SEASONAL PATTERN OF MORBIDITIES IN PRESCHOOL SLUM CHILDREN IN LUCKNOW, NORTH INDIA

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Objective: *To quantify the burden of common morbidities for each month in one year, in preschool children.* ***Setting:*** *Anganwadi centers under the Integrated Child Development Services Scheme (ICDS) in Lucknow, North India. Design: Prospective cohort study, Methods: From 153 anganwadi centers in urban Lucknow, 32 were selected by random draw. All eligible children registered with the anganwadi worker were enrolled over a period of six months from July 1995 to January 199b. All the subjects were then contacted a second time six months later. Subjects: There were 1061 children (48.3% girls and 51.7% boys) between the ages of 1.5 to 3.5 years.* ***Results:*** *The annual incidence rate (IR) per 100 child-years for respiratory, diarrhea and skin diseases and pneumonia were 167, 79.9, 30.6 and 9.6, respectively. When compared to other seasons, the IR of pneumonia was lowest in the winter months (October to February) while those of diarrhea and skin diseases were the highest in summer (March-June) and monsoon (July to September) months, respectively. Season specific diseases were measles in summer, and fever as the isolated symptom in monsoon. The IR for combined morbidities was the highest in the monsoon as compared to winter months.* ***Conclusions:*** *Season specific intensification of existing health care resources for these morbidities can be considered. Similar studies are needed from other parts of the country.*

Key words: *Community-based, Morbidity, Primary health care, Under-fives.*

WHILE there is data on the causes of mortality(l) or reasons for hospitalization in the under-five's from India and other developing countries(2-4), there is a need for accurate community-based information on morbidity patterns among them. These will be of use in assessing the overall impact of improved nutritional and immunization status as a result of various ongoing nutritional improvement and disease control programs as well as in planning resource allocations at the national level. The study aim was to quantify the burden of various morbidities and their seasonally, if any, among the preschool children in the urban slums of Lucknow, North India.

Subjects and Methods

Selection of Subjects

An urban slum is an area designated by the municipal authorities on the basis of lack of proper amenities like housing, water supply, electricity and the family income is below the national poverty line. Each slum had a population of 1000 people at the time of creation, but the population increased with time and thus most centers today have more than the initial number of people. The primary health care of children under five years of age here is provided by the national Integrated Child Development Services Scheme (ICDS) through the anganwadi centers. An anganwadi worker is posted at each anganwadi center. Hence, all the ICDS beneficiaries are registered with the anganwadi worker.

Sample size Calculations

These were based on the 14.5% point prevalence of respiratory disease found in the urban anganwadi centers of Lucknow(5). To detect this prevalence with 3% precision, alpha risk of 5% and a design effect of 2, we would require 1058 children. Therefore, from 153 anganwadi centers of urban Lucknow, by random draw, 32 were selected for the study. Children were recruited at an age when it was assumed that they would have received the primary immunization as well as the first booster dose of diptheria-tetanus and pertusis (DTP) and oral polio vaccine (OPV) and were not eligible for the second booster of DPT and OPV during the study duration. So, included in this study were children between the ages of 1.5 to 3.5 years with parental consent. The study duration was from July 1995 till June 1996.

Outcomes of Interest

Each child was contacted once in six months, or two times in the followup period of 1 year. Parents were asked to recall all the symptoms of diseases with which the child had suffered in the preceding one month. Based on reported symptoms, the project staff categorized them into one or more of the following morbidities: (i) *Respiratory disease* defined as an episode of one or more of the following symptoms with or without fever: runny nose, cough either productive or non-productive, sore throat, difficulty in breathing and noisy respiration, stridor or wheeze(5,6); *(ii) Pneumonia* defined as cough and /or breathing difficulty with fast breathing and/or chest indrawing(7); *(iii) Diarrheal disease* defined as change in consistency and character of stools 'or three or more watery stools per day(8) or presence of blood in the stools; *(iv) Skin disease* which included (a) scabies, defined as the presence of pruritic lesions and mite holes in the interdigital clefts, *(b)* furuncle defined as suppurative skin lesions on indurated bases and (c) impetigo, defined as vesiculopustular skin lesions which rupture with heaped up honey colored crusts(9); *(v) Measles* defined as rash, fever, cough, runny nose or red eyes and exposure to a case of measles in previous two weeks or an epidemic of measles in that area(10); and *(vi)* Fever defined as body hot to touch being the only presenting symptom and all of the above mentioned causes being ruled out(7).

It was assumed that in one month there could be a single episode of pneumonia. It was also assumed that in the follow-up time each child could suffer from measles just once. However, each child could have more than one[1] episode of diarrhea, respiratory and skin diseases each month. To differentiate between two episodes, a symptom free period of 3 days was mandatory for diarrhea, respiratory and skin diseases.

Co-variables

Data was also collected on the immunization status. The weight and height of the children was recorded. Ten per cent of the morbidity and anthropometric data was validated by a paramedical project officer.

Analyses

We have reported the mean age, weight

and height of the subjects. Using EP16.1 statistical software(11), children with weight for age, height for age and weight for height z-scores <-2.00 SD on comparing with the World Health Organizations' growth standards were classified as underweight, stunted and wasted, respectively. We report on the number of children who had received 0-4 doses of DPT and oral polio as well as those who had received one or more shots of measles vaccine.

At every contact each child's mother recalled the events of preceding 1 month. Each child thus contributed to one month of person time for the analysis of incidence rate. Incidence rate (IR) for 100 child-years were calculated using the following formula:

$$IR = \frac{\text{(number of new cases of disease in a given time period)}}{\text{(total person rime of observation)}} \quad (12)$$

The formula used to derive 95% confidence interval (CI) for proportion(13) was employed for calculating the 95% CI of IR. We report the IR for respiratory diseases (excluding pneumonia), pneumonia, diarrheal and skin diseases. Since measles occurs only once, we have reported its cumulative incidence only for 100 children. Months were categorized into three seasons; summer (March to June), monsoon (July to September) and winter (October to February) and we have reported seasonal and annual IR of these morbidities. To assess the effect of seasons one diseases, Chi square test was used to compare IR in winter with that found in summer and monsoon months.

Results

The number of children contacted at the first and the second visit is shown in *Table I.* Of the 1061 children contacted in the first visit, 4 had died (2 accidental deaths and 1 death each due to diarrhea and pneumonia) and 1 had left the anganwadi center at the time of the second visit six months later.

Of the 1061 children enrolled, 51.7% (n=549) were boys artH 48.3% (n=512) girls. The mean age was 31.1 months (SE 0.27), mean weight was 10.13 kg (SE 0.07), mean height was 81.9 cm (SE 0.26). When compared to the growth standards of the World Health Organization, 67.6% (n=717) were underweight, 62.8% (n=666) stunted and 26.5% (n=281) were wasted.

Three primary and one booster dose of DPT/OPV had been received by 658 children (62%; 95% CI 59.1-64.9), three primary doses by 255 (24.03%; 95% CI 21.5-26.7), no dose by 101 (9.5%; 95% CI 7.9-11.4) while the rest had received 1 or 2 doses only. Immunization against measles had been given to 921 children (86.8%; 95% CI 84.7-88.7).

The number of episodes for respiratory, diarrheal and skin diseases and pneumonia is given in *Table I.* There were 15 cases of measles, giving a cumulative incidence of 1.41 (95% CI 0.8-2.27) per 100 children. Isolated symptom of fever occurred in July (n=4 cases) and August (n=14 cases).

Seasonal IR/100 child-year of diseases is shown in *Table II.* There were 524 disease episodes, of which 34.2% (n=179) were in summer, 37.8% (n=198) in monsoon and 27.9% (n=146) in winter months.

Discussion

In the current study, the annual IR for common childhood morbidities was 297 per 100 child years *(Table II).* It was found that in the urban anganwadi centers of Lucknow, the major community burden of disease was due to combined respiratory and diarrheal diseases, and this is in accordance with observations of other workers (2,8,14-16).

TABLE I— *Number of Children Contacted at Every Month in the 1st and 2nd Visit and the Number of Reported Eposides of Various Morbidities*

Period	1st Visit	2nd Visit	Resp n	Pneu n	Diar n	Skin n
1996						
January	42	92	19	1	5	0
February	0	179	26	0	11	0
March	0	186	18	3	12	1
April	0	186	25	1	15	0
May	0	211	17	2	17	0
June	0	181	31	4	25	9
July	0	21	0	0	2	0
1995						
July	77	0	8	1	2	2
August	284	0	53	3	19	25
September	236	0	41	2	15	7
October	233	0	30	0	10	6
November	146	0	16	0	6	4
December	43	0	10	0	2	0
Total	1061	1056	294	17	141	54

Abbreviations
Resp: Respiratory diseases (excluding pneumonia)
Pneu: Pneumonia
Diar: Diarrheal diseases

We have observed that the IR of pneumonia was the highest in the summer, diarrhea in the summer and skin diseases in the monsoon months. We did not observe any seasonality for other respiratory diseases. Our hospital had participated in a multicentric study on the surveillance of invasive bacterial infections due to *Hemophilus influenzae* and *Streptococcus pneumoniae*. For the years 1993-95 the isolates, in descending order of number, for *Hemophilus influenzae* were found in the months of April, January and May{17). The isolates, in descending order of number, for *Streptococcus pneumoniae* were found in the months of January, December and February(17). However, in children over 1 year of age *Streptococcus pneumoniae* was the predominant isolate. If the results of this hospital based multicentric study were to reflect the community pattern of infection, then we would have expected to observe more cases of pneumonia in the winter months, contrary to the observations of the current study. This paradoxical observation may be attributed to an epidemic of unknown organism for the year of the study. Further community-based studies are needed to monitor the seasonal incidence and etiology of pneumonia.

With reference to the health care provided by the governmental agencies, the quantity of care to preschool children in India is constant throughout the year. In view of the fact that certain diseases can have seasonal patterns, this does not seem to be an optimal strategy. Even though the current study was not the ideal one to assess the seasonal pattern of diseases, we found that the IR of combined morbidities was the highest in the monsoons months as compared to winter months *(Table II,* p value <0.001). Seasonality of diseases calls for a reassessment of the existing health care facilities. Keeping the amount of health care personnel constant, the health care supply, in terms of diagnostic and management facilities, can be varied corresponding to the burden of disease in a particular season. For example, compared to the quantity of health care supplies for the management of diarrheal disease in winter there has to be an increase in summer, the scaling up factor guided by the seasonal .burden of .disease in a specific area. Likewise, health care supplies for the management of skin disease and fever in monsoon months have to be the maximum as compared to the other two seasons in the urban slums of Lucknow.

The main strengths of our study are in its longitudinal design, its setting in the

TABLE II – *Seasonal Pattern of Morbidities in Preschool Children in the Urban Slums of Lucknow, North India (Incidence Rates (IR) per 100 Child Years)*

	Seasons			
	Summer	Monsoon	Winter	Annual
# Children	764	618	735	2118
Child-year	63.7	51.5	61.3	176.5
Morbidity	(n) IR	(n) IR	(n) IR	(n) IR [95% CI]
Respiratory	(91)143	(102)198	(101)165	(294)167[a] [149-185]
Pneumonia	(9) 14.1*	(6) 11.7*	(1) 1.6	(17) 9.6[b] [5.7-15.7]
Diarrheal	(69)108**	(38)74	(34)55	(141)79.9[c] [67.8-93.8]
Skin	(10) 15.7	(34)66**	(10)16.3	(54) 30.6[d] [23.2-40.1]
Fever	0	(18)34.9		(18) 10.2[e] [6.2-15.7]
Total	(179)281.2	(198)384.5**	(146)238	(524)297 [275-320]

As compared to IR in winter, *p value <0.05, **p value <0.001.

Expressed as incidence rate/100 child-days:
a = 0.46 b = 0.03 c = 0.22 d = 0.08 e = 0.03.

urban slums, and in monitoring and reporting all the common morbidities simultaneously. The burden of diseases in the community has thus been quantified. Similar studies have to done in other parts of the country before the results can be generalized. Community monitoring of morbidities in pre-school children is being continued in the urban anganwadi centers of Lucknow to look for the pattern of diseases found in the subsequent year. However, there could have been recall bias in reporting and thus an underestimation of the morbidities.

In conclusion, the observed seasonal pattern of certain common childhood morbidities indicates the need for consideration of season specific intensification of existing health care resources for these morbidities. Since the major burden of diseases is in the monsoon months, we also conclude that an overall increase in the volume of health care can be considered for these months.

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