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Measuring the Self-Efficacy of Health Professionals in Hand Hygiene and Glove Usage during the COVID-19 Pandemic: A Brazilian Multicenter Observational Survey

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Abstract: In social cognitive theory, self-efficacy refers to the belief of a person in their own capacity to successfully perform certain tasks or behaviors. This study measured the self-efficacy of health professionals in hand hygiene (HH) and glove usage (GU) during the COVID-19 pandemic. It was an observational Brazilian multicenter study with a cross-sectional design with an online application of an instrument measuring the self-efficacy of health professionals in HH and GU. Health professionals ($n = 193$) participated in this study: 96 (49.7%) were nursing professionals, 38 (20.2%) were dental professionals, 21 (10.9%) were physicians, 10 (5.2%) were pharmacists, and 27 (14.0%) were other health professionals. Regarding the instrument applied, the maximum score (100 points) was achieved by 167 (86.5%) participants on Question 2 (confidence in regular routine behaviors), and the lowest scores achieved were 0, 10, 30, 40, and 50 points, referring to 18 (9.3%) participants, on Question 14 (the influence of management's conduct related to practices). A total of 64.1% dental professionals, 57.1% of physicians, 39.6% of nurses, 20.0% of pharmacists, and 55.6% of other health professionals were classified as having self-efficacy. There was only a significant association between being a dental professional and having self-efficacy regarding HH and GU during the COVID-19 pandemic in relation to other health professional categories.

Keywords: standard precautions; personal protective equipment; health personnel; SARS-CoV-2; infection control

1. Introduction

An epidemiological alert from the World Health Organization (WHO) in December 2019 about pneumonia of unknown cause in China turned into a pandemic in March 2020. This international public health emergency alerted the health professional community to the importance of precautionary procedures against the virus, identified as a novel coronavirus (2019n-CoV) that later received the official nomenclature of Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) [1,2]. The disease caused by SARS-CoV-2 was

named COVID-19 [2]. As of May 2023, nearly 766 million people have been infected with COVID-19, and 6.94 million have died worldwide [3]. The novel coronavirus spreads rapidly and is mainly transmitted through droplets, aerosols, and respiratory secretions from infected people. Moreover, hands, surfaces, equipment, and fomites are important reservoirs in the transmission of SARS-CoV-2 to other people through the direct contact of the hands with the eyes, mouth, and/or nose [4]. Precautionary measures against contagion recommended by the WHO were widely publicized by the media around the world; among them, we highlight those focused on attitudinal issues, such as the proper practice of hand hygiene (HH) and the use of gloves [3]. Nonetheless, contradictory to such recommendations, Putrawan et al. (2021) demonstrated that HH compliance behavior was lower than adherence to glove usage in an intensive care unit during the COVID-19 pandemic [5]. Additionally, HH compliance was poor upon room entry during the first and second waves of the pandemic [6].

Different health professionals, including infectious disease specialists and emergency physicians, nurses, pharmacists, nutritionists, occupational therapists, physical therapists, physiologists, dental professionals, etc., played a crucial role in pandemic situations by providing a wide range of services aimed at mitigating the impact of the infectious disease. Their diversity of functions and expertise, along with their collective efforts, significantly contributed to improving the quality of healthcare across the globe during the pandemic. The holistic contribution of these diverse health professionals enhanced the quality of healthcare during the pandemic by addressing aspects related to prevention, diagnosis, treatment, public health measures, and mental well-being. Their collaborative efforts were essential for an effective pandemic response and the goal of safeguarding public health on a global scale [7].

HH is the simplest and most effective prophylactic measure to control community infection and healthcare-associated infections (HAIs) [3]. Since the 19th century, HH has directly contributed to the reduction in deaths by infectious processes. The physician Ignaz Philipp Semmelweis (1847) was able to reduce parturient mortality with the use of chlorine solution for physicians' HH. In addition, the nurse Florence Nightingale (1854), during the Crimean War, adopted preventive measures against infectious diseases with HH [8]. For better adherence to HH, products for antiseptic hand rubs, such as alcoholic preparations, are widely recommended for ease of distribution and the minimization of expenses for inputs and physical structures in health services, but they do not replace HH with soap and water. In addition, the proper performance of the HH technique at five moments of providing healthcare to patients is essential in controlling HAIs [9–15].

Gloves are a type of personal protective equipment (PPE) used in health services as part of standard precautions to enhance the safety of health professionals and prevent the transmission of microbial contaminants to patients, professional teams, and the environment. It plays a crucial role in protecting hands from biological, chemical, and physical hazards present in the work environment, such as pathogens, contaminated body fluids, chemicals, and sharp instruments. It is worth noting that the use of gloves does not replace HH either [7,16].

In social cognitive theory, self-efficacy refers to the belief of a person in their own capacity to successfully perform certain tasks or behaviors. In the context of HH and the use of gloves by health professionals, self-efficacy plays a key role. Believing in one's own capacity to correctly perform these practices directly influences adherence to these protective behaviors. When health professionals have high self-efficacy in relation to HH and the use of gloves, they tend to engage in these practices more consistently and appropriately, reducing the risk of transmission of microbial contamination and contributing to a safer and healthier work environment [17,18].

Due to the importance of precautionary measures and to the urgency caused by COVID-19, evaluating the self-efficacy of HH and the use of gloves by health professionals during the pandemic became relevant so that the technique and importance of such actions were reiterated and put into action correctly. Additionally, the evaluation of self-efficacy in

HH and the use of gloves is essential to identifying this behavior and proposing actions to improve adherence to this practice among health professionals.

Thus, the aim of this study was to evaluate whether health professionals have self-efficacy in HH and the use of gloves during the COVID-19 pandemic, as well as verify the association between professional categories regarding whether they have self-efficacy in HH and glove usage.

2. Material and Methods

In this observational study with a cross-sectional design, there was no interference in what was being studied, but rather an observation at that moment, which was recorded with the help of a research instrument [19]. In its making, the study followed the checklist for Reporting of Observational Studies in Epidemiology (STROBE) and the Checklist for Reporting Results of Internet E-Surveys (CHERRIES) [20].

According to Resolution No. 466/2012, this Brazilian multicenter study was approved by the Research Ethics Committees of the University of São Paulo at Ribeirão Preto School of Dentistry (FORP-USP) (CAAE: 39685720.0.0000.5419) and other coparticipants: University of São Paulo at Ribeirão Preto College of Nursing (EERP-USP) (CAAE: 39685720.0.3002.5393); Federal University of Uberlândia (UFU) (CAAE: 39685720.0.3001); and Clinical Hospital of the Federal University of Uberlândia (HC-UFU) (CAAE: 39685720.0.3003.5152). The participants of the study were informed about the objectives and signed the Free and Informed Consent Form.

The recruitment of the participants of the study was carried out from April 2021 to July 2022 through invitations via social networks (WhatsApp® and Instagram®) and e-mail. The questionnaire was made available through the tool Google Forms®. The sample size was defined according to the results obtained in data collection [21], with a standard deviation of 1.6 and a difference of 0.7 between the means. Considering $\alpha = 0.05$, $\beta = 0.20$, and a power of 80%, the evaluation of 83 participants on average in each region (Ribeirão Preto, São Paulo, represented by FORP-USP and EERP-USP, and Uberlândia, Minas Gerais, represented by UFU and by HC-UFU) was defined in the study in order to be able to reject the null hypothesis that the population averages of the professionals evaluated were equal to the probability.

Health professionals and graduate students who worked in health services in the participating regions during the COVID-19 pandemic were included in the study. In contrast, health professionals and graduate students who did not agree to participate in the study or did not completely answer the survey form were excluded from the study.

The instrument, validated by Pereira et al. (2022) to evaluate the self-efficacy of health professionals in HH and the use of gloves (SEHP-HHG), has 19 items (Table 1), with a continuous response scale from 0 to 100 points, and the highest score corresponds to the greatest self-efficacy [22]. Together with the SEHP-HHG instrument, a sociodemographic questionnaire with questions about sex, age group, profession, education, professional course completion time (years in which the professional course was completed), and professional performance time (length of time the professional has worked during their training) was made available to study participants.

The results were evaluated through the answers to the questions or items on the SEHP-HHG and sociodemographic forms made with Google Forms® and analyzed by descriptive statistics (absolute (n) and relative (%) frequency). Arbitrarily, the cutoff points for having self-efficacy and not having self-efficacy were set at ≥ 1800 and ≤ 1790 points, respectively. To evaluate the association between health professionals who have self-efficacy, Fisher's exact test was used. In addition, to verify the association of the level of education (in years) and the time of work experience (in years) with having or not having self-efficacy in each professional category, the Pearson chi-square test was used. The data were analyzed using the statistical software Statistical Package for Social Sciences (SPSS), version 23, with the level of significance set at $\alpha = 5\%$.

Table 1. Instrument for evaluating the self-efficacy of health professionals in HH and use of gloves (SEHP-HHG).

0	10	20	30	40	50	60	70	80	90	100	Confidence Rating (0–100)	
Not at All Confident							Moderately Confident			Totally Confident		
1. How confident are you that you play an important role in the control of healthcare-associated infections (HAIs)?											-----	
2. How confident are you that hand hygiene and the use of gloves should be regular and frequent behaviors in your professional routine?											-----	
3. How confident are you that your motivation influences adherence to hand hygiene and glove use?											-----	
4. How much do you know about hand hygiene and glove use recommendations?											-----	
5. How confident are you that you comply with the hand hygiene and glove recommendations?											-----	
6. How confident are you that your professional performance makes you happy because you are protecting patients and yourself against the risk of infections?											-----	
7. How confident are you that you meet the expectations of the patients in your care regarding hand hygiene?											-----	
8. Are you confident that gloved and ungloved hands can carry contamination from one place to another?											-----	
9. How confident are you that you can apply your knowledge of hand hygiene and glove use in your clinical practice?											-----	
10. How confident are you in deciding between hand hygiene and/or wearing gloves?											-----	
11. How confident are you that the accident with biological material is a factor that modifies your behavior regarding the use of gloves?											-----	
12. How confident are you that in-service education changes your behavior regarding hand hygiene and glove use?											-----	
13. How confident are you that your conduct, in relation to hand hygiene and use of gloves, influences the behavior of your co-workers?											-----	
14. How confident are you that your supervisor's conduct, in relation to hand hygiene and the use of gloves, influences your behavior?											-----	
15. How confident are you that you comply with the recommendations for hand hygiene and use of gloves in emergency situations?											-----	
16. How confident are you that, when you want, you can find a way to adhere to hand hygiene and glove recommendations?											-----	
17. How confident are you that you follow hand hygiene recommendations, even when your hands are dry, painful, and/or sore or cracked?											-----	
18. How confident are you that the time taken to sanitize your hands is not a disincentive to your adherence?											-----	
19. How confident are you that the proper structure (sink, paper towel, soap, alcohol) influences your adherence to hand hygiene?											-----	

Source: Pereira et al., 2022 [22].

3. Results

The results are presented in Table 2.

A total of 193 professionals participated in the study: 95 (49.2%) health professionals were working at HC-UFU, 40 (20.7%) were from FORP-USP, 37 (19.2%) were from EERP-USP, and 21 (10.9%) were from UFU. Of these, a total of 96 (49.7%) were from the group of nursing professionals (nurses, nursing technicians, and nursing assistants), 38 (20.2%) were from dentistry (dentists, technicians, oral health assistants, and prosthodontists), 21 (10.9%) were physicians, 10 (5.2%) were pharmacists, and 27 (14.0%) were other health professionals (physiotherapists, psychologists, biologists, and speech therapists).

As for sex, 150 (77.7%) were female, and the group of nursing professionals was the most representative, with 96 (49.7%) participants. The predominant age group was from 30 to 39 years, with 73 (37.8%) professionals included.

Regarding the highest level of education, 52 (26.9%) participants had specializations. It is worth mentioning that the dentistry professionals had the highest level of education, with 14 (7.3%) postdoctoral participants. Furthermore, 57 (29.5%) professionals had spent 1 to 5 years in their profession. However, 49 (25.4%) had worked for more than 20 years in their professional category, with 20 (10.4%) and 14 (7.3%) of these professionals in nursing and dentistry, respectively. Finally, concerning time working at the institution where they currently worked, 56 (29.0%) and 35 (18.1%) professionals had worked there for 1 to 5 years and less than 1 year, respectively, which demonstrated a high number of hires during the COVID-19 pandemic period.

Table 2. Distribution of health professionals according to sociodemographic characteristics, education, and other professional variables.

	Professional Groups					Total n (%)
	Physicians	Nurses, Nursing Technicians and Assistants	Dentists, Technicians and Oral Health Assistants, Prosthodontists	Pharmacists and Pharmacy Technicians	Other Health Professionals	
	n (%)	n (%)	n (%)	n (%)	n (%)	
Institution						
HC-UFU	17 (8.8)	51 (26.4)	-	10 (5.2)	17 (8.8)	95 (49.2)
UFU	4 (2.1)	11 (5.7)	1 (0.5)	-	5 (2.6)	21 (10.9)
EERP-USP	-	34 (17.6)	1 (0.5)	-	2 (1.0)	37 (19.2)
FORP-USP	-	-	37 (19.2)	-	3 (1.6)	40 (20.7)
Sex						
Female	14 (7.3)	82 (42.5)	28 (14.5)	7 (3.6)	19 (9.8)	150 (77.7)
Male	7 (3.6)	14 (7.3)	11 (5.7)	3 (1.6)	8 (4.1)	43 (22.3)
Age Group						
18 to 24 years	1 (0.5)	5 (2.6)	2 (1.0)	-	-	8 (4.1)
25 to 29 years	2 (1.0)	7 (3.6)	6 (3.1)	2 (1.0)	3 (1.6)	20 (10.4)
30 to 39 years	6 (3.1)	43 (22.3)	9 (4.7)	4 (2.1)	11 (5.7)	73 (37.8)
40 to 49 years	5 (2.6)	30 (15.5)	11 (5.7)	3 (1.6)	9 (4.7)	58 (30.1)
50 to 59 years	5 (2.6)	9 (4.7)	10 (5.2)	1 (0.5)	3 (1.6)	28 (14.5)
>60 years	2 (1.0)	2 (1.0)	1 (0.5)	-	1 (0.5)	6 (3.1)
Highest Level of Education						
Technical Course	-	15 (7.8)	1 (0.5)	5 (2.6)	4 (2.1)	25 (13.0)
Higher Education	2 (1.0)	15 (7.8)	3 (1.6)	1 (0.5)	5 (2.6)	26 (13.5)
Specialization	11 (5.7)	27 (14.0)	5 (2.6)	3 (1.6)	6 (3.1)	52 (26.9)
Master's Degree	4 (2.1)	25 (13.0)	11 (5.7)	1 (0.5)	9 (4.7)	50 (25.9)
Doctorate	3 (1.6)	12 (6.2)	5 (2.6)	-	1 (0.5)	21 (10.9)
Postdoctorate	1 (0.5)	2 (1.0)	14 (7.3)	-	2 (1.0)	19 (9.8)
Professional Course Completion Time						
<1 year	-	1 (0.5)	1 (0.5)	-	-	2 (1.0)
Between 1 and 5 years	5 (2.6)	26 (13.5)	16 (8.3)	1 (0.5)	9 (4.7)	57 (29.5)
Between 6 and 10 years	2 (1.0)	10 (5.2)	2 (1.0)	5 (2.6)	4 (2.1)	23 (11.9)
Between 11 and 15 years	3 (1.6)	25 (13.0)	2 (1.0)	2 (1.0)	7 (3.6)	39 (20.2)
Between 16 and 20 years	4 (2.1)	17 (8.8)	3 (1.6)	-	3 (1.6)	27 (14.0)
>20 years	7 (3.6)	17 (8.8)	15 (7.8)	2 (1.0)	4 (2.1)	45 (23.3)
Professional Performance Time						
<1 year	-	2 (1.0)	-	-	2 (1.0)	4 (2.1)
Between 1 and 5 years	6 (3.1)	14 (7.3)	14 (7.3)	3 (1.6)	3 (1.6)	40 (20.7)
Between 6 and 10 years	1 (0.5)	13 (6.7)	3 (1.6)	5 (2.6)	6 (3.1)	28 (14.5)
Between 11 and 15 years	3 (1.6)	23 (11.9)	3 (1.6)	-	7 (3.6)	36 (18.7)
Between 16 and 20 years	4 (2.1)	24 (12.4)	5 (2.6)	-	3 (1.6)	36 (18.7)
>20 years	7 (3.6)	20 (10.4)	14 (7.3)	2 (1.0)	6 (3.1)	49 (25.4)
Profession in which one work in this Institution						
Physician	21 (10.9)	-	-	-	-	21 (10.9)
Nurse	-	62 (32.1)	-	-	-	62 (32.1)
Nursing Technician	-	29 (15.0)	-	-	-	29 (15.0)
Nursing Assistant	-	5 (2.6)	-	-	-	5 (2.6)
Dentist	-	-	38 (19.7)	-	-	38 (19.7)
Oral Health Technician	-	-	-	-	-	-
Oral Health Assistant	-	-	-	-	-	-
Pharmacist	-	-	-	3 (1.6)	-	3 (1.6)
Laboratory Technician	-	-	-	-	9 (4.7)	9 (4.7)
Radiology Technician	-	-	-	-	1 (0.5)	1 (0.5)
Physiotherapist	-	-	-	-	6 (3.1)	6 (3.1)
Nutritionist	-	-	-	-	2 (1.0)	2 (1.0)
Speech Therapist	-	-	-	-	1 (0.5)	1 (0.5)
Psychologist	-	-	-	-	1 (0.5)	1 (0.5)
Pharmacy Technician	-	-	-	7 (3.6)	-	7 (3.6)
Occupational Safety Technician	-	-	-	-	2 (1.0)	2 (1.0)
Teacher	-	-	-	-	2 (1.0)	2 (1.0)
Medical Physicist	-	-	-	-	1 (0.5)	1 (0.5)
Biologist	-	-	-	-	1 (0.5)	1 (0.5)
Biomedical Scientist	-	-	-	-	1 (0.5)	1 (0.5)
Prosthodontist	-	-	1 (0.5)	-	-	1 (0.5)

Table 2. Cont.

	Professional Groups					Total
	Physicians	Nurses, Nursing Technicians and Assistants	Dentists, Technicians and Oral Health Assistants, Prosthodontists	Pharmacists and Pharmacy Technicians	Other Health Professionals	
	n (%)	n (%)	n (%)	n (%)	n (%)	
Role one holds in this Institution						
Higher Education Teacher	1 (0.5)	12 (6.2)	14 (7.3)	-	4 (2.1)	31 (16.1)
Higher Education Teacher (Course or Dept. Coord.)	-	-	2 (1.0)	-	-	2 (1.0)
Technical Level Teacher	-	4 (2.1)	1 (0.5)	-	-	5 (2.6)
Technical Level Teacher (Course or Dept. Coord.)	-	1 (0.5)	-	-	-	1 (0.5)
Graduate Student	2 (1.0)	11 (5.7)	16 (8.3)	-	5 (2.6)	34 (17.6)
Employee	18 (9.3)	68 (35.2)	6 (3.1)	10 (5.2)	18 (9.3)	120 (62.2)
Time one worked in this Institution						
<1 year	5 (2.6)	22 (11.4)	2 (1.0)	2 (1.0)	4 (2.1)	35 (18.1)
Between 1 and 5 years	3 (1.6)	25 (13.0)	18 (9.3)	6 (3.1)	4 (2.1)	56 (29.0)
Between 6 and 10 years	1 (0.5)	15 (7.8)	4 (2.1)	-	8 (4.1)	28 (14.5)
Between 11 and 15 years	3 (1.6)	13 (6.7)	4 (2.1)	-	3 (1.6)	23 (11.9)
Between 16 and 20 years	6 (3.1)	12 (6.2)	1 (0.5)	-	4 (2.1)	23 (11.9)
>20 years	3 (1.6)	9 (4.7)	10 (5.2)	2 (1.0)	4 (2.1)	28 (14.5)

Note: n, number; %, percentage; <, less than; >, more than; -, no answer; HC-UFG, Clinical Hospital of the Federal University of Uberlândia; UFU, Federal University of Uberlândia; EERP-USP, School of Nursing of Ribeirão Preto of the University of São Paulo; FORP-USP, School of Dentistry of Ribeirão Preto of the University of São Paulo; Dept., department; Coord., coordinator. Source: Authors (2023).

As for SEHP-HHG, the question most answered (by 167 (86.5%) professionals) with the maximum score (100 points) was Question 2 (How confident are you that hand hygiene and the use of gloves should be regular and frequent behaviors in your professional routine?). Nevertheless, the lowest scores (0, 10, 30, 40, and 50 points) for the questions on SEHP-HHG were for Question 14 (How confident are you that your supervisor’s conduct, in relation to hand hygiene and the use of gloves, influences your behavior?) and were related to the answers of 18 (9.3%) professionals (Table 3).

Table 3. Answers to the instrument to evaluate self-efficacy of health professionals in hand hygiene and use of gloves.

Questions	Points	Professional Groups					Total
		Physicians	Nurses, Nursing Technicians and Assistants	Dentists, Technicians, Oral Health Assistants, Prosthodontist	Pharmacists and Pharmacy Technicians	Other Health Professionals	
		n (%)	n (%)	n (%)	n (%)	n (%)	
1. How confident are you that you play an important role in the control of healthcare-associated infections (HAIs)?	60	1 (0.5)	3 (1.6)	-	-	-	4 (2.1)
	70	1 (0.5)	4 (2.1)	4 (2.1)	2 (1.0)	4 (2.1)	15 (7.8)
	80	2 (1.0)	14 (7.3)	6 (3.1)	2 (1.0)	5 (2.6)	29 (15.0)
	90	8 (4.1)	25 (13.0)	8 (4.1)	3 (1.6)	4 (2.1)	48 (24.9)
	100	9 (4.7)	50 (25.9)	21 (10.9)	3 (1.6)	14 (7.3)	97 (50.3)
2. How confident are you that hand hygiene and the use of gloves should be regular and frequent behaviors in your professional routine?	60	-	1 (0.5)	-	-	-	1 (0.5)
	80	-	3 (1.6)	-	2 (1.0)	-	5 (2.6)
	90	-	14 (7.3)	1 (0.5)	2 (1.0)	3 (1.6)	20 (10.4)
	100	21 (10.9)	78 (40.4)	38 (19.7)	6 (3.1)	24 (12.4)	167 (86.5)
	3. How confident are you that your motivation influences adherence to hand hygiene and glove use?	00	-	1 (0.5)	-	-	-
50		-	-	1 (0.5)	-	-	1 (0.5)
60		-	2 (1.0)	-	-	-	2 (1.0)
70		-	3 (1.6)	-	-	-	3 (1.6)
80		-	14 (7.3)	3 (1.6)	3 (1.6)	3 (1.6)	23 (11.9)
90		4 (2.1)	14 (7.3)	4 (2.1)	4 (2.1)	5 (2.6)	31 (16.1)
100		17 (8.8)	62 (32.1)	31 (16.1)	3 (1.6)	19 (9.8)	132 (68.4)

Table 3. Cont.

Questions	Points	Professional Groups					Total	
		Physicians	Nurses, Nursing Technicians and Assistants	Dentists, Technicians, Oral Health Assistants, Prosthodontist	Pharmacists and Pharmacy Technicians	Other Health Professionals		
		<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	
4. How much do you know about hand hygiene and glove use recommendations?	50	-	-	1 (0.5)	-	-	1 (0.5)	
	60	-	1 (0.5)	-	-	-	1 (0.5)	
	70	1 (0.5)	3 (1.6)	1 (0.5)	-	1 (0.5)	6 (3.1)	
	80	4 (2.1)	11 (5.7)	4 (2.1)	3 (1.6)	2 (1.0)	24 (12.4)	
	90	2 (1.0)	24 (12.4)	6 (3.1)	3 (1.6)	8 (4.1)	43 (22.3)	
	100	14 (7.3)	57 (29.5)	27 (14.0)	4 (2.1)	16 (8.3)	118 (61.1)	
5. How confident are you that you comply with the hand hygiene and glove recommendations?	60	-	1 (0.5)	-	-	-	1 (0.5)	
	70	3 (1.6)	5 (2.6)	2 (1.0)	-	-	10 (5.2)	
	80	3 (1.6)	19 (9.8)	5 (2.6)	3 (1.6)	1 (0.5)	31 (16.1)	
	90	6 (3.1)	25 (13.0)	9 (4.7)	3 (1.6)	9 (4.7)	52 (26.9)	
	100	9 (4.7)	46 (23.8)	23 (11.9)	4 (2.1)	17 (8.8)	99 (51.3)	
	6. How confident are you that your professional performance makes you happy because you are protecting patients and yourself against the risk of infections?	60	-	1 (0.5)	-	-	-	1 (0.5)
70		-	5 (2.6)	-	-	-	5 (2.6)	
80		5 (2.6)	12 (6.2)	1 (0.5)	1 (0.5)	-	19 (9.8)	
90		4 (2.1)	16 (8.3)	10 (5.2)	5 (2.6)	9 (4.7)	44 (22.8)	
100		12 (6.2)	62 (32.1)	28 (14.5)	4 (2.1)	18 (9.3)	124 (64.2)	
7. How confident are you that you meet the expectations of the patients in your care regarding hand hygiene?		60	-	1 (0.5)	-	-	1 (0.5)	2 (1.0)
	70	1 (0.5)	3 (1.6)	-	1 (0.5)	1 (0.5)	6 (3.1)	
	80	2 (1.0)	11 (5.7)	5 (2.6)	1 (0.5)	1 (0.5)	20 (10.4)	
	90	12 (6.2)	27 (14.0)	6 (3.1)	4 (2.1)	10 (5.2)	59 (30.6)	
	100	6 (3.1)	54 (28.0)	28 (14.5)	4 (2.1)	14 (7.3)	106 (54.9)	
	8. Are you confident that gloved and ungloved hands can carry contamination from one place to another?	70	-	-	1 (0.5)	-	-	1 (0.5)
80		-	5 (2.6)	1 (0.5)	-	-	6 (3.1)	
90		1 (0.5)	13 (6.7)	1 (0.5)	1 (0.5)	5 (2.6)	21 (10.9)	
100		20 (10.4)	78 (40.4)	36 (18.7)	9 (4.7)	22 (11.4)	165 (85.5)	
9. How confident are you that you can apply your knowledge of hand hygiene and glove use in your clinical practice?		60	-	1 (0.5)	-	-	-	1 (0.5)
		70	-	3 (1.6)	-	-	-	3 (1.6)
	80	3 (1.6)	9 (4.7)	2 (1.0)	1 (0.5)	2 (1.0)	17 (8.8)	
	90	4 (2.1)	16 (8.3)	8 (4.1)	2 (1.0)	6 (3.1)	36 (18.7)	
	100	14 (7.3)	67 (34.7)	29 (15.0)	7 (3.6)	19 (9.8)	136 (70.5)	
	10. How confident are you in deciding between hand hygiene and/or wearing gloves?	00	-	1 (0.5)	-	-	-	1 (0.5)
50		-	1 (0.5)	-	-	-	1 (0.5)	
60		2 (1.0)	2 (1.0)	1 (0.5)	-	-	5 (2.6)	
70		2 (1.0)	3 (1.6)	1 (0.5)	-	-	6 (3.1)	
80		3 (1.6)	9 (4.7)	-	2 (1.0)	3 (1.6)	17 (8.8)	
90		1 (0.5)	14 (7.3)	8 (4.1)	5 (2.6)	7 (3.6)	35 (18.1)	
100	13 (6.7)	66 (34.2)	29 (15.0)	3 (1.6)	17 (8.8)	128 (66.3)		
11. How confident are you that the accident with biological material is a factor that modifies your behavior regarding the use of gloves?	00	-	3 (1.6)	-	-	1 (0.5)	4 (2.1)	
	10	-	2 (1.0)	-	-	-	2 (1.0)	
	30	-	1 (0.5)	-	-	1 (0.5)	2 (1.0)	
	40	-	1 (0.5)	-	-	-	1 (0.5)	
	50	-	1 (0.5)	2 (1.0)	-	-	3 (1.6)	
	60	-	2 (1.0)	-	1 (0.5)	-	3 (1.6)	
	70	2 (1.0)	2 (1.0)	-	-	-	4 (2.1)	
	80	3 (1.6)	16 (8.3)	5 (2.6)	2 (1.0)	3 (1.6)	29 (15.0)	
	90	1 (0.5)	16 (8.3)	2 (1.0)	2 (1.0)	6 (3.1)	27 (14.0)	
	100	15 (7.8)	52 (26.9)	30 (15.5)	5 (2.6)	16 (8.3)	118 (61.1)	
12. How confident are you that in-service education changes your behavior regarding hand hygiene and glove use?	50	-	-	1 (0.5)	-	-	1 (0.5)	
	60	-	1 (0.5)	-	-	-	1 (0.5)	
	70	1 (0.5)	6 (3.1)	1 (0.5)	-	-	8 (4.1)	
	80	2 (1.0)	10 (5.2)	5 (2.6)	4 (2.1)	-	21 (10.9)	
	90	2 (1.0)	20 (10.4)	1 (0.5)	2 (1.0)	4 (2.1)	29 (15.0)	
	100	16 (8.3)	59 (30.6)	31 (16.1)	4 (2.1)	23 (11.9)	133 (68.9)	
13. How confident are you that your conduct, in relation to hand hygiene and use of gloves, influences the behavior of your co-workers?	30	-	1 (0.5)	-	-	-	1 (0.5)	
	40	-	1 (0.5)	-	-	-	1 (0.5)	
	50	1 (0.5)	1 (0.5)	-	-	1 (0.5)	3 (1.6)	
	60	2 (1.0)	4 (2.1)	-	-	-	6 (3.1)	
	70	1 (0.5)	7 (3.6)	3 (1.6)	2 (1.0)	3 (1.6)	16 (8.3)	
	80	4 (2.1)	17 (8.8)	7 (3.6)	1 (0.5)	4 (2.1)	33 (17.1)	
	90	1 (0.5)	16 (8.3)	7 (3.6)	3 (1.6)	6 (3.1)	33 (17.1)	
	100	12 (6.2)	49 (25.4)	22 (11.4)	4 (2.1)	13 (6.7)	100 (51.8)	

Table 3. Cont.

Questions	Points	Professional Groups					Total
		Physicians	Nurses, Nursing Technicians and Assistants	Dentists, Technicians, Oral Health Assistants, Prosthodontist	Pharmacists and Pharmacy Technicians	Other Health Professionals	
		<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)
14 How confident are you that your supervisor's conduct, in relation to hand hygiene and the use of gloves, influences your behavior?	00	-	3 (1.6)	1 (0.5)	-	1 (0.5)	5 (2.6)
	10	-	-	-	-	1 (0.5)	1 (0.5)
	30	-	1 (0.5)	-	-	1 (0.5)	2 (1.0)
	40	-	2 (1.0)	-	-	-	2 (1.0)
	50	-	4 (2.1)	3 (1.6)	-	1 (0.5)	8 (4.1)
	60	2 (1.0)	3 (1.6)	1 (0.5)	1 (0.5)	1 (0.5)	8 (4.1)
	70	1 (0.5)	11 (5.7)	1 (0.5)	-	1 (0.5)	14 (7.3)
	80	3 (1.6)	9 (4.7)	5 (2.6)	1 (0.5)	5 (2.6)	23 (11.9)
	90	3 (1.6)	16 (8.3)	6 (3.1)	4 (2.1)	3 (1.6)	32 (16.6)
	100	12 (6.2)	47 (24.4)	22 (11.4)	4 (2.1)	13 (6.7)	98 (50.8)
15. How confident are you that you comply with the recommendations for hand hygiene and use of gloves in emergency situations?	50	-	1 (0.5)	1 (0.5)	-	-	2 (1.0)
	60	1 (0.5)	3 (1.6)	-	-	2 (1.0)	6 (3.1)
	70	1 (0.5)	10 (5.2)	3 (1.6)	1 (0.5)	1 (0.5)	16 (8.3)
	80	4 (2.1)	16 (8.3)	3 (1.6)	-	-	23 (11.9)
	90	7 (3.6)	25 (13.0)	6 (3.1)	4 (2.1)	7 (3.6)	49 (25.4)
	100	8 (4.1)	41 (21.2)	26 (13.5)	5 (2.6)	17 (8.8)	97 (50.3)
16. How confident are you that, when you want, you can find a way to adhere to hand hygiene and glove recommendations?	10	-	1 (0.5)	-	-	-	1 (0.5)
	40	-	2 (1.0)	-	-	-	2 (1.0)
	50	-	2 (1.0)	-	-	-	2 (1.0)
	60	-	4 (2.1)	1 (0.5)	-	1 (0.5)	6 (3.1)
	70	-	5 (2.6)	3 (1.6)	1 (0.5)	-	9 (4.7)
	80	2 (1.0)	8 (4.1)	-	-	2 (1.0)	12 (6.2)
	90	3 (1.6)	20 (10.4)	4 (2.1)	3 (1.6)	5 (2.6)	35 (18.1)
	100	16 (8.3)	54 (28.0)	31 (16.1)	6 (3.1)	19 (9.8)	126 (65.3)
	17. How confident are you that you follow hand hygiene recommendations, even when your hands are dry, painful, and/or sore or cracked?	10	-	1 (0.5)	-	-	-
40		-	-	-	-	1 (0.5)	1 (0.5)
50		-	2 (1.0)	-	-	-	2 (1.0)
60		-	3 (1.6)	1 (0.5)	-	-	4 (2.1)
70		1 (0.5)	6 (3.1)	1 (0.5)	1 (0.5)	-	9 (4.7)
80		3 (1.6)	8 (4.1)	3 (1.6)	3 (1.6)	3 (1.6)	20 (10.4)
90		4 (2.1)	26 (13.5)	7 (3.6)	5 (2.6)	5 (2.6)	47 (24.4)
100		13 (6.7)	50 (25.9)	27 (14.0)	1 (0.5)	18 (9.3)	109 (56.5)
18 How confident are you that the time taken to sanitize your hands is not a disincentive to your adherence?	00	1 (0.5)	-	1 (0.5)	-	-	2 (1.0)
	10	-	-	1 (0.5)	-	-	1 (0.5)
	30	-	1 (0.5)	-	-	-	1 (0.5)
	40	-	1 (0.5)	-	-	1 (0.5)	2 (1.0)
	50	1 (0.5)	1 (0.5)	2 (1.0)	-	-	4 (2.1)
	60	-	1 (0.5)	-	-	-	1 (0.5)
	70	-	5 (2.6)	-	2 (1.0)	2 (1.0)	9 (4.7)
	80	4 (2.1)	12 (6.2)	3 (1.6)	2 (1.0)	1 (0.5)	22 (11.4)
	90	4 (2.1)	24 (12.4)	8 (4.1)	3 (1.6)	4 (2.1)	43 (22.3)
100	11 (5.7)	51 (26.4)	24 (12.4)	3 (1.6)	19 (9.8)	108 (56.0)	
19. How confident are you that the proper structure (sink, paper towel, soap, alcohol) influences your adherence to hand hygiene?	20	-	1 (0.5)	-	-	-	1 (0.5)
	40	-	1 (0.5)	-	-	-	1 (0.5)
	50	-	-	-	1 (0.5)	-	1 (0.5)
	60	-	6 (3.1)	-	-	-	6 (3.1)
	70	-	6 (3.1)	-	1 (0.5)	3 (1.6)	10 (5.2)
	80	2 (1.0)	8 (4.1)	2 (1.0)	1 (0.5)	1 (0.5)	14 (7.3)
	90	2 (1.0)	10 (5.2)	3 (1.6)	1 (0.5)	5 (2.6)	21 (10.9)
	100	17 (10.9)	64 (33.2)	34 (17.6)	6 (3.1)	18 (9.3)	139 (72.0)

Note: 0 to 40 points, not at all confident; 50 to 70 points, confident; 80 to 100 points, totally confident; *n*, number; %, percentage. Source: Authors (2023).

There is no association between being a physician, nurse, pharmacist, or other health professional (except those cited and dentistry) and having or not having self-efficacy ($X^2 = 0.848$; $p = 0.488$; $X^2 = 0.505$; $p = 0.235$; $X^2 = 3.237$; $p = 0.104$; and $X^2 = 0.783$; $p = 0.411$, respectively). It should be noted that a total of 57.1% of physicians, 39.6% of nurses, 20.0% of pharmacists, and 55.6% of other health professionals were classified as having self-efficacy. On the other hand, a significant association between being a dental professional and having self-efficacy ($X^2 = 5.292$; $p = 0.031$) was observed, with 64.1% of dental professionals having self-efficacy in relation to other professional categories. Additionally, we verified in each professional category the association of the level of education and time of work experience

with having or not having self-efficacy. We did not find an association between the level of education for physicians, nursing professionals, dentistry professionals, pharmacists, or other health professionals (except those cited) and having or not having self-efficacy ($X^2 = 3.801$; $p = 0.553$; $X^2 = 0.690$; $p = 0.986$; $X^2 = 5.984$; $p = 0.327$; and $X^2 = 5.833$; $p = 0.222$; and $X^2 = 2.678$; $p = 0.851$, respectively). Regarding the association between the length of work experience as a physician, a nursing professional, a dentistry professional, a pharmacist, or another health professional (except those cited) and having or not having self-efficacy, no statistically significant association was observed ($X^2 = 2.771$; $p = 0.724$; $X^2 = 5.224$; $p = 0.405$; $X^2 = 2.413$; $p = 0.740$; and $X^2 = 5.833$; $p = 0.089$; and $X^2 = 1.157$; $p = 0.986$, respectively).

4. Discussion

In this study, the objective was to assess the self-efficacy of health professionals in HH and the use of gloves, as well as verify the association between professional categories regarding whether they have self-efficacy in HH and glove usage. The dentistry professionals were more often classified as having self-efficacy than other health professionals. HH is essential in dentistry, as the hands of these professionals are the main working instrument in the practice of dental care for patients. However, for the other professionals, especially physicians and nursing professionals, it should not be different, since the hands of these professionals are also essential for providing care to patients. It is important to distinguish that dental professionals often perform HH with soap and water, while nursing professionals use alcoholic solutions at 70% for HH [23].

A 2021 study in France showed that most health professionals who worked on the front lines of combating the COVID-19 pandemic were nursing professionals [24]. These health professionals, mostly women, are responsible for the direct care of patients and are subject to the greatest demand concerning the implementation of standard precautionary measures, such as infection control actions (HH) and the proper use of PPE (gloves). Referring to dentists, the direct and frequent contact of hands with patients' mouths reinforces the importance of implementing standard precautionary measures during patient care. Despite their workloads, nurses and dentists were the two categories of professionals who were most willing to participate in our study (Table 2).

In the context of the self-efficacy evaluation, the highest score (100 points) was widely achieved by all professional categories. The questions that evaluate self-efficacy in relation to confidence in the frequent adoption of HH and the use of gloves as part of the routine, as well as confidence in the transmission of microbial contaminants by hands, regardless of the use of gloves, received the highest scores, indicating a significant level of confidence (Table 3).

A study conducted in France demonstrated in real time a positive association between the behavior of health professionals and adherence to HH, leaving the patient's room, and local COVID-19 incidence. Nevertheless, adherence to HH was reduced over the study period, and it was not influenced by entering the patient's room, the tendency of the COVID-19 pandemic, or COVID-19 patients' conditions [6]. These findings suggest the existence of variations in the behavior of HH, with different levels of adherence depending on the specific context. In addition, another previous study highlighted inconsistencies in the behavior of nurses concerning HH [25]. These findings reinforce the importance of a comprehensive and continuous analysis of HH behavior among health professionals in order to identify factors that may influence adherence and promote continuous improvement in infection control practices.

This study revealed a high level of total confidence and frequency scores, mainly from nursing professionals, regarding self-efficacy in adherence to HH and the use of gloves (Table 3). On the other hand, a study carried out in the USA in 2021 evaluated the opportunities of 50 nurses to perform HH in patient healthcare. The average adherence to HH by nurses was 45.6% in a total of 400 observations evaluated. In addition, the most

frequently observed and performed opportunity was HH before providing healthcare to patients, with adherence to HH of 60.1% [26].

As for confidence in the transmission of microbial contamination through the hands and the need for HH even with the use of gloves, the maximum score was widely reported by health professionals. This result reinforces the importance of making health professionals aware of the transmission of microbial contamination through the hands (Table 3). In a study that addressed the control of contamination with COVID-19 during clinical dental practice, researchers emphasized the need to strengthen knowledge and appropriate and fundamental practices of HH and the use of PPEs (it is important to emphasize that the use of gloves does not replace HH) for dental professionals, as the oral environment of patients can be a source of SARS-CoV-2 contamination [27]. Furthermore, a systematic review suggested that various personal and social protection measures, including HH, mask wearing, and physical distancing, are associated with reduced cases of COVID-19 [28]. This information is crucial to promoting the safety of health professionals and preventing the spread of infectious diseases, such as COVID-19.

In 2019, an online survey was conducted in cooperation with the WHO through the application of the Hand Hygiene Self-Assessment Framework (HHSAF) instrument [29], a self-administered questionnaire that aims at a systematic analysis of the HH situation in a health unit by measuring the level of HH implementation and its relationship with HAIs. In total, 3982 questionnaires were answered in 109 countries, and 34 of these countries already promoted coordinated data collection for the evaluation of HH. The results showed that most health units reached an advanced level of HHSAF. These results support the importance of HH as a key measure in controlling the viral spread of SARS-CoV-2 and reducing the risk of infection. Therefore, the data reinforce the need for continuous awareness concerning the importance of HH and other protective measures, as well as the implementation of effective strategies to ensure adequate adherence to these practices. Through this study, it is worth noting that self-evaluation can be a limiting factor in obtaining impartial results, especially when conducted remotely. However, self-efficacy can be considered a product of personal perception and the evaluation of one's own abilities. In other words, the greater the perception of one's capacity to perform a given task, the greater the effort one will put into its execution, acquiring motivation and perseverance to achieve one's goals [30].

In summary, the results obtained in this study represent a specific historical moment of the COVID-19 pandemic and, despite its limitations, can contribute to the enhancement and improvement of the performance of health professionals in facing different problems that may arise in future health emergencies.

5. Conclusions

Among health professional categories (dental professionals, physicians, nurses, pharmacists, and other health professionals), dental professionals showed the highest frequency of self-efficacy regarding HH and glove usage during the COVID-19 pandemic. In addition, there was only a significant association between being a dental professional and having self-efficacy in relation to other health professional categories.

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