

EFFECT OF INCREASED RADIOACTIVE BACKGROUND ON QUALITY OF LIFE OF HEALTHY RESIDENTS IN MAILU-SUU AND CHRONIC OBSTRUCTIVE PULMONARY DISEASE PATIENTS

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The work was aimed at assessing the impact of increased radioactive background quality of life (QOL) of healthy residents of working age and patients with COPD living in Mailu-Suu, in the vicinity of which are located powerful uranium tailings. A survey was conducted on the MOS SF36 questionnaire and a clinical and functional examination of 70 employees of the electric-lamp factory (30 men and 40 women) and 42 patients with COPD with stage 1–3 disease registered in the FMC. Revealed a moderate decrease in some of the indicators of QOL in healthy workers and a significant decrease in patients with COPD, depending on the stage of the disease. The degree of decline in physical activity and general health directly and strongly correlated with lower indices of respiratory function, indicating an existing bronchial obstruction, which may be due to the pathogenic effect of environmental factors.

Keywords: Radiation, COPD, respiratory function, quality of life

It is known that working with uranium ore leads to the development of chronic obstructive pulmonary disease, lung cancer, and less often other localization of cancer [13]. The predominant lesion of the lungs is due to the high radon content in uranium mines, concentration plants, and near the tailings of radioactive waste. In France and Germany, a cross-analysis of the causes of death of each worker in the uranium production from 1946 to 1990 was conducted, and a significantly higher mortality rate from lung cancer was found in comparison with the whole country [13, 14]. Therefore, monitoring the health of residents of areas with high radioactive background is an important public health task.

Kyrgyzstan is one of the environmentally hazardous regions of the planet, on its relatively small area – 199.9 thousand km², with a population of 5.12 million people, there are 49 uranium tailings and 80 dumps of rocks, where 70 million m³ of uranium waste is buried [4]. The city of Mailu-Suu is located in a geochemical province with an increased radioactive background, in its vicinity there are the largest radioactive waste tailings in Central Asia, affecting the inhabitants living there [2, 3]. Earlier, scientists of Kyrgyzstan showed a high incidence of detection of chronic obstructive pulmonary disease (COPD) and lung cancer in local residents [6]. Laboratory studies, even in relatively healthy individuals living near the tailings of the uranium production, revealed significant violations of local cellular and molecular defense mechanisms [5, 15]. Similar changes have been identified in other provinces with an increased radioactive background [11].

Assessment of life's quality (ALQ) using questionnaires allows you to reliably quantify health in comparable population groups, both healthy people and patients with various chronic diseases, including COPD [8, 9, 10]. It is known that radiation adversely affects QOL [7].

In Kyrgyzstan, a number of studies have been published on the assessment of the quality of life in a particular pathology, however, especially for residents of areas with an elevated radioactive background, QL was not investigated.

The aim of the study was to study the quality of life of healthy residents of Mailu-Suu and patients with COPD in comparison with the clinical and functional examination.

Materials and research methods

Employees of the Mailusu Electrolamp Plant were examined for 40 women and 30 men of working age from 20 to 60 years, with an average age of 38.7 years. At the time of the survey (summer period), all workers were healthy. Of concomitant diseases, 8 people had a history of gastrointestinal pathology (chronic gastritis, cholecystitis), 5 had chronic bronchitis (all smokers), 3 had hypertension, 4 had gynecological pathology, 3 had urological pathology.

Also, 43 patients with COPD were surveyed – residents of Mailu-Suu in the stage of incomplete remission (summer period) under our supervision. Of these, 17 patients – with stage I, 16 – with stage II, and 10 – with stage III COPD (according to GOLD criteria, 2003).

The following research methods were applied:

- 1) Standard general clinical examination.
- 2) Study of respiratory function on the device Spirolan (Russia). FER was estimated by FEV1 – forced expiratory volume in the first

second, FVC – forced vital capacity of the lungs, PIC – peak expiratory flow rate. There was a frequency of violations of respiratory function as a percentage of the number surveyed.

3) Evaluation of QOL according to the general questionnaire of health – Medical Outcomes Study – Short Form (MOS SF-36). This questionnaire contains 36 questions covering 8 basic health characteristics.

The criteria for QOL for SF-36 are:

1. Physical activity (PA).
2. The role of physical problems in the limitation of vital activity (RF).
3. Pain (P).
4. General health (GH).
5. Social activity (SA).
6. The role of emotional problems in the limitation of vital activity (RE).
7. Mental Health (MH).
8. Comparison of well-being with the previous year (WB). By all measures the point of stability is 60.

The standards for QOL indicators for residents of the Kyrgyz Republic are 250 healthy respondents in Bishkek.

Statistical processing of research results was performed using generally accepted methods of variation and non-parametric statistics. We use Microsoft Excel, SPSS (“Statistic for Windows”) programs. Differences between the compared values were considered statistically significant at a significance level of $p < 0.05$.

Research results and discussion

Employees of the Maylisu electric lamp plant had a respiratory function close to those

characteristic of their age, sex, anthropometric type. Weakly marked disorders of respiratory function occurred with a frequency of 5.5–9.7%, mainly in male smokers (table 1).

In patients with COPD in the stage of incomplete remission, violations of the respiratory function were significantly more frequent. At the same time, the severity of violations of bronchial patency was greater than in healthy workers of MELZ (Table 2). Moderately and strongly marked disorders were observed only in patients with COPD.

Most of the indicators of QOL in healthy workers of the Mailu Suu electric lamp factory were slightly different from the age norm (figure).

At the same time, all indicators of QOL tended to decrease, but only PA, WB and GH were significantly lower (–7.4%, –6.0%, –7.9%, respectively). Sanitary and hygienic production conditions complied with the requirements in Kyrgyzstan. Wages allowed to feel confident, and therefore the indicators of ER and PZ did not differ significantly from the respondents in Bishkek.

In patients with COPD, the parameters of QOL depended on the stage of the disease. It is known that COPD is a continuously progressive disease.

At the first stage of COPD, the indicators of QOL were 10–15% lower than those of able-bodied residents living in the same area and exceeded stability points by 60%. This allowed them to lead a relatively free lifestyle, to work, not to feel bad in social and family life, to assess their emotional and psychological capabilities accordingly. Similar judgments are published by Russian scientists [1, 11].

Table 1

Frequency of detected violations of respiratory function (%) among workers of MELF and patients with COPD

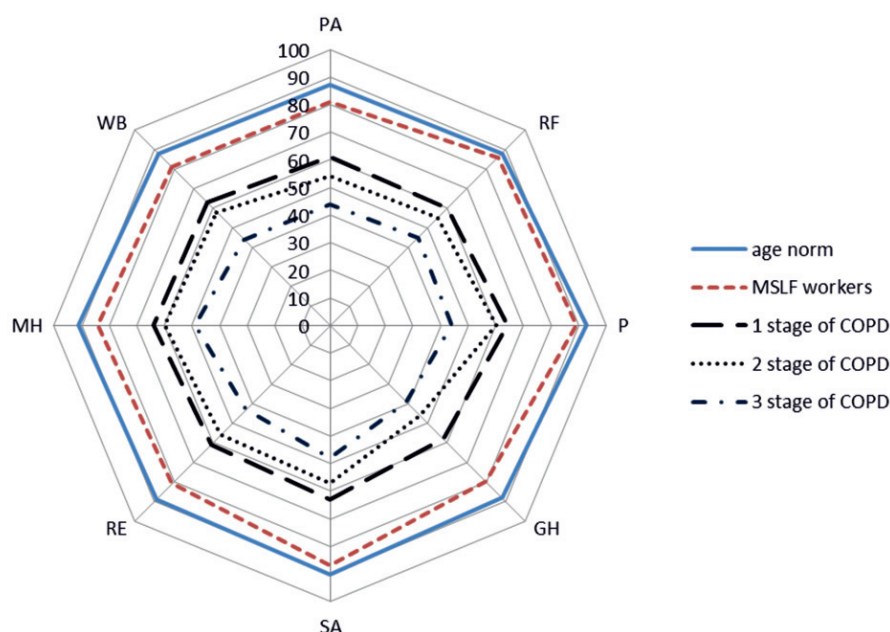
Group	FVC	FEV1	POS
COPD	17,3 ± 2,5 *	16,9 ± 2,5 *	25,8 ± 3,4*
Employees MELF	9,7 ± 3,0	5,5 ± 2,8	7,5 ± 3,4

Note: * – criterion of reliability of differences with a group of healthy individuals $p < 0.05$.

Table 2

Frequency of decrease in FEV1 (% of due) in workers of MELF and patients with COPD

Group	FEV1 (% of due)				
	>80	80-70	70-60	60-50	<50
COPD	82,4 ± 3,8	10,5 ± 2,9	2,8 ± 1,1	1,7 ± 1,1	1,2 ± 1,1
Employees MELF	93,5 ± 2,6	5,5 ± 2,8	0	0	0



Indicators of quality of life among residents of Mailu-Suu

In the second stage of COPD, QOL was below the stability point of 60%. apart from pain, the decline was due to malaise due to respiratory symptoms (despite a stable summer period for them), physical activity and limited mobility due to shortness of breath and the psychosocial effects of the disease (90% of them were not engaged in production and business).

At the third stage of COPD, residents of Mailu-Suu had pronounced restrictions on QOL, ranging from 43 to 54%, sometimes half the age norm.

The degree of decline in the levels of PA, OZ directly and strongly correlated with lower rates of LF, indicating an existing bronchial obstruction, which may be due to the pathogenic effect of environmental factors.

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