GENDER DIFFERENCES IN EPIDEMIOLOGICAL FACTORS ASSOCIATED WITH TREATMENT COMPLETION STATUS OF LEPROSY PATIENTS IN THE MOST HYPERENDEMIC DISTRICT OF NEPAL

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Abstract. The introduction of multidrug therapy (MDT), recommended by WHO, has been a major advance in the treatment of leprosy because of its relatively short treatment course and low rate of relapse. Although leprosy treatment is provided to both sexes equally, in most parts of the world significant differences have been found in treatment status. The main objective of the study was to investigate gender differences in epidemiological factors associated with treatment status of leprosy patients. An analytic cross-sectional study was carried out in the most hyperendemic Dhanusa District, Nepal. Stratified random sampling was applied for selection of the patients. Statistical analysis of the differences in treatment status, between males and females, and among other epidemiological factors of interest was carried out using multiple logistic regression. Chi-square/Fisher's exact test were also used to assess significant differences in values between males and females. There were 580 leprosy patients (385 male and 195 female) aged >15 years registered for MDT between April 1, 2001 to March 31, 2002 in the 16 main health centers of the district. Of the 580 patients, a total of 273 (183 male and 90 female) were included in the study, to collect data on clinical type of leprosy, patterns of physical deformity/disability, site of skin lesions, and socio-demographic information. There were 183 male (68.3% on MB-MDT) and 90 female (61.1% MB-MDT) leprosy patients. We found that 79.2% of male patients completed treatment, while 34.4% female patients did not complete within the given time frame. Significant gender differences among leprosy patients were found in the distribution of disability grades and treatment completion status. However, there was no significant gender difference in the distribution of leprosy types and skin lesion sites. The study also found significant associations between treatment completion status and gender (adjusted OR 2.05, 95% CI: 1.07-3.94), educational status (adjusted OR 2.37, 95% CI: 1.12-4.99), disability grade I (adjusted OR 3.14, 95% CI: 1.23-8.04), and disability grade 0 (adjusted OR 2.92, 95% CI: 1.14-7.47) after adjustment for all other leprosy/demographic factors.

INTRODUCTION

Leprosy is a serious public health problem in Nepal and has a national prevalence rate more than 4 times greater than WHO's target level of less than one case per 10,000 population (Ministry of Health, 2001/2002). Multidrug therapy (MDT) provides the means to cure, within a relatively short time scale, all those with the disease, and has been adopted for control and prevention of leprosy. However, for effective implementation of MDT, it is not only the therapeutic factors, but also the patient factors and service factor that require consideration (Prem Kumar and Dave, 1993). Completing treatment is usually an independent choice of patients (Garner and Volmink, 1997). In Nepal, leprosy treatment is

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provided free of charge by trained health personnel as one of the services provided by health centers. It has been suggested that a good quality control program may impact on the early establishment of a treatment routine, but patient factors determine the final establishment of a treatment routine (Heynders *et al*, 2000). It has been reported in several studies (Xiang-Sheng *et al*, 1997; Schafer, 1998; Griffiths and Ready, 2001; White, 2002) that the treatment outcome among male and female leprosy patients was different, while considering various patient factors. We assumed that patient factors, coupled with their type of leprosy, disability grade and sites of skin lesions, might play a greater role in treatment regimen completion by male and female patients. The present study attempts to investigate gender differences in epidemiological factors associated with treatment completion status of leprosy patients in the most hyperendemic district of Nepal.

MATERIALS AND METHODS

This analytic cross-sectional study was carried out in the most hyperendemic, Dhanusa, district of Nepal. The total area of this district is 1,180 km^2 and the elevation ranges from 61-610 meters. The district is bordered in the north by Sindhuli district, in the west by Mahottari district, in the east by Siraha district (Janakpur zone) and in the south by Bihar State (India). This district has 16 main health centers - 2 hospitals, 5 primary health care (PHC) centers and 9 health posts (HP).

The study was undertaken from July 16, 2001 to January 15, 2003 and covered all main health centers of the district to find case load and epidemiological factors associated with treatment status of leprosy patients. The leprosy patients (>15 years old) registered for MDT between April 1, 2001 to March 31, 2002 in these health centers were included in the sampling frame, from which 35-45% were included in the study by stratified random sampling method, using gender and health center as the main strata. The record review method was used to get the number of leprosy patients from each health center. The case notes of all selected patients were examined. Confidentiality and anonymity of the patient's names were maintained while examining the patients' records for the number of supervised monthly doses taken, and leprosy types. The pattern of disability/deformity grades were assessed per WHO norms, *ie* zero (no anesthesia, no visible deformity or damage), grade I (anesthesia present but no visible deformity or damage), and grade II (visible deformity or damage present). The location of skin lesion sites were categorized into two-unexposed area (arm, thigh, chest, belly, back, genitals), and exposed area (face, eye, hand, leg). Patient's socio-demographic/economic data were collected near the health center using a standardized questionnaire. Informed consent was obtained from all respondents.

Data were collected by the principal author and trained data collectors. Quality control measures included cross-checking 10% of samples, spot checks and questionnaire editing. Treatment completion was defined as completion of fixed duration of WHO-MDT (WHO, 1997). Paucibacillary (PB) patients were required to take six doses of PB-MDT blister packs within 9 months, and multibacillary (MB) cases were to take 12 doses of MB-MDT blister packs within 18 months before they were released from treatment. Treatment non-completers were those who failed to maintain treatment for > 3 months for PB and > 6 months for MB. All the defaulting patients were traced and interviewed at their homes.

All information obtained were entered and verified into the study database. Crude and adjusted odds ratios with 95% confidence interval were estimated by multiple logistic regression, to assess significant differences in treatment completion status between males and females, and epidemiological factors of interest. Odds ratios were calculated using STATA (version 6). Statistical analysis of the differences in values between males and females was also carried out using chi-square/Fisher's exact tests (SPSS version 11.5). The level of significance was set at 0.05.

RESULTS

There were 580 leprosy patients (385 male and 195 female) (>15 years old) registered for MDT between April 1, 2001 to March 31, 2002 in the 16 main health centers of the district. Of

Table 1
Gender differences in treatment completion status, types of leprosy, disability grades and skin lesion sites.

	Male (n=183)		Female (n=90)		Total (N=273)		p-value[b]
	n	%[a]	n	%[a]	n	%[a]	
Treatment completion status							
Not completed	38	20.8	31	34.4	69	25.3	0.014
Completed	145	79.2	59	65.6	204	74.7	
Leprosy types							
Paucibacillary (PB)	58	31.7	35	38.9	93	34.1	0.238
Multibacillary (MB)	125	68.3	55	61.1	180	65.9	
Disability grades (DG)							
DG 0	99	54.1	58	64.4	157	57.5	0.024
DG I	49	26.8	26	28.9	75	27.5	
DG II	35	19.1	6	6.7	41	15.0	
Skin lesion sites							
Unexposed area (arm, thigh, chest, belly, back, genital)	56	30.6	37	41.1	93	34.1	0.085
Exposed area (face, eye, hand, leg)	127	69.4	53	58.9	180	65.9	

[a]Column percentage to indicate the distribution of overall leprosy characteristics.
[b]Compare the significance difference between males and females.

the 580 patients, treatment records of 273 patients (183 male and 90 female) were examined. We found that 65.9% patients were classified as having MB leprosy. There were 68.3% male patients under MB-MDT and 61.1% among the female group. Table 1 shows that only 74.7% of patients completed treatment. The treatment completion rates for males (79.2%) were significantly better than those for females (65.6%), with higher defaulter rates among the female patients. Moreover, 57.5% of patients had disability grade 0, 27.5% grade I, and 15% grade II. More female patients were found to have disability grade 0 (64.4% *versus* 54.1%), but notably, the proportion of disability grade II was more among the male group (19.1% *versus* 6.7%). However, the proportion of disability grade I between male and female patients showed no apparent difference, with 26.8% for males versus 28.9% for females. These results show overall significant differences between male and female patients in their types of disability grade distribution. Examining the skin lesion sites revealed that 65.9% of patients had lesions in exposed areas *ie* face, eye, hand, leg, etc. The distribution of skin lesion sites, and as leprosy types, between males and females was not statistically significant.

Table 2 shows the association between leprosy treatment status and leprosy/demographic factors of the patients. The study found significant associations between treatment completion status and gender (adjusted OR 2.05, 95% CI: 1.07-3.94), educational status (adjusted OR 2.37, 95% CI: 1.12-4.99) and disability grades particularly disability grade I (adjusted OR 3.14, 95% CI: 1.23-8.04), and disability grade 0 (adjusted OR 2.92, 95% CI: 1.14-7.47), after adjustment with all other variables (leprosy types, skin lesion sites, age, caste level, religion, occupation, family types, family income per year, and family land) used in the model. However, there was no significant association between treatment completion status and leprosy type, skin lesion site, age, caste level, religion, occupation, family type, family income per year or family land. This means that the risk of default among different categories of leprosy type, skin lesion site, age, caste level, religion, occupation, family type, family in-

Table 2
Association between leprosy treatment status and leprosy/demographic factors of the patients.

Leprosy/ Demographic factors	Treatment status				Crude OR (95% CI)[a]	Adjusted OR (95% CI)[b]
	Treatment non-completers (n = 69)		Treatment completers (n = 204)			
	n	%	n	%		
Gender						
Female	31	44.9	59	28.9	Ref	
Male	38	55.1	145	71.1	2.00 (1.14-3.51)	2.05 (1.07-3.94)
Leprosy type						
MB	51	73.9	129	63.2	Ref	
PB	18	26.1	75	36.8	1.64 (0.89 -3.02)	1.74 (0.79-3.81)
Disability Grades						
Grade II	16	23.2	25	12.3	Ref	
Grade I	18	26.1	57	27.9	2.02 (0.89-4.6)	3.14 (1.23-8.04)
Grade 0	35	50.7	122	59.8	2.23 (1.07-4.63)	2.92 (1.14-7.47)
Skin lesion site						
Unexposed area (arm, thigh, chest, belly, back, genital)	29	42.1	64	31.4	Ref	
Exposed area (face, eye, hand, leg)	40	57.9	140	68.6	1.58 (0.90-2.78)	1.65 (0.88-3.09)
Age (years)						
Young (15-34)	19	27.5	48	23.5	Ref	
Old (35+)	50	72.5	156	76.5	1.23 (0.66-2.29)	1.76 (0.81-3.80)
Educational status						
Illiterate	52	75.4	107	52.5	Ref	
Literate	17	24.6	97	47.5	2.77 (1.50-5.11)	2.37 (1.12-4.99)
Caste level						
Lower caste/Unidentified	63	91.3	185	90.7	Ref	
Upper caste	6	8.7	19	9.3	1.07 (0.41-2.82)	1.23 (0.40-3.74)
Religion						
Muslim/Buddhist	4	5.8	26	12.7	Ref	
Hindu	65	94.2	178	87.3	0.42 (0.14-1.25)	0.45 (0.14-1.43)
Occupation						
No work	10	14.5	28	13.7	Ref	
Farmer	34	49.3	123	60.3	1.29 (0.57-2.92)	1.29 (0.49-3.40)
Laborer	19	27.5	28	13.7	0.52 (0.20-1.33)	0.42 (0.14-1.20)
Business/Service	6	8.7	25	12.3	1.48 (0.47-4.68)	1.00 (0.27-3.70)
Family type						
Nuclear	19	27.5	64	31.4	Ref	
Joint	50	72.5	140	68.6	0.83 (0.45-1.52)	0.75 (0.38-1.45)
Family income/year						
<Rs.40,000	66	95.7	189	92.6	Ref	
>Rs.40,000	3	4.3	15	7.4	1.74 (0.48-6.22)	1.18 (0.29-4.75)
Family land						
<6 Kattha (0.201 hectare)	31	44.9	81	39.7	Ref	
>6 Kattha (0.201 hectare)	38	55.1	123	60.3	1.23 (0.71-2.14)	0.60 (0.29-1.23)

[a]The crude odds ratio with 95% confidence interval.
[b]The adjusted odds ratio with 95% confidence interval obtained from multiple logistic regression.

come per year, and family land was the same, whereas the risk of default among different categories of gender, educational status and disability grade was different, after adjustment with all variables used in the logistic model.

DISCUSSION

Tables 1 and 2 show that the proportion of treatment completion among the male patients was significantly higher than females, whereas a higher proportion of default was found among the female patients. Multivariate analysis revealed that there was a significant association between treatment completion status and gender, after adjustment with other covariates, such as leprosy type, disability grade, skin lesion site, age, educational status, caste level, religion, occupation, family type, family income per year, and family land. Female defaulter patients missed appointments for several months, which may be related to the distance and actual or perceived cost of travel, fear and social consequences, family problems, and other illnesses. The road transportation network was poor and access to many areas was difficult during the dry and rainy seasons, possibly due to the long civil war and strikes. Treatment completion behavior may relate to factors such as acceptance of the condition and the need to treat it, beliefs about the value of treatment, including the speed of improvement and lack of side effects, and the quality of the relationship with health personnel (Mull *et al*, 1989). The greater level of treatment completion in males may relate to social status, whereas the study conducted in Pakistan revealed no significant difference in treatment status between the sexes (Mull *et al*, 1989).

Table 1 also shows that more male patients suffered a higher proportion of disability grade II. Several studies (Iyere, 1990; Ponnighaus *et al*, 1990; Guocheng *et al*, 1993; Saha and Das, 1993; Ulrich *et al*, 1993; Rao *et al*, 1994; Tiendrebeogo *et al*, 1996) conducted in India, Burkina Faso, Venezuela, Nigeria, Malawi and China, respectively, reported similar findings. The consequent higher proportion of disability/deformity in men may be better explained by their skin lesion sites. Males had more skin lesions (69.4%) in their exposed body areas (face, eye, hand and legs), and they were found to have suffered more from leprosy-associated injuries on their feet and hands, which are more vulnerable in an agricultural setting and riding a bicycle/rickshaw. These results are consistent with studies conducted in India (Rao *et al*, 1994; Saha and Das, 1993).

Table 2 shows that there was a significant association between treatment completion status and educational status and disability grades after adjustment with other factors used in the model. Illiterate patients tended to default more. This may be due to an inability to understand long-term nature of treatment and drug compliance. The occupations of patients were not a factor for defaulting, which supports the finding of the study conducted in Myanmar (Myint *et al*, 1992). We found similar risk of default among MB and PB patients, contrary to a study in Myanmar, where defaulting was observed to be much higher among PB cases (Myint *et al*, 1992). The treatment completion rate was the highest among leprosy cases with no disability. This may be due to their better mobility, travel and motivated nature. This finding refutes the previous findings of a Myanmar study, that cases without deformity may be less motivated to obtain treatment (Myint *et al*, 1992).

Conclusion

In summary, we concluded that male patients are twice as likely to be treatment completers than female patients, after adjustment for leprosy type, disability grade, skin lesion site, age, educational status, caste level, religion, occupation, family type, family income per year, and family land (adjusted OR 2.05, 95% CI: 1.07-3.94). Similarly, after adjustment with the above-mentioned variables we also conclude that literate patients and patients with no disability and disability grade I are more than twice as likely to be treatment completers than illiterate patients and patients having disability grade II.

The review of the available literature on gender differences related to leprosy revealed that many leprosy and epidemiological factors play a role in the comparative leprosy treatment completion status of males and females. Additional research is needed to determine the relative impor-

tance of health service-related factors in treatment completion. Moreover, other research will focus on assessing community behavior and attitude towards leprosy patients under treatment. It is recommended that closer attention to gender differences be given, to improve MDT coverage, capacity building, increase community awareness. Treatment completion rates, should be maintained at around 90-95% MDT completion (WHO, 1999). The system for delivery of MDT should be patient-friendly. Flexibility is important, but regular contact between patient and health workers should be maintained. Only in exceptional cases, in which the patients cannot be seen monthly, more than a 1-month supply of MDT blister packs should be provided.

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