

## ORIGINAL ARTICLE

## Impact of Supplementary Nutrition on Undernourished Children In An Urban Area Of Meerut- A Longitudinal Study

Gargi Pandey<sup>1</sup>, Harivansh Chopra<sup>2</sup>, Tanveer Bano<sup>3</sup>, Seema Jain<sup>4</sup>, Ganesh Singh<sup>5</sup>

<sup>1</sup>Junior Resident, Department of Community Medicine, Lala Lajpat Rai Medical College, Meerut, Uttar Pradesh; <sup>2</sup>Professor, Department of Community Medicine, Lala Lajpat Rai Medical College, Meerut, Uttar Pradesh; <sup>3</sup>Professor and Head Department of Community Medicine, Lala Lajpat Rai Medical College, Meerut, Uttar Pradesh; <sup>4</sup>Professor; Department of Community Medicine, Lala Lajpat Rai Medical College, Meerut, Uttar Pradesh; <sup>5</sup>Professor and statistician Department of Community Medicine, Lala Lajpat Rai Medical College, Meerut, Uttar Pradesh.

<a href="#">Abstract</a>	<a href="#">Introduction</a>	<a href="#">Methodology</a>	<a href="#">Results</a>	<a href="#">Conclusion</a>	<a href="#">References</a>	<a href="#">Citation</a>	<a href="#">Tables / Figures</a>
--------------------------	------------------------------	-----------------------------	-------------------------	----------------------------	----------------------------	--------------------------	----------------------------------

### Corresponding Author

Dr Gargi Pandey, 35-D Pocket-A Dilshad Garden, Delhi  
E Mail ID: [itsgaurapandey@gmail.com](mailto:itsgaurapandey@gmail.com)



### Citation

Pandey G, Chopra H, Bano T, Jain S, Singh G. Impact of Supplementary Nutrition on Undernourished Children in An Urban Area Of Meerut- A Longitudinal Study. Indian J Comm Health. 2022;34(2):176-181. <https://doi.org/10.47203/IJCH.2022.v34i02.008>

Source of Funding: Nil Conflict of Interest: None declared

### Article Cycle

Received: 29/01/2022; Revision: 15/05/2022; Accepted: 07/06/2022; Published: 30/06/2022

This work is licensed under a [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/). ©The Author(s). 2022 Open Access

### Abstract

**Background:** Infants and pre-school are most susceptible to undernutrition. Integrated Child Development Services is the programme focussing undernourished children by providing them supplementary nutrition. **Aim& Objective:** To study prevalence of undernutrition in 0-6 year old children and to study factors associated with it. To study impact of supplementary nutrition on undernourished children. **Settings and Design:** A longitudinal study. **Methods and Material:** The present longitudinal study was conducted in randomly selected Anganwadis of urban Meerut. Children found to be suffering from under nutrition were followed up at interval of six months to see the impact of supplementary nutrition provided to them at the anganwadi centre. A detailed history of relevant underlying factors responsible for causation of under nutrition were taken from mothers of these children. **Statistical analysis used:** chi square test was used to find out association between risk factors and undernutrition. Risk factor found statistically significant were further analysed using step wise multiple logistic regression analysis. The impact of supplementary nutrition was assessed using paired t test. **Results:** Iron folic acid supplementation during pregnancy, exclusive breast feeding in children, immunization and time of initiating complementary feed were found statistically significant on both chi-square and multiple logistic regression analysis. No impact of supplementary nutrition was found on anthropometric measurements of children. **Conclusions:** The main focus for fighting undernutrition in children (0-6 years) should be on preventing risk factors associated with mothers in antenatal period and during child rearing practices

### Keywords

Child; Malnutrition; Risk factors

### Introduction

Worldwide 5.6 million children die before their 5th birthday each year and half of them were due to malnutrition(1). Infants and pre-school children are most vulnerable to retardation in growth as a result of malnutrition specifically under nutrition, with this same idea ICDS i.e. Integrated Child Development Services was developed in 1975 with aim of making Indian human resources resilient.(2)

Supplementary Nutrition Programme is one of the core components of ICDS(3). The program has undergone numerous changes in its scope, content, implementation but its main focus to break the chain of intergenerational cycle of malnutrition, reduction in morbidity and mortality caused by nutritional deficiency is the same(4). Ever since the ICDS was initiated in 1975, there have been many studies, which have tried to assess its success in improving maternal and child health in India. Also, there is a paucity of studies in India regarding the impact of supplementary

nutrition in undernourished children. Keeping all the above facts in view a need was felt to determine the impact of supplementary nutrition provided through ICDS on undernourished children over a period of time and the following study was planned.

### Aims & Objectives

- 1) To report the prevalence of undernutrition in 0-6 year old children
- 2) To study the factors associated with undernutrition.
- 3) To study the impact of supplementary nutrition on undernourished children.

### Material & Methods

After the ethical clearance from the Institute Ethic Committee all the anganwadi centres of urban area of Meerut were line listed after taking list of anganwadis from Child Development Office Meerut .There are 297 Anganwadis in urban area of Meerut. With help of random number tables three Anganwadis were selected and to complete the sample of 152; 51 children from two anganwadis and 50 from one anganwadi centre were selected with help of simple random tables. A detailed interview with the mother of child and anthropometric examination of child was done at home of the selected child by the author. If the selected children according to the random number table was not present, or his family did not give verbal consent or the child was sick, then the child who was next in the random selection was taken till the entire sample size was covered.

A detailed history of ANC care and child-rearing practices were taken from the mothers.

**Calculation of sample size:** Taking prevalence of under nutrition in Meerut 33.1%(5) and absolute precision 7.5% at 95% confidence interval, the sample size for the study is calculated as follows:

$$n = (1.96 \times 1.96) p (1-p) / d^2 \\ = 3.84 \times 0.331 \times (1-0.331) / (0.075)^2 = 152$$

The data thus collected was entered in epiinfo.7.2.3.1 from which distribution as well as association tables were prepared, analyzed and statistically evaluated using chi square test. The factors found significant through chi square test were further tested using stepwise Multiple logistic regression analysis which was performed using IBM SPSS statistics 20.0 Impact of Supplementary nutrition was assessed using paired –t test

### Results

**Prevalence of underweight in 0-6 years children.** Out of total 152 children 52 were underweight (34.2%), 17 were stunted (11.2%) and 30(19.7%) were wasted.

Among socio-demographic factors Majority 46.1% of underweight children were in 3-6 years of age group as compared to 25.3% in 0-3years. Also maximum 88.9% children of low SLI were underweight while it was 32.3 % and 11.8% in middle and high SLI children. According to religion among children belonging to Muslim community

66.7% were underweight as compared to 28.1% underweight children among those belonging to Hindu families

Among antenatal factors studied in mothers, the percentage of underweight children 42.3% was significantly higher when the age of the mother at the time of conceiving was 15-20 years. Likewise, majority of underweight children 83.3% belonged to mothers who had less than four antenatal visits. The prevalence of underweight children was significantly higher in mothers who gained less than eight kilos during pregnancy, who had a gap between two pregnancies of less than equal to two years, who did not take Iron folic acid tablets, and when the place of delivery was at home. ([Table 1](#))

Among child rearing practices the prevalence of underweight children was significantly higher in children partially immunized, when not exclusively breast fed, if initiated into complementary feed after 6 months of age and also when mothers did not give any extra diet after an episode of illness. The prevalence of underweight children was also significantly higher when growth monitoring of the child was not done monthly and in children not supplemented with iron in childhood. ([Table 2](#))

[Table 3](#) demonstrates the stepwise multiple binary logistic regression analysis of correlates of underweight in children (0-6 years) in accordance to factors related to antenatal care of mother and child rearing practices. Factors found significant on chi square test in [Table 1](#) and [Table 2](#) was taken. In the analysis exclusive breastfeed for first six months, IFA tablets taken during pregnancy, time of initiating complementary feed and immunization were found statistically significant i.e if no exclusive breastfeeding for first six month of age (OR=55.86, p<0.05), no iron folic acid tablets taken during pregnancy (OR=85.69, p<0.05), time of initiating complementary feed at more than six months of age (OR=22.45, p<0.05) and partial immunization (OR= 39.95, p <0.05) affects the prevalence of undernutrition

[Table 4](#) illustrates the mean weight, mean height and mean mid upper arm circumference of malnourished children in first and second visit. Difference in first and second visit was not found to be statistically significant. The Mid upper Arm circumference of infant was not taken.

### Discussion

In the present study the overall prevalence of undernutrition among children of 0-6 years of age was assessed in terms of underweight 34.2%, stunted 11.2% and wasted 19.2%. The findings of the study for underweight and wasted was consistent with Subramaniam et al (2018)(5) and NFHS-5(6) which reported a prevalence of 33.1% of underweight and 17.7% of wasted ; 29.1% of underweight and 20.0% of wasted respectively. The prevalence of stunting reported in this study was similar to that observed by Malik et al (2018)

who reported prevalence of stunted children in Delhi 19.0%(7)

The current study revealed the positive association between age of mother at time of conceiving and underweight. The findings were consistent with Ambadekar et al (2016) where higher age of mother at the time of birth was found to reduce the risk of malnutrition (OR=0.5%(C.I 0.4-0.7))(8)

The findings of present study revealed higher risk of being underweight when mothers had less than four antenatal visits. The results were similar to Sharma et al (2015)(9) who reported higher risk of being malnourished when less than three antenatal visits were there. Similarly Ambadekar et al (2016)(8) reported mean ANC checkups in malnourished children to be less than four. The present study revealed a significant association between weight gained by mother during pregnancy (less than eight kilos) and underweight. Weight gained by mother during pregnancy is indicative of diet taken by her. Adequate weight gain indicates balanced diet while decreased weight gain may not support growing baby. The findings of this study shows gap between two pregnancies as determinant of child undernutrition which was in accordance with children from Jhalawar(9) district where malnutrition was found to be positively correlated with birth interval . This study showed positive association between mothers who did not took iron folic acid tablets during pregnancy and undernutrition in children and the results were similar to those reported by Sharma et al(9) who observed that prevalence of malnourished increased when mother did not took iron folic acid tablets during pregnancy. In this study it was found that undernutrition was more prevalent among children born at home and the findings were in accordance with observations made by Ambadekar et al (2016)(8) who reported that less children were malnourished when born through institutional delivery. The current study noted that the prevalence of underweight children was more when partially immunized and; the findings were consistent to children from Jabalpur(10) district where children with incomplete / partial immunization were more affected by malnutrition as compared to those with complete immunization. The present study reported significantly higher prevalence of underweight children when not breast fed exclusively for the first six month of life. Similar results were observed from North India(11) and Yavatmal(8) district. In the current study more children were affected with undernutrition when initiated into complementary feeding after six months of age. The results were consistent with the findings reported by Shukla et al (2018) who observed the prevalence of underweight children was more 37.0% when initiated into complementary feed after six months as compared to 23.8% when done at or during six months of Age(10).

The present study also reported higher prevalence of underweight children when not receiving extra diet after

an episode of illness. The findings were consistent with Anusuya et al (2018)(12) who reported that prevalence of underweight were more among those who were not given special meal after an episode of illness . The positive association between monthly growth monitoring and underweight was also revealed. Monthly growth monitoring is an important factor for making mother aware about the progress made by child and reminding her continuously to take appropriate steps if child is malnourished. In the current study iron supplementation during childhood was found important determinant of undernutrition. Iron supplementation becomes important in childhood due to the fact that child does not receives it through breast milk.

Step wise multiple logistic regression analysis revealed IFA tablets taken during pregnancy, exclusive breastfeed for first 6 months, immunization and time of initiating complementary feed as statistically significant i.e if no iron folic acid tablets taken during pregnancy (OR=85.69, p<0.05), no exclusive breastfeeding for first six month of age (OR=55.86, p<0.05), partial immunization (OR= 39.95, p <0.05) and time of initiating complementary feed was more than six months of age (OR=22.45, p<0.05) affects the prevalence of undernutrition. The result were consistent with Ambadekar et al (2016)(8) who reported exclusive breast feed for less than four months increases risk of undernutrition by 7.8 times (OR=7.8; p<0.05)

The impact of supplementary nutrition was calculated by comparing mean of weight, height and mid-upper arm circumference of malnourished children on first and second visit and it was observed that there was no impact of supplementary nutrition on anthropometric measurements of children. Similar results were quoted by Dixit et al (2018)(13) who observed that there was no positive impact was seen on children’s nutritional status. Also Alim et al (2012)(14) reported that supplementary nutrition received by children had no effect on their height.

The main reason we found that why there was no impact of supplementary nutrition was children were given only take home ration which was distributed among all family members in 100.0% of families. Also supplementary nutrition was irregular in frequency and was not provided in month of April and May in a six month duration from March 2021 to August 2021 and when mother of children were interviewed regarding frequency of supplementary nutrition they mentioned it was irregular.

The Supplementary nutrition provided in six month follow up was:

<b>March 2021</b>	Wheat (2 kg), Chana daal (750gm), milk powder (750gm) and Ghee(450gm)
<b>Then again in March 2021</b>	2 kg wheat
<b>June 2021</b>	Mustard Oil (1 Ltr) and Chana Dal (2 kgs)
<b>July 2021</b>	1 kg chana daal
<b>August 2021</b>	2kg chana daal, 1ltr Mustard oil and 2kgs of Daliya

Nothing was distributed in month of April and May.

### Conclusion

As found in the present study prevalence of undernutrition is still a whopping crisis among children of Urban slums. Also As found in the present study there was no significant impact of supplementary nutrition provided to malnourished children in Anganwadi centre (under Integrated Child Development Services). While risk factors developed during antenatal period and in child rearing factors seem to have significant association with prevalence of undernutrition.

### Recommendation

The following recommendations could be made after the study:

1. Instead of putting more focus on supplementary nutrition more efforts should be put upon prevention of risk factors of undernutrition during antenatal period and during child rearing practices.
2. Instead of giving food ration we could focus on giving Direct Beneficiary transfer.
3. As factors were found significant we could recommend following approach to win this big fight against undernutrition:

- B:** exclusive breast feeding for 6 months
- I:** infection prevention/treatment & immunization
- G:** growth promotion/monitoring
- W:** appropriate weaning practice & safe water
- I:** iron supplementation during antenatal period
- N:** nutrition education & extra nutrition in pregnancy, lactation and illness in child

### Limitation of the study

As take home ration was provided it could not be assessed what amount of supplementary nutrition was solely eaten by the child and what amount was distributed among family members

### Relevance of the study

Still the prevalence of undernutrition is a whopping crisis among children of under six years of age. Along with supplementary nutrition provided through Integrated Child Development Services Scheme, focus on other risk factors also play a major role.

### Tables

**TABLE 1 DISTRIBUTION OF UNDERNOURISHED CHILDREN ACCORDING TO ANTENATAL CARE PROVIDED TO MOTHER**

Age of mother (years)	No. of children		Underweight		
	Frequency	Percentage	Frequency	Percentage	
15-20	78	51.3	33	42.3	<b>X<sup>2</sup>= 3.95 ,d.f= 1 ,p=0.04</b>
20-35	74	48.7	19	25.7	
<b>Total</b>	152	100	52	34.2	
ANC visits	No. of children		Underweight		<b>X<sup>2</sup>=86.44, d.f=1 ,p=0.00</b>
<4	54	35.5	45	83.3	
>=4	98	64.5	7	7.1	

### Authors Contribution

GP: Main Author, contributed to conception, design and acquisition of data also drafting the article and revising it critically and approving the final version to be published.  
 HC: contributed to conception, design, revising it critically.  
 TB: contributed to conception, design, revising it critically.  
 SJ: contributed to conception, design, revising it critically.  
 GS: contributed to revising it critically

### References

1. Black RE, Victoria CG, Walker et al. Maternal & child nutrition study group, Maternal & child under nutrition and overweight in low income & middle income countries: Lancet 2013; 382:427-451
2. Park’s textbook of preventive and social medicine 25th edition;647
3. Thakur J,Prinja S,Bhatia S.Persisting malnutrition in Chandigarh:Decadal Underweight Trends and Impact of ICDS Program.Indian Pediatrics 2011;48:315-318
4. Kandarp N, Nimbalkar S, Phatak A, Patel D. Take home ration in ICDS programmes:opportunities for integration with health systems for improved utilisation via mamta card and e- mamta card. BMJ global health 2016;1(A2-A43):A7
5. Subramanian SV,Joe W& Kim R. State of nutrition among children in parliamentary constituencies of India (2016). TATA Trusts:Mumbai,india2016:07-43
6. NFHS-5available at http://rchiips.org
7. Malik R, Puri S, Adhikari T. Double burden of malnutrition among mother-child DYADS in urban poor settings in India. Indian J Comm Health. 2018; 30, 2: 139-144.
8. Ambadekar N, Zodepy S. Risk factors for severe acute malnutrition in under-five children: a case-control study in a rural part of India. Public Health. 2017;142:136-143.
9. Sharma A, Yadav A, Baig V, Swarnkar M, Singh R, Kumar S. Malnutrition & Associated Risk Factors among Under Five Children: A Study from Rural South-Eastern Rajasthan, India. Indian J Comm Health. 2015; 27, 3: 311-319.
10. Shukla N, Toppo NA, Thakur A, Kasar PK, Sharma B. A study of malnutrition and associated risk factors among children of age 06-59 months in rural area of Jabalpur district, Madhya Pradesh. Indian J Comm Health. 2018; 30, 1: 24-29.
11. Mishra K, Kumar P, Basu S, Rai K, Aneja S. Risk Factors for Severe Acute Malnutrition in Children below 5 y of Age in India: A Case-Control Study. The Indian Journal of Pediatrics. 2013;81(8):762-765.
12. Ansuya, Nayak B, Unnikrishnan B, George A, N. S, Mundkur S et al. Risk factors for malnutrition among preschool children in rural Karnataka: a case-control study. BMC Public Health. 2018;18(1).
13. Bhutta Z.Micronutrient Needs of malnourished Children.Current Opinion in Clinical Nutrition and Metabolic Care 2008,11:309-314
14. Sahu S., Kumar S., Bhat B., Premrajan K.,etal. Malnutrition among under 5 children in India and strategies for control: J Nat Biol Med 2015;6:18-23

Age of mother	No. of children		Underweight		
<b>Total</b>	152	100	52	34.2	
<b>Weight gain by mother</b>	<b>No. of children</b>		<b>Underweight</b>		
<8kgs	52	34.2	46	88.5	<b>X<sup>2</sup>=99.73 d.f=1 ; p=0.00</b>
>=8kgs	100	65.8	6	6	
<b>Total</b>	152	100	52	34.2	
<b>Gap between two pregnancies</b>	<b>No. of children</b>		<b>Underweight</b>		
> 2 years	86	56.6	10	11.6	<b>X<sup>2</sup>=42.59 , d.f=1 ,p=0.00</b>
<=2 years	66	43.4	42	63.6	
<b>Total</b>	152	100	52	34.2	
<b>IFA tablets taken during pregnancy</b>	<b>No. of children</b>		<b>Underweight</b>		
IFA tablets taken	90	59.2	2	2.2	<b>X<sup>2</sup>=96.85,d.f=1 ,p=0.00</b>
IFA tablets not taken	62	40.8	50	80.5	
<b>Total</b>	152	100	52	34.2	
<b>Place of delivery</b>	<b>No. of children</b>		<b>Underweight</b>		
Institutional	103	67.8	27	26.2	<b>X<sup>2</sup>=8.00 ,d.f=1 p =0.00</b>
At home	49	32.2	25	51	
<b>Total</b>	152	100	52	34.2	

**TABLE 2 DISTRIBUTION OF UNDERNOURISHED CHILDREN ACCORDING TO CHILD REARING PRACTICES**

Immunization status	No. of children		Underweight		X <sup>2</sup> = 13.3 ,d.f= 1 p=0.00
	Frequency	Percentage	Frequency	Percentage	
<b>Complete</b>	139	91.4	42	30.2	
<b>Partial</b>	13	8.6	10	76.9	
<b>Total</b>	152	100	52	34.2	
<b>Exclusive breast feed</b>	<b>No. of children</b>		<b>Underweight</b>		<b>X<sup>2</sup>=101.73 ,d.f=1 ,p=0.00</b>
Yes	94	61.8	3	3.2	
No	58	38.2	49	84.5	
<b>Total</b>	152	100	52	34.2	
<b>Initiation of complementary feed</b>	<b>No. of children</b>		<b>Underweight</b>		<b>X<sup>2</sup>= 51.39 ,d.f= 1 p =0.00</b>
At 6months	121	79.6	24	19.8	
>6months	31	20.4	28	90.3	
<b>Total</b>	152	100	52	32.4	
<b>Extra diet after episode of infection</b>	<b>No. of children</b>		<b>Underweight</b>		<b>X<sup>2</sup>= 76.43 ,d.f=1 p =0.00</b>
Given	99	65.1	9	9.1	
Not given	53	34.9	43	81.1	
<b>Total</b>	152	100	52	34.2	
<b>Intervals between growth monitoring</b>	<b>No. of children</b>		<b>Underweight</b>		<b>X<sup>2</sup>= 74.94 , d.f=1 p =0.00</b>
Monthly	111	73.1	15	13.5	
>monthly	41	26.9	37	90.2	
<b>Total</b>	152	100	52	34.2	
<b>Iron supplementation in childhood</b>	<b>No. of children</b>		<b>Underweight</b>		<b>X<sup>2</sup>=44.28 ,d.f= 1 p=0.00</b>
Yes	60	39.5	1	1.7	
No	92	60.5	51	55.4	
<b>Total</b>	152	100	52	34.2	

**TABLE 3 CORRELATES OF MALNUTRITION IN ACCORDANCE TO FACTORS RELATED TO ANTENATAL CARE OF MOTHER AND CHILD REARING PRACTICES**

Risk factors	OR	95% CI	Coefficient	S.E	P value
IFA tablets taken during pregnancy	<b>85.69</b>	5.17-1418	4.45	1.43	<b>0.002</b>
Exclusive breastfeed for first 6 months	<b>55.86</b>	5.86-531.82	4.02	1.15	<b>0</b>
Immunization	<b>39.95</b>	1.64-972.29	3.68	1.62	<b>0.02</b>
Time of initiating complementary feed	<b>22.45</b>	2.06-244.67	3.11	1.21	<b>0.01</b>

**TABLE 4 IMPACT OF SUPPLEMENTARY NUTRITION ON THE ANTHROPOMETRIC MEASUREMENTS OF CHILDREN**

Impact of supplementary nutrition on weight of malnourished children (0-6years)					
Age group (years)	No. of children	Mean of weight in 1 <sup>st</sup> visit (kgs)	Mean of weight in 2 <sup>nd</sup> visit (kgs)	Paired t calculated	P value
0-1	2	5.4±0.8	6.0±0.0	-	-
1-2	10	7.2±1.5	7.3±1.4	0.15;df=9	>0.05
2-3	10	9.2±1.5	9.2±1.1	0.00;df=14	>0.05
3-4	12	10.6±1.1	10.6±1.3	0.00;df=11	>0.05
4-5	13	12.4±1.2	12.5±1.2	0.21;df=12	>0.05
5-6	5	13.6±1.1	13.6±1.1	0.00;df=4	>0.05
Impact of supplementary nutrition on height of malnourished children (0-6years)					
Age group (years)	No. of children	Mean height in 1 <sup>st</sup> visit (cm)	Mean height in 2 <sup>nd</sup> visit (cm)	Paired t calculated	P value
0-1	2	60.5±0.7	61.0±0.0	-	-
1-2	10	69.6±9.1	71.1±7.0	0.41;df=9	>0.05
2-3	10	79.7±5.5	79.8±4.9	0.04;df=9	>0.05
3-4	12	90.0±10.8	91.0±7.4	0.26;df=11	>0.05
4-5	13	96.4±8.1	97.2±8.1	0.25;df=12	>0.05
5-6	5	105.1±8.3	105.4±9.6	0.05;df=4	>0.05
Impact of supplementary nutrition on mid-upper arm circumference of malnourished children (1-6years)					
Age groups (years)	No. of children	Mean muac in 1 <sup>st</sup> visit(cm)	Mean muac in 1 <sup>st</sup> visit(cm)	Paired t calculated	P value
1-2	10	13.5±0.9	12.8±0.8	-1.83;df=9	>0.05
2-3	10	13.1±1.4	13.4±1.3	0.49;df=9	>0.05
3-4	12	13.5±0.9	13.4±1.0	-0.25;df=11	>0.05
4-5	13	13.4±1.1	13.4±1.2	0.0;df=12	>0.05
5-6	5	13.9±1.1	13.6±0.8	-0.49;df=4	>0.05