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Prevalence and risk factors for multidrug-resistant tuberculosis in the Republic of Georgia: a population-based study

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SUMMARY

SETTING: Multidrug-resistant tuberculosis (MDR-TB, defined as resistance to at least isoniazid and rifampicin) has emerged as a serious global public health problem, especially in the former Soviet republics. The extent of the problem in Georgia has been incompletely defined.

OBJECTIVE: To determine the prevalence and risk factors for MDR-TB in Georgia.

DESIGN: A population-based study was carried out between July 2005 and May 2006.

RESULTS: Of 1314 patients with acid-fast bacilli smear- and culture-positive pulmonary tuberculosis (TB), 799 (60.8%) were newly diagnosed patients and 515 (39.2%) had been treated previously. Overall, 733 (56%) patients had resistance to at least one anti-tuberculosis drug and 195 (15%) had MDR-TB. Patients who had been treated previously for TB were significantly more likely to have MDR-TB than newly diagnosed patients (141/515 [27.4%] vs. 54/794 [6.8%], OR 5.27, 95%CI 3.75–7.41). In multivariate analysis, previous TB treatment (aOR 5.47, 95%CI 3.87–7.74) and female sex (aOR 1.58, 95%CI 1.02–2.32) were independent risk factors for the presence of MDR-TB.

CONCLUSIONS: Drug-resistant TB, including MDR-TB, has emerged as a major public health problem in Georgia. Further TB control efforts need to be implemented to prevent the development of new cases of MDR-TB and to treat existing patients with MDR-TB.

KEY WORDS: multidrug-resistant tuberculosis; MDR-TB; Drug Resistance Survey; Georgia

TUBERCULOSIS (TB) is widespread in the republics of the former Soviet Union.[1] TB has emerged as a major public health problem in the country of Georgia following the break-up of the Soviet Union due to the sudden decline in socio-economic status, increased poverty, a large number of internally displaced persons resulting from the civil war in 1991–1992, following Georgia's independence from the Soviet Union, and the failure of TB control and other health services.[2–4] According to the National Tuberculosis Programme (NTP), the annual incidence of TB rose from 29.5 per 100 000 population to 165/100 000 between 1989 and 1996.

In 1996, the NTP established a surveillance system for TB in Georgia. The Georgian NTP embraced the World Health Organization (WHO) recommended DOTS strategy, but has begun to aggressively implement DOTS only in recent years. Despite modest declines, TB case rates remain high in Georgia. In 2005, the annual new TB case notification rate (incidence) was reported by the Georgian NTP to be 97/100 000 and the total TB case notification rate (new and retreatment cases) was 147/100 000.[5] The prevalence of TB and human immunodeficiency virus (HIV) co-infection is 1.1%.[4]

The prevalence and risk factors for multidrug-resistant TB (MDR-TB, defined as resistance to at least isoniazid [INH] and rifampicin [RMP]) have been incompletely defined in Georgia. Drug-resistant TB is thought to be a problem, given that the Georgian NTP has observed high rates of treatment failure (4% of new sputum smear-positive TB cases and 10% of retreatment smear-positive TB cases), large numbers of chronic cases, and suboptimal treatment success rates (68% of new sputum smear-positive TB cases and 49% of retreatment smear-positive TB cases) for the 2004 cohort.[6] In the late 1990s, MDR-TB was reported among inmates at Georgian correctional facilities; the prevalence of MDR-TB was found to be 13% of all strains tested.[7] Data for the civilian population are limited. In a pilot study conducted at four sentinel sites in Georgia, 10.5% of newly diagnosed patients and about 50% of retreatment cases had MDR-TB.[8] There is therefore a great need for data from a representative sample to assess the degree of drug resistance. The purpose of the present study was to assess the

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prevalence of and risk factors for drug-resistant TB, including MDR-TB, in Georgia using a population-based approach.

METHODS

Study design

This cross-sectional population-based study was carried out by the Georgian NTP based on WHO recommendations to perform an Anti-tuberculosis Drug Resistance Survey (DRS).[9] The study took place from July 2005 to May 2006. All 75 NTP diagnostic centres in Georgia participated. Approval was obtained from the Emory University Institute Review Board and the Ethics Committee of the Georgian National Centre for Tuberculosis and Lung Disease for the purposes of the study.

Sample size and inclusion criteria

Sampling of all diagnostic centres was adopted for this study. All patients self-reporting to all 75 TB facilities throughout Georgia and registered as acid-fast bacilli (AFB) sputum smear-positive pulmonary TB (PTB) cases during the study period were included. Sputum smear-positive status was assigned according to the definitions of the WHO/International Union Against Tuberculosis and Lung Disease.[10] Previously treated sputum smear-positive PTB patients diagnosed during the survey period were enrolled in the study. Patients who were registered as sputum smear-negative were not eligible for inclusion in the study.

Study organisation and data collection

The NTP network in Georgia is comprised of 75 TB units, 30 microscopy laboratories, 37 sputum collection spots and one National Reference Laboratory (NRL) at the National Centre for Tuberculosis and Lung Diseases (NCTBLD). Three sputum samples were collected from all patients suspected of having PTB who visited the 75 NTP TB units during the study period. Patients were instructed on how to collect their sputum, and were supervised by a laboratory technician.[11] Sputum smear microscopy of the specimens collected at the 37 sputum collection spots was performed at the corresponding TB microscopy laboratories. One specimen from each AFB smear-positive patient was sent to the NRL in Tbilisi for AFB culture and drug susceptibility testing (DST). A courier system was established for delivering the sputum samples from the 30 TB laboratories to the NRL. Sputum was transported in standard containers (70 ml firm, wide-mouthed, water-proof screwcap containers) twice a week by three couriers moving through western Georgia, eastern Georgia and in Tbilisi. In the mountainous part of the country, the sputum samples were transported to the nearest regional centres by the laboratory technician.

At the microscopy laboratory, 1% cetylpyridinium chloride was added to the sputum specimen for preservation prior to transportation to the NRL.

Patient-related data were collected using a standardised form by the physician caring for the patient with suspected TB.[9] The patient's treatment status (new vs. previously treated) was based on vigorous patient interview and validated by review of the patient's medical record whenever possible. The current TB recording and reporting system in Georgia was established in 1998; patients diagnosed with TB before 1998 had to be assigned treatment status based on history, as no medical records were available for these patients. In this case, the accuracy of treatment history was confirmed by re-interview.

Definitions

A newly diagnosed TB case was defined as a patient who had never had treatment for TB or who had received anti-tuberculosis drugs for <1 month; retreatment cases were defined as patients who had a prior history of treatment with anti-tuberculosis drugs for $\geqslant 1$ month.[12] Retreatment cases included relapses, treatment after failure, treatment after default and chronic cases. MDR-TB was defined as resistance to at least both INH and RMP.[13] Monoresistance was defined as resistance to a single first-line anti-tuberculosis drug (INH, RMP, pyrazinamide [PZA], ethambutol [EMB] or streptomycin [SM]).[13] Polyresistance was defined as resistance to two or more of the first-line anti-tuberculosis drugs, but not both INH and RMP.

Laboratory methods

Smear status was assessed by the Ziehl-Neelsen staining method.[14] Sputum specimens received at the NRL were decontaminated and treated with 4% NaOH solution for 20 min and then neutralised with an HCl/phenol red solution. Specimens were centrifuged and the sediment was inoculated onto Löwenstein-Jensen medium which was incubated at 37°C using standard methodologies, as previously described.[9]

Mycobacterium tuberculosis was identified using the p-nitrobenzoic acid and thiophene carboxylic acid hydrazine resistance test.[9]

DST was performed using the absolute concentration method.[9] The following concentrations of first-line anti-tuberculosis drugs were used in media: SM 4 μg/ml, INH 0.2 μg/ml, RMP 40 μg/ml and EMB 2 μ/gml; DST for PZA was not performed. The Georgian NRL participates in annual panel testing and validation of results, and quality assurance was provided by the Antwerp WHO Supranational Reference Laboratory, which indicates 100% agreement.

Data entry and statistical analysis

Data were double-entered into a database using SDRTB3 software provided by the WHO,* and compared to ensure accuracy. Data were exported into SAS 9.1 (SAS Inc, Cary, NC, USA) to carry out univariable and multivariable analyses. Univariable analysis was performed to assess risk factors for MDR-TB, and

* http://www.who.int/tb/dots/dotsplus/drugresist_tb_software/en/

Mantel-Haenszel odds ratios (ORs), 95% confidence intervals (CIs) and corresponding *P* values were reported. To adjust for multiple covariates, we used a logistic regression method. Variables included in the final multivariate model were chosen a priori on the basis of the biological plausibility of their association with the outcome of interest, as well as on the basis of statistical and epidemiological criteria. A *P* value of ⩽0.05 was defined as statistically significant.

RESULTS

A total of 1693 AFB sputum smear-positive patients were enrolled in the study; 1449 (86%) had a positive culture for *M. tuberculosis*, 157 (10%) were culture-negative and 87 (4%) had contaminated cultures. Complete clinical and DST data were available for 1314 patients with culture-confirmed PTB, who were included in the final analysis. Demographic information for those excluded from the analysis (due to missing data or lack of a positive culture) did not differ from those included in the final analysis (data not shown).

Among the 1314 patients included in the final analysis, 240 (18%) were female and 1072 (82%) were male. The median age was 37 years, 100% were Caucasian, 113 (9%) were incarcerated and 1201 (92%) were from the civilian sector; 799 (60.8%) were newly diagnosed patients with TB and 515 (39.2%) were previously treated cases (Table 1). Resistance to one or more anti-tuberculosis drugs was found in *M. tuberculosis* isolates recovered from 733 (55.8%) of the 1314 patients (Table 2); 581 (44.2%) were fully susceptible to all drugs tested. The prevalence of resistance

Table 1 Characteristics of patients with culture-confirmed pulmonary tuberculosis in Georgia (*N* = 1314)

Patient characteristics	*n* (%)
Caucasian	1314 (100)
Sex	
Female	240 (18)
Male	1074 (82)
Age groups, years	
0–14	1 (0.1)
15–24	209 (15.9)
25–34	372 (28.3)
35–44	298 (22.7)
45–54	262 (19.9)
55–64	92 (7.0)
⩾65	80 (6.1)
Incarceration status	
Incarcerated	113 (9)
Civilian	1201 (91)
Region	
East Georgia	605 (46.0)
West Georgia	596 (45.4)
Prison	113 (8.6)
Treatment history	
Retreatment case	515 (39.2)
Newly diagnosed	799 (60.8)

Table 2 Prevalence of drug-resistant tuberculosis among patients in Georgia with pulmonary disease, July 2005–May 2006 (*N* = 1314)

Drug resistance pattern	New patients* (*n* = 799) *n* (%)	Previously treated patients† (*n* = 515) *n* (%)	OR (95%CI)	*P* value	Total (*N* = 1314) *n* (%)
Susceptible to all four drugs	406 (50.8)	175 (33.8)			581 (44.1)
Resistance to any drug	393 (49.2)	340 (66.1)	2.01 (1.59–2.53)	<0.0001	733 (55.9)
Any resistance to					
INH	187 (23.4)	243 (47.2)	2.9 (2.31–3.73)	<0.001	430 (32.7)
RMP	61 (7.6)	147 (28.5)	4.8 (3.49–6.71)	<0.001	208 (15.8)
EMB	33 (4.1)	56 (10.9)	2.8 (1.82–4.5)	<0.001	89 (6.7)
SM	330 (41.3)	299 (58.1)	1.97 (1.57–2.47)	<0.001	629 (47.9)
Monoresistance to					
INH	49 (6.2)	28 (5.5)			77 (5.9)
RMP	4 (0.5)	4 (0.8)			8 (0.6)
EMB	3 (0.4)	0			3 (0.2)
SM	193 (24.2)	91 (17.7)			284 (21.6)
Total	249 (31.2)	123 (24.0)			372 (28.3)
Multidrug resistance to					
INH + RMP	6 (0.8)	6 (1.2)			12 (0.9)
INH + RMP + EMB	0	2 (0.4)			2 (0.2)
INH + RMP + SM	27 (3.4)	83 (16.1)			110 (8.4)
INH + RMP + EMB + SM	21 (2.6)	50 (9.7)			69 (5.3)
Total	54 (6.8)	141 (27.4)	5.27 (3.75–7.41)	<0.001	195 (14.8)
Polyresistance to					
INH + EMB	1 (0.1)	1 (0.2)			2 (0.2)
INH + SM	78 (9.8)	70 (13.6)			148 (11.3)
INH + EMB + SM	5 (0.6)	3 (0.6)			8 (0.6)
RMP + EMB	0	0			0
RMP + SM	3 (0.4)	2 (0.4)			5 (0.4)
RMP + EMB + SM	0	0			0
EMB + SM	3 (0.4)	0			3 (0.2)

* Patients never diagnosed with TB or treated for <1 month with anti-tuberculosis drugs.
† Patients with previous exposure to TB treatment for ⩾1 month.
OR = odds ratio; CI = confidence interval; INH = isoniazid; RMP = rifampicin; EMB = ethambutol; SM = streptomycin.

Table 3 Univariable analysis of risk factors for MDR-TB in Georgia ($N = 1314$)

Variables	MDR-TB cases *n/N* (%)	OR	95%CI
Retreatment case*			
Yes	141/515 (27.4)	5.27	3.75–7.41
No	54/799 (6.8)		
Age groups, years			
0–14	0/1 (0)		
15–24	21/209 (10)		
25–34	57/372 (15)	1.62	0.93–2.92
35–44	52/298 (17)	1.85	0.98–3.42
45–54	41/262 (15)	1.66	0.92–3.07
55–64	13/92 (14)	1.47	0.64–3.26
⩾65	11/80 (14)	1.43	0.59–3.28
Sex			
Female	38/240 (16)	1.14	0.77–1.48
Male	157/1074 (14)		
Prison			
Yes	13/113 (12)		
No	182/1201 (15)	0.79	0.43–1.48
Region			
Prison	13/113 (12)		
West Georgia	89/596 (15)	0.74	0.37–1.40
East Georgia	93/605(15)	0.72	0.34–1.35

* Cases with previous exposure to TB treatment for ⩾1 month.
MDR-TB = multidrug-resistant tuberculosis; OR = odds ratio; CI = confidence interval.

Table 4 Univariable analysis of risk factors for MDR-TB among patients with tuberculosis in Georgia ($N = 1314$)

Variables	MDR-TB cases *n/N* (%)	OR	95%CI
A Newly diagnosed patients ($n = 799$)			
Age groups, years			
0–14	0/1 (0)		
15–24	13/167 (7.8)		
25–34	17/217 (7.8)	1.01	0.45–2.33
35–44	6/156 (3.8)	0.47	0.14–1.38
45–54	13/155 (8.4)	1.08	0.45–2.62
55–64	3/53 (5.7)	0.71	0.13–2.74
⩾65	2/50 (4.0)	0.49	0.05–2.31
Sex			
Female	19/176 (10.8)	2.15	1.19–3.87
Male	35/623 (5.5)		
Prison			
Yes	5/70 (7.1)	1.07	0.32–2.80
No	49/729 (6.7)		
Region			
Prison	5/70 (7.1)		
West Georgia	10/364 (5.2)	1.4	0.39–4.05
East Georgia	30/365 (8.2)	0.86	0.25–2.35
B Previously treated patients* ($n = 515$)			
Age groups, years			
0–14	0		
15–24	8/42 (19.0)		
25–34	40/155 (25.8)	1.48	0.60–4.00
35–44	46/142 (32.4)	2.03	0.84–5.49
45–54	28/107 (26.2)	1.50	0.59–4.21
55–64	10/39 (25.6)	1.46	0.45–4.88
⩾65	9/30 (30)	1.81	0.53–6.33
Sex			
Female	19/64 (29.7)	1.14	0.60–2.08
Male	122/451 (27.1)		
Prison			
Yes	8/43 (18.6)	0.58	0.23–1.32
No	133/472 (28.2)		
Region			
Prison	8/43 (18.6)		
West Georgia	70/232 (30.2)	0.53	0.20–1.24
East Georgia	63/240 (26.3)	0.64	0.24–1.51

* Previous treatment with anti-tuberculosis medications for ⩾1 month.
MDR-TB = multidrug-resistant tuberculosis; OR = odds ratio; CI = confidence interval.

was as follows: 32.7% were resistant to INH, 15.8% to RMP, 6.8% to EMB and 47.9% to SM (Table 2).

Overall, isolates recovered from 195/1314 (14.8%) patients had MDR-TB; those with a prior history of TB treatment (retreatment cases) were significantly more likely to have MDR-TB than newly diagnosed patients (141/515 [27.4%] vs. 54/799 [6.8%], OR 5.27, 95%CI 3.75–7.41) (Tables 2 and 3). Risk factors for MDR-TB among the entire study population are shown in Table 3; risk factors for MDR-TB among newly diagnosed cases are shown in Table 4A and for retreatment cases in Table 4B. In multivariate logistic regression analysis, previous history of anti-tuberculosis treatment (retreatment cases) (adjusted OR [aOR] 5.47, 95%CI 3.87–7.74) and female sex (aOR 1.58, 95%CI 1.02–2.32) were independent risk factors for having MDR-TB. Among those with newly diagnosed TB, MDR-TB was more likely to occur in female than male patients (11% [19/176] vs. 5.5% [35/623], OR 2.15, 95%CI 1.19–3.87, $P < 0.01$).

DISCUSSION

A high prevalence of drug-resistant TB, including MDR-TB, was found among patients in Georgia in this population-based study. The prevalence of MDR-TB was high: 6.8% in newly diagnosed cases, 27.4% in retreatment cases and 14.8% overall. Risk factors for MDR-TB in multivariate analysis include previous TB treatment (OR 5.47) and female sex (OR 1.60). Among those patients with newly diagnosed TB (i.e., no prior TB treatment), risk factors for MDR-TB included female sex (OR 2.15).

Previous TB treatment has been noted to be a major risk factor for the development of drug resistance.[15–17] The WHO/International Union Against Tuberculosis and Lung Disease Global Project on Anti-tuberculosis Drug Resistance Surveillance reported that retreatment status was significantly associated with both MDR-TB and any drug resistance.[16] Previous treatment was also demonstrated as the strongest determinant of MDR-TB in Europe in a systematic review based on studies from 12 European countries.[18] The likelihood of having MDR-TB increases linearly with increasing total duration of previous TB treatment.[19] The current WHO recommendations for treatment of patients who relapse or fail initial treatment (Category II) includes the administration of five first-line drugs (adding SM to the first-line regimen), and may lead to further amplification of resistance.[15] New guidelines and the Global Plan to Stop TB emphasise the need to be able to perform DST and provide treatment for MDR-TB.[20] In this regard, since December 2007 second-line

treatment has been universally accessible throughout the country. In addition, it is essential to prevent the development of new drug-resistant cases through the implementation and expansion of the DOTS strategy.[20]

In most reports, men have been noted to more commonly have drug-susceptible and MDR-TB, but in some reports females seem to be at higher risk for MDR-TB.[21] Three studies from former Soviet Union countries reported that men were at lower risk for MDR-TB than women.[18] The finding that newly diagnosed women with TB had an increased risk of MDR-TB in Georgia appears to be in line with findings from other studies carried out in the region, and confirms similar findings from a pilot study undertaken in selected Georgian cities.[8] Reasons for the increased risk of MDR-TB among women observed in our population-based study are not entirely clear and require further investigation. One hypothesis is cultural reasons: as treatment for MDR-TB has not previously been available in Georgia and there have been no in-patient services in Georgia for patients with MDR-TB, such patients are likely to stay in their houses and become progressively more ill. As the prevalence of HIV co-infection among TB patients in Georgia is low,[4] it is possible that such patients may live for months or years after diagnosis. It is likely that the care provided to these MDR-TB patients was provided by women (e.g., wives, mothers or sisters), thus placing the women at increased risk for exposure to and subsequent development of MDR-TB. Further investigation of household contacts of MDR-TB cases is needed, including case-control studies, to test our hypothesis and evaluate the reasons for these findings.

Our study had some limitations. A small percentage (14%) of cultures from AFB smear-positive sputum cases were culture-negative or contaminated and did not yield *M. tuberculosis*. Negative cultures from smear-positive patients may be due in part to delays in transportation of specimens to the NRL in Tbilisi where cultures were performed. However, demographic data did not differ between AFB sputum smear-positive patients who were culture-positive and those who did not have a positive culture. Furthermore, sputum smear-negative patients were not enrolled in the survey. Another limitation was that treatment status (i.e., newly diagnosed case vs. previously treated case) was assessed for some patients by history when medical records indicating treatment status were not available or did not exist. Finally, HIV status was not examined in the study population. However, previous studies carried out in Georgia have indicated a low prevalence of HIV co-infection among patients with TB (e.g., 1% in a recent publication).[4]

CONCLUSION

MDR-TB has emerged as a major public health problem in Georgia. The prevalence of MDR-TB was found to be high in this population-based study (approximately 15% overall, 7% among newly diagnosed patients and 27% among previously treated patients). Previous treatment and female sex were associated with an increased risk of MDR-TB. Aggressive TB control efforts urgently need to be implemented to prevent the development of new MDR-TB cases and to treat existing MDR-TB patients. The Georgian NTP succeeded in reaching WHO targets for TB case finding, and in 2006 the new smear-positive case detection rate was 109%.

The findings of this study have had several favourable outcomes: 1) approval from the WHO Green Light Committee for procurement of second-line drugs; 2) two DOTS-Plus pilot programmes, one in the civilian sector with Médecins sans Frontières and one in the penitentiary sector with the International Committee of the Red Cross, have been implemented to begin the treatment of persons with MDR-TB in Georgia; and 3) a proposal made by Georgia to the Global Fund Against AIDS, TB and Malaria focusing on MDR-TB treatment and control was recently approved. A case-control study to investigate the reasons for the increased risk of MDR-TB among newly diagnosed females was funded and has been initiated.

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RÉSUMÉ

CONTEXTE : La tuberculose à germes multirésistants (TB-MDR), définie comme une résistance à au moins l'isoniazide et la rifampicine, s'est avérée un grave problème mondial de santé publique, particulièrement dans les anciennes républiques soviétiques. L'étendue de ce problème n'a été qu'incomplètement déterminée en Géorgie.
OBJECTIF : Déterminer la prévalence et les facteurs de risque de la TB-MDR en Géorgie.
SCHÉMA : Etude basée sur la population menée entre juillet 2005 et mai 2006.
RÉSULTATS : Sur 1314 patients atteints de tuberculose (TB) pulmonaire à bacilloscopie et culture positive, 799 (60,8%) étaient des cas nouvellement diagnostiqués et 515 (39,2%) des cas traités antérieurement. Au total, une résistance à l'égard d'au moins un médicament antituberculeux a concerné 733 patients (56%) et une TB-MDR 195 patients (15%). Les patients ayant été traités antérieurement pour TB ont été significativement plus susceptibles de souffrir d'une TB-MDR que les patients récemment diagnostiqués et chez qui aucun traitement n'avait été administré antérieurement (141/515 [27,4%] vs. 54/794 [6,8%] ; OR 5,27 ; IC95% 3,75–7,41). Dans une analyse multivariée, un traitement antérieur pour TB (aOR 5,47 ; IC95% 3,87–7,74) ainsi que le sexe féminin (aOR 1,58 ; IC95% 1,02–2,32) se sont avérés des facteurs indépendants de risque d'existence d'une TB-MDR.
CONCLUSIONS : En Géorgie, la TB à germes résistants, y compris la TB-MDR, s'avère un problème majeur de santé publique. Il est nécessaire de renforcer la lutte antituberculeuse de manière urgente pour prévenir l'apparition de nouveaux cas de TB-MDR et pour traiter les patients actuellement atteints de TB-MDR.

RESUMEN

MARCO DE REFERENCIA : La tuberculosis multidrogorresistente (TB-MDR, definida como resistencia por lo menos a isoniazida y rifampicina) se ha convertido en un problema grave de salud pública, en particular en las antiguas repúblicas soviéticas. La magnitud del problema no se había definido plenamente en Georgia.
OBJETIVO : Determinar la prevalencia y los factores de riesgo de TB-MDR en Georgia.
MÉTODOS : Se llevó a cabo un estudio poblacional entre julio de 2005 y mayo de 2006.
RESULTADOS : De 1314 pacientes con tuberculosis (TB) pulmonar y baciloscopia y cultivo positivos del esputo, 799 (60,8%) fueron casos nuevos y 515 (39,2%) habían recibido tratamiento previamente. Globalmente, 733 (56%) pacientes presentaron resistencia como mínimo a un medicamento antituberculoso y 195 (15%) presentaron TB-MDR. Los pacientes con antecedente de tratamiento antituberculoso tuvieron una probabilidad significativamente mayor de TB-MDR que los pacientes que nunca habían recibido tratamiento (141/515 [27,4%] contra 54/794 [6,8%] ; OR 5,27 ; IC95% 3,75–7,41). El análisis multifactorial reveló como factores independientes de riesgo de TB-MDR el tratamiento antituberculoso previo (OR ajustado 5,47 ; IC95% 3,87–7,74) y el sexo femenino (OR ajustado 1,58 ; IC95% 1,02–2,32).
CONCLUSIONES : La TB farmacorresistente, incluida la TB-MDR, se ha convertido en un problema grave de salud pública en Georgia. Es urgente introducir nuevas campañas de control de la TB con el fin de prevenir la aparición de nuevos casos de TB-MDR y de tratar los pacientes que la padecen actualmente.