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Health workers: cardiovascular risk and occupational stress

Trabalhadores da saúde: risco cardiovascular e estresse ocupacional

Fernanda Oliveira Ulguim[1], Jane Dagmar Pollo Renner[1], Hildegard Hedwig Pohl[1], Caio Fernando de Oliveira[1], Guilherme Cassão Marques Bragança[2]

ABSTRACT | Background: Work might cause severe physical stress associated with emotional overload, especially among hospital employees. **Objective:** To identify risk factors for cardiovascular diseases and occupational stress among employees of a teaching hospital. **Method:** Cross-sectional study conducted with 45 employees of a philanthropic health institution in the central area of Rio Grande do Sul, Brazil. Data collection was performed to analyze anthropometric variables, blood pressure, biochemical markers and indicators of health and occupational stress. **Results:** 60.0% of the participants reported sedentary behavior. Analysis of non-modifiable risk factors showed that 55.6% of the sample had family history (mother and father) of hypertension, 22.2% of myocardial infarction and stroke and 13.3% of diabetes. Body mass index categories overweight and obesity predominated (55.5%); 73.4% of the sample was categorized as with moderate-to-high risk to health based on the waist-to-hip ratio; the body fat percentage was above normal or indicated tendency to obesity for 73.3% of the participants. About 71.1% of the sample exhibited excellent or normal blood pressure. Total cholesterol was high or borderline for 88.9% of the sample. On assessment of occupational risk, 55.5% of the participants were categorized as with intermediate degree of exposure. **Conclusion:** The results point to the relevance of health policies to promote lifestyle changes in and outside the workplace with consequent impact on the physical and mental state of workers.

Keywords | occupational risks; occupational health; risk factors; cardiovascular diseases; health personnel.

RESUMO | Introdução: A atividade laboral pode trazer consigo profundo estresse físico associado à sobrecarga emocional sobretudo em trabalhadores no ambiente hospitalar. **Objetivo:** Buscou-se identificar os fatores de risco para doenças cardiovasculares e estresse ocupacional em profissionais de um hospital de ensino. **Método:** Trata-se de um estudo transversal, realizado com 45 trabalhadores de uma instituição de saúde filantrópica da região central do Rio Grande do Sul. A coleta de dados seguiu com base na premissa de avaliar variáveis antropométricas, pressão arterial, marcadores bioquímicos, indicadores de saúde e estresse ocupacional. **Resultados:** Dos participantes, 60,0% autorreferiram-se sedentários. A avaliação dos fatores de risco não modificáveis mostrou que 55,6% dos participantes apresentavam histórico familiar (pai e mãe) com hipertensão, 22,2% com infarto e acidente vascular cerebral e 13,3% com diabetes. Houve predominância dos indivíduos com sobrepeso ou obesidade no quesito índice de massa corporal (55,5%): 73,4% apresentaram relação cintura-quadril de moderado a alto risco para a saúde e 73,3% estavam com percentual de gordura acima do normal e tendência à obesidade. 71,1% dos avaliados apresentaram pressão arterial entre ótima e normal. Os marcadores bioquímicos apontaram 88,9% dos participantes apresentando colesterol total nas faixas limítrofe ou alta. Na avaliação do estresse ocupacional, 55,5% dos trabalhadores encontram-se no grupo de exposição intermediária. **Conclusão:** Os resultados encontrados ressaltam a importância de políticas de saúde que incentivem a mudança do estilo de vida dentro e fora do trabalho, com impacto direto nas condições de saúde física e mental dos trabalhadores.

Palavras-chave | riscos ocupacionais; saúde do trabalhador; fatores de risco; doenças cardiovasculares; pessoal de saúde.

[1]Master course in Health Promotion, Universidade de Santa Cruz do Sul – Santa Cruz do Sul (RS), Brazil.
[2]Health Sciences Center, Universidade da Região da Campanha – Bagé (RS), Brazil.
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INTRODUCTION

Considerable changes took place in the health of the global population in the past decades resulting in higher epidemiological impact of noncommunicable diseases (NCD). To this one should add cardiovascular diseases (CVDs) and their associated risk factors, which account for a significant increase in the morbidity and mortality of the Brazilian and global population, with consequent individual and collective socioeconomic losses. CVD cause about 16.7 million deaths/year worldwide and 30% of deaths among individuals above 20 years old in Brazil[1,2].

CVDs, i.e. abnormalities of the cardiovascular system, interfere with the transport of oxygen and nutrients to the cells. These diseases are currently the main cause of death among adults. According to the Department of Science and Technology of the Brazilian Ministry of Health, NCD represent the main source of costs with medical care within the Unified Health System[1]. Several factors are associated with the development of CVDs, including hyperlipidemia, smoking, alcohol consumption, hyperglycemia, obesity, sedentary behavior, stress and inadequate diet. These conditions depend on modifiable factors and family history, as well as on non-modifiable factors, such as age, sex and ethnicity. The more frequent and severe the risk factors, the higher the odds of occurrence of CVDs[3,4].

Some studies conducted in developed countries such as the United States point to a trend of decrease in the mortality associated with diseases with the aforementioned characteristics. However, in Brazil, lack of epidemiological information on risk for these chronic diseases hinder early diagnosis and achieving adequate control[5]. Identifying risk factors for CVDs enables enrolling the involved individuals in specific preventive and educational protocols designed not only to distribute them across categories, but also to provide them due treatment[6,7].

Occupation should be included in the analysis of cardiovascular risk factors, since some work environments are characterized by high levels of stress. In addition to occupational stress, also the socioeconomic profile of workers is a significant predictor of risk to health[8]. Occupational health is a field at the interface between work, health, disease and their repercussion, therefore relevant to public health. Beyond complying with the legislation in force, employers have a moral duty to provide safe and healthy workplaces and thus reinforce their commitment to mutual collaboration with their employees and reduce disruptions in the work process[9,10].

CVDs account for a large number of early retirement requests due to disability or sick leave in Brazil. It is believed that the work environment might have decisive influence on the state of health of workers as a possible source of psycho-emotional stress, with consequent increase of the risk for CVDs. The length of workers' exposure to high job demands deserves particular attention. Despite the scarce epidemiological evidence available, the phenomenon known as *karoshi* — sudden death by overwork — is increasing among Japanese workers[11].

Good practices for health and safety at work are relevant in the combat against occupational diseases, work accidents, and also risk factors for CVDs. However, improving continuously such practices poses operational challenges to organizations. The reason is that it does not suffice to merely survey indicators, but for such indicators to become effective tools for risk management actions planned from a systemic perspective in which safety and well-being are intertwined are necessary[9].

While issues related to the health of workers are gaining visibility within the scientific community, there is still a shortage of studies on stress-related cardiovascular risk among hospital workers. Therefore, the aim of the present study was to identify risk factors for CVDs among the employees of a teaching hospital to contribute with data to the planning and execution of strategies for health promotion in the workplace.

METHOD

The present cross-sectional study was performed at the main hospital complex in Pardo River Valley, with about 23,000 m^2 of built-up area, 234 beds and about 940 employees distributed across four shifts. This philanthropic, non-profit healthcare institution is acknowledged as a referral center for trauma/orthopedics and childbirth in the Pardo River Valley, Rio Grande do Sul, Brazil. Data collection took place in April and May 2017.

Participants were 45 employees who completed all three study phases: responding and returning questionnaires,

physical examination and blood sample collection. Eligible subjects were employees allocated to administrative and operational units. The sample comprised individuals from both sexes, aged 18 to 64 years old, who voluntarily agreed to participate and signed an informed consent form. Temporary employees, those hired less than one year earlier, with contraindications for blood sample collection, on vacation, on sick leave, diagnosed with CVD less than one year earlier, pregnant women or refusing participation were excluded. The study was approved by the institutional academic board coordination and the research ethics committee of Holy Southern Cross University, ruling no. 1,078,373.

Anthropometric measurements included waist and hip circumference, taken with anthropometric tape measure, to calculate the waist-to-hip ratio (WHR)[12]. WHR over 0.80 for women and 0.95 for men was considered indicative of risk to health. Body weight and height were measured with a digital scale (Plena) and portable stadiometer, respectively. According to the body mass index (BMI)[13], the participants were categorized as underweight (BMI≤18.4 kg/m^2), normal weight (BMI 18.5–24.9 kg/m^2), overweight (BMI 25–29.9 kg/m^2) or obesity class I (BMI 30–34.9 kg/m^2), II (35.5–39.9 kg/m^2) or III (BMI≥40 kg/m^2). The body fat was calculated based on the skinfold, which was measured three times in alternate order; the mean value of the three measurements was considered for analysis. For men, measurements included the triceps, chest and subscapular skinfold, for women the triceps, abdominal and suprailiac skinfold. The results were categorized as follows: women — below normal (up to 16%), normal (16% to 25%), above normal (25% to 33%) and tendency to obesity (>33%); men — below normal (up to 12%), normal (12% to 18%), above normal (18% to 25%) and tendency to obesity (>25%)[14].

The systolic (SBP) and diastolic (DBP) blood pressure was measured with the subjects sitting at rest, preferentially on the right arm and with cuffs adequate to the arm circumference of adults. Following the VI Brazilian Hypertension Guidelines[15], the results were categorized as: excellent (SBP<120 mmHg, DBP<80 mmHg), normal (SBP 120–129 mmHg, DBP 80–84 mmHg), normal-high (SBP 130–139 mmHg, DBP 85–89 mmHg), hypertension stage I (SBP 140–159 mmHg, DBP 90–99 mmHg), hypertension stage II (SBP 160–179 mmHg, DBP 100–109 mmHg) or hypertension stage III (SBP≥180 mmHg, DBP≥110 mmHg).

Biochemical markers were measured from 5-mL blood samples collected after 12-hour fasting by a duly trained professional at the intervention site. The samples were transferred to Vacutainer® tubes (with clot activator for serum separation for blood sugar and lipid profile measurement). The samples were processed with automated device Miura One (I.S.E., Rome, Italy) and commercial kit DiaSys (DiaSys Diagnostic Systems, Germany). Total cholesterol was categorized as: desirable (<200 mg/dL), borderline (200–239 mg/dL) or high (≥240 mg/dL). Triglycerides were categorized as: desirable (<150 mg/dL), borderline (150–199 mg/dL), high (200–499 mg/dL) or very high (≥500 mg/dL). Blood sugar was categorized according to the classification formulated by the American Diabetes Association[16] as: normal (up to 99 mg/dL), prediabetes (100–125 mg/dL) or diabetes (≥126 mg/dL).

Occupational stress was investigated by means of the Portuguese version of the self-report questionnaire *Job Strain Scale* (JSS)[17] originally developed in Sweden. While the full questionnaire was administered, we only analyzed the items which correspond to the demand-control (DC) model to characterize the participants' work process. This two-dimensional model evaluates the psychosocial organization of work, the influence of the external environment demands and the workers' level of control over their tasks. *Demand* represents the workload imposed on workers, personal conflict, conflict in the relationship with coworkers and supervisors and how tasks are executed. *Control* points to the workers' opportunities to apply their mental and physical skills to, and autonomy for decision-making relative to the execution of tasks.

JSS is responded on a Likert scale; the score for *psychological demand* ranges from 5 to 20 (minimum and maximum) and the score for *control* from 6 to 24 (minimum and maximum). We established the mean of the sum of the scores attributed to all the items as cutoff point. Two categories were set for each domain: low or high demand and low or high control. The demand and control levels were dichotomized and combined into four categories (DC model): high strain job (high demand, low control), active job (high demand, high control), passive jobs(low demand, low control) and low strain job (low demand and high

control). This model presupposes that low-control, high-demand (high strain) jobs are harmful to health.

We also administered a self-report questionnaire to investigate several health indicators — including sedentary lifestyle, alcohol consumption and smoking — selected for analysis in the present study and corresponding to modifiable cardiovascular risk factors. The sample size was calculated based on the total number of employees, i.e. 940. By subtracting the 125 employees who met the exclusion criteria, the study population comprised 815 subjects; with 95% of confidence and sample error (adequate for health studies) of 14.21%, the sample size was 45 participants. Statistical Package for the Social Sciences (SPSS, Windows, version 20) was used to plot relative frequency tables, expressed as percentage and calculated by dividing absolute frequencies by the total number of observations.

RESULTS

The sample characteristics are described in Table 1. Participants were predominantly female, aged 20–29 and 30–39 years old, married, without children, having worked one to the 10 years at the institution and educational level corresponding to incomplete higher education.

Analysis of the modifiable cardiovascular risk factors, described in Table 2, showed that most participants (60.0%) had a sedentary lifestyle, 66.7% did not or seldom consumed alcohol and 77.8% had never smoked. Relative to the non-modifiable risk factors (Table 3) 55.6% of the participants had family history (mother and father) of hypertension, 22.2% of myocardial infarction and stroke and 13.3% of diabetes.

On analysis of anthropometric variables, SBP and biochemical indicators (Table 4) most participants were found to have overweight or obesity (55.5%), 74.5% moderate-to-high risk based on WHR and 73.3% body fat above normal or tendency to obesity. The blood pressure was excellent-to-normal for 71.1% of the participants. Biochemical markers triglycerides and blood sugar were within the desirable range for 88.9 to 97.8% of the participants, respectively; 78.9% of the sample exhibited borderline or high total cholesterol.

Occupational stress was analyzed according to the four abovementioned categories: low strain, passive,

Table 1. Sample characterization according to demographic and institutional variables. Santa Cruz do Sul, 2017 (n=45).

Participants' data	n	%
Age range (years old)		
<20	1	2.2
20 to 29	19	42.2
30 to 39	16	35.6
40 to 49	6	13.3
50 to 59	2	4.4
≥60	1	2.2
Sex		
Male	19	42.2
Female	26	57.8
Marital status		
Single	20	44.4
Married	21	46.7
Widowed	1	2.2
Divorced	3	6.7
Number of children		
None	21	46.7
1	10	22.2
2	11	24.4
3	1	2.2
≥4	2	4.4
Length in the job (years)		
1 to 10	42	93.3
11 to 20	1	2.2
≥21	2	4.4
Educational level		
Complete elementary school	6	13.3
Complete secondary school	6	13.3
Incomplete higher education	24	53.3
Complete higher education	9	20.0
Units		
Administrative	20	44.4
Operational	25	55.6
Total	45	100.0

active and high strain jobs. The employees exposed to combination high demand-low control (high strain) jobs were considered as at the highest risk for occupational stress (13.3%). Those exposed to high demands, but with high control over tasks (active jobs) or to low demands and low control were rated as with moderate risk (55.5%). The reference group was the one characterized by low demands and high control (low strain jobs) which was classified as without exposure to risk (31.1%) as shown in Chart 1.

Table 2. Self-reported cardiovascular risk factors. Santa Cruz do Sul, 2017 (n=45).

Risk factors	n	%
Sedentary behavior		
Yes	27	60.0
No	18	40.0
Alcohol consumption		
No	12	26.7
Seldom	18	40.0
Frequent	15	33.3
Smoking		
Never smoked	35	77.8
Ex-smoker	5	11.1
Current smoker	5	11.1
Total	45	100.0

Table 3. Self-reported non-modifiable risk factors according to family history. Santa Cruz do Sul, 2017 (n=45).

Risk factors (mother and father)	n	%
Hypertension	25	55.6
Myocardial infarction	5	11.1
Stroke	5	11.1
Diabetes	6	13.3
Not reported	4	8.9
Total	45	100.0

Table 4. Sample characterization based on the comparison of anthropometric variables, blood pressure and biochemical indicators. Santa Cruz do Sul, 2017 (n=45).

Variables	n	%
BMI		
Underweight	1	2.2
Recommended	19	42.2
Overweight	19	42.2
Obesity class I	5	11.1
Obesity class II	1	2.2
WHR		
Low	12	26.7
Moderate	19	42.2
High	7	15.6
Very high	7	15.6
% body fat		
Below normal	1	2.2
Normal	11	24.4
Above normal	28	62.2
Tendency to obesity	5	11.1
SBP		
Excellent	22	48.9
Normal	10	22.2
Hypertension stage 1	10	22.2
Hypertension stage 2	3	6.7
Total cholesterol		
Desirable	5	11.1
Borderline	27	60.0
High	13	28.9
Triglycerides		
Desirable	40	88.9
Borderline	1	2.2
High	4	8.9
Blood sugar		
Desirable	44	97.8
High	1	2.2
Total	45	100.0

BMI: body mass index; WHR: waist-to-hip ratio; SBP: systemic blood pressure.

DISCUSSION

The main results of the present study show that four parameters exhibited significant abnormalities relevant to health and which denote predisposition for cardiovascular risk, to wit: sedentary behavior, family history of CVDs, anthropometric measurements and inadequate cholesterol levels. These factors do not act separately, and when combined they exponentially increase the odds of occurrence of cardiovascular events[8].

The predominant prevalence of overweight and obesity among the analyzed population is similar to that reported in studies conducted in Brazil and Europe, for instance, a study performed in Spain with workers with obesity and high cardiovascular risk[18]. Since obesity is associated with higher odds of CVDs among workers, incentives to physical activity combined with healthy diet contribute to reduce excessive body fat[19]. While BMI exhibits several limitations, it is used in many studies[20-23] to establish the prevalence of obesity, especially among workers, as a function of the associated risk factors. In our quest for higher reliability, in the present study we also considered WHR and body fat percentage, which are able to identify the body sites with higher concentration of fat.

Despite all the knowledge available on the benefits of regular exercising, the largest challenge to healthcare professionals is to stimulate the population to adopt healthy lifestyles and perform regular physical activity[24]. Sixty percent of the participants in the present study reported sedentary behavior, which is a cause of much concern, as according to some reports physically inactive individuals exhibit poorer anthropometric indicators, in addition to poorer physical fitness and a large number of risk factors for coronary artery disease compared to the active population[25].

About 55.5% of the participants were categorized as with intermediate levels of occupational stress. For this group, adopting healthy lifestyles might contribute not only to improve their general well-being, but also to control anxiety, reduce the occurrence of depressive episodes and improve their mood[24]. The results of the present study allow allocating the participants to the intermediate category of risk, i.e. considerable emotional tension, which other studies found to be associated with higher blood pressure. Yet, high blood pressure was not a relevant finding for the analyzed population. Several authors observed that mental and physical exhaustion combined with poor diet and sedentary behavior contribute to the occurrence of hypertension and stress[26].

The frequency of participants with high cholesterol levels (88.9%) was much higher than that reported for truck drivers (51.6%) and electricity workers (24.7%) also from the central area of Rio Grande do Sul[23,27]. This finding corroborates the results of studies which indicate association between high consumption of food rich in saturated fat and cholesterol and risk for coronary artery disease, ischemia and other CVDs[28].

Cross-sectional studies enable inferences on reverse causality with repercussion in the interpretation of results. Self-report instruments are susceptible to errors in responding and interpretation. A shortage of studies with other hospital employees hindered eventual comparisons of results.

CONCLUSION

The results of the present study point to the relevance of health policies to promote changes in lifestyle in and outside

Chart 1. Distribution of participants as per the demand-control model. Santa Cruz do Sul, 2017 (n=45).

		Psychological demand	
		High	Low
Control	High	Low strain jobs (31,1%) Operational (n=7) Administrative (n=7)	Active jobs (24,4%) Operational (n=5) Administrative (n=6)
	Low	Passive jobs (31,1%) Operational (n=10) Administrative (n=4)	High strain jobs (13,3%) Operational (n=3) Administrative (n=3)

the workplace with impact on the physical and mental health of workers. Occupational health is currently in a new phase, with focus on prevention and health promotion, and strategic planning is needed to achieve these goals. Within this new scenario, merely surveying indicators does not suffice, but interdisciplinarity should be supported to align planning in labor, health and social security for these fields to cooperate and act in a complementary manner.

Multiprofessional programs centered on quality of life and well-being in the workplace are increasing in relevance as a means to raise the awareness of workers toward the need to make continuous changes in their behavior and lifestyle in and outside the workplace. Well-informed workers, aware of that fact that their behavior might increase or reduce their risk for illness (or even of becoming disabled or dying prematurely) are certainly healthier, more productive and possibly also happier. We call the attention to the efforts needed to adjust worksites to the needs of workers, and thus reduce the cost of diseases directly related to occupational dysfunctions.

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Correspondence address: Fernanda Oliveira Ulguim – Universidade de Santa Cruz do Sul – Avenida Independência, 2.293, sala 4.205, bloco 42 – Bairro Universitário – CEP: 96815-900 – Santa Cruz do Sul (RS), Brazil – E-mail: feulguim@yahoo.com.br