REVISTA CONTRIBUCIONES A LAS CIENCIAS SOCIALES

Prevalence and associated factors of masked hypertension in nursing professionals working in oncology

Prevalência e fatores associados à hipertensão mascarada em profissionais de enfermagem que atuam na área de oncologia

DOI: 10.55905/revconv.16n.6-017

Recebimento dos originais: 02/05/2023
Aceitação para publicação: 05/06/2023

Juliano dos Santos
PhD in Adult Health Nursing by the Escola de Enfermagem da Universidade de São Paulo
Institution: Instituto Nacional de Câncer - Hospital do Câncer III
Address: Rio de Janeiro - RJ, Brasil
E-mail: jlnsantos@yahoo.com.br
Orcid:https://orcid.org/0000-0001-9961-3576

Karina Cardoso Meira
PhD in Epidemiology from Escola Nacional de Saúde Pública Sergio Arouca da Fiocruz
Institution: Universidade Federal do Rio Grande do Norte - Escola de Saúde
Address: Natal - RN, Brasil
E-mail: karina.meira@ufrn.br
Orcid:https://orcid.org/0000-0002-1722-5703

Juliana Chaves Coelho
PhD in Adult Health Nursing from the Escola de Enfermagem da Universidade de São Paulo
Institution: Universidade de São Paulo - Escola de Enfermagem
Address: São Paulo - SP, Brasil
E-mail: juccoelho@usp.br
Orcid: https://orcid.org/0000-0001-8781-7627

Angela Maria Geraldo Pierin
PhD in Adult Health Nursing from the Escola de Enfermagem da Universidade de São Paulo
Institution: Departamento de Enfermagem em Saúde da Universidade de São Paulo
Address: São Paulo - SP, Brasil
E-mail: pierin@usp.br
Orcid https://orcid.org/0000-0002-3274-7729

ABSTRACT
Introduction: Considering the process linked to working conditions, nursing professionals are exposed to situations that can increase the risk of cardiovascular diseases. Objective: To evaluate the prevalence and factors associated with masked hypertension (MHT) in nursing professionals. Methods: This was a cross-sectional study of 182 nursing professionals. Office blood pressure measurement and 24-hour Ambulatory Blood Pressure Monitoring (ABPM) were applied during a usual workday using Spacelabs 90207. An interview was conducted to evaluate biopsychosocial related to work and life habits variables. Fasting venous blood was drawn for

biochemical analysis. MHT was defined as office blood pressure (SBP/DBP) ≤140/90 mmHg and mean daytime ABPM ≥ 135/85 mmHg and non-use of antihypertensive treatment. Poisson regression with robust variance was used to examine the relationship of MHT with associated factors. Results: The prevalence of MHT was 19.8% (95% confidence interval:15.67-23.93). The nursing professionals with masked hypertension had significantly higher than no MH: mean 24-hour, daytime, and nighttime systolic/diastolic BP in the ABPM. HMT was associated with age (1.06; 95%; confidence interval: 1.03-1.10) and shift work (2.18; 95%; confidence interval: 1.10-4.31). Conclusions: There was a high prevalence of MHT, and these outcomes were associated with age and shift work.

Keywords: masked hypertension, ambulatory blood pressure monitoring, nursing staff, occupational health.

RESUMO

Introdução: Considerando o processo ligado às condições de trabalho, os profissionais de enfermagem estão expostos a situações que podem aumentar o risco de doenças cardiovasculares. Objetivo: Avaliar a prevalência e os fatores associados à hipertensão mascarada (HM) em profissionais de enfermagem. Métodos: Este foi um estudo transversal com 182 profissionais de enfermagem. A medição da pressão arterial no consultório e a Monitorização Ambulatorial da Pressão Arterial (MAPA) de 24 horas foram aplicadas durante um dia normal de trabalho usando o Spacelabs 90207. Foi realizada uma entrevista para avaliar variáveis biopsicossociais relacionadas ao trabalho e aos hábitos de vida. Foi coletado sangue venoso em jejum para análise bioquímica. A MHT foi definida como pressão arterial no consultório (PAS/PAD) ≤140/90 mmHg e média da MAPA diurna ≥ 135/85 mmHg e não uso de tratamento anti-hipertensivo. A regressão de Poisson com variância robusta foi usada para examinar a relação da MHT com os fatores associados. Resultados: A prevalência de HMH foi de 19,8% (intervalo de confiança de 95%: 15,67-23,93). Os profissionais de enfermagem com hipertensão mascarada apresentaram PA sistólica/diastólica média de 24 horas, diurna e noturna na MAPA significativamente mais alta do que os sem HM. A HMT foi associada à idade (1,06; 95%; intervalo de confiança: 1,03-1,10) e ao trabalho em turnos (2,18; 95%; intervalo de confiança: 1,10-4,31). Conclusões: Houve uma alta prevalência de HMT, e esses resultados foram associados à idade e ao trabalho em turnos.

Palavras-chave: hipertensão mascarada, monitoramento ambulatorial da pressão arterial, equipe de enfermagem, saúde ocupacional.

1 INTRODUCTION

Masked hypertension (MHT) is defined as a clinical condition in individuals who are not receiving pharmaceutical treatment for hypertension and whose office blood pressure measurements taken in a physician's office or clinic setting are normal, but who exhibit altered blood pressure in ambulatory blood pressure monitoring (ABPM)(O'Brien et al.,2013; Babu & Drawz,2019; Penmatsa et al.,2020). The prevalence of masked hypertension in the general

population varies, ranging from 8% to 20% in adults without antihypertensive treatment (Verberk et al.,2008; Bobrie et al.,2008). One study with normotensive healthcare workers found that 23.9% had masked hypertension (Sobrino et al.,2013). Results were similar to those observed in a study carried out with Brazilian civil servants, in which 25.5% of the participants had MHT(Brochini,2020).

There is still no consensus on the prognostic value of masked hypertension. However, there is evidence that individuals with masked hypertension have higher cardiovascular risk than normotensive individuals (Pierdomenico & Cuccurullo,2011) with target organ lesions, such as left ventricular hypertrophy, carotid intima-media thickness, changes in arterial distensibility, presence of carotid atherosclerotic plaques and microalbuminuria (Saeed S et al.,2016; Geijerstam et al.,2023).

The most variables associated with masked hypertension are male gender, young age, family history of hypertension, smoking, alcoholism, decreased physical activity, stress-induced hypertension, occasional high blood pressure measurements, obesity, overweight, diabetes, chronic kidney disease, left ventricular hypertrophy, multiple associated cardiovascular risk factors, sleep apnea, and psychoemotional variables such as anxiety, interpersonal conflict, and stress at work (Sobrino et al.,2013; Brochini,2020; Alessi et al.,2014). It is believed that nursing professionals who work in oncology have a greater chance of developing MHT due to the high emotional demand of this activity when dealing with pain, suffering, and mourning for the loss of patients (Sant'Ana et al.,2023; Paiva et al.,2021).

Despite the evidence related to unfavorable cardiovascular outcomes, we did not find studies that evaluated masked hypertension in Brazilian nursing professionals working in oncology. Thus, the present study aimed to assess the prevalence and associated factors of masked hypertension among nursing professionals working in Oncology.

2 METHODS

2.1 STUDY DESIGN AND SAMPLE SIZE

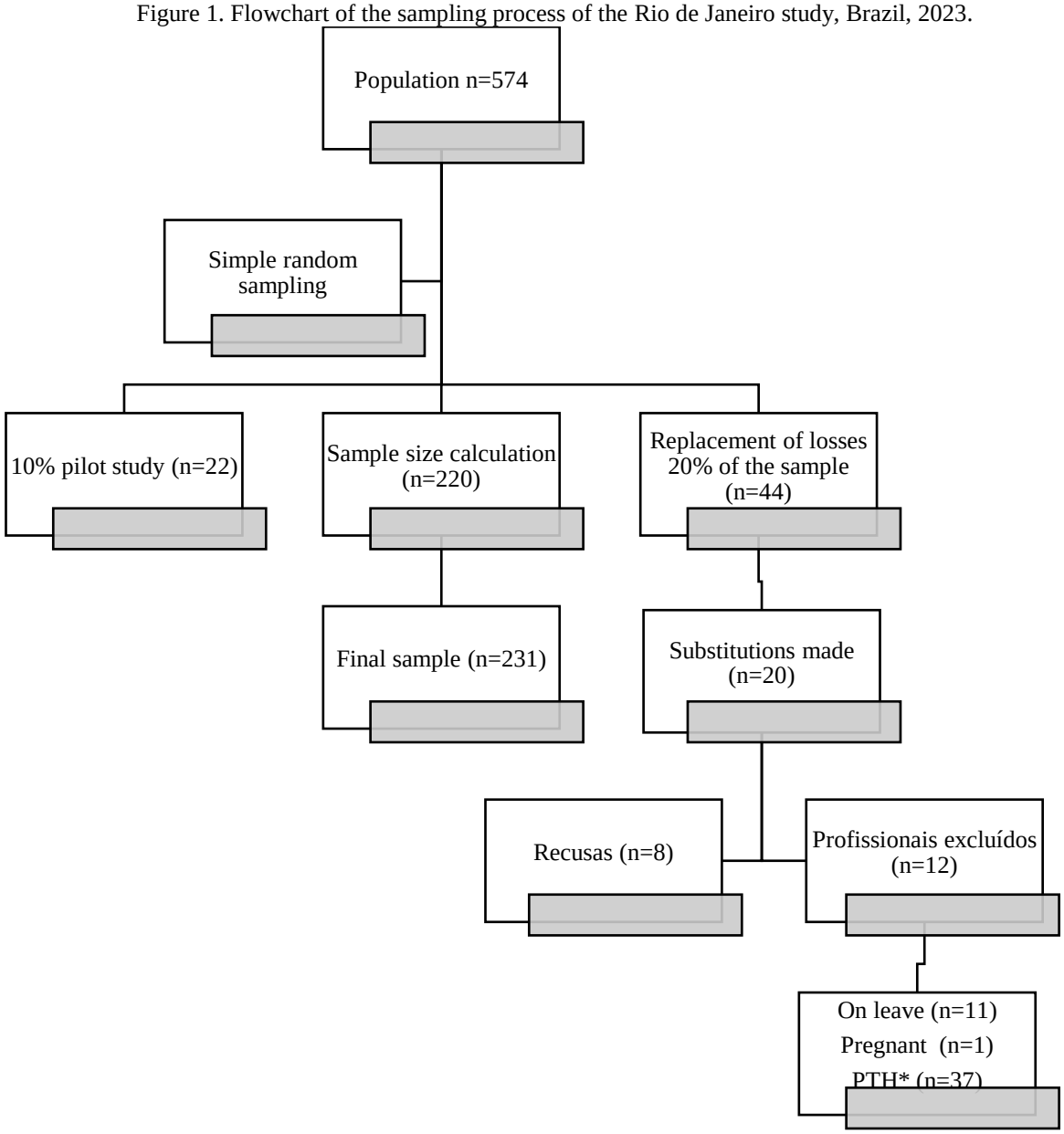
Analytical, observational, and cross-sectional study that followed the recommendations of the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) initiative. They were conducted at an institute specializing in cancer treatment in Rio de Janeiro from December 2013 to June 2015. The study population consisted of 534 nursing professionals

who worked in the wards of this institute. The participants were selected through simple random sampling, using an automated lottery, from a nominal list provided by the hospital management, and the researchers did not influence this selection.

Sample size was calculated based on an estimated prevalence of hypertension of 40%, adopting a power of the test of 80% and a level of significance of 5%. Following Kang's recommendations for controlling type I (false positive) and type II (false negative) errors, the calculation was performed a priori, and the power of the effect was determined based on a previous study with a similar methodological design. Thus, of the 574 eligible nursing professionals, the calculated sample size was 220 professionals.

The inclusion criteria were belonging to the nursing staff (nursing assistants/technicians and nurses); caring for cancer patients in inpatient units; having been a member of the hospital staff for at least one year; and not using any antihypertensive drugs. The exclusion criteria were being on leave (n=11) and being pregnant (n=1). To form the selected sample (n=220) and allow for 10% (n=22) who were part of the pilot study and replacement of losses (n=115), 357 of a total of 574 professionals were randomly selected. There was no exclusion for time of service under one year; eight professionals refused to participate in the study; and 182 underwent ambulatory blood pressure monitoring (Figure 1).

Figure 1. Flowchart of the sampling process of the Rio de Janeiro study, Brazil, 2023.



Note: *PTH=Pharmacological Treatment for Hypertension

The study was approved by the Research Ethics Committees (CAAE nº 13329513.3.0000.5392) of the institutions involved (Opinion 320.343 and Opinion 46/13) under the prerogatives of Resolution 466/2012 of the National Health Council. All professionals who agreed to participate in the study signed the Free and Informed Consent Form, and a copy was made available to the research participant.

2.2 DATA COLLECTION

The professionals were characterized through interviews in relation to the following variables: sociodemographic (sex, age, race/color, marital status, education and monthly income); work (professional category, length of time of professional training, number of formal jobs, working hours/week, shift work); lifestyle habits (smoking, use of alcoholic beverages, physical activity);burnout syndrome; personal medical history were assessed through self-report (dyslipidemias, hypertension, angina pectoris, diabetes mellitus, acute myocardial infarction, stroke, varicose veins, metabolic syndrome, ,health treatment). In addition, collected body composition variables were measured (body fat percentage, visceral fat percentage), and were calculated, body mass index, waist-to-hip ratio, and neck circumference. Peripheral blood samples were taken to assess laboratory markers, blood glucose, ultrasensitive C-reactive protein, triglycerides, total cholesterol, high-density lipoproteins [HDL-C], low-density lipoproteins [LDL-C], fibrinogen, plasma cortisol, serum creatinine and glycated hemoglobin [HbA1c])

The use of alcoholic beverage was evaluated through the CAGE questionnaire, consisting of four questions related to the anagram Cut-down, Annoyed, Guilty and Eye-opener, which was validated for use in Brazil. At least one positive response means that are alcohol problems suspected and two or more affirmative answers indicate problems with alcohol.

Burnout was evaluated through the Maslach Burnout Inventory (MBI) (Maslach et al.,1997), a self-reporting instrument composed of 22 items distributed in three subscales: emotional exhaustion (9 items), depersonalization (5 items) and low professional achievement (8 items). The cut-off points for each of the dimensions were based on the table provided by the instrument manual (18): emotional exhaustion (≥ 27), depersonalization (≥ 10) and low professional achievement (≤ 33). The presence of burnout was defined based on the cut-off points for the three dimensions, concomitantly. The instrument showed good reliability for all items (Cronbach's alpha = 0.73) and emotional exhaustion (Cronbach's alpha = 0.88), depersonalization (Cronbach's alpha = 0.67) and low professional achievement (Cronbach's alpha = 0.73).

The research team consisted exclusively of nurses with previous experience in the research area, trained by the leading researcher about the application of instruments and procedures for measuring blood pressure and installing the ABPM. The training for carrying out anthropometric measurements and using the bioimpedance scale was carried out by a nutritionist

certified by the Brazilian Ministry of Health for this type of activity and had a theoretical and practical moment.

2.3 BLOOD PRESSURE MEASUREMENTS AND MASKED HYPERTENSION

First office blood pressure was measured three consecutive times, in a private environment, by nurses previously trained, with a 2-minute interval between measurements, with a validated automatic device (OMROM HEM 705CP), a hose adjusted to the size of the arm, and the person in a seated position, following the recommendations of the 7th Brazilian Guideline of Hypertension (O'Brien et al.,1997; Malachias et al.,2016). For the analysis, we use the average of the last two readings for office measurements. After office blood pressure, ambulatory blood pressure monitoring was performed for 24 hours, on a day shift, with a validated instrument, by the recommendations of the V Guidelines for Ambulatory Blood Pressure Monitoring, with the Spacelabs Medical monitor on the OSI Systems Company model 90217/90207 validated by the AAMI (Association for the Advancement of Medical Instrumentation) and by the BHS (British Hypertension Society) (Baumgart & Kamp,1998).

The means and prevalence of altered pressure levels from the 24-hour, awake, and sleep periods were assessed based on the schedules described in the activities reports of the participants. The measurements were taken every 20 minutes in the 24 hours and were considered valid for study inclusion if ≥ 80% of the readings were satisfactory, and there was a ≤ 2-hour absence of readings. The cutoff points adopted for altered pressure levels were: ≥130/80 mmHg for the 24 hours, ≥135/85 mmHg for the awake period, and ≥120/70 mmHg for the sleep period for systolic and diastolic pressures. Masked hypertension was defined as the simultaneous presence of the following criteria: last two office blood pressure means < 140/90 mmHg, non-use of antihypertensive drugs, and daytime period ABPM ≥ 135/85 (Baumgart P, Kamp,1998).

Before starting the actual data collection, a pilot study was carried out with 22 professionals to identify possible problems and difficulties in the application instruments, blood pressure measurement, ABPM installation, anthropometric measurements, and the use of the bioimpedance scale. Adjustments to the questionnaire were made based on the difficulties or non-compliance encountered during the pilot study. Participants in the pilot study did not make up the final study sample.

2.4 DATA ANALYSIS

The analysis of the relationships between masked hypertension and the nominal and ordinal variables was done using Pearson's chi-square test, likelihood ratio test, or Fisher's exact test. For the continuous variables, the Mann-Whitney U test or Student's t-test was used according to the normality of the variables being examined.

Multiple analysis was performed using a non-optimized stepwise-forward method. Poisson regression with Robust variance, and those considered significant had $p<0.05$. Initially, univariate analysis was performed, and the variables that presented $p<0.20$ at this stage were considered candidates for permanence in the final model. After the simultaneous inclusion of all main effects, plausible interactions were tested. The final model choice considered the biological and epidemiological plausibility and statistical significance, assessed based on the Akaike Information Criterion (AIC) (Hosmer & Lemeshow,2000). Analyses were performed in the R software, version 4.2.0 (R: A Language and Environment for Statistical Computing, Vienna, Austria), using the 'sandwich' packages.

3 RESULTS

The prevalence of masked hypertension was 19.8% [95% confidence interval:15.67-23.93). Professionals with masked hypertension were older than those without masked hypertension (41.6 vs. 37.2, p=0.002) and had lower income (p=0.029). Regarding the professional variables, nursing workers with masked hypertension showed a higher mean time in the profession (16.7 vs. 14.2, p=0.011) and a higher proportion of shift work compared to those without masked hypertension (75.0% vs. 57.5, p=0.005) (Table 1).

Table 1 Masked hypertension in nursing professionals according to sociodemographic and work-related characteristics.

	Masked Hypertension						
Variables	**Yes**		**No**		**Total**		**p-value**
	n	**%**	**n**	**%**	**n**	**%**	
Sex							
Female	28	77.8	122	83.6	150	82.4	0.414*
Male	8	22.2	24	16.4	32	17.6	
Age: Mean (SD)	41.6 (7.6)		37.2 (7.2)		38.0 (7.5)		**0.002*** **
Race/color							
White	14	38.9	72	49.3	86	47.3	0.262*
Non-white	22	61.1	74	50.7	96	52.7	

Marital status							
With partner	29	80.6	104	71.2	133	73.1	0.259*
Without partner	7	19.4	42	28.8	49	26.9	
Education level							
Technical level	13	36.1	46	31.5	59	32.4	
Undergraduate	6	16.7	22	15.1	28	15.4	0.799**
Residency/Specialization/Master's	17	47.2	78	53.4	95	52.2	
Monthly income ($)							
> 2,731	2	5.6	15	10.3	17	9.4	
1,365 to 2,731	13	36.1	71	49.0	84	46.4	**0.029****
547 to 1,364	16	44.4	56	38.6	72	39.8	
260 to 546	5	13.9	3	2.1	8	4.4	
Professional category							
Nursing technician	12	33.3	57	39.0	69	37.9	0.527*
Nurse	24	66.7	89	61.0	113	62.1	
Time of professional (years): Mean (SD)	16.7 (5.8)		14.2 (6.9)		14.7 (6.8)		**0.011*****
Number of jobs							
1	18	50.0	84	57.5	102	56.0	
2	16	44.4	57	39.0	73	40.1	0.665**
3	2	5.6	5	3.4	7	3.8	
Work schedule/shift							
Day shift	20	55.6	85	58.2	105	57.7	
Night shift	13	36.1	51	34.9	64	35.2	0.936**
Part-time work	3	8.3	10	6.8	13	7.1	
Working hours/week: Mean (SD)	55.8 (18.2)		51.2 (14.9)		52.1 (15.7)		0.143***
Shift work	27	75.0	84	57.5	111	61.0	**0.0500***

Concerning personal medical history, particularly noteworthy were the frequencies of varicose veins in the legs (62.1%), health treatment (31.9%), dyslipidemia (24.2%), and 9.3% reported hypertension. Based on the plasma levels of glycated hemoglobin, it was observed that 20.3% had a high risk of diabetes, and 2.2% had diabetes. There were no statistically significant differences in the frequencies of lifestyle habits among professionals without and with masked hypertension. Regarding personal medical history, it was found that professionals with masked hypertension had a higher proportion of arterial hypertension (25.0 vs.5.5, p=0.001) and also showed a higher mean creatinine (0.8 vs.07, p=0.04) (Table 2).

Table 2 Masked hypertension in nursing professionals working in oncology according to lifestyle habits, personal medical history, laboratory makers and anthropometric measurements.

	Masked Hypertension						
	Yes		**No**		**Total**		**p-value**
Variables	**n**	**%**	**n**	**%**	**n**	**%**	

Smoking	2	5.6	12	8.2	14	7.7	0.591*
Problems with alcohol (CAGE)	6	60.0	12	28.6	18	34.6	0.060*
Physical activity	22	61.1	94	64.4	116	63.7	0.715*
Burnout syndrome (MBI)	1	2.8	20	13.7	21	11.5	0.081***
Personal medical history							
Dyslipidemias	8	22.2	36	24.7	44	24.2	0.760*
Hypertension	9	25.0	8	5.5	17	9.3	**0.001*** **
Angina pectoris	2	5.6	10	6.8	12	6.6	0.779*
Diabetes mellitus	0	0.0	7	4.8	7	3.8	0.180*
Acute myocardial infarction	1	2.8	0	0.0	1	0.5	0.198***
Varicose veins	19	52.8	94	64.4	113	62.1	0.199*
Body mass index: Mean (SD)	27.5 (4.2)		27.2 (4.8)		27.3 (4.7)		0.492£
Waist circumference: Mean (SD)	88.5 (12.4)		88.9 (15.3)		88.8 (14.7)		0.961£
Laboratory markers (mg/dL)							
Fasting blood glucose: Mean (SD)	90.4 (10.0)		92.7 (12.0)		92.2 (11.6)		0.207£
Ultrasensitive C-reactive protein: Mean (SD)	0.55 (0.4)		0.62 (0.8)		0.60 (0.8)		0.681£
Triglyceride: Mean (SD)	136.5 (67.7)		132.0 (69.0)		132.8 (68.6)		0.691£
Total cholesterol: Mean (SD)	188.4 (37.1)		188.6 (36.7)		188.5 (36.6)		0.816£
High-density lipoproteins (HDL-C): Mean (SD)	57.0 (14.6)		56.4 (14.3)		56.5 (14.3)		0.674£
LDL-C: Mean (SD)	119.7 (31.2)		120.8 (32.2)		120.6 (31.9)		0.820£
Creatinine: Mean (SD)	0.8 (0.1)		0.7 (0.2)		0.8 (0.2)		**0.042£**
Glycated hemoglobin: Mean (SD)	5.1 (0.8)		5.0 (0.8)		5.1 (0.8)		0.357£

Note: SD=Standard deviation *Chi-square, **Likelihood ratio, ***Fisher's exact test; £Mann-Whitney U Test

The office blood pressure measurement showed that many of the professionals studied (49.5%) had excellent pressure levels and systolic and diastolic means within normal parameters. On the other hand, most had altered pressure levels in the 24-hour ABPM period (92.9%). In addition, the prevalence of altered pressure levels in the awake and sleep ABPM periods was 22.5% and 36.3%, respectively (Table 3).

Most professionals had systolic (50%) or attenuated (40.7%) dipping. Diastolic dipping was present in 63.7% and attenuated in 30.2%. Compared to professionals without masked hypertension, those with it had a higher proportion of office blood pressure classified as usual (33.3% vs. 17.8%) or borderline (30.6% vs. 15.8%) and higher diastolic blood pressure [78.7 (SD=8.5) vs. 75.4 (SD=11.7) mmHg]. Regarding ABPM, it was noted that professionals with masked hypertension had higher proportions of altered pressure levels and higher systolic and diastolic pressure means in all the periods: 24-hour, awake, and sleep periods ($p<0.0001$). The prevalence of attenuated diastolic dipping was higher among professionals with masked hypertension (50% vs. 25.3%) (Table 3).

Table 3 Blood pressure measurements in nursing professionals working in oncology according to the presence of masked hypertension.

	Masked Hypertension						
Blood pressure measurement	**Yes**		**No**		**Total**		**p-value**
Office blood pressure	**n**	**%**	**n**	**%**	**n**	**%**	
Excellent (<120 mmHg / <80 mmHg)	13	36.1	77	52.7	90	49.5	
Normal (< 130 mmHg/< 85 mmHg)	12	33.3	26	17.8	38	20.9	
Borderline (130-139 mmHg/ 85-89 mmHg)	11	30.6	23	15.8	34	18.7	
Stage 1 hypertension (140-159 mmHg/ 90-99 mmHg)	0	0.0	16	11.0	16	8.8	**0.006*** **
Stage 2 hypertension: (160-179 mmHg/ 100-109 mmHg)	0	0.0	3	2.1	3	1.6	
Stage 3 hypertension: ≥ 180 mmHg/ ≥ 110 mmHg	0	0.0	1	0.7	1	0.5	
Systolic blood pressure Mean (SD), mmHg	118.3 (11.9)		118.1 (16.6)		118.2 (15.8)		0.491[£]
Diastolic blood pressure Mean (SD). mmHg	78.7 (8.5)		75.4 (11.7)		76.1 (11.2)		0.056[£]
ABPM	**n**	**%**	**n**	**%**	**n**	**%**	
24-hour period							
Normal (<130 mmHg and/or <80 mmHg)	1	2.8	12	8.2	13	7.1	
Altered pressure (≥ 130 mmHg and/or ≥ 80 mmHg)	35	97.2	134	91.8	169	92.9	**<0.0001***
Systolic blood pressure Mean (SD), mmHg	130.0 (9.1)		113.6 (8.5)		116.9 (10.8)		<**0.0001**[£]
Diastolic blood pressure Mean (SD), mmHg	85.5 (5.0)		71.0 (6.0)		73.9 (8.2)		<**0.0001**[£]
Daytime							
Normal (<135 mmHg and/or < 85 mmHg)	0	0.0	141	96.6	141	77.5	
Altered pressure (≥ 135 mmHg and/or ≥ 85 mmHg)	36	100.0	5	3.4	41	22.5	**<0.0001***
Systolic blood pressure Mean (SD), mmHg	134.6 (9.6)		117.2 (8.8)		120.6 (11.3)		<**0.0001**[£]
Diastolic blood pressure Mean (SD), mmHg	89.7 (5.4)		74.8 (6.2)		77.7 (8.5)		<**0.0001**[£]
Night time							
Normal (<120 and/or <70 mmHg)	6	16.7	110	75.3	116	63.7	**<0.0001***
Altered pressure (≥120 and/or ≥ 70 mmHg)	30	83.3	36	24.7	66	36.3	
Systolic pressure Mean (SD), mmHg	121.0 (12.5)		106 (9.8)		109.0 (11.9)		<**0.0001**[£]
Diastolic pressure Mean (SD), mmHg	79.0 (8.5)		63.1 (8.0)		66.3 (10.3)		<**0.0001**[£]
Systolic dipping (%)							
Absent (≤ 0)	2	5.6	15	10.3	17	9.3	
Present (≥ 10 e ≤ 20)	18	50.0	73	50.0	91	50.0	0.627***
Attenuated (>0 and <10)	16	44.4	58	39.7	74	40.7	
Diastolic dipping (%)							
Absent (≤ 0)	1	2.8	10	6.8	11	6.0	
Present (≥ 10 e ≤ 20)	17	47.2	99	67.8	116	63.7	**0.017*** **
Attenuated (>0 and <10)	18	50.0	37	25.3	55	30.2	

Note: SD=Standard deviation *Chi-square, ***Likelihood Ratio; [£]Mann-Whitney U Test

The factors associated with masked hypertension were age and working in shifts. The advance of one year in the age of nursing professionals increased the prevalence of masked hypertension by 6% (PR=1.06; CI95% 1.03-1.10). Likewise, working in shifts increased the likelihood of being diagnosed with masked hypertension (PR=2.18; CI95% 1.10-4.31) (Table 4)

Table 4. Factors associated with masked hypertension in nursing professionals working in oncology.

Variable	RP* non adjusted (CI 95%**)	p value	RP adjusted (CI 95%)	p-value
Age (years)	1.06 (1.02-1.09)	<0.0001	1.06 (1.03-1.10)	<0.0001
Shift work				
No		1		
Yes	1.92 (0.96-3.84)	0.07	2.18 (1.10-4.31)	0.03

Note:* Prevalence Ratio; ** 95% confidence interval

4 DISCUSSION

The nursing professionals in this study who work in oncology showed a high prevalence of masked hypertension, which was associated with age and shift work.

The prevalence of masked hypertension in the oncology hospital nursing team (19.8%) in the present study was higher than that observed in the general population (8.5%-17%) (Alessi et al.,2014; Peacock et al.,2014), in the American population (12.3%) (Wang et al.,2017), Among people suffering from obesity (17.1%) (Kenny et al.,2017) .However, it was lower than that found in health unit workers (23.9%) (Sobrino et al.,2013), diabetics (26.5%) (Zhao et al.,2017), chronic kidney patients (27.8%)[24], and one African American cohort (30.5%) (Drawz et al.,2016). Differences between the different prevalence may be related to the sociodemographic and clinical characteristics of the sample in each study.

We believe that the high prevalence of masked hypertension observed in our study may be related to these nursing workers' working and clinical conditions. Previous studies with these workers showed a high prevalence of work-related stress, Burnout Syndrome and verbal/physical violence, and metabolic syndrome (Sant'Ana et al.,2023; Santos et al.,2021; Santos et al.,2022).

The nursing professionals with a higher prevalence of masked hypertension were older than professionals without masked hypertension. Higher age is closely related to a progressive increase in blood pressure levels and increased prevalence of hypertension, because of vascular changes, left ventricular hypertrophy, and decreased kidney function, in addition to comorbidities

such as diabetes mellitus (Kithas et al.,2010; Li et al.,2014). Advanced age was associated with masked hypertension in diabetic patients[23], the American population, and Brazilian civil servants (Wang et al.,2017; Brochini, et al.,2020).It is important to note that professionals with masked hypertension had a higher prevalence of risk of diabetes and serum creatinine, which can characterize a subclinical manifestation of vascular damage and long-term renal impairment. Higher blood pressure with increased age may also be related to lifestyle habits (Li et al.,2014; Verberk et al.,2008). However, no statistically significant differences were observed between the groups with and without masked hypertension in relation to smoking, alcoholism, physical activity, stress, and leisure activities.

The frequency of individuals with alcohol-related problems assessed by the CAGE instrument was higher among those with masked hypertension. However, this difference was not statistically significant (p=0.06). A study with treated hypertensive individuals showed that regular alcohol consumption increased the chance of masked hypertension by 37% (Verberk et al.,2008). In the present study, the finding related to alcohol consumption may be interpreted as an inadequate coping strategy for work-related stress. It is also essential to consider that the relationship between alcohol consumption and hypertension is still controversial. There are reports of increased blood pressure connected with its ingestion, lower risk of mortality, regardless of the condition of hypertension, and decreased pressure levels linked to wine consumption (Fan et al.,2013; Ohira et al.,2009; Urquiaga et al.,2015; Wightman et al.,2015).

In the present study, it was found that individuals who worked in shifts had a higher prevalence of masked hypertension when compared to those who did not work in shifts (PR=2.18). Shift work was also related to a greater chance of occurrence of HMT in a previous study with hospital workers and home caregivers (OR=8.25; CI 95%2.11-40.31). This study observed an association between work tension and effort-reward imbalance (Landsbergis et al.,2013; Trudel et al.,2020).

Masked hypertension and rotating shift work as cardiovascular risk factors, independent from the other, may increase the chances of cardiovascular morbidity and mortality. Other factors can contribute to higher cardiovascular risk, such as attenuated blood pressure dipping, as shown by the sleep period ABPM, and blood pressure levels compatible with hypertension in the 24 hours ABPM (Hermida et al.,2014; Roush et al.,2014; Pierdomenico et al.,2014; Penmatsa et al.,2020). The absence of attenuated blood pressure dipping during sleep is related to the

development of lesions in target organs, such as left ventricular hypertrophy and urinary albumin excretion, whereas nocturnal hypertension is characterized as a predictor of cardiovascular events, such as acute myocardial infarction or stroke(Hermida et al.,2014; Roush et al.,2014; Pierdomenico et al.,2014; Penmatsa et al.,2020).

Masked hypertension may be associated with higher cardiovascular risk compared with normotension and even a similar risk attributed to untreated hypertension (Roush et al.,2014; Pierdomenico et al.,2014; Penmatsa et al.,2020). It should also be mentioned that the participants with masked hypertension had a higher prevalence of office blood pressure measurements in the "borderline" range, similar to the findings of other studies (Sobrino et al.,2013; Wang et al.,2017; Bromfield et al.,2016).Concerning ABPM blood pressure levels, the participants with masked hypertension had higher frequencies, and meant that in all the parameters assessed, particularly a higher prevalence of altered pressure levels in the ABPM 24-hour sleep periods and attenuated diastolic pressure dipping.

An inherent limitation of the present study was the cross-sectional design, in which the assessments of risk factors and outcomes need to enable establishing of cause-and-effect relationships concomitantly. However, the sample was probabilistic, which controlled selection bias and ensured that all the professionals in the target population had the same probability of being part of the study. Another limitation of this study is that blood pressure readings from a single visit, no matter how well standardized, cannot adjust for the well-documented visit-to-visit variability of in-office blood pressure. However, visit-to-visit variability in-office blood pressure assessment would make the study unviable. However, this was the first Brazilian study that evaluated masked the prevalence and associated factors of masked hypertension among nursing professionals working in oncology.

5 CONCLUSION

In this study, the nursing professionals in oncology had a higher prevalence of masked hypertension than the Brazilian population, and the outcome in question was associated with advancing age and shift work. This study shed light on variables that can be included in intervention programs for nursing staff to reduce the exposure of these professionals to the risk factors. Based on the findings, it is also possible to identify professionals who are at risk, which would allow for individualized interventions. It is recommended that ambulatory blood pressure

monitoring be used as an evaluation strategy in periodic occupational examinations, primarily among older professionals who have a history of problematic alcohol consumption or use anti-sleep medication. Such actions are essential tools for human resource and occupational health management and contribute to the progress of nursing.

REFERÊNCIAS

ALESSI, A.; BRANDAO, A.A.; PAIVA, A.M.G.; NOGUEIRA, A.R.; FEITOSA, A.; GONZAGA, C.G.; et al. I Brazilian position paper on prehypertension, white coat hypertension and masked hypertension: diagnosis and management. **Arq Bras Cardiol**. V.102,p.110-118,2014. doi: 10.5935/abc.20140011

BABU, M.; DRAWZ, P .Masked Hypertension in CKD: Increased Prevalence and Risk for Cardiovascular and Renal Events. **Curr Cardiol Rep**.v.21,n.7p.58 ,2019. doi: 10.1007/s11886-019-1154-4.

BAUMGART, P.; KAMP, J. Accuracy of the SpaceLabs Medical 90217 ambulatory blood pressure monitor. **Blood Press Monit**. v.3,n.5,p.303-307,1998.doi: 10.1097/MBP.0000000000000132

BOBRIE, G.; CLERSON, P.; MENARD, J.; POSTEL-VINAY, N.; CHATELLIER G.; PLOUIN, P.F. Masked hypertension: a systematic review. **J Hypertens**. v.26,p. 1715-1725,2008. doi: 10.1097/HJH.0b013e3282fbcedf

BROCHINI,M.M.Hipertensão Mascarada em servidores públicos: resultados do Estudo Longitudinal de Saúde do Adulto (ELSA-Brasil).[Dissertação];2020,105p.

BROMFIELD, S.G.; SHIMBO, D.; BOOTH, J.N.;CORREA, A.; OGEDEGBE, G.; CARSON, A.P.; et al. Cardiovascular Risk Factors and Masked Hypertension: The Jackson Heart Study. **Hypertension.** v.68,p.1475-1482 2016. doi:10.1161/HYPERTENSIONAHA.116.08308

DRAWZ, P.E.; ALPER, A.B.; ANDERSON, A.H.; BRECKLIN, C.S.; CHARLESTON, J.; CHEN, J.; et al. Masked Hypertension and Elevated Nighttime Blood Pressure in CKD: Prevalence and Association with Target Organ Damage. **Clin J Am Soc Nephrol**. v.11, p.642-652,2016. doi:10.2215/CJN.08530815

FAN, A.Z.; LI, Y.; ELAM-EVANS, L.D.; BALLUZ, L. Drinking pattern and blood pressure among non-hypertensive current drinkers: findings from 1999-2004 National Health and Nutrition Examination Survey. **Clin Epidemiol**. v.5,p.21-272013. doi:10.2147/CLEP.S12152

GEIJERSTAM, A.F.P.; ENGVALL, J.; ÖSTGREN, C.J.; RÅDHOLM, K.; NYSTRÖM, F.H. Masked hypertension in a middle-aged population and its relation to manifestations of vascular disease. **Journal of Hypertension**.2023; Online ahead of print. doi: 10.1097/HJH.0000000000003431

HERMIDA, R.C.; AYALA, D.E.; MOJÓN, A.; SMOLENSKY, M.H.; PORTALUPPI, F.; FERNÁNDEZ, J.R. Sleep-time ambulatory blood pressure as a novel therapeutic target for cardiovascular risk reduction. **J Hum Hypertens**. v.28,p.567-574,2014. doi: 10.1038/jhh.2014.1

HOSMER, D.W.; LEMESHOW S. Applied logistic regression. 2nd edition. New York: John Wiley e Sons; 2000.

KENNY, I.E.; SAEED, S.; GERDTS, E.; MIDTBØ, H.; HALLAND, H.; LØNNEBAKKEN, M.T. Masked hypertension in obesity: potential predictors and arterial damage. **Blood Press Monit**.v.22,p.12-17,2017.doi:10.1097/MBP.0000000000000220

KITHAS, P.A.; SUPIANO, M.A. Hypertension and chronic kidney disease in the elderly. **Adv Chronic Kidney Dis**. v.17,p.341-347,2010. doi:10.1053/j.ackd.2010.04.003

LANDSBERGIS, P.A.; TRAVIS, A.; SCHNALL, P.L. Working Conditions and Masked Hypertension. **High Blood Press Cardiovasc Prev**. v.20,p. 69–76. 2013. doi:10.1007/s40292-013-0015-2

LI, J.;ZHENG, H.; DU, H.B.; TIAN, X.P.;JIANG, Y.J.; ZHANG, S.L.; et al. The multiple lifestyle modification for patients with prehypertension and hypertension patients: a systematic review protocol. **BMJ Open**.v.4,p.e004920, 2014. . doi:10.1007/s40292-013-0015-2

MALACHIAS, M.V.B.; SOUZA, W.K.S.B; PLAVNIK, F.L.; RODRIGUES, C.I.S.; BRANDÃO, A.A.; NEVES, M.F.T.; et al. 7th Brazilian Guideline of Arterial Hypertension. **Arq Bras Cardiol**. v.107,p.1-83,2016. doi:10.5935/abc.20160140

MASLACH, C.;JACKSON S.; LEITER, M. The Maslach Burnout Inventory Manual. In: Evaluating Stress: a book of resources. Zalaquett CP, Wood RJ (editors). Lanham: Scarecrow Press; 1997. pp.191-218.

O'BRIEN, E.;MEE, F.; ATKINS, N.; THOMAS M. Evaluation of three devices for selfmeasurement of blood pressure according to the revised British Hypertension Society Protocol: the Omron HEM-705Cp, Philips HP5332, and Nissei DS-175. **Blood Press Monit**. v.1,n.7,p.55-61.1996. PMID: 10226203

O'BRIEN, E.; PARATI, G.; STERGIOU, G.; ASMAR, R.; BEILIN L.; BILO, G.; et al; European Society of Hypertension Working Group on Blood Pressure Monitoring. European Society of Hypertension position paper on ambulatory blood pressure monitoring. **J Hypertens**.v. 31, p.1731-1768,2014. doi:10.1097/HJH.0000000000000221

OHIRA, T.; TANIGAWA, T.; TABATA, M.; IMANO, H.; KITAMURA, A.; KIYAMA M.; et al. Effects of Habitual Alcohol Intake on Ambulatory Blood Pressure, Heart Rate, and Its Variability Among Japanese Men. **Hypertension**. v.53,p.13-19,2009. doi:10.1161/HYPERTENSIONAHA.108.114835

PAIVA, B.S.R.; MINGARDI,M.; VALENTINO, T.C.O.; et al. Prevalence of burnout and predictive factors among oncology nursing professionals: a cross-sectional study. **São Paulo Med J**. v.139, n.4, p.341-50 2021. doi:10.1590/1516-3180.2020.0606.R1.1202021

PENMATSA, K.R.; BIYANI, M.; , GUPTA, A. Masked Hypertension: Lessons for the Future. **Ulster Med J**. v.89, n.2,p.77-82, 2020. PMCID: PMC7576393

PEACOCK, J.; DIAZ, K.M.;VIERA, A.J.; SCHWARTZ, J.E.; SHIMBO, D. Unmasking masked hypertension: prevalence, clinical implications, diagnosis, correlates and future directions. **J Hum Hypertens,** v.28,p.521–528 2014. doi:10.1038/jhh.2014.9

PIERDOMENICO,S.D.; CUCCURULLO, F. Prognostic value of white-coat and masked hypertension diagnosed by ambulatory monitoring in initially untreated subjects: an update meta-analysis. **Am J Hypertens**. v.24,p.52-58, 2011. doi:10.1038/ajh.2010.203

ROUSH, G.; FAGARD, R.; SALLES, G.; PIERDOMENICO, S.; REBOLDI, G.;

VERDECCHIA, P.; et al. Prognostic impact of clinic, daytime, and night-time systolic blood pressure in nine cohorts of 13,843 patients with hypertension: systematic review and meta-analysis. **J Hypertens**. v.32,p.2332-2340,2014. doi:10.1097/HJH.0000000000000355
SAEED, S.; WAJE-ANDREASSEN, U.; FROMM, A.; ØYGARDEN, H.; NAESS H.;

GERDTS, E. Prevalence and covariates of masked hypertension in ischemic stroke survivors: the Norwegian Stroke in the Young Study. **Blood Press Monit**. V.21,p.244–250,2016. doi: 10.1097/MBP.0000000000000190

SANT'ANA, J.C.P.; SANTOS ,J dos.; SILVA, P.G.B.; MEIRA, K.C.; OLIVEIRA, L.V e.; ALMEIDA, S.G.P de.; PIERIN, A.M.G. Prevalência e Fatores associados ao Estresse Relacionado ao Trabalho e à Síndrome de Burnout entre Profissionais de Enfermagem que Atuam em Oncologia. R**ev. Bras. Cancerol.** v.69,n.2,p.e-053644,2023. doi:10.32635/2176-9745.RBC.2023v69n2.3644

SANTOS, J.D.; MEIRA, K.C.; COELHO, J.C.; DANTAS, E.S.O.; OLIVEIRA, L.V.E.; OLIVEIRA, J.S.A.; ALMEIDA, S.G.P.; PIERIN, A.M.G. Work-related violences and associated variables in oncology nursing professionals.**Cien Saude Colet**. v.26,n.12,p.5955-5966,2021. doi:10.1590/1413-812320212612.14942021

SANTOS, J.; PORCIUNCLA, T.C.; MEIRA, K.C.; da SILVA, P.G.B.; PIERIN, A.M.G. Síndrome metabólica em profissionais de enfermagem que atuam na assistência oncológica: prevalência e fatores associados. **Cienc Cuid Saude**. v.21,p.e59005,2022. doi:10.4025/ciencuidsaude.v21i0.59005

SOBRINO, J.; DOMENECH, M.; CAMAFORT, M.; VINYOLES, E.; COCA, A. Prevalence of masked hypertension and associated factors in normotensive healthcare workers. **Blood Press Monit**.v.18, p. 326-331,2013. doi:10.1097/MBP.0000000000000002

TRUDEL, X.; BRISSON, C.; GILBERT-OUIME, M.; VÉZINA, M.;TALBOLT. D;MILOT,A.; Long Working Hours and the Prevalence of Masked and Sustained Hypertension. **Hypertension**. v.75,n.2,p.532-538,2020. doi:10.1161/HYPERTENSIONAHA.119.12926

URQUIAGA, I.;D'ACUÑA, S.; PÉREZ, D.; DICENTA, S.; ECHEVERRÍA, G.; RIGOTTI, A.; LEIGHTON, F. Wine grape pomace flour improves blood pressure, fasting glucose and protein damage in humans: a randomized controlled trial. **Biol Res.** v.48,n.1,p.49 2015. doi:10.1186/s40659-015-0040-9

VERBERK, W.J.; KESSELS, A.G.H.; LEEUW,P,W. Prevalence, causes, and consequences of masked hypertension: a meta-analysis. **Am J Hypertens**. v.21p.969-975,2008. doi: 10.1038/ajh.2008.221

WANG Y.C.; SHIMBO, D., MUNTNER, P.; MORAN, A.E.; KRAKOFF, L.R.; SCHWARTZ, J.E. Prevalence of masked hypertension among US adults with non elevated clinic blood pressure. **Am J Epidemiol**. v.185,p.194-202, 2017. doi:10.1093/aje/kww237

WIGHTMAN, J.D.; HEUBERGER, R.A. Effect of grape and other berries on cardiovascular health. **J Sci Food Agric**. v.95,p.1584-1597,2015. doi:10.1002/jsfa.6890

ZHAO, H.; ZENG, F.; WANG.; X, WANG, L. Prevalence, risk factors, and prognostic significance of masked hypertension in diabetic patients. **Medicine**. v.96,p.e8363,2017. doi: 10.1097/MD.0000000000008363