

Indian Pediatrics – Environmental Health Project

Special Article Series

The Indian Academy of Pediatrics felt the need to focus on the rapidly expanding and under privileged urban poor who lack an organized health care delivery system in contrast to the rural population. They lack basic civic amenities including safe water supply and proper sewage disposal. It is therefore understandable that their child health indices are two to three times worse off than their counterparts. On the initiative of the Academy, Indian Pediatrics in collaboration with the Environmental Health Project has decided to bring out a series of well-researched papers highlighting important issues on this subject. It is expected that these papers would help in providing programmatic directions to the planners. Publication of these articles will be partly funded by Environmental Health Project.

Editor-in-Chief

Determinants of Childhood Mortality and Morbidity in Urban Slums in India

Shally Awasthi*
Siddharth Agarwal**

The large and continuous increase in India's urban population and the concomitant growth of the population residing in slums has resulted in overstraining of infrastructure and deterioration in public health. The link between urbanization, a degraded environment, inaccessibility to healthcare

Department of Pediatrics and Institute of Clinical Epidemiology, King George's Medical University, Lucknow-UP, India, USAID-EHP Urban Health Program*

*Corresponding author: Shally Awasthi, Department of Pediatrics and Institute of Clinical Epidemiology, King George's Medical University, Shahmina Road, Lucknow-UP, 226003, India.
E-mail: sawasthi@sancharnet.in*

and a deteriorating quality of life is significant and particularly evident in the sharp inequities in IMR if one looks at urban specific studies. It is hence, germane to address the appalling inequalities in the distribution and access to basic amenities and health services with a focus on enhanced service coverage, improved sanitation and water supplies and mobilization of community action for effectively mitigating the childhood death and disease burden in urban slums.

Key words: *Childhood mortality, urban slum.*

What is an urban slum and the magnitude of population living in it?

In the recent decade rapid urbanization has occurred in almost all developing countries. Majority of world's biggest cities are in the developing countries and 60% of their population live in the urban slums(1). Most of the inhabitants of slums are migrants from rural areas and exposed to new environmental dynamics of poor housing, water supply and sanitation with poor access to health care.

In India out of the total population of 1027 million as on 1 March, 2001, about 742 million live in rural areas and 285 million in urban areas. The net addition of population in rural areas during 1991-2001 has been to the tune of 113 million while in urban areas it is 6 million. The percentage decadal growth of population in rural and urban areas during the decade is 17.9 and 31.2 per cent, respectively. Of the urban population [27.8% of total population(2)], thirty eight per cent of urban population was living in poverty in 1990, mostly in slums(3). Children living in the urban slums are exposed to risks of infectious diseases(4), malnutrition(5) and possibly impaired cognitive development(6). Treatment or health care of sick children forms a significant proportion of expenditure for the urban poor(7). There is an urgent need to review mortality and morbidity determinants among them. In this review we have concentrated on post-neonatal period among the underfives.

What are the mortality rates reported from urban slums in Indian cities?

Under 5 mortality rate (U5MR) varies

from state to state and also in the rural and urban areas across the country. The lowest U5MR is in Kerala (32, 1992-93) and the highest UP (141.3 .1992- 93)(8). In the 1981, 0-4 years death in rural versus urban Madhya Pradesh, according to the Registrar General, was 152 versus 142 per 1000 live births(8). Thus the urban slums till mid-90s had better chances of child survival than in rural areas. This may also have been a factor favoring the movement from rural areas to the urban slums. Childhood mortality rates from certain cities in India and Bangladesh is shown in *Table I*.

What are the causes of childhood mortality?

Community Based Studies

There are few community based studies on cause specific childhood mortality. Causes of death since January 1992 were recorded in 1995 in all the existing anganwadi centers in urban Lucknow. There were 24196 children less than 5 years of age and 1469 deaths, of which 298 were stillbirths. Beyond neonatal period – pneumonia (23.4%), diarrheal diseases (20.9%), malnutrition and/or anemia (11.4%) formed major cause of death and

TABLE I—*Childhood Mortality Rates from Certain Studies in India and Bangladesh*

	Age group	Mortality rate (per thousand live births)
Awasthai, Lucknow, 1993-94(9)	<5 years	126.7
Bang, Maharashtra, 1990(10)	1-4 years	18.4
	<5 years	86.6
Hussain, Dhaka 1992(11)	Infant mortality rate	73.5
	1-3 years	10.9
	3-9 years	3.48
Thora, Jabalpur 1985(12)	Infant Mortality Rate	128.7
Bhandari, Delhi 1995-96(13)	Infant Mortality Rate	46.25
NFHS SLI (Low)(14)	Infant Mortality Rate (Urban)	76.1

NFHS: National Family Health Survey.
SLI: Standard of Living Index.

disease burden. The Integrated Children Development Scheme (ICDS) system underreports death by one-thirds(9). 71.8% deaths occurred at home; 94.5% hospital deaths did not have a death certificate. Since most deaths occur at home causes of death cannot be monitored reliably.

In a prospective study from Dhaka, Bangladesh, in children below 12 months the common causes of death were respiratory and diarrheal illnesses. In older children these were diarrhea, followed by measles, accidents and fever(11). A similar pattern of deaths was seen in Delhi where the major causes of death for infants beyond the neonatal period were diarrhea, meningitis and sepsis followed by pneumonia(13).

The common causes of death *i.e.*, diarrhea, pneumonia and fevers are the most prevalent diseases identified among slum children besides nutritional deficiencies (*Table II*).

What are the causes of childhood morbidity?

Community Based Studies

Awasthi and Pande(9) reported that in the preceding 1 month 31.31% (95% CI: 26.9-36.01) of 396 children surveyed in 32 randomly selected slum had an episode of morbidity. Since they excluded children below 1.5 years of age their prevalence is lower than that reported by others. Prevalence of the common infections as reported by the authors in *Table II* indicates that more slum children are affected compared with the National Family Health Survey (NFHS) figure of 19% children under three suffering from diarrhea and respiratory infections(14). Thus averages mask the underlying inequity in health status.

Assessment of the causes of morbidity in a (9) prospective follow up study of 1061

(48.3% girls and 51.7% boys) children aged 1.5-3.5 years from 32 randomly selected out of 153 anganwadi centers was done in 1995-1996. Annual Incidence rate (IR) per 100 child years for respiratory, diarrheal, skin disease and pneumonia was 167, 79.9, 30.6 and 9.6 respectively.

A morbidity survey was done in Chennai and Delhi in 2000. Illnesses were classified as those requiring hospitalization and those not requiring hospitalization. Non-hospitalized illnesses were further sub-classified as acute (which occurred in the last 30 days provided over all duration was less than 90 days) and chronic or continuing illness where the episode had lasted for 90 or more days. They found that in contrast to adults, children less than 14 years had more acute illness than chronic ones and fewer hospitalizations. In a 30-day reference period per 1000 population age there were 0.9 and 2.3 hospitalizations in children and adults, respectively(19). Measures of hospitalization also reflect morbidity. A one year recall for hospitalizations in Chennai and Delhi is reported as 20 per 1000 population. Hospitalization rates were found to be higher in slums than resettlement colonies but no differential by gender was found(19). National Sample Survey (NSS) of 1995-96 reported a hospitalization rate of 23 per 1000 population (19).

Children living in the urban slums are also undernourished. Commonly reported nutritional deficiencies and nutritional profile of under five children in urban slums is shown in *Table III*.

National Data Base

In the NFHS-II data was collected on 2 week recall by respondents on morbidity in the under fives. NFHS data 1998-99 (SLI)(14) is given in *Table IV*.

TABLE II—*Common Childhood Morbidity from Urban Slums of India*

	Age	Morbidity prevalence (%)
S. Rao, Pune 1992-95(15)	<5 years	Diarrheas + Fever + Respiratory infections = 57.5*
Awasthi and Pande, Lucknow, 1998(9)	1.5 – 3.5 years	Respiratory illness = 17.2%, Diarrheas = 4.5%, Dysentery = 1.8%, Skin disorder = 4.5%, Fever = 2%, Others = 1.3%

TABLE III—*Nutritional Profile of Children from Urban Slums of India*

		Nutritional deficiency and profile
S. Rao, Pune, 1992-5(15)	<5 years	Underweight for age=40% Stunted = 55% Vitamin D deficiency = 23% Vitamin A deficiency = 5.3 - 5.6%
	0-2 years	= 16.3 - 19.6%
	2-5 years	= 16.3 - 19.6%
Kapur, Delhi, 1977(16)	9-36 months	Anemia = 30% Underweight for age = 90% Anemia = 64%
Awasthi & Pande, 1997(17)	1.5 - 3.5 years	Underweight = 67.6% Stunted = 62.8%, Wasted = 26.5%
Swami, 1999(18)	1-5 years	Vitamin A deficiency = 24.6%

TABLE IV—*NFHS 98-99 India, Disaggregated by Standard of Living Index*

Morbidity	Low SLI	Medium SLI	High SLI
Percentage of children suffering in past two weeks from			
Acute Respiratory Infections	21	19.4	15.7
Fever	29.8	30.1	26.7
Any diarrhea	19.9	19.7	19.7
Percentage of children treated with ORS	24.2	27.3	32.6
Percentage of children treated with recommended home made sugar-salt water solution	2.6	3.4	4.5

ORS: Oral rehydration salts; SLI: Standard of Living Index

What are the determinants of childhood mortality and morbidity? How these differ in urban slums vis-à-vis national and state averages?

There is an overlap between the determinants of childhood mortality and morbidity. Hence we are dealing with these together.

I. Biological

Low birth weight (LBW)

At the national level LBW constitutes about 30% of all live births(20). A multicentric study done by Indian Council of Medical Research (ICMR) in three urban slums of Delhi, Calcutta and Madras and in same number of rural areas, revealed that 41.4% live births were LBW as compared to 38.1% rural children(21). The risk of perinatal and infant mortality rates are greater among the LBW infants with higher morbidity and long term developmental problems among those babies who survived(22). In an observational study of slums in Calcutta with a population of 10000, 50 normal birth weight (NBW) and 50 LBW were followed for 4 months. IR Ratio of diarrhea in LBW exclusively BF versus early weaned was 8.9 (95% CI: 3.6-22.4); NBW 2.7 (95% CI: 0.9-8.0)(23).

Maternal age

Marriage at a younger age puts adolescent girls at a greater risk of giving births to a still born child or one who is premature or has low birth weight (24). ICMR Task Force National Collaborative study revealed that mean age at marriage of slum women is 13.8 years and age at consummation of marriage is 16 years(21).

II. Physical

Macro and Micro environment

Scale and nature of morbidity depends

also on local geography, climatic pattern, habitation of community close to drains and polluting units and recent migration. In a multivariate analysis with 64 slums and 16 migrant settlement colonies across Chennai and Delhi a high correlation ($r = 0.89$) was found between environment and migration(19).

Environmental Pollution

Children living in the urban slums are exposed to ambient as well as indoor pollutants. This is due to excess use of bio-mass fuel for cooking, parental smoking, poor housing and improper disposal of garbage and biomedical wastes. Exposure to parental smoking is related to increased episodes of acute respiratory infections and asthma in children(25). In a study from urban slums of Lucknow, use of bio-mass fuel was associated with an increased risk of respiratory illness and longer duration of episodes(26).

Hygiene and Sanitation

Practices: (i) Faeces disposal

A case control study was conducted in West Africa to assess the association of sanitation with diarrhea morbidity. Cases were children admitted with diarrhea and there were 2 control groups, one from the same community where the child came from and the other were those hospitalized for other illnesses(27). They found that it is not where the children defecate but what the mother does with the stool that is important.

Another case control study examined the impact of several environmental sanitation conditions and hygiene practices on diarrhea occurrence among children under 5 years of age living in an urban area. Cases were identified as children with diarrhea and controls were randomly selected among children under 5 years of age. The following

variables were found to be significantly associated with diarrhea-washing and purifying fruit and vegetables, presence of waste water in the street, refuse storage, collection and disposal, domestic water reservoir conditions, faeces disposal from swaddles, presence of vectors in the house and flooding in the lot(28).

Practices: (ii) Hand washing

Diarrheal diseases pose a major threat to the health of people living in developing countries particularly where there is poverty and poor environment. A hospital based study in USA showed that nosocomial infections could be prevented by washing hands with soap and water(29). The effect of hand washing in reducing the incidences of diarrhea in day care centers has also been reported(30). In a study conducted in Calcutta slums it was found that exercise of hand washing with soap appeared to be an effective measure in reduction of dysentery cases among those over five years(31).

A Bangladesh study(32) demonstrated that exercise of washing hands with soap appeared to be an effective measure for reducing the occurrence of secondary clinical cases of Shigellosis in the study group of houses with index shigellosis cases as compared to controls.

Access to sanitation facilities

Morbidity was found to be influenced by family size, socio-economic status, mother's educational level, hygiene practices, and environmental sanitation and water availability. Provision of adequate and safe water for the underprivileged population is the most urgent need in community health interventions.

Access to a flush or pit toilet is a very important determinant of infant and child mortality in developing countries. Factors found to be significantly associated with an increased risk of death from diarrhea include the non availability of piped water and the absence of a flush toilet(33). The unadjusted figures for neonatal, infant and childhood mortality is higher for children in households that do not have access to a flush or pit toilet, both in India as a whole and in all states (NFHS I)(35) (Table V).

Poor sanitation and water supply are generally assumed to increase the risk of morbidity and mortality from diarrhea thereby increasing the child mortality rate. Esrey *et al.*(36) reported that mortality of children with improved water supply and excreta disposal facilities was found to be 0 to 81 per cent lower than that of children without the facilities.

TABLE V—Relationship of access to toilet and neonatal, infant and child mortality rate (NHFS-I)

State	Has access to own, shared or public flush or pit toilet											
	Neonatal Mortality				Infant mortality				Child mortality			
	Unadjusted		Adjusted		Unadjusted		Adjusted		Unadjusted		Adjusted	
	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
India	63	34	57	44	104	55	93	75	44	19	36	34
UP	82	42	76	59	135	74	123	109	59	29	52	48
Kerala	31	21	26	22	46	28	39	30	16	8	12	9

In a proportional mortality study in North Eastern Brazil(37) diarrhea was found to be the underlying cause of 20% deaths of infants aged under 4 months in households with piped water inside the house, as compared to approximately 60% deaths in other household.

Zaheer(38) showed that the introduction of treated and piped water in 14 towns of Uttar Pradesh was associated with a 43% reduction in the diarrhea mortality rate at all ages in the 5 years following the improvements compared to the previous five years.

Season and geographic location

In the assessment of morbidity in the urban slums of Lucknow, seasonality of illness was also assessed(39). Winter was from October to February, summer from March to June, and monsoon from July to September months. The IR for pneumonia was lowest in winter while that of diarrhea and skin infections was highest in summer and monsoon months, respectively. Season specific diseases were measles in summer and fever as isolated symptom in monsoon. There should be season specific intensification of existing health care resources for these morbid conditions.

III. Economic

A recent World Bank report supported the previously documented inverse relationship between per capita income and infant mortality in India(40). ICMR multicentric study revealed that 90% families had an average monthly family income of less than Rs. 600/-. In the assessment of morbidity by income in Delhi and Chennai, the lowest quintile had a morbidity of 126.5 per 1000 population as compared to 62.1 in the highest quintile(19). While age desegregated data has not been reported it seems likely that similar patterns of morbidity will be observed in children also.

In a prospective study on 112 under fives in the urban slums of Calcutta by Biswas, *et al.*(41) higher morbidity in the under-nourished and those from the lower socio-economic strata was reported. Mean episode of illness in children in families with mean ICMR score scale of III versus IV & V was 4.00 (SD 0.9) versus IV & V 6.04 (SD 1.7) (RR 1.5; P value <0.05). In the same study, the episode/child/year was highest when per capita income was <Rs. 100 (*Table VI*).

Even though morbidity is more in the economically underprivileged, hospitalizations are paradoxically directly related to income. For the poorest 40% hospitalization rates based on NSS data is 18 per 1000. Likewise, National Sample Survey Organisation (NSSO) data for urban Delhi reported a hospitalization rate of 13 per 1000 population, but for poorest 40% it was 7 per 1000; therefore hospitalization is effected by income(19).

IV. Socio-cultural

Religion: In a study of childhood mortality rate in urban slums of Madhya Pradesh, IMR in Muslims was 192.5 as compared to 91.9 per 1000 in the Hindus (P value = 0.01) (12). IMR in Muslims, which were 27.8% of the population, was much higher than the 1981 IMR reported by the office of Registrar General in rural MP of 152(12).

TABLE VI—Association of Illness in Children with Per Capita Income

Per capita income (Rs)	IR (episode/child/year) Mean	SD	RR	P value
<100	6.74	1.8	1.7	<0.05
101-200	5.90	1.8	1.5	<0.05
>200*	3.9	0.9	1.0	—

* Reference category

Gender: While there are sex related differences in illness and mortality among males and females, social constrains effect health seeking behavior thus leading to gender related inequities. Gender differences in mortality can be explained by patterns of treatment received and choice treatment received effected by financial paying capacity, A prospective study was carried out in Dhaka city, Bangladesh(11). Three out of seven slums were randomly selected. Each slum had 15000 households. Surveyed were 1500 households with a parent <40 years and at least one surviving child aged 0-107 months. More girls than boys died (OR = 1.5, 95% CI: 1.2 to 1.8).

In urban Nasik(42) survey questionnaire for morbidity was done in 1999. In one month' reference period high morbidity in females was found (487 per 1000 people vs 254 per 1000 people). Reasons for this were not stated. In contrast, males were found to have higher morbidity than females in NSSO data of 1995-96(19). Information 15 days prior to survey was noted. Variations may be due to differential reporting in males and females. Thus males may report a morbid event overlooked by females. This will also reflect in health care seeking behavior of males and females and thus mortality. A female in India is 30 times more likely to die within 5 years of age, than a male(43).

Educational status: Improving female education is important for reducing childhood mortality rates(44).

Migration: In various surveys inclusion of household from resettlement migrant colonies is inadequate. Hence even though it can be hypothesized that resettlement colonies may have worst health indices this has not been proved or refuted reliably. In addition proximity to health services, quality of water supply and public sanitation, support of non-

governmental organizations, women and children empowerment effect morbidity.

Effect of maternal employment: Sivakami(45) reported adverse effect of maternal employment on child care and morbidity. World Fertility survey from 28 countries showed that mother's participation in work was associated with higher child mortality(46). Possibly because working mothers in developing countries were less educated and belonged to lower socio-economic status. Even after controlling for education and socio- economic status net effect of work participation on child survival was negative. In 10 out of 14 countries surveyed (UN 1984)(34) women who do not participate in economic activities or who work within their family enterprise have the lowest levels of child mortality. In Sudan(47) it has been reported that mother's involvement in labor force raised child mortality by 10% when compared to the entire country. Children of working mothers are at greater risk of ailments even after economic factors have been controlled (48-49). However from Goa(50) and Orissa(51) it was found that association of maternal employment on child survival could be attributed to other factors and once these were controlled there was negligible effect of employment. Negative effect is due to reduced time spent with the child; positive effects are increased earning which can be directed to the child, greater control of woman on spending of resources, increased exposure, access to relevant information on childbearing and rearing practices, enhanced ability to manipulate and engage in world outside home to better meet the nutritive, medical and survival needs of infants.

V. Feeding practices

During the period of first six months of life it is recommended that an infant should be

exclusively breastfed. Even a malnourished mother is able to provide enough good quality milk for the normal growth of her child, as indicated by growth pattern of exclusively breastfed infants(52). However, in a study in Delhi slums, only 20% infants were exclusively breastfed for 5-6 months and 41% exclusively breastfed for less than 2 months(53). Children who were given only breastfeed for two months weighed 4.5 (SD: 3.9) kg as compared to 6 (SD 4.5) kg for children exclusively breastfed for 6 months. Initiation of breastfeeding was within 6 hours for 56% women. However 22% women started breastfeeding after 48 hours thereby implying that children of these women were deprived of colostrum. The mean weight of children who were given colostrum was 5.7 (SD 3.6) kg as compared to 4.8 (SD 4.07) kg of children who were not given colostrum. Top milk was given to 68% and of these 86% received diluted top milk. Semisolids were given to 47% at 6-7 months leading to a mean higher weight by 2.5 kg as compared to children not consuming semisolids. Due to these reasons, on an average, the calorie intake of slum children was found to be deficient by 25% of the RDA for children of that age(53).

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. Peak prevalence of malnutrition was seen at 18 months due to faulty infant feeding and weaning practices. In rural areas the same is seen at 2-3 years(15).

VI. Personal cleanliness

Personal cleanliness, household cleanliness and clean drinking water, fecal contamination of drinking water are also related to morbidity in children, specifically those related with diarrheal disease(54). It has been reported that despite high immunization

coverage, socio-economic and environmental factors must be controlled to reduce mortality.

The susceptibility to HIV infections is greater amongst urban slum dwellers due to lack of awareness about HIV/AIDS(55). This could be related to poor hygiene, sanitation nutrition and possibly to their vocation (rag pickers and garbage sorters).

VII. Access and utilization of health care

Access to health care/efficiency of health care provider:

Even though morbidity may be different by sex and gender, access to health care ultimately determines survival. Proportion of illness episodes for which treatment was sought in the urban slums was 90.5% and in resettlement colonies 96.6%, with an average of 91.4%(19).

Utilization of health care:

Physical distance is an important factor in primary health care utilization in India(56). In the urban slums preferred health care provider is the closest one. Most often the parents take the child to a non-governmental dispenser(7) who may not be a qualified practitioner.

Economic status(19) data shows that people from financially constrained wards are less likely to seek health care; with increasing economic status the proportion of untreated illnesses declines. In Delhi and Chennai 11% population did not seek care during an episode of illness. Gender difference in seeking health care, are obvious after 15 years of age. Reasons for not seeking treatment in children aged 0-14 years were either that the illness was not considered serious in most cases, or there was no facility nearby, financial constrains, lack of time/long waiting *etc.*(19). Gap in seeking health care was approximately 2 days for acute and 4.5 days for chronic illness in urban slums(19).

For non-hospitalized illness episodes the facilities of non-governmental health dispenser were preferred in urban slums of Lucknow(7). Governmental health facilities were not preferred here. Likewise in the urban slums of Delhi and Chennai facilities used were governmental(43.8%), private (47.2%), charitable (2.8%), chemist shop (2.8%), faith healer (0.8%), home remedy (2.3%) and combination (0.3%)(19). Slum dwellers prefer to get advise and medicines from the same facility. It has been stated that relative importance of governmental institutions falls and private institution rises with an increase in income(19). However this is not true in case of urban slum dwellers.

Hospitalized illnesses

Majority of children in slums and resettlement colonies rely on public funded hospitals for in-patient facilities(19). Stay in governmental and charitable hospitals is twice as long as that in private ones (approx. 14 versus 7 days). Before hospitalization more than 1/3rd sought treatment with almost half of them preferring private practitioner. After hospitalization most did go for check ups at

public facilities. Finding may vary by the city being considered(19).

Self reported major determinant of health care facility utilization for governmental hospitals was that treatment was “free and/or inexpensive”. For use of private facilities the major reason was proximity, perceived higher quality “doctor is popular or has a good reputation”(19).

Expenditure on health care

Almost all the slum dwellers pay out of pocket for health care. More than 90% had family income in Rs. 500-1000.00 range in Lucknow(7). But this is likely to differ across cities. On an average 1% of family income was spent as direct medical cost of treatment of a sick child(7). Direct medical cost of treatment of respiratory illness, diarrhea, dysentery, skin disorder and fever is given in *Table VII*.

From studies the assessment of health of children in urban slums of India is not optimal. Mortality and morbidity rates are higher than the better off. When sick, children from the poor families are taken to health care providers for whom there are no quality

TABLE VII—Expenditure for Family of Pre-School Children(7)

Illness	Health care provider service charges in rupees (A) Mean (SD)	Additional medicine charges in rupees (B) Mean (SD)	Cost of illness in rupees (C = A + B) Mean (SD)	P value
Respiratory illness (all types)	30.8 (16.7)	0.6 (2.6)	31.4 (16.3)	
Diarrhea	40.0 (13.7)	2.1 (8.7)	42.1 (20.4)	0.02
Dysentery	44.7 (22.2)	0.0 (0.0)	44.7 (22.2)*	0.05
Skin disorders	53.0 (29.4)	1.4 (4.0)	54.4 (28.3)	0.08
Fever	52.8 (49.1)	55.0 (67.4)	65.4 (68.9)	0.3
Others	22.2 (20.3)	12.6 (27.9)	29.6 (30.9)	0.7

P value when compared to respiratory illness

P* value 0.8 on comparing with diarrhea

control measures in the prevailing social infrastructure. However there are gaps in knowledge about (a) Magnitude of problem: Cause specific mortality, morbidity patterns, health seeking behavior; (b) Determinants of mortality and morbidity; (c) Behavior patterns related to hygiene and health seeking and influence of gender.

In the urban slums there is poorly regulated health care system. Therefore implementation of interventions of known efficacy cannot be done efficiently. Hence, programs will have to be introduced through innovative methods like through the non-governmental organizations. Impact of various programs has to be monitored. To ensure equity programmatic measures to enable equal access to health care by sex and economic classes have to be identified. This may involve introduction of economic reforms and subsidies, plus regulation of private practitioners and hospitals to ensure quality. Careful monitoring of efficiency of these measures must be done. Urban child health has to be prioritized.

The Way Forward

In the recent decade rapid urbanization has occurred in almost all developing countries. Children residing in slums are exposed to adverse living conditions, which render them more vulnerable to risks of infectious diseases and malnutrition.

In general, the available data clearly indicates that child health in urban slums in the India is worse than national averages or urban averages. High mortality and morbidity among infants and children below 5 years occurs on account of inadequate care, birth asphyxia, prematurity, low birth weight, acute respiratory infections, diarrhea, vaccine preventable diseases, malnutrition and deficiencies of nutrients.

Improvements would come about only through innovative approaches for health outreach and integration with environmental, economic and other social welfare programs, with a focus on community ownership for practical and sustainable efforts.

As is evident from the discussion above it is important to focus on: enhancing service coverage, improving sanitation and water services, community behaviors germane to the causation of childhood illnesses in urban slums and community participation in prevention and treatment of childhood illnesses for effectively mitigating the childhood death and disease burden in urban slums. This requires increased political commitment and convergence of efforts from all primary and secondary stakeholders.

Enhancing Service Coverage

Strengthening the quality and coverage of routine immunization programs

Significant improvements need to be made to strengthen the quality and coverage of the routine immunization programs with focus on providing a comprehensive package of services that are effective and affordable and monitoring and tracking left outs and dropouts using the catchment area approach.

Non-availability of outreach services in urban slums, cause higher morbidity and mortality, particularly among mothers and children belonging to migrant populations. Reaching these groups through innovative approaches like organizing camps and enhancing the use of immunization cards which would help maintain a regular record of the number of children vaccinated would be beneficial. Special campaigns including mobile vans if appropriate, for missed out pockets such as migrant populations will be effective.

Strengthening the role of Indigenous systems of Medicines (ISM) and Informal private providers

ISM providers are approached more frequently by urban poor as compared the formally trained allopathic providers. Consequently, strengthening capacity of ISM providers in health education activities on basic and vital health issues such as reproductive and child health care will expand the pool of effective health care promoters, optimize utilization of locally based remedies and cures, and promote low-cost health care.

An effort to reach out to urban slum households cannot be sustained by government alone. There is a need to place a partnership of non-government voluntary organizations, the private (profit and non-profit) corporate sector, government and the community. This is particularly relevant to urban settings considering the significant presence of such private agencies.

Since informal sector private provider is often the first contact care giver for urban slum dwellers, strategies for strengthening the role of these providers as agents of health behavior change will be effective and will complement public sector efforts.

Improving Sanitation and Water Services

It is important to focus on infra-structural facilities in terms of access to safe and adequate water supplies and sanitation facilities for combating various infectious diseases in children residing in urban slums. Studies have shown that non-availability of piped water and absence of flush toilets are associated with increased incidence of infant deaths from diarrhea. Hence, it is vital to expand availability of water and sanitation facilities to the urban population to effectively address mortality and morbidity associated with diarrhea.

The Valmiki Ambedkar Malin Basti Yojana (VAMBAY) introduced in 2001-02 by the Ministry of Urban Development and Poverty Alleviation, Government of India attempts to integrate sanitation as a part of the housing development for people living below the poverty line in urban slums with a goal of providing a healthy and enabling urban environment. The scheme focuses on community participation for the maintenance of toilet blocks. Each toilet block would be maintained by a group which would make a monthly contribution of Rs 20 per person to obtain a monthly pass. Maintenance of toilet block by slum dwellers at Rs. 20 per month is viewed more economical than other existing provisions by the Government of India. Hence, low cost sanitation and government schemes targeting the urban poor will go a long way in mitigating the death and disease burden in slums.

“*Swajal*” approach to rural water supply and environmental sanitation, started with assistance from World Bank is a paradigm shift in terms of delivery of sustainable water supply and environmental sanitation facilities. It is now being piloted in several cities of the country to target urban slums. The key components of the project entail improving knowledge, attitude and practices about the linkages between health and hygiene, providing higher water supply service levels (quantity, quality, equity, reliability, coverage and access), and improving environment through safe disposal of human waste. As an approach it focuses on participation of community especially women.

Addressing Community Behaviors Germane to the Causation of Childhood Illnesses in Urban Slums

Appropriate hygiene behaviors can play a critical role in minimizing the frequency of infectious diseases, and can possibly reduce

the risk of malnutrition in children. In India and in developing regions it is recognized that if community water supply and sanitation programs are undertaken in isolation, without action to integrate these with promotion and education on hygiene and sanitation within the community (particularly the home and its immediate surroundings), the health benefits from these programs will not commensurate with the investment made. Evidence shows hand washing could prevent more than one million deaths a year from diarrheal diseases. A new systematic review that set out to determine the impact of washing hands with soap in the community worldwide concludes that hand-washing could reduce the risk of diarrhea by up to 47%(57). Therefore, improvement of water supplies needs to be integrated with other interventions, such as sanitation and health education, which focus on better environmental hygiene and personal cleanliness.

Health seeking behavior: Firm traditional and socio-cultural beliefs of slum dwellers may in some cases pose negative influence on health seeking behavior for young children. For example, strong beliefs against immunization or not valuing the benefits of immunization are prevalent in certain migrant slum dwellers as was learnt during participatory community health inquiry conducted in the slums of Indore (Report of Participatory Community Health Inquiry in Indore, USAID-EHP Urban Health Program, 2003). Such beliefs prevent these communities from accessing immunization services even when available.

Health seeking behavior of the women especially during pregnancy has an important role to play for the health of newborn. Therefore, proper prenatal care and assistance during delivery and the quality of such services are greatly emphasized in any

population. It is important to address the low social and economic status of girls and women as it limits their access to education, good nutrition, as well as money to pay for health care and family planning services.

Hence, behavior promotion strategies addressing community beliefs focusing on environment-related issues such as hand washing, feeding practices, health seeking and appropriate prenatal and new born care are paramount.

Maternal employment leads to inadequate rest during pregnancy, consequent early resumption of work post delivery and neglect of newborn (Inadequate breastfeeding and other newborn care practices).

Community Participation in Prevention and Treatment of Childhood Illnesses

There is an urgent need to empower communities to take control of their health by strengthening their participation in identifying their own maternal and child health needs and identifying measures to address them. The important role of community participation should hence be strengthened to effectively address behaviors contributing to childhood mortality in urban slums.

This can be achieved by training basti level women groups which could serve as a platform for counseling and behavior promotion focusing on health education about environment-related issues such as hand washing, prenatal care for pregnant women and updating skills of trained birth attendants to improve new born care practices to reduce the risks of hypothermia and infection. These women groups could also strengthen linkage with service providers, thereby increasing utilization of services, coverage of left outs and dropouts and improved referral for LBW.

An effort in this direction is being made by

Key Messages

- Determinants specific to childhood mortality in urban slums include maternal employment and insanitary and unhygienic conditions.
- Informal health providers are the first contact care for urban slum dwellers. Thus, need to strengthen their capacity and role.
- Better coordination between multiple stakeholders for improved outreach of child health services.
- Promote low cost sanitation and government schemes targeting the urban poor with focus on community ownership.
- Address hygiene behaviors critical in minimizing the frequency of infectious diseases and reducing the risk of malnutrition.
- Empower communities by stimulating participation in identifying their own maternal and child health needs.

a Mumbai based NGO Apnalaya, whose philosophy is based on the community development model where participation is the key word. By selecting women from the community (Arogya sevikas), Apnalaya, ensures that health care is available to the community at all times. The local community groups are helped in identifying their needs and meeting them via programs and services undertaken through a partnership between Apnalaya and the community.

A silent but remarkable partnership in progress is supervening unobtrusively among the women of the slums, NGOs and government health workers in the slum communities of Hyderabad thanks to India's Family Welfare Urban Slums project. Backed by World Bank, this Central Government project is implemented in the low income areas of Bangalore, Calcutta and Delhi besides Hyderabad. The innovative measures undertaken entail a revolving fund for women's health committees to carry out sanitation and slum improvement schemes. Besides, NGOs are conducting workshops on health and nutrition providing education

facilities for drop outs and are conducting basic health and literacy education to teenage girls. A mid term review of the project by the Bank revealed that there has been an increase in institutional deliveries and prenatal care.

Acknowledgement

The authors gratefully acknowledge the research assistance provided by Breeda Hicky, Amrita Behar, Gunika Dua, Arti Majumdar of the EHP India team and Dr. Ekta Kalra of Department of Pediatrics, CSMMU without whose untiring support this write-up would not have been possible.

REFERENCES

1. Sting A. Uber Urbanization, Verelendung and Gesundheit Kolumbien. *Offizielles Gesundheitswesen* 1990; 52: 277-281.
2. Urban India. Ministry of Urban Development and Poverty alleviation, Nirman Bhavan, New Delhi. <http://urbanindia.nic.in/mud-final-site/urbscenelindex.html>.
3. World Bank. World Development Indicators 2003. www.worldbank.org/poverty/wdr/poverty/dhaka/gunewardena.pdf.
4. Hughart N, Silimperi RD, Khatun J, Stanton B.

ENVIRONMENTAL HEALTH

- A new strategy to reach high risk urban children in Bangladesh, Urban Volunteers. *Trop Geog Med* 1992; 44: 142-148.
5. Choudhary R, Sharma A, Agarwal KS, Kumar A, Sreenivas V, Puliye J. Building for the future: influence of housing on intelligence quotients of children in an urban slum. *Health Policy Plan* 2002; 17: 420-424.
 6. Pryer JA, Rogers S, Normand C, Rahman A. Livelihoods, nutrition and health in Dhaka slums. *Pub Hlth Nutr* 2002; 5: 613-618.
 7. Awasthi S, Pande VK. Family expenditure on sickness episodes of pre-school children in urban slums of Lucknow, North India. *J Trop Pediatr* 1998; 27: 1-5.
 8. Registrar General India. Sample Registration System. *Bulletin* 1998; 32: 1-3.
 9. Awasthi S, Pande VK. Cause specific mortality in under Fives in the urban slums of Lucknow, North India. *J Trop Pediatr* 1998; 44: 358-361.
 10. Bang AT, Bang RA, Tale O, Sontakke P, Solanki J, Wargantiwar R *et al.* Reduction in pneumonia mortality and total childhood mortality by means of community-based intervention trial in Gadchiroli, India. *Lancet* 1990; 336: 201-206.
 11. Hussain A, Keramatali SM, Kulae G. Determinants of Mortality among children in the urban slums of Dhaka city, Bangladesh. *Trop Med Inter Hlth* 1999; 4: 758-764.
 12. Thora S, Awadhya S, Chansoriya L, Kaul K. Perinatal and Infant Mortality in Urban Slums under ICDS Scheme, Jabalpur, Indian *Pediatr* 1986; 23: 595-598.
 13. Bhandari N, Bahl R, Taneja S, Martinez J, Bhan MK. Pathways to infant mortality in urban slums of Delhi, India: implications for improving the quality of community and hospital-based programs. *J Hlth Popul Nutr* 2002; 20: 148-155.
 14. National Family Health Survey (NFHS-2) India 1998-1999. Key Findings. Mortality, Morbidity and Immunization. International Institute of Population Sciences, Mumbai, 2000; 178-239.
 15. Rao S, Joshi S B, Kelkar R S. Changes in nutritional status and morbidity over time among pre school children from slums in Pune, India. *Indian Pediatr* 2000; 37: 1060-1070.
 16. Kapoor D, Agarwal KN, Sharma S, Kela K, Kaur I. Iron Status of children aged 9-36 months in an urban slum Integrated Child Development Services Project in Delhi. *Indian Pediatr* 2002; 39: 136-144.
 17. Awasthi S, Pande VK. Prevalence of Malnutrition and intestinal parasites in Pre-school slum children in Lucknow. *Indian Pediatr* 1997; 34 : 599-605.
 18. Swami HM, Thakur JS. Linking vitamin A Distribution to Pulse Polio Program. *Indian Pediatr* 2001; 38: 103-107.
 19. Sundar R, Mahal A, Sharma A. The Burden of ill health among the urban poor: The case of slums and resettlement colonies in Chennai and Delhi. *NCAER* 2002; 25: 38-84.
 20. Bhargava S K. Perspectives in child health in India. *Indian Pediatr* 1991; 28: 1403-1410.
 21. Bhargava S K, Singh K K, Saxena B N. ICMR Task Force National Collaborative Study of Identification of High Risk Families, Mothers and outcome of their off-springs with particular reference to the problem of maternal nutrition, low birth weight, perinatal and infant morbidity and mortality in rural and urban slum communities. *Indian Pediatr* 1991; 28: 1473-1480.
 22. Gopalan C. Low birth weight: Significance and implications. *In: Sachdev HPS, Choudhury P, eds. Nutrition in Children Developing Country Concern.* 1st edn, New Delhi; Department of Pediatrics, Maulana Azad Medical College, 1995; 1-33.
 23. Sur D, Mondal SK, Gupta DN, Ghosh S, Manna B, Sen Gupta PG. Impact of breast feeding on weight gain and incidence of diarrhea among low birth weight infants of an urban slum of Calcutta. *Indian Pediatr* 2001; 38: 381-384.
 24. Friedman HL. The Health of adolescents and youth: A global overview. *World Health Stat Q* 1985; 38: 256-262.
 25. Were JH. Passive smoking gas cooking and respiratory health of children living in six cities. *Am Rev Respir Dis* 1984; 129: 366-374.

ENVIRONMENTAL HEALTH

26. Awasthi S, Glick AH, Fletcher RH. Effect of cooking fuels on Respiratory Diseases in Pre school children in Lucknow, India. *Am J Trop Med Hyg* 1996; 55: 48-51.
27. Traore E, Cousens S, Curtis V, Mertens T, Tall F, Traore A *et al.* Child defecation behavior, stool disposal practices and childhood diarrhea in Burkina Faso: results from a case control study. *Jour Epidemiol Com Hlth* 1994; 48: 270-275.
28. Heller L, Colosimo EA, Antunes CM. Environmental sanitation conditions and health impact: A case control study. *Rev Soc Bras Med Trop* 2003; 36: 41-50.
29. Steere AC, Mallison GF. Handwashing practices for prevention of nosocomial infections. *Ann Intern Med* 1975; 83: 683-690.
30. Black RE, Dykes AC, Anderson KE, Wells JG, Sinclair SP, Gary Jr GW *et al.* Hand washing to prevent diarrhea in day care centres. *Am J epidemiol* 1981; 113: 445-451.
31. Sircar BK, Sengupta PG, Mondal SK, Gupta DN, Saha NC, Ghosh S *et al.* Effect of hand-washing on the incidence of diarrhea in Calcutta slum. *J Diarrheal Dis Res* 1987; 5: 112-114.
32. Khan MU. Interruption of Shigellosis by hand washing. *Trans R Soc Trop Med Hyg* 1982; 76: 164-168.
33. Victora C, Smith P, Vaughan J, Nobre L, Lombardi C, Teixeira A *et al.* Water supply, sanitation and housing in relation to the risk of infant mortality from diarrhea. *Int J Epidemiol* 1988; 17: 651-654.
34. United Nations. Department of International Economic & Social affairs 1985. Socio-economic Differentials in Developing countries. New York: UN.
35. National Family Health Survey (NFHS-1) India 1992-1993. Key Findings. Morbidity and Mortality. International Institute of Population Sciences, Bombay, 1995: 201-226.
36. Esrey SA, Feachem RG, Hughes JM. Interventions for the control of diarrheal diseases among young children: Improving water supplies and excreta disposal facilities. *Bull WHO* 1985; 63: 757-772.
37. Wagner EG, Lanoxia JN. Water supply of rural areas and small communities WHO. Geneva 1959. Monograph series No. 42.
38. Zaheer M, Prasad BG, Govil KK, Bhadury T. A note on urban water supplies in Uttar Pradesh. *Indian Med Assoc* 1962; 38: 177-182.
39. Awasthi S, Pande VK. Seasonal Pattern of Morbidity in Preschool slums Children in Lucknow, North India. *Indian Pediatr* 1997; 34: 987-993.
40. Measham AR, Rao KD, Jamison DT, Wang J, Singh A. The performance of India and Indian States in reducing infant mortality and fertility 1975-1990. *Economic and Political Weekly* 1999; 34: 1359-1367.
41. Biswas A, Biswas R, Dutta K, Manna B. Risk factors of Acute respiratory infections in underfives of urban slum community. *Indian J Pub Hlth* 1999; 43: 73-75.
42. Madhiwalla N. Women's illness: Life cycle approach. *Natl Med J India*. 2003; 16: 35-38.
43. Claeson M, Bos ER, Mawji T, Pathmanathan I. Reducing child mortality in India in the new millennium. *Bull WHO*. 2000; 78: 1192-1199.
44. Pandey A. Infant and Child mortality in India, Mumbai, India and East-West Center Program Honolulu, HI, USA, International institute of Population Sciences, 1998 (National Family Health Survey Subject Reports), No. 11.
45. Sivakami M. Female work participation & child health: An investigation in rural Tamil Nadu, India. *Health Transition Review* 1997; 7: 21-32.
46. Hobcraft JW, McDonald JW, Rutstech SO. Socio-economic factors in infant and child mortality: A cross national comparison. *Population Studies* 1984; 38: 193-223.
47. Farah A, Preston S. Child mortality Differentials in Sudan. *In: Demographic Transition in Metropolitan Sudan*. 1982 Canberra. Australian National University Press.
48. Basu AM, Basu K. Women's economic roles and child survival: The case of India. *Health Transition Review* 1991; 1: 83-101.
49. Sivakami M. Does maternal employment influence child care and morbidity evidence

- from Poor populations 2000. *Demography India*; 29: 99-115.
50. Rao SR, Pandey A. Child mortality in Goa: A study of Socio-economic and Behavioural factors. International Institute of Population Science 1993-1994. Research Report Series No. 1. Bombay, India.
 51. Nanda S, Surender S. Female work status and its relationship with fertility and child loss in Orissa. *J Fam Welfare* 1997; 43: 34-37.
 52. Arifeen SE, Black RE, Caulfield LE, Antelman G, Baqui AH. Determinants of infant growth in the slums of Dhaka: size and maturity at birth, breastfeeding and morbidity. *Eur J Clin Nutr* 2001; 55: 167-178.
 53. Aneja B, Singh P, Tandon M. Etiological factors of Malnutrition among infants in two urban slums of Delhi. *Indian Pediatr* 2001; 38: 160-164.
 54. Zeitlin MF, Ahmad NU, Beisir AS, Zeitlin JA, Super CM, Guhin V. Developmental, behavioural and environmental risk for diarrhea among rural Bangladeshi children of less than two years. *J Diarrhea Dis Res* 1995; 13: 99-105.
 55. Gupta I, Mitra A. Knowledge of HIV/AIDS among migrants in Delhi slums. *J Health Popul Dev Ctries* 1999; 2: 26-32 .
 56. Rajaratnam J, Abel R, Duraisamy S, John KR. Morbidity pattern, Health care utilization and Per Capita health expenditure in a rural population of Tamil Nadu. *Natl Med J India* 1996; 9: 259-262.
 57. Curtis V, Cairncross S. Effect of washing hands with soap on diarrhoea risk in the community: a systematic review. *The Lancet Infectious Dis* 2003; 3: 275-281.

Urban Slum-Specific Issues in Neonatal Survival

Armida Fernandez
Jayshree Mondkar*
Sheila Mathai⁺

Urbanization is rapidly spreading throughout the developing world. An urban slum poses special health problems due to poverty, overcrowding, unhygienic surroundings and lack of an organized health infrastructure. The primary causes of neonatal

From the Department of Neonatology, LTMMC & LTMG Hospital, Sion, Mumbai, and INS Ashwini Hospital, Colaba, Mumbai⁺ and SNEHA.*

*Correspondence to: Dr. A. Fernandez, 53, Sea Sprints, Bandstand, Bandra, Mumbai 400 050, Maharashtra, India.
 E-mail: mcfhi@vsnl.net*

mortality are sepsis, perinatal asphyxia and prematurity. Home deliveries, late recognition of neonatal illness, delay in seeking medical help and inappropriate treatment contribute to neonatal mortality. Measures to reduce neonatal mortality in urban slums should focus on health education, improvement of antenatal practices, institutional deliveries, and ensuring quality perinatal care. Success of a comprehensive health strategy would require planned health infrastructure, strengthening and unification of existing health care program and facilities; forming a system of referral and developing a program with active participation of the community.

Key words: *New born infant, Urban slum.*

Improving newborn survival is a national priority in child health today. A staggering 26 million babies are born in our country every year. Of these 1.2 million die in the first 28 days of life accounting for 20% of the global burden of newborn deaths(1). If these deaths have to be reduced, one must begin by