
Study on the Incidence of Malnutrition in Children (1-5 Years) of Low Income Group

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Abstract

Malnutrition during childhood can affect the growth potential and risk of morbidity and mortality in later years of life. In the present study an attempt has been made to assess the grades of malnutrition in the children with the help of anthropometric measurements, visible clinical features and a 3-day dietary recall. A sample of 160 children between the age group of 1-5 years belonging to the low income group were selected along with their mothers. The probable causes of malnutrition were also taken into account through the mother's body mass index, awareness, knowledge and practices using a questionnaire. It was seen that 53.7% of the children were underweight, 34.3% were wasted and 77.8% were stunted and showed distinct clinical symptoms of malnutrition. Role of mothers' nutritional status during pregnancy, breast feeding, weaning and dietary practices, knowledge of proper health care, sanitation and hygiene could be the probable causes leading to malnutrition in children apart from other factors that were directly related to malnutrition.

Key words: Malnutrition; Wasting; Stunting; Underweight; Micronutrient Deficiency; Overnutrition; Marasmus; Kwashiorkor; Marasmic Kwashiorkor; Breast feeding; Weaning.

Introduction

Malnutrition refers to any imbalance in satisfying nutrition requirements. Malnutrition among children is often caused by the synergistic effects of inadequate or improper food intake, repeated episodes of parasitic or other childhood diseases such as diarrhoea and improper care during illness.^[12] Malnutrition during childhood can also affect growth potential and risk of morbidity and mortality in later years of life. Malnourished children are more likely to grow into malnourished adults who face heightened risks of disease and death.^[9] Malnutrition is a silent killer – under-reported, under-addressed and as a result, under prioritised.^[14]

Malnutrition is of various types which can be broadly classified as Acute Malnutrition and Chronic Malnutrition.^[15] The first form of growth failure is acute malnutrition. There are three clinical forms of acute malnutrition like Marasmus, Kwashiorkor and Marasmic-kwashiorkor. Marasmus involves a rapid deterioration in nutritional status in a short time. It is characterised by severe wasting of fat and muscle which the body breaks down to make energy.^[17] Wasting results from a severe and often sudden lack of food or disease. With wasting, a child does not consume enough food or absorb enough to get the calories or nutrition they need and as a result their body begins to digest muscle to meet the need for protein, minerals and energy. More than one third of the world's children who are wasted live in India.^[17]

Kwashiorkor or bi-lateral oedema is characterised by bilateral pitting oedema (affecting both sides of the body) in the lower legs and feet which as it progresses becomes more generalised to the arms, hands and face. Oedema is the excessive accumulation of fluid in body tissues which results from severe nutritional deficiencies. Marasmic Kwashiorkor or combined wasting and bilateral pitting oedema are a combination of both marasmus and kwashiorkor and is characterized by the presence of both wasting and bilateral pitting oedema.^[17]

Chronic malnutrition or stunting is another form of growth failure which occurs over time. A child who is stunted or chronically malnourished often appears to be normally proportioned but is actually shorter than normal for his/her age. Stunting starts before birth and is caused by poor maternal nutrition, poor feeding practices, poor food.^[17]

Micronutrient deficiencies account for one-third of all malnutrition-related child deaths, and 10% of all children's deaths. Nearly all deaths linked to micronutrient deficiency are due to a lack of vitamin A, zinc or iron.^[14]

Vitamin A deficiency affects preschool-aged children (under 5 years), school age children and pregnant women. Vitamin A deficiency causes xerophthalmia, impairs the immune system and increases the severity and mortality risk of measles and diarrhoeal disease.^[14] Iron deficiency affects 3.5 billion people worldwide. The most affected groups are pregnant women, preschool-aged children (under 5 years), 5-14 year old children and older adults. Lack of iron eventually results in iron-deficiency anaemia.^[15] Vitamin C (also called Ascorbic Acid) deficiency leads to scurvy.^[17]

Malnutrition is an underlying cause of more than 2.6 million child deaths every year, a third of the total of child deaths. Many malnourished children die because they are vulnerable to repeated bouts of disease and infection. Others become malnourished while suffering from infectious disease and are unable to recover.^[14] The various causes of malnutrition are gender inequality, lack of mothers' awareness and knowledge, maternal nutritional status, breast feeding practices, diseases and infections suffered by the children, environmental causes, dietary practices, poverty and food prices and agricultural productivity.

Methodology

This survey was aimed to study the incidence of malnutrition in children of 1-5 years of age belonging to the low income group.

Selection of Location

North East Calcutta Social Welfare Organisation permitted to carry out the survey in different areas under them. The children were selected from two different places, JnandeepValikaVidyalaya and Rajabazar slum area, Kolkata.

Selection of Sample

A total of 160 children of the age group 1-5 years belonging to the low income group were selected.

Data Collection Method

The data was collected by preparation of a questionnaire, standardization of recipes and 3-Day Diet Recall of the respondents was taken.

Construction of Questionnaire

A structured questionnaire was prepared which was divided broadly into two parts: one for the mother and the other for the child. Information about the child included personal details, anthropometric measurements, clinical information and eating pattern of the child. Information of the mothers included the mother's anthropometric measurements, their education, knowledge, attitude and practices.

Standardization of recipes

To carry out the dietary assessment, the most common low cost recipes were standardized in terms of measuring cups, glasses and spoons in the food laboratory of J. D. Birla Institute.

Analysis of Data

A three day dietary recall of the subjects was done and Food Composition Table by Indian Council of Medical Research (ICMR) was used to calculate the average amount of macro and micro nutrients consumed by them. The data was tabulated and organized and the nutrient adequacy was then compared with the RDA given by NIN, Hyderabad.

After obtaining the mean values, the standard deviation was calculated for all the macronutrients and micronutrients. The degree and type of malnutrition among the children of the low income group were determined and classified by calculating the height for age and weight for age and comparing with the references. Percentages were calculated for analysis of the clinical assessment of the children. The results were represented in the form of tables, pie charts and bar graphs. Statistical analysis was done by using t- tests to accept or reject the formed hypothesis.

Results & Discussion

The present study focusses on the incidence of malnutrition among children 1-5 years of age belonging to the low income group in the slums of Kolkata. The data that was collected has been analysed and discussed.

Table 1: Mean macro and micro nutrient intake of the respondents of the age group 1-3 years and 4-5 years from the slums of Kolkata.

Nutrients	Age group (years)	RDA	Mean	Difference between RDA and Mean intake	% of Difference between RDA and Mean intake	SE	Value of computed t-test statistic
Protein (g/day)	1-3	16.7	13.33	3.37	20.18	5.97	3.09
	4-5	20.1	17.2	2.9	14.43	4.45	2.76
Fat (g/day)	1-3	27	19.47	7.53	27.89	5.24	7.87
	4-5	25	17.41	7.59	30.36	2.95	10.92
Carbohydrate (g/day)	1-3	185.5	74.1	111.4	60.05	24.64	24.76
	4-5	236.25	108.89	127.36	53.91	25.71	21.02
Energy (Kcal/day)	1-3	1060	541.92	518.08	48.87	136.79	20.75
	4-5	1350	686.98	663.02	49.11	125.35	22.44
Iron (mg/day)	1-3	9	2.53	6.47	71.89	2.01	17.63
	4-5	13	4.85	8.15	62.69	2.12	16.31
Calcium (mg/day)	1-3	600	204.94	395.06	65.84	70.58	30.66
	4-5		212.56	387.44	64.57	123.26	13.34
Vitamin C (mg/day)	1-3	40	16.98	23.02	57.55	7.62	16.55
	4-5		31.73	8.27	20.68	34.05	1.03

As seen in Table 1 the 3 Day Diet Recall showed that there was a difference of 60.05 percent of carbohydrate intake among children of 1-3 years age group while a difference of 53.91percentin case of respondents in the age group of 4-5 years. Analysis of their dietary pattern revealed that the major sources of carbohydrates were rice and potato, although in some cases intake of roti, puri, muri, bread, noodles, maggi, biscuits were also seen.

Similarly the protein intake was less by 20.18 per cent and 14.43 per cent in the age group of 1-3 years and 4-5 years respectively. It was seen that 43 per cent of the mothers could afford to provide animal protein, other than milk, thrice a week to their children, only 14 per cent were able to provide daily and about 19 per cent of the children were found to consume animal protein once a week. The main sources of animal protein were fish, chicken and very poor quality of mutton. Eggs were given only to a very small percentage of the children once in a week. Similarly consumption of fat and energy was found to be below the RDA among the children of both the age groups.

Cereals and cereal products, potato and oil were the major sources of energy in both the age groups. There was a significant difference between the RDA and the intake of dietary iron and calcium among the children of both the age groups. Similarly there was a difference in Vitamin C (57.5percent) intake among the children of 1-3 years of age. The difference was noticeably less (20.68percent) among the children of 4-5 years. This was mainly due to the consumption of banana, potato, cauliflower and other vegetables by the children of 4-5 years, although consumption of the major sources of Vitamin C was not prevalent.

Calcium intake was found to be 65.84 per cent less in the children of 1-3 years and 64.57 per cent less in the children of 4-5 years than the RDA. Although milk was the main source of calcium, the quantity of milk consumed was very less as a result of which the diet failed to meet the recommended calcium requirement.

All the estimated t-statistics are greater compared to the tabulated t-value, therefore there exists a significant difference between the average intake and RDA, except in the case of vitamin C among children of 4-5 years.

In a study of dietary intake and nutritional status of children below five years of age in slums of Kolkata city, it was found that calorie intake of more than 81percentof under-five pre-school children was below 50percentof RDA and protein consumption was less than 70percent of RDA in about 68percentof study population. In case of iron more than 80percent of study population was consuming less than 50percentof RDA.^[9]

Table 2: Weight for age for children of the age group 1-3 years and 4-5 years given by NCHS (National Centre for Health Statistics)

Age Group	Reference Weight (Kg)	Mean Weight (Kg)	Difference between Reference and Mean Weights (Kg)
1-3 years	12.9	10.26	2.94
4-5 years	18.0	13.43	4.57

Table 2 shows that the mean weight for age of children belonging to 1-3 years of age was 10.26 kg, which is less by 2.94 kg as compared to the reference weight. While the mean weight for age was 13.43 kg in the age group of 4-5 years which was 4.57 kg less than the reference weight. It can be seen that the difference between the mean weight for age and the reference weight of the children 4-5 years of age was more than that of the children of the age group of 1-3 years. Thus from the above data it can be inferred that though the incidence of wasting is seen in both the age groups, it is almost double in the children belonging to the age group of 4-5 years as compared to the age group of 1-3 years.

The prevalence of underweight in children in India (48 per cent) is almost twice as high as the average prevalence for the 26 sub-Saharan African countries that have similar data (25 per cent).^[19] A study in Kenya showed an increased risk of being underweight when complementary food was started early.^[5]

Table 3: Height for age for children belonging to the age group 1-3 years and 4-5 years NCHS (National Centre for Health Statistics)

Age Group (Years)	Reference Height (cm)		Mean Height (cm)		Difference between Reference and Mean Height (cm)	
	Male	Female	Male	Female	Male	Female
1	75.7	74.0	62.10	73.42	13.6	0.58
2	87.1	85.7	75.94	68.81	11.16	16.89
3	96.1	95.1	80.77	70.63	15.33	24.47
4	103.9	102.7	94.83	88.45	9.07	14.25
5	110.0	109.4	90.98	97.97	19.02	11.43

It can be seen from Table 3 that the maximum difference between the reference height and mean height (24.47 cm) of the girls were seen in the age of 3 years whereas the maximum difference in case of boys (19.02 cm) was seen in the age of 5 years. The minimum difference was seen in girls of 1 year of age (0.58 cm) whereas that in boys was seen in 4 years of age (9.07 cm). The mean height for age among children of 1-3 years and 4-5 years was significantly low compared to the reference given by NCHS for both sexes. The possible reason for stunting in girls would be gender bias prevalent in India.

A study among 533 rural children of 3 to 5 years age of Bengali ethnicity at 11 Integrated Child Development Services centres of Nadia District, West Bengal revealed that boys were significantly heavier than girls at age 3 years. Significant age differences existed in mean height and weight in both sexes. The rate of underweight and wasting was higher among girls (underweight = 35.1 per cent, wasting = 12.2 per cent) compared with boys (underweight = 26.5 per cent, wasting = 6.3 per cent). In general, the frequency of stunting increased with increasing age in both sexes. [4]

In a study on Santal children in the district of Puruliya, West Bengal it was seen that stunting among Santal children was less than the Gond tribe, which showed 30.1% of children as severely stunted compared to 4.98 per cent of Santal children. Though there was no remarkable difference between boys and girls in severe stunting and underweight, the total stunting appeared to be higher in girls compared to boys. The gender difference was also prominent in total wasting of girls. [7]

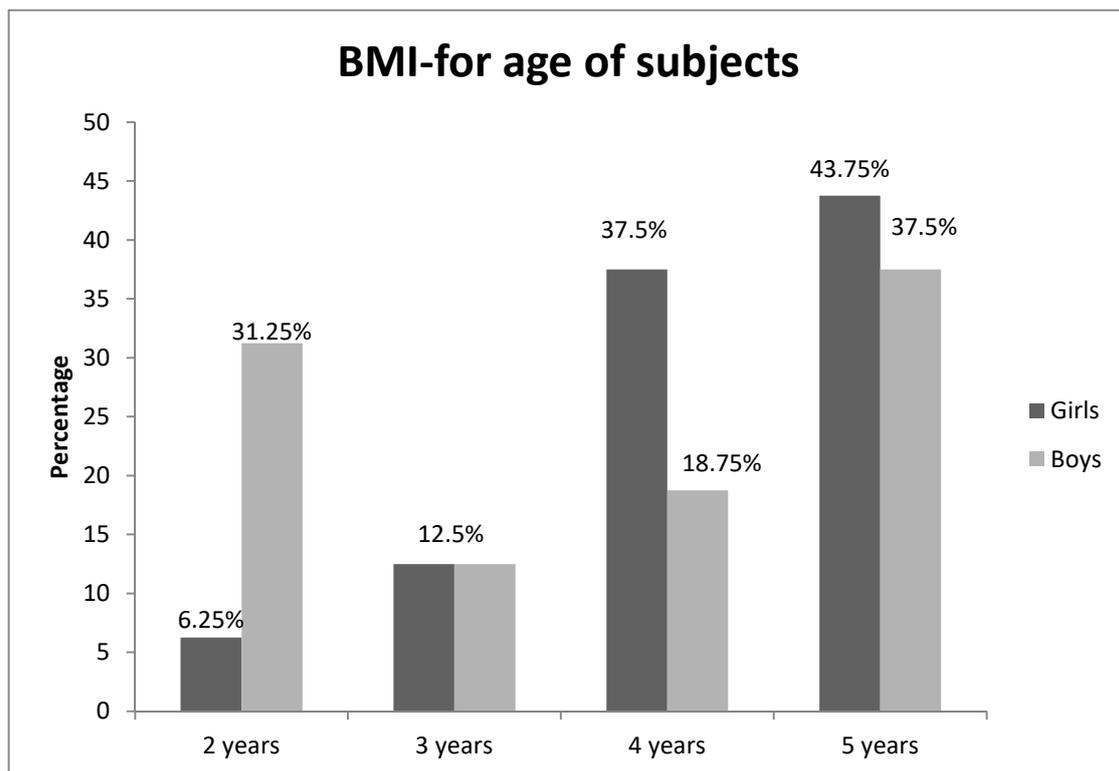


Figure 1: Malnutrition in girls and boys of 2-5 years of age according to BMI for age percentile according to CDC

Figure 1 reveals that about 6.2percent of the girls and 31percent of the boys of 2 years of age were below 5th percentile whereas the percentage of malnutrition in the girls and boys equals in the 3rd year of life (12.5 percent). It can also be seen that the percentage of malnutrition in girls exceeded to that of boys from 4 to 5 years of age which can be due to the prevalence of gender biasness in the families.

Indian mothers selectively feed male children better than female children. More female children suffered from protein energy malnutrition, especially those with mothers in traditional communities. [8]

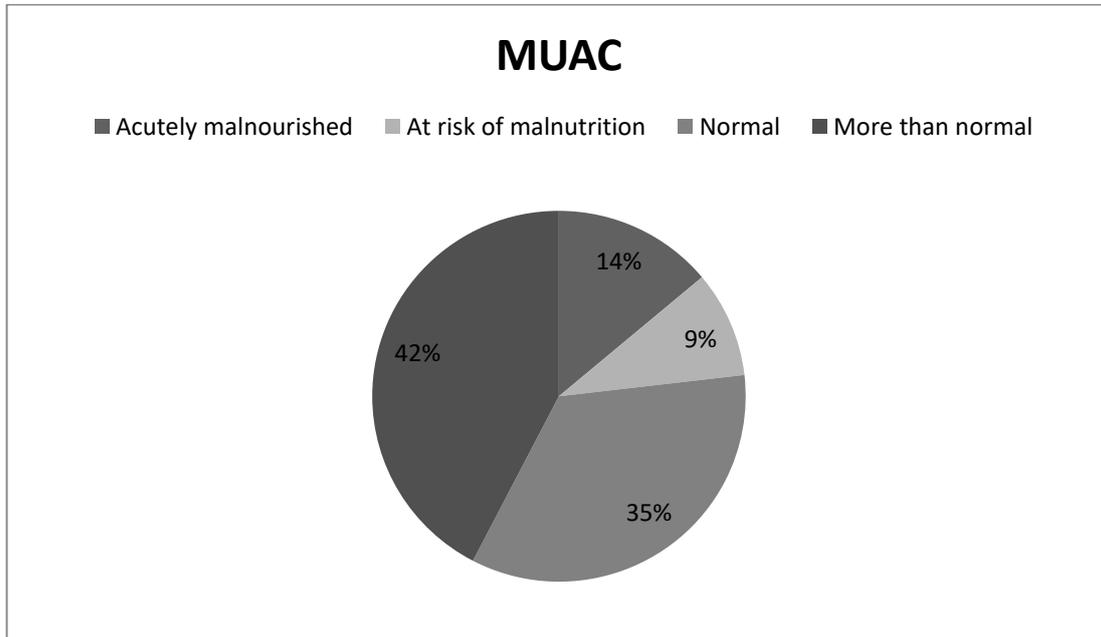


Figure 2: Prevalence of malnutrition according to the mid upper arm circumference (MUAC) of the children of 1-5 years of age.

Figure 2 above indicates that 14 percent of the children were acutely malnourished and 9 percent were at a risk of malnutrition as assessed by the mid upper arm circumference and compared with the references given by WHO. It was also seen that 42 percent of the children seemed to be more than normal. Table 4 reveals that 42 per cent of children showed signs of oedema and hence were suffering from Kwashiorkor. The possible reason for the cases of MUAC being more than the normal could be due to the presence of oedema.

A study done in Uganda showed that about 21.6 per cent of the children under the age of 5 years had low MUAC. According to this study the risk factors for low MUAC were poor health, lack of meat and cow's milk consumption, low intake of energy from fat, and less well educated and older mothers.^[10]

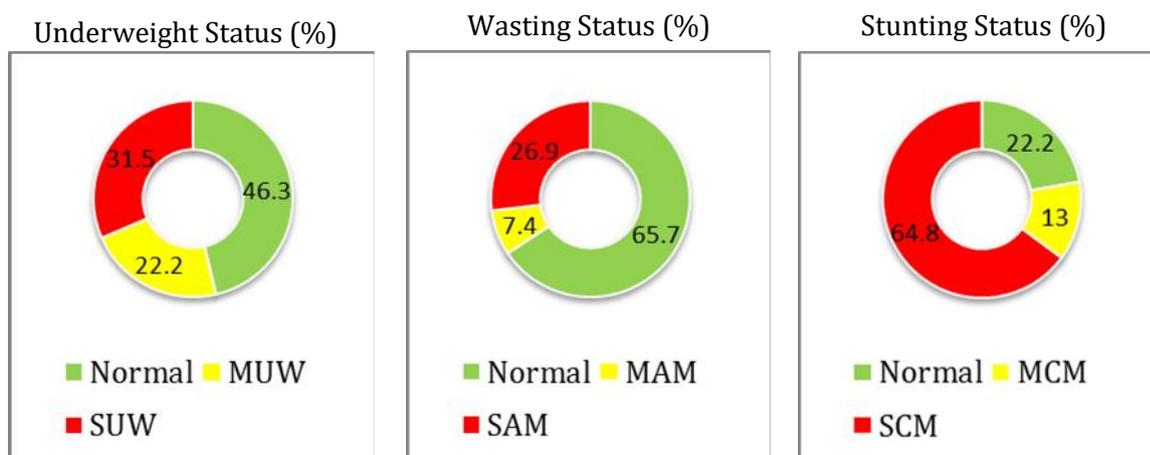


Figure 3: Classification of the respondents (1-5 years of age) based on the grades of malnutrition. (given by Gomez and Waterlow)

It can be determined from figure 3, that among the underweight children, 31.5percentwere severely underweight (SUW) while 22.2percentwere moderately underweight (MUW). It was also seen that 26.9percentof the children were suffering from severe acute malnutrition (SAM) or wasting and 7.4percentwere suffering from moderate acute malnutrition (MAM). Moreover there were 64.8percentcases of severe chronic malnutrition and 13percentcases of moderate chronic malnutrition.

A comparison of male and female children in Amritsar indicates that only 11.23percent of girls and 7.39percentof boys were normal. On the whole, about 90.80percent children suffered from various grades of under nutrition. ^[18]

Table 4: Prevalence percentage of clinical signs and symptoms among children of 1-5 years of age.

Body Parts	Features	Percentages (%)
Nails	Pigmented	36
	Brittle	22
	Soft	35
	Normal	7
Hair	Dry	50
	Rough	21
	Discoloured	5
	Thin	18
	Normal	6
Skin	Dry	88
	Loose	6
	Normal	6
Limbs	Thin	23
	Swollen	42
	Normal	35
Abdomen	Distended	28
	Normal	72
Face	Puffy	39
	Normal	61

It can be seen from Table 4, that 36percentof the children had pigmented nails, 18percent had thin and 5percenthad discoloured hair. It was also observed that 88percenthad dry skin, 42percenthad swollen limbs, 28percenthad distended abdomen and 39percenthad puffy face, which collectively denotes that these children were probably suffering from Kwashiorkor whereas 35percentof the children had soft nails, 50percent had dry and 21percenthad rough hair, 6percenthad loose skin and 55percenthad thin limbs which can be the probable symptoms of Marasmus.

Similar results were seen in a study conducted in South India, where hair changes like sparseness and depigmentation of the hair, especially at the tips, were observed.^[13] Advanced emaciation (marasmus) was encountered in 1.7% of the children examined, as against oedema, which was observed in 38 children only. It

is, however, interesting to note that this occurred frequently in communities whose diets were inadequate in both calories and proteins. ^[13]

In the present study it was found that about 51percentof the children had low birth weight of which 78percentwere severely underweight and the remaining 22percentwere moderately underweight during birth. Of these 51percentlow birth weight children, only 12percentwere able to attain normal weight as assessed during the survey. On the other hand, among the 49percentof the children who had normal birth weight, 16percentwere found to be underweight during the survey. Of these 16percent underweight children, 25percentwere severely underweight and 27percentwere moderately underweight during the survey although they were born as healthy individuals.

Also it was seen that malnutrition among children could be linked to the pregnancy and number of siblings the subjects had. It was analysed that about 66percentof the mothers in the slums of Kolkata were between the ages of 15-19 years during their first pregnancy while about 6percentconceived at 10-14 years of age. At this young age the body of a girl is not well developed which may affect the health and birth weight of the neonate.

A study done in the urban slums of Patiala showed the chances of being underweight decreased as the mother's age increased. Prevalence of underweight children was 75% where mother's age was less than 20 years, whereas it was 39.9%, 32.6% and 32.2% for the age groups 21-25 years, 26-30 years and more than 30 years. Similarly prevalence of stunting also decreased with increasing mother's age, i.e., it was 87.5%, 46.3%, 40.22%and 40.3% in the same age groups. ^[11]

In the present survey 34percentof the mothers had two children and 22percenthad three children while about 15percenthad five or more number of children. The number of siblings a child has can be related to the nutritional status of each child.

Available evidence suggests that special conditions of risk attend first births and births that occur after the fifth pregnancy. A research done in the state of West Bengal showed that approximately 32% of the women reported having one or two pregnancies; more than half of the women reported having three or four pregnancies; and 16 per cent reported having five or more pregnancies. ^[6]

Table 5: Awareness and practice of feeding colostrum and lactation among the mothers.

Initiation of Breast Feeding After Birth	Feeding of colostrum	Span of Exclusive Breast Feeding
Within 1 hour : 42%	Fed: 61%	Less than 6 months: 28%
Within 23 hours: 41%	Discarded: 39%	Less than 1 year: 20%
After 24 hours: 27%	-	More than 1 year: 52%

Table 5shows that 42percentof the mothers started breast feeding their child within one hour of birth. On the other hand, 41percent and 27percentstarted breast feeding within 23 hours and after 24 hours after the child was born, respectively. In some of the cases it was seen that breast feeding was initiated 3 days after the child was born. There were no medical evidences behind this delay and the main reasons were found to be traditional beliefs and customs of the family and gender preferences.

Researches done in Varanasi show that the first feeding was offered mostly within the first 6-8 hours of birth in the urban slum areas and within the first 4-6 hours of birth in rural areas. The majority of children in all groups were breastfed on the 3rd day after birth. ^[2]

From Table 5 it is seen that in 61percentof the cases colostrum was fed to the child whereas in 39percentcases colostrum was discarded.

A research in Andhra Pradesh reveals that breastfeeding was delayed till 3 days in the belief that colostrum is dirty and inadequate to meet the infant's need. ^[3]

Table 5 also shows the time span for which the children of 1-5 years of age were exclusively breast fed. It can be seen that 52 percent of the children were breast fed for more than a year while 28 percent were breast fed for less than 6 months.

A similar study in Varanasi showed that 53.85% of urban children were breastfed up to 6 months, as compared to 10.21% of those in urban slums or 12.2% in rural areas; breast feeding was prolonged in the slums and in rural areas, and sometimes beyond 2 years of age in rural areas. 66.67% of children in the urban group were weaned before 6 months, as compared to 40.14% and 33.63% in the slums and in the rural group; 5-9% of children in rural areas were not weaned at all. ^[2]

Researches have shown that prolonged exclusive breast feeding leads to deterioration of the nutrient content of the breast milk and delayed initiation of weaning results in deficiency of nutrients which leads to malnutrition and other childhood diseases. ^[1]

It was also revealed during the survey that the reason for discontinuing with exclusive breast feeding were another pregnancy of the mother which was the main cause (55 percent) followed by losing interest in feeding the child (13 percent), lack of milk production (10 percent), health of the child (10 percent), child lost interest (6 percent), mother was not well and doctor's advice (3 percent each).

A study was done on the breastfeeding practices of mothers in the urban slums. It was seen that insufficient milk production was the main reason for discontinuation of breastfeeding within 6 months. ^[2] However, in a study in Delhi slums, only 20 per cent infants were exclusively breastfed for 5-6 months and 41 per cent exclusively breastfed for less than 2 months. In Pune too it is reported that infants are exclusively breast fed only to an average of 3.5 months which is much shorter than that in rural areas of 11-12 months. ^[2]

It was also found that only 4 per cent of the mothers visited growth monitoring centres once or twice in order to procure medicines when their children were sick, while 96 per cent did not have any idea about growth monitoring centres and its importance. Unawareness of the mothers about the existence and importance of growth monitoring centres leads to severe grades of malnutrition in the children without being detected and treated at an early age.

In a study done in Gaza it was observed that growth monitoring, staff and maternal education, supplementation with vitamins and iron were associated with marked improvements in feeding pattern and the growth status of children aged 3-15 months. ^[16]

Conclusion

Malnutrition among children is often caused by the synergistic effects of inadequate or improper food intake, repeated episodes of parasitic or other childhood diseases such as diarrhoea and improper care during illness. ^[12]

It was seen that 53.7 per cent of the children were underweight, 34.3 per cent were wasted and 77.8 per cent were stunted. Wasting was double in children belonging to 4-5 years of age as compared to those belonging to 1-3 years of age. The rates of children suffering from frequent attacks of infections, diarrhoea, abdominal discomforts, cold and cough, fever were also very high (65 percent). Gender bias was an important reason for malnourishment among girl child in the slums. Traditional beliefs and customs was an alarming cause for cessation of exclusive breast feeding was another pregnancy of the mother in about 55 percent of the cases.

The dietary intakes of the children were inadequate and failed to meet the recommended allowances which could have led to poor health of the children and at large made the children susceptible to frequent infections. Poor hygiene and sanitary conditions are also the reasons of these infections. The mother's nutritional status, lack of awareness and knowledge as well as early pregnancy and multiple births affected the nutritional status of the child.

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