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Summary  This study compares the epidemiological pattern of leprosy in pre- (April 1986 to March 1992) and post- (April 1992 to March 2002) multi-drug therapy (MDT) periods by retrospective analysis of 3274 registered leprosy cases in the rural field area of Regional Leprosy Training & Research Institute (RLTRI), situated in Raipur district of Chattisgarh province of Central India. The area has high endemicity for leprosy. In the post-MDT period, prevalence rate (PR) came down to less than 1 in 10, while New Case Detection Rate (NCDR) remained almost static during the two periods. Of the total new registered cases, 30.1% were registered during the pre-MDT period and the remaining 69.9% during the post-MDT period. Comparison of key leprosy variables among new registered cases showed a 2-fold rise in the proportion of MB cases (14.8 versus 27.6%), 3.0% increase in proportion of child cases (15.3 versus 18.6%) and cases with deformity grade II (3.1 versus 5.9%) and 4.0% increase in female proportion (41.4 versus 45.7%) during the post-MDT period. A decline was noted in mean age of registration for both MB (6.4 years) and PB (5.7 years) groups in the post-MDT period. While comparing treatment and outcome related variables, a marked fall of 25.8 months was recorded in treatment duration in the post-MDT period. The defaulter rate came down by 45.0% and relapse rate by more than 12.0% during the same period. The study shows that MDT is effective operationally, but continued ongoing transmission of infection and delayed diagnosis needs corrective action.

Introduction

Chattisgarh province, located in central India, is the highest endemic area for leprosy in the country. Presently, it has a prevalence rate (PR) of 5.9 per 10,000 population. Introduction of multi-drug therapy (MDT) for treatment has been reported to bring about a shift in the epidemiological pattern of leprosy. The Government of India adopted a new strategy based on MDT in 1983, after which it was implemented in a phased manner all over the country. In the study area, MDT was implemented in 1992. Prior to introduction of MDT, the entire area was resurveyed and all the cases were registered afresh. However, there is no
available report comparing the epidemiological pattern in pre- and post-MDT eras from this part.

The present study was undertaken to describe certain indicators, namely prevalence rate (PR), new case detection rate (NCDR), proportion of multibacillary (MB) leprosy cases, female and child cases and grade II deformity among new registered cases, mean age at registration, treatment duration, treatment completion rate, reaction rate and relapse rate.7,8

Material and methods

STUDY AREA

Out of three Regional Leprosy Training and Research Institutes (RLTRIs) established in India, one is located at Raipur, the capital city of Chattisgarh Province.

The study refers to the rural practice area of RLTRI Raipur, spreading in 136 villages of three blocks of the district. Besides extending treatment facilities, surveillance of PB and MB cases is carried out for 2 and 5 years, respectively, after releasing them from treatment (RFT). Classification of leprosy cases into PB (paucibacillary) and MB (multibacillary) groups has been practised in the field since 1986. This was done as per Government of India guidelines issued at that time.9 These guidelines were revised in the 1991 resurvey, when the cases were reclassified according to number of patches in PB (≤5) and MB (>5) groups.

Records of the cases are kept in the field station until the period of surveillance/deletion, after which they are brought to headquarters.

STUDY POPULATION

At the beginning of the period under review (April 1986), the population of RLTRI field area was 1,50,000, which grew to 2,53,000 in March 2002.

STUDY SUBJECTS

All registered leprosy cases between 1 April 1986 to 31 March 2002 were included in the data analysis. For identifying relapse, cases registered up to March 1997 and March 2000 were included for MB and PB groups, respectively.

DATA RETRIEVAL AND COMPILATION

Case registered during the period under review were segregated and enlisted. Case sheets of the cases were drawn from the records. Information related to the variable of interest for the study was retrieved from the case sheets. Case sheets with missing/incomplete information regarding the variable were excluded. Data were entered in specially designed compilation sheets.

DATA ANALYSIS

Data were entered in the computer. Epi-Info V 6.04d was used for analysis. Values of the variables were calculated during pre- (April 1986 to March 1992) and post- (April 1992 to March 2002) MDT periods.
Results

The study subjects belonged to the low economic strata, with mean per capita income of Indian Rs 256.7 (US $5.6) per month and median of Indian Rs 200.0 (US $4.3) per month. The majority (51.6%) of the cases were either marginal farmers or daily wage labourers, 26.7% were engaged in household work, 15.1% were student and remaining 6.6% were skilled workers, for example tailors, carpenters and drivers. A total of 43.8% of cases were illiterate, 25.3% were educated up to primary level. The remainder, 30.9%, had higher educational level.

Out of 3673 case sheets identified during the period under review, 3274 (89.1%) were included in the analysis. A total of 399 (10.9%) case sheets with incomplete information were excluded, except for calculation of PR and NCDR Of these 3274 cases analysed, 987 (30.1%) were registered during the pre-MDT period and the rest 2287 (69.9%) were registered during the post-MDT period.

The total load of registered cases decreased from 1366 in April 1986 to 242 in March 2002. Prevalence rate (PR) was recorded as 91.8/10,000 population in the year 1986. It was reduced to 9.5/10,000 population in 2002. There was a marginal rise in NCDR from 11.2/10,000 population in 1986 to 11.9/10,000 population in 2002. However, P/D ratio, which was 8.2 in the year 1986, recorded a marked fall to 0.8 in 2002.

Table 1 compares key leprosy variables in new registered cases between pre- and post-MDT periods. The proportion of MB cases among newly registered cases has almost doubled in the post-MDT period (27.6%), compared with the pre-MDT period value (14.8%). A rise of more than 4% was recorded in the proportion of female cases, the proportion of child cases increased by more than 3% and the proportion of grade II deformity by about 3% in the post-MDT period. A decline was noted in mean age of registration in the post-MDT period, both for PB (5.7 years) and MB (6.4 years) groups.

Table 2 shows the comparison between treatment and outcome related variables in new registered cases. A marked fall of 25.8 months was registered in overall duration of treatment in the post-MDT period. The overall defaulter rate came down by 44.8% and relapse rate by 12.6% between the two periods. The treatment completion rate showed a steep rise from 19.0 to 81.4%. The rate of reaction rose to 12.5% in the post-MDT period compared with the pre-MDT value (1.6%). The reaction rate was higher for the MB group, both in pre- as well as post-MDT periods, but the rise was greater for the PB group.

Discussion

The study is aimed to compare certain epidemiological indicators in pre- and post-MDT periods by retrospective analysis of 16-year-old data from rural practice field of RLTRI, Raipur.

Analysis has revealed that caseload has come down to less than 1 in 5 and PR to less than 1 in 10 during the period, which seems to be a direct effect of MDT. The number of RFT cases
is higher than that detected in fixed and shorter treatment regimens compared with dapsone monotherapy. The observations are in line with the report of WHO, GOI and State health authorities.\textsuperscript{6,10,11} However, NCDR has remained almost static. This corroborates findings reported by other Indian states.\textsuperscript{12,13} Thus MDT has yet to show its impact on incidence. The chronic nature of the disease and long incubation period seem to be underlining factors. At a global level also, similar trends have been reported, although others have reported a decline in incidence even before introduction of MDT.\textsuperscript{14} The decline in P/D ratio reflects the combined effects of shorter treatment regimen, timely deletion of cases and continued detection of new cases. Overall, these findings indicate ongoing active transmission of the disease in the community.

The higher proportion of MB cases in the post-MDT period is in line with the secular trend observed in Chhattisgarh and other Indian states which are heading towards elimination.\textsuperscript{11-13} Hence, it may be considered a positive step. However, both increase as well as decrease in MB proportion have been reported in situation of declining incidence.\textsuperscript{3,4,15,16}

The rise in proportion of female cases in the post-MDT period may be due to improved case detection among females rather than rising incidence. Routine IEC (Information, Education & Communication) activities as well as special campaigns such as modified leprosy elimination campaigns (MLECs) seem to have played a role. Overall higher proportion of males in both the periods is similar with the findings of others.\textsuperscript{2,17}

The increase in the proportion of child cases may be due to the cumulative effect of regular school surveys in the area. It also indicates active transmission of \textit{Mycobacterium leprae} in the community. Other researchers have shown lower proportion of children among

\begin{table}[h]
\centering
\begin{tabular}{l|c|c}
\hline
Study variable & Value of variable & \\
 & Pre-MDT period April 1986 to & Post-MDT period April 1992 to \\
 & March 1992 (n = 987) & March 2002 (n = 2287) \\
\hline
Proportion of MB cases (%) & 14.8* & 27.6* \\
Proportion of SSL cases\textsuperscript{a} (%) & – & 6.9 \\
Proportion of female cases (%) & 41.4* & 45.7* \\
Proportion of child cases & 15.3* & 18.6* \\
(<15 years) cases (%) & 3.1* & 5.9* \\
Proportion of cases with grade II deformity (%) & 35.2 ± 16.9* (36.0) & 29.6 ± 16.0* (28.0) \\
Age at registration (in years) for PB and MB cases combined, mean ± SD (median) & 34.2 ± 16.9* (35.0) & 28.5 ± 15.5* (26.0) \\
Age at registration (in years) for PB cases, mean ± SD (median) & 40.4 ± 15.2* (40.0) & 34.0 ± 16.4* (32.0) \\
Age at registration (in years) for MB cases, mean ± SD (median) & – & 21.8 ± 14.8 (16.0) \\
Age at registration (in years) for SSL cases, mean ± SD (median) & – & – \\
\hline
\end{tabular}
\caption{Comparison between key leprosy variables in new registered cases during pre- and post-MDT periods}
\end{table}

\textsuperscript{*} Significant at $P < 0.05$ level.
\textsuperscript{a} Included for calculation during post-MDT period.
However, the study findings are in line with the reports of Government of India and WHO.\textsuperscript{10,11} The proportion of grade II disability cases has risen in the post-MDT period. Re-registration of old cases for MDT as well as detection of hidden cases during resurvey of the area and MLECs may be contributing factors. The reports of WHO and Government of India have shown the reverse trend.\textsuperscript{1,10}

A decline was observed in mean age of registration for all leprosy types in the post-MDT period. Lower mean age of registration again points towards existence of active transmission of disease in the community rather than early detection. Others have also shown a rise in the mean age of registration with declining incidence.\textsuperscript{3,4}

The introduction of MDT has led to a drastic reduction in median duration of treatment for both the groups. This in turn has resulted in marked improvement in treatment completion

<table>
<thead>
<tr>
<th>Study variable</th>
<th>Pre-MDT period (n = 987)</th>
<th>Post-MDT period (n = 2287)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration of treatment (in months) for PB and MB cases combined, mean ± SD (median)</td>
<td>35.2 ± 20.8* (36.0)</td>
<td>9.4 ± 6.4* (8.0)</td>
</tr>
<tr>
<td>Duration of treatment (in months) for MB cases, mean ± SD (median)</td>
<td>34.2 ± 17.0* (35.0)</td>
<td>8.0 ± 4.0* (7.0)</td>
</tr>
<tr>
<td>Duration of treatment (in months) for MB cases, mean ± SD (median)</td>
<td>40.4 ± 15.2* (42.0)</td>
<td>14.5 ± 7.7* (13.0)</td>
</tr>
<tr>
<td>Treatment completion rate for PB and MB (and SSL\textsuperscript{a}) cases combined (%)</td>
<td>19.0*</td>
<td>81.4*</td>
</tr>
<tr>
<td>Treatment completion rate for PB cases (%)</td>
<td>17.5*</td>
<td>83.3*</td>
</tr>
<tr>
<td>Treatment completion rate for MB cases (%)</td>
<td>27.4*</td>
<td>72.4*</td>
</tr>
<tr>
<td>Relapse rate for PB &amp; MB (and SSL\textsuperscript{a}) cases combined (%)</td>
<td>13.7 *</td>
<td>1.2*</td>
</tr>
<tr>
<td>Relapse rate for PB cases (%)\textsuperscript{b}</td>
<td>12.8*</td>
<td>0.9*</td>
</tr>
<tr>
<td>Relapse rate for MB cases (%)\textsuperscript{c}</td>
<td>18.5*</td>
<td>1.4*</td>
</tr>
<tr>
<td>Relapse rate for SSL cases (%)\textsuperscript{c}</td>
<td>–</td>
<td>2.5*</td>
</tr>
<tr>
<td>Default rate for PB and MB cases combined (%)</td>
<td>57.0*</td>
<td>12.2*</td>
</tr>
<tr>
<td>Default rate for PB cases (%)</td>
<td>59.9*</td>
<td>10.9*</td>
</tr>
<tr>
<td>Default rate for MB cases (%)</td>
<td>40.4*</td>
<td>18.4*</td>
</tr>
<tr>
<td>Reaction rate for PB &amp; MB (and SSL\textsuperscript{a}) cases combined (%)</td>
<td>1.6*</td>
<td>12.5*</td>
</tr>
<tr>
<td>Reaction rate for PB cases (%)</td>
<td>0.1*</td>
<td>10.8*</td>
</tr>
<tr>
<td>Reaction rate for MB cases (%)</td>
<td>10.3*</td>
<td>19.4*</td>
</tr>
<tr>
<td>Reaction rate of for SSL cases\textsuperscript{a} (%)</td>
<td>–</td>
<td>1.3</td>
</tr>
</tbody>
</table>

\textsuperscript{a} Signiﬁcant at \( P < 0.05 \) level.
\textsuperscript{b} Included for calculation during post-MDT period.
\textsuperscript{c} Cumulative RR calculated after 5 years follow-up of RFT cases.

\textsuperscript{1} A: Pandey and M. Jamal Uddin & R. Patel
rate and consequent reduction of defaulter rate. Improvement in treatment completion rate is more marked for PB group (65.8%) than for the MB group (45.0%). This is probably due to the shorter treatment regimen for PB cases. Similar findings had been reported by Leprosy Elimination Monitoring (LEM) surveys undertaken in the state to assess the progress of the programme during recent years.\textsuperscript{19}

The proportion of defaulters is higher for PB cases (59.9%) than for MB cases (40.4%) in the pre-MDT period. However, this trend is reversed in post-MDT periods, when a defaulter rate of 10.9% has been reported for PB cases in comparison with 18.4% for MB cases. Shorter treatment duration seems to be responsible for lower rate of defaulters among PB cases in the post-MDT period. However, during the pre-MDT period the effect of treatment duration seems to be nullified by long therapy, and seriousness of disease may be responsible for holding the MB cases more often for treatment completion.

A higher relapse rate of 13.7% has been reported in the pre-MDT period compared with the post-MDT period when the relapse rate came down to 1.1%. This further stresses the effectiveness of MDT in reducing relapse when compared with dapsone monotherapy. Similar views have been expressed by WHO.\textsuperscript{20} However, some authors have reported higher relapse rate for PB cases.\textsuperscript{21}

The higher rate of reaction in the post-MDT period needs further investigation by undertaking a follow-up study. The present study findings are based on retrospective analysis of field based data. Hence, the possibility of over diagnosis and inflated values cannot be ruled out, as others have reported much lower rates of reaction in the post-MDT period.\textsuperscript{22,23} However, higher rates of reaction for the MB group both in pre- and post-MDT periods is similar to the findings of other researchers.\textsuperscript{22,23}

It can be concluded that introduction of MDT has been effective in operational terms. It has reduced the caseload considerably, shortened treatment duration, increased treatment completion rate and reduced relapse rate. However, stable case detection rate, lowered mean age of registration, and higher numbers of child, MB and grade II disability cases suggest ongoing transmission in the community and delay in diagnosis. This requires corrective steps.

**Acknowledgement**

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**References**


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