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## EVALUATION OF OCCUPATIONAL RISK FACTORS AT MANICURISTS AND PEDICURISTS FOR HEPATITIS B AND C VIRUS INFECTION

**\*<sup>1</sup>Denis Henrique de Oliveira, <sup>1</sup>Luiz Almeida da Silva, <sup>2</sup>Sérgio Valverde Marques dos Santos, <sup>1</sup>Marielena Vogel Saivish, <sup>1</sup>Roger Luiz Rodrigues, <sup>1</sup>Vivaldo Gomes da Costa, <sup>1</sup>Alécio Perini Martins and <sup>1</sup>Marcos Lázaro Moreli**

<sup>1</sup>Federal University of Goiás, Jataí, Goiás, Brazil, (64) 3441-5300

<sup>2</sup>State University of Minas Gerais, Passos, Minas Gerais, Brazil, (35) 3221-7610

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#### \*Corresponding author:

Denis Henrique de Oliveira

### ABSTRACT

Professional manicurists/pedicurists constitute a group at risk of the transmission of infectious diseases. This study analyzed the occupational risks to which they are exposed, the biosafety practices that they undertake, and the serological markers for hepatitis B virus and hepatitis C virus infections. A validated questionnaire was administered to 163 of these professionals and 142 serum samples were obtained from two cities of Goiás state, Brazil. Overall, 47.2% of the participants stated that they had undergone professional training, but 73% had not taken a biosafety preparatory course (PR = 1,25; IC95%: 0,56-2,81; p = 0,578). Adherence to the use of personal protective equipment was low, with 80% of those interviewed not wearing gloves during care. The methods of choice for material sterilization were not the most adequate and only 1.9% reported using an autoclave (PR=1,93; IC95%: 0,46-8,14; p=0,367). Isolated HBsAg serological marker was identified in 5.6% of the samples and anti-HBc/anti-HBs were identified in 4.9%, but none of these samples were positive in RT-PCR. Of the professionals interviewed, 56.4% had already experienced accidents at work (PR =1,54; IC95%: 0,73-3,23; p=0,248), but the anti-HBs marker was identified in 33.1%, showing low vaccine protection. This work reveals the lack of compliance with biosafety standards by professionals and the danger of cross-infection at the workplaces of manicurists and pedicurists.

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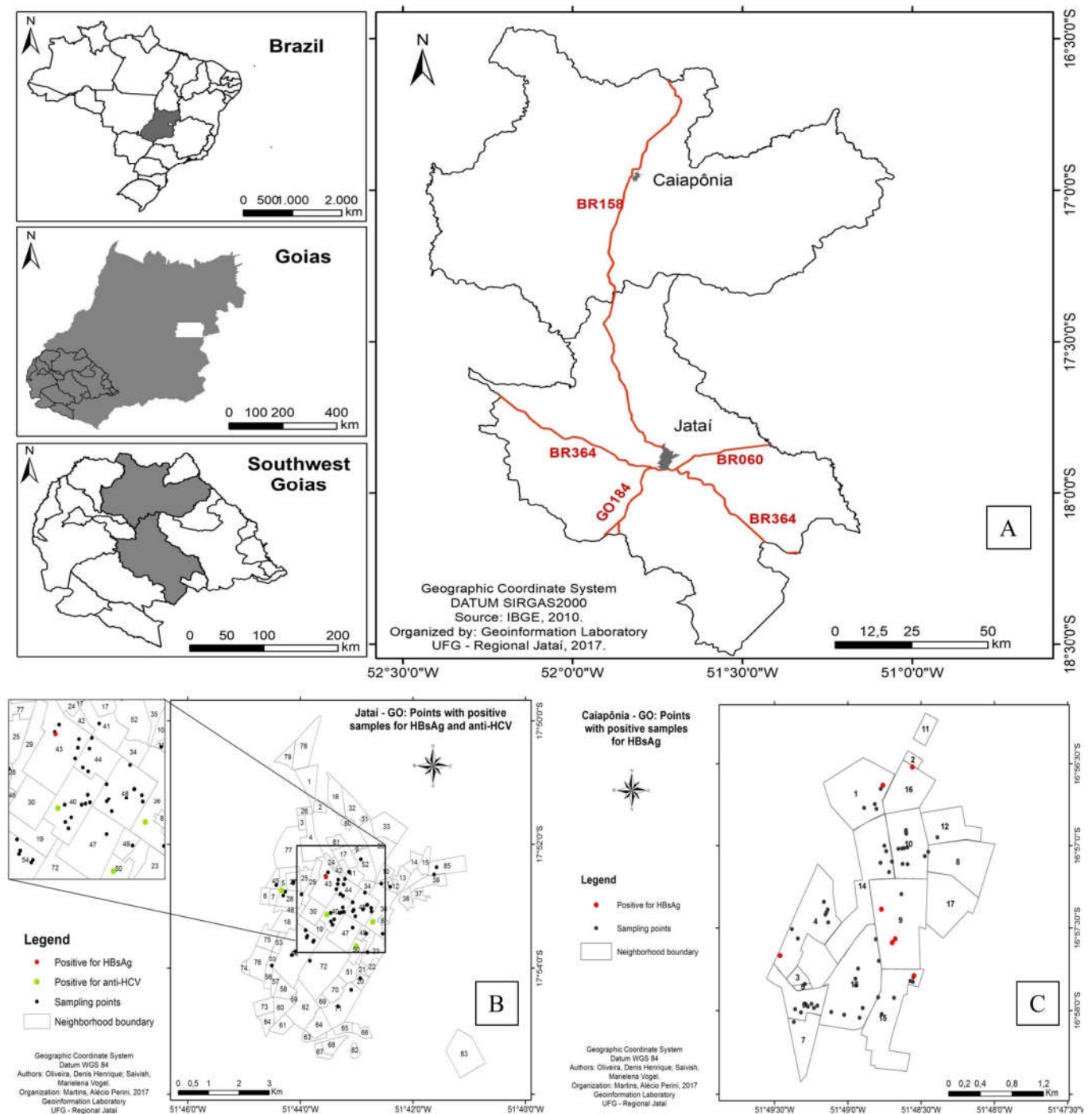
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### INTRODUCTION

The hepatitis B virus is a serious public health problem, with approximately 257 million people living with the infection<sup>1</sup>. In Brazil, between 2007 and 2017, 218,257 cases of the disease were confirmed<sup>2</sup>. The activities performed by manicures and pedicures are associated with the risk of infection by hepatitis B virus (HBV) and hepatitis C virus (HCV) and the adoption of standards and biosafety procedures is fundamental to protect professionals and their clients<sup>3</sup>. However, few studies in the country have evaluated the knowledge and compliance of biosafety standards by these professionals. This work aimed to investigate the knowledge and preparation of professional manicures and pedicures, the occupational risks to which they are exposed and the presence of markers for HBV / HCV infections.

### METHODOLOGY

This is a cross-sectional correlational study with a quantitative approach. Between March and October 2016, 163 professional manicures and pedicures were visited, of which 101 were residents in Jataí and 62 in Caiapônia, Goiás, Brazil (Figure 1). The professionals were asked to complete a validated questionnaire and donated 5 mL of whole blood for serological and molecular tests. All the professionals completed the validated questionnaire and 142 allowed blood collection. Samples were analyzed by ELISA for the identification of HBsAg, anti-HBc, anti-HBs and anti-HCV markers using the commercial test of Interkit (ACON Biotech Co., Hangzhou, China). Viral RNA was extracted using the Viral Gene-spin™ kit (Intron Biotechnology, Seongnam-si, South Korea) and the PCR reactions were performed according to the methodology of Zauli et al, 2016.



**Figure 1. Geographic localization of study sites (A). Distribution of samples included in the study of serological markers obtained for HBV and HCV in the municipalities of Jataí (B) and Caiapônia (C)**

The data were analyzed in the STATA program, version 14.0. The frequencies of the markers for HBV and HCV infection were estimated using the  $\chi^2$  test ( $p < 0.05$ ). The 95% confidence interval (CI) was calculated. The prevalence ratio (PR) was determined by the model of Bivariate Analysis and Multivariate Logistic Regression. This study was approved by the Research Ethics Committee of the Federal University of Goiás (n° 1,803,340).

## RESULTS

The interviewees were predominantly women (99.4%), with a mean age of 32 years, unmarried (PR = 1.26, 95% CI: 0.59-2.28,  $p = 0.658$ ) and low adherence to professional qualification.

Of these interviews, 73% did not participate in courses on biosafety or dissemination of diseases (PR = 1.25, 95% CI: 0.56-2.81,  $p = 0.578$ ) (Table 1). Low adherence to biosafety standards was identified regarding the use of personal protective equipment, cleaning and sterilization of working instruments and disposal of potentially infectious materials (Table 2). In addition, there was an increase in the vulnerability to HBV infections due to the absence of the hand hygiene procedure (PR = 1.31, 95% CI: 0.64-2.67,  $p = 0.466$ ), the practice of reuse salon materials (PR = 1.29, 95% CI: 0.63-2.63,  $p = 0.479$ ), in the incorrect application of instruments sterilization (PR = 1.93, 95% CI: 0.46-8.14,  $p = 0.367$ ) and in the absence of any cleaning and decontamination methodology (PR = 1.71, 95% CI: 0.67-4.36,  $p = 0.258$ ).

Table 1. Sociodemographic and labor characteristics

Variables	N <sup>a</sup>	%
<b>Sociodemographic</b>		
Age (years)	32,0	(26,0-42,0)
<b>Place of recruitment</b>		
Jataí	101	62,0
Caiapônia	62	38,0
<b>Sex</b>		
Female	162	99,4
Masculine	1	0,6
<b>Civil status</b>		
Married or consensual union	85	52,1
Single, separated or widowed	78	47,9
<b>Children</b>		
No	42	25,8
Yes	121	74,2
<b>Schooling (years)</b>		
< 8	12	7,4
8-11	54	33,1
≥ 12	97	59,5
<b>Responsible for family income</b>		
No	110	67,5
Yes	53	32,5
<b>Labour</b>		
Time in the esthetic branch (months)	120,0	(60,0-228,0)
Time of work in the beauty salon (months)	36,0	(12,0-96,0)
Daily working load	8,0	(6,0-8,0)
<b>Works in another salon</b>		
No	157	96,3
Yes	6	3,7
<b>Professional qualification</b>		
Professional courses	77	47,2
Informal training	44	27,0
TV, magazines	42	25,8
Duration of vocational training courses (hours) (N = 77)	562,0	(86,0-936,0)
<b>Training with specific courses</b>		
No	82	50,3
Yes	81	49,7
<b>Training with biosafety courses</b>		
No	119	73,0
Yes	44	27,0
<b>Other services offered at the establishment<sup>b</sup></b>		
Podiatry	30	18,4
Hairdresser	148	90,8
Depilation	80	28,8
Barber shop	32	19,6
Another aesthetic service	47	28,8
<b>Participation in class association</b>		
Yes	-	-
No	163	100,0

Note: quantitative variables presented as medians and interquartile range; a. N = 163; b. Multiple response variable.

Failure to comply with biosafety standards results in frequent accidents (56.4%) and increased risk of infection (PR = 1.54, 95% CI: 0.73-3.23; p = 0.248) (Table 3). The sexual pathway has been confirmed to be important in the transmission of hepatitis B. Was found a positive association between the number of sexual partners (PR = 2.24, 95% CI: 1,18 - 4,03, p = 0.013) and exposure to HBV, as well the occurrence of accidents in the nail itself with the materials used in the salon (PR = 2,24, 95% CI: 1,04-4,24, p = 0.040) (Table 4). Information on vaccination against hepatitis B was provided by 63.8% of the participants. Of these, 87.5% reported having completed the vaccination schedule. The ELISA test showed a positivity 5.6% for anti-HBs Ag (95% CI: 2.9-10.7), 7% for anti-HBc (95% CI: 3.9-12.5) and 33.1% for HBs (95% CI: 25.9-41.2). The rate of the anti-HBs marker presents a worrying number of professionals at risk. Among the samples, 49.3% did not present positive serological markers (95% CI: 41.2-57.4) and the anti-HCV positivity rate was 2.8% (95% CI: 1,1- 7.0).

Table 2. Characteristics associated with adherence to precautionary and biosafety measures

Variables	N <sup>a</sup>	%
<b>Materials used in the beauty salon<sup>b</sup></b>		
Client	152	93,3
Salon	85	52,1
Professional	72	44,2
<b>Used cliente materials (N = 152)<sup>b</sup></b>		
Pliers	149	98,0
Nail polishes	69	45,4
Toothpicks	113	74,3
Hemostatic	13	8,6
Towels	26	17,1
Bowls	24	15,8
Bowl guard	4	2,6
<b>Hygiene of hands</b>		
Always	110	67,5
Sometimes	41	25,2
Never	12	7,4
<b>Material used for hand hygiene (N = 151)</b>		
Bar soap	37	24,5
Liquid soap	114	75,5
<b>Material used for hand drying (N = 151)</b>		
Fabric towel	137	90,7
Paper towel	14	9,3
<b>Use of personal protective equipment (PPE)<sup>b</sup></b>		
Gloves	41	25,2
Masks	21	12,9
Protective goggles	-	-
Bouffant cap	2	1,2
<b>Frequency of change of gloves (N = 41)</b>		
Exchange to each client	36	87,8
Use in other attendance	5	12,2
<b>Touch the glove on furniture (N = 41)</b>		
No	26	63,4
Yes	15	36,6
<b>Hygiene of hands before putting on gloves (N = 41)</b>		
Never	7	17,1
Sometimes	16	39,0
Always	18	43,9
<b>Hygiene of hands after removing gloves (N = 41)</b>		
Never	1	2,4
Always	31	75,6
Sometimes	9	22,0
<b>Change mask to each client (N = 21)</b>		
No	14	66,7
Yes	7	33,3
<b>Cover nose and mouth with mask (N = 21)</b>		
No	-	-
Yes	21	100,0
<b>Use of accessories in the attendance</b>		
Does not remove	79	48,5
Do not use/withdraw	84	51,5
<b>Nail appearance</b>		
Short, trimmed	125	76,7
Long	38	23,3
<b>Used clothes at work<sup>b</sup></b>		
Uniform	29	82,2
Apron	19	11,7
Common clothes	123	75,5
<b>Daily change of clothing, apron or uniform</b>		
No	3	1,8
Yes	160	98,2
<b>Washing clothes</b>		
At home, along with other types	115	70,6
At home, separated	47	28,8
Laundry	1	0,6
<b>Shoe type<sup>b</sup></b>		
Open	135	82,8
Closed	88	54,0
<b>Reusable materials<sup>b</sup></b>		
Toothpicks	108	66,3
Nail files	101	62,0
Plastic products	-	-
Gloves	2	1,2
<b>Disposal of sharps instruments</b>		
Common trash	135	82,8
Container with rigid walls	11	6,7
None	17	10,4
<b>Use of basins</b>		
No	26	16,0
Yes	137	84,0
<b>Origin of the basins (N = 137)</b>		
Client	2	1,5
Beauty salon	135	98,5
<b>Management of the basins of beauty salon (N = 137)</b>		
Washed with soap and water to each client	59	43,1
Wash with soap and water when needed	9	6,6
Disposable plastic used to cover such basins	69	50,4

a. N = 163; b. Variable with multiple answers.

Table 3. Bivariate analysis of the potential factors associated with HBV infection

Variables	HBV infection				PR <sup>a</sup> (95% CI) <sup>b</sup>	p
	Negative (N = 70)	%	Positive (N = 25)	%		
<i>Age (years)</i>	39,0 (33,5-44,0)		32,0 (27,0-45,5)		0,96 (0,93-1,00)	0,095
<i>Time in the field of aesthetics (months)</i>	174,0 (114,0-240,0)		108,0 (18,0-216,0)		0,87 (0,69-1,09)	0,236
<i>Working time in the salon (months)</i>	48,0 (12,0-120,0)		36,0 (10,5-96,0)		0,96 (0,71-1,29)	0,807
<i>Daily working load</i>	8,0 (6,0-8,0)		8,0 (7,0-8,0)		1,13 (0,97-1,31)	0,102
<i>Place of recruitment</i>						
Jataí	43	78,2	12	21,8	1,00	
Caiaipônia	27	67,5	13	32,5	1,48 (0,75-2,92)	0,247
<i>Marital status</i>						
Married	40	75,5	13	24,5	1,00	
Not married	30	71,4	11	28,6	1,16 (0,59-2,28)	0,658
<i>Schooling (years)</i>						
< 8	7	63,6	4	36,4	1,00	
8-11	25	73,5	9	26,5	0,72 (0,27-1,91)	0,520
≥ 12	38	76,0	12	24,0	0,65 (0,26-1,67)	0,381
<i>Works in another salon</i>						
No	67	72,8	25	27,2		
Yes	3	100,0	-	-	-	-
<i>Professional training with vocational courses</i>						
Yes	31	70,5	13	29,5	1,00	
No	39	76,5	12	23,5	1,10 (0,56-2,17)	0,770
<i>Training with biosafety courses</i>						
Yes	21	77,8	6	22,2	1,00	
No	49	72,1	19	27,9	1,25 (0,56-2,81)	0,578
<i>Hygiene of hands</i>						
Always	53	75,7	17	24,3	1,00	
Sometimes/Never	17	68,0	8	32,0	1,31 (0,64-2,67)	0,446
<i>Use of gloves</i>						
Yes	14	73,7	5	26,3	1,00	
No	56	73,7	20	26,3	1,00 (0,42-2,32)	1,000
<i>Using masks</i>						
Yes	8	80,0	2	20,0	1,00	
No	62	72,9	23	27,1	1,35 (0,37-4,93)	0,647
<i>Reuse sticks</i>						
No	24	72,7	9	27,3	1,00	
Yes	46	74,2	16	25,8	0,94 (0,46-1,91)	0,877
<i>Reuses nail file</i>						
No	31	77,5	9	22,5	1,00	
Yes	39	70,9	16	29,1	1,29 (0,63-2,63)	0,479
<i>Use of methods for cleaning or decontaminating materials</i>						
Yes	66	75,0	22	25,0	1,00	
No	4	57,1	3	42,9	1,71 (0,67-4,36)	0,258
<i>Sterilizes objects</i>						
Yes	69	74,4	24	25,8	1,00	
No	1	50,0	1	50,0	1,93 (0,46-8,14)	0,367
<i>Use of chemical substances or processes for cleaning or disinfecting</i>						
Yes	63	74,1	22	25,9	1,00	
No	7	70,0	3	30,0	1,15 (0,41-3,20)	0,776
<i>History of accident with sharp instruments<sup>c</sup></i>						
No	32	80,0	8	20,0	1,00	
Yes	38	69,1	17	30,9	1,54 (0,73-3,23)	0,248
<i>History of accident with sharp instruments<sup>d</sup></i>						
No	42	71,2	17	28,8	1,00	
Yes	28	77,8	8	22,2	0,77 (0,36-1,60)	0,448
<i>Accident doing the nail itself with materials used in the salon</i>						
No/Do not nail with materials used in the salon	47	81,0	11	19,0	1,00	
Yes	23	62,2	14	37,8	1,99 (1,01-3,92)	0,046
<i>Previous serology for hepatitis B</i>						
No	34	77,3	10	22,7	1,00	
Yes	36	70,6	15	29,4	1,29 (0,64-2,59)	0,467
<i>Use of illicit drugs<sup>e</sup></i>						
No	68	73,9	24	26,1	1,00	
Yes	2	66,7	1	33,3	1,27 (0,24-6,62)	0,770
<i>Number of sexual partners<sup>e</sup></i>						
1	49	81,7	11	18,3	1,00	
≥ 2	20	58,8	14	41,2	2,24 (1,14-4,39)	0,018
<i>Condom use<sup>e</sup></i>						
Already used	60	71,4	24	28,6	1,00	
Never	8	90,0	1	10,0	0,35 (0,05-2,34)	0,279

Note: quantitative variables presented as medians and interquartile range; a. Prevalence ratio; b. 95% confidence interval (CI); c. In the life; d. Last 12 months.

Molecular confirmation for the presence of the virus was performed in 12 samples, 8 positive for HBsAg and 4 anti-HCV positive, however, there was no amplification for HBV and HCV (Table 4).

**Table 4. Multiple regression model of factors associated with HBV infection in manicures**

Variables	PR <sup>a</sup> ajusted (95% CI) <sup>b</sup>	p
Age (years)	0,97 (0,92-1,03)	0,453
Activity time in the branch (months)	0,87 (0,65-1,18)	0,397
Daily working load	1,16 (0,96-1,41)	0,111
Local		
Jataí	1,00	
Caiaipônia	1,29 (0,64-1,18)	0,397
Schooling (years)		
< 8	1,00	
8-11	0,64 (0,27-1,53)	0,327
≥ 12	0,55 (0,27-1,33)	0,188
Accident doing the nail itself with materials used in the salon		
No/Do not nail with materials used in the salon	1,00	
Yes	2,09 (1,04-4,24)	0,040
Number of sexual partners		
1	1,00	
≥ 2	2,24 (1,18-4,03)	0,013

a. Prevalence ratio; b. 95% confidence interval (CI); c. Adjusted for age, time of activity in the branch, daily workload, location, schooling, accident making the nail itself with materials used in the salon and number of sexual partnerships in life; R<sup>2</sup>: 0,110.

## DISCUSSION

Manicures activities are characterized by long working hours, repetitive movements, contact with blood and the possibility of contracting and transmitting infectious diseases, and the informality of work associated, mainly, with the absence of biosafety courses and applications of their recommendations, increase the risks for transmission of infection between this group of professionals and their clients<sup>5</sup>. Even with the use of personal protective equipment (PPE's) being legally mandatory in all situations where there is a risk of contact with biological agents<sup>6</sup>, their employment is low among this professional group. Similar to that observed in our study, in the city of São Paulo, approximately 80% of professionals do not wear gloves when attending clients<sup>7</sup>. It is recommended that the instruments should not be used in new clients without having undergone an adequate cleaning and sterilization process and the lack of knowledge of beauty professionals about these measures may be related to cases of viral hepatitis<sup>8</sup>. For sterilization, although there are restrictions regarding its use in Brazilian regulations, the Pasteur greenhouse was the most used method, even if the indication is for autoclave use<sup>6,9,10</sup>. Boiling was the second method most used by professionals, however, the associated risk is that, at the maximum temperature reached of 100 ° C, some spores and viruses, such as hepatitis, can resist<sup>11</sup>. Accidents with sharps, failure to wash working materials and handling materials used in previous clients without sterilization are considerable risk factors and administration of a hepatitis B vaccine is an efficient prophylaxis<sup>8,12</sup>. In this study, due to the reluctance of the professionals, data on vaccination were obtained by reports and compared to the positive anti-HBs marker rates in immunized individuals who, together with other national studies of 34.5%<sup>3</sup> and 44%<sup>13</sup>, provides an estimate of the correct protection index among these professionals. Measurements of the total anti-HBs/anti-HBs and HBsAg markers were similar to an earlier study in the central region of

Brazil<sup>13</sup>, however, they differed from the rates observed in Minas Gerais<sup>3</sup>, as well as to Cacoal city in the State of Rondônia, where they were identified 64% positive for total anti-HBc/HBs, indicating differences in infection rates in country<sup>12</sup>. The low protective response in this group demonstrates the need for sanitary surveillance to maintain constant surveillance of the conditions that this work is being carried out. Noncompliance with various standards found in this study is related to the lack of adherence to biosafety measures, and although professionals in this sector have information on existing risks, it appears to be insufficient to change their behavior in the workplace. Continued education and supervision is required on the correct use of instrument cleaning, disinfection and sterilization procedures, as well as incentives for good bisexuality practices. The present study intends to warn about the need for new discussions and national surveillance programs aimed at increasing safety for clients and professionals in this niche.

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