

SUBSTANTIAL UNDERREPORTING OF TUBERCULOSIS IN WEST GREECE - IMPLICATIONS FOR LOCAL AND NATIONAL SURVEILLANCE

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In order to estimate the reliability of the officially reported national tuberculosis (TB) incidence rates we performed a retrospective review of data collected in regional and national public health framework. TB notifications for the period 2000-2003 were obtained from two major hospitals and three relevant Public Health Departments (PHDs) in the region of West Greece, and subsequently compared with the data reported to the Hellenic Centre for Diseases Control (KEELPNO). During the four-year study period a total of 161 cases of TB were reported to the PHDs in West Greece; 70% of these cases were reported to the KEELPNO. Furthermore only 72 (38.7%) out of the 186 cases of TB identified in the two hospitals were notified to the PHDs. Assuming that the degree of undernotification observed for the two hospitals is the same throughout the region, we estimated that the case detection rate was 14 cases per 100,000 persons per year, i.e. 3.7 times higher than the rate officially reported for the period 2000-2003. Male predominance (2.1, male/female ratio) and an increased incidence in the elders (older than 60 years) and adolescents (10-14 years old) were also evident. The study demonstrated a substantial underestimation of TB burden in West Greece. In the face of the massive influx of immigrants and refugees coming from regions with high TB incidence and the increase of the number of drug-resistant cases a reliable and complete notification of TB is crucial in the planning of programs and development of appropriate control policies.

Introduction

The subject of underreporting is an important problem in tuberculosis (TB) care in many countries in the world including Europe. It is particularly important for Greece as its case detection rate, according to the World Health Organization (WHO) data, is one of the lowest in Europe [1,2]. In Greece as well as in other European countries the burden of disease is increasingly associated with immigrants from countries with a high prevalence of tuberculosis and other groups at higher risk of infection, such as the elderly (aged 60 years and older), homeless, drug users, and immunosuppressed patients [3,4]. It is widely acknowledged that these high risk groups should be the target of prevention and control strategies of tuberculosis in the European Union (EU) [5].

In Greece, during the period 1996-2005, the notification rates ranged between 5 and 11 cases per 100,000 population per year [6]. Between 2000 and 2003 only 5-6 cases per 100,000 population were reported annually through the national notification system, resulting in one of the lowest rates in the EU, comparable only with Sweden, Malta and Cyprus. It is worth mentioning that in the same period neighbouring countries reported notification rates between 19.3 (Albania) and 43.8 (Bulgaria) [6]. However, the Greek national data are not considered as complete due to various limitations in the notification system [7]. The massive influx of immigrants from the Balkans, Eastern Europe and Asia, i.e. regions with high TB incidence and increase in resistance of *Mycobacterium tuberculosis* does not correspond with the reported case detection rate [8-10]. Therefore, the necessity to report exhaustive and representative data in order to obtain reliable comparisons has been widely acknowledged not only in Greece [5].

TB has been a notifiable disease for many years, but completeness of notification varies among different countries. Despite a number of limitations, notification contributes to the monitoring and control of TB. The main drawbacks are insufficient data and incompleteness of notification which do not reflect the actual situation in the population [2,11,12,13]. In Greece, reporting of TB is obligatory and physicians make notification on a standardised notification form. TB cases are notifiable if they meet certain criteria: TB cases with culture-confirmed disease due to *M. tuberculosis* or culture-negative TB cases with clinical and/or radiological signs and/or symptoms treated with antituberculosis drugs [14]. At the level of the prefectures, the Public Health Departments (PHDs) are charged with the collection of data regarding all notifiable diseases. At the national level, the Hellenic Centre for Disease Control (KEELPNO) collects information from all PHDs for central epidemiological surveillance and trend analysis purposes.

The objective of this study was to examine the process of reporting TB cases between the local (two major hospitals) and regional levels (three public health departments) and subsequently between the regional and national levels (KEELPNO) in order to

evaluate the completeness of notification records held at the national level for the region of West Greece.

Study population and methods

The study took place in West Greece, one of the 13 peripheries of Greece, which is further divided into the prefectures of Aitolokarnania, Achaia and Elia, and covers an area of 11,350 square kilometres (8.6% of the total area of Greece). According to the 2001 census, the population of this region was 741,282 (7% of the country's total population).

For the study period of 2000-2003, the data on TB notifications were obtained both from the three prefectural PHDs and from the KEELPNO.

For the same period, all clinical records on TB cases were collected from the two major tertiary care hospitals in the municipality of Achaia (the Specialised Hospital for Pulmonary Diseases – Thorax Hospital and the University Hospital of Patras). Although in West Greece there are nine more small and medium-sized hospitals as well as 17 health centres, the two hospitals selected for the study are believed to cover a large proportion of TB cases in this region. For each TB patient, data were obtained regarding the date of diagnosis, the site of disease, the criteria used for the case's ascertainment and demographic characteristics (sex, age, profession, place of residence). These data were obtained mainly through the records kept by the hospital-based Committee

of Infectious Disease Control which is responsible by law for the continuous monitoring of all communicable diseases. In the next step, two researchers collected and confirmed all records of TB cases kept in handwritten form in a corresponding book of laboratory results in the Departments of Microbiology and Cytology. Furthermore we have traced additional cases through the patient discharge lists from the departments of internal medicine and pulmonology.

Incidence rates (per 100,000 population) were calculated according to 2001 census provided by the National Statistical Service of Greece. The study was approved by both the Board of Medical School of the University of Patras and the Regional Health Authority of West Greece.

Statistical Package for Social Sciences (SPSS) program-version 12.0 (SPSS Inc., USA) was used for data entry and descriptive analysis.

Results

Table 1 shows the TB cases documented in the two selected hospitals and the corresponding notifications to the PHDs. Based on the place of residence in West Greece, 186 notifiable TB cases were identified in the two hospitals in the four-year period. Of these, only 72 cases (38.7%) were reported to the PHDs. Specifically from the 144 TB cases identified in the Thorax-Hospital only 43 (30%) were reported to the corresponding PHDs whereas the notification rate for the University Hospital was significantly higher (69%). Consequently, at least 114 cases of TB were not notified to the PHDs of West Greece during 2000-2003, i.e. almost 30 cases per year. The combined undernotification rate of the two hospitals reached 61% (114/186) and it was significantly higher in 2002 and 2003 compared to 2000 and 2001.

During the study period (2000-2003), 161 cases were reported to the PHDs in West Greece by all sources (including 72 cases notified by the two hospitals), so that in total we identified 275 TB cases which would correspond to a mean annual notification rate of 9.5 per 100,000 (Figure). On the basis of demographical characteristics of the study population we observed a clear predominance of male patients (male/female ratio of 2.1) and an increased incidence in the elderly (over 60 years old) as well

TABLE 1
Tuberculosis cases documented and reported to the Public Health Departments by two large hospitals in West Greece during 2000-2003

Prefecture	Thorax and University Hospital identified cases	Reported cases to PHD	Notification rate (%)
Achaia	100	22	22
Aitolokarnania	39	20	51.3
Ilia	47	30	63.8
West Greece total	186	72	38.7

FIGURE
Mean notification rate of tuberculosis per 100,000 population, Greece, 2000-2003, by age and sex

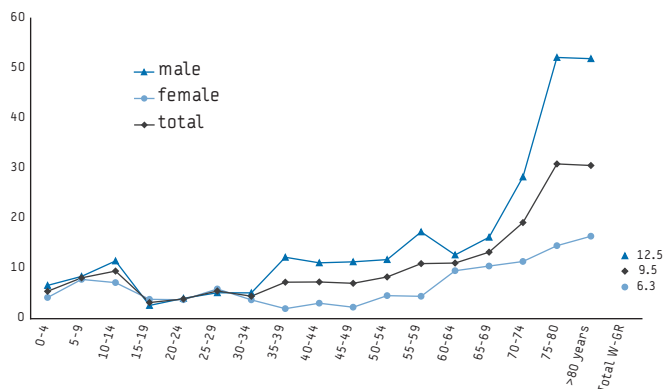


TABLE 2
Cases of tuberculosis registered in the Public Health Departments in three prefectures of West Greece and reported to the Hellenic Centre for Infectious Disease Control (KEELPNO)

Year	Registered cases of TB					
	Public Health Departments				Reported to KEELPNO	
	Achaia	Aitolokarnania	Ilia	West Greece total	From West Greece n (%)	Greece total
2000	12	26	23	61	56 (92%)	703
2001	7	4	9	20	18 (90%)	617
2002	18	13	10	41	27 (66%)	581
2003	13	12	14	39	12 (31%)	621
Total	50	55	56	161	113 (70%)	2,522

as a clustering in the age-group of 10-14 years old (Figure). It is worth mentioning that eight paediatric cases of TB, including six boys and a girl from the urban area of Achaia, were reported from February to May 2002. Any other information was not possible to be obtained for these cases.

Finally, only 70% of the 161 cases notified to the three PHDs were further reported by the PHDs to the KEELPNO (Table 2). There were no significant differences in the proportion of cases reported from the PHDs to KEELPNO by prefecture, since the range was 68-74%.

Discussion

This study demonstrates a substantial underestimation of TB burden in West Greece and reflects an insufficient TB monitoring system in Greece. Assuming that the degree of undernotification observed is the same throughout the whole region of West Greece – which is more than probable considering that the Infectious Diseases Control Committees of the two large hospitals are relatively well organised – we estimate that the actual case detection rate could reach 14 cases per 100,000 persons per year, i.e. a value 3.7 times higher than the data officially reported by the KEELPNO for the period 2000-03. The reasons for this underreporting are not well studied. Although our results cannot necessarily be extrapolated to the whole national surveillance system, the few studies on completeness of tuberculosis notification in Greece have shown similar results [7,15,16]. Obviously the participation of physicians (in both primary and hospital care) in the obligatory (passive) reporting system is not efficient [17] perhaps because the reporting system has not been properly introduced to health professionals and other related stakeholders, and the forms as well as the procedures of reporting remain very complicated. As other studies mentioned, the inconsistency or incompleteness of data produce further difficulties in the data analysis [13,14,18].

A great challenge for TB control is posed by the fact that during the last decade there has been an uncontrolled illegal immigration from high TB endemic regions such as Balkans, Eastern Europe and Asia in many European countries including Greece. Between 1991 and 2004, the number of immigrants in Greece has raised from 270,000 to 1.1 million, accounting for the 10.3% of the total population. Immigrant population densities ranged between 0 and 25% in different areas, whereas in West Greece the density lies around the mean. Immigrants originated mainly from Albania (55%), Bulgaria (4.7%), Georgia (2.9%), Romania (2.2%), Russia (2.3%), Ukraine (1.9%), Poland (1.9%) and Asia (5.6%, mainly Pakistan, India, Iraq, Syria etc.) [8]. During the study period, many of the abovementioned countries showed very high mean annual TB incidence rates per 100,000 population, like Romania (140), Georgia (133), Russia (97), Ukraine (78), Bulgaria (44) [6]. The majority of these (in a great part illegal) immigrants and refugees usually do not undergo any tuberculosis control program [19,20]. Possible cases among the immigrants are less likely to be diagnosed which consequently contribute to further underestimation of the disease burden and facilitate further spread of TB in the country [16,19,20,21].

Another important finding is the observed peak in adolescents and the gender differences. This result is in line with well-established knowledge. During adolescence, higher prevalence of TB among males has been reported which may reflect a genuine sex difference in susceptibility to TB infection [22,23]. It is

probable that our results reflect the usual biphasic age-related TB incidence curve often found in low-incidence countries: the first peak mainly attributable to recent transmission and disease among young immigrants and the second peak reflecting reactivation of old infections among the native population in Western European countries [2,6]. Another possibility could be that undernotification is lesser in paediatric cases than in adult cases. However, the first peak in our curve is in a younger age group than in some other countries and cannot be explained by immigrant labour or marriage (usually 20–40 years age groups) [2,6]. Perhaps the peak in adolescents is due to a school outbreak but we lack data to support that. Gender differences in biological susceptibility may be one plausible reason but also socio-economic and cultural factors may play a role in determining sex differences in rates of infection and progression to disease. Also differences in the risk of exposure to infection between male and female adolescents play a role.

Our results indicate that in two specialised hospitals in West Greece physicians seem reluctant to notify TB cases and, in addition, the regional responsible authorities (PHDs) seem to fail in executing their professional duty of forwarding all surveillance data to the national level. This is partly due to delays in collecting all necessary supplementary administrative data from the hospitals which cause further delays in forwarding on time the data to KEELPNO. These problems should be investigated and addressed by, for example, the Ministry of Health or the Health Care Inspectorate. Effective disease control and prevention in Greece can be achieved only with a well organised surveillance of TB at the local, regional and national level in order to evaluate and plan programs, to target resources and to develop appropriate policies. In order to improve the accuracy of the notification system good understanding of the reasons for underreporting and proper and sincere cooperation with the physicians, the health centres and the hospitals are required. In the light of our findings, the following recommendations are made to increase the notification of TB and to target disadvantaged groups. On the national level KEELPNO must inform regularly all PHDs and physicians regarding the importance and usefulness of the TB notification as well as of the notifications for other infectious diseases. National training and consensus meetings should be organized in order to improve notification rates. On the regional level all necessary activities regarding notification should be centralized and coordinated by the local PHDs, given that offices and professionals at the local PHDs have to perform their duties. The quantity of information collected and reported must balance the need for simplicity, increased efficiency of the system and sufficient data. Cooperation should be strengthened among PHDs, health professionals and KEELPNO. Medical examination of immigrants (especially from countries with high TB incidence) should be enforced.

In the face of the massive influx of immigrants and refugees coming from regions with high TB incidence and the increase of the number of drug-resistant cases challenging the quality of the TB control system a reliable and complete notification of TB – including drug susceptibility testing for monitoring the occurrence of drug-resistant TB – is crucial in the planning of programs and development of appropriate control policies regarding early case finding and transmission control as well as treatment adherence and success.

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