

## MORBIDITY RATE OF COVID-19 AMONG THE EMERGENCY WARD WORKERS IN RYAZAN

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The biological factor is one of the leading adverse labor factors for medical workers. Establishing risk factors of exposure to COVID-19 within this occupational group is a relevant hygienic task. The purpose of the study is to examine the morbidity in coronavirus among the emergency ward workers and determine risk factors of occupational infection. The morbidity rate of COVID-19 among the emergency ward workers in Ryazan for 2020–2021 has been analyzed. The highest risk of COVID-19 infection was established for medical workers of mobile teams. The infection risks for drivers and medical workers were comparable. Comparative analysis of COVID-19 infection rates for drivers and employees of the ward not engaged in mobile teams confirms higher risks of infection of mobile team workers, including the ones who do not participate in provision of medical aid directly. High morbidity rates and statistically significant probability of a more severe course of the disease among mobile team medical workers as compared to drivers and employees not engaged in mobile teams are probably not accidental, and are due to a closer contact with a patient while providing medical aid and, as a consequence, a higher viral load that partially determines the disease severity. Emergency ward workers have a high occupational risk of exposure to COVID-19 during the pandemic. Mobile team medical workers and drivers are at higher risk of developing the novel coronavirus infection. Emergency care mobile team medical personnel are subjected to the highest risk of a more severe course of the disease.

**Keywords:** medical workers, emergency medical care, coronavirus infection, morbidity

**Funding:** the study was conducted under financial support of the Russian Foundation for Basic Research within scientific project No. 20–313–90005.

**Author contribution:** Bolobonkina TA — data collection and processing, preparation of the manuscript; Dementyev AA — development of the general concept and study design.

**Compliance with ethical standards:** the study was approved by the local ethics committee of the Ryazan State Medical University of the Ministry of Health of the Russian Federation (protocol No. 2 as of October 08, 2019).

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**Received:** 23.04.2022 **Accepted:** 27.05.2022 **Published online:** 30.06.2022

**DOI:** 10.24075/rbh.2022.045

## ЗАБОЛЕВАЕМОСТЬ COVID-19 РАБОТНИКОВ СТАНЦИИ СКОРОЙ МЕДИЦИНСКОЙ ПОМОЩИ ГОРОДА РЯЗАНИ

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Одним из ведущих неблагоприятных факторов труда медицинских работников является биологический фактор. Установление факторов риска заражения COVID-19 в этой профессиональной группе является актуальной гигиенической задачей. Целью данного исследования стали изучение заболеваемости коронавирусной инфекцией работников станции скорой медицинской помощи и определение факторов риска профессионального инфицирования. Выполнен анализ заболеваемости COVID-19 работников городской клинической станции скорой медицинской помощи города Рязани за 2020–2021 гг. Наиболее высокие риски инфицирования COVID-19 установлены среди медицинских работников выездных бригад. При этом риски заражения водителей были сопоставимы с рисками инфицирования медицинских работников. Сравнительный анализ показателей инфицирования COVID-19 водителей и сотрудников станции, не занятых в работе в выездных бригадах, подтверждает повышенные риски заражения работников выездных бригад, в том числе не принимающих непосредственного участия в оказании медицинской помощи. Высокая частота заболеваемости и достоверно большая вероятность более тяжелого течения болезни среди медицинских работников выездных бригад по сравнению с водителями и сотрудниками, не занятыми в работе в выездных бригадах, вероятно, носят не случайный характер, а обусловлена более тесным контактом с пациентом при оказании медицинской помощи и, как следствие, более высокой вирусной нагрузкой, отчасти определяющей тяжесть течения заболевания. Работники станций скорой медицинской помощи имеют высокий профессиональный риск инфицирования COVID-19 в условиях пандемии. Среди них к группам повышенного риска инфицирования новой коронавирусной инфекцией можно отнести медицинских работников выездных бригад и водителей. Наибольшему риску более тяжелого течения заболевания подвержен медицинский персонал выездных бригад скорой медицинской помощи.

**Ключевые слова:** медицинские работники, скорая медицинская помощь, коронавирусная инфекция, заболеваемость

**Финансирование:** исследование выполнено при финансовой поддержке РФФИ в рамках научного проекта № 20–313–90005.

**Вклад авторов:** Т. А. Болобонкина — сбор материала, обработка, подготовка рукописи; А. А. Дементьев — разработка общей концепции и дизайна исследования.

**Соблюдение этических стандартов:** исследование одобрено локальным этическим комитетом ФГБОУ ВО РязГМУ Минздрава России (протокол № 2 от 08.10.2019).

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**Статья поступила:** 23.04.2022 **Статья принята к печати:** 27.05.2022 **Опубликована онлайн:** 30.06.2022

**DOI:** 10.24075/rbh.2022.045

The spread of the new coronavirus infection produced a significant influence on the functioning of various areas of the society [1]. The disease has caused specific challenges for global healthcare aimed to mobilize all forces to struggle the pandemic and preserve all the functional resources to supply patients suffering from other pathologies with medical assistance.

Conditions of labor of emergency care medical workers commonly belong to a harmful class by the levels of hazards and risks [2, 3]. The biological factor that frequently determines the class of labor conditions leads among occupational hazards [4, 5]. In a number of studies, data on a wide range of bacterial load in indoor air of medical facilities have been obtained, occupational exposure of medical workers to the pathogens of tuberculosis, diphtheria, helicobacteriosis, cryptosporidiosis, parenteral viral hepatitis and HIV infection has been proven [6]. A higher risk of occupational infection was established for medical workers who can come in contact with infectious patients such as employees of infectious and antituberculosis institutions, medical workers who provide primary medical care, specialists providing urgent and emergency aid when reliable establishment of an infectious disease in a patient is not possible [7, 8].

An interrelation between occupational contacts with patients and development of infectious diseases in mobile team medical workers has been established [9, 10].

A number of COVID-19 infections continues to increase globally. A number of medical workers infected with SARS-CoV-2 is growing as well. Thus, identification of patterns and risk factors of exposure of emergency ward personnel to COVID-19 and scientific justification of preventive measures for the novel coronavirus infection within this occupational group belong to an essential hygienic task.

## MATERIALS AND METHODS

The conducted study was approved by the local ethics committee of the Ryazan State Medical University of the Ministry of Health of the Russian Federation (protocol No. 2 as of October 08, 2019). The study was conducted on the basis of the city clinical emergency ward in Ryazan with 637 employees including 385 mobile team medical workers (320 paramedics and 65 doctors) and 129 drivers of specialized vehicles. The morbidity of the novel coronavirus infection in 2020–2021 has been studied.

In the study, they used data from the log of infectious diseases (form No. 060/y) among employees of the city clinical emergency ward in Ryazan. Clinical diagnoses confirmed in a laboratory were regarded as a case of COVID-19 infection of emergency care mobile team medical workers. Laboratory research data confirming that the employee is infected with COVID-19 were represented with detection of the RNA virus in 67% of cases and serological samples in 33% of cases. The relative values were compared with Student's test ( $t$ ); the variables are presented as  $M \pm tm$  ( $M$  is the arithmetic average in absolute terms;  $m$  is the mean error of the arithmetic average;  $t$  is a significance test for the given sample size). When calculating a relative risk ( $RR$ ), the statistical significance of the effect produced by the factor on the outcome rate was calculated

using an aggregate estimation of the  $RR$  value (values exceeding 1 were regarded as significant) and 95% of confidence limits excluding 1 ( $p < 0.05$ ). Statistical processing was done with the Data Analysis add-in of *Microsoft Excel* 2007.

## STUDY RESULTS

Analysis data of new coronavirus infection cases among the workers of the city clinical emergency ward in Ryazan during the studied period are presented in table.

The highest COVID-19 infection rate was found among mobile team medical workers (table) and amounted to 15.97 cases per 100 employees. This is 1.2 times more than among drivers ( $p > 0.05$ ) and 3.0 times more than among employees not engaged in mobile teams ( $RR$  3.27 [1.88–5.72],  $p < 0.001$ ). Resuscitation team medical workers had a high relative risk of infection ( $RR$  3.10 [2.47–3.90],  $p < 0.05$ ) as compared to other teams. Infection rates of drivers were 2.48 times higher as compared with employees not engaged in mobile teams ( $RR$  2.70 [1.47–4.97],  $p < 0.001$ ). In 99.40% of cases, the diseases were mild and moderate. One very severe case with a lethal outcome was reported in a doctor of a general mobile team. Among mobile team medical workers, mortality was 1.30%. Meanwhile, diseases of moderate severity and hospitalizations were reported in 26.01 cases per 100 employees for mobile team medical workers, 2.90 cases per 100 employees for drivers, and 2.40 cases per 100 employees for those not engaged in mobile teams. In mobile team medical workers, a relative risk of a more severe course of COVID-19 was 8.84 [1.25–62.40] compared with drivers, and 10.66 [3.35–33.92] compared with employees not engaged in mobile teams.

It should be noted that the frequency of indoor exposure of the emergency ward mobile team medical personnel to the novel coronavirus was 4.46 cases per 100 employees being 9 times higher than under conditions not associated with an occupational activity ( $p = 0.0003$ ). Both patients with the coronavirus infection, and their infected colleagues were the sources of infection.

## DISCUSSION OF RESULTS

The highest risk of COVID-19 infection was found among mobile team medical workers. Significantly high COVID-19 morbidity rate among resuscitation team medical personnel was probably associated with the nature of the resuscitation medical manipulations provided by specialists. The manipulations are related to the procedures that can result in emission of SARS-CoV-2 containing aerosol from the respiratory tract of a patient into the occupational air and ensure patency of the upper respiratory tracts, artificial pulmonary ventilation and cardiovascular resuscitation [11, 12].

The risks of drivers' infection were correlated with the risks of infection of medical workers. It can be associated with a high density of calls during the pandemic accompanied with the long-term stay of infected patients in a small and relatively contained space of a vehicle with limited abilities of ventilation and air/surface decontamination. Comparative analysis of

**Table.** The morbidity rate of COVID-19 among the workers of the city clinical emergency ward in Ryazan

Employees	Number of employees	Absolute number of infections	Cases per 100 employees
Mobile team medical workers	385	123	15.97 [13.56–18.73]
Mobile team drivers	129	34	13.18 [9.59–17.85]
Employees not engaged in mobile teams	123	12	5.31 [3.06–9.05]

COVID-19 infection rates of drivers and ward employees not engaged in mobile teams confirms the high infection risk of mobile team workers, including those who don't participate in provision of medical aid directly.

High rate of morbidity and significantly large probability of a more severe course of the disease among mobile team medical workers as compared with drivers and employees not engaged in mobile teams are probably not accidental. It is due to a closer contact with a patient while providing medical assistance and, as a consequence, a higher viral load, partially determining the disease severity.

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## CONCLUSIONS

1. Emergency ward mobile team workers have a high risk of COVID-19 infection during the pandemic.
2. The highest risk of occupational infection is found among resuscitation team medical workers.
3. The risks for drivers' infection are compatible with those for mobile team medical workers.
4. Emergency care mobile team medical personnel are subjected to the highest risk of a more severe course of the disease.

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