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Risk Estimation as An Element of Management Mechanism in System of Organization of Health Care and Public Health.

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ABSTRACT

Protection of health of military servicemen stays one of priorities of state policy of the Russian Federation. Reforms in our country reflected themselves on condition of health and quality of life of our population [1]. Major directions of health care are disclosed in "Concept of development of health care and medical science in the Russian Federation". The major task is the increase of quality of aid provided, rational use of resources. At contemporary stage the problem of military servicemen health protection is actual [2]. This problem is significant both for military servicemen by draft and by conditions of contract service. Numerous scientific researches are observing a high level of morbidity among military servicemen. More than a half of officer staff has chronic diseases that increase their professional suitability [3, 4]. Contemporary methods of research are applied in this research: sociological, hygienic, risk-metrical, bio-chemical, statistic. A research of risk-metrical estimation of system of indexes forming biomedical direction of military type of technogenesis was conducted for the first time. On basis of discriminant analysis the model of reproduction risk allowing to develop conditions of risk optimization was developed for the first time. For researched work 22 848 information units were collected and processed.

Keywords: military servicemen, professional risk, reproductive risk, discriminant model.

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INTRODUCTION

Selective researches among the adult population within last 20 years had detected a high spread of chronic non-infection diseases. Among them, cardiovascular, particularly ischemic heart disease and arterial hypertension, a wide spread of risk factors of these diseases development among population, connected to way of life, habits, nutrition, low medicine activity, low level of population awareness about factors, adversely impacting on its health, deficient readiness of population to sanitation of its way of life.

At present day one of the most acute problems of health care is a social-economic hazard of malignant growths. Charges for treatment of oncologic patients in Russia are 10% of all health care charges, 61% of them - for treatment of patients within last 6 months of their lives. It is necessary to develop efficient preventive anti-cancer measures with application of mass media abilities [3, 5].

Indexes of individual and cancerogenic risks are used for estimation of cancerogenic danger. Individual cancerogenic risk (ICR) is an estimation of probability of malignant growth development in exposed individual at impact of cancerogene within his life.

Population cancerogenic risk (PCR) is an anticipated frequency of effects among the whole population exposed to cancerogenic impact (established for year exposition) [7].

Preliminary and final estimation of professional risk (PR) are distinguished. Preliminary estimation of PR is the estimation of labor conditions at attestation of work places. Attestation of work places by labor conditions is the 1st stage of PR estimation. Further the Guidelines on estimation of professional risk for employees' health (Guidelines P 2.2—2003) are adhered to. Conducted researches established that 64% of officers of military air forces are related to healthy by the level of health, 15% of officers have chronic diseases [8]. Cardiovascular diseases are one of the major reasons of officer's retirement from service. It is established that smoking, exceed body mass for officers with pathology of cardiovascular system are found in 47%, 53%, 64% and 9% of cases respectively [9].

In recent years adverse tendencies in dynamic of reproductive health of population had emerged. One of the reasons is a low level of sexual education of population and, mainly, teenagers [10, 11]. Researches on studying of peculiarities of sexual-reproductive behavior of military servicemen were conducted [12,13]. Distinctive feature of sexual-reproductive behavior of military servicemen is the early beginning of sexual life (before age of 18 years) of 61.3% representatives of sterner sex [14, 15].

Researches had shown the growth of male sterility. The probability of erectile dysfunction among men is 28.0%, and in group of absolute risk it is 4.0%. For people of age over 40 the erectile dysfunction increases from 2.5 to 6 times.

In "Strategy of national security of the Russian Federation till year 2020", approved by the RF Presidential Decree of May 12, 2009, No. 537, the development of health care and provision of ecological safety are stated in a row of priorities of stable development as measures of management of leading risk factors for population's health. At this as major principles are considered amplification of preventive direction of health care, orientation at preservation of human health, improvement of family institute, protection of motherhood, fatherhood and childhood as a basis of society's vital activity.

The objective of research is a study of bio-medical risks forming in contemporary conditions of military type of technogenesis. In order to solve the set objective the following tasks were solved: to study professional risks among military servicemen with taking into account of service branch, contingent and medical-biological factors; to study cancerogenic risks forming in conditions of military type of technogenesis; to study reproduction risks among military servicemen with taking into account of distant effects of impact; to conduct statistic processing of data with application of methods of parametric and non-parametric statistics; construction of models on management of reproductive risk factors.

A research of risk-metrical estimation of system of indexes forming biomedical direction of military type of technogenesis was conducted for the first time.

On basis of discriminant analysis the model of reproduction risk allowing to develop conditions of risk optimization was developed for the first time.

For researched work 22 848 information units were collected and processed. Two major groups of control were formed: non-military (k1), common soldiers (k2), group of experiment: military servicemen at present time (o1), retired officers (o2). All surveyed were divided into age gradations: 1 gradation - 18-29 years, 2 gradation – 30-39 years, 3 gradation – 40-49 years, 4 gradation - 50-59 years, 5 gradation - 60-69 years, 6 gradation - older than 70 years. Pensionable employment gradations were taken into account: 1 gradation - up to 2 years 2 gradation - 3-9 years, 3 gradation - 10-19 years, 4 gradation - 20-29 years, 5 gradation - 30-39 years.

For processing of data by statistic method were selected programs SPSS and STATISTICA.

RESULTS

In contemporary conditions of military type of technogenesis, high levels of bio-medicine risk are forming.

Analysis of calculated cancerogenic risk had determined that in group of experiment (o1 and o2) risk levels are accurately higher than in group of control (Pearson's code 1.58, number of degrees of freedom 9, Kramer's test 0.504, correlation connection of medium degree). It is interesting to note that levels of cancerogenic risk in group of control are not minimal, which is the evidence of significant cancerogenic burden of all layers of employable population.

Comparative analysis of professional risk levels had detected accurate differences in groups of control and experiment, which is confirmed by data of statistic analysis (Pearson's code 1.094, number of degrees of freedom 18, Kramer's test 0.508, correlation connection of medium degree).

Group of control is also a subject to professional risk. Professional risk belongs to category of suggested in 15.8% of conclusion estimations. This arrangement is explained by the fact that representatives of group of control in conditions of their professional activity experience the impact of risks of professional genesis.

Indexes of reproductive risks were studied with taking into account of contingent groups, location of service, aspects of age and pensionable employment.

Indexes by reproductive risk are arranged in group of experiment in 1 pensionable employment gradation in the following manner: low level is 33.3%, medium level equals to 16.7%; high level is 50%. Arrangement of indexes in the same group but by the second pensionable employment gradation goes as follows: medium level of reproduction risk was detected in 82.4% and the high - in 17.6% of cases. This can be explained by processes of organism adaptation to factors of professional activity.

The level of testosterone hormone can serve as one of criteria of reproduction health condition. Studied indexes of testosterone in all age gradations show the exceeding of norm. Significant deviation of testosterone level from standards impacts the reproduction health negatively. Exceeding of standard data with taking into account of age gradations can serve as criterion of cancerogenic risk.

Estimation of reproduction risk in group of control/experiment allowed to determined that to Pearson's code corresponds 45.7/39.41; number of degrees of freedom 8/15, $\chi^2=0.000/0.001$, data differs accurately. By Kramer's test the connection is $CC=0.452/0.377$, which characterizes weak correlation connection.

Comparative data by correlation pleiades showed that an average level of impact on reproduction risk in group of experiment is caused by department participation of this group service.

By means of discriminant analysis was developed the model of factors that form reproduction risk among military servicemen. Factor of professional risk has an accurately high value of discriminant function.

Match of observed and calculated cases of belonging to one of groups is 83.8%, data are described in Table 1.

Table 1. Match of observed and calculated cases of belonging to one of groups of reproduction risk (in absolute and per cent proportions).

Value		Code of reproduction risk	Calculated				amount
			1	2	3	4	
Observed	abs.	1	50	3	0	53	50
	abs	2	5	72	15	92	5
	abs	3	1	9	49	59	1
	%	1	94.3	5.7	0.0	100.0	94.3
	%	2	5.4	78.3	16.3	100.0	5.4
	%	3	1.7	15.3	83.1	100.0	1.7

Force of factors' impact is determined by value of standardized coefficients (max. value = ±1).

Calculated values of centroids applied to reproduction risk have expression: for 1 group (low) – (-3.371), for 2 group (medium) - (0.714), for group 3 (high) - (1.837).

As an example of developed mechanism of management by this phenomenon can be stated recommendations on transfer from condition of high reproductive risk into condition of medium reproductive risk.

In order to transfer from group 3 (high) into group 2 (medium) is recommended to decrease the class of hazard and danger degree of labor conditions for 49% (i.e., transfer from dangerous level of labor conditions to the level of hazardous ones). In order to transfer from 2 group (medium level of risk) into group 1 (low level of risk) is recommended to decrease a dangerous level of labor conditions for 51% (i.e. to rise from hazardous level of labor conditions to permitted level).

CONCLUSIONS

In contemporary conditions of military type of technogenesis, high levels of bio-medicine risk are forming.

The formation of professional risks of military servicemen is accurately impacted by a complex of factors: cancerogenic risk, reproductive risk, labor conditions, type of service department of military servicemen, pensionable employment of military servicemen.

By means of discriminant analysis is constructed the model of reproductive risk allowing to develop mechanisms of risk factors management for military servicemen. Accuracy level of model is $P < 0.001$. Match of observed and calculated cases of belonging to one of groups is 83.8%. Management approaches of optimization (minimization) of risk factors among military servicemen are developed.

SUMMARY

Contemporary methods of research are applied in this research: sociological, hygienic, risk-metrical, bio-chemical, statistic.

A research of risk-metrical estimation of system of indexes forming biomedical direction of military type of technogenesis was conducted for the first time. On basis of discriminant analysis the model of reproduction risk allowing to develop conditions of risk optimization was developed for the first time.

For researched work 22 848 information units were selected and processed.

It is established that the formation of professional risks of military servicemen is accurately impacted by a complex of factors: cancerogenic risk, reproductive risk, labor conditions, type of service department of military servicemen, pensionable employment of military servicemen.

The dominating factor in developed model of reproductive risk is integral estimation of sanitary-hygiene conditions of attending the military service. By modeling this index the level of reproductive risk can be significantly reduced.

Modeling of detected factors of reproduction risk is a base for development of management solutions on minimization of reproductive risk in contemporary conditions of military type of technogenesis.

Analysis of health condition of military servicemen is conducted in interests of optimization of personnel medical support, supporting of high health level of military servicemen, decrease of morbidity level.

Contemporary information technologies are key factors for modernization. There are good reasons to implement the project of robotized system for easing or smoothing of professional hazards for military type of technogenesis.

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