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Impact of active tobacco smoking and other associated determinants on tuberculosis evolution and treatment outcome

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Abstract

Background: Tuberculosis and smoking represent a major global health problem that is well recognized in the Republic of Moldova and worldwide. There is strong relationship between social vulnerability and psychotropic substance abuse: tobacco smoking, alcohol abuse and illicit drug use. The aim of the study was the impact assessment of active tobacco smoking and associated determinants on evolution of pulmonary tuberculosis and treatment outcome.

Material and methods: pulmonary TB patients diagnosed in the period 1.1.2014-31.12.2014 in Chisinau city were distributed in two groups: study group constituted 209 patients with pulmonary TB and active smoking and control group (CG) – 79 patients with pulmonary TB never-smokers.

Results: Risk factors for development of active TB at smokers are poverty-related conditions, male sex, single matrimonial status, medico-biological conditions and alcohol addiction, low educational status, urban residence. Case-management of smokers with pulmonary TB was worsened by the lack of health insurance (two thirds), late detection and epidemiological danger due to positive bacillary smear status. Co-morbidities and TB-related radio-morphological features (bilateral localization, lung destructions, dissemination, and positive bacillary status) adjusted to risk factors contribute to low treatment outcome.

Conclusions: Targeted interventions for smoking quitting in the frame of risk subgroups will diminish the rate of severe and complicated forms of TB and will increase success rate, strengthening TB control at the community level.

Key words: tuberculosis, tobacco smoking, risk groups.

Introduction

Tuberculosis (TB) represents a major global health problem that is well recognized in the Republic of Moldova (MDA) [3]. Annually are registered almost 10 million new TB cases that in association with human immunodeficiency virus represent a leading cause of death. In 2014 were registered 5,4 million new cases among men, 3,2 million cases among women and 1.0 million sick children worldwide. In addition to this in 2014 were registered 1,5 million deaths due to tuberculosis, among them – 1,1 million were HIV negative and 0,4 million were HIV-positive [15]. The Republic of Moldova shows a slow decreasing of disease prevalence during the period 2013-2015 with 3904 TB patients in 2013, 3450 patients in 2014 and 3073 patients in 2015 [3]. The social determinants of TB are well recognised in MDA as well as worldwide . The continuous socio-economical, as well as, political crisis through which passes MDA determine the continuously increasing rate of socially vulnerable individuals [3]. It was defined a strong relationship between social vulnerability and psychotropic substance abuse: tobacco smoking, alcohol abuse and illicit drug use. Tobacco smoking is probably the most widespread with the major socio-economic impact. Smoking is defined as an addictive disease of persons who reported smoking at least 100 cigarettes during their lifetime and who, at the time when they participated in the survey, reported smoking every day or some days. About 1.1 billion people, that means one in every three adults, are smokers according to the World Health Organization [16]. Worldwide, tobacco smoking causes nearly 6 million deaths per year, and more than 8 million deaths annually are predicted by 2030 [6]. More than 160 million Americans are

living with tobacco addiction: 16.8% of all adults (40 million people): 18.8% of males and 14.8% of females in the US are smokers. Cigarette smoking is responsible for more than 480.000 deaths per year in the US and 42.000 deaths resulting from environmental (second-hand smoke) exposure [12]. According to the Demographic Study of Health in MDA in 2005 there were estimated 51,1% smoking men and 7,1% smoking women [10]. The prevalence of tobacco smoking is identified at 65% of general Moldovan adult population and Moldovan men are 4 times more predisposed to smoke than women. The current data established that the tobaccco smoke represents the second cause of chronic morbidities among Moldovan men and the seventh cause among women [10].

The chemical components of cigarette smoke depend on the structure of the cigarette and delivery way of the smoke. Most of the studies have reported the effects of the mainstream smoke and fewer identified effects of sidestream and passive smoking [3]. The International Organization for Standardization expressed that the puff volume is 35 milliliters, for a two-second puff duration and butt length is 26 mm for filter cigarettes. When alternative smoking regimens (e-cigarette, cigar or pipe) are used, level of potentially harmful substances in smoke emission usually differs from those measured in standard conditions. Cigarette smoke is a complex of chemical compounds that are transformed in aerosol or in gas phase due to burning process. Smoke from a burning cigarette is a concentration of liquid particles suspended in the atmosphere consisting mainly of nitrogen, oxygen, carbon monooxide and carbon dioxid. Chemical tobacco compounds can be distilled into smoke or can react with other constituents and then distilled to smoke. It was estimated that cigarette smoke contains 7.357 chemical components from different classes, including 20 carcinogenes (acrolein, formaldehyde, carbon monooxide, acealdehyde, phenol, potasium cianide, etc.) that cause cancer in laboratory animals and humans. The characterisitcs of the smoke vary due to cigarette design and chemical nature of the products: 1,3-butadiene exposes the greatest potential risk for cancer development; acrolein and acetaldehyde is the most potential irritant for respiratory tract; cyanide, arsenic, and cresols are the primary causes for cardiovascular risk. The concentration of chemical compounds differs according to: the smoke formation, the way through the cigarette is smoked and differences among cigarettes (tobacco type, tobacco preparation, the dimensions of the cigarettes, the weight of the tobacco rod, the porosity of the paper, the presence, type and the size of the filter) [5]. Mainstream smoke is released from the butt end of the burning cigarette during puffing. Sidestream smoke is emanated from the burning cigarette coal. The air surrounding an active smoker contains a mixture of sidestream smoke, smoker's exhaled mainstream smoke and smoke that passes the paper surounding the tobacco in burning. Toxic effects of the smoking are immediate, also called rapid toxic effects on the brain and are responsable for addictive power of nicotine. The initial increasing of dopamine activity due to nicotine inhalation determines the pleasant feelings for the smoker. The long anamnesis of smoking determines the reduction of dopamine receptor function and decreasing the number of dopamine receptors, that causes to consume more cigarettes [7]. It was demonstrated that earlier starting of smoking alters the development of the lung in adolescent period, limiting adult-future breathing capacity and physical potential. The most expressed are immediate toxic effects of tobacco smoke on the respiratory system. Cigarette smoking conduces primary mucociliary transport alterations, expressed through reduction of mucociliary clearance, due to diminishing of the ciliary beat frequency and changes of mucus properties [6]. The chronic stress inflamation causes mucus metaplasia of the respiratory epithelium (starting with hyperplasia, then metaplasia with keratinization of epithelium), diminishes the viability of cells, induces apoptosis, increases the size of goblet cells and consequently stimulates the upper airway mucous secretions [1, 7]. Smoking interferes in ciliogenesis process, determining the alteration in maturation and reduces the size of cilus, that predisposes bacterial colonization and infection of the respiratory tract. Airways of smokers are preferentially colonized by Gram negative bacteria, due to an increased resistance of Gram negative more than Gram positive microorganisms to the smoke, and due to an increased adhesion of microbs to epithelial cells. The exposure to high concentration of smoke stimulates the formation of bacteria biofilms. The bacteria-epithelium interaction causes the increased inflammatory reaction of epithelium, that is not linked to the toxins of the smoke. Due to stress inflammation an acute bronchospam, increased phlegm production, disturbances in air-blood distribution in lungs. All identified alterations decrease physical performance of the smokers due to reduced mecanical ventilation and decreased lung function.

Also the cigarette smoke determines cardiovascular toxic effects more relevant on the lipid profile, that may increase risk of thrombosis, vasoconstriction and increased blood pressure. Nicotine consumption increases heart rate 30 minutes after puffing. In association with a constantly increased blood pressure due to vasoconctriction the congestive heart failure is ten times more frequently than in non-smokers [3].

Second-hand smoke, called also environmental smoke is considered more carcinogenic than the smoke of the mainstream inhaled by the active smoker. Because the cigarette burns at a lower temperature and much more amount of tobacco is pyrolised during smouldering (80% of cigarette burns between puffs), the sidestream smoke contains a higher amount of carcinogenes (more than 40 of known), than the same volume of mainstream smoke: up to 50 times more formaldehyde, 3.5 times benzopyrene

and 7.2 times cadmium. Hundreds of studies performed after 1980 identified the relationship between exposing to environmental tobacco smoke and lung, nasal cavity, head and neck, stomach, cervix, bladder cancers and leukemia. The risk of cancer depends on the way of smoking (passive and active smoking), measures of the individual exposure, populational exposure to passive smoking, residential and occupational exposure. For every person who dies because of smoking, at least 30 people live with serious-smoking related disease. More frequently associated diseases are different types of cancers, diseases of cardio-vascular system and suddden death, diabetes, respiratory diseases (chronic obstructive pulmonary disease, emphysema, bronchiectasis) [9]. The tobacco smoking contributes to the development of lung cancer, followed by oral, pharingeal and esophageal cancers, as well as tuberculosis [4].

The risk is increased by the lack of ventilation, indoor pollution, and depends on the room size, the number of persons who smoke, the number of smoked cigarettes. Chronic respiratory diseases (CRD), such as: chronic bronchitis, chronic obstructive pulmonary disease, small airways disease, pulmonary emphysema, lung fibrosis, bronchiectasis, chronic rhinosinusitis and chronic pharingo-laringitis are results of an active or environmental smoking (passive smoking) [1]. Acute bronchitis, community aquired pneumonia, asthma exacerbation, acute middle ear infection, acute nasal irritation, acute conjunctivitis, and TB are more common in smokers than in non-smokers [2]. There is a little variety of studies on vulnerability of smokers to active TB. The pathways that increase the vulnerability of the smoker to mycobacterial infection are: chronic alterations of epithelium, decreasing local immune resistance, lower ability of smokers to maintain latent mycobacterial infection, that increase the risk of active TB up to three times.

Research review identified that chronic exposure to tobacco and to environmental pollutants, impairs the clearance of tracheo-bronchial secretions, as well as impairs the function of pulmonary alveolar macrophages. *In vitro* studies, determined that nicotine acts on acetiylcholine receptors of macrophages, that decreases the production of intracellular tumor necrosis factor (TNF-α) and impairs the killing of intracellular mycobacteria [7]. So, resulting deficiency in non-specific defense represents the main cause that contributes to the progression of active tuberculosis from latent TB infection [1].

It was identified a strong relationship between the duratation of smoking and the severity of TB. In addition, active as well as passive smoking reduces the effectiveness of chemopreventive treatment and the effectiveness of TB treatment (the risk of death among smokers is six times higher than in non-smokers, and the risk of relapse is three times higher than in non-smokers). Much more data we need to investigate for establishing the impact of: the age at which smoking was started, the duration and the intensity of smoking (the number of smoked cigarettes), type of tobacco and the quality of cigarettes on the risk of active TB development [1].

A special attention is actually paid to second-hand smoke that affects children and adults, sharing the same house/place with smokers with active TB. The sick smokers put their families at a greater risk for contracting mycobacterial infection and at a greater risk for active TB development [1]. Considering all related data, associated with unstable socioeconomical and epidemiological situation in MDA, as well as the large proportion of smokers in the general population it was identified the need for performing a research about the health consequences and the impact of the smoking on active TB evolution and treatment outcome. So, **the aim of the study** was the impact assessment of active tobacco smoking and associated determinants on evolution of pulmonary tuberculosis and treartment outcome. Established **objectives** were: 1. Assessment of general, socio-economical and epidemiological characteristics of active smokers with pulmonary TB; 2. Evaluation of case-management, clinical aspects, radiological aspects and treartment outcome of pulmonary TB at active smokers.

Material and methods

It was realised a retrospective and selective research of a study group (SG) consisting of 209 patients with pulmonary TB and active smoking and control group (CG) – 79 patients with pulmonary TB never-smokers, registered as a new case during the period 01.01.2014 to 31.12.2014. The patients' medical records were assessed after being hospitalized in the Municipal Hospital of Tuberculosis of Chisinau, where the patients were investigated and received TB treatment during the intensive phase. Including criteria in both groups were the diagnosis of new pulmonary TB cases, new case (patients never treated for TB, or have taken anti-TB drugs less than one month), signed informed consent. Individual research chart included the points with such data: anamnesis, data of clinical examination, results of radiological investigations (chest radiography, high resolution computer tomography), results of microbiological investigations (smear bacterioscopy at Ziehl-Neelson staining) and bacteriological examenations (culture on conventional solid medium Lowenstein-Jensen and liquide BACTEC MGIT) [4]. Investigations were performed according to National Policy – Tuberculosis in Adults. Smoking behaviour questionnaire included the questions about the number of cigarettes smoked per day, the period of time of "smoking pack years", type of smoked cigarettes (with or without filters). Statistical assessements were performed using soft Microsoft Excel XP and Statistica 10,0.

Results and discussions

Assessing current status of active smokers with pulmonary TB it was established that only 28 (13,6%) were light smokers with less than 10 pack years. The majority [163 (79,13%) patients] were moderate smokers, being assessed with 10-20 pack years and heavy smokers (more than 20 pack years) were 18 (8,7%) cases. The biggest part of SG [198 (96,1%) patients] smoked cigarettes with filter. Assessment of general, socioeconomical and medico-biological characteristics of active smoking patients with pulmonary TB in comparison with never-smokers is shown in the table 1. Distributing patients by sex it was estbalished the predominance of male sex in comparison with female in both groups: 158 (76,6%) males in comparison with 48 females (23,4%) in SG and 48 (60,7%) males *vs* 31 (39,3%) females in CG. Comparing the groups it was established that the males predominated in SG 158 (76,6%) vs 48 (60,7%) in CG. Females were more frequent in CG 48 (23,4%) than in SG 78 (98,7%) cases. Repartition of patients in age subgroups according to the WHO recommendations, identified that the largest subgroup in SG represented 25-34 year age group: 62 (30,1%) patients and in CG 35-44 year subgroup 78 (98,7%) patients. The younger group of patients aged 18-24 predominated in SG: 46 (22,3%) *vs* 7 (8,8%) cases in CG. Redistributing patients in two subgroups aged 18-44 and >45 it was established the predominance of younger subgroup (18-44 years) in both SG and CG: 156 (75,7%) patients 67 (84,8%) cases, respectively.

Assessing the place of stable residence it was identified that patients from urban area were more frequently in SG [162 (78,6%) cases] than in CG [45 (56,9%) cases] and patients from rural area were more prevalent in CG [34 (43,1%) cases] than in SG [44 (21,4%) cases]. Considering the educational level of selected patients it was determined that individuals with low level of school education (primary and incomplete secondary school) were identified in a similar proportion in both study and control groups: 123 (59,7%) and 51 (64,5%) cases, respectively. Socioeconomic (employment) status was higher in CG than in SG. One third of patients were employed in CG [23 (29,1%) patients] and 25 (12,2%) cases in SG. Two thirds of patients were unemployed in SG [156 (75,73%) cases] and 48 (60,6%) patients in CG. Other socio-economical categories were in a similar proportion, but the totality of economically disabled patients, that included all non-economically productive patients (unemployed, retired and students) statisticaly prevaled in SG: 181 (87,86%) *vs* 46 (58,23%) cases in CG. Considering the high rate of economically defavorised patients in both groups, the tobacco smoking worsens the financial state, predisposing the development of TB. Appreciating the civil status it was identified more frequently married persons in CG [51 (64,5%) cases] than in SG [84 (40,7%) cases] and single state individuals predominated

Tabel 1

Distribution of patients according to the demographic factors

Demographic factors	SG, n=206		CG, n=79	p value
	n (%)	n (%)		
Sex	Men	158 (76,6)	48 (60,7)	**<0,01**
	Women	48 (23,4)	31 (39,3)	**<0,01**
Young age (reproductive groups)	18-24 years	46 (22,3)	7 (8,8)	**<0,01**
	25 – 34 years	62 (30,1)	24 (30,4)	>0,05
	35-44 years	48 (23,3)	78 (98,7)	**<0,001**
>45 years old	45-54 years	38 (18,5)	10 (12,6)	>0,05
	>55years	15 (7,28)	2 (2,5)	>0,05
Residence	Urban	162 (78,6)	45 (56,9)	**<0,001**
	Rural	44 (21,4)	34 (43,1)	<0,001
Educational status	Low (primary/ Incomplete secondary)	123 (59,7)	51 (64,5)	>0,05
	Good (lyceum, high level)	83 (40,3)	28 (35,4)	>0,05
Socio economical status	Employed	25 (12,2)	23 (29,1)	**<0,001**
	Unemployed	156 (75,73)	48 (60,6)	**<0,01**
	Disabled	8 (3,8)	5 (6,3)	>0,05
	Students	2 (0,9)	1 (1,3)	>0,05
	Retired	15 (7,3)	2 (2,5)	>0,05
Civil status	Married	84 (40,7)	51 (64,5)	**<0,001**
	Single	117 (56,8)	25 (31,6)	**<0,001**
	Divorced&widow	5 (2,43)	3 (3,7)	>0,05
Life style	Under minimum standard life	123 (59,8)	32 (40,5)	**<0,01**
	Migration	28 (13,6)	10 (12,6)	>0,05
	Alcohol abuse	111 (53,8)	3 (3,8)	**<0,001**
	Drug use	4 (1,9)	0	>0,05
	History of emprisonment	8 (3,8)	0	>0,05
	Family cluster of TB	24 (11,6)	7 (8,8)	>0,05

in SG: 122 (59,3%) *vs* 28 (35,5%) cases in CG. Poor life conditions considered as under the minimum consumer basket predominated in SG: 123 (59,8%) *vs* 32 (40,5%) patients in CG. Although smoking is a leading cause of morbidity and mortality worldwide, it is not recognised as a disease by itself. Considering nicotine, the component of tobacco an addictive drug regulating the feelings of pleasure, in most cases the desire to smoke is combined with the consumption of other drugs such as alcohol or illicit drugs. Alcohol is the second most used addictive substance in the world, after tobacco smoking. Chronic alcoholism, as well as binge drinking and heavy drinking is 10 times more frequent at tobacco smokers than among nonsmok-

ers. Alcohol abuse and chronic alcoholism were identified at one half of smokers and only at a couple of non-smoking patients. Illicit drug use was identified only in SG. History of emprisonment was identified at a lower rate in SG. In this context it is important to note a very low rate of family TB clusters [24 (11,6%) cases] affiliated to each investigated patient. It is due to a low quality epidemiological cross-examination of the patient, rather than to the lack of close (family) contacts in the patient's environment.

Associated diseases were identified at one half of patients from both groups. No neoplastic diseases were identified at the selected patients. The effect of associated disorders or diseases is important because they endanger the TB treatment effectiveness. If the clinical state of the patient is not so worsened the TB treatment might be started primarily, subsequent treatment for underlined diseases will be performed when the clinical tolerance to the TB treatment is established (TB/HIV infection). One third of patients was identified with one comorbidity in both groups [59 (28,6%) cases in SG and 18 (22,78%) cases in CG]. There was not found a statistical difference between groups counting diagnosis clusters, except the group of chronic respiratory diseases, that predominated in the SG: 42 (20,4%) patients in comparision with 9 (11,4%) patients from CG. More patients from CG had gastrointestinal, diabetes mellitus, chronic renal diseases, but was not found a statistical difference between groups.

Studying case-management, diagnosis delay, medical staff involved in the patient's detection and clinical-radiological diagnosis it was established that three fourths of patients from SG exposed as a barrier for health care seeking the lack of health insurance comparing with only one half of CG. Delayed case detection, that means more than 60 days after the disease onset was registered more often in patients from the SG (two thirds) and only one third in CG. According to the actual recommendations the main way for new case detection is the microscopic examination of the symptomatic patients associated with the smear genetic test through GeneXpert MTB/Rif assay. So, two thirds of all selected patients were detected by the general practitioner due to specific symptomatology (passive way of case detection): 152 (73,7%) patients from SG and 52 (65,8%) patients from CG. One fifth of patients of both groups were detected by the specialist (pneumophtysiologist) and a fewer rate were detected otherwise (by transfer from other medical institutions, investigation by other specialists, detected in the frame of investigations performed for the work engagement).

Assessing laboratory features of pulmonary TB it was identified that one half of smokers were microscopic positive for acid-fast-bacilli and only a fewer part of the CG. So, the first criteria that defined the highest epidemiological danger of TB clusters was identified in one half of patients from SG. Infiltrates localized in both lungs were more frequently identified in SG [131 (63,6%) patients] comparing with infiltrates identified only in one lung, which were more frequently identified in CG 54 (26,2%). Evaluating radio-morphological features of pulmonary TB, were identified lung infiltrates complicated with destructions at 131 (63,6%) cases of SG and only at 18 (22,8%) patients from CG. Lung dissemination (through bronchogenic and lymphogenic ways) was established only in SG [28 (13,6%) patients]. Complications (such as hemoptysis, pneumothorax, pleurisy) occurred more often in the SG [59 (28,6%) cases] than in CG. Patients were informed about the fact that smoking cessation will improve treatment outcome, but no other psychological interventions and quitting replacement therapy were performed. A little rate of patients discontinued smoking due to increasing dyspnea. Treatment outcome convincingly established the impact of tobacco smoking on disease outcome. The highest rate of patients succesfully finished the standard treatment

Table 2

Case-management and pulmonary TB features

Characteristics n (%)		SG, n=206 n (%)	CG, n=79	P value
Case management	Lack of health insurance	162 (78,6)	45 (56,9)	**<0,001**
	Associated diseases	123 (59,7)	36 (45,6)	>0,05
	Late detected (>60 days)	131 (63,6)	28 (35,4)	**<0,001**
	Detected by general practitioner way	152 (73,7)	52 (65,8)	>0,05
	Detected by pneumophtysiologist	31 (15,0)	18 (22,7)	>0,05
	Other ways of detection	23 (11,1)	9 (11,4)	>0,05
Para-clinical features	Microscopic positive	121 (58,7)	12 (15,2)	**<0,001**
	1 lung involved	54 (26,2)	58 (73,4)	**<0,001**
	2 lungs involved	152 (73,7)	21 (26,6)	**<0,001**
	Lung destructions	131 (63,6)	18 (22,8)	**<0,001**
	Dissemination (bronchogenic, lymphogenic)	28 (13,6)	0	<0,001
	Complications	59 (28,6)	3 (3,8%)	**<0,001**

Tabel 3

Distribution of patients according to the demographic factors

Factors RR		Statistical indices		
		OR	AR%	
Demographic	Men	1,25 (1,04-1,53)	2,16 (1,22-3,7)	**20,8**
	Urban	1,38 (1,13-1,71)	2,78 (1,569-4,85)	**24,2**
	Low economical status	1,24 (1,03-1,5)	2,01 (1,16-3,51)	**19,9**
	Single person	1,32 (14-1,53)	2,84 (1,64-4,91)	**44,4**
	Poverty	1,47 (1,1-1,97)	2,17 (1,28-3,69)	**32,3**
	Alcohol abuse	1,94 (1,67-2,24)	36,6 (11,23-119,3)	**92,9**
Disease features	Lack of health insurance	1,35 (1,1-1,66)	2,61 (1,49 – 4,59)	**27,6**
	Microscopic positive	1,62 (1,39-1,89)	7,94 (4,06-15,59)	**74,1**
	2 lungs involved	1,8 (1,48-2,19)	7,63 (4,24-13,72)	**74,2**
	Lung destructions	1,56 (1,34-1,84)	5,69 (3,13-10,3)	**63,9**
	Dissemination	1,36 (1,23-1,51)	11,43 (1,53-85,5)	**92,3**
	Complications	1,43 (1,29-1,59)	9,96 (3,02-32,8)	**86,7**

according to WHO recommendations in CG: 76 (96,21%) *vs* 142 (68,9%) patients from SG. No deaths were registred in CG and 16 (7,67%) cases in SG. Patients that failed the standard treatment or those who were lost from follow-up predominated in patients from SG: 48 (23,31%) vs 3 (3,89%) patients of CG.

An important research outcome represents the relative risk (RR), odds ratio (OR) and attribuitable risk (AR) indices for identifying the priority interventions in the frame of specific subgroups. All indices demonstrated the risk impact of causal factor-tobacco smoking on TB development. There were selected only risk factors and features which exposed statistical differences between groups of patiens.

Calculating relative risk index it was established that all exposed conditions are associated with tobacco smoking. Odds ratio identified that major risk factors associated with tobacco smoking are alcohol abuse and TB-related characteristics: dissemination, complications due to TB, pathological process localised in both lungs, bacillary TB (smear positive for acid fast bacilli), lung destructions. It was establshed that preventive advantages of smoking cessation will be obtained especially on diminishing the rate of patients with lung dissemination and destructions, involvement of both lungs in the pathological process, associated complications (hemoptysis, pneumothorax, pleurisy), epidemiological danger (bacillary forms of pulmonary TB). In addition such associated determinants will be substantially reduced by smoking cessation: alcohol abuse and single civil state. A lower impact will be achieved by poverty-related features and residence.

Conclusions

Tuberculosis is a big challenge worldwide, in addition active smokers are the most widely expressed risk group for active disease.

Risk factors for the development of active tuberculosis at smokers are: poverty-related conditions, male sex, single matrimonial status, medico-biological conditions and alcohol addiction, low educational status, urban residence.

One half of smoking group with TB patients was established with positive bacillary status at smear microscopy.

Delayed case-management of active smokers with pulmonary TB was determined by the lack of health insurance in the frame of primary health care sector. Comorbidities and disease-related radio-morphological features (bilateral localization, lung destructions, dissemination, positive bacillary status) associated with enumerated risk factors contibute to low treatment outcome. Targeted interventions for smoking quitting in the frame of risk subgroups will diminish the rate of severe and complicated forms of TB and will increase the rate of treatment success, strenghthening TB control at the community level.

Raising awareness among smokers and their families about TB, emphasizing that the diagnosis and treatment is free of charge and independent regarding their social status will improve epidemiological state. Improvement of the socio-economical and hygienic conditions, associated with quitting drug therapy and psychological counseling will diminish the risk for TB development among smokers. Maintaining the active smokers as a part of high risk groups for the screenng to TB will diminish the rate of severe TB forms and the burden of smoking-related disease.

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