

# The COVID-19 pandemic's impact on the practices and biosecurity measures of veterinary medicine professionals in Brazil

Impactos da pandemia de COVID-19 nas práticas e medidas de biossegurança de profissionais da medicina veterinária no Brasil

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## Abstract

Veterinarians, among other health professionals, are considered health professionals at high risk of exposure to and contraction of COVID-19. The main objective of this study is to assess changes in the clinical practices of veterinarians during the COVID-19 pandemic around prophylactic and biosafety measures, as well as to evaluate changes in workload and cost-benefit ratio. An online questionnaire was sent to veterinary professionals from July 2020 to July 2021 using Google Forms. A total of 1134 veterinarians answered the questionnaire on clinical experiences and biosafety practices during the COVID-19 pandemic. Veterinarians changed their routine clinical practices, as there was a reduction in working hours, and applied new patient approaches and advice to their owners, as well as restricting the number of people allowed inside. Biosafety measures were added in their workplaces, with an increase in the use of personal protective equipment. COVID-19 tests were administered at least once in 19.0%, and more than once in 9.5% of the respondents. Flu symptoms were present in 23.8% of the respondents, and 31.0% of the veterinarians attended to COVID-19 positive pet owners. Therefore, most veterinarians altered their routine practices, and some were exposed to sources of COVID-19 infection.

**Keywords:** coronavirus, health professionals, personal protective equipment, universal healthcare, veterinary medicine.

## Resumo

Os médicos veterinários, entre outros profissionais de saúde, são considerados profissionais de saúde sob alto risco de exposição e contração do COVID-19. O objetivo principal do presente estudo foi avaliar as mudanças na prática clínica de médicos veterinários durante a pandemia de COVID-19 em torno das medidas profiláticas e de biossegurança, assim como avaliar as mudanças na carga de trabalho e a relação custo-benefício. De julho a dezembro de 2020, um questionário online foi enviado aos profissionais por meio da ferramenta Formulários Google. Um total de 1.134 veterinários responderam ao questionário relacionado às experiências clínicas e práticas de biossegurança durante a pandemia COVID-19. Os médicos veterinários mudaram suas práticas clínicas rotineiras, pois houve redução da jornada de trabalho, novas abordagens dos pacientes e orientações aos proprietários, além da restrição do número de pessoas nos locais. Medidas de biossegurança foram adicionadas aos locais de trabalho, com aumento do uso de equipamentos de proteção individual. Os testes COVID-19 foram realizados pelo menos uma vez em 19,0% e mais de uma vez em 9,5% dos entrevistados. Sintomas de gripe estavam presentes em 23,8% dos profissionais entrevistados e 31,0% dos veterinários atendiam tratadores de animais positivos para COVID-19. Portanto, a maioria dos veterinários alterou suas práticas de rotina e alguns foram expostos a fontes de infecção COVID-19.

**Palavras-chave:** coronavírus, profissionais de saúde, equipamentos de proteção individual, saúde universal, medicina veterinária.



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## Introduction

The coronavirus disease (COVID-19) pandemic has caused massive and unprecedented disruptions in social and economic life worldwide, historically marked as one of the world's biggest health crises. It is a respiratory syndrome that can cause symptoms similar to those of common influenza (*Orthomyxoviridae* family); however, COVID-19 can lead to pneumonia accompanied by respiratory failure and vascular impairment (Perlman, 2020; Zhu et al., 2020).

COVID-19 was first discovered in December 2019 in Wuhan Province, China, and is caused by a viral species called severe acute respiratory syndrome-related coronavirus 2 (SARS-CoV-2), belonging to the family *Coronaviridae*, genus *Betacoronavirus*. The genus *Betacoronavirus* also comprises other viral species that cause respiratory diseases in humans, such as the severe acute respiratory syndrome virus (SARS-CoV-1) and Middle East respiratory syndrome virus (MERS-CoV) (Cui et al., 2019).

Regarding animals and outbreaks of coronaviruses in humans, Martina et al. (2003) reported the susceptibility of cats and ferrets to SARS-CoV-1 infection. Similarly, SARS-CoV-2 uses the same receptor for cell invasion, ACE II, which is also present in mice, cats, pigs, ferrets, and primates (Wan et al., 2020). Thus, the possibility of interspecies transmission cannot be ruled out (Li et al., 2020). There is a hypothesis that animals can act as fomites for SARS-CoV-2, but there are still no studies on the survival and viability of the virus on animal surfaces (Hosie et al., 2021). In addition to contact with people who may be virus carriers, veterinarians are also exposed to patients who are potentially mechanical carriers of the virus, which requires the adoption of biosafety measures (Wayne & Rozanski, 2020), justifying the research herein presented.

Veterinarians, among other health professionals, are considered at high risk of exposure and contraction of COVID-19 because they maintained full professional activity (Wayne & Rozanski, 2020), as the majority of dog owners attended to their dogs' health as a priority, even during the pandemic (Kogan et al., 2021). Veterinary medicine presents itself ontologically as strongly related to One Health, and all the valuable related knowledge can be properly integrated into multidisciplinary task forces with a renewed role in the management and monitoring structures necessary for the COVID-19 pandemic (Decaro et al., 2020; Ferri & Lloyd-Evans, 2021; Gortázar & Fuente, 2020; Yoo & Yoo, 2020).

More than two years after the first outbreak of COVID-19, the cumulative number of confirmed infection cases has exceeded 470 million worldwide, and there are still many variants circulating on a large scale among the world's population. Even though these variants have higher transmissibility and lower mortality, there is still concern about the pandemic's epidemiological progression and outcome (Ritchie et al., 2020).

Brazil has surpassed almost 30 million cases of COVID-19, with a massive 660 thousand deaths, placing itself as the third most affected country, after the United States and India. Complete vaccination rates (two doses) reached 11.1 billion people vaccinated worldwide and 410 million in Brazil, representing approximately 57% of the world's population and 75% of the Brazilian population. On the other hand, only an approximate 20% of the global population and 35% of Brazil's population received the proper third vaccine dose, and only 14.4% of people in low-income countries have received at least one dose to date (Ritchie et al., 2020). Such discrepancies may result in a new epidemiological scenario for this health crisis and an unstable outlook for the pandemic's outcome, since to bring it to an end, a large share of the world needs to be immune to the virus.

Considering the current global COVID-19 pandemic, as well as the scarcity of scientific reports on changes in the use of personal protective equipment among veterinarians and modifications to their routine practices during the pandemic period; the purpose of this study was to examine the prophylactic and biosafety measures adopted by veterinarians, their personal experiences with COVID-19, and changes made to their practices during the pandemic.

## Material and methods

The inclusion criteria were graduates in veterinary medicine who were working in medical or surgical clinics for companion animals. Participants that did not meet the inclusion criteria were

excluded. An online questionnaire was developed using Google Forms, disseminated through postgraduate programs, professional councils, and an active search of veterinarian e-mails.

The questionnaire was administered between from July 2020 to July 2021. After the initial consent, the respondents answered questions about their knowledge and clinical experiences regarding COVID-19, including prophylactic and biosafety measures, use of personal protective equipment, changes in medical practices, exposure to potential sources of infection, and occurrence of COVID-19.

The statistical analyses were performed using the R Development Core Team (2020) software. A chi-square test was used to compare working time and the use of protective equipment before and during the pandemic. For all analyses, a significance level of 0.05 was considered. For all evaluated variables, 95% confidence intervals (CIs) were obtained.

## Results

A total of 1134 valid surveys were obtained from all 26 Brazilian states. The region with the highest number of participants was the southeast (32.1%), followed by the south (28.4%), central-west (19.6%), northeast (12.4%), and north (7.5%). The profile of the respondents was mostly women (71.4%), 47.6% had up to five years of professional experience, 31.7% had six to 15 years of professional experience, and 20.6% had 16 to 20 years of professional experience. The mean age of the respondents was  $32.72 \pm 8.34$  years, and 19.84% of them had at least one chronic disease (Table 1).

The pandemic required veterinarians to make some changes in their workplace and routines (Table 2), with increases in biosafety measures at reception (96.0%) and in consultation areas (90.4%). A minority of professionals (38.1%) adopted a pre-screening process with pet owners for symptoms of COVID-19, and only 18.2% of veterinarians adopted animal hygiene protocols at reception and before clinical examination. The number of owners per consultation was restricted to only one in 69% of the clinics and to two in 21.0% of clinics to prevent agglomeration, and 68.2% implemented awareness around some guidelines on the sanitization of animals when returning from walks in the street.

There was a 59.5% change in the number of hours worked by veterinarians. The pandemic has also led to reductions in the number of cases seen by 57%, but only 31% have made changes in employee salaries. Improvements in biosecurity led to an increase in operating costs for 73% of respondents, but only 13.0% increased the value of the services provided to compensate for such investments (Table 2).

Flu symptoms during the pandemic were present in 23.8% of the professionals surveyed (Table 1), and 31.0% of the veterinarians attended to COVID-19 positive pet owners; however, COVID-19 tests were only performed at least once in 19.0% and more than once in 9.5% of the interviewees (Table 2).

Several types of personal protective equipment were added during the COVID-19 pandemic (Figure 1), with significant differences between its use before and during the pandemic. These additions included the use of surgical masks ( $p < 0.05$ ), N95 masks ( $p < 0.05$ ), face shields ( $p < 0.05$ ), and TNT coats ( $p < 0.05$ ). A large percentage of veterinarians reported discomfort with the use of personal protective equipment during the pandemic (58.1%), and 12.7% had allergic reactions due to its use (Table 2).

There were significant changes in working hours before and during the pandemic in both groups evaluated ( $p < 0.0001$ ). In the group with a work period of up to 30 hours, 8.7% increased their workload, and in the group above 30 hours, only 5% increased their weekly work hours during the COVID-19 pandemic (Table 3).

Most of the respondents reduced or maintained their weekly workload, and there were no differences ( $p > 0.05$ ) between the frequencies of respondents who maintained their working hours and those who reduced them. That is, 50% of the interviewees who had more than 30 hours per week and 41.3% of those who had less than 30 hours per week had a reduction in the workload, showing the impact of the pandemic on the professional activity of veterinarians (Table 3).

Even though most professionals were post-graduate (71.4%), the adoption of prophylactic measures also occurred by those without post-graduation.

**Table 1.** Characterization of the sample studied.

Variable	n	%	Mean±SD	CI (95%)
<b>Age</b>	-		32.72±8.31	32.24-33.20
<b>Gender</b>			-	
Male	324	28.6		26.01-31.27
Female	810	71.4	-	68.73-73.98
<b>Chronic diseases</b>			-	
No	909	80.16	-	77.74 - 82.38
Yes	225	19.84	-	17.62-22.26
<b>Postgraduate degree</b>			-	
Yes	810	71.4	-	68.73-73.98
No	324	28.6	-	26.01-31.27
<b>Flu symptoms in recent weeks</b>			-	
Yes	270	23.81	-	21.42-26.37
No	864	76.19	-	73.62-78.58

**Table 2.** Characterization of clinical practices, changes in the clinic's routine and costs, and characterization of personal protective equipment.

Variable	n	%	CI (95%)
<b>Pre-screening</b>			
Yes	432	38.10	35.31-40.96
No	702	61.90	59.04-64.69
<b>Changes in biosecurity at reception</b>			
Yes	1089	96.03	94.73-97.02
No	45	3.97	2.98-5.27
<b>Visits of tutors</b>			
None	108	9.52	6.88-12.28
One	783	69.05	66.40-71.81
Two	243	21.43	18.78-24.19
<b>Number of people per service</b>			
No restriction	108	9.52	6.88-12.28
Only one person	783	69.05	66.40-71.81
Two people	243	21.43	18.78-24.19
<b>Does it allow children and the elderly to enter?</b>			
No	576	50.79	47.89-53.69
Yes	558	49.21	46.30-52.11
<b>Sanitizes the animal before consultation</b>			
No	927	81.75	79.39-83.89
Yes	207	18.25	16.11-20.61
<b>Guidelines</b>			

Table 2. Continued...

Variable	n	%	CI (95%)
No	360	31.75	29.10-34.51
Yes	774	68.25	65.49-70.90
<b>Biosafety in the clinic in the consultation places</b>			
No	108	9.52	7.95-11.37
Yes	1026	90.48	88.63-92.05
<b>Changes in work hours</b>			
No	459	40.48	37.66-43.36
Yes	675	59.52	56.64-62.34
<b>Increased costs</b>			
No	306	26.98	24.48-29.64
Yes	828	73.02	73.36-75.52
<b>Have you changed the price of the procedures?</b>			
No	981	86.51	84.39-88.37
Yes	153	13.49	11.63-15.60
<b>Modified employee pay</b>			
No	774	68.80	66.03-71.44
Yes	351	31.20	28.56-33.97
<b>Changes in staff</b>			
I'm not an owner	360	31.75	28.66-34.89
There were no changes	567	50	46.91-53.14
Yes	207	18.25	15.17-21.40
<b>Home care</b>			
I don't do home care	297	26.19	23.19-29.30
There were no changes	387	34.13	31.13-37.24
Yes, the calls dropped a little	207	18.25	15.26-21.37
Yes, calls have dropped considerably	90	7.94	4.94-11.05
Yes, I have not performed home care	153	13.49	10.49-16.61
<b>Changes in the cases series</b>			
No changes	486	42.86	39.86-45.94
Yes, assiduous customers	252	22.22	19.22-25.30
Yes, it's slowed down a bit	189	16.67	13.67-19.75
Yes, it has decreased considerably	144	12.70	9.70-15.78
Yes, just emergency	63	5.56	2.56-8.64
<b>Changes in the series</b>			
No	486	42.86	40.00-45.76
Yes	648	57.14	54.24-60.00
<b>Have you ever performed a COVID test?</b>			
No	180	71.43	68.87-74.11
Yes, just one	216	19.05	16.49-21.73

Table 2. Continued...

Variable	n	%	CI (95%)
Yes, more than one	108	9.52	6.97-12.20
<b>Attendance - Tutor with suspected covid</b>			
No	774	68.25	65.61-71.05
Yes, just one	153	13.49	10.85-16.28
Yes, more than one	207	18.25	15.61-21.05
<b>Allergy to personal protective equipment</b>			
No	990	87.30	85.24-89.11
Yes	144	12.70	10.89-14.76
<b>Discomfort to personal protective equipment</b>			
No	468	41.27	38.44-44.16
Yes	666	58.13	55.84-61.56

Table 3. Workload before and during the pandemic.

Weekly workload	BEFORE PANDEMIC		DURING PANDEMIC				p-value*		
	n	%	Kept		Increased			Reduced	
			n	%	n	%		n	%
up to 30 hours	414	36.5	207	50.0	36	8.7	171	41.3	0.0146
more than 30 hours	720	63.5	324	45.0	36	5.0	360	50.0	0.0647

\*Chi-square test (p<0.001) for frequencies before the pandemic and during the pandemic. K\*R: chi-square test between the frequencies of the respondents who maintained or reduced the weekly workload during the pandemic. K: respondents who maintained their workload; R: respondents who reduced the workload.

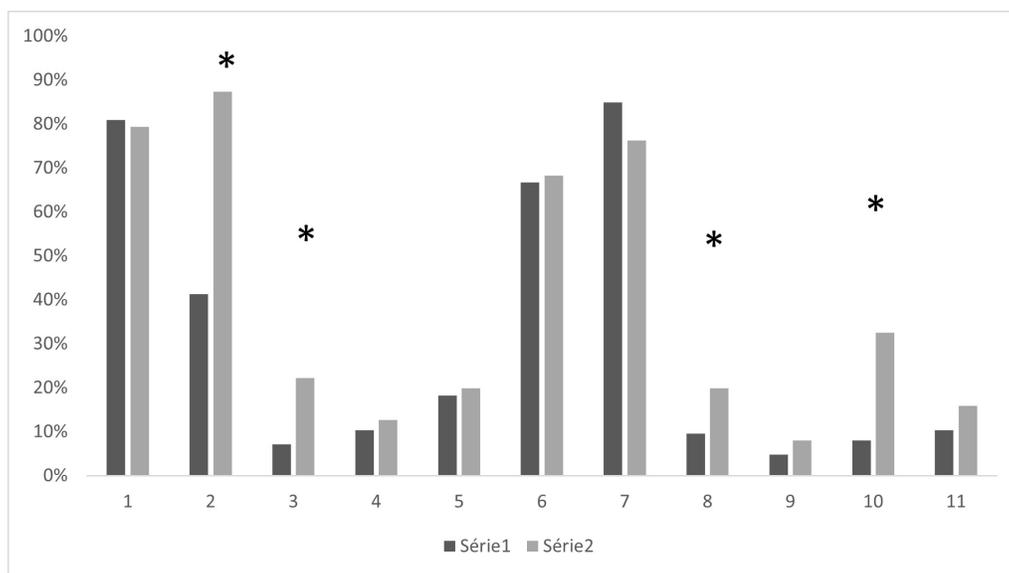


Figure 1. Use of personal protective equipment before and during the COVID-19 pandemic. \*Chi-square test (p < 0.05).

## Discussion

The use of social networks as a facilitator in the process of access to and dissemination of the questionnaire was important to reach veterinary medicine professionals. Although some researchers (Topolovec-Vranic & Natarajan, 2016; Weller, 2015) have indicated that social media is more effective in recruiting the younger population, this study was able to obtain answers from professionals of different age groups, resulting in a representative sample of professionals in the area, including different professional experiences, perhaps also due to the dissemination of the survey through professional class councils.

An extremely important aspect to highlight is veterinary engagement in the epidemiological context of the COVID-19 pandemic, and their high exposure and risk of contamination. The results show that 31.0% of veterinarians unconsciously worked with COVID-19-positive pet owners after being informed about their disease condition. Supporting this result, Wayne and Rozanski (2020) reported that 18% of responding hospitals had at least one veterinarian that tested positive for COVID-19.

The results of the present study revealed that neither age level nor years of experience affected the adoption of biosafety measures. This result differs from that of Kamate et al. (2020), in which dentists with higher qualifications (post-graduates) had greater knowledge of biosafety measures than recent graduates. In addition, regardless of chronic disease condition, veterinarians were concerned with biosafety care and considered infection control essential for practice, similar to Rossato et al.'s (2021) findings, in which most dental professionals adopted biosafety measures during the pandemic, such as the use of facial protectors and disposable personal protective equipment. The majority of emergency veterinary hospitals surveyed reported significant changes in day-to-day operations as a result of the COVID-19 pandemic (Wayne & Rozanski, 2020).

The COVID-19 pandemic has brought numerous changes not only in the personal lives of individuals but also in the routines of health professionals. Although veterinarians are among the professionals at high risk of exposure, no study has investigated the occurrence of transmissible respiratory diseases, including SARS-CoV-2, in this population. However, the present study demonstrates that most veterinarians have adopted biosafety measures to protect themselves, team members, and patients by increasing the use of surgical masks, N95 masks, face shields, and TNT coats, as reported by veterinarians from the United States of America (Wayne & Rozanski, 2020).

Veterinary services provide essential care to people and their animals, and these professionals have continued to provide care during the COVID-19 pandemic (Wayne & Rozanski, 2020), despite a significant reduction in their workload, which was also observed in studies conducted with dentists (Rossato et al., 2021; Guo et al., 2020). This may be due to pet owners avoiding leaving their houses because of the pandemic and seeking medical care only in cases of urgency or emergency. However, a study showed that the majority of dog owners maintained the healthcare of their dogs as a priority during the pandemic in the United States and Canada (Kogan et al., 2021).

The additional expenses for safety equipment and biosafety measures impacted the fiscal performance of veterinarians, since there was an increase in cost but without correction of values to compensate for this. In a study by the American Veterinary Medical Association (2021), the financial repercussions of the pandemic were significant, in part due to dramatic decreases in client visits which resulted in substantial cash shortages, and it was necessary to reorganize the practice to reduce costs and maintain minimal profitability. In addition, veterinary hospitals reported dealing with issues of biosafety protocols, staff shortages, and financial impact (Centers for Disease Control and Prevention, 2020). Many veterinarians also reported greater discomfort and some allergies due to the use of additional personal protective equipment, consistent with the findings of Yuan et al. (2021) who found a total of 94.57% of professionals reported discomfort regarding the use of personal protective equipment.

Our research drew data from a heterogeneous group of veterinarians, mostly aware of and concerned about the risks inherent to the COVID-19 pandemic and its respective social and economic impacts. Most professionals reported improvement in biosafety measures, considering the adoption of these primary practices for infection prevention as essential to stop the spread of COVID-19. Moreover, understanding the impact of the COVID-19 pandemic on pet owners may guide veterinary professionals to better address their clients' concerns and needs (Kogan et al.,

2021), as also there are several lines of contributions the veterinary profession might provide to manage the COVID-19 pandemic in the framework of interventions jointly concerted in the veterinary and medical domains (Ferri & Lloyd-Evans, 2021).

The COVID-19 pandemic has brought about more than just changes in veterinary practices in Brazil. This pandemic has also brought positive impacts on veterinary science teaching, as demonstrated by the study around the acceptance of the anatomical kits as an alternative method and efficient tools to facilitate the understanding and visualization of anatomical structures to study veterinary anatomy during the COVID-19 pandemics (Machado et al., 2022). The veterinary professionals faced the critical choice of stopping work to ensure their health or continuing to work to support their home and family. Therefore, it is up to each professional, based on their circumstances, to evaluate the risks and benefits when making their decisions.

## Conclusion

It is important to highlight that veterinary professionals are potentially exposed to sources of COVID-19 transmission and infection. Based on the results of this study, we conclude that most veterinarians have altered their routine practices in response to the COVID-19 pandemic. The biggest changes reported were regarding the use of personal protective equipment and the adoption of biosafety measures, as well as a decrease in workload. To the best of our knowledge, this is the first study to evaluate changes in veterinary practice during the COVID-19 pandemic in Brazil. The findings also allow for the implementation of evidence-based surveillance and control measures, since the proximity to the outcome of the pandemic in Brazil and in the world is not exactly known.

## Ethics statement

The experiments followed the standards established by the Research Ethics Committee (CEP) under the approval number of 4.178.479.

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## Conflict of interests

No conflict of interests.

## Authors' contributions

JVPB, FCAR: Conception and design of the study, acquisition, analysis and interpretation of data, drafting, revision, written and final approval of the manuscript. SFNP: written, editing and final approval of the manuscript. EL, NBP, AMJ, RMS: Conception and design of the study, final approval of the manuscript. DAGK, MZ: Interpretation of data, revision and final approval of the manuscript.

## Availability of complementary results

None.

The study was carried out at Universidade Pitágoras - UNOPAR, Araçatuba, PR, Brazil.

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