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RISK FACTORS FOR SOCIALLY SIGNIFICANT INFECTIONS AMONG WORKING- AND OLDER WORKING-AGE POPULATION (ON THE TUBERCULOSIS EXAMPLE)

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ABSTRACT. The article presents the results of an ecologic study where leading risk factors for socially significant infections (SSI), on the tuberculosis (TB) example, among working-age (WA) and older working-age (OWA) population, which is especially actual at the period of implementation of the pension reform in Russia were determined. In the study face-to-face survey in 1,497 adults aged 18 y.o. and older in Republic of North Ossetia-Alania (RNO-Alania) was conducted; differences between variables assessed by Fisher's exact test. Based on the study results it was established that OWA group, compared to WA, is less healthy (1.7 times), more often has chronic diseases, including TB (2 times), ($p<0.0001$). Also, OWA people are more vulnerable in socio-economic terms: they prove to be more often single, especially women (1.4 times), more often disabled (1.6 times), earn less (1.4 times), medical care is less accessible to them (1. 3 times) ($p<0.001$). At the same time, OWA group is more conservative: being aware of the negative impact of close family ties in SSI, among them those who avoid contact with TB relatives are definitely fewer, especially women ($p<0.001$), less who approve use of telemedicine ($p<0.002$), and fewer who have smartphones ($p<0.0001$). WA group, earning more and being more progressive, compared to OWA, more often consumes alcohol (1.4 times) ($p<0.048$), more often associates poor health with poor nutrition (1.2 times) and environmental problems (1.5 times) ($p<0.001$). The obtained data allow us to conclude that in national programs of non-prolifiration of SSI, which reduce the quality of public health, at the period of realization of the pension reform in Russia, along with health problems in OWA population, it is necessary to take into account their socio-economic adaptation, conservatism and historical-cultural features. Behavioral, nutritional and environmental risk factors for SSI (TB), especially among WA, should also be reduced.

KEYWORDS: socially significant infections, tuberculosis, risk factors, working- and older-working-age groups, pension reform

ФАКТОРЫ РИСКА СОЦИАЛЬНО ЗНАЧИМЫХ ИНФЕКЦИЙ СРЕДИ НАСЕЛЕНИЯ ТРУДОСПОСОБНОГО И СТАРШЕГО ТРУДОСПОСОБНОГО ВОЗРАСТА (НА ПРИМЕРЕ ТУБЕРКУЛЕЗА)

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РЕЗЮМЕ. В статье представлены результаты экологического исследования по определению ведущих факторов риска социально значимых инфекционных заболеваний на примере туберкулеза среди населения трудоспособного возраста (ТВ) и старшего трудоспособного возраста (СТВ), что особо актуально в период пенсионной реформы в России. Проведен опрос 1497 взрослых от 18 лет и старше в Республике Северная Осетия-Алания. Различия переменных оценивались по точному критерию Фишера. По итогам исследования установлено: группа СТВ по отношению к группе ТВ менее здорова (в 1,7 раза), чаще имеет хронические заболевания, чаще болеет туберкулезом (в 2 раза) ($p < 0,0001$). Также люди СТВ более уязвимы в социально-экономическом отношении: чаще одиноки, особенно женщины (в 1,4 раза), чаще имеют инвалидность (в 1,6 раза), меньше зарабатывают (в 1,4 раза), медицинская помощь им менее доступна (в 1,3 раза) ($p < 0,001$). В то же время группа СТВ более консервативна: при осознании негативного влияния тесных родственных связей при социально значимых инфекционных заболеваниях (СЗИЗ), среди них меньше избегающих контакта с больными туберкулезом родственниками, особенно среди женщин ($p < 0,001$), меньше одобряющих применение телемедицины ($p < 0,002$), меньше имеющих смартфоны ($p < 0,0001$). Группа ТВ, больше зарабатывая и будучи более прогрессивными, по сравнению с группой СТВ, чаще употребляет алкоголь (в 1,4 раза) ($p < 0,048$), чаще связывает плохое здоровье с плохим питанием (в 1,2 раза) и проблемами экологии (в 1,5 раза) ($p < 0,001$). Полученные результаты позволяют заключить, что при разработке национальных программ по противодействию распространению СЗИЗ, снижающих качество общественного здоровья, в период реализации пенсионной реформы в России, наряду с проблемами здоровья у населения СТВ, необходимо учитывать вопросы их социально-экономической адаптации, консервативность и историко-культурные особенности жителей регионов. Следует также снижать поведенческие, нутритивные и экологические факторы риска распространения СЗИЗ (туберкулеза) среди населения, особенно среди ТВ.

КЛЮЧЕВЫЕ СЛОВА: социально значимые инфекции, туберкулез, факторы риска, трудоспособный возраст, старше трудоспособного возраста, пенсионная реформа

INTRODUCTION

Reducing the burden and impact on the quality of public health (PH) of socially significant infectious diseases (SSID), which include tuberculosis (TB), HIV infection, parenteral viral hepatitis and other diseases that pose a danger to others, is one of the global problems of society both in Russia and worldwide [1–3]. In Russia, despite the observed downward trend in TB rates as one of the most common SSID, this infection still remains an urgent and significant medical and social problem [4, 5]. SSID, including TB in people of working age (WA) and older working age (OWA), are a special problem.

From the point of view of medicine, old age comes when irreversible physiological changes begin in the human body. From the economic point of view the “old age” begins at retirement age. The World Health Organization refers to old age as people from 65 years of age and above [6]. In the Russian Federation, before the pension reform that began in 2019, the OWA population included men from the age of 60 and women from

the age of 55 [7]. The pension reform provides for a gradual increase in the retirement age among men and women; according to the latest version of the Federal Law of the Russian Federation No. 400-FL of 28.12.2013 (ed. of 25.12.2023, not in a force) "On Insurance Pensions", the retirement age for men is increased to 65 years, for women it is increased to 60 years, and the working age starts at 15 years [8]. Currently, Russia, as well as the rest of the world, is experiencing population aging: over 60 years, from 1961 to 2021, the number of WA population in the country increased by 19%, and the number of OWA persons by 167% [9]. A.A. Kalininskaya et al. note that by 2050, there will be about 74 OWA people per 100 WA people; at the same time, OWA people, despite high mortality and morbidity among them, have become more socially and physically active, which should be used as the country's economic potential [10].

Returning to SSID, in particular to TB, it should be noted that most domestic scientific publications associated with biological age-related changes in the organism, where geriatric age includes persons 60 years and older among both men and women, predominantly study the features of clinical manifestations of TB [11–16]. In foreign studies related to TB and age, the geriatric group also includes persons aged 60 years and older, where authors, like domestic researchers, more often describe clinical features of TB rather than medical and social aspects of the disease [17–21]. It is known that in Russia TB and HIV infection predominantly affect the able-bodied population from 20 to 45 years old [22–24]. In foreign studies, an assessment of the economic damage caused by SSIDs to society is widely available, which indirectly addresses gender and age differences among those affected by one or another SSID: the average age of TB and HIV-infected people in Ethiopia and Iran ranges from 30 to 40 years [25–27].

In the previous study, we pointed out that risk factors for the spread of TB in the general population are well studied both in Russia and abroad [28]. Meanwhile, studies devoted to the comprehensive assessment of risk factors for SSID spread among the population, with their division into WA and OWA groups, which is important from the point of view of public health, are practically not found in the scientific literature.

There are publications assessing the general morbidity and mortality of the able-bodied population of Russia, where a high mortality rate among them from external causes is noted [29, 30]. A significant excess of mortality in Russia among men and women of WA over similar indicators in European countries was determined [31]. Also among the able-bodied population the risk factors for the development of non-communicable diseases, especially cardiovascular and oncologic pathologies, are well studied [32–34].

AIM

On the basis of comparative analysis, to establish the leading risk factors for SSID spread (using TB as an example) among the population of WA and OWA with the subsequent development of scientific and practical measures to reduce the social burden of TB among the selected groups.

MATERIALS AND METHODS

A total of 1,497 respondents were interviewed in an ecological study conducted by face-to-face questionnaire survey of adults aged 18 and older in the Republic of North Ossetia-Alania (RNO-Alania), with cluster-nested selection of territories. The sample size was set based on the population of ~700,000 people in the region, with a margin of error of ±3.0% and 95% confidence interval, while maintaining quota ratios of respondents by gender, age and place of residence to the general population. All 9 administrative entities of RNO-Alania, including the city of Vladikavkaz, were included in the survey. The survey of participants was organized by sampling formed by respondents without identification data. The questionnaire consisted of 41 questions grouped into 8 blocks, which included information on: gender-age, behavioral, social and economical, medical, organizational, epidemiological, cultural-ethnic and environmental. The WA group consisted of respondents among males 18 to 59 years old, over OWA, 60 years old and above; females 18 to 54 years old and 55 years old and above, respectively. The study was conducted from January to October 2023, approved by the Ethical Committee "N.A. Semashko National Research Institute of Public Health". Statistical processing of the material was performed on the SPSS.26 platform. Differences in variables were established by Fisher's exact test with the

determination of the probability p value between the WA and OWA groups as a whole, as well as between men and women in these groups. In addition to general characteristics (sex, age, place of residence, ethnicity), only risk factors with significant differences in the compared groups are summarized in the article.

RESULTS

The total area of RNO-Alania is 8,000 km^2, with a population of 683,071 at the beginning of 2023. The main feature of the region is high population density — 85.23 people/km^2, by this criterion the republic ranks 5th among all subjects of the Russian Federation. In terms of gender composition, women prevail over men (55.2% vs. 44.8%), urban residents prevail over rural residents (63.2% vs. 36.8%). In terms of gross regional product per capita (293.4 thousand rubles), the republic belongs to regions with medium economic level. TB incidence in 2022 was slightly higher than the average for Russia as a whole, amounting to 31.5 per 100,000 population against 31.1.

According to the results of the environmental survey itself, the average age of all respondents was 47.26±14.3 years. In the WA group it was 41.75±10.7. In OWA group it was 66.59±6.2. In accordance with the quota characteristics, among all respondents women prevailed (56.6%), the majority lived in the city (68.7%), by ethnic composition 77.0% of respondents were Ossetians (Fig. 1). Among the compared groups, the above variables had no reliable differences (p >0.05), which allowed us to show general information.

Table 1 summarizes the risk factors for the spread of TB that have significant differences between the compared groups. In terms of marital status, more than 40% of respondents were single (divorced, single, widows, widowers), with OWA women 1.4 times more prevalent than WA women (p <0.0001); among all respondents. This difference between OWA and WA groups was 1.2 times (p <0.0001). Also, disability was 1.6 times more common among OWA women than WA women (p <0.044). Monthly salaries above 30,000 rubles were more common among WA men than OWA men (20.4% vs. 10.7%, p <0.025). This indicator was 1.4 times more prevalent among the WA group than among the OWA group (p <0.006).

More than 1/3 of the respondents indicated alcohol consumption, which was taken more often in the WA group than in the OWA group: it was 1.3 times more often among men (p <0.021) and 1.7 times more often among women (p <0.001) and 1.4 times more often overall (p <0.001). Heavy smokers (1 pack of cigarettes per day or more) were more likely to be OWA men (1.6 times) than WA men (p < 0.046). Among all respondents, OWA respondents were also more likely to be heavy smokers than WA individuals on this criterion (p <0.052).

Among the ethnocultural characteristics, there were differences between the compared groups only in commitment to national sports, where the WA group was more often engaged in them than the OWA group: men were engaged 7 times more often (p <0.0001), women were engaged 3.2 times more often (p <0.008), and overall 4.5 times more often (p <0.001). On environmental factors, about 1/4 of the questionnaire respondents noted problems of garbage disposal: among them women, and in general, WA persons were 1.5 times more often concerned about this problem than women and the whole OWA group (p <0.004, p <0.001, respectively).

According to medical and social factors, more than 60% of respondents consider themselves healthy, especially the OWA group: with a significant difference in relation to the OWA group among men by 1.6 times, among women by 2 times and by 1.7 times in general (p <0.0001). About 1/3 of respondents indicated the presence of chronic diseases with their predominance among the OWA group 2 times in relation to the WA group, both in general and among men and women separately (p <0.0001). About 1/4th of the respondents

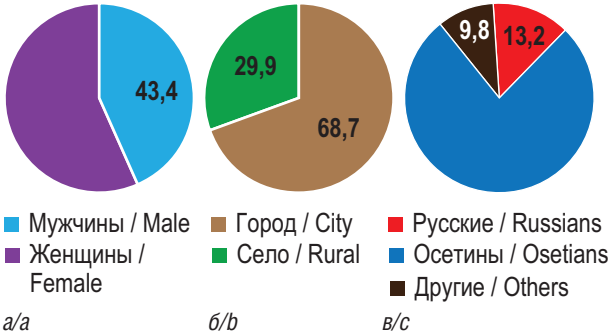

Fig. 1. Gender (*a*), residential (*b*) and ethnic (*c*) characteristics of respondents (%)

Рис. 1. Характеристика респондентов по полу (*а*), месту жительства (*б*) и этнической принадлежности (*в*) (%)

Table 1

Comparative analysis of tuberculosis risk factors among working- and older working-age groups (%)

Таблица 1

Сравнительный анализ факторов риска распространения туберкулеза среди групп трудоспособного и старшего трудоспособного возраста (%)

Факторы / Factors	**Пол / Gender Всего / Total**	**Всего / Total N=1497: М/М=673 Ж/F=824 (%)**	**Трудоспособный возраст / Working-age group N=1165: М/М =520; Ж/F=645 (%)**	**Старшего трудоспособного возраста / Older working-age group N=332: М/М= 153; Ж/F=179 (%)**	**P**
Социально-экономические факторы / Socio-economic factors					
Одинокий (ая) / Single	М/М	45,7	46,2	44,3	<0,0001
	Ж/F	42,1	39,0	53,4	<0,0001
	Всего/Total	43,8	42,2	49,3	<0,0001
Инвалидность / Disable	М/М	8,0	7,1	11,1	>0,08
	Ж/F	2,4	2,2	3,4	>0,254
	Всего/Total	4,9	4,4	6,9	<0,044
Зарплата в месяц больше 30 000 руб. / Monthly salary more than 30,000 rub	М/М	18,4	20,4	10,7	<0,025
	Ж/F	9,6	9,7	9,4	>0,060
	Всего/Total	13,4	14,3	10,0	<0,006
Поведенческие факторы / Behavioral factors					
Употребление алкоголя / Alcohol consumption	М/М	40,7	42,9	33,3	<0,021
	Ж/F	26,9	29,6	17,3	<0,001
	Всего/Total	33,1	35,5	24,7	<0,001
Тяжелый курильщик / Heavy smoker	М/М	11,0	9,6	15,7	<0,046
	Ж/F	1,2	1,6	0,00	–
	Всего/Total	5,6	5,2	7,2	<0,052
Этнокультурные факторы / Ethnic-cultural factors					
Национальный вид спорта / National type of sport	М/М	7,4	9,2	1,3	<0,0001
	Ж/F	6,1	7,1	2,2	<0,008
	Всего	6,7	8,1	1,8	<0,0001
Экологические факторы / Ecologic factors					
Проблемы вывоза мусора / Garbage removal problems	М/М	19,3	20,6	15,0	>0,077
	Ж/F	26,8	29,0	19,0	<0,004
	Всего/Total	23,4	25,2	17,2	<0,001
Медико-социальные факторы / Medico-social factors					
Здоров / Healthy	М/М	62,9	68,3	43,4	<0,0001
	Ж/F	59,2	65,3	34,0	<0,0001
	Всего/Total	60,9	66,6	38,5	<0,0001
Имеет хронические заболевания / Have chronic diseases	М/М	29,8	25,5	45,6	<0,0001
	Ж/F	32,2	26,7	55,3	<0,0001
	Всего/Total	31,1	26,1	50,7	<0,0001
Плохое здоровье из-за плохого питания / Poor health due to poor nutrition	М/М	19,0	19,0	19,0	>0,543
	Ж/F	23,5	25,3	17,3	<0,015
	Всего/Total	21,5	22,5	18,1	<0,048
Из-за проблем экологии / Due to ecologic issues	М/М	21,2	24,0	11,1	<0,0001
	Ж/F	23,5	24,5	20,1	>0,130
	Всего/Total	22,4	24,3	16,0	<0,001

Ending of the table 2 / Окончание табл. 2

Факторы / Factors	Пол / Gender Всего / Total	Всего / Total N=1497: М/М=673 Ж/F=824 (%)	Трудоспособный возраст / Working-age group N=1165: М/М =520; Ж/F=645 (%)	Старшего трудоспособного возраста / Older working-age group N=332: М/М= 153; Ж/F=179 (%)	P
Медико-организационные факторы / Medical and health care management factors					
Врачебные амбулатории / Medical ambulatories	М/М	20,2	20,8	18,3	>0,293
	Ж/F	16,1	17,7	10,6	<0,013
	Всего/Total	18,0	19,1	14,2	<0,023
Старое медоборудование / Old medical equipment	М/М	14,7	15,0	13,7	>0,403
	Ж/F	19,4	21,2	12,8	<0,007
	Всего/Total	17,3	18,5	13,3	<0,015
Есть смартфон / Have a smartphone	М/М	78,5	83,7	60,8	<0,0001
	Ж/F	80,2	84,8	63,7	<0,0001
	Всего/Total	79,4	84,3	62,3	<0,0001
Одобрение телемедицины / Approval of telemedicine	М/М	36,8	40,6	24, 2	<0,001
	Ж/F	31,9	32,9	28,5	>0,173
	Всего/Total	34,1	36,3	26,5	<0,002
Эпидемиологический фактор / Epidemiological factor					
Болел/болею ТБ / Had/have the TB	М/М	20,4	19,8	22,2	>0,292
	Ж/F	7,2	5,9	11,7	<0,008
	Всего/Total	13,1	12,1	16,6	<0,023
Избегает контакта с ТБ / Avoid TB contact	М/М	64,8	64,8	64,7	>0,527
	Ж/F	65,0	67,8	55,3	<0,001
	Всего/Total	64,9	66,4	59,6	<0,013
Тесные родственные отношения / Close relative relations	М/М	34,2	34,2	34,0	>0,519
	Ж/F	31,1	29,5	36,9	<0,037
	Всего/Total	32,5	31,6	35,5	<0,099
Влияние традиций на ТБ / Influence of traditions on TB	М/М	57,4	54,0	68,6	<0,001
	Ж/F	51,1	49,1	58,1	<0,021
	Всего/Total	53,9	51,3	63,0	<0,0001

associated poor health with poor nutrition, especially the WA group as a whole and women at the same age, with a difference of 1.2 and 1.5 times in relation to the OWA group, respectively ($p < 0.048$ and $p < 0.015$). The association of poor health with environmental disturbance was reported predominantly by WA men ($p < 0.0001$) and WA respondents in general ($p < 0.001$).

Medical care by availability of outpatient clinics is less accessible to the OWA group than to the WA group, with a difference of 1.3 times ($p < 0.023$) overall and 1.7 times ($p < 0.013$) among women of the same age. Wear and tear of medical equipment in use was 1.4 times more often indicated by the WA group than the OWA group ($p < 0.015$), especially by women ($p < 0.007$). Telephone communication when a smartphone was less accessible to the OWA group than the WA group, with a difference of 1.4 times, both overall and among men and women ($p < 0.0001$). The use of telemedicine in health care was significantly more frequently endorsed by the WA group, especially men, than by the OWA group, with a difference of 1.4 and 1.8 times, respectively ($p < 0.002$ and $p < 0.0001$).

When assessing epidemiologic factors, past and present TB disease was indicated by more than 10% of respondents, mostly from the OWA group, especially women, with a difference of 2-fold ($p < 0.008$) among women in relation to the WA group and 1.3-fold ($p < 0.002$) among

participants overall. However, OWA women and the OWA group as a whole were less likely to avoid a TB patient relative, colleague, neighbor, acquaintance in order to "not offend" them ($p < 0.001$ and $p < 0.013$). They also indicate the influence of close family ties on the spread of TB in the population with a significant difference in relation to the WA group ($p < 0.037$ and $p < 0.099$). This group also recognizes the influence of traditions (weddings, funerals, etc.) on the rapid and massive spread of respiratory infections, especially during epidemics ($p < 0.0001$).

DISCUSSION

Our study, which correctly reflects the main characteristics of the general population by the method of conducting, is the first work on the study of the leading risk factors of SSID on the example of TB among the population of WA and OWA in a region with high population density and historical and cultural peculiarities. The findings confirm the high health vulnerability of the OWA population (fewer healthy people, more people with chronic diseases, TB) [10]. OWA people are also more vulnerable, especially women, socially and economically (more likely to be single, more likely to have a disability, less likely to earn money), and have less access to health care, including measures related to digital technologies (fewer people have smartphones that can be used to remotely monitor health care delivery). At the same time, the OWA population is more conservative, with less approval of the use of digital technologies in medicine, in particular telemedicine; they are more committed to national traditions with the preservation of close family ties, while realizing their negative role in the spread of SSID. Unexpectedly, we found a higher frequency of heavy smokers among OWA men than among WA men, which exacerbates the influence of the medical and social factor on the spread of SSID among them.

The leading risk factors for TB in the WA population are behavioral (alcohol use), nutritional (poor diet) and environmental. On the positive side, the WA population has higher earnings, especially for men, is more likely to participate in sports (national sports) and is more progressive (more likely to have modern digital gadgets, approve of telemedicine and recognize worn and old medical equipment).

CONCLUSION

During the period of implementation of the pension reform in Russia, in order to reduce the impact of socially significant infectious diseases on the quality of public health, it is necessary to take into account not only health problems in the population of older working age, but also the issues of their social and economical adaptation, conservatism and historical and cultural characteristics of the inhabitants of the regions. Attention should also be paid to behavioral, nutritional and environmental risk factors for the spread of socially significant infections (tuberculosis) among the population, especially among the working-age group.

ADDITIONAL INFORMATION

Author contribution. Thereby, all authors made a substantial contribution to the conception of the study, acquisition, analysis, interpretation of data for the work, drafting and revising the article, final approval of the version to be published and agree to be accountable for all aspects of the study.

Competing interests. The authors declare that they have no competing interests.

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ДОПОЛНИТЕЛЬНАЯ ИНФОРМАЦИЯ

Вклад авторов. Все авторы внесли существенный вклад в разработку концепции, проведение исследования и подготовку статьи, прочли и одобрили финальную версию перед публикацией.

Конфликт интересов. Авторы декларируют отсутствие явных и потенциальных конфликтов интересов, связанных с публикацией настоящей статьи.

Источник финансирования. Авторы заявляют об отсутствии внешнего финансирования при проведении исследования.

Информированное согласие на публикацию. Авторы получили письменное согласие анкетируемых на публикацию данных.

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