Analysis of newly detected leprosy in Sohag Governorate, Upper Egypt, 2004–2008

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Summary
Introduction: Leprosy is a chronic and complex infectious illness; the new-case detection rate is better than prevalence as an indicator of disease trends. This study presents an analysis of pattern of new cases of leprosy detected annually from 2004 to 2008 in Sohag Governorate, Upper Egypt.
Patients and methods: Data about patients with newly diagnosed leprosy were collected from Sohag leprosy hospital, the main referral centre in the governorate. Case detection rates (CDR) were calculated for each year by dividing the newly diagnosed cases by mid-year populations for the same year.
Results: 587 patients were newly diagnosed between 2004 and 2008. The mean age of patients at diagnosis was 34 years, 62% were males, and 11% were children below 15 years of age. The overall leprosy case detection rate was 3·1/100,000 population and it decreased from 3·4/100,000 population in 2004 to 2·8/100,000 population in 2008. Ninety three percent were classified as multibacillary, and 20·4% had Grade 2 disability at diagnosis.
Conclusions: Leprosy remains a health problem in Sohag Governorate. It is possible that new cases are being detected late owing to inadequate community awareness of the disease. Leprosy control activities should be provided in primary health care units in order to detect new cases, and continued surveillance is required to detect relapses and to ensure good patient compliance with treatment.

Introduction

Leprosy is a chronic and complex infectious illness, dependent in large part upon the individual's immunologic response to the causative organism, *Mycobacterium leprae*.[1]

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The disease usually affects the skin, peripheral nerves, mucosa of the upper respiratory tract and the eyes, and it is classified as paucibacillary (PB) or multibacillary (MB).[2] Leprosy is not highly infectious, transmission being attributed primarily to droplets from the nose and mouth during close contact with untreated MB cases. Untreated, leprosy can cause progressive and permanent damage to the skin, nerves, limbs and eyes. Early diagnosis and treatment with multidrug therapy (MDT) remain the key elements in controlling the disease.[3]

There is evidence that populations experiencing a decline in leprosy show a gradual increase in the multibacillary (MB) form, as well as a shift to an older age at diagnosis of disease.[4] Improvements in health care and socioeconomic conditions are associated with increasing survival of cured patients.

The prevalence of leprosy and the detection rate are the conventional indicators for monitoring trends in leprosy control and elimination programmes.[5] The new-case detection rate is a better indicator of disease than prevalence, because it is not affected by changing case definitions or duration of treatment.

Globally, the reported annual detection of new cases has declined in recent years, from 620,638 cases in 2002 to 244,796 in 2009 and the registered prevalence at the beginning of 2010 was 211,903 cases. For the first time in its history, Egypt had less than 1000 new cases detected in 2006. In 2009, 700 new cases were detected and the treatment completion rate was 83%.[6]

There is little published information about the leprosy situation in Upper Egypt. This study represents an analysis of the number of new cases of leprosy detected annually from 2004 to 2008 in Sohag Governorate, Upper Egypt. The aim of the study was to describe the pattern of detection rate by gender and age of patients, grades of disability, types of leprosy and locations in an endemic area of Egypt.

Patients and Methods

Egypt consists of 26 governorates in three regions: Upper Egypt, Lower Egypt and Sinai. Sohag is one of the nine governorates of Upper Egypt (Figure 1).

It consists of 11 municipalities with a total area of $11\,218\,\text{km}^2$ and a total population of 4,004,613 in 2010 according to Central Agency for Public Mobilization and Statistics, Egypt (2010). Socio-economic indicators show Sohag to be the poorest or the second poorest governorate in Egypt on the basis of population density on land, illiteracy and infrastructure.[7] This retrospective study was conducted in the Departments of Dermatology, Medical Microbiology & Immunology and Community Medicine of Sohag University Hospital. Data on the population in Sohag Governorate during the study period were obtained from Central Agency for Public Mobilization and Statistics (CAMAS).

The National leprosy Control Programme (NLCP) at the Ministry of health is the main body in charge of leprosy control in Egypt. Leprosy treatment services are provided in 17 governorates including Sohag. These centres comprise a main leprosy dermatology clinic with sub-centres in districts. WHO cooperates with the Ministry of Health, by providing multi-drug therapy (MDT) drugs to these centres (based roughly on the number of patients identified the year before) as well as training, health education and rehabilitation of leprosy patients).

Data about 587 patients with newly diagnosed leprosy during the period from 2004 to 2008 were collected from Sohag Leprosy Hospital, which is the main referral centre for patients with leprosy in Sohag Governorate. Case finding was by three methods: 261(44·5%)
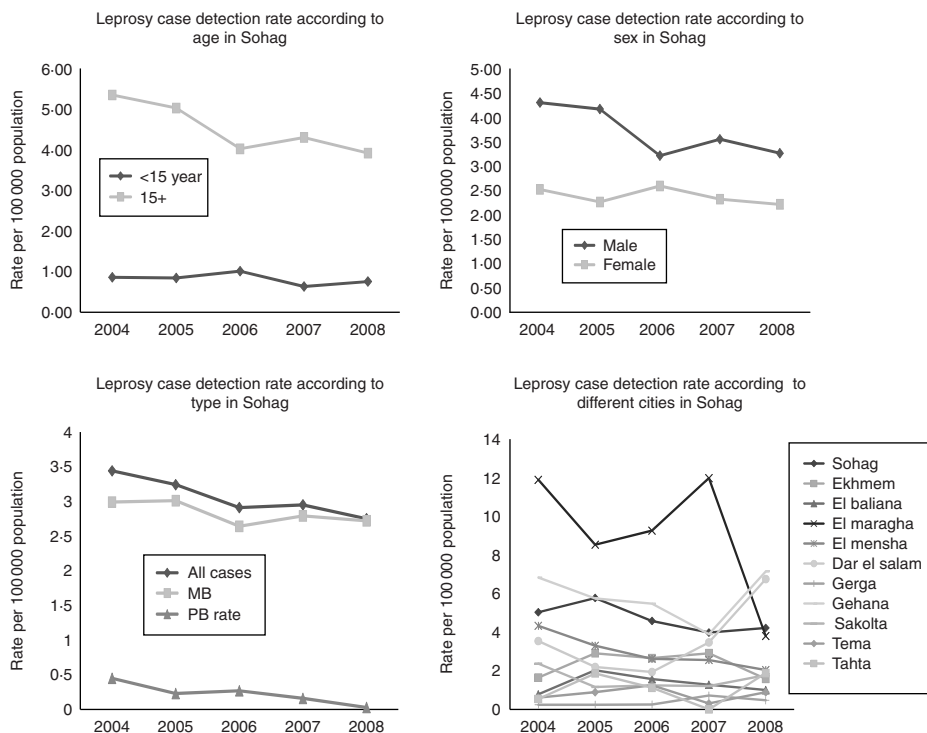
Figure 1. Leprosy case detection rate.

cases by referral of patients from dermatologic departments in other hospitals or private clinics (notification), 216 (36·8%) cases by self reporting of patients who attend Sohag Leprosy Hospital (passive) and 110 (18·7%) cases by annual surveys of contacts (which replaced annual mass surveys after 1988). Diagnosis is based upon clinical presentation, slit skin smear and biopsy (both of which are carried out on almost all suspects). The available data included age, sex and year at diagnosis, form and type of leprosy, history of contact with leprosy case and presence or absence of disability at diagnosis.

The distribution of cases according to disability was assessed according to the WHO grading scale:

HANDS AND FEET

Grade 0: No anaethesia, no visible deformity or damage.
Grade 1: Anaessthesia present, but no visible deformity or damage.
Grade 2: Visible deformity or damage present.

EYES

Grade 0: No eye problem due to leprosy,no evidence of visual loss.
Grade 1: Eye problems due to leprosy present but vision not severely affected as a result (vision ≥ 6/60, can count fingers at 6 metres).
Grade 2: Severe visual impairment (vision ≤ 6/60 inability to count fingers at 6 metres), lagophthalmos, irridocyclitis and corneal opacities.

We examined case detection rates of Grade 2 disability, because this statistic is emphasised in the current WHO strategy.[8]

Patients receive treatment according to their WHO classification. A patient with up to a maximum of five patches and/or one involved nerve is considered as pauci-bacillary. If confirmed also by negative skin smear, such patients receive 'PB-MDT' consisting of dapsone100 mg/day and rifampicin 600 mg/month for at least 6 months. Any PB patients who had taken six doses of PB-MDT for 9 months were considered as having completed treatment (often equated with 'cured'). Patients with more than five lesions or positive skin-smear receive 'MB-MDT' consisting of dapsone 100 mg/day, clofazimine 50 mg/ day, rifampicin 600 mg/month, and clofazimine 300 mg/month for at least 1 year or until smear negative. Completion of treatment is followed by surveillance for 6 months after which patients were considered completely cured.

Statistical analysis was done using SPSS version 10. The collected data were compared between the two types of leprosy (MB and PB) using chi square test for categorical data and student's *t*-test for quantitative data. $P < 0.05$ is considered statistically significant. Case detection rates (CDR) were calculated for each year by dividing the newly diagnosed cases by the appropriate mid-year population for the same year. CDR was calculated for different groups: all patients, MB, PB, and those with disability (Grade 1 and 2). In a similar way CDR was calculated for the whole period, males, females and children under 15 years. Case detection rates were calculated for different districts in Sohag Governorate for each year of study period and for the whole period.

Results

CHARACTERISTICS OF THE PATIENTS

During the period from 2004 to 2008, 587 patients were newly diagnosed with leprosy in Sohag Governorate. Of these, 544 (92·7%) were classified as multibacillary.

AGE

The age-sex distribution of the 587 patients is shown in Figure 2.

The mean age (SD) of the patients at diagnosis was 34·0 (16·6) years, and was higher for multibacilliary 34·4 (16·7) year than for paucibacillary 29·3 (14·6) patients ($P = 0.05$). Children less than 15 years represented 16·3% of the paucibacillary cases but only 10·1% of the multibacilliary leprosy cases ($P = 0.2$) (Table 1).

SEX

Sixty two percent of the cases were males. The male proportion is greater among the multibacillary than among the paucibacillary cases (62·7% vs 48·8% respectively) ($P = 0.07$) (Table 1).

PREVIOUS CONTACT TO LEPROSY CASES

More than one third of the new patients (36·5%) reported a positive history of having had contact with a known leprosy case (Table 1).
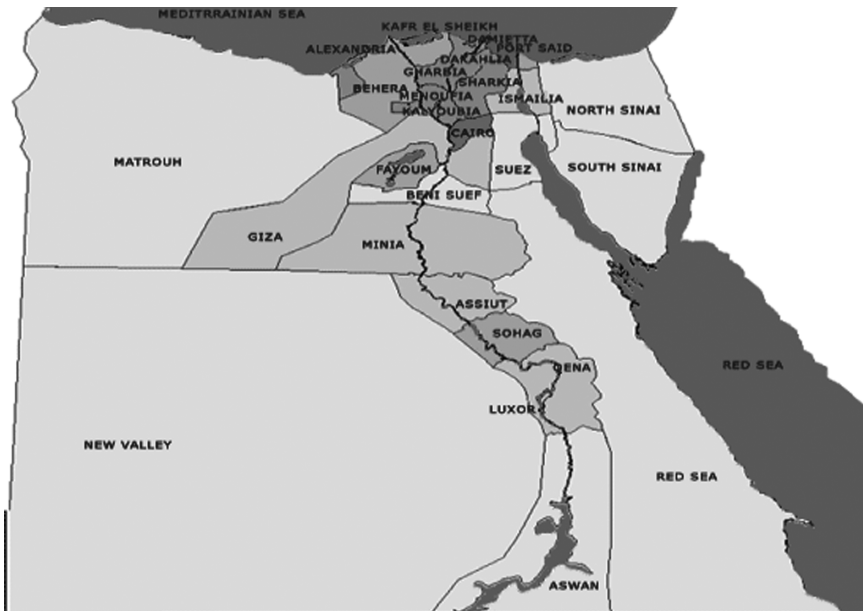
Figure 2. A map of Egypt, showing the Governorates. Upper Egypt is defined geographically as the territory of the governorates along the Nile valley above (to the south of) Cairo. In turn it is divided into the southern region (Aswan, Luxor, and Qena), the middle region (Sohag, Assiut, and Menia), and the northern region (Beni Suef, Fayoum, and Giza).

DISABILITY

Thirty five percent of patients had disability Grade 1 or 2 at time of diagnosis (Table 1). Disability was statistically higher in patients with multibacilliary (36·8%) than paucibacillary (9·3%) leprosy. Hands were most often affected by disabilities (97 patients, 16·6%), followed by feet (49 patients, 8·3%) and eyes (two patients, 0·3%).

Table 1. Characteristics of new leprosy cases in Sohag

Characteristics	All cases No. (%)	Paucibacillary No. (%)	Multibacilliary No. (%)	*P* value
Mean age (SD)	34·0 (16·6)	29·3 (14·6)	34·4 (16·7)	0·05
Age groups				
< 15 (year)	62 (10·6)	7 (16·3)	55 (10·1)	0·2
> 15 (year)	525 (89·4)	36 (83·7)	489 (89·9)	
Sex				
Males	362 (61·7)	21 (48·8)	341 (62·7)	0·07
Females	225 (38·3)	22 (51·2)	203 (37·2)	
Previous contact with patients				
Yes	214 (36·5)	14 (32·6)	200 (36·8)	0·06
No	373 (63·5)	29 (67·4)	344 (63·2)	
Presence of disability				
No	383 (65·2)	39 (90·7)	344 (63·2)	<0·0001
Yes	204 (34·8)	4 (9·3)	200 (36·8)	
Total	587 (100)	43 (7·3)	544 (92·7)	

Chi square test was applied except for age student's *t*-test was done.
The percentages were calculated per columns.

Table 2. Leprosy Case detection rate according to the year, age and sex of participants in Sohag Governorate

| Year | Case detection rate | | | |
	Over all	Multibacilliary	Paucibacillary	Cases with disability
2004	3·4	3·0	0·5	1·0
2005	3·2	3·0	0·2	1·0
2006	2·9	2·6	0·3	0·8
2007	3·0	2·8	0·2	1·4
2008	2·8	2·7	0·0	1·1
Age				
< 15	0·8	0·7	0·1	0·3
> 15	4·5	4·2	0·3	1·6
Ratio	0·2	0·2	0·3	0·2
Sex				
Males	3·7	3·5	0·2	1·4
Females	2·4	2·2	0·2	0·8
Ratio	1·6	1·6	0·9	1·8
Over all	3·1	2·8	0·2	1·1

Rate/100,000 populations.

LEPROSY CASE DETECTION RATE

The overall leprosy case detection rate over the 5 years study period was 3·1/100,000 population and it decreased from 3·4/100,000 population in 2004 to 2·8/100,000 population in 2008. Both multibacilliary and paucibacillary leprosy decreased over this period (Tables 2, 3 & Figure 1), as did the rates for both children and adults (Figure 3).

CASE DETECTION RATE OF CASES WITH GRADE 2 DISABILITY

The average annual case detection rate for cases with Grade 2 disability was 0·62 per 100,000 population. This remained roughly constant over the 5 years included in this survey. The rate was higher in males than in females (0·81/100,000 and 0·43/100,000, respectively), and higher in adults than in children (94/100,000 and 0·13/100,000 respectively).

Table 3. Leprosy Case detection rate in different cities of Sohag Governorate

	Average population	Average number of cases	2004	2005	2006	2007	2008	Over all
Sohag	602,178	28	5·0	5·8	4·6	4·0	4·2	4·7
Ekhmem	308,054	7	1·7	2·9	2·7	2·9	1·6	2·3
El baliana	390,403	5	0·8	2·0	1·6	1·3	1·0	1·3
El maragha	310,883	28	11·9	8·5	9·3	12·0	3·8	9·1
El mensha	426,465	13	4·3	3·3	2·6	2·7	2·0	3·0
Dar el salam	316,111	11	3·5	2·2	1·9	3·5	6·8	3·6
Gerga	417,197	2	0·2	0·2	0·3	0·7	0·5	0·4
Gehana	205,775	12	6·8	5·8	5·5	3·9	7·2	5·8
Sakolta	167,430	3	2·4	1·2	1·2	1·2	1·8	1·6
Tema	329,669	3	0·6	0·9	1·3	0·3	0·9	0·8
Tahta	367,717	4	0·5	1·9	1·1	0·0	1·9	1·1

Figure 3. A map of Sohag governorate.

LEPROSY CASE DETECTION RATE IN DIFFERENT MUNICIPALITIES

The average annual case detection rates varied from 0·8 per 100,000 to 9·1 per 100,000 over the years 2004 to 2008 in the different municipalities of Sohag Governorate.

Discussion

Leprosy is a curable disease with a well-defined etiology, but better diagnostic tools and therapeutic strategies are needed. Untreated multibacillary patients are probably the most important source of *M. leprae* transmission.[9] Early detection and protection of susceptible population should reduce transmission and thus reduce the physical and social disabilities associated with leprosy.

The present study showed that the overall leprosy case detection rate amongst the studied population was 3·1/100,000 and it decreased from 3·4/100,000 in 2004 to 2·8/100,000 in 2008. These rates are higher than those reported in Kalyubia governorate (Lower Egypt), where CDR decreased from 0·2/100,000 in 2000 to 0·1/100,000 in 2006.[10] The number of new cases detected in all of Egypt decreased from 1216 in 2004 to 797 cases in 2008, with a parallel decrease in CDR from 1·7/100,000 to 1·0/100,000 respectively.[11,12] It is unclear whether the slight decrease in CDR observed in the current study reflects an actual decrease in transmission of *M. leprae* or is a consequence of operational factors, in particular the shift

from active to passive case detection. Sohag has one of the highest CDRs for leprosy in Egypt, which may be associated with its low socio-economic status.[13]

As MB cases are considered to be more infectious than PB, and thus more likely to be responsible for *M. leprae* transmission, it is important to know how many of the newly detected cases fall into this category. In this study, the proportion MB was 92·7%. This is consistent with the pattern reported in Kalyubia governorate, where the MB proportion was 95·7% with a peak of 98·6% in years 2002 and 2004.[10] Another published study, in Dakhalia governorate (Lower Egypt) reported an equally high MB proportion of 95·3%.[14] These figures may be compared to summary national statistics reported for the proportion MB among newly detected cases in 2008 in the Eastern Mediterranean region: (89·5% in Egypt as a whole, 84·0% in Sudan and 80·0% in Pakistan).[12]

The high proportion of MB cases may indicate a delay in detection of leprosy but it may also have been influenced by changes to the clinical definition of MB leprosy (a case with ≥ 5 skin lesions) proposed by WHO since the introduction of MDT.[15]

As child cases reflect recent transmission of *M. leprae*, the number and proportion of child cases are important epidemiological indicators for leprosy.[16] Sixty-two child cases were identified in the present study, reflecting 10% of all cases and a case detection rate of 0·8/100,000. This percentage was comparable to what was reported in the Kalyubia study (11·0%) but marginally less than that reported in Yemen (15·5%).[12] This statistic needs to be monitored over time to see evidence of reduced transmission.[16] The ages of the youngest cases ranged from 3 to 9 years over the 5 years 2004–2008 reported here.

Almost two-thirds (62%) of the new leprosy new cases in Sohag Governorate 2004–2008 were males. The Sohag figures are similar to those reported in Kalyubia and Yemen.[17] There remains some uncertainty whether the male excess reflects a true difference and whether it is influenced by differential case ascertainment associated with and unequal availability of health services for men and women. Other explanations have been postulated, women, in general, are poorly represented in hospital statistics; due to socio-economic and cultural difficulties. There may be a delay in seeking treatment and even after identifying the symptoms, women were observed to rely on non-medical treatment for a longer period than males.[18] It has been suggested that the proportion of female cases may be increasing, in some populations, as a consequence of women working more outside the home.[19]

The proportion of new cases with Grade 2 disabilities is an important indicator as it can be reliably measured and it reflects delays in case detection.[16] Globally, between 12 000 and 15 000 cases with Grade 2 disabilities are detected and reported each year. In the present study the proportion of cases with Grade 2 disabilities among newly detected cases was 21·4%. The high proportion of Grade 2 disability is consistent with that reported in Sudan (23·3%) and Pakistan (19·5%) in 2008.[12] However, lower percentages had been reported in Kalyubia (11·6%), Egypt (7·3%) and Yemen (13·2%).[10,12] The high rate in Sohag may indicate that new cases are being detected late owing to inadequate community awareness of the disease, thus resulting in late self-reporting. The proportion of disability Grade 2 was slightly higher among males (22·7%) than females (18·7%). Several studies conducted in many countries reported a similar pattern.[20–22] The higher risk of disabilities in males may be associated with the fact that males are more often affected by MB leprosy than females and MB leprosy is more prone to disabilities than PB leprosy.

Differences in leprosy case detection between the several municipalities of Sohag Governorate are difficult to interpret without data on socio-economic and operational factors in the populations.

Conclusion and Recommendations

Leprosy persists in Sohag governorate, and efforts are still needed to control this problem. Leprosy control activities should be provided in primary health care units in order to increase public awareness and to detect new cases. Case-finding activities should be increased among contacts and school-children to promote early case detection and reduction of disabilities. Continued surveillance is also required to detect relapses and to ensure good patient compliance with treatment. Awareness of the disease among the general public and general healthcare workers should be improved. Further research is needed to better understand the variable endemicity of the disease in the governorate, which should in turn encourage appropriate targeting of control activities.

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