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Impact of the COVID-19 pandemic on the practice of General Surgery in Mexico. National survey

Impacto de la pandemia COVID-19 en la práctica de Cirugía General en México. Encuesta Nacional

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Palabras clave: *Coronavirus, SARS-CoV-2, COVID-19, cirugía general, equipo de protección personal.*

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ABSTRACT

Introduction: In December 2019, an outbreak of pneumonias of unknown cause was first reported in the city of Wuhan, Hubei province, China; its contagiousness quickly crossed borders, and became a pandemic that to date is present in 188 countries, with a total of 16,950,407 cases and 664,961 deaths. This event has generated substantial changes in all areas of human activity, and medical and surgical practice have not been an exception. **Objective:** To collect and analyze data related to some conditions of the general surgeon's practice and the effect caused by the COVID-19 pandemic, in addition to highlight useful information with the possibility of building a reference of support for personal actions and for decision makers. **Material and methods:** In this descriptive observational study, the authors developed an anonymous survey using the Survey Monkey® tool which sent to surgeons by e-mail and taking the database of associates of the Mexican Association of General Surgery and reinforced by social networks. To get an overview, the following sections were included: demographic data, professional activity, hospital characteristics, surgical practice, personal protective equipment, and COVID-19. **Results:** 723 responses were obtained from surgeons, from which following data were collected: 90.32% were general surgeons, 79.61% were male and 20.39% female; main group age ranged from 30 to 60 years (75.5%); the main comorbidity was hypertension (23.24%), with a medium level of risk of complications (59.86%) for COVID-19 severity. The 52.52% of surgeons worked in the so-called COVID Hospitals; elective surgery was performed in 44.2%. In minimally invasive surgery no CO_2 filtering device was used in 63.99% of the procedures and only 20.76% of operating rooms had negative pressure. The personnel acquired their own personal protective equipment in 48.5%; the personnel with the greatest contagion were the medical staff (42.46%), and those

RESUMEN

Introducción: *En diciembre de 2019 se reportó por primera vez un brote de neumonías de causa desconocida en la ciudad de Wuhan, provincia de Hubei, China; su contagiosidad rápidamente traspasó fronteras, y se convirtió en una pandemia que a la fecha está presente en 188 países, con un total de 16,950,407 de casos y 664,961 muertes. Este evento ha generado cambios sustantivos en todos los ámbitos de la actividad humana, la práctica médica y quirúrgica no son la excepción.* ***Objetivo:*** *Recolectar y analizar datos relacionados con algunas condiciones de la práctica del cirujano general y el efecto causado por la pandemia COVID-19, además de resaltar información útil con la posibilidad de construir una referencia de apoyo para acciones personales y para los tomadores de decisiones.* ***Material y métodos:*** *Estudio observacional descriptivo, los autores desarrollaron una encuesta anónima utilizando la herramienta Survey Monkey®, enviada a cirujanos por correo electrónico y tomando la base de datos de asociados de la Asociación Mexicana de Cirugía General, reforzado por redes sociales. Para tener un panorama general, se incluyeron los siguientes apartados: datos demográficos, actividad profesional, características del hospital, práctica quirúrgica, equipo de protección personal y COVID-19.* ***Resultados:*** *Se obtuvieron 723 respuestas de cirujanos, de los que se recolectaron los siguientes puntos sobresalientes: 90.32% fueron cirujanos generales, del género masculino 79.61% y femenino 20.39%; el grupo de edad está centrado entre 30 y 60 años (75.5%); la principal comorbilidad es la hipertensión (23.24%), con un nivel medio de riesgo de complicaciones por COVID-19 en 59.86%. El 52.52% de los cirujanos laboran en Hospitales COVID; la cirugía electiva se realiza en 44.2%, en cirugía de mínima invasión no se utiliza algún dispositivo para filtrar CO_2 en el 63.99% y sólo 20.76% de las salas de operaciones cuenta con presión negativa. El personal adquiere su*

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working in the emergency service (43.26%); and as a response to this situation, 49.57% had issues adapting in the professional and family fields. **Conclusions:** The impact of the COVID-19 pandemic has generated substantive changes in the practice of general surgery in Mexico, from an immediate response that requires training and prevention measures to the development of medium- and long-term strategies for the best performance and safety for patients and health professionals.

equipo de protección personal en el 48.5%; el personal con mayor contagio es el médico (42.46%), y del servicio de urgencias con 43.26%; y como respuesta a esta situación le ha sido complicado adaptarse en el terreno profesional y familiar al 49.57%. ***Conclusiones:*** *El impacto de la pandemia COVID-19 ha generado cambios sustantivos en la práctica de cirugía general en México, desde una respuesta inmediata que requiere capacitación y medidas de prevención hasta desarrollar estrategias a mediano y largo plazo para el mejor desempeño y seguridad para los pacientes y los profesionales de la salud.*

INTRODUCTION

Although throughout the history of mankind contagious diseases have gained relevance, it is evident that we are currently living through a historical event, with unprecedented events for current generations, both in daily activities and in the field of health, which have brought about radical changes.

In late December 2019, a cluster of cases of pneumonia of unknown etiology was reported in Wuhan city, Hubei province, China.[1,2]

Subsequently, the causative agent, a new virus of the coronavirus (CoV) family, was identified and the disease it produces was named by the World Health Organization (WHO) as coronavirus-19 disease (COVID-19). Because of its rapid global spread and high contagiousness, it was declared a worldwide health emergency.[3-5]

COVID-19 is primarily a respiratory disease; the spectrum of infection with this virus can range from asymptomatic individuals with very mild non-respiratory symptoms to severe acute respiratory disease, sepsis with organ dysfunction and death;[6] the virus caused a greater involvement amongst the vulnerable population, including the elderly and patients with comorbidities such as hypertension, diabetes, and obesity, among others.[3]

According to current evidence, the SARS-CoV-2 virus is transmitted mainly between people through respiratory droplets and by contact; when an infected person is within one meter when coughing or sneezing, and inoculation is by mouth, nose or conjunctiva;[6] this contamination is direct, although it can be indirect by contamination of inert surfaces with the virus.[7,8]

We know more and more about the nature of this SARS-CoV-2 virus. It belongs to the beta coronavirus genus, as do SARS-CoV and MERS-CoV, both of which caused the epidemics reported in China (2002) and Saudi Arabia (2012), respectively. On January 12, 2020, its genetic sequence was discovered through electron microscopy. The SARS-CoV-2 virus has been identified to have projections or spicules on its surface that give it its corona-like appearance. Like SARS-CoV, it requires the angiotensin-converting enzyme-2 (ACE-2) receptor for entry into the host cell; both originate from the bat. However, in the case of SARS-CoV-2, the intermediate host between the bat and the human has not been determined.[8,9]

In addition to the previously mentioned epidemics, in the last 20 years the H1N1 pandemic (2009) and the current coronavirus pandemic have been added, which has represented a global health crisis. Up to this time, 16,950,407 cases have been documented with 664,961 deaths. In Mexico, since the first case reported on February 28 of this year, there have been 408,449 cases and 45,361 deaths.[10,11]

Under this scenario, in similar works using a survey, changes in working conditions have been identified, as well as the steps necessary to reinforce the safety of the professional staff and reduce risk in surgical care. What stands out is that despite a critical situation and uncertainty, the professional activity continues to seek the best response to this challenge.[12,13]

MATERIAL AND METHODS

To obtain an overview of the general surgeon's practice in the face of the COVID-19 pandemic, a descriptive observational study was carried out, supported by a digital survey tool (Survey Monkey®). This work is the result of a collaborative work of the Mexican Association of General Surgery and the Academia Aesculap Mexico Foundation. The survey consisted of 60 questions with the points considered most relevant, reviewed, and validated by five general surgeons, with the following sections: demographic data, characteristics of the hospital where they work, surgical practice, personal protective equipment, and COVID-19 incidence. It was sent to general surgeons chosen from the database of the Mexican Association of General Surgery and reinforced in social networks from May 11 to 30, 2020.

A probabilistic sampling with analysis of the variables included in the survey was carried out.

RESULTS

The survey was answered by 723 surgeons from the 32 Mexican states, with the greatest representation of Mexico City (20.50%), which was the entity with the greatest impact in terms of the number of infections, people confirmed with COVID-19 and deaths. The complete results are shown in the following tables: I. Demographic data and professional activity, II. Characteristics of the hospital where he/she works, III. Surgical practice, IV. Personal protection equipment, and V. COVID-19 features.

DISCUSSION

Demographic data and professional activity *(Table 1)*. With the results obtained it was possible to perform an analysis of the working conditions of general surgeons in Mexico in the face of this COVID-19 pandemic.

In relation to age group and gender, it corresponds to a pattern previously identified in the surgical community.* Regarding health conditions or comorbidities, the prevalence of diabetes mellitus is lower compared to the general population (5.91 vs 7.5%); as for arterial hypertension, it is like the national reference (23.42-23.6%). Relating to overweight and obesity differences were identified when compared to general population (35.64 vs 39.7%), being more notorious in obesity (8.96 vs 29.9%).[14-16]

Another risk factor was reported in 128 respondents, including 12 that smoked, 10 with bronchial asthma, six with cancer and three with heart disease.

The survey used a digital tool designed by the Mexican Institute of Social Security known as "Calculator to evaluate the level of severity to health in case of suffering from COVID-19". The results show that 31.80% of surgeons had a "high" level and 8.35% a "very high" level in a mostly male population (79.61%), with 37.34% over 50 years of age and hypertension, which has already been mentioned as the main risk factors studied for severe COVID-19.[17]

It is evident that professional activity has been affected restricting the surgical practice, both in the public (28.51%) and private (31.13%) settings, with relevant consequences; this situation that will be analyzed in greater detail in another section. It is also very important to highlight the drastic changes and the impact on professionals in training (medical and nursing students) by reducing their attendance at hospitals by 83.86%. No less important is the impact seen on residents, who have focused their activities on on-call duty by 60% and these are now more spaced out by 18.82%, thus limiting their surgical training. Although a few months have passed since the beginning of this critical situation, the repercussion has been important with the need to restructure the surgical programs to optimize the workforce and, at the same time, apply preventive measures such as physical distancing and reduce risks for those physicians in training. Every training activity had to be modified, which has forced to make rapid and drastic changes with greater flexibility and determination to continue with a program, a condition that requires the study and analysis in greater depth that will surely modify the education models so far in force.[18,19]

* Cote-Estrada Lilia. Survey of the Alliance for Surgical Patient Safety (AMCG- FAAM), April 2019.

Table 1: Demographic data and professional activity.

No.	Query	Results	%
1	What is your age?		
	20-30	71	9.82
	31-40	205	28.35
	41-50	177	24.48
	51-60	164	22.68
	61-70	99	13.69
	Over 70	7	0.97
2	What is your gender?		
	Male	566	79.61
	Female	145	20.39
3	What is your specialty?		
	Anesthesiology	3	0.41
	Intensive Care	1	0.14
	Emergency Medicine	3	0.41
	General Surgery	653	90.32
	Other	63	8.71
4	Do you have any co-morbidities?		
	Diabetes mellitus	29	5.91
	Arterial hypertension	115	23.42
	Overweight	175	35.64
	Obesity	44	8.96
	Other	128	26.07
5	Identify your risk level *http://www.imss.gob.mx/covid-19/calculadoracomplicaciones*		
	Medium	416	59.86
	High	221	31.80
	Very high	58	8.35
6	What is your current main activity?		
	Surgical practice	693	95.85
	Administrative function	71	9.82
	Research	21	2.90
	Teaching	94	13.00
	Retired	31	4.29
7	What is your hospital activity?		
	Directive board	43	6.12
	Head of service	68	9.67
	Attending physician	526	74.82
	Resident	66	9.39

Continued from Table 1: Demographic data and professional activity.

No.	Query	Results	%
8	In what type of institution do you perform your surgical practice?		
	Public	228	31.40
	Private	191	26.31
	Both	307	42.29
9	During this pandemic, what is your professional activity like?		
	Works on a regular basis	116	15.98
	Only public practice	102	14.05
	Only private practice	23	3.17
	Restricted activities in public practice	207	28.51
	Restricted activities in private practice	226	31.13
	I am in quarantine	52	7.16
10	If you are a resident, what are the main changes in your activity?		
	Regular activities	6	7.06
	On-call activities only	51	60.00
	More spaced out guards	16	18.82
	The activity is restricted to non-COVID areas.	12	14.12
11	Do medical or nursing students still attend your hospital?		
	Yes	16.14%	112.00
	No	83.86%	582.00

Hospital features *(Table 2)*. The surgeons surveyed work in Social Security hospitals in 78.80% and private hospitals in 11.64% in the 32 Mexican states; the majority are in contact with suspected or COVID-positive patients, since they practice in the so named COVID hospitals (52.52%), classified in this way by a government disposition as part of the COVID-19 Hospital Reconversion Program, with the purpose of influencing the prevention and control of the SARS-CoV-2 virus disease pandemic in Mexico.[20] However, in hospitals that do not have this category, 81.31% have a special section for the care of these patients; with respiratory triage in 94.23% of them.

Regarding hospital infrastructure, the following data stand out: one third (33.15%) has between 20 and 100 beds, with less than 20 intensive unit care beds (50.21%); serious intubated patients (66.50%) are in intensive care units but are also distributed in other services such as internal medicine, emergency services, and in other adapted hospital areas (46.02%). It is important to emphasize that in addition to sufficient equipment in the aforementioned areas, it is essential to have trained personnel. Regarding the surgical area, most of the hospitals have less than five operating rooms (51.05%) and from five to 10 the percentage is 34.87%. In 41.01% of these hospitals, exclusive rooms for patients with suspected COVID have been arranged. Among the measures recommended to reduce the risk of contamination in operating rooms is the use of negative pressure and in this case only 20.76% have this resource. Another preventive measure is disinfection. Of the staff,

Table 2: Hospital features.

No.	Query	Results	%
12	What is the institution where you work?		
	SSA	185	29.51
	IMSS	244	38.92
	ISSSTE	46	7.34
	State ISSSTE	2	0.32
	SEDENA	10	1.59
	PEMEX	7	1.12
	Private Hospitals	73	11.64
	Another	60	9.56
13	Which Mexican state do you work in?		
	There was participation from the 32 Mexican states.		
	The largest representation was from Mexico City	147	20.50
14	Where do you live?		
15	What is the total number of beds in the hospital where you work?		
	Less than 20 beds	92	12.87
	20-50	145	20.28
	51-100	135	18.88
	100-150	108	15.10
	150-200	87	12.17
	200-250	59	8.25
	230-300	56	7.83
	Other	33	4.62
16	Has your hospital been named as COVID-19?		
	Yes	375	52.52
	No	339	47.48
17	Is there a special section for COVID-19 patients in your hospital?		
	Yes	583	81.31
	No	134	18.69
18	How many beds are designated for suspected or COVID-19 positive patients?		
	Less than 20	266	41.37
	21-30	91	14.15
	31-40	45	7.00
	41-50	45	7.00
	Over 50	196	30.48
19	What is the number of beds available in the intensive care unit of your hospital?		
	None	188	26.52
	Less than 10	356	50.21
	11 a 20	114	16.08

Continued from Table 2: Hospital features.

No.	Query	Results	%
	21-30	24	3.39
	Over 30	27	3.81
20	What is the number of intubated patients in your hospital?		
	None	214	30.40
	Less than 10	296	42.05
	11 a 20	99	14.06
	21-30	47	6.68
	31-50	19	2.70
	41-50	14	1.99
	Over 50	15	2.13
21	In which areas are patients intubated?		
	Intensive care unit	393	66.50
	Internal medicine service	193	32.66
	Emergency department	139	23.52
	Adapted areas	272	46.02
	Other	39	6.60
22	Is there a respiratory triage space in your hospital?		
	Yes	650	94.23
	No	39	5.66
23	What is the number of operating rooms in your hospital surgical unit?		
	Less than 5	366	51.05
	5 to 10 operating rooms	250	34.87
	11 to 15 operating rooms	74	10.32
	20 or more operating rooms	27	3.77
24	Do you have exclusive operating rooms for COVID-19?		
	Yes	289	41.05
	No	412	58.52
25	Do the operating rooms have negative pressure?		
	Yes	147	20.76
	No	561	79.24
26	Do you know the substance used to disinfect operating rooms?		
	Yes	376	52.51
	No	340	47.49
27	If yes, what substance is used?		
	Sodium hypochlorite	307	77.72
	Hydrogen peroxide	26	6.58
	Quaternary ammonium derivatives	41	10.38
	Other	21	5.32

Table 3: Surgical practice.

No.	Query	Results	%
28	Is your hospital performing elective surgery during the COVID-19 pandemic?		
	Yes	316	44.20
	No	399	55.80
29	If yes, how often do you perform elective surgery?		
	As usual	27	5.57
	Less than 30% reduction	62	12.78
	31-59% reduction	45	9.28
	60-80% reduction	71	14.64
	81-100% reduction	51	10.52
	Only emergency surgery is performed	229	47.22
30	Before any surgical procedure is performed, is the PCR test for COVID-19 performed on patients?		
	Yes	114	1.22
	No	589	83.78
31	During the pandemic, what is the most frequently performed surgical procedure in conventional surgery?		
	Cholecystectomy	181	26.81
	Appendectomy	257	38.07
	Hernioplasty	12	1.78
	Exploratory laparotomy	110	16.30
	Trauma surgery	42	6.22
	Other	73	10.81
32	Does your hospital perform minimally invasive surgery?		
	Yes	515	73.26
	No	188	26.74
33	What is the most common procedure?		
	Cholecystectomy	481	81.25
	Appendectomy	59	9.97
	Hernioplasty	7	1.18
	Exploratory laparotomy	22	3.72
	Other	23	3.89
34	Is any mechanism or device used to filter CO_2?		
	Yes	238	36.01
	No	423	63.99
35	In general, what equipment do you use for CO_2 filtration?		
	Based on water seal	120	29.34
	Using CO_2 inlet filters	79	19.32
	Using filters at the exit of the pneumoperitoneum	115	28.12
	A system where the vacuum cleaner is used	123	30.07
	Other	32	7.82
36	Do you perform any additional security measures?		
	No	474	73.15
	Yes	174	26.85

52.51% know which substances are used and they consist of sodium hypochlorite (77.72%) and hydrogen peroxide (7%).

An operating room with positive pressure and air changes could eliminate the virus from the environment. However, negative pressure is crucial in a situation like the COVID-19 pandemic. In this case, it is possible to implement this system with relatively simple adjustments, but it is important to note that it is not the only measure needed and other complementary actions should be considered such as the appropriate use of personal protective equipment (PPE).[21,22] Another important measure is the disinfection of the operating room, for which it is essential to use the appropriate substance and procedures; the surface disinfectants recommended to effectively inactivate SARS-CoV-2 consist of 62-71% ethanol, 0.5% hydrogen peroxide or 0.1% sodium hypochlorite.[23,24]

Surgical practice *(Table 3)*. In early March 2020, the Center for Disease Control and Prevention (CDC) and the world's major surgical societies, including the Mexican Association of General Surgery, recommended canceling or rescheduling elective surgeries and shifting these to outpatient settings, when possible.[25] The reaction of physicians was to restrict care to emergency cases and postpone elective surgical procedures in all disciplines except oncology. Consequently, non-urgent, non-essential or elective surgeries, where the surgeon and patient may consider it possible to wait for two to three months without consequences, were restricted or cancelled *(Figure 1)*.

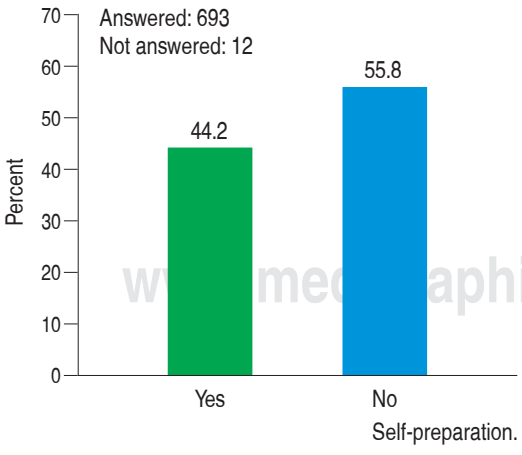

Figure 1: *Q28 Does your hospital perform elective surgery?*

Even though the delay in elective surgery can become a serious problem in the context of possible adverse health implications, this is one of the main recommendations. In this Mexican survey, it was striking that only in a quarter of hospitals (25.16%) it was reduced by 60-100%, and in almost half of the hospitals (47.22%) only emergency surgery was performed, and almost 20% of the hospitals continued with elective surgery ignoring the recommendations, with the risk this implies for the surgical teams in case of not having personal protective equipment, and for the patients themselves. The surgeries mostly performed in the survey were cholecystectomy and appendectomy with almost 90% and trauma surgery in more than 6%, which are basically emergency surgeries; hernioplasties accounted for a minimum amount.

In the first 12 weeks of confinement, according to published estimates, nearly 30 million elective procedures have been cancelled globally and nearly 200,000 in Mexico alone.[4] Many cancellations were for benign conditions; however, more than 80% of cancer operations were also postponed.[26]

The risks associated with surgery and COVID-19 must be carefully balanced against those of delaying surgery on an individual patient basis.

According to an article published in *Lancet* journal, on possible complications in elective surgery with positive or unknown COVID and later diagnosed, the operated patients presented a 51% morbidity with pneumonia and/or acute respiratory distress syndrome or needed unexpected ventilation in the 30 days after the operation.[27]

Regarding minimally invasive surgery (MIS), the survey showed that 26.74% do not perform it in their hospitals, which reflects the reality of hospital in Mexico, that lack laparoscopic equipment. Of those that do perform laparoscopic surgery, 36% use some mechanism for CO_2 filtration, 29.34% use water seals (improvised and not yet proven to be effective) and almost 50% use

Table 4: Personal protective equipment.

No.	Query	Results	%
37	Currently, how do you get your personal protective equipment that you use for your daily activities?		
	It is provided by the institution	278	39.27
	I acquired it with personal resources	343	48.45
	I acquired it with personal resources and have contributed financially amount to acquire PPE for residents and other health personnel.	87	12.29
38	The personal protective equipment provided to you at your hospital is:		
	Equal for all patients	184	27.38
	Only for suspected and COVID positive patients.	342	50.89
	Only for COVID positive patients	146	21.73
39	If your hospital provides you with PPE, is it sufficient and of adequate quality?		
	Yes	249	37.84
	No	409	62.84
40	When performing surgeries, in addition to the surgical uniform: cap, boots, gown and sterile gloves, what other personal protective equipment are you provided?		
	Safety goggles, N95 or similar, and face shield	311	53.44
	Closed goggles, N95 or similar, waterproof gown and face shield	172	29.55
	Safety goggles, N95 or similar, waterproof gown, face shield and coveralls	99	17.01
41	Is the personal protective equipment for other members of the surgical team the same as for the surgeon?		
	Yes	475	70.06
	No	203	29.94
42	Do you know how to put on and remove personal protective equipment?		
	Yes	654	92.90
	No	50	7.10
43	Do you consider it necessary to receive training in donning and doffing of personal protective equipment?		
	Yes	571	81.46
	No	130	18.54
44	What is the source of the training you have received in donning and doffing PPE?		
	On behalf of your institution	375	53.80
	On behalf of the medical association	57	8.18
	Through social networks or other means of communication	265	38.02

Continued from Table 4: Personal protective equipment.

No.	Query	Results	%
45	Do you use an N95 or similar respirator for your daily activity?		
	Yes	523	74.29
	No	181	25.71
46	What type of mask/respirator do you use?		
	Surgical mask	155	21.89
	N95	346	48.87
	KN95	141	19.92
	FFP2	16	2.26
	FFP3	15	2.12
	Other	35	4.94
47	What is the handling and destination of your N95 or similar respirator?		
	Discard after use	303	4.17
	They are decontaminated for reuse in the sterilization plant.	50	7.29
	I decontaminate it	333	48.54
48	Do you have sufficient supplies for hand hygiene?		
	Yes	603	85.29
	No	104	14.71
49	According to your perception, what is the most frequently performed action?		
	Hand washing with soap and water	426	60.08
	Hand disinfection with alcohol-based solution	283	39.92
50	According to your perception, has hand hygiene compliance increased?		
	Yes	685	96.61
	No	24	3.39

pneumoperitoneum inlet and outlet filters, although they do not specify which ones, but so far, they are the most used in our country and globally.[28]

It is worth remembering main recommendations: use a closed suction system, avoid redundant incisions, use leak-free trocars such as balloon trocars, avoid creating a leak for smoke evacuation, and aspirate the entire pneumoperitoneum before retrieving a specimen, at the end of the procedure before removing the trocars or before conversion to open surgery. In case of lack of adapted skills and equipment allowing safe laparoscopic surgery, laparotomy should be preferred instead.[29]

On the other hand, respondents state that the polymerase chain reaction (PCR) diagnostic test as a preoperative measurement was only performed in 1.22%, despite the fact that it has been recommended to perform PCR diagnostic tests and/or chest axial tomography (in case of emergency surgery) on all patients to be operated on in order to select the

Table 5: COVID-19.

No.	Query	Results	%
51	Do you know the number of staff at your hospital who have tested COVID positive?		
	Yes	475	67.19
	No	232	32.81
52	Which is the service with the most affected personnel?		
	Emergency department	244	43.26
	Intensive care unit	33	5.85
	Clinical services	162	28.72
	Surgical services	54	9.57
	Other	71	12.59
53	Which personnel are most affected?		
	Physicians	242	42.46
	Nursing staff	226	39.65
	Laboratory personnel	1	0.18
	Residents	45	7.89
	Other	56	9.82
54	In relation to specialist physicians, who are the most affected?		
	Intensivist physicians	48	8.73
	Internists	147	26.73
	Emergency physicians	216	39.27
	General Surgeons	21	3.82
	Other surgical specialists	36	6.55
	Other	82	14.91
55	Have there been any fatalities?		
	No	487	73.12
	Yes	179	26.88
56	Have you heard of any deaths of general surgeons?		
	No	594	93.10
	Yes	44	6.90
57	Have you suffered any type of aggression or discrimination for being a physician?		
	Yes	84	11.98
	No	617	88.02
58	When you get up in the morning and face another workday, do you feel fatigued?		
	Yes	322	46.20
	No	375	53.80
59	Do you feel emotionally drained performing your medical practice during the COVID-19 pandemic?		
	Yes	400	57.22
	No	299	42.78
60	How do you consider the adaptation of your medical practice during the COVID-19 pandemic?		
	It has been easy to adapt to the new work environment	146	20.80
	It has been difficult to adapt professionally	171	24.36
	It has been difficult to adapt to the professional and family environment.	348	49.57
	Extremely difficult to adapt	28	3.99
	I cannot adapt	9	1.28

best available treatment for the patient, and when the patient is already infected to avoid aggravation of the respiratory situation, due to intubation and surgical aggression. In addition, it favors the choice of the approach route (laparoscopy or laparotomy) and for the health personnel to take the necessary protective measures to avoid possible infections, since there are reports of positivity in surgeons of 23.5% and residents of 26.6%.[30-32]

Personal Protective Equipment (PPE) *(Table 4)*. PPE is indispensable in the prevention of infection during the COVID-19 pandemic, especially in health professionals who are in the first line of contact with sick people and in some serious cases, in whom the viral load is high. The results of the survey showed that 39.27% of the PPE is provided by the institution where they work which, in their opinion, is not of proper quality and is incomplete. On the other hand, most of health professionals (48.45%) had to acquire it with their personal resources. Facing this situation, Surgeons for Mexico "Joining forces" has brought together several medical-surgical organizations led by the Mexican Association of General Surgery, to provide support to surgeons in the states with the greatest needs. To date, 1,878 face masks and 1,958 KN95 respirators have been delivered in the States of Mexico, Colima, Merida, Cancun, Mexico City, Veracruz, and Guerrero.**

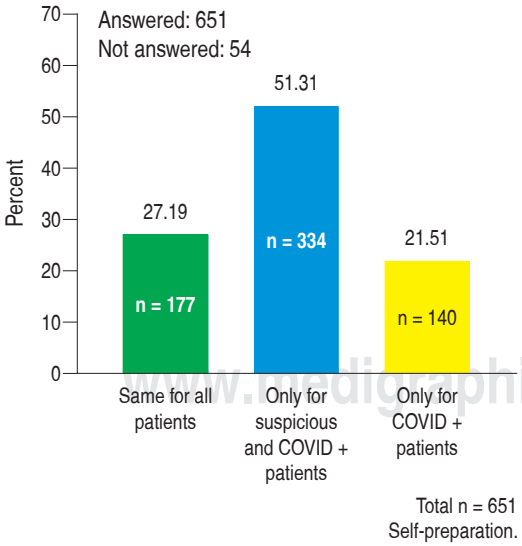

Figure 2: *P38 personal protective equipment provided to you at your hospital.*

The complete PPE used by the surgeons was in 53.44%, in addition to the waterproof gown in 29.55% and coveralls in 17.01%. They considered that training for donning and doffing PPE was needed in 81.46%. However, 38% have obtained training through social networks and the media. Respiratory protection has become the first vital line of defense; the N95 respirator is the most frequently used (48.87%). It is a disposable device but, in the event of a crisis, it is possible to reuse it under established decontamination protocols that are usually carried out in the Sterilization Center. But in this case, this action was carried out by the surgeons themselves (48.54%).

The N95 respirator has been the device with the greatest presence during this pandemic, since it represents protection for the health professional and a significant reduction in the risk of infection, by filtering 95% of airborne particles. The recommended decontamination for this respirator processes are heat, gas plasma and ultraviolet light.[33]

The availability of adequate material and sufficient PPE has been one of the most relevant issues since the beginning of the pandemic, due to the worldwide shortage[34] *(Figure 2)*.

Another important preventive measure is hand hygiene, since it prevents cross-contamination, which, when touching any contaminated surface or device, can facilitate the transport of the virus to the mouth, nose, and eyes; fortunately, 85.29% of the population surveyed had the necessary supplies. Washing with soap and water is the most frequent practice (60.08%) and the perception of an increase in compliance was 96.61%. During the last five years, Mexico has worked intensively through institutional and governmental campaigns to promote and consolidate the increase in hand hygiene and make it a habit to reduce health care-associated infections. In a study related to hand hygiene compliance in surgical services,

** Torres-Cisneros Roberto. Cirujanos por México Personal Protective Equipment donation registration, June 2020.

it only reached 9%;*** we were in search of the best strategies to achieve this purpose, but too far from imagining that a virus could be the engine of this change.

COVID-19 *(Table 5)***.** In relation to the health professionals, those most affected were physicians 43.26% and nurses 39.65%; the most affected service was the emergency departments (43.26%), surgical services (9.57%), and in terms of medical specialties, emergency physicians (39.27%) were the most affected, while deaths of general surgeons were identified in 6.90%.

Health care personnel have been significantly affected during this pandemic, with one report accounting for a total of 39,032 (41%) nurses and physicians 30%, with 584 deaths.[35]

In the present study, some points were reviewed in relation to the psycho-emotional impact generated by SARS-CoV-2 infection (COVID-19) in the work environment of the surveyed surgeons.

There are no previous reports in the literature on the discrimination suffered by health personnel, surgeons, internists, nurses, etc., who in the performance of their professional duties have had to care for patients with COVID-19. Our study found that 11.98% (84/701) of those surveyed accepted having been victims of social discrimination, which can be translated as rejection by the non-medical population, due to fear and ignorance that medical personnel could be a vector of transmission of the disease to the community.

Burnout syndrome is an emotional disorder associated with stress caused by the work environment. It is characterized by emotional fatigue, organizational cynicism, low productivity, job dissatisfaction, depersonalization, and increased rate of medical errors.[36] Shanafeld et al, in a study of 7,905 recently graduated surgeons, found a 70% prevalence of emotional fatigue before the COVID-19 pandemic.[37] In the present study, 46.2% (322/697) of the surgeons surveyed agreed to experience fatigue upon waking up to start another workday. 57.22% (400/699) of the surgeons surveyed agreed to feel emotionally exhausted while performing their medical practice during the COVID-19 pandemic.

The daily conditions in the face of eventualities are changing. The surgical scenario changes from patient to patient, even with the same disease, so the surgeon must necessarily develop, among his non-technical skills, an enormous capacity for adaptation and resilience. In a study by the University of Cincinnati, in 2019, the correlation between *burnout* syndrome and resilience was studied in 103 general surgery residents. A direct association was found between the presence of burnout and the adaptive capacity and resilience developed over the years of surgical practice.[38] In our study, 20.8% (146/702) of the surgeons surveyed had adapted easily to the new conditions of life and surgical work in the face of the COVID-19 pandemic. In contrast, 1.28% (9/702) recognized that it has been impossible for them to adapt to the use of permanent protection measures and to the increase in the use of PPE. It is also interesting that almost half of the respondents (49.57%, 348/702) considered that the arrival of COVID-19 has made it difficult to achieve a balance between professional and family work, since many surgeons who treat patients with COVID-19 daily and who are on the first contact line have had to isolate themselves without seeing their families for months.

In Mexico, there are no previous studies that have evaluated the prevalence of burnout in the population of general surgeons in the country, so our study is the first to explore this aspect of life in our specialty. However, in the absence of previous epidemiological studies, it is not possible to distinguish between the previous prevalence of these traits in the pre-COVID and post-COVID eras, which motivates future studies aimed specifically at exploring these conditions.

CONCLUSIONS

The SARS-CoV-2 coronavirus pandemic has constituted a great challenge in contemporary medicine. No health system could visualize a

*** Cote-Estrada Lilia. Institutional Hand Hygiene Campaign, Mexican Institute of Social Security 2016.

problem of such magnitude and, therefore, none was prepared for it. However, it has been essential to make decisions and implement actions in response to the needs arising from this health crisis. In the same sense, health professionals have been affected in their personal, professional, and family fields. The present study shows an overview in the practice of the general surgeon in Mexico in a particular scenario, which obliges more than ever to radical changes by redefining roles, adapting programs, specifying and designing strategies with the necessary adaptation and resilience, without forgetting to prioritize safety for the patient and for the health professionals.

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