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Occupational risks in the vaccination room and its implications for the health of the nursing workers

Riscos ocupacionais na sala de vacinação e suas implicações à saúde do trabalhador de enfermagem

Riesgos laborales en la sala de vacunación y sus implicaciones para la salud del trabajador de enfermería

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ABSTRACT
Objective: to analyze the association between occupational risks and damages related to nursing work in the vaccination room. **Method:** analytical cross-sectional study conducted in the vaccination rooms of primary health care units in the city of Rio de Janeiro between June and July 2017, with 171 nursing workers. An instrument was used with information on sociodemographic, occupational and occupational risk data and the Work-Related Damage Assessment Scale. The study was approved by the research ethics committee. **Results:** occupational exposure to physical and ergonomic risk were associated with all forms of illness investigated, while exposure to mechanical risk to forms of illness related to Physical and Psychological Damage Exposure to chemical risk was associated to physical illness. **Conclusion:** the working conditions to which nursing professionals are exposed in vaccination room, expressed in occupational risks, negatively affect their health.
Descriptors: Occupational Diseases; Occupational Health; Nursing; Vaccination**.**

RESUMO
Objetivo: analisar a associação entre os riscos ocupacionais e os danos relacionados ao trabalho de enfermagem em sala de vacinação. **Método:** estudo transversal analítico realizado em salas de vacinação de unidades de atenção primária à saúde entre junho e julho de 2017, com 171 trabalhadores de enfermagem. Utilizou-se um instrumento com informações sobre dados sociodemográficos, laborais e riscos ocupacionais e a Escala de Avaliação dos Danos Relacionados ao Trabalho. Estudo aprovado pelo Comitê de Ética em Pesquisa. **Resultados:** a exposição ocupacional aos riscos físico e ergonômico esteve associada a todas as formas de adoecimento investigadas, enquanto que a exposição ao risco mecânico às formas de adoecimento relacionadas aos danos físicos e psicológicos. A exposição ao risco químico associou-se ao adoecimento físico. **Conclusão:** as condições de trabalho a que os profissionais da enfermagem são expostos nas salas de vacinação, expressadas em riscos ocupacionais, são associadas a danos à sua saúde.
Descritores: Doenças Ocupacionais; Saúde do Trabalhador; Enfermagem; Vacinação**.**

RESUMEN
Objetivo: analizar la asociación entre riesgos laborales y daños relacionados con el trabajo de enfermería en la sala de vacunación. **Método:** estudio transversal analítico realizado en las salas de vacunación de las unidades de atención primaria de salud de la ciudad de Río de Janeiro entre junio y julio de 2017, con 171 trabajadores de enfermería. Se utilizó un instrumento con información sobre datos sociodemográficos, laborales y de riesgos laborales y la Escala de evaluación de daños relacionados con el trabajo. El estudio fue aprobado por el comité de ética de investigación. **Resultados:** la exposición ocupacional al riesgo físico y ergonómico se asoció con todas las formas de enfermedad investigadas, mientras que la exposición al riesgo mecánico a las formas de enfermedad relacionadas con el daño físico y psicológico La exposición al riesgo químico se asoció a la enfermedad física. **Conclusión:** las condiciones de trabajo a las que están expuestos los profesionales de enfermería en la sala de vacunación, expresados en riesgos laborales, afectan negativamente su salud.
Descriptores: Enfermedades Profesionales; Salud Ocupacional; Enfermería; Vacunación**.**

INTRODUCTION

Work can be a potentiating factor of quality of life, in the sense that it generates satisfaction, favoring self-esteem, emotional balance, and social and financial recognition; conversely, it can be a source of health damages due to the work activity itself and to the environment where it takes place[1]. Most of the times, it is observed that the work environment is endowed with occupational risks that can cause harms to the health and physical integrity of the workers due to their nature, susceptibility to them, intensity, length of exposure, and concentration, contributing to the occurrence of work accidents, procedure errors, and occupational diseases[2].

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From a more innovative perspective, supported by the Brazilian legislation, occupational risks are understood as the possibility that some element or circumstance in the environment or in the work process may cause harms to health, either because of illness, accident, or suffering in the worker[3]. These risks are classified into physical, chemical, biological, ergonomic and psychosocial, mechanical, and accident risks[4].

A number of studies[5-7] showed that the health care professionals are often exposed to diverse occupational risks due to the activities inherent to their profession. Of the professional categories of the health sector, the nursing personnel is signaled as the most exposed to risks because they maintain frequent direct contact with the patients[8,9].

Several research studies focused on the occupational risks among nursing professionals are predominant in the medium- and high- complexity health care modalities. However, in the different nursing work settings, the workers are exposed to several risk factors and workloads that can compromise their health[3].

Within this perspective, occupational risks are also present in Primary Health Care (PHC), but with different risk factors[5]. In the PHC context, the Vaccination Room (VR)[10], research setting of this scientific investigation, is one of the essential items in the structure required to offer basic health care actions.

Unlike other countries, Brazil has implemented the National Immunization Program (*Programa Nacional de Imunização*, PNI) in its public health network, which is developed through the VRs, areas exclusively intended for the administration of the immunobiological agents[11]. The work process in these facilities is dynamic and complex due to the constant need for updating knowledge on vaccination, confirmed by the several changes in the vaccination schedule, with the incorporation of new vaccines, and changes in the recommended age groups for certain immunobiological agents, resulting in constant changes in the recommendations[12].

Despite acknowledgment of the worker's health risks and harms related to this work environment, there are still few scientific productions on this theme[13], both in Brazil and abroad. In the international scenario, the scarcity of scientific publications can be justified by the absence of VRs or a similar modality, in contrast to the Brazilian reality. Given the complexity of working in VRs, it is worth highlighting the importance of research studies that address the occupational risks in this work context, which is an exclusive domain of nursing.

A multi-center study[14] conducted with nursing technicians working in PHC units in the South, North, and Mid-West regions of Brazil, identified aspects that increase the workloads for these professionals, such as low monthly remunerations, lack of material resources to provide care, work overload, physical suffering, interpersonal relationships, and scarcity of human resources.

In this sense, PHC professionals working in a municipality in Rio Grande do Sul evaluated as a severe illness risk the number of human resources for the execution of tasks, as well as the working conditions, which were classified as critical for this risk[15].

Since VRs are inserted in the PHC work context, their reality is similar to the previously presented data. Thus, the interest in the theme arises from the belief that the occupational risks also trespass the work environment of the VRs, with the possibility of having a direct negative effect on the health-disease process of the nursing workers in the sector. Therefore, this study contributes with the scientific production on the occupational risks in the work environment of the VRs in PHC, in contrast to the generally addressed theme which focuses on the hospital setting.

In view of the foregoing, the study aimed to analyze the association between the occupational risks and the damages related to the nursing work in the vaccination room.

METHOD

This is a cross-sectional analytical study conducted in the VRs of the PHC units in programmatic areas in the municipality of Rio de Janeiro, Brazil.

For sampling, the inclusion criterion adopted was being a nursing professional working in a VR; conversely, the exclusion criteria were the following: being off-duty because of a special leave, sick leave not related to occupational diseases or work accidents, or vacation at the time of data collection. The target population included 196 nursing workers; two of whom participated in the pre-test (data not considered in the analyses) and, since eight refused to participate, the total losses were 10, in addition to 15 exclusions according to the pre-established criteria. The sample consisted of 23 nurses, 115 nursing technicians, and 33 nursing assistants, totaling 171 participants, which represents an adherence rate of 87.2%.

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Data collection took place between June and July 2017, and was conducted by the lead researcher. The workers who met the inclusion criteria were individually contacted in their workplace. The researcher availed the workers a self-administered data collection instrument in an unidentified envelope. When the workers were absent from the unit for any reason, they were contacted to schedule another meeting.

The self-constructed instrument contained information related to the sociodemographic, working, and occupational risks data, with objective questions and options to record the existing occupational risks indicated by the workers in the context of the VRs. Work-related damages were assessed using the Work-Related Damage Assessment Scale (*Escala de Avaliação dos Danos Relacionados ao Trabalho*, EADRT), which is part of the Inventory on Work and Illness Risks (*Inventário sobre o Trabalho e Riscos de Adoecimento*, ITRA).

The ITRA measures the different and interdependent modalities of the respondents' representations related to the world of work. It was created and validated by Mendes and Ferreira in 2003, with 5,437 workers of public federal companies in the Federal District. The ITRA is already in its third version, the one administered in this research[16].

The EADRT is a seven-point *Likert* scale composed of three factors: Physical Damages, Social Damages, and Psychological Damages, with eigenvalues of 1.5, a variance of 50.09%, and correlations above 0.30. Defined as body pain and biological disorders, the Physical Damages factor includes 12 items. Defined as negative feelings about oneself and life in general, the Psychological Damages factor consists of ten items. The Social Damages factor has seven items related to isolation and difficulties in family and social relationships[16].

The results are classified into four levels, namely: over 4.1 = the most negative evaluation, presence of occupational diseases; between 3.1 and 4.0 = moderate to frequent evaluation, severe; between 2.0 and 3.0 = moderate evaluation, critical; and below 1.9 = the most positive evaluation, bearable[16].

The items arranged in the scale represent situations related to health and their occurrence and repetition, in a moderate level, portray illness. In this study, it was decided to regroup this assessment in absence of illness (score equal to or less than 1.9) and illness (score over 1.9), based on a previous study[17], with the aim of maximizing the differences between groups.

To assess the occupational risks, the arithmetic mean of the repetitions was calculated, using it as a discrimination bridge of the categories, namely: yes (when the risk is present, the number of items is equal to or greater than the arithmetic mean) and no (no risk, when the number of items is below the arithmetic mean). For the occupational risks, the items were grouped as follows: physical, biological, chemical, mechanical, and ergonomic, with arithmetic means of 02, 08, 08, 02, and 08, respectively.

Data were typed, organized, processed, and statistically analyzed using the Statistical Package for the Social Sciences (SPSS) software, version 21.0. The variables related to the occupational risks and to illness were described by means of absolute and relative frequencies. The associations between the occupational risks and worker's illness in the three factors (Physical Damages, Psychological Damages, and Social Damages) were examined by means of the chi-square test, with significance level set at 5%.

All the phases of the study complied with the requirements of Resolution No. 466/2012 of the National Health Council, which addresses research studies with human beings, obtaining a favorable Opinion under No. 1,988,482 by the Research Ethics Committee. All the participants in the present study read, signed, and received a copy of the Free and Informed Consent Form.

RESULTS

Among the respondents, most were nursing technicians (67.2%, n=115), female (90.1%, n=154), did not live with a partner (52.0%, n=89), had children (67.3%, n=115), a high school degree (71.3%, n=122), less than three years of professional experience in the area (51.5%, n=88), only one employment contract (79.5%, n=136), and training to work in the VR (69.6%, n=119); additionally, 21.6% (n=37) had already been involved in a work accident. The mean age of the sample was 41.77 years old.

Based on the results presented in Table 1, the predominance was verified of the bearable assessment for all the damages, whereas in the critical and severe assessments, the Physical Damages and Psychological Damage factors predominated, respectively. A predominance of the Psychological Damages was also observed in the illnesses classification.

Considering the work-related occupational risks in the VRs, there was a predominance of the chemical risk, followed by the biological risk and by the mechanical risk, as can be seen in Table 2.

The data from Table 2 also show that the occupational exposure to the physical and ergonomic risks was associated with all the forms of illness studied, whereas the exposure to the mechanical risk was associated with forms of illness related to the Physical and Psychological Damages, and the exposure to the chemical risk was associated with physical illness. It is to be noted that the exposure to the biological risk was not associated with any form of illness here in studied.

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TABLE 1: Distribution of the health-related damages of the nursing workers in the vaccination rooms of the city of Rio de Janeiro, Brazil, according to the classification of the Work-Related Damage Assessment Scale factors. Rio de Janeiro, RJ, Brazil, 2017. (n = 171)

Factor	Classification							
	Bearable		Critical		Severe		Diseases	
	n	%	n	%	n	%	n	%
Physical Damages	129	75.4	40	23.4	02	1.2	00	0.0
Psychological Damages	132	77.3	17	9.9	11	6.4	11	6.4
Social Damages	155	90.6	13	7.6	01	0.6	02	1.2

TABLE 2: Association between the exposure to the occupational risks and illness assessed by the Work-Related Damage Assessment Scale. Rio de Janeiro, RJ, Brazil, 2017. (n = 171)

RISK	n(%)	Physical Illness		*p-value*	Psychological Illness		*p-value*	Social Illness		*p-value*
		No n(%)	Yes n(%)		No n(%)	Yes n(%)		No n(%)	Yes n(%)	
Physical				0.006			0.033			0.045
Yes	67(39.2)	43(64.2)	24(35.8)		46(68.7)	21(31.3)		57(85.1)	10(14.9)	
No	104(60.8)	86(82.7)	18(17.3)		86(82.7)	18(17.3)		98(94.2)	06(5.8)	
Biological				0.118			0.958			0.126
Yes	109(63.7)	78(71.6)	31(28.4)		84(77.1)	25(22.9)		96(88.1)	13(11.9)	
No	62(36.3)	51(82.3)	11(17.7)		48(77.4)	14(22.6)		59(95.2)	03(4.8)	
Chemical				0.035			0.782			0.259
Yes	130(76.0)	93(71.5)	37(28.5)		101(77.4)	29(22.3)		116(89.2)	14(10.8)	
No	41(24.0)	36(87.8)	05(12.2)		31(75.6)	10(24.4)		39(95.1)	02(4.9)	
Mechanical				0.003			0.010			0.208
Yes	92(53.8)	61(66.3)	31(33.7)		64(69.6)	28(30.4)		81(88.0)	11(12.0)	
No	79(46.2)	68(86.1)	11(13.9)		68(86.1)	11(13.9)		74(93.7)	05(6.3)	
Ergonomic				<0.001			<0.001			0.001
Yes	85(49.7)	53(62.4)	32(37.6)		50(58.8)	35(41.2)		71(83.5)	14(16.5)	
No	86(50.3)	76(88.4)	10(11.6)		82(95.3)	04(4.7)		84(97.7)	02(2.3)	

Among the occupational risks with greater exposure, the most salient was the chemical risk related to the aerosols released by the following vaccines: MMR (n=70), followed by yellow fever (n=60) and by BCG (n=45). In relation to the chemical risk, in the liquid form, citations referring to all the vaccines predominated (n=38), followed by the BCG (n=24) and yellow fever vaccines (n=22) (Table 3).

TABLE 3: Exposure to the chemical risk related to the liquid and aerosol forms released by the vaccines, according to the nursing workers. Rio de Janeiro, RJ, Brazil, 2017. (n = 171)

Vaccine	Liquid	Aerosols
All	38	04
BCG	24	45
Yellow fever	22	60
MMR	20	70
Varicella	01	11
Pentavalent/DTP/dT	05	05
MMRV	02	04
Influenza	07	03
Rabies	01	02
Rotavirus	19	-
OPV	06	-
Pneumococcal	02	-
Hepatitis B	04	-
VIP	01	-
Diluted	-	01
Total	**154**	**205**

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DISCUSSION

In this study, the occupational risks of the nursing work in the VRs most reported by the participants were predominantly the chemical, biological, and mechanical risks. This result is not in line with the literature[18], which identified that most of the VR workers only reported the ergonomic and biological risks. Conversely, when studying the management of the occupational risks of nursing in PHC[5], it was evidenced that the greatest concern of the workers was related to the biological risk resulting from the manipulation of sharp devices and from the contact with patients with communicable diseases.

The chemical risk was associated with the direct contact with the chemical substances present in the composition of the immunobiological agents in the liquid and aerosol (aerosolization) forms during their dilution, aspiration, and administration. The chemical risk was the predominantly reported risk in the VRs, corroborating a review study that addressed the exposure of the PHC workers to the chemical risks in the preparation and administration of immunobiological agents or medications, and in the direct contact with cleaning and sanitizing products, such as sodium hypochlorite and alcohol[19].

In line with the data found, nursing assistants of a VR in the urban area of Ceará reported infection with the MMR and BCG vaccines[20]. The accidental ocular and percutaneous inoculation during the preparation and administration of the BCG vaccine without using glasses and mask is also highlighted. The Ministry of Health acknowledges the risk of infection by advising that, since the BCG vaccine is vacuum-packed, "when the air abruptly enters into the ampoule, lyophyllum can be released as aerosols and contaminate the environment"[11:71].

It is worth emphasizing that constant exposure to chemical substances without adequate protection is likely to cause health problems. In line with these findings, a study[5] on the management of the occupational risks of nursing in PHC signaled that irritation in the mucosae, in the cutaneous region, and in the respiratory and digestive tracts – resulting from the exposure to these chemical substances – were mentioned in all the safety datasheets of the chemical products. In the correlation between the chemical substances and the splash risk, it was identified that a reduced number of professionals presented some impairment as a consequence of manipulating these chemicals.

In the VRs, immunobiological agents are used composed of live bacilli and viruses and also those with inactivated microorganisms, containing antibiotics and chemical products that preserve and enhance the immune response of the immunobiological agents[11]. The results of this research signaled certain exposure to the chemical compositions of the immunobiological agents. It is worth highlighting that the scientific production on the professionals' exposure to the vaccine compositions is still scarce. Considering the relevance of the subject from the perspective of the workers' health, this issue deserves further reflection and consideration. In this sense, new research studies on the subject must be encouraged.

With regard to the exposure to the chemical risk related to the vaccine composition in the liquid form, one fourth of the participants reported exposure to all the vaccines, and approximately 15% reported the BCG, yellow fever, MMR, and rotavirus vaccines. As for the preparation of the immunobiological agents in the VRs, it is highlighted that the professional must pay close attention to keeping the balance between the pressures inside and outside the vial when diluting and aspirating the vaccine. Lack of care can cause aerosolization of the immunobiological agent, exposing the worker to the particles suspended in the air, which can be inhaled or absorbed by the vaccinator's skin.

Depending on the nature and concentration of the chemical substances existing in the workplace and on the intensity and length of exposure to them, there can lead to impairments in the workers' health, such as cutaneous eruption in the patients and in the workers who had contact with these chemicals[21]. The first condition for them to cause some damage is that they come into contact with or penetrate the body through the skin (dermal absorption), inhalation (absorption through the lungs), or ingestion (absorption through the digestive tract). It is to be noted that the most toxic exposure route is inhalation, followed by ingestion and by dermal absorption[22].

In this context, it becomes important to prevent exposure to the drugs released into the air, into the environment, onto clothes, onto the equipment, and in the workplace. It is reiterated that the use of Personal Protective Equipment (PPE) while handling the drugs is a measure which can minimize risk exposure[21].

Sequentially, the biological risk was the second most reported health risk among the respondents in this study. Although the VR is considered as a place aimed at disease prevention, a number of studies reveal that it leads to continuous exposure to occupational risks related to contaminated waste, organic fluids, and immunobiological agents composed of certain classes of viruses and bacteria[18,19].

It is highlighted that, in this sector, in addition to successively handling and administrating immunobiological agents, the workers also perform the heel test and have direct contact with the patients without having previous knowledge of their health condition. Such duties expose the professionals to risks of infection from biological material, since they may come into contact with viruses like Hepatitis B, Hepatitis C, and the Human Immunodeficiency

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Virus (HIV). Moreover, the nursing teams working in all care modalities are frequently involved in accidents with sharp materials contaminated with blood[3,8].

The present study also evidenced that the mechanical and accident risks were the third most cited by the workers. This fact must also be contemplated and corroborates with another study which identified the mechanical risk in the VRs, revealing critical organization problems in their structure[5], such as poorly planned spaces and poorly designed furniture. With regard to the mechanical risks, a number of studies verified that they are one the main causes of work accidents in Basic Health Units (BHUs)[23] and among nursing assistants and technicians from the Family Health Strategy (FHS)[24].

In view of the foregoing, it is inferred that the mechanical risks are inserted in the PHC context and, consequently, in the VRs. Therefore, health harms to the worker become evident, resulting from the presence of mechanical and accident risks in these services. It is highlighted that research studies on the mechanical risks in the VR are still incipient[5].

As for the association between risk exposure and health harms, both physical and ergonomic risks were related to the three damage factors (physical, psychological, and social). In view of this, a study[25] conducted in Taiwan found a significant association between physical and psychological symptoms, these being caused by exposure to workplace stress and exhaustion, shift work schedule, incorrect posture, and insufficient rest. Another research[15] conducted in the PHC context identified that the professionals considered that assessing work organization is critical, being the main determining factor of their suffering – with negative health effects – due to short-term pressures, high demands, repetitive tasks, and accelerated pace, among others.

Another study[26] conducted with FHS professionals found a negative correlation between the factors which make up the work context and the domains of quality of life – physical, psychological, and social –, thus allowing understanding that the working conditions have a negative effect on the quality of life of the nursing professionals. Highlighting the exposure to the physical risk, a study[27] signaled that insufficient ventilation – generating excessive heat – was considered as a discomfort factor for the professionals during their work duties.

The exposure to the mechanical risk was related to the physical and psychological damages. It is highlighted that the professionals considered they were susceptible to the accident risks related to the use of machines in the workplace and to the exposure to sharp materials[27]. Considering that the chemical risk was associated with the physical damages, a finding corroborated by another study[28], it is possible to reflect if such a risk is correlated with the different chemical substances used by the nursing professionals, substances capable of entering the body and of causing health alterations.

It can be perceived that the biological risk was not associated with the damages to the professionals' health in the present research – a result that needs to be further assessed in future studies –, because it is considered that there exists a potential risk of exposure to biological materials in 90% of the procedures conducted by the health professionals[29], with the VR being a service where this exposure occurs daily in the nursing work.

Contrary to the data obtained in this research, when analyzing the situation of workers' exposure to biological agents, a study[29] identified psychological expressions related to despair and to fear of accidents, as well as it observed that these professionals feel vulnerable when performing their activities. Therefore, the importance of biosecurity management in the daily practices is highlighted, strengthening risk prevention by improving the working conditions[30].

In this way, with a view to prevent and/or minimize the occupational risks, in addition to other measures such as continuing education, adequate human resources, and appropriate equipment and furniture, spaces must be created in the work context for the collective reflection by the workers on their work process.

The limitations of this study are the following: its methodological design, which makes it impossible to define causality and the subjectivity inherent to the analyzed outcomes, which may be influenced by the individuals' conditions, added to the convenience sampling process, undoubtedly not sufficient for the generalization of the findings herein presented. However, this study brings relevant contributions to the extent that it offers information on the assessment of the health damages that affect the professionals working in the VRs. Furthermore, it allows identifying the occupational risks in this environment, with emphasis on the innovative potential of the research for delineating a setting which is an exclusive domain of nursing, showing significant associations between these work-related variables.

CONCLUSION

The health damages that affected the professionals working in the VRs prevailed with critical and severe assessments in the psychological and physical factors, and the illness assessment prevailed in the psychological damages. With regard to the occupational risks of this work, the participants predominantly highlighted the chemical, biological, and mechanical risks.

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It was possible to identify significant associations between the occupational risks and damages, demonstrating that these risks have an influence on the development of physical, psychological, and/or social problems. As for the chemical risk, certain predominance was perceived of the exposure to the chemical risk in the form of aerosols in the MMR and yellow fever vaccines.

Thus, it can be inferred that the working conditions which the nursing professionals are exposed to in the VRs – expressed in the form of occupational risks – have a negative impact on their health. Therefore, it is necessary to build permanent education strategies related to the occupational risks, in order to reduce the problems that affect the nursing team.

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