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Impact of social risk factors on treatment outcome in patients with culture positive pulmonary tuberculosis (CPPTB)

Wpływ czynników społecznych na wyniki leczenia chorych
na gruźlicę płuc potwierdzoną bakteriologicznie

Abstract

Introduction: The aim of the study was to evaluate the impact of social risk factors on treatment outcome among culture-positive patients treated for active pulmonary tuberculosis in three separate districts — Warsaw, Gdansk and Siedlce — in years 1995 and 2000.

Material and methods: We retrospectively reviewed medical records of patients who were notified in 1995 and 2000 and were treated in hospitals and dispensaries. Alcohol abuse and homelessness were recognized as risk factors associated with tuberculosis and nonadherence to treatment. Treatment outcome was evaluated using treatment indicators defined by the World Health Organisation: cured, treatment completed, treatment defaulted, treatment failure and "other" results of treatment.

Results: Seven hundred and eight patients with culture positive pulmonary tuberculosis were included (373 in 1995 and 335 in 2000). There were 85 patients with risk factors in 1995 and 101 patients in 2000. 80 of participants in 1995 and 69 in 2000 abused alcohol, 5 and 32 were classified as homeless, respectively. Among alcohol abusers treatment success rates according to the WHO definition (either bacteriologic cured or treatment completed) were 45.1% in 1995 and 53.6% in 2000. Among patients not abusing alcohol treatment success rates were 63.8% and 54.1%, respectively. The differences were statistically significant (p = 0.005 in 1995 and p = 0.0186 in 2000). In 1995 forty percent of homeless patients had succeeded treatment, while the rate of treatment success among non-homeless was 60%. Because of small number included in homeless group the difference was not statistically significant (p = 0.6532). In 2000 treatment success rate among homeless participants was 25% and among non-homeless — 57.1%, which was highly statistically significant (p = 0.001).

Conclusion: Alcohol abuse and homelessness were associated with bad treatment outcome among patients with pulmonary tuberculosis. Interventions to improve treatment adherence in patients considered to be at risk for default are necessary.

Key words: culture-positive pulmonary tuberculosis, social factors, alcohol abuse, homelessness, treatment outcome

Introduction

Efficient treatment is the most important element of antituberculosis strategy. According to World Health Organisation (WHO) recommendations, the rate of successful treatment should not be lower than 85% [1, 2]. Into that category fall the patients who are sputum smear-negative at the end of the treatment, and the patients who have completed the treatment but sputum cultures have not been performed and the supervising physician decides they do not require further follow up [2,

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3]. Modern antituberculosis therapy allows for successful treatment outcome in 95% of patients, and the failure rate is reduced to 5% [4]. Lack of compliance is a very well known problem in patients with chronic disease. Despite shortening the time of antituberculosis therapy to 6 months, patients' poor adherence to treatment remains an important issue affecting its results. Poor compliance leads to prolonged sputum-positivity, relapses, and development of drug resistance, and increases treatment costs [5, 6]. From a public health point of view, treatment default is more dangerous than disease-related death. Uncompleted therapy protects a patient from death, but at the same time it contributes to increasing number of infectious individuals. Patients who take drugs irregularly remain sputum-positive for a longer time and are at higher risk of drug-resistance development; and that requires prolonged use of second-line antituberculosis treatment [5, 7]. According to the literature, alcohol abuse and homelessness, the two recognised tuberculosis risk factors, are also predictors of poorer compliance [3, 8–12].

The aim of the presented study was to assess the impact of risk factors related to social background, such as alcohol abuse and homelessness, on treatment outcome in patients with culture-positive pulmonary tuberculosis in the years 1995 and 2000 in 3 provinces.

Material and methods

The study was conducted in the area of 3 provinces (according to 1995 administrative status), which varied in terms of tuberculosis incidence. The provinces of Warsaw, Gdańsk, and Siedlce were chosen. Data from the years 1995 and 2000 were collected.

We investigated the number of patients with positive sputum smear and sputum culture, and the number of performed drug susceptibility tests.

The following data were extracted from the patients' medical notes: sex, age, education, and the presence of risk factors for tuberculosis associated with social background (which at the same time are risk factors for poor compliance). Alcohol abuse and homelessness were included into those factors [13].

The inclusion to the group of alcohol abusers was based either on the remark in the notes/discharge letter about alcohol abuse, made by a doctor or a nurse, or on information about the presence of a chronic alcohol abuse-related condition. In the description of our study we refer to such patients as 'alcoholics'.

The other group consisted of patients with homelessness documented in their notes.

The influence of alcohol abuse and homelessness on the sputum conversion rate and treatment outcome was analysed. The time to sputum conversion was defined as the period between antituberculosis treatment commencement and the date of the first negative sputum culture. The rate of achieved negativities was assessed. Because there was no fixed scheme for repeated bacteriologic examinations, it was not possible to establish how quickly the real sputum negativity was achieved.

The compatibility of the choice of therapy scheme and the treatment duration with WHO recommendations [1, 2] was verified.

The following treatment regimens were considered as appropriate:
1. standardized scheme:
   RMP + INH + PZA + EMB/SM (rifampicin + isoniazid + pyrazinamide + ethambutol) for 2 months (an initial phase) and RMP + INH for 4 months (a continuation phase);
2. acceptable scheme:
   RMP + INH + EMB/SM for 3 months (an initial phase) and RMP+ INH for 6 months (a continuation phase).

Patients receiving any other than the above-mentioned regimens were included into the group of 'other scheme' (scheme 3).

The prolongation or shortening of the treatment duration by ± 10% was still considered as appropriate. Otherwise, the therapy was classified as either 'too long' or 'too short'.

A medication was considered as a part of a scheme if it was added within 14 days of the therapy commencement.

A patient was considered to be treated according to a scheme if he/she was taking scheme specific medications for at least one month (time between the first and last dose).

If the treatment was interrupted for less than 2 months and then reintroduced in the same scheme, the therapy was considered as one course and periods of actual treatment were summed up [1, 2].

The treatment outcome was categorized according to WHO recommendations [2]:
— 'cured' — a patient who completed the treatment and the sputum culture was negative at the end of the therapy;
— 'treatment completed' — a patient who completed treatment, but sputum cultures had not been performed and a supervising physician decided that further follow up was not required;

— 'default' — a patient whose treatment lasted for at least one month but was later interrupted for at least 2 months;

— 'treatment failure' — a patient whose sputum culture is positive at 5 months of treatment;

— 'died' — a patient who died for any reason during the course of treatment.

In addition, the category 'other' was used for patients not meeting criteria of any of the above-mentioned categories. It includes: a patient who was not treated (at all or on medication for less than one month), and a patient considered as cured by a physician but the treatment was 'too short'.

Treatment success was defined as the sum of patients 'cured' and those who 'completed treatment'.

Statistical analysis

Differences between paired variables were analysed using non-parametric Wilcoxon test. This test compares the rank sum of the number of negative and positive differences. The chi square test was applied for investigating the differences in numbers of patients having a given feature (value observed vs. expected). If the numbers of columns or rows exceeded 2, contingency tables were used. In cases of 2 x 2 table chi square test, v square test, or chi square rest with Yates' and Fisher's modifications were applied [14]. P < 0.05 was considered statistically significant.

Results

A total of 708 patients, 373 treated in 1995 and 335 treated in 2000, were included in the study. It was found that 42.1% of patients form the 1995 group and 35.5% of patients from the 2000 group were sputum smear-positive.

Initial drug susceptibility test was done in 262 (90%) patients in 1995 and in 213 (91.4%) patients in 2000. Resistance to at least one drug was confirmed in 29 (10%) patients in 1995 and in 20 (8.6%) patients in 2000. Resistance to RMP and INH was confirmed in 1.2% of cases in 1995 and in 2.6 % of cases in 2000. Resistance to INH was present in 5.2% and 4.3% of patients, to SM in 3.4% and 1.7%, in the years 1995 and 2000, respectively.

The 1995 group consisted of 134 (35.9%) women and 239 (64.1%) men. The 2000 group consisted of 106 (31.6%) women and 229 (68.4%) men. The range of patients' age was 16–92 years (mean 49 years) in 1995, and 18–89 years (mean 51 years) in 2000.

Patients with higher education accounted for 1.9% of the 1995 group and 3.0% of the 2000 group; secondary education for 17.7% of the 1995 group and 23.3% of the 2000 group; and elementary education for 55% and 54.3%, respectively. In 25.5% of patients in 1995 and 19.4% in 2000 information about education level was not available. There were no significant differences in the percentage distribution of tuberculosis incidence depending on education level between the two groups (p < 0.20).

The data on the education status of the Polish population were published by the Central Statistical Office (GUS [Główny Urząd Statystyczny]), but only for the years 1995 and 2002 [15]. No such data were available for the year 2000, so we assumed that data from 2002 should be also representative for the year 2000. According to GUS, in 1995 in Poland 6.8% of people had higher education, 50.5% had secondary education, and 38.8% had elementary education. In 2002 the structure was as follows: 9.9% with higher, 51.5% with secondary, and 29.8% with elementary education [15]. Our analysis showed a statistically significant dependence of tuberculosis incidence on education level (p < 0.001). In both groups, 1995 and 2000, incidence was higher among patients with a lower level of education.

The tuberculosis risk factors associated with social background were present in 85 (22.7%) patients in the 1995 group and in 101 (30.2%) patients in the 2000 group. We failed to find statistically significant differences in the influence of alcohol abuse on tuberculosis incidence between the two groups: 21.4% of alcoholics developed tuberculosis in 1995 and 20.6% in 2000 (p < 0.3675). In 1995 1.3% of patients were homeless and 9.6 % of patients in 2000 (Table 1). The percentage of homeless patients was significantly higher in 2000 than in 1995 (p < 0.0001).

Treatment outcome

Sputum culture conversion in alcoholics and the homeless

In 1995, among 5 homeless patients, sputum negativity was achieved in all but 1 patient (20%). The only treatment failure was associated with the patient's lack of compliance and interruption of the treatment. In 2000, in 8 (25%) out of 32 homeless patients the sputum conversion was not achieved. Among those 8 cases: 4 were not treated at all, 2 were treatment failures, and 2 died during the therapy. The percentage of patients in whom sputum culture conversion was not achieved was 25.3% for patients with permanent address of residency and 22.1% for those who were homeless (Table 2).

Table 1. Frequency of social risk factors associated with tuberculosis

Risk factors	Numer of patients (%)	Number of patients (%)	p-value
Alcohol abuse	80 (21.4)	69 (20.6)	p < 0.3675
Homelessness	5 (1.3)	32 (9.6)	p < 0.0001
Total	85 (22.7)	101 (30.2)	

Table 2. Sputum culture conversion among homeless and alcoholics

Sputum culture conversion	1995			2000		
	Yes Number (%)	No Number (%)	p-value	Yes Number (%)	No Number (%)	p-value
Homeless	4 (80)	1 (20)	p = 0.8035	24 (75.0)	8 (25.0)	p = 0.7098
None homeless	275 (74.7)	93 (25.3)		236 (77.9)	67 (22.1)	
Alcoholics	55 (68.8)	25 (31.3)	p = 0.1597	55 (79.7)	14 (20.3)	p = 0.6389
None alcoholics	224 (76.5)	69 (23.6)		205 (77.1)	61 (22.9)	

In 1995, the sputum culture conversion was not achieved in 25 (31.3%) from 80 alcoholics. Among them: 2 were not treated at all, 15 interrupted the treatment, 3 were treatment failures, and 5 died during the therapy. In 2000, in 14 (20.3%) out of 69 alcoholics sputum culture negativity was not achieved. Among them: 4 were not treated, 4 interrupted the treatment, 5 were treatment failures, and 1 died. The percentage of patients with lack of sputum culture conversion among non-alcoholics was 23.6 and 22.9% in 1995 and 2000, respectively. In both the 1995 group and the 2000 group, no significant influence of any of the studied factors on the percentage of achieved sputum culture conversions was found (Table 2).

Among 80 alcoholics in 1995 — 45,1% were cured or completed the treatment and 35% were classified as defaults. Six (7.5%) died, in 3 (3.8%) the treatment failed, and a further 7 (8.8%) patients were classified as 'other' category (6 not treated — including 4 treated for less than 1 month and 1 treated for not long enough).

In non-alcoholics the treatment success ratio was 63.8%, default ratio was 10.2%, and 3.1% of patients died. There were 6 (2.1%) treatment failures and 61 cases (20.8%) allocated to the treatment outcome category 'other': 43 not treated (including 2 treated for less than 1 month) and 18 with 'too short' treatment.

Among alcoholics treated in 2000 the treatment success ratio was 53.6%, ratio of defaults was 21.7%, ratios of treatment failures and deaths were 5.8% and 7.3%, respectively, and 11.6% were al-

located to the treatment outcome group 'other' (1 patient not treated and 2 treated for 'too short' a time).

In non-alcoholics treated in 2000 the treatment success ratio was 54.1%, default ratio 1.9%, treatment failure ratio 1.9%, 2.3% of patients died, and 24.8% of patients were allocated to the treatment outcome group 'other' (Table 3).

In both groups, 1995 and 2000, there was a statistically significant relationship between successful treatment outcome and alcohol abuse (p = 0.005; p = 0.0186). The percentage of the subjects defined as treatment success in the group of alkoholics was lower in comparison to non-alkoholics.

There was a correlation between defaults ratio and alcoholism (p < 0.0001) in 1995 patients. There were significantly more alcoholics than non-alcoholics in the default group. A similar correlation was not found in the 2000 patients.

In both groups, there was a statistically significant relationship between 'other treatment outcome' ratio and alcoholism (p = 0.0132 and p = 0.0184, respectively). The percentage share of 'other treatment outcome' was smaller in alcoholics than in non-alcoholics.

The treatment success ratio for 5 homeless patients from the 1995 group was 40% (2 patients), number of defaults was 2, and 1 patient was treated for less than 1 month (category 'other').

Among the remaining patients, 221 (60%) were allocated to the treatment success group, 56 (15.2%) to the default group, 15 (4.1%) died, and in 9 (2.5%) the treatment failed. The category

Table 3. Treatment outcome among alcoholics and not alcoholics

Results	1995		
	Alcoholics Number of patients (%)	**None alcoholics Number of patients (%)**	**p-value**
Cured	**29 (36.3)**	**153 (52.2)**	0.0050
Treatment completed	**7 (8.8)**	**34 (11.6)**	
Defaulted	28 (35.0)	30 (10.2)	0.0000
Treatment failure	3 (3.8)	6 (2.1)	0.6395
Death	6 (7.5)	9 (3.1)	0.1427
Other	7* (8.8)	61** (20.8)	0.0132
Total	80 (100.0)	293 (100.0)	
Results	2000		
	Alcoholics Number of patients (%)	**None alcoholics Number of patients (%)**	**p-value**
Cured	**25 (36.2)**	**112 (42.1)**	0.0186
Treatment completed	**12 (17.4)**	**32 (12.0)**	
Defaulted	15 (21.7)	45 (16.9)	0.3520
Treatment failure	4 (5.8)	5 (1.9)	0.1690
Death	5 (7.3)	6 (2.3)	0.0903
Other	8* (11.6)	66** (24.8)	0.0184
Total	69 (100.0)	266 (100.0)	

1995
*2 untreated patients + 4 patients treated shorther then one month + 1 patients treated too short
**41 untreated patients + 2 patients treated shorther then one month + 18 patients treated too short
2000
*4 untreated patients + 2 patients treated shorther then one month + 2 patients treated too short
**41 untreated patients + 3 patients treated shorther then one month + 22 patients treated too short

'other' contained 67 (18.2%) patients: 48 not treated (including 5 treated for less than 1 month) and 19 with treatment 'too short' (Table 4). We failed to show any significant relationship between homelessness and treatment outcome, due to the small sample number.

The 2000 group contained 32 homeless patients. Among them 4 (12.5%) were cured, another 4 completed the treatment, 2 (6.3%) died, 15 (46.9%) interrupted the treatment, and in 2 (6.3) the treatment failed. Five (15.6%) patients were allocated to the outcome category 'other': 4 not treated and 1 treated for not long enough.

Among the remaining patients, 173 (57.1%) were allocated to treatment success group, 45 (14.9%) to the default group, 9 (3.0%) died, and in 7 (2.3%) the treatment failed. The category 'other' contained 69 (22.8%) patients: 46 not treated (including 5 treated for less than 1 month) and 23 with 'too short' treatment (Table 4).

There was a statistically significant relationship between treatment success ratio and homelessness (p = 0.001), and between defaults ratio and homelessness (p < 0.0001). The percentage of the subjects with the successful treatment was lower in the group of homeless patients in comparison with non-homeless. The homeless significantly more often interrupted the treatment.

Discussion

Many studies indicate that low socio-economic status increases the risk of tuberculosis. Poor education is related to low income, which subsequently determines living conditions. More than half of our group, in both years, were patients with primary education. Only 1.9% of patients from the 1995 group and 3.0% from the year 2000 group had higher education. The structure of education presented in our group was clearly different than that reported by the Central Statistical Office for the general population. According to above-mentioned data, 6.8% of the Polish nation had higher education, 50.5% had secondary education, and 38.8% had only elementary education in 1995. In 2002 the structure presented as follows: 9.9% had hi-

Table 4. Treatment outcome among homeless and not homeless patients

Results	1995		
	Homeless Number of patients (%)	None homeless Number of patients (%)	p-value
Cured	**2 (40)**	**180 (48.9)**	0.6532
Treatement completed	**0**	**41 (11.1)**	
Defaulted	2 (40)	56 (15.2)	0.3693
Treatment failure	0	9 (2.5)	0.2657
Death	0	15 (4.1)	0.4933
Other	1* (20)	67** (18.2)	0.6313
Total	5 (100.0)	368 (100.0)	
Results	**2000**		
	Homeless Number of patients (%)	None homeless Number of patients (%)	p-value
Cured	**4 (12.5)**	**133 (43.9)**	0.0010
Treatement completed	**4 (12.5)**	**40 (13.2)**	
Defaulted	15 (46.9)	45 (14.9)	0.0000
Treatment failure	2 (6.3)	7 (2.3)	0.4617
Death	2 (6.3)	9 (3.0)	0.6394
Other	5* (15.6)	69** (22.8)	0.4822
Total	32 (100.0)	303 (100.0)	

1995
*1 patients treated shorther then one month
**43 untreated patients + 5 patients treated shorther then one month + 19 patients treated too short
2000
*4 untreated patients + 1 patient treated too short
**41 untreated patients + 5 patients treated shorther then one month + 23 patients treated too short

gher, 51.5% had secondary, and 29.8% had elementary education [15]. Earlier analyses of the Central Tuberculosis Registry also indicated that tuberculosis patients were characterised by lower education in comparison to the general population [16–18].

It is known that increased intake of alcohol is a risk factor for tuberculosis. Alcohol abuse increases susceptibility to airways infections. In the 1995 group as well as in the 2000 group alcoholics accounted for around 1/5 of all patients (Table 1). The alcohol abuse ratio among Polish tuberculosis patients is similar to that found in the United States of America, and lower than that found in Russia [8, 19].

Conversion of sputum culture is the best measure of treatment effectiveness and proof of patients' good compliance. In both of our groups the percentage of alcoholics and non-alcoholics in whom sputum negativity was achieved was similar. It was probably a result of the intensive phase of the treatment being administered during hospital stay and directly observed. A study by Miller and Masztalerz indicates that in the group of pa-

tients in whom sputum culture conversion was not achieved, the percentage of alcoholics was 30%, and it was 3 times higher in comparison to the group of patients with good treatment outcome [17]. Korzeniewska-Koseła et al. showed that almost half of patients with chronically positive sputum cultures, despite therapy duration longer than 12 months, were alcoholics [20].

The majority of studies devoted to tuberculosis treatment showed that treatment outcome in alcohol abusers is worse than in the general population. It is mainly related to poor patient compliance and treatment interruption, and to a lesser degree to bad tolerance of the treatment [9, 10, 12, 16, 21, 22]. In 1995, according to WHO definitions, less than half of alcoholics were cured or completed the treatment. One out of three such patients interrupted the therapy. Among non-alcoholics good treatment outcome was obtained in almost 64% of patients; one patient out of ten interrupted the therapy (Table 3). Similar results were presented by Burman et al.: the ratio of irregular intake of medication and treatment interruptions was 4

times higher for alcoholics than for non-alcoholics [10]. Jakubowiak et al. analysed treatment outcome in 6 regions of Russia and found that 24% of tuberculosis patients were alcohol abusers, and the risk of treatment interruption in this subgroup was 7 times higher than in remaining patients [8, 19]. In our both groups, treated in 1995 and in 2000, the percentage of good treatment outcomes was lower in alcoholics than in non-alcoholics. The default ratios were similar (Table 3).

Interestingly, there were discrepancies between numbers of patients in whom negativity of sputum cultures was achieved during the treatment and patients with negative sputum cultures at the end of the treatment. The main reason for that was the high proportion of patients who interrupted the treatment after initial sputum culture conversion was obtained. Negative sputum culture achieved in the initial phase of treatment, when the patients usually stay in hospital and take medication under close supervision, is not equivalent to being cured. Only properly conducted therapy, without any interruptions, guarantees treatment success and minimalizes the chances for disease relapse [23].

In both groups, treated in 1995 and in 2000, there were patients with treatment outcome classified as 'other'. They did not tend to be insubordinate or interrupt the treatment, and most probably they would have completed therapy with good outcome if not for their physicians' incomprehensible decision about shortening the treatment. In these cases the negativity of sputum cultures was achieved, and at that point they were considered cured and the treatment was stopped, although the overall duration of therapy was too short in comparison to recommendations. There were 18 such patients in 1995 and 20 in 2000, in the non-alcoholics subgroup. Among alcoholics 1 patient in 1995 and 12 patients in 2000 were treated for not long enough. Physicians tend to prolong treatment in alcoholics, trying to compensate for the poorer compliance in that group. Unfortunately, the directly observed treatment strategy was not used in Poland at that time.

The ratio of treatment failures and deaths in alcoholics in 1995 was twice as high, and in 2000 was three times higher than in non-alcoholics (Table 3). All deaths in alcoholics were due to tuberculosis. In non-alcoholics around 33% of deaths were considered to be related to tuberculosis. Tuberculosis related deaths usually occurred in the first days of treatment, which indicates that those patients were admitted to hospitals in serious condition and the treatment was started too late.

There are no precise data on homelessness burden in Poland. The only reliable sources of information on that subject are registries of social services showing the number of homeless people seeking help. Reception centres could accommodate 215 homeless people in 1995, and 3271 in 2000. One hundred and seventy homeless people stayed in shelters in 1995, and the number increased to 3121 in 2000. These data clearly show the dynamic and direction of the phenomenon [15]. A significant increase in the number of the homeless among tuberculosis patients was also seen in our groups: in 1995 they accounted for 1.3% of all patients, and in 2000 for 9.6% (Table 3). This ratio was higher than that reported by other authors [24–26]. Romaszko et al. researched tuberculosis incidence among the homeless in the area of the Warmian-Masurian province. They found that 1.95% of the studied people were sputum-positive [24]. Similar ratio of tuberculosis prevalence in the homeless was revealed in Poznań [26].

The percentage of homeless patients with persistent positive sputum cultures was similar in 1995 and 2000, and it was around 20% (Table 2). There was no relationship between homelessness and number of patients with persistent positive sputum cultures in a study by Liu et al., either [27]. This was probably because the initial phase of treatment was conducted in an in-patient setting allowing for close supervision.

Two out of five (40%) homeless patients finished the treatment with good results in 1995, two interrupted the treatment, and 1 took medication for less than 1 month, which, according to the WHO means no real treatment. In 2000, eight out of thirty-five (25%) homeless patients had good treatment outcome. One out of each six homeless patients was not treated, and almost half of them interrupted the therapy. In the non-homeless group the ratio of patients cured or having completed the treatment was statistically significantly higher: 60% and 57%, respectively (Table 4).

In the group studied by Brudney et al. the homeless accounted for 68%. It was shown that the homeless, together with alcoholics and drug-addicts, interrupt the treatment most frequently, especially when symptoms of the disease diminish [9]. Homelessness and alcoholism, beside lack of employment, also appeared to be risk factors for treatment interruption in a study by Jakubowiak et al.[8]. It may be hypothesized that among our homeless patients, in both years, there were also alcoholics and people with mental disturbances, but such data were not found in medical records.

McAdam et al. reported on 55% of homeless patients completing the treatment within a year, the remaining either taking medications not systematically or interrupting the therapy [28]. In the Canadian study 20% of homeless patients died within a year of tuberculosis diagnosis [29].

There were no treatment failures among the homeless in 1995, but it should be remembered that the group was small. In 2000, however, treatment failures were 3 times more frequent, and deaths twice as frequent in the subgroup of homeless patients (Table 4). Also, other Polish authors reported on homelessness as a prognostic factor of poor treatment outcome [17, 18, 25].

The literature shows that among homeless patients, resistance to first-line antituberculosis drugs is more frequent [9, 30, 31]. The factor of drug resistance was not significant in our group. Resistance to RMP and INH was present only in 1 homeless patient from the 2000 group. Strains cultured from all remaining patients were susceptible to essential antituberculosis drugs. Khan et al. found drug resistance to single drugs in 2 homeless patients [29].

Many authors emphasize that staying in a shelter for the homeless is an independent risk factor for tuberculosis, and that the exogenous infections may play a role in disease transmission among the homeless [28, 30, 32]. Moss et al., investigating ways of *M. tuberculosis* infection transmission in the homeless, using the restriction fragment length polymorphism (RFLP) analysis (DNA fingerprints), showed that in 60% of cases tuberculosis was a result of recent infection [33]. It means that an increase in tuberculosis prevalence in the homeless, also in Poland, may be expected, especially if an effective treatment policy is lacking. Our own and other authors' observations prove that no effort is put into tracing the contacts of homeless tuberculosis patients in our country. Ways of disease spread caused by these patients remain unknown [24, 25].

The experience of many countries shows that treating patients from risk groups is difficult and often ends with failure. These patients are characterised by poor compliance and often interrupt the therapy, which results in disease relapse. There were alcoholics and homeless patients included in our group in whom no attempt for treatment had been made or the therapy lasted for less than a month. This situation is very bad from an epidemical point of view because it promotes the existence of permanent sources of infection. At the same time, medical records proving that an attempt was made to communicate with these people and to persuade them to start the treatment were found only in very few cases.

The presented data are in agreement with other authors' findings, i.e. that taking care of patients abusing alcohol or homeless patients is difficult and the results are often unsatisfactory. Low awareness of health-related issues in these social groups is one of the main causes of the problems that the health system encounters. It has been proven that only a directly observed treatment strategy may improve patient compliance and treatment outcome [19, 29–31, 34, 35].

Conclusions

In both groups of patients, treated in 1995 and in 2000, alcohol abuse and homelessness were factors significantly worsening the treatment outcome in sputum culture-positive tuberculosis patients. It is necessary to undertake actions aimed at improvement of treatment supervision strategy, especially in high-risk groups.

Conflict of interest

The authors declare no conflict of interest.

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