe conditions (running out of food, going to bed hungry, or going a whole day and night without eating), even as infrequently as rarely.

A study conducted Chinnakali P et al among the household of north India inferred the proportion of the food insecurity was 77.2%.<sup>12</sup> Using this rate, with 95% confidence interval and 7% absolute error we found the minimum sample size to be 135. We then included 150 study subjects in our study for our convenience.

**Statistical analysis**

The data was collected and compiled using EPI info 7.2 and the analysis was done using social package for statistical software (SPSS) version 20.00 for windows. The level of significance was set at <0.05. Chi square test was used to indicate the differences between two proportions. Odds ratio was used to define the strength of the association.

**Results:**

We enrolled total 200 participants in our study. All the enrolled participants had consented for the study. But, 50 participants were excluded from the study due to various reasons like incomplete filling of questionnaire, ignorance about birth weight of the child or socio-economic status. Finally 150 study subjects were considered for the final analysis.

**Table 1: Distribution of children based on socio demographic factors**

Socio demographic factors	Nor	%
Educational status of mother		
Profession/Honour	1	0.7
Graduate/ Post graduate	14	9.3
Intermediate/Post high school diploma	10	6.7
High school certificate	34	22.7
Middle school certificate	75	50.0
Primary school certificate	6	4.0
Illiterate	10	6.7
Socio economic status of the family		
Class 1	7	4.7
Class 2	29	19.3
Class 3	35	23.3
Class 4	53	35.3
Class 5	26	17.3
Religion		
Hindu	83	55.33
Muslim	45	30.00
Buddhist	22	14.67
Residence		
Urban	146	97.3
Rural	4	2.7
Age of the child (months)		
0 to 12	93	62.0
13 to 36	40	26.66
37 to 60	17	11.34
Gender of the child		
Male	78	52
Female	72	48
Working status of mother		
Working	8	5.3
Not working	142	94.7
Type of delivery		
Normal	79	52.7
LSCS	71	47.3
Birth weight		
<2.5Kg	48	32
≥2.5Kg	102	68

Nor-Number, %-Percentage, 140 mothers were literate (93.30%). Majority of the mothers were educated up to middle school (50.00%), belonged to class 4 socio economic status (35.3%), majority were Hindu by Religion (55.33%) and large number of mothers were home makers (94.7%). The mean (±SD) age of the children was 14.60 ± 16.03 months and majority of the children were males (52%) and delivered by normal vaginal

delivery (52.7%). The proportion of children with low birth weight was 32%.

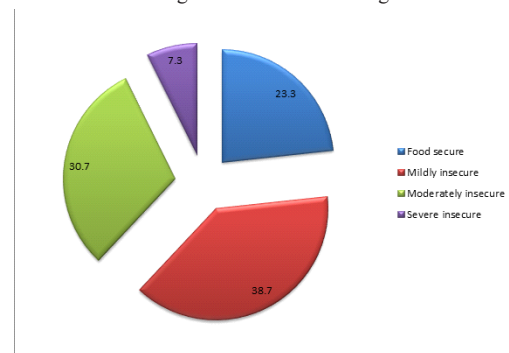
**Table 2: Distribution of children based on proportion of stunting, wasting and underweight status**

Nutritional status	Nor	%
Wasting@ (n=57)	7	12.28
Stunting (n=150)	42	36.52
Underweight (n=150)	54	46.95

Nor-Number, %-Percentage

@- Less than one year have been excluded

The rates of stunting, wasting and underweight were 36.52%, 12.28% and 46.95% respectively. Mean height of children was 71.63 cm with SD of 16.48 & Mean weight of children was 7.4 kg with SD of 3.41.



**Figure 1: Distribution of children based on household food insecurity**

Among the 150 study subjects interviewed 38.7% had mild food security, 30.7% had moderate food insecurity and 7.3% had severe food insecurity.

**Table 3: Association of household food insecurity with nutritional status of the children**

Nutritional status of the children	Household food Insecurity				Odds ratio	P value
	Present		Absent			
	No	%	No	%		
Wasting (n=57)						
Present	5	22.72	2	6.06	4.85 (0.85 to 27.67)	0.0915
Absent	17	77.28	33	93.94		
Stunting (n=150)						
Present	38	33.04	4	11.42	3.76 (1.32 to 13.42)	0.0126*
Absent	77	66.96	31	88.58		
Underweight (n=150)						
Present	47	40.86	7	20.00	2.74 (1.13 to 7.29)	0.02*
Absent	74	59.14	28	80.00		

Nor-Number, %-Percentage, \*Significant

Upon analysing further, we found a significant association between the underweight and stunting status with the food insecurity status of the household (p<0.05). But, the association between wasting and household food insecurity did not yield significant (p>0.05).

**Discussion:**

The second goal of the seventeen Sustainable Development Goals given by the United Nations is to “End hunger, achieve food security and improved nutrition, and promote sustainable agriculture”<sup>9</sup>.

Several studies have emphasized that household food insecurity adversely affects the nutritional status of the children. To add the knowledge to this pool we conducted this study.

The prevalence of stunting, wasting and underweight among the study subjects in our study was 36.52%, 12.28% and 46.95% respectively. These findings were in concordance with the National family health survey 4 conducted in a larger population in the 2015-16.<sup>10,11</sup> The prevalence of food insecurity among our study subjects was 76.7%. Studies conducted by Chinnakali P et al (77.2% in north India) reported almost similar prevalence of food insecurity.<sup>12</sup> Some studies done by Singh A et al (56.9% in Nepal),<sup>13</sup> Sreeramareddy CT et al (58.4% in Nepal),<sup>14</sup> Speirs KE et al (19% in United States of America),<sup>15</sup> Shahraki SH et al (42.3% in Iran)<sup>16</sup> and Lopes TS et al<sup>17</sup> (64% in Brazil) were having lower rates compared to our study. Studies done by Regassa N et al<sup>18</sup> (82.3% in Ethiopia), Shinsugi C et al<sup>19</sup> (81.43% in Kenya) and Mohamadpour M et al<sup>20</sup> (85.21% in Malaysia) reported higher rates than our study. This varied difference is due to the geographical distribution and the health economics of the country.

Our study demonstrated that stunting & underweight in under-5 children was significantly associated with household food insecurity. In a study conducted in Nepal by Singh A et al<sup>13</sup> found that there is a significant association between household food insecurity and malnutrition among children and women. In severely food-insecure households, 51% of children were stunted and 40% were underweight. In severely food-insecure households, children were 1.50 (95% CI, 1.15 to 1.97) and 1.40 (95% CI, 1.05 to 1.85) times as likely as children in food-secure households to be stunted and underweight, respectively. A cross sectional study by Shamah-Levy T et al<sup>21</sup> found that stunting was more prevalent in preschool children with moderate or severe HFI (Household Food Insecurity) (16.2% and 16.8%, respectively) ( $p=0.036$  and  $p=0.007$ , respectively) than in their counterparts with mild or no HFI (13.2% and 10.7%, respectively). A cross-sectional study was conducted in Iran by Shahraki SH et al<sup>16</sup> found that children living in food insecure with severe hunger households were 10.13, 10.07, and 4.54 times as likely to be underweight, stunted, and thin, respectively, as counterparts from food secure households. A longitudinal study was done between 2006 and 2012 in two informal settlements in Nairobi, Kenya by Maurice Mutisya et al,<sup>22</sup> in which mothers and their new-borns were recruited into the study at birth and followed prospectively. The prevalence of stunting was found to be 49% and the risk of stunting increased by 12% among children from food insecure household.

A cross sectional study was conducted to assess the nutritional status and food insecurity among children aged 1-5 years in the Jaffna District, Sri Lanka by Karthigesu Kandeepana et al.<sup>23</sup> It reported the prevalence of wasting [31.8% (n=27)], underweight [41.2% (n=35)] and stunting [34.1% (n=29)] in children in food insecure group to be significantly higher than the wasting [20.6% (n=157)], underweight [32.5% (n=247)] and stunting [25.5% (n=194)] of children in food secure group ( $p<0.05$ ). Similar findings were postulated by Chaparro C,<sup>24</sup> Lawal BO et al<sup>25</sup> & Unisa S et al<sup>26</sup> in their studies. A socioeconomic survey was conducted in 800 households across eight countries by Psaki S et al.<sup>27</sup> Across countries; the prevalence of stunting (42%) was much higher than the prevalence of wasting (6%). In pooled regression analyses, a 10-point decrease in food security score was associated with a 0.23 SD decrease in height-for-age (95% CI 0.09 to 0.37 SD) A study conducted in Brazil by Leonardo Pozza et al found that the average height-for-age, weight-for-age and weight-for-height were -0.31, 0.12 and 0.40, respectively, being lower among children with food insecurity.<sup>28</sup> Our study was in accordance with majority of the studies conducted across the world.

Our study had some limitations, one of which is that, it was a cross sectional study, so the inferences drawn should be confirmed by analytical studies. The second limitation is a small sample size. The third limitation is that, some other factors that influence the nutritional status of children like cultural factors, ethnic factors, and physical activity patterns of the children have not been considered. This study is hospital based study, we reflects only the cases seen at a tertiary case setup level, studies done in community would yield more precise and higher rates of household food insecurity than expected one.

Children in food insecure households may face less variation in diet or nutrient intake of food which will later result in malnutrition. Similarly the risk of being stunted, for the children living in food insecure

household, is higher than those children living in food secure households. It is known that stunting is result of long time effect of under nutrition. Thus, children living in households, where food insecurity remains the same over the years, will face this problem and are expected to be stunted. However the present study assesses the situation of only one month preceding the survey and this was found to be the fourth limitation of this study.

Recall bias was also possible. Hence, some of the variables were based on a recall to a situations happening few weeks before the actual data collection time. The analysis was based on the data that was collected during one season of the year, but the magnitude of household food insecurity may vary across seasons, so that data which shows seasonal variations may be needed to fully understand household food insecurity and its association with nutritional status (especially for stunting) of children.

We did not conduct any health education or counselling for the mothers in our study. Any kind of intervention in the form of nutritional counselling or dietary supplements could have had a greater impact in combating the problem of malnutrition found in our study. A larger study coupled with intervention will contribute not only to the knowledge pool but also help us to draw conclusions & take effective steps to help the malnourished children in food insecure households. In order to understand the association between household food insecurity and malnutrition of children and women, not only at the national level but also at the regional and state levels, there has to be regular monitoring and analysis of food insecurity and malnutrition of children and women. This would require collection, compilation, and generation of data at regular intervals at the national and state levels. Furthermore, more research is required on issues related to measurement of household food insecurity.

#### Conclusions and recommendations:

We found a high rate of household food insecurity among the households. There was a significant association between stunting & underweight status in under-5 children & household food insecurity ( $p < 0.05$ ). But it did not yield a significance level for wasting status ( $p>0.05$ ). We found that the children who belonged to households with food insecurity were having poor nutritional status as compared to those with food secure households. We recommend that analytical studies have to be conducted in a larger representative population to infer with more precise results.

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**Conflict of interest:** None declared

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