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Original Article

A Study on Incidence of Leprosy among Children in Five High Prevalence Districts of West Bengal

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A descriptive observational study was conducted in five high prevalent districts of West Bengal with an objective to estimate incidence of new cases of leprosy among children. A total 441,954 children were examined from October 2013 to September, 2014 by conducting a house-hold as well as school surveys in five endemic districts of West Bengal namely Kolkata, Burdwan, Paschim Midnapur, Bankura & Purulia. A total 248 suspected child leprosy cases were identified. The male/female sex ratio of suspects was 1:1. Clinically confirmed leprosy child cases ware 17/248.The overall incidence of leprosy suspects and clinically confirmed leprosy cases was 56.11 and 3.85 per 100,000 children screened, respectively. District-wise difference in incidence of leprosy suspects was found to vary from 23.53 per 100,000 in Purulia to 91.01 per 100,000 in Paschim Midnapur district. Of the 248 suspected cases in the child population, 17 cases were confirmed as leprosy by the CHC and PHC medical officers of NLEP and the State Health Services. All these cases were put on treatment. The incidence of new child cases during this 1 year period was observed to be 3.85/100,000 of examined child population. All these cases resided in Burdwan, Kolkata as well as Paschim Midnapur districts. No cases were confirmed in the suspected cases in Bankura and Purulia districts. One child in Kolkata district also had Grade 2 disability. The incidence of suspected leprosy cases among adult contacts of suspected leprosy children in the study is 33.01/100,000 population (23 suspected to have leprosy in a population of 69655). Among these, 8 cases were confirmed as leprosy cases, by the NLEP and State health services staff. It appears that transmission of leprosy is still high in some geographical areas/pockets and active search in addition to IEC on signs, symptoms and treatment of leprosy is required for the general population as well as other health care workers for effective & early treatment as well as to block transmission of leprosy in the community. While for leprosy programme confirmed cases are relevant, need to strengthen the capacity of health services to differentiate and treat other conditions which created suspicion of leprosy will be equally important.

Key words: Leprosy suspect, Incidence of leprosy, Leprosy in children, West Bengal, India

Introduction

The burden of leprosy continues to decline globally as a result of sustained efforts carried out by respective national leprosy programmes of individual countries, along with continued support from international partners. The enhanced

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global strategy of WHO emphasizes reducing Grade-2 disabilities among new cases. It is therefore important that cases be detected early, and identified patients complete the course of multidrug therapy in a timely manner (WHO 2011).

As a result of the hard work and meticulously planned and executed activities, India achieved the goal of elimination of leprosy as a public health problem, defined as prevalence of less than 1 case per 10,000 population, at the National Level in the month of December, 2005. Though 33 States/UTs have achieved the level of elimination, some pockets of high endemicity are still present and need attention (Kumar 2015).

The percentage of new childhood leprosy cases, and disabilities among them are two important indicators for monitoring the leprosy programme as well as transmission of leprosy in a given area (NLEP, Sachdeva et al 2010). In the last 4 years starting from 2009-10 to 2013-14, these two indicators remained almost static (9.97% & 3.1%; 9.83% & 3.1%; 9.7% & 3.0% and 9.49% & 4.14% respectively) indicating active and continuing transmission along with delayed reporting is still prevalent in the community (NLEP, Kumar 2015, WHO 2011, Vara 2006). The source of infection is commonly an infectious cases in the family, particularly for the pre-school age group. In endemic areas, the peak age incidence is in the age group of 10-14 yrs (Vara 2006, Kumar et al 1989). As per census 2011, 0 to 14 years age group constituted 35.5% of total population of our country (SRS report 2011). Therefore, the presence of leprosy in the child population is of considerable epidemiological importance not only as marker of transmission but also the consequences can be life long. Community based studies are essential to find out the real situation of leprosy among children (Reddy & Bansal 1983). There is dearth of such data from community based studies specially from West Bengal.

With this background, a community based epidemiological study was undertaken in 5 high endemic districts of West Bengal with the following objectives.

1. To estimate the incidence of leprosy suspects & clinically confirmed leprosy among children in high endemic districts of West Bengal.
2. To identify visibly disabled cases (Grade 2 disabilities) among newly detected child leprosy cases.
3. To examine all family members and immediate neighbours (most likely source of childhood leprosy) for signs of leprosy.

Methods

This descriptive observational study was conducted in five highly leprosy prevalent districts of West Bengal, from 01.10.2013 to 30.09.2014 (1 year). Study subjects included children below 15 years of age, residing in selected 5 Districts. All family members and neighbours of leprosy suspects were also examined to identify signs of leprosy (probable source for the affected child).

Sample size

Considering prevalence of childhood leprosy to be 4.6 per 10000 population (Kumar et al 2005), with 95% confidence, 20% marginal error and 2 as the design effect for multi stage sampling, the calculated estimated sample size comes to about 417,373 population. Adding 10% non-response it totals to 459,110. A total of five lakh child was to be examined for signs of leprosy and visible disabilities. It was targeted to cover 1 lakh children from each district, however we could eventually examine 441954 children in the identified five high prevalent districts of West Bengal.

Sampling techniques

Multi-stage sampling technique was adopted.

Working definition of suspected leprosy

Persons with hypo pigmented (lighter than surrounding skin colour) and/or reddish patches on skin were labelled as a suspect of leprosy (NLEP Training Manuals). Sensory testing was also done to screen the suspected cases: Persons with hypo -pigmented (lighter coloured) or reddish patches on skin were examined for sensation over the skin by touching the patch by tip of ball pen lightly without producing a dimple on the skin and asking if he/she felt the touch. This was done first with open eyes and then repeated with closed eyes. Similarly, these sensations were also tested over the hands & feet. Nerve trunks were also palpated and any thickening of nerve trunk was regarded as suspicious of leprosy (NLEP Training Manuals)

Exclusion criteria for a suspect

A patch on the skin present since birth; very itchy patches appearing and disappearing on the skin; milky while skin patches were excluded as not leprosy suspects.

Operational/classification of patients for the purpose of treatment

Confirmed cases of leprosy, having 1 to 5 patches and /or one nerve involvement were grouped as Pauci-bacillary (PB) leprosy. Multi-bacillary (MB) cases were those who had more than 5 patches and/or two or more nerve involvement. (NLEP Training Manual for Medical Officers), patients with 1-5 lesions but 2 and more nerve involvement/thickening were also grouped as MB leprosy for treatment purposes.

In the 1st stage

Five districts were selected randomly from the list of 9 high prevalent districts of West Bengal. Thus, the districts of Kolkata, Burdwan, Paschim Midnapur, Bankura & Purulia were selected randomly from the above 9 endemic districts for the present study. From each district, it was targeted to cover one lakh children. In the 2nd stage, 10 blocks from each district were selected randomly, so that from each selected block 10,000 children were targeted for examination for signs and symptoms of leprosy. From each selected block, 10 sub-centers (Municipal ward in Kolkata) were chosen randomly. In the 3rd stage, from each selected sub centre, a target of examination of 1000 children was planned. In the 4th stage from each sub centre, 5 villages (hamlet or slum in Kolkata) were selected randomly to examine 200 children from each village / slum of Kolkata. Starting From the midpoint of the village / slum, which was the random start point, the field investigator moved in a given direction and every adjacent household was visited until required number of children was examined. If desired number of children were not found from that village, primary schools in the village / locality was approached and the children examined to complete the survey. It may be noted that some of the children studying in the schools were from adjacent villages / slums.

For house hold survey & in school surveys family members / students respectively, were shown a flip card exhibiting different leprosy patches, nerve involvement and disabilities. Each of them was asked if such patches were there on their skin and bodies. If the response was yes, they were thoroughly examined. When suspected cases were identified based on working definition, sensory testing was done as per guidelines to confirm a leprosy case. Peripheral nerve trunks were also examined. Irrespective of status of sensory testing, all patients were referred with a referral slip to the PHC for re-examination and for confirmation of diagnosis as well as to initiate appropriate treatment.

Field workers of GRECALTES with years of experience in leprosy activities were a integral part of data collection in Kolkata, parts of

Burdwan & Paschim Midnapur districts. Before the survey, ASHA workers, ANMs, and other health workers were oriented about signs and symptoms of leprosy & methods of data collection. They were then deployed for field survey for timely completion of the activities. The principal Investigator supervised the work continuously and assisted them when required.

Ethical clearance was taken from Institutional Ethics Committee of Institute of Post Graduate Medical Education &Research, Kolkata. We took necessary permission from Dept of Health & Family Welfare to conduct the study in the selected districts and sought cooperation from the district health authorities and NLEP staff.

Field workers took informed consent in local language from parents in household survey & teachers in school surveys before undertaking their interviews. Separate schedule containing open and close ended questions, were used for collecting data form children (less than 15 years), and their parents.

The age, gender, type of residence, religion, caste of suspected leprosy cases, with and without sensory impairment, nerve thickening, disabilities if any were recorded on the proforma and data sheet of the study. Parents and neighbours of the suspected cases were also examined for detecting hidden cases among the adult population, who may have acted as a sources of infection for the child cases.

Analysis

We entered the data in MS excel sheet. For test of significance, statistical calculation was done using EPINFO-7 version, and Chi-square was applied and p value less than 0.05 was taken as significant.

Results

In this study, a total of 441,954 children were examined. Of these 272,808 were studying in primary school of the selected villages and 169,146 were detected during the household visit. Most of respondents in household visit were Hindus (88%), and about 54% belonged to backward community. These included 36.4% SC and 12.5% ST and the rest were of the general category. About 65.6% of the children lived in nuclear families. Almost equal number of boys and girls were examined during survey, and out of total children 46% were between 6-10 years of age (Table 1).

Leprosy suspects

Two hundred and forty eight children had signs of hypo-pigmented or erythematous patch (suspect), of which 124 were males & 124 were females; maximum number (50.4%) came from

Table 1 : Showing details of children examined (according to age sub groups and gender) in the five districts.

Age group (Years)	Boys		Girls		Total	
	No examined	Percentage (%)	No examined	Percentage (%)	No examined	Percentage (%)
0-5	62429	14.1	61208	13.8	123637	28.0
6-10	101667	23.0	101654	23.0	203321	46.0
11-14	56973	12.9	58023	13.1	114996	26.0
Total	221069	50.0	220885	50.0	441954	100.0

6-10 years age group, 21.4% of the suspects were under 5 age group & and 28.2%. belonged to the 11-14 years age group (Table 2).

The overall incidence of leprosy suspects in the 1 year survey period was 56.11/100,000. This incidence was higher among children above 6 years (61.47/100,000) of age, compared to lower age group (42.86/100,000) of less than 6 years. This difference was found to be statistically significant. This incidence of leprosy suspects was nearly equal for both boys & girls and was 56/100,000. Under five years girls had higher incidence than the boys of same age (49.01 vs. 36.84), whereas boys above 10 years appeared to have a higher incidence (64.94 v/s 56.14) (Table 3).

Among the districts, Paschim Midnapur contributed the most leprosy suspects, followed by Kolkata, Bankura, Burdwan and Purulia in the descending order, respectively (Table 4). District-wise difference in incidence was highly significant ($p<0.01$). Incidence of leprosy suspects in boys was found to be more in Kolkata & Burdwan than their counterparts (102.01/100,000 in Kolkata & 29.80/100,000 in Burdwan district); these differences were also statistically significant. Reverse were the findings in Bankura, where leprosy girl suspect cases were in a significantly higher proportion than boys. 84.81/100,000 versus 53.12/100,000, respectively ($p=0.04$) (Table 4, Fig 1).

Table 2 : Showing the distribution of leprosy suspects detected during the survey according to age sub groups & gender.

Age group	Male		Female		Total	
(Years)	Number	%	Number	%	Number	%
0-5	23	9.27	30	12.10	53	21.37
6-10	64	25.81	61	24.60	125	50.40
11-14	37	14.92	33	13.31	70	28.23
Total	124	50.00	124	50.00	248	100.00

Table 3 : Showing the Incidence of leprosy suspects in the population according to the different age sub groups & gender.

Age group	Boys		Girls		Total	
(Years)	No. examined	Suspects detected No. (per 100,000 population)	No. examined	Suspects detected No. (per 10,000 population)	No. examined	Suspects detected No. (per 100,000 population)
0-5	62429	23 (36.84)	61208	30 (49.01)	123637	53 (42.86)
6-10	101667	64 (62.95)	101654	61 ((60)	203321	125 (61.47)
11-14	56973	37 (64.94)	58023	33 (56.87)	114996	70 (60.87)
Total	221069	124 (56.09))	220885	124 (56.14)	441954	248 (56.11)

Table 4 : Showing the district-wise distribution of leprosy children suspects in the population examined.

Districts	Boys		Girls		Total	
	No. examined	Suspects detected No. (per 100,000)	No. examined	Suspects detected No. (per 100,000)	No. examined	Suspects detected No. (per 100,000)
Kolkata	30364	31 (102.09)	28295	20 (70.68)	58659	51 (86.94)
Burdwan	43622	13 (29.80)	44403	9 (20.26)	88025	22 (24.99)
Paschim Midnapur	40197	37 (92.04)	40018	36 (89.96)	80215	73 (91.01)
Bankura	56472	30 (53.12)	56593	48 (84.82)	113065	78 (68.94)
Purulia	50414	13 (26.79)	51576	11 (21.33)	101990	24 (23.53)
Total	221069	124 (56.09)	220885	124 (56.13)	441954	248 (56.11)

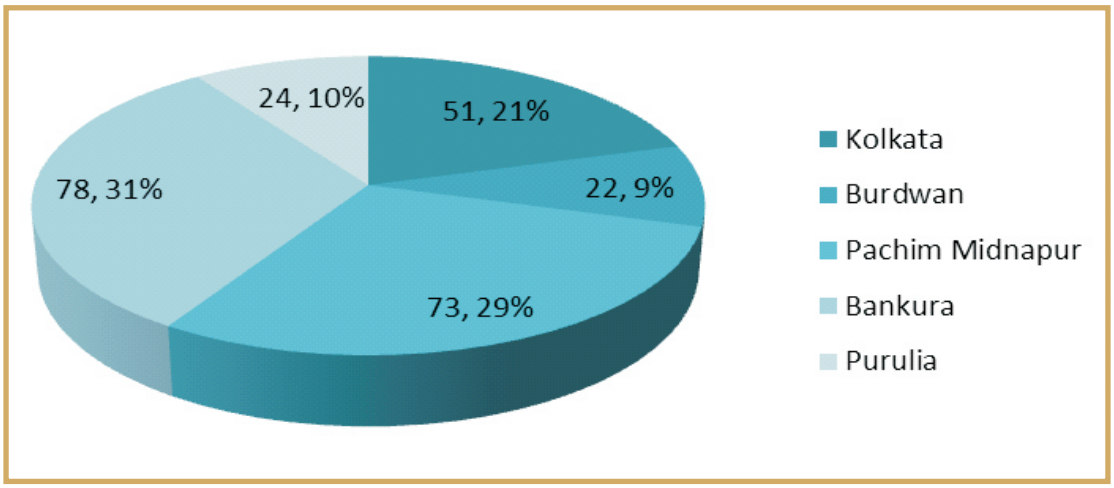

Fig 1 : Showing the district-wise frequency of detection of Leprosy children suspects

Out of 248 leprosy children suspects, only 2 children had more than 5 patches and the rest 246 children had lesser number of patches. Of these 61.3% presented with hypo pigmented patches, 27.4% hypo pigmented anaesthetic patches and 9.3% had erythematous-anaesthetic patches. Five children showed additional nerve involvement (Table 5). Hypo-pigmented and/or erythematous patches with sensory losses were present in 96 children. We referred all suspects to Government Health facilities, for confirmation of leprosy.

Confirmation of leprosy cases

All the suspect children were referred to the PHC/CHC of the respective blocks/districts for confirmation of leprosy by the NLEP Medical Officers and State Health Services Medical doctors. Seventeen out of 248 suspects (6.85%) were confirmed as leprosy cases, registered & put to MDT (Table 6) the incidence of leprosy in

Table 5 : Showing the presentation of signs of children suspected to have leprosy

Presentation	Number	Percentage (%)
No. of patches		
≥ 5	2	0.81
< 5	246	99.19
Characteristics of patches		
Hypo-pigmented patch only	152	61.29
Hypo-pigmented as well as anaesthetic	68	27.42
Erythematous anaesthetic patch	23	9.27
Hypo or erythematous patch associated with nerve involvement	5	2.02
Duration of lesion (in months)		
<6	227	91.53
6-12	17	6.85
12-24	4	1.61
Disability present	1	0.40

Table 6 : Showing the number of leprosy child cases confirmed as leprosy and put on treatment.

S No.	Name of district surveyed	Population of children examined	No. of suspects detected in the survey	No. of child cases confirmed as leprosy and put on treatment
1	Kolkata	58659	51	9
2	Burdwan	88025	22	5
3	Paschim Midnapur	80215	73	3
4	Bankura	113065	78	Nil
5	Purulia	10190	24	Nil
	Total	441954	248	17

children in this survey is 3.85 per 100,000 child population. The highest incidence was observed in Kolkata 15.34/100,000 followed by 5.68/ 100,000 in Burdwan and 3.74/100000 in Paschim Midnapur. Of these patients, 91.5% reportedly noticed the disease from less than 6 months duration, and rest was suffering for more than six months duration. One child in Kolkata district had visible disability at the time of diagnosis (Table 5). No children were found to be taking MDT before the screening in the study.

Contacts of suspected children

Out of 69655 adults examined, which included family members and close neighbours, 23 were identified as suspects by the trained health workers. The remaining contacts were not available at the time of examination and/or did

Table 7 : showing the profile of new child leprosy cases detected in the survey.

District name	Gender		Age group distribution			Type of case		Total number of leprosy cases detected	Incidence/ 100,000
	Male	Female	0-5 years	6-10 years	11-14 years	PB	MB		
Kolkata	3	6	1	4	4	8	1	9	15.34
Burdhwan	4	1	nil	3	2	5	nil	5	5.68
Paschim Midnapur	1	2	nil	2	1	2	1	3	3.74
Bankura	...	...	..	...	...	..	...	Nil	Zero
Purulia	...	...	...	...	...	...	...	Nil	Zero
Total	8	9	1	9	7	15	2	17	3.85

not give consent for the examination. The incidence of suspected leprosy cases among adults (contacts) of suspected leprosy children as observed in the study is 33.02/100,000 population. Among these 8 cases were confirmed as leprosy cases, by the NLEP and State health services staff. The incidence of leprosy among the contacts of child leprosy suspects is 11.49/ 100,000 which is more than that observed for childhood leprosy disease. All of them have been put on treatment. Five of these cases are from Kolkata and 3 from Paschim Midnapur district. Their age ranged from 19 to 50 years and 4 of them were MB cases and 4 PB cases.

Discussion

An important observation of the study was that equal number of boys & girls i.e. 124 each in both gender groups were identified as childhood suspects in the study in the 5 selected districts of West Bengal. A retrospective record based study conducted between 2000 to 2009 in Aligarh showed 76.3% leprosy affected children ware boys (Sachdev et al 2010). Other studies conducted in a Leprosy Referral Centre in West Bengal during 2004-2006 (Haro et al 2010); & at Gandhi Hospital, Secunderabad, Telangana from June 2004 to May 2009 (Rao et al 2009) observed male predominance of childhood cases of leprosy. In an analysis done on 12 studies the same trend showing male predominance was observed in all of these studies (gender ratio varying from 1·25:1 to 3:1) (Palit & Inamdar 2014). However, Palit & Inamadar (2014) have reported the same incidence of leprosy in both boys and girls in one study. This more preponderance of leprosy cases among boys than girls, may be due to self reporting, where male children are brought to health facilities more often. The girl child's health concerns are paid lesser attention in the community. Community based study as the present one, has eliminated such gender bias. Another community based study done in Pondicherry (Reddy & Bansal 1983), & one at Agra (Kumar et al 2005) reported similar findings showing a somewhat similar prevalence among boys & girls.

In the present study 53/248 of child leprosy suspects belonged to age group of 0-5 years while 125/248 belonged to the age group of 6-10 years

(Tables 2 & 3). Among the confirmed leprosy cases also 9/17 cases (52.9%) belonged to this group of 6-10 years where as only 1/17 (5.9%) confirmed child leprosy case belonged to 0-5 years age group, remaining 7 belonged to 11-14 years (Table 7). Age-related incidence was similar for both sexes (Table 3). The reported prevalence of childhood leprosy in Agra (U.P) was found to be 4.6/10,000 in 5 to 14 years age group (Kumar et al 2005) whereas Sachdev et al found the most commonly affected age group to be 11 to 15 years in their study (Sachdev et al 2010).

Like most of the other studies conducted in tertiary care hospitals and/or community, (Sachdev et al 2010, Reddy et al 1983, Palit & Inamadar 2014), the observation in the present study is also that the majority of the new incident child cases are of pauci-bacillary type.

A recent study from Cebu shows that the age-specific new case detection rate in under 15 years declined from around four cases per 100,000 to just under two per 100,000 between 2000 and 2011, while the proportion of child cases remained the same, at 11% (Ruth Butlin & Saunderson 2014). Therefore in addition to the standard indicator as used in NLEP (proportion of child cases amongst new cases) age-specific rates also need to be assessed.

Leprosy prevalence as well as incidence has always been unevenly distributed geographically, even within country or within a state or tehsil (Kumar 2015). In the present study, Kolkata, Burdwan and Paschim Midnapur showed a higher incidence of leprosy in childhood cases, while no leprosy child cases were confirmed from Bankura and Purulia districts.

Though proportion of child cases among new detected cases was reported to be highest in Purulia district in 2009 (11.8%) of all districts (leprosy key indicators as on 31.3.2009; Source: wbhealth.gov.in), in our study no suspect child was confirmed to have leprosy in 2013-2014. This may be due to more intensive efforts employed for early detection as well as prompt treatment of cases. Most of the confirmed childhood cases did not have any history of contact in this series. Sachdeva et al (2010) and Reddy & Bansal (1983) observed 32-35% contact history in their studies. Similar findings were also observed in the study undertaken by Wakhlu et al (1977). Analysis done on 12 different studies family contact history varied from 0.66% to as high as 47% (Palit & Inamadar 2014). Only 1 case out of 17 confirmed cases of childhood leprosy had Grade 2 Disability. Different epidemiological studies have described varied range of disabilities among child leprosy cases ranging from no disabilities to as high as 24% (Palit & Inamadar 2014).

The advantages of school surveys in hyper endemic areas are that these can ensure early identification of child leprosy patients at an early stage and prompt and effective treatment can help in prevention of the spread of the infection in the community and breaking the chain of transmission.

Adequate training of health staff including ASHA, ANM & Medical Officers, and an effective referral network, and supportive supervision are very crucial for timely and effective diagnosis and treatment of the disease and preventing its complications. In addition, increased community awareness activities at all levels with more emphasis on high prevalent districts should be undertaken. Active case search not only ensures early diagnosis, timely treatment & disability prevention, but also could take care about issues relating to stigma and discrimination with a view to realize the dream of leprosy-free India.

Limitation

Due to paucity of current community based data on incidence of childhood leprosy, older data on prevalence of childhood leprosy were taken to estimate sample size. Proportional sample from each district could not be collected. Demographic details about caste, religion family type could not be elicited in school survey. Due to lack of experience, the community contact survey could not be done with the proposed sample size.

The suspected child leprosy cases need to be rigorously followed up and treated if they show any signs of the disease which could not be done in the present study. As most of suspects did not have leprosy, competence of staff (specially doctors) to diagnose and differentiate these conditions will be in the best interests of patients and will also ensure faith in health services.

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