Original Research Article

A Study of Overnutrition and Associated Risk Factors among Children of Age 06-59 Months in Rural and Urban Areas of Jabalpur District Madhya Pradesh

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Abstract:

Background: Every nation is entering into a situation with double burden of malnutrition where there is a co-existence of undernutrition (stunting/wasting/underweight) and overnutrition (overweight/ obesity). There has been a phenomenal rise in proportions of children having obesity in the last 4 decades. In the current scenario, the trends of rise in overweight among children under five years of age is increasing, which is leading double burden of malnutrition.

Methods: Cross sectional study conducted among children of age group 06-59 months in rural and urban areas of Jabalpur district. Multistage random sampling technique was used for the selection of study subjects. Predesigned questionnaire was used to collect data and anthropometric measurements were done. Data entry and analysis was done using *Epi Info*™ 7.1.5 and SPSS 20.0 (free trial version).

Results: The prevalence of obese and overweight in the present study was found to be 2.9% and 6.6% respectively. It was found to be higher in urban areas (overweight 7.4% & obese 3.1%) as compared to rural areas (overweight 5.6% & obese 2.7%). Overnutrition was found to be higher among children belonging to upper class, children living in nuclear family, having less family members, no or one sibling, children with illiterate parents and the children with inappropriate complementary feeding practices in both rural and urban areas.

Conclusions: The present study demonstrates the multiple socio demographic risk factors for childhood overnutrition, encompassing sectors other than health alone like social and economic sectors, requiring multisectoral approach to fight against the double burden of malnutrition.

Keywords: Malnutrition, Over Nutrition, Overweight, Rural.

Introduction

"Malnutrition is a silent emergency" [1]. Malnutrition is defined as pathological state resulting from a relative or absolute deficiency or excess of one or more essential nutrients. It comprises of – Under nutrition, Over nutrition, Imbalance and specific deficiency [2] .

Malnutrition is not only an important cause of childhood mortality and morbidity, but also leads to permanent impairment of both physical and mental growth of those who survive. Therefore much emphasis should be given to provide good nutrition to growing populations especially in the formative years of life [3].

In the current scenario, the trends of rise in overweight is increasing, which is leading double burden of malnutrition. Very few studies had been conducted to assess the prevalence of overweight or obesity among under-five children [4,5,6]. The study by Kumar et al revealed the prevalence of overweight as 4.5% [6]. The relative high prevalence of overweight and obesity in some urban and high socioeconomic status groups is a matter of concern [7].

There has been a rise in obesity among children under five years of age with 33 states and union territories registering a spike in the number of overweight children, according to the National Family Health Survey (NFHS-4) [8].

Experts attributed the increase in obesity to lack of physical activity and unhealthy food habits.

"Although current understanding of the health consequences of overweight and obesity is predominately based on adult studies, increasing evidence suggests that childhood obesity has a number of

immediate, intermediate, and long-term health consequences. This is arising out of an obesogenic environment, which includes changing food systems and reduced physical activity," Dash said [9].

There is a need for effective programmes and policies in multiple sectors to address overnutrition, undernutrition, mobility and physical activity, he added.

Therefore, this study will be useful in determining the burden of malnutrition (undernutrition and overnutrition) and associated risk factors in children aged 06-59 months in rural and urban area of Jabalpur district. It is expected that the result of this study will help to understand the actual requirements in the area for such children and will help policy makers to take specific interventional measures.

The objectives of present study are to determine the prevalence of overnutrition (obesity and overweight) among children of age 06-59 months in rural and urban areas of Jabalpur district and its association with various socio-demographic factors.

Material and Method

It was a cross sectional study conducted among children of age group 06-59 months in rural and urban areas of Jabalpur district from 1st April 2016 to 31st March 2017.

Sample size was calculated according to the formula: $N = Z2pq/d2$ where; P= Prevalence, q = (100-P), d = Margin of error, Z = Confidence level (for 95% confidence level it is 1.96).

For this study prevalence of malnutrition was considered for determining sample size as overnutrition comes under malnutrition
The sample size for rural and urban area was calculated separately.

According to NFHS-4 M.P [8], the prevalence of malnutrition among children under five years of age in rural and urban area of Madhya Pradesh was 45% and 37% respectively, taking these values as prevalence, with the relative error (d) as 10% of Prevalence (P) and Z as 1.96, the sample size for rural area was calculated as 470 while that for urban area was calculated as 654.

After adding 10% non-respondents, the final sample size came out to be 517 and 720 for rural and urban areas respectively. Thus, a total of 1237 children of age 06 to 59 months were taken as the final sample size.

Multistage random sampling technique was used for the selection of study subjects.

Face to face interview of the mothers or the primary caregiver of the child was conducted after explaining the objectives of the study and obtaining informed consent. Height and weight measurements were recorded following the standard techniques. The weight was measured using Salter's scale with light clothing and without shoes. Zero error was checked and adjusted before measurements.

The height of the child was recorded with the help of non-stretchable measuring tape.

Overweight and Obesity:

 *Defined as **body mass index (BMI) > 85th and 95th percentiles for that age and sex, respectively** [6] .*

All the children whose weights were more than 85th percentiles (BMI) for the age and sex were considered as overweight and more than 95th percentiles (BMI) for the age and sex were considered obese.

Ethical approval was taken from the Institutional ethical committee of Netaji Subhash Chandra Bose Medical College Jabalpur, M.P. Before starting the study, informed consent was taken from mother or primary caregiver of the child after explaining the purpose of study. Severely ill children and whose parents were not willing to participate in the study were excluded from the study.

Data thus obtained was coded and entered into Microsoft excel worksheet. This was analyzed using *Epi Info™* 7.1.5 and SPSS 20.0 (free trial version). For determining the association of malnutrition Chi-square test, odds ratio were applied for each of the factor. The statistical significance was evaluated at 5% level of significance. *p* value less than 0.05 was considered as statistically significant. Microsoft Office Word 2007 and Microsoft Office Excel 2007 were used to generate tables.

Result

Table 1: Distribution of study population according to their nutritional status

BMI	Rural (N=517)	Urban (N=720)	Total (N=1237)
OBESE (≥95th Percentile)	14 **(2.7%)**	22 **(3.1%)**	36 (2.9%)
OVERWEIGHT (85th - <95th Percentile)	29 **(5.6%)**	53 **(7.4%)**	82 (6.6%)
NORMAL (5th - <85th Percentile)	344 (66.6%)	496 (68.9%)	840 (67.9%)
UNDERWEIGHT (<5th Percentile)	130 (25.1%)	149 (20.6%)	279 (22.6%)
Total	517 (100%)	720 (100%)	1237 (100%)

For (Obese & Overweight Vs Underweight) χ2 =3.47; p = 0.06 ; df =1

The prevalence of obese and overweight in the present study was found to be 2.9% and 6.6% respectively. It was observed that obese and overweight among the study subjects was high in urban areas (3.1% & 7.4% respectively) as compared to the rural areas (2.7% & 5.6% respectively).However the difference was not statistically significant (p = 0.06),the result of this study is in concordance with the study from Kaski district in Nepal who found that the odds of having overweight/obese children in urban households were 2.3 times higher compared to rural households ($p = 0.001$, OR = 2.3) [10]

Table 2: Factors associated with overnutrition Distribution of study population of Rural area according to Overnutrition

Factor		Nutritional status		Total	p value
		Overweight /obese (43)	Normal		
Age (in months)	06-12	6 (9.8%)	55 (90.2%)	61 (100%)	0.62 df=4
	13-24	11 (10.8%)	91 (89.2%)	102 (100%)	
	25-36	7 (5.5%)	119 (94.5%)	126 (100%)	
	37-48	9 (7.3%)	114 (92.7%)	123 (100%)	
	49-59	10 (9.5%)	95 (90.5%)	105 (100%)	
Gender	Male	26 (9.5%)	247 (90.5%)	273 (100%)	0.29
	Female	17 (6.9%)	227 (93.1)	244 (100%)	
Educational status of mother	ILLITERATE	5 (9.6%)	47 (90.4%)	52(100%)	0.72
	LITERATE	38(8.2%)	427 (91.8%)	465 (100%)	
Educational status of father	ILLITERATE	6 (10.2%)	53 (89.8%)	59 (100%)	0.58
	LITERATE	37 (8.1%)	421 (91.9%)	458 (100%)	
Occupational status of mother	UNEMPLOYED	31 (9.9%)	282 (90.1%)	313 (100%)	0.10
	EMPLOYED	12 (5.9%)	192 (94.1%)	204 (100%)	
Occupational status of father	UNEMPLOYED	0	15 (100%)	15 (100%)	0.23
	EMPLOYED	43 (8.6%)	459 (91.4%)	502 (100%)	
Socioeconomic status	≤951	10 (4.4%)	218 (95.6%)	228 (100%)	**0.004**
	Above 951	33(12.9%)	256 (88.6%)	289 (100%)	
Type of Family	Nuclear	16 (9.5%)	152 (90.5%)	168 (100%)	0.49
	Joint	27 (7.7%)	322 (92.3%)	349 (100%)	
No. of family members	≤4	25(16.1%)	130 (83.9%)	155 (100%)	**0.00002**
	>4	18(4.9%)	344 (95.1%)	362 (100%)	
Birth weight	<2.5	4 (4.7%)	81 (95.3%)	85(100%)	0.18
	≥2.5	39 (9%)	393 (91%)	432 (100%)	
No. of sibling	None to 1	35 (8.8%)	361 (91.2%)	396 (100%)	0.43
	≥2	8 (6.6)	113 (93.4%)	121 (100%)	
Age of initiation of complementary feed (N= 517)	Before 6 month	6 (9.2%)	59 (90.8%)	65 (100%)	
	During 6month	2 (3.2%)	61 (96.8%)	63 (100%)	0.309
	After 6month	21 (5.4%)	368 (94.6%)	389 (100%)	

Table 3: Distribution of study population of urban area according to overnutrition

Factor		Nutritional status			p value
		Overweight /obese (75)	Normal	Total	
Age (in months)	06-12	19 (20%)	76 (80%)	95 (100%)	**0.016** df=4
	13-24	15 (10.1%)	134 (89.9%)	149 (100%)	
	25-36	19 (9.9%)	172(90.1%)	191 (100%)	
	37-48	14 (8.9%)	144(91.1)	158 (100%)	
	49-59	8 (6.3%)	119(93.7%)	127 (100%)	
Gender	Male	32 (9.1%)	319(90.9%)	351 (100%)	0.26
	Female	43 (11.6%)	326(88.4%)	369 (100%)	
Educational status of mother	ILLITERATE	11(22%)	39 (78%)	50 (100%)	**0.0054**
	LITERATE	64 (9.5%)	606 (90.5%)	670 (100%)	
Educational status of father	ILLITERATE	4 (13.8%)	25(86.2%)	29 (100%)	0.54
	LITERATE	71(10.3%)	620 (89.7%)	691 (100%)	

Occupational status of mother	UNEMPLOYED	63 (11%)	508 (89%)	571 (100%)	0.29
	EMPLOYED	12 (8%)	137(92%)	149 (100%)	
Occupational status of father	UNEMPLOYED	0	3 (100%)	3 (100%)	0.55
	EMPLOYED	75 (10.5%)	642(89.5%)	717 (100%)	
Socioeconomic status	≤951	26 (10%)	233(90%)	259 (100%)	0.81
	Above 951	49 (10.6%)	412(89.4%)	461 (100%)	
Type of Family	Nuclear	26 (10.7%)	217 (89.3%)	243 (100%)	0.85
	Joint	49 (10.3%)	428 (89.7%)	477 (100%)	
No. of family members	≤4	35(14.9%)	200(85.1%)	235 (100%)	**0.006**
	>4	40(8.2%)	445(91.8%)	485 (100%)	
Birth weight	<2.5	6 (5.2%)	109(94.8%)	115 (100%)	**0.046**
	≥2.5	69 (11.4%)	536(88.6%)	605(100%)	
No. of sibling	None to 1	60(10.8%)	493(89.2%)	553 (100%)	0.48
	≥2	15 (8.9%)	152(91.1%)	167 (100%)	
Age of initiation of complementary feed (N= 517)	Before 6 month	5 (14.7%)	29(85.3%)	34 (100%)	**0.021**
	During 6month	9 (5%)	170(95%)	179 (100%)	
	After 6month	61 (12%)	446 (88%)	507 (100%)	

Socioeconomic Status

No. of Family Members

Age of Initiation of Complementary Feed
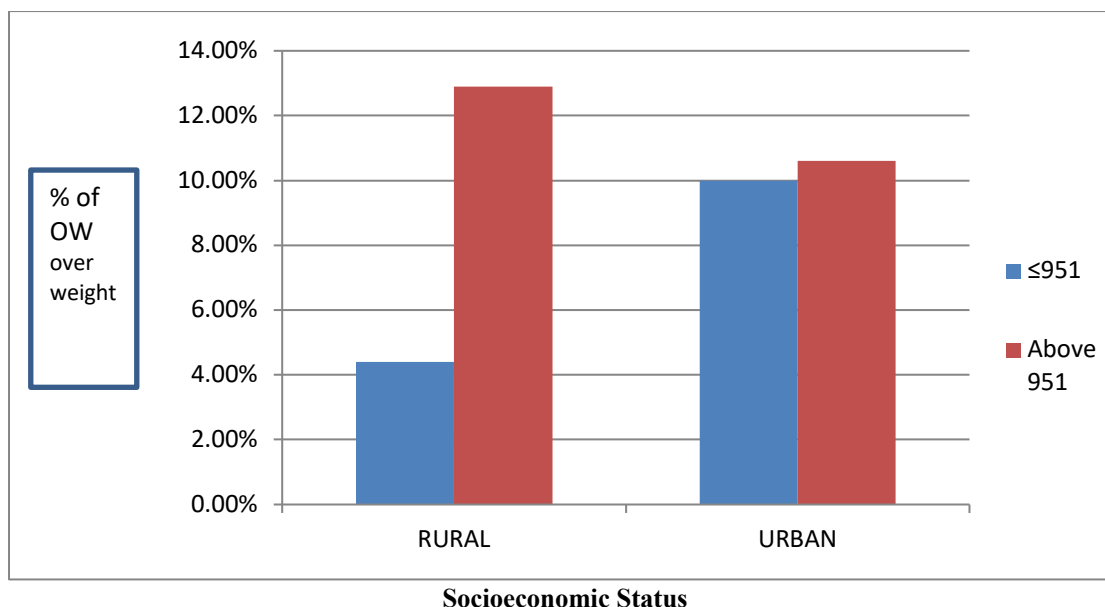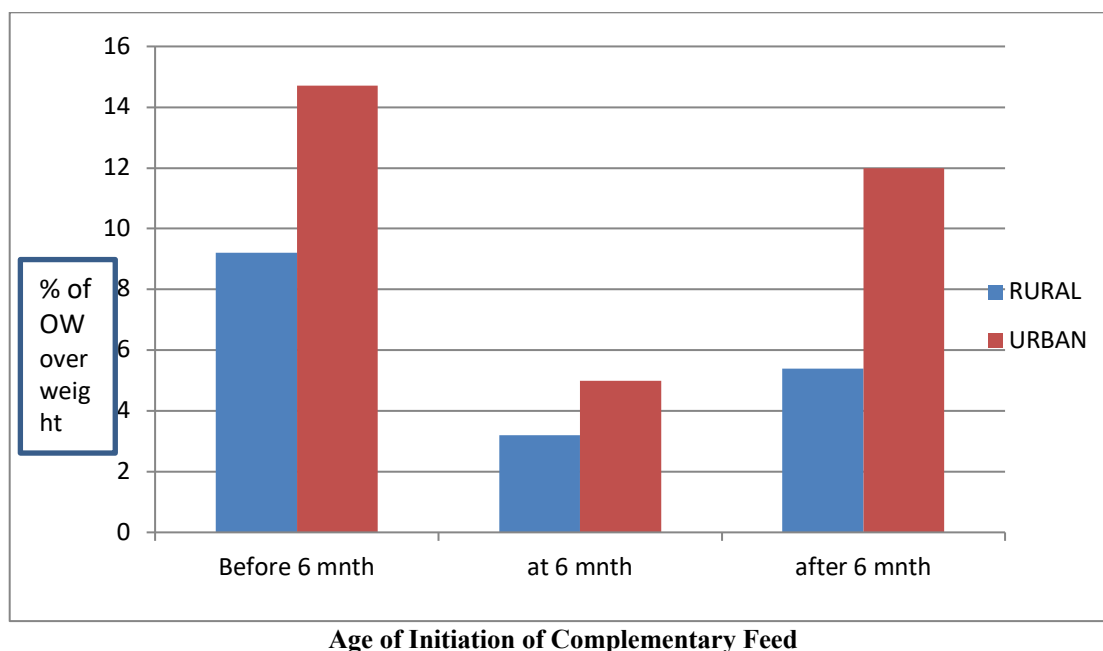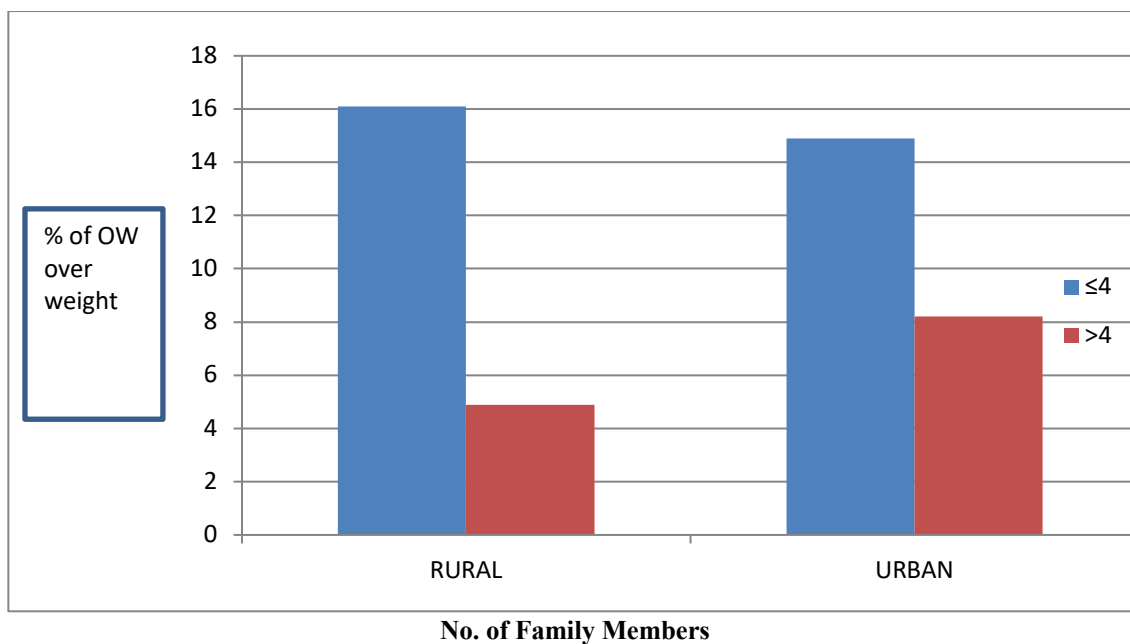
Discussion

It is evident from the above table that in rural areas , prevalence of overweight and obese was found to be more in the children of 13-24 months age group. While in urban areas, prevalence of overnutrition was found to be more among 06-12 months of age group children and it was statistically significant. It might be the result of inappropriate complementary feeding practices. The present study also demonstrates the association of overnutrition with inappropriate complementary feeding practices. The faulty practices responsible for overnutrition could be due to lack of knowledge and awareness regarding proper child rearing.

According to gender, the prevalence of overweight was more among male in rural area , Similar results have been documented from the study done by Ashmita Karki et al [11] , Kaur S et al [12] and the study from Punjab [13] ,they also reported that the prevalence of OW and OB was greater in male subjects as compared to female subjects.

While in urban area the prevalence was higher in females, the result of which is similar to the study done by Armstrong ME et al [14] who reported that the prevalence of obesity was 3.2% for boys and 4.9% for girls, whereas overweight prevalence was 14.0% for boys and 17.9% for girls.

This study found the association of overnutrition with one or no sibling in both rural and urban areas. Being the youngest or only child has been shown to increase the odds of being overweight or obese which is supported by other studies also like

study done by Ashmita Karki et al [11], Tiwari N et al [15] and Koirala M et al [16].

Dr Antaryami Dash, Head, Nutrition, Save the Children, India, said every nation is entering into a situation with double burden of malnutrition where there is a co-existence of undernutrition (stunting/wasting/underweight) and overnutrition (overweight/ obesity) at the population level [9].

There has been a phenomenal rise in proportions of children having obesity in the last 4 decades, especially in the developed world. Studies emerging from different parts of India within last decade are also indicative of similar trend [18,19,20,21,22,23]. This view has been challenged over recent years and we presently consider these as different forms of the global malnutrition problem [17].

The present study also found the association of overnutrition with higher socioeconomic status, supported by Poonam Muttreja, Executive Director at the Population Foundation of India who said that, behind the trend of increasing obesity among Indian women, men and children over the past 15 years are rising incomes and unhealthy life choices [9], other studies also supported it, the study done by Ashmita Karki et al [11] said this could be because a higher income status could lead to unrestricted access to energy-dense fast foods in the family, luxurious lifestyle, and high daily expenses to children.

However, blaming rising incomes is not fair, much has also to do with poor eating habits. The consumption of unhealthy foods (popularly termed junk foods) that are high in calories from sugar or fat and contain little dietary fibre, protein, vitamins, and minerals is known to increase," Muttreja said [9]. It is also supported by Sheila Vir, a public health nutrition expert and founder director of Public Health Nutrition and Development Centre, said there is also lack of awareness on what are good food habits. Also, high-fat and high-sugar foods are easily available and so there is higher consumption of it, she said

"We have a double burden of malnutrition, undernutrition and overnutrition occurring together. So, I think what to feed a child is what we are going wrong in," Vir said [24].

The present study also showed the association of overnutrition with less number of family members, which is supported by study done by Yoseph Tadesse et al [25]. This study revealed that family size less than five was associated with increased risk of overweight and obesity among children compared to family size larger than five. Studies conducted by Ramata Diallo et al [26] had similar results. A smaller family size might imply less sharing of available food and other family resources and allows families to tender better nutrition, which in a

tremendous state of affairs may well contribute to excessive energy intake and obesity.

Present study also showed the association of overnutrition with higher birth weight which is supported by study done by Koirala M et al [16] who also observed children who were of larger birth weight (>4.0 kg) had a greater likelihood of being overweight/obese, also supported by study done by Ramata Diallo et al [26].

For children the focus has been on breastfeeding, but now it's time that complementary feeding is also focused upon," Dr Maroof suggested [24].

He suggested that children, with more stress on complementary feeding practices in the community, and reducing screen time, can be the immediate actions.

The present study also demonstrates the association of overnutrition with inappropriate complementary feeding practices, so we need to focus on complementary feeding practices in the community. "Counselling of breastfeeding mothers of children around 4 months of age should focus on counselling on complementary feeding. We find that all mothers know 'what' to give to the child but 'how much', 'when' and in 'what consistency' need to be explained with respect to complementary feeding." he said [24].

About the repercussions of obesity among children, he said non-communicable diseases can develop among obese children earlier than others. "There are higher chances for them being bullied in schools, neglected or shamed by peers, which lead to mental health problems among them," he said [24] .

Conclusion

The present study demonstrates the multiple socio-demographic risk factors for childhood overnutrition, encompassing sectors other than health alone like social and economic sectors, requiring multisectoral approach to fight against the double burden of malnutrition.

It is concluded that there is a need for effective programmes and policies in multiple sectors to address overnutrition, undernutrition, mobility and physical activity among children in both rural and urban area.

We also need to generate awareness regarding good food habits and physical activity through information, education and communication activities which will help the parents for taking decisions regarding consumption of food, with more stress on complementary feeding practices in the community

Some cost-effective interventions such as WHO's 'best buys' have been identified, but political will and implementation have so far been limited.

So, It is expected that the result of this study will help to understand the actual requirements in the area for such children and will help policy makers to take specific interventional measures.

Ethical approval: The study was approved by the Institutional Ethics Committee

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