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Оценка профессиональных рисков заражения гемоконтактными инфекциями для персонала стоматологического профиля

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АННОТАЦИЯ

Обоснование. Осведомлённость работников стоматологического профиля об эпидемиологии гемоконтактных инфекций (ВИЧ-инфекции, гепатитов В и С), а также знание алгоритма действий в случае аварийной ситуации на рабочем месте являются ключевым звеном в профилактике профессионального заражения данными заболеваниями.

Цель исследования — оценка информированности персонала стоматологического профиля о соблюдении алгоритма постэкспозиционной профилактики профессионального заражения гемоконтактными инфекциями и приверженности ему.

Материалы и методы. Выполнено наблюдательное многоцентровое одномоментное выборочное неконтролируемое исследование. Объекты исследования — медицинский персонал государственных и частных клиник стоматологического профиля г. Казани. Проведено анкетирование медицинского персонала в феврале–марте 2023 года (n=173). Определены доля аварийных ситуаций и их характер среди специалистов стоматологического профиля, а также рассчитана частота правильно выполненного алгоритма действий при возникновении аварийной ситуации. Оценена частота реализации мер по профилактике профессионального заражения гемоконтактными инфекциями. Категориальные данные были описаны с указанием абсолютных значений и процентных долей (%).

Результаты. Аварийные ситуации на рабочем месте встречались у 65 специалистов (65/173, 37,6%). Аварийные ситуации значимо чаще встречались среди женщин, чем среди мужчин: 44,7% (55/123) против 20,0%(10/50) соответственно (p=0,002). Последняя аварийная ситуация у 50 человек была связана с повреждением кожи (проколы или порезы), у 17 — с попаданием крови на слизистые оболочки (включая 2 человек со смешанным характером аварийной ситуации: повреждение кожи + попадание крови на слизистые). Местную обработку после аварийной ситуации правильно (согласно требуемому СанПиНом алгоритму) провели 18,0% при повреждении кожных покровов, 70,5% — при попадании крови на слизистые. После последней аварийной ситуации руководство оповестили чуть больше половины специалистов (38/65, 58,5%), запись в журнал регистрации аварийных ситуаций произвели треть опрошенных (23/65, 35,4%). При работе в стоматологическом кабинете почти все специалисты всегда используют перчатки (172/173, 99,4%). В отношении использования защитных очков или экранов всегда их используют 64,2% медицинских работников стоматологического профиля (111/173), не используют средства индивидуальной защиты глаз 9 человек (9/173, 5,2%). Остальные (53/173, 30,6%) надевают защитные очки / экраны только при выполнении определённых процедур. Большинство респондентов (147/173, 85,0%) вакцинированы против вирусного гепатита В, не привито 18 человек (18/173, 10,4%), 8 человек (8/173, 4,6%) не знают свой прививочный статус.

Заключение. Продемонстрирована необходимость повышения информированности специалистов стоматологических организаций в области эпидемиологии и профилактики гемоконтактных инфекций с целью снижения риска профессионального заражения этими инфекциями.

Ключевые слова: гемоконтактные инфекции; факторы риска; профессиональное воздействие; средства индивидуальной защиты; инфекционный контроль; аварийная ситуация.

Как цитировать

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Assessment of occupational risks of bloodborne infectious diseases for dental personnel

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ABSTRACT

BACKGROUND: Awareness of dental workers about the epidemiology of blood-borne infections (HIV, hepatitis B virus [HBV], and hepatitis C virus infections) and knowledge about actions to take if accidents occur in the workplace such as contact with blood and other biological fluids are a key link in the prevention of these infections.

AIMS: To assess awareness and adherence of dental personnel to the algorithm of postexposure prophylaxis of occupational infections with blood-borne pathogens.

MATERIALS AND METHODS: This descriptive crosssectional study enrolled the dental staff of public and private dental clinics in Kazan, Russia. A survey of 173 dental staff was conducted in February–March 2023. The rates of incidents caused by contact with blood and their nature among dental staff were determined, and the frequency of correctly performed algorithm of actions during an incident was calculated. The frequency of the implementation of measures for the prevention of occupational infections with blood-borne pathogens was estimated. Categorical data were described as absolute values and proportions (%).

RESULTS: In total, 65 specialists (37.6%) had encountered incidents such as contact with blood at the workplace. These incidents were significantly more common among women than among men: 44.7% (55/123) vs. 20.0% (10/50), respectively (p=0.002). The last incident in 50 respondents was associated with skin damage (needlestick injury or cut exposure); in 17 participants, their mucous membranes were exposed to blood (including two people with a mixed characteristic of incident: skin damage + exposure of their mucous membranes to blood). After contact with blood, local treatment was carried out correctly (according to Russian recommendations) in 18.0% of the participants with skin damage and 70.5% with blood exposure to mucous membranes. After the incident, 58.5% of the participants (38/65) reported to the head of the department or clinic, and a third of the respondents (23/65, 35.4%) recorded a case of contact with blood in the incident log. Nearly all respondents always use gloves (172/173, 99.4%) when they work in the dental office. Moreover, 64.2% of the respondents (111/173) always use safety glasses or screens. Nine respondents (9/173, 5.2%) do not use personal eye protection. Others (53/173, 30.6%) wear safety glasses/screens only when performing certain procedures. In addition, 85.0% (147/173) of the respondents have been vaccinated against HBV, 18 have not been vaccinated (10.4%), and 8 (4.6%) do not know their vaccination status.

CONCLUSIONS: The results of this study present the necessity of raising awareness among dental staff regarding the epidemiology and prevention of blood-borne infections to reduce the risk of occupational infections.

Keywords: blood-borne pathogens; risk factors; occupational exposure; protective clothing; infection control; needlestick injuries.

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BACKGROUND

The activity of specialists in dental organisations, as well as other medical workers, is associated with a number of occupational risks, including the risk of infection with haemocontact infections (HIV infection, viral hepatitis B and C) [1, 2]. When providing dental care, an emergency situation may occur at the workplace when there is contact with blood and/or other biological fluids of the patient due to their penetration under the skin during cuts and punctures, on mucous membranes or damaged skin. For example, in a study conducted in Saudi Arabia, three out of ten dental assistants (29.8%, 95% confidence interval (CI) 25.6–34.2%) had a history of at least one episode of puncture or cut in the course of their professional duties [3].

The incidence of haemocontact infection depends largely on the nature of the procedure performed and the severity of the exposure. Overall, the risk of HIV infection after needle puncture is estimated to be approximately 0.3% (95% CI 0.2–0.5%) [4], and approximately 0.09% (95% CI 0.006–0.5%) after exposure to infected blood on mucous membranes [5]. The risk of infection with viral hepatitis B (HBV) and C (HCV) after percutaneous exposure to a contaminated needle is slightly higher than the risk of HIV infection. Thus, the probability of hepatitis C virus infection, according to the results of various studies, ranged from 1.2 to 10% [6–8]. The risk of developing manifest acute viral hepatitis B is 22–31% if HBsAg and HBeAg-positive blood has been exposed, and 1–6% if HBsAg-positive, HBeAg-negative patient's blood has been exposed [9].

The main means to actually protect health care workers are HBV vaccination, antiretroviral drugs and personal protective equipment [10, 11].

Awareness of the epidemiology of haemocontact infections (HIV infection, viral hepatitis B and C) and knowledge of the algorithm of actions in case of an emergency situation at the workplace are key links in the prevention of occupational infection.

The aim of the study was to assess the awareness of dental personnel about and adherence to the algorithm of post-exposure prophylaxis of occupational haemocontact infection.

MATERIALS AND METHODS

Study design

An observational multicentre single-measurement randomised uncontrolled trial was conducted.

Eligibility criteria

The inclusion criteria for the study were:

- age of respondents — 18 years and older;
- work in a medical organisation providing dental care to the population;
- accommodation in Kazan.

For this type of study, completion of a formal consent form was not required, and participants' answers to the questionnaire and its return (if printed forms were distributed) were regarded as consent to participate in the study.

Terms and conditions of the event

A questionnaire survey of medical personnel of dental profile of public and private clinics in Kazan was conducted. Kazan. Since many specialists combine their work in different medical organisations, the organisation of preventive measures was assessed in relation to the main place of work (for the purpose of possible subgroup analysis). The return rate of printed questionnaire forms was 95%.

Duration of the study

The questionnaire survey of dental professionals was conducted in February-March 2023.

Description of the medical intervention

Anonymous questionnaire survey of specialists of dental organisations was conducted in a mixed format (using Google Forms service and by distributing printed questionnaire forms in medical organisations).

The questionnaire consists of 4 main blocks. The first block includes questions concerning the frequency of emergencies at the workplace and their nature. The questions of the second block allow assessing the correctness of actions taken in case of an emergency that occurred in the course of labour activity of the questionnaire respondents. The third block includes questions assessing the level of knowledge on prevention of occupational infection with haemocontact infections. The fourth block is the passport part, including information on gender, age, speciality, length of service and place of work.

Study outcomes

Main outcome of the study

The proportion of emergencies and their nature among specialists of dental organisations in Kazan was determined, and the frequency of correctly executed algorithm of actions in case of emergency was calculated. Correctness of local treatment of damaged skin or mucosa was assessed according to sanitary rules and regulations SanPiN 3.3686-21 "Sanitary and Epidemiological Requirements for the Prevention of Infectious Diseases".

Additional study outcomes

Measures taken to prevent occupational haemocontact infections (briefings, availability of instructions and wound care stowage at the workplace, vaccination against viral hepatitis B, use of personal protective equipment, etc.) were evaluated.

Subgroup analyses

A comparative analysis of the correctness of local treatment of wounds or mucous membranes after an emergency depending on gender, position, place of work and briefing (on the algorithm of actions in case of emergency) was carried out.

Methods of recording outcomes

A questionnaire developed by the authors was used to record outcomes. The questionnaire was prepared in accordance with the requirements of sociological science for questionnaires [12].

Ethical expertise

The article was approved by the Local Ethical Committee of the Federal State Budgetary Educational Institution of Higher Professional Education "Kazan State Medical University" of the Ministry of Health of Russia, Minutes No. 6 of 20 June 2023.

Statistical analysis

Principles of sample size calculation

The sample size was not pre-calculated. The sample for the questionnaire survey was formed by the "snowball" method.

Methods of statistical analysis of data

Questionnaire results were processed using Microsoft Office Excel 2016 (USA) and Jamovi 2.3.2. Categorical data were described with absolute values and percentages (%). Quantitative data did not follow a normal distribution, so they were presented as median (Me), lower and upper quartiles [Q1–Q3]. Comparative analysis of the two groups on quantitative index was performed using Mann-Whitney U-criterion. Comparison of percentages in the analysis of four-field conjugation tables was performed using Fisher's exact criterion (for values of the expected phenomenon less than 10) or Pearson's χ^2 criterion (for values of the expected phenomenon 10 and more).

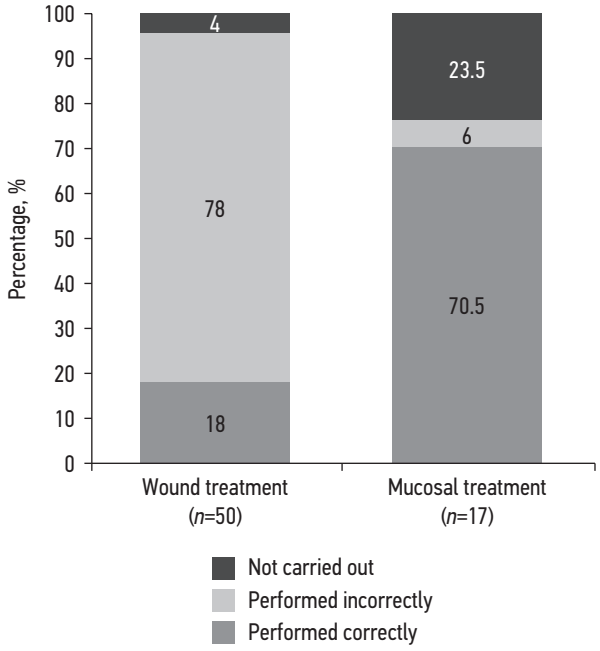

Fig. 1. The correctness of performing local wound treatment (in case of skin damage) or mucous membranes after the last emergency at work, %.

RESULTS

Objects (participants) of the study

173 dental specialists took part in the survey: 66.5% were doctors (50 general dentists, 31 orthopaedic dentists, 24 dental surgeons, 5 periodontists, 4 orthodontists, 1 paediatric dentist) and 33.5% were nurses (49 dental assistants and 9 dental nurses). There were 50 males (28.9%) and 123 females (71.1%). The age of respondents ranged from 20 to 73 years, Me age was 28 years [Q1–Q3=23–42 years], Me work experience was 5 years [Q1–Q3=2–15 years], min was 3 months and max was 45 years. The main place of work for 106 interviewed specialists (61.3%) is a private clinic, for the rest (67 people, 38.7%) — a state medical organisation.

The main results of the study

Workplace emergencies occurred in 65 dental professionals (65/173, 37.6%) and were mainly accompanied by skin damage from punctures and cuts (40/173, 23.1%). Spillage of biological fluids on mucous membranes (eyes, nose, mouth) was recorded in 10 questioned workers (10/173, 5.8%). The other 15 persons (15/173, 8.7%) had both skin and mucous membrane accidents. Consequently, 31.8% (55/173) of respondents had a history of accidents with skin damage from contaminated needles or instruments and 14.4% (25/173) with mucous membranes (eyes, nose, mouth) contaminated with biological fluids.

Accidents were significantly more common among women than men: 44.7% (55/123) vs. 20.0% (10/50), respectively (p=0.002). Among the victims, 61.5% (40/65) had crashes more than once. In 2/3 of the respondents with crashes, they occurred within the last year (42/65, 64.6%).

In terms of the nature of accidents, skin punctures with contaminated needles or instruments prevailed (51/65, 78.5%). The penetration of potentially infected material on the mucous membrane of the eyes was noted by 21 respondents (32.3%), cuts — by 14 respondents (21.5%). Spillage of blood and other biological fluids on damaged skin was reported by 8 respondents (12.3%), on oral mucosa by 5 (7.7%), and on nasal mucosa by 4 (6.2%).

In 76.9 per cent (50/65) of those who had workplace emergencies, the most recent emergency was associated with skin damage (punctures or cuts), and in 26.2 per cent (17/65) with blood on mucous membranes. In addition, 2 people out of 65 reported mixed emergencies (skin and mucous membranes).

We also evaluated the actions of medical workers after the last emergency. The results of the assessment of the correctness of local treatment after the emergency are presented in Fig. 1.

The percentage of persons with correctly performed algorithm of local wound or mucosal treatment after an emergency is presented in Table 1. The correctness of local wound and mucous membrane treatment after an emergency did not depend on gender, position, place of work and briefing

Table 1. The correctness of performing local wound treatment (in case of skin damage) or mucous membranes after the last emergency, depending on gender, position, place of work and instructing

Characteristics	Correct execution of local wound care (*n*=50)		Correct topical treatment of mucous membrane contact (*n*=17)	
	% (abs.)	*p*	% (abs.)	*p*
Paul:				
male	25.0% (2/8)	0.574	66.7% (2/3)	0.869
female	16.7% (7/42)		71.4 (10/14)	
Position:				
doctors	16.7% (5/30)	0.764	69.2% (9/13)	0.825
nursing staff	20.0% (4/20)		75.0% (3/4)	
Place of employment:				
public clinics	18.2% (4/22)	0.976	75.0% (6/8)	0.707
private clinics	17.9% (5/28)		66.7% (6/9)	
Instruction:				
previously conducted	19.0% (8/42)	0.659	76.9% (10/13)	0.301
dormant	12.5% (1/8)		50% (2/4)	
Work experience:				
up to 3 years	26.7% (4/15)	0.296	83.3% (5/6)	0.394
3 years or more	14.3% (5/35)		63.6% (7/11)	

(on the algorithm of actions in case of an emergency). The Me age of the specialists who correctly performed local wound treatment was slightly lower than the Me age of the workers who did not correctly perform local wound treatment or did not perform it at all: 30 years [Q1–Q3=22–46 years] and 36 years [Q1–Q3=22–50 years], respectively; however, the differences were insignificant (p=0.979). Correctness of local mucosal treatment after an emergency was also independent of age (p=0.874).

As can be seen from the table presented, none of the factors analysed had an effect on the quality of skin or mucosal treatments.

After the last emergency, management was notified by just over half of the specialists (38/65, 58.5 per cent), while a third of the respondents (23/65, 35.4 per cent) made an entry in the emergency logbook.

Only 1 person (1/65, 1.5%) was fully tested for HIV infection and viral hepatitis B and C after the last emergency (as required by SanPiN 3.3686-21). Four people (4/65, 6.2%) were examined on the day of the emergency, 13 (13/65, 20%) 3 months after the emergency, 13 (13/65, 20%) 6 months after the emergency, and 5 (5/65, 7.7%) 1 year later. 27.7% of respondents (18/65) were not examined at all. Among those with a history of an accident, 26 indicated that they were routinely tested for haemocontact infections regardless of AS (26/65, 40.0%).

After the emergency, 29.2% of professionals (19/65) were interested in information about the presence of viral hepatitis and sexually transmitted infections in the patient, 10.8% (7/65) were interested in whether the patient had injected drugs, and 20% (13/65) were interested in the results of the patient's examination for HIV infection and viral hepatitis. After the emergency, 10.8% (7/65) of health care workers did not inquire about the possible presence of haemocontact infections in the patient. The rest of the health care workers (33/65, 50.8%) noted that they always collected a history of haemocontact infections before seeing a patient.

After the emergency, 23.1% (15/65) went to the AIDS prevention and control centre. Pregnancy testing was recommended for 2 women out of 55 emergency victims (3.6 per cent); 1 woman was tested.

Additional findings from the study

The majority of health care workers (159/173, 91.9%) know who to contact in case of emergency. 6 workers (6/173, 3.5%) answered that they do not have a responsible person for emergency situations. 8 people (8/173, 4.6%) do not know who to contact in the medical organisation after an emergency.

Briefing on the algorithm of actions in case of emergency was conducted in 83.2% of the surveyed specialists. Briefing among doctors was conducted slightly more often than

among nurses (86 and 77%, respectively), but the differences were insignificant (p=0.158). Analysis of the frequency of briefing depending on the place of work showed that briefing was more frequent in public dental organisations than in private clinics (94% vs. 76%, respectively, p=0.003).

10.4% (18/173) of respondents do not know where to see the algorithm of actions after an emergency. 44.5% (77/173) of respondents reported that this information can be found in the instructions posted at the workplace, 17.9% (31/173) — in the standard operating procedure (SOP). 19.1% of personnel (33/173) hope to find the algorithm of actions in sanitary rules. The rest (14/173, 8.1%) noted that this information is available "in clinical recommendations", "in methodological recommendations", "on the Internet".

91.3% of respondents (158/173) are aware of the availability of wound care pads in the office. 7 people (7/173, 4.1%) reported the absence of a wound care pad, and 8 respondents (8/173, 4.6%) did not know if and where such a pad was located in their medical organisation.

When working in the dental office, almost all specialists always use gloves (172/173, 99.4%), only 1 person (0.6%) noted that he/she allows working without gloves with acquaintances.

Regarding the use of protective goggles or screens at work, 64.2% (111/173) of dental health workers noted that they always use them. Nine people (9/173, 5.2%) do not use personal eye protection. The rest (53/173, 30.6%) wear protective goggles/screens only when performing certain procedures, such as those involving aerosol formation (professional oral hygiene, polishing of surfaces, endo-treatment, surgeries, tooth extraction, etc.).

The majority of respondents (147/173, 85.0%) are vaccinated against HBV, 18 people (18/173, 10.4%) are not vaccinated. 8 people (8/173, 4.6%) do not know their vaccination status. Among those vaccinated against HBV, the majority (105/147, 71.4%) were vaccinated in childhood, 6.8% of respondents (10/147) were vaccinated before starting their professional activity, 21.8% (32/147) were vaccinated in the course of their labour activity. It should be noted that among those who were vaccinated against viral hepatitis B in childhood, about one third of the respondents (33 out of 105) also had a booster dose before/in the process of labour activity.

Undesirable events

Didn't register.

DISCUSSION

Summary of the main result of the study

Accidents at the workplace of dental specialists are quite common: one third (65/173, 37.6%) of respondents had a history of AS, including 31.8% (55/173) of respondents with skin punctures with contaminated needles or instruments and 14.4% (25/173) with penetration of biological fluids on mucous membranes (eyes, nose, mouth).

The last emergency in 50 people was associated with skin damage (punctures or cuts), in 17 people — with blood on mucous membranes (including 2 people with mixed AS: skin damage + blood on mucous membranes). Local treatment after an emergency was performed correctly (according to the algorithm required by SanPiN) by 18.0% in case of skin damage and 70.5% in case of blood on mucous membranes. Correctness of local treatment of wounds and mucous membranes after AC did not depend on age, sex, position, place of work and briefing. After the last accident, the management was notified by slightly more than half of the specialists (58.5%), and only in 35.4% of cases an entry was made in the emergency logbook.

Discussion of the main result of the study

Similar results were obtained by foreign scientists when analysing the frequency of accidents (puncture and cut injuries) among dental personnel [3, 13, 14].

We identified under-reporting of emergencies: only half of the cases were reported to management and only one third were recorded in the AC logbook. A similar situation was demonstrated in studies conducted in Australia [15], Jordan [16], Pakistan [17, 18], Saudi Arabia [3].

The epidemiological situation of HIV infection in the Russian Federation (RF) continues to be unstable, with the prevalence rate increasing annually. At the end of 2022. 0.8% of the total Russian population and 1.4% of the population aged 15–49 years were living with HIV infection. Despite a decrease in the incidence of acute forms of viral hepatitis B and C, a high incidence of chronic viral hepatitis continues to be registered in the Russian Federation. Thus, in 2022, the incidence of chronic viral hepatitis B was 6.37 cases per 100,000 population, chronic viral hepatitis C — 23.2 cases per 100,000 population. It should also be noted that in 2022, 5 cases of occupational infection of health care workers with viral hepatitis C were registered in the Russian Federation [19]. Consequently, the implementation of non-specific and specific post-exposure prophylaxis of haemocontact infections is an important measure to protect the health of medical personnel, including those who provide dental care to the population.

Vaccine prophylaxis against viral hepatitis B and the use of antiretroviral drugs are the most effective in managing the risks of haemocontact infections [10]. In our study, the majority of respondents were vaccinated against viral hepatitis B (85%), which is comparable to the data of foreign studies [3, 18, 20].

The means of non-specific prevention include the use of barrier means of protection and the formation of adherence to the algorithm of actions in the event of an emergency [10]. We positively assess the fact of using medical gloves revealed by almost all respondents. The frequency of use of protective goggles / screens is lower. It is disturbing that 9 people

out of the respondents (5.2%) do not use personal eye protection at all. This creates conditions for an emergency situation at the workplace. This problem persists in other countries where the level of compliance with eye protection requirements has been insufficient among practitioners in dental organisations [3, 21–24].

According to the results of our study, local wound treatment after skin injury in the majority of respondents did not comply with the procedure recommended by SanPiN 3.3686-21. In case of mucous membranes, the majority of dental health workers performed the algorithm of actions correctly, which is probably due to its simplicity. We also compared the correctness of local treatment of wounds and mucous membranes depending on age, sex, position, place of work and briefing and obtained statistically insignificant results, which is probably due to the small sample size (50 people with skin injuries, 17 — with penetration of biological fluids on mucous membranes). However, it should be noted that among those who had been instructed and had up to 3 years of experience, the proportion of cases with correct local treatment was higher than in the groups of persons who had not been instructed and had 3 or more years of experience. Therefore, regular safety briefings among health care workers and training at refresher courses are still relevant.

Limitations of the study

When planning and conducting the survey, the sample size to achieve the required statistical power of the results was not calculated. The survey was conducted also in online format. Accordingly, we do not know the true value of the percentage of questionnaires "returned". Therefore, we cannot completely rule out the presence of systematic selection error. Another limitation of the study is that the data on AS were obtained using questionnaires, were based on self-reporting and were not compared with medical records.

CONCLUSION

The algorithm of actions in case of an emergency is not fully implemented by dental personnel. Consequently, the risk of occupational exposure to haemocontact infections, particularly among those who are not vaccinated against viral hepatitis B, cannot be ruled out. Our results demonstrate the need to raise the awareness of dental professionals about the epidemiology and prevention of haemocontact infections in order to reduce the risk of occupational exposure to these infections.

ADDITIONAL INFORMATION

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Authors' contribution. All authors made a substantial contribution to the conception of the work, acquisition, analysis, interpretation of data for the work, drafting and revising the work, final approval of the version to be published and agree to be accountable for all aspects of the work. S.T. Agliullina — study design, literature analysis, statistical analysis and its interpretation, writing the text of the article, discussion of the manuscript; G.R. Khasanova — study design, editing the text, approval of the final version of the article; A.I. Ganieva — analysis of literary data, creation of a database, collection of material, statistical analysis and its interpretation, writing the text of the article; E.R. Askarova — study design, collection of material, discussion of the manuscript; L.R. Shakirova — collection of material, discussion of the manuscript; I.R. Bilalov — study design, collection of material, discussion of the manuscript.

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