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FACTORS INFLUENCING THE NUTRITIONAL STATUS OF INFANTS AND PRE-SCHOOL CHILDREN OF THE URBAN POOR

N. WICKRAMASINGHE[1], D. G. GUNAWARDENA[2] AND T. W. WIKRAMANAYAKE[1]

SUMMARY. Morbidity and nutritional status of 200 children under 5 years of age, selected randomly from 19608 families living in slum dwellings in the city of Colombo have been related to their living conditions, per capita income of household and educational status of the mother.

The incidence of diarrhoea was high in all age groups except during infancy, being very high where there was no toilet or a toilet was shared between several households. Incidence of respiratory tract infections ranged from 33 to 48%, being inversely related to the per capita floor area in dwelling. Angular stomatitis and glossitis were the main clinical manifestations of malnutrition, being highest in the 4-5 year group. The type of dwelling and the income of the household were the two most important factors determining the nutritional status at the children.

The need for providing a hygienic and sanitary environment, clean drinking water and effective primary health care services, in addition to poverty alleviation, is stressed.

INTRODUCTION

The Municipality of Colombo (area 9,400 acres) has a population of 585,776 (1981 census), of which 2% are under 1 year of age and 7.4% are from 1 to 4 years old.

The vital statistics for the year 1982 were as follows :

Birth rate	19.5%
Crude death rate	7.6%
Infant mortality rate	38.0%
Maternal mortality rate	0.25%

(Source : Colombo Municipal Council Budget Supplement, 1988).

A survey conducted by the Urban Development Authority (UDA) in 1979 revealed the existence of about 700 slum "tenement gardens" and 15,951 units of shanties, in 750 different locations, occupied by 19,608 families, with a total population of 250,470 persons. "Tenements" or "slum dwellings" are attached, residential dwellings constructed by the Colombo Municipal Council (CMC) four to five decades ago to accommodate a large influx of labour into the city. They were built in rows on blocks of land referred to as "tenement gardens", and consisted of permanent or semi-permanent structures in units of 5 or 6, up to a few hundred. Each group of dwellings share a common yard, water tap and latrine facilities. Due to lack of maintenance and repair of dwellings, toilets and surface drains, the "gardens" are damp and insanitary. "Shanties" are single-unit, improvised, make-shift shelters made of non-durable material, constructed by the dwellers on land to which they have no legal ownership. They have mushroomed illegally on state and private land and banks of water ways. They have no regular water supply, drainage system and sewage disposal, are over-crowded, poorly ventilated, damp and insanitary.

1. Food and Nutrition Unit, University of Kelaniya.
2. Nutritionist, Medical Research Institute, Colombo 8.

The Department of Health (Curative) of the CMC maintains 37 out-door dispensaries at 27 centres, which are mainly patronised by the under-priviledged, the majority of whom live in shanties or slum dwellings. The percentage of permanent residents of the city living in slums and shanties, revealed during the UDA survey of 1979, is as follows :

Parliamentary Electorate	Slum/Shanty Population
Colombo North	45%
Colombo Central	52%
Borella	25%
Colombo East	30%
Colombo West	3%

This is a report of a study, carried out in 1988, of the nutritional status of a sample of children under 5 years of age attending dispensaries in 4 out of the 5 electoral divisions. Co ombo West was excluded from the study as only 3% of the population live in slums/ shanties. The nutritional status of pre-school children is assumed to reflect that of the slum population.

MATERIALS AND METHODS

The study was confined to a sample of about 0.5% of the children under 5 years of age in the 4 electoral divisions, approximately 200 children.

The siting of the dispensaries selected from these 4 divisions are as follows :

Aluthmawatha	No. 268, Mutuwal, Colombo 15
Slave Island	No. 104, Sir James Peiris Mawatha, Colombo 2
Borella	No. 136, Cotta Road, Colombo 8
Kirillapone	No. 5, Robert Gunewardene Mawatha, Colombo 6

At each dispensary 50 children less than 5 years of age were chosen at random. Every child attending on an appointed day and thereafter was examined until 50 children had been seen. The following data were collected on each of them:

(i) General information on the family;

(ii) Morbidity data : incidence of measles, diarrhoea and respiratory tract infections during the 30 days preceding the day of interview, obtained from parent or guardian.

(iii) Immunisation data from immunisation cards issued by the CMC.

(vi) Age was calculated to the nearest month, according to WHO recommendations (1) from the date of birth obtained from a birth certificate or from growth charts issued by the CMC to the mother. For example, an infant born on 13th July, 1987 was recorded as 6 months if seen between 13th December, 1987 and 12th January, 1988.

(v) Socio-economic survey based on a questionnaire administered to the parent.

(vi) Weight of the child, in light clothing and barefooted, was measured using a Salter spring balance.

(vii) Length or height was measured using a measuring board with a movable foot piece, with the child barefooted. Supine length was measured in children below 2 years and standing height in older children.

Weight-for-age, height-for age and weight-for-height were compared with reference values published by the US National Center for Health Statistics (NCHS).

The socio-economic survey was carried out on a sub-sample of 30 children.

An assessment of the type of dwelling and toilet, floor area and source of water was made by inspection. The per capita income was calculated by dividing the stated household income by the number in the household.

RESULTS

Immunization

The immunization coverage of the children is indicated in Table 1. A child was deemed to be completely immunized if he/she had been given all the vaccinations defined for that age group by the WHO and required by the Ministry of Health. Of the total, 83.5% had been completely immunized, the defaulters being mainly in the 0 to 2 year old group. Vaccination against measles was the requirement least adhered to by the parents.

Breast feeding

Breast feeding practices among the community were good, 96.5% of the children being breast-fed up to 3 months and 81% up to 6 months.

Morbidity

The prevalence of measles, diarrhoea and respiratory tract infections (RTI) among the children (as indicated by the parent) is shown in Table 2. The most prevalent condition was RTI, being highest in the 2 to 3 year old group. Diarrhoea was most prevalent in the 1 to 2 year old group.

TABLE 1. Percentage of "Completely Immunised" children in each age group

Age Years	Number of children studied M	F	M&F	% completely immunised
0–	21	26	47	80.8
1–	30	17	47	80.8
2–	21	16	37	83.8
3–	23	17	40	90.0
4—5	19	10	29	82.7

TABLE 2. Prevalence of infections among infants and pre-school children

Age Years	n	Measles %	Diarrhoea %	Respiratory Tract Infections %
0–	47	—	9.5	33.3
1–	47	—	29.6	41.8
2–	37	—	12.8	48.5
3–	40	—	15.4	38.1
4—5	29	8	13.6	40.1

TABLE 3. Prevalence of signs of avitaminosis among infants and pre-school children

Age Years	n	Xerosis %	Bitot's spots %	Angular Stomatitis %
0–	47	—	—	—
1–	47	—	—	—
2–	37	—	—	3.7
3–	40	—	—	4.8
4—5	29	4.5	3.4	15.9

Table 3 sets out the prevalence of signs of nutritional disorders seen among the children. Oedema, phrynoderma and signs of fluorosis were not seen. Bitot's spots were seen in the 4 to 5 year group, the overall prevalence being 0.5%. Prevalence of angular stomatitis and glossitis was high (3.5%), being highest in the 4 to 5 year age group.

The relationship between the incidence of RTI and the type of dwelling and area occupied per person is shown in Table 4. More than 90% of children living in shanties and less than 30% of those living in permanent buildings had RTI. The incidence of RTI falls rapidly with increase in the space available per person in the dwelling.

Table 5 indicates the relationship between the prevalence of diarrhoea and the type of toilet available to the household. All the children in dwellings with no toilet facilities were reported to have had an episode of diarrhoea during the 30 days preceding the interview, whereas only 12.5% of children in families owning their own toilet had diarrhoea.

TABLE 4. Relationship between the incidence of respiratory tract infections (RTI) and the type of dwelling and the area occupied per person

Parameter		n	Incidence of RTI	Statistical significance
Type of Dwelling	Shanty	11	90.9	khi square 8.15 d.f. 2
	Tenements	12	75.0	$0.01 < p < 0.05$
	Permanent	7	28.6	
Square feet per person	<100	20	85.0	khi square 11.5 d.f. 2
	100—200	6	50.0	$p < 0.01$
	>200	4	—	

Table 5. Relationship between the prevalence of diarrhoea and the available toilet facilities

Type of toilet	N	% with diarrhoea
None	3	100
Public toilet	8	37.5
Shared toilet	11	36.4
Own toilet	8	12.5

khi square 7.24, d.f. 3, $p > 0.05$

Nutritional status

The mean heights, weights and body mass indicies of the children are given in Table 6. About 21% of the children were "normal" according to the Gomez classification (Table 7). A majority of the children were only marginally undernourished. The highest prevalence of the "moderately" malnourished were in the 4 to 5 year age group, which group also had the greatest percentage of those severely malnourished. The differences between the sexes were not significant.

TABLE 6. Mean heights, weights and body mass indices (BMI) of pre-school children

Age mths.	N	Height cm	Weight kg.	BMI kg/m²
Males				
0—5	11	59.0	5.83	16.71
6—11	10	67.5	7.69	16.77
12—17	13	73.0	8.37	15.68
18—23	14	79.9	9.81	15.37
24—29	14	84.3	10.41	14.62
30—35	09	86.6	10.76	14.28
36—41	14	87.8	11.36	12.64
42—47	07	96.4	13.60	14.61
48—53	12	96.3	12.63	13.62
54—59	10	98.4	13.72	14.09
Females				
0—5	6	59.0	5.08	14.43
6—11	15	65.8	6.71	15.56
12—17	12	71.0	8.03	15.81
18—23	9	78.2	8.54	13.95
24—29	5	87.6	12.12	15.81
30—35	11	85.1	10.56	14.56
36—41	12	88.6	10.71	13.69
42—47	5	90.1	11.98	14.74
48—53	5	89.7	12.22	15.45
54—59	6	96.0	15.32	13.87

TABLE 7. Percentage of children in each age group who were malnourished, according to the Gomez classification

Grade	Sex	Age in years					Total
		0— %	1— %	2— %	3— %	4—5 %	
Normal	M	52.4	20.0	14.3	8.7	0	19.2
	F	34.6	23.5	37.5	5.9	0	23.3
	M+F	42.5	21.3	24.3	7.5	0	21.0
Mild	M	28.6	50.0	52.4	56.5	52.6	48.2
	F	42.3	29.4	31.3	58.9	50.0	41.9
	M+F	36.1	42.6	43.2	57.7	51.7	45.5
Moderate	M	14.3	30.0	33.4	30.4	36.8	28.9
	F	19.2	41.2	25.0	29.4	50.0	30.0
	M+F	17.0	34.0	32.4	30.0	41.4	29.5
Severe	M	4.5	0	0	4.3	10.5	3.5
	F	3.8	5.9	6.3	5.9	0	4.6
	M+F	4.3	2.1	2.7	5.0	6.8	4.0
Total number in each age group	M	21	30	21	23	19	114
	F	26	17	16	17	10	86

M = Male F = Female

Table 8 shows the nutritional status of the children according to the Waterlow classification. More than two-thirds of the children were "normal", 19.5% were stunted and 11.5% were wasted. The highest percentage wasted were in the 1—2 year old group, whereas the number stunted increased with age, being more than 25% in the 3 to 5 year old group. Children who were both wasted and stunted were seen only in the latter age group.

There were no "normal" children in households with less than Rs. 200 per month per capita income (Table 9). Only in this group was concurrent wasting and stunting seen. The percentage normal as well as those wasted decreased with increase in income. There was no stunting in the higher income groups, the incidence being highest in the Rs. 200 to 400 groups.

About two-thirds of the mothers had stopped schooling at Grade 5. In this group only 15% of their children were considered normal according to the Waterlow classification (Table 10). The data in this table shows that the level of education of the mother can have only a limited effect on the nutritional status of their children when the environment in which they live is insanitary and housing inadequate.

TABLE 8. Percentage children in each age group who were categorised as normal, wasted (acute malnutrition), stunted (chronic malnutrition) and both wasted and stunted, according to the Waterlow classification

Grade	Sex	Age in Years					Total
		0—	1—	2—	3—	4—5	
Normal	M	80.9	80.0	71.4	65.2	52.6	71.0
	F	69.2	70.5	68.7	47.0	50.0	62.0
	M+F	74.5	76.6	70.3	57.5	51.7	67.5
Acute	M	0	13.3	14.3	4.3	21.0	10.5
	F	15.3	17.6	0	23.5	0	12.8
	M+F	8.5	14.9	8.1	12.5	13.7	11.5
Chronic	M	19.0	6.6	14.3	26.0	15.7	15.7
	F	15.3	11.7	31.2	29.4	50.0	24.4
	M+F	17.0	8.5	21.6	27.5	27.6	19.5
Concurrent acute and chronic	M	0	0	0	4.3	10.5	2.6
	F	0	0	0	0	0	0
	M+F	0	0	0	2.5	6.8	1.5
Total number in each age group	M	21	30	21	23	19	114
	F	26	17	16	17	10	86

M = Male F = Female

TABLE 9. The relationship between nutritional status (according to the Waterlow classification) and the per capita income of the households

Per capita income Rs.	N	Nutritional status			
		Normal %	Acute %	Chronic %	Concurrent %
<200	8	0	37.5	37.5	25
200—400	11	18.3	27.5	54.5	0
401—600	5	60.0	40.0	0	0
>600	6	83.4	16.6	0	0

khi square 21.32, d.f. 9, $0.01 < p < 0.05$

TABLE 10. Relationship between the level of the mother's education and the nutritional status of their children (according to the Waterlow classification)

Level of mother's education (Grade)	N	Nutritional status of children			
		Normal %	Acute %	Chronic %	Concurrent %
1—5	20	15	40	35	10
6—10	5	80	0	20	0
>10	5	60	20	20	0

khi square 8.7, d.f. 6, $p > 0.05$

Tables 11 and 12 indicate the relationship between the nutritional status of the children and the type of dwelling and space available in the dwelling. All children living in shanties were undernourished, more than half being stunted and 18% being both stunted and wasted. A large majority of those living in permanent buildings were healthy. The size of the dwelling had a significant effect on nutritional status. Only 10% of the children living in the smallest dwellings were normal, as against 75% of those occupying more than 20 sq. m. Both wasting (acute undernutrition) and stunting (chronic undernutrition) bear a relationship to the floor area available.

TABLE 11. Relationship between the type of dwelling and the nutritional status of children (Waterlow classification)

Type of dwelling	N	Nutritional status %			
		normal	acute	chronic	concurrent
Shanty	11	0	23.7	55.5	18.1
Tennement	12	33.3	41.7	25.0	0
Permanent	7	85.7	14.3	0	0

khi square 18.8, d.f. 6, $p < 0.01$

TABLE 12. Relationship between the space occupied per person and the nutritional status of children (Waterlow classification)

Area per person m2	N	Nutritional status			
		normal %	acute %	chronic %	concurrent %
<10	20	10.0	40.0	40.0	10.0
10—10	6	66.6	16.7	16.7	0
>20	4	75.0	25.0	0	0

khi square 13.4, d.f. 6, $0.01 < p < 0.05$

TABLE 13. Relationship between nutritional status of children under 6 years of age and the socio-economic parameters studied

Socio-economic parameter	C	d.f.	khi square	Significance	
				p 0.01	p 0.05
Nutritional Status VS. Type of dwelling	G	6	25.34	S	S
	W	6	18.80	S	S
VS. Percapita income	G	9	22.70	S	S
	W	9	21.32	ns	S
VS. Floor area occupied per person	G	6	12.95	ns	S
	W	6	13.40	ns	S
VS. Mother's literacy level	G	6	12.90	ns	S
	W	6	8.71	ns	ns

C = classification G = Gomez W = Waterlow S = Significant
ns = not significant

Table 13 summarises the relationship between nutritional status of the children and the socio-economic parameters studied. The type of dwelling and the income level are the two most important factors that determine nutritional status, the level of education of the mother having very little effect.

DISCUSSION

Morbidity

The immunization coverage of 83.5% (Table 1) is better than the island-wide coverage of 63% reported for 1988 (2), probably due to a greater access to health personnel in the City, the ready availability of facilities at city dispensaries and easy access to the households by health workers. In spite of this protection against whooping cough, tuberculosis and measles, the prevalence of RTI was 42.5%, a figure similar to that reported for admissions to the Lady Ridgeway Children's Hospital, Colombo (3). The high prevalence of RTI is probably due to overcrowding (Table 4).

The prevalence of diarrhoea was 17%, which is close to the figure of 11% obtained during the Demographic and Health Survey of Sri Lanka in 1987 (4). It is possible that the actual prevalence was higher. The mother's recollection of events during the previous 30 days might not be reliable, and a more accurate estimate might have been obtained had the period of recall been shorter, say 7 days. There is the additional possibility that, in communities without proper toilet facilities, one or two loose motions a day in a child might be unnoticed by the parent. The data show that the prevalence of diarrhoea was lowest during infancy (when the child was being breast-fed), and highest in the 1 to 2 year old group, i.e. during the period of weaning and immediately after (Table 2). Prevalence was high where there were no toilets or toilets were being shared between several households.

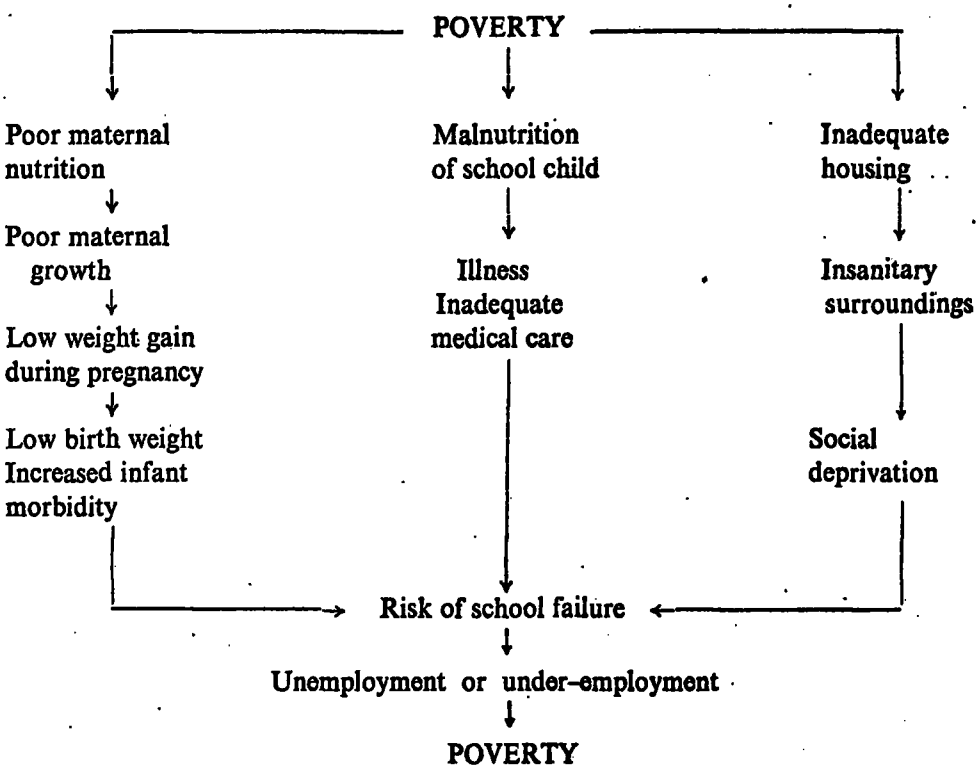
The overall prevalence of Bitot's spots (0.5%) indicates that vitamin A deficiency is high and public health intervention is required (5). Signs of vitamin B deficiency were seen in the older children, probably reflecting a high consumption of highly milled, white rice (the cheapest in the market) and flour of low extraction.

Nutritional Status

The two most important factors influencing the nutritional status of pre-school children among the urban poor are the economic status of the family and the type of dwelling. Mothers who had some education had healthier children than those who had little or no formal education, but there is a limit to what can be achieved by mother's educational level when her income is low and she lives in a small space surrounded by an insanitary environment. Therefore, when attempting to raise the nutritional level of slum dwellers, the priorities should be the alleviation of poverty along with improvement in housing and sanitation.

Intervention Programmes

The diagram below, adapted from the flow diagram of Birch and Gussow (6) shows that poverty is the main cause of malnutrition which, in turn, leads to continued poverty. Poverty compels a family to live in insanitary surroundings which exacerbates malnutrition, especially in pregnant women and children, leading to underemploymet or unemployment of the next generation and to poverty.



To break this vicious cycle, the country has initiated a "poverty alleviation" programme. Poverty alleviation by distribution of money alone will be ineffective In addition, in the City, there has to be a three-pronged attack on malnutrition and ill-health. The nutrition and health of women in general, and of pregnant and lactating women in particular, needs to be improved. The programme of feeding one substantial meal to pregnant women, now being put into effect in a limited area in the City, must be extended, with a view to increasing the weight gained during pregnancy which will lead to a larger and more viable infant (7). The percentage of low-birth-weight babies born in maternity homes of the CMC has been reported to be 25.7%(8). Attention presently paid to the health of the school child is inadequate. The free mid-day meal should be reinforced by more regular school health inspections.

The greatest need in the City is the provision of proper sanitation It is incumbent on the CMC to maintain the "tenement gardens" in a sanitary condition, with daily removal of garbage, provision of an adequate water supply, and effective surface drainage always maintained in good repair.

Those living in shanties should be provided with better housing. When laying out new "gamas' in urban areas. the provision of "common" latrines should be abandoned in favour of a toilet for each household. There is less ill-health among families having their own toilets (Table 5).

The "poverty alleviation" programme envisages greater production by the recipients of aid. The urban poor will have no space to produce food. The urban youth, especially the school dropouts, must be given some vocational training that will enable them to find employment.

Setting in motion programmes such as those outlined above will lead to a higher health and nutritional status of the City dwellers.

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