ORIGINAL ARTICLE

AL-ANBAR MEDICAL JOURNAL
Anb. Med. J. 19(1): 36−41, 2023

Prevalence of Coronavirus Disease-2019 Among Anaesthesiologists and Anaesthesia Technicians in Al Anbar Governorate, Iraq

Yahya A. Mohammed,[1,*] Mohammed A. Mohammed,[2] and Khalida I. Rajab[3]

[1] *Department of Anaesthesia and Intensive Care, Higher Health Institution, Anbar Health Directorate, Anbar, Iraq.*
[2] *Department of Biochemistry, Anbar Educational Directorate, Anbar, Iraq.*
[3] *Department of Obstetrics and Gynecology, Almaarif University College, Anbar, Iraq.*
(Received : 10 October 2022; Accepted : 13 February 2023; First published online: 26 March 2023)

ABSTRACT

Background: Anesthesiologists and their assistants, who have extensive skills and powerful impact, are major contributors to the COVID-19 management team. However, the procedures they perform expose them to the danger of infection.
Objectives: To estimate the prevalence rate of COVID-19 among anesthesiologists and the assistant staff in Al Anbar Governorate and factors that might affect the rate of infection.
Materials and methods: A prospective survey study was conducted for the anesthesiologists and anesthetist assistants who worked in any hospital (12 in number) in Al Anbar Governorate, Iraq. The agreed participants were contacted by phone. Demographic and clinical data were recorded for each participant.
Results: Of 214, there were 100 participants responded to the questionnaires with a response rate of 46.7%. The prevalence of COVID-19 among them was 93%. The majority of the subjects were from the age group ≤ 40 years (65%), males (67%), and non-smokers (73%). Most of the individuals were sub-staff (90%), with a service duration of 1–2 years (44%), work in the operative room (60%), and they were not worked in an isolation hall (58%). There was no statistically significant difference between infected and non-infected groups regarding the above-mentioned variables (P-value > 0.05). The majority of the participants (92%) were vaccinated. There were 4 out of 92 from the vaccinated group and 3 out of 8 from the non-vaccinated group got an infection with a statistically significant difference (P-value = 0.0001). The majority (83) of the participants were taken the Pfizer vaccine. Most of the infected subjects with mild severity. Besides, there was a statistically significant difference between COVID-19 severity and the timing of the infection (P-value = 0.0001).
Conclusion: The prevalence of COVID-19 among the participants was 93%. Vaccination could have a protective effect against the disease.
Keywords: Prevalence; Coronavirus; Anesthesiologist; Anesthesia; COVID-19.

DOI: 10.33091/amj.2023.178119
© 2023, Al-Anbar Medical Journal

INTRODUCTION

The Coronavirus family includes a wide range of viruses that were used to cause minor to moderate respiratory infections in humans. Two zoonotic coronaviruses with significant but moderate pathogenicity emerged in 2002 and 2012, namely the severe acute respiratory syndrome coronavirus 1 (SARS-CoV-1) and Middle East respiratory syndrome coronavirus (MERS-CoV). By then, the respiratory system involvement was mild to moderate and most of the infected individuals were treated as outpatients. In 2019, a new designation, Coronavirus Disease-19 (COVID-19), was made by the World Health Organization (WHO) for an emerging new coronavirus infection [1]. This took place after the massive increment in the infection rate with a new strain of Coronaviruses

* Corresponding author: E-mail: yahyaaboudm@gmail.com
Phone number: +9647818222117

http://doi.org/10.33091/amj.2023.178119

and the fatal respiratory illness that caused alarming deaths and spread rapidly across the world, therefore the Coronaviruses started to constitute a new public health issue and were declared as the cause of a new pandemic [2]. The virus swept most countries of the world, including Iraq, where the total number of infections in Iraq reached 2.32 million until 2022, while the death exceeded 25,181(https://www.who.int/data/gho/publications/world-health-statistics).

At the initial phase of the pandemic, there was great uncertainty regarding the management as well as the anticipated severity of the infection; severe acute respiratory syndrome coronavirus 2 (SARS-Cov-2), was extremely contagious and brought on severe viral pneumonia with the involvement of many systems other than the respiratory system [3, 4]. Moreover, it has significantly outperformed SARS-CoV-1 and MERS-CoV in terms of the number of infected individuals and the geographic scope of the epidemic zones. The reported symptoms of COVID-19 patients caused mild to severe illness and used to appear after 2 to 14 days following virus exposure. These COVID-19 symptoms included fever or chills, cough, fatigue, headache, muscle or body aches, the new loss of taste or smell, sore throat, and nasal congestion. Alternate symptoms include a stuffy nose, diarrhea, nausea, etc. [4–6], and with such alarming symptoms the continuing COVID-19 outbreak was recorded to be a real threat to world public health [6, 7].

In addition, a major difficulty in managing Corona patients was attributed to the electrolyte imbalance which was part of the presentation. There were many indications from early COVID-19 investigations that electrolyte abnormalities may also be present when patients report to hospitals. Reports indicate that patients presented with anomalies in sodium, potassium, chloride, and calcium [6]. Doctors have proposed that people with more severe COVID-19 show a larger proportion of baseline hypokalemia than those with less severe versions of the illness [8]. Moreover, doctors and specialists have noticed that patients admitted to hospitals may suffer from changes in the level of sodium in their bodies [9].

The severity of the symptoms called upon the involvement of Anaesthesiologists and Anesthesia Technicians in the management of such patients which led to their extensive exposure to the virus [10, 11]. The current study aimed at estimating the prevalence rate of COVID-19 among anesthesiologists and the assistant staff in Al Anbar Governorate by designing and conducting a survey study for the period from October 2021 to February 2022.

MATERIALS AND METHODS

This prospective survey study was conducted in Al Anbar Governorate, Iraq from October 2021 to February 2022. The participants were anesthesiologists and assistants employed at all hospitals of Al Anbar Governorate (12 in number). The anesthetists and anesthesiologist assistants are working in the intensive care, operating theaters, or health isolation halls of both genders. Those who not responded to the survey were excluded from the study. The current investigation was approved by the Anbar Health Directorate Research Committee.

To achieve the objectives of this study, a questionnaire was created consisting of three sections:

1. Socio-demographic characteristics of the participants included age, gender, job title, place of work, and duration of service.
2. Data related to the administration of the vaccines, type, positive testing results pre and post-vaccination, and type of investigation.
3. Assessing the severity of the symptoms and the need for hospitalization and oxygen administration.

We contacted the participants by phone to get the abovementioned information. The data were entered using the Statistical Package for Social Sciences (SPSS) version 22 and analyzed using descriptive statistics (frequency, percentage) and presented as figures or tables. A Chi-square test was used for the comparison between categorical variables. A P-value of less than 0.05 was considered a statistically significant difference.

RESULTS

Out of 214, 100 individuals respond to our questionnaires with a response rate of 46.7%. The age of our participants ranged from 26–50 years with a mean age of 37.46 ± 7.059 years. While the median and mode were 37 and 31 years respectively. The highest age group was ≤ 40 years (65%). Around two-thirds of the participants were male. And 73% of individuals were non-smokers (Table 1).

Ninety percent of the participants were sub-staffs. The majority of them with a service duration of 1–2 years (44%) worked in the operative room (60%), and they were not worked in an isolation hall (58%) as shown in Table 2.

The majority of participants (93%) got an infection with SARS-CoV-2. Out of 65, there were 61participants belonged to the infected group. Males (n = 61) outnumbered females (n = 32) regarding the prevalence of infection. Twenty-four persons who got infection were no-smokers. Most of the participants (n = 84) got the infection from the sub-staffs. Forty-one of the participant from the infected group were with a service duration of 1–2 years. The majority (n = 56) of the infected group worked in the operative theater. While 53 of the individuals from the infected group worked in a non-isolated ward. The majority of infected persons (n = 88) were vaccinated. There were no statistically significant differences between the infected and non-infected groups regarding all variables (P-value > 0.05) apart from the history of vaccination (P-value = 0.0001) as shown in Table 3.

The majority of participants were taken the Pfizer vaccine type (83%) as shown in Figure 1.

Most of the infected persons were with a mild course of COVID-19 (n = 42). The majority of participants with a history of COVID-19 were taking the infection before vaccination (26 with mild, 16 moderate, and 6 with severe course).

Table 1. Demographic data of the 100 participants.

Variable	Frequency	Percentage
Age groups per years		
≤ 40	65	65.0
> 40	35	35.0
Gender		
Males	67	67.0
Females	33	33.0
Smoking habit		
Yes	27	27.0
No	73	73.0

http://doi.org/10.33091/amj.2023.178119

Table 2. Distribution of the 100 participants according to the work characteristics.

Variable	Frequency	Percentage
Job title		
Senior	4	4.0
Resident doctor	6	6.0
Sub-staff	90	90.0
Duration of service		
1–2 years	44	44.0
3–10 years	18	18.0
11–15 years	19	19.0
16–20 years	15	15.0
21–25 years	4	4.0
Workplace		
Operative room	60	60.0
Intensive care unit	14	14.0
Both	26	26.0
Work in isolation hall		
Yes	42	42.0
No	58	58.0

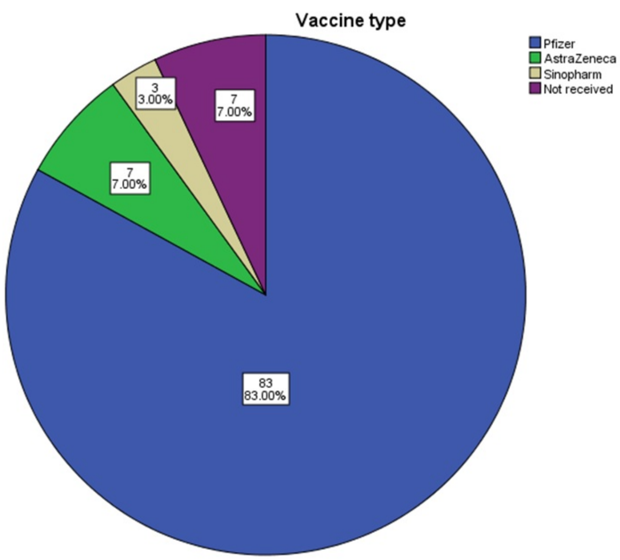

Figure 1. The distribution of the 250 patients according to the duration of the lesions. P-value = 0.001.

Table 3. Relationship between the infected and non-infected groups with certain variables.

Variable	Non-Infected group(7) Number%	Infected group(93) Number%	Total (100) Number%	P-value
Age groups per years				0.651
≤ 40	4 (6.2%)	61 (93.8%)	65 (100%)	
> 40	3 (8.6%)	32 (91.4%)	35 (35%)	
Gender				0.275
Males	6 (9%)	61 (91%)	67 (100%)	
Females	1 (3%)	32 (97%)	33 (100%)	
Smoking habit				0.327
Yes	3 (11.1%)	24 (88.9%)	27 (100%)	
No	4 (5.5%)	69 (94.5%)	73 (100%)	
Job title				0.555
Senior	0 (0%)	4 (100%)	4 (100%)	
Resident doctor	1 (16.7%)	5 (83.3%)	6 (100%)	
Sub-staff	6 (6.7%)	84 (93.3%)	90 (100%)	
Duration of service				0.567
1–2 years	3 (6.8%)	41 (93.2%)	44 (100%)	
3–10 years	0 (0%)	18 (100%)	18 (100%)	
11–15 years	2 (10.5%)	17 (89.5%)	19 (100%)	
16–20 years	2 (13.3%)	13 (86.7%)	15 (100%)	
21–25 years	0 (0%)	4 (100%)	4 (100%)	
Workplace				0.985
Operative room	4 (6.7%)	56 (93.3%)	60 (100%)	
Intensive care unit	1 (7.1%)	13 (92.9%)	14 (100%)	
Both	2 (7.7%)	24 (92.3%)	26 (100%)	
Work in isolation hall				0.455
Yes	2 (4.8%)	40 (95.2%)	42 (100%)	
No	5 (8.6%)	53 (91.4%)	58 (100%)	
Vaccination				0.0001
Yes	4 (4.3%)	88 (95.7%)	92 (100%)	
No	3 (37.5%)	5 (62.5%)	8 (100%)	

There was a statistically significant difference between the severity of the disease and the timing of getting the infection (P-value=0.0001) as shown in Table 4.

DISCUSSION

This study shows that working in close contact with COVID-19 patients has caused greater exposure to SARS-CoV-2 and a high infection rate (93%). The main reason behind this high rate might be the increased viral load which puts this category of medical specialists and staff under occupational hazard despite all the precautions taken to ensure low exposure (e.g. gowns, sanitization, vaccinations, etc. [12]. Moreover, the current study revealed that there were no statistically significant differences between the infected and non-infected groups regarding age groups, gender, smoking habit, job title, workplace, and service duration. However, there was a statistically significant difference between the two groups regarding the vaccination variable.

The conducted study showed no significant gender variations concerning the risk of infection with COVID-19. It was reported that independent of age, the male gender is a new risk factor for severe COVID-19 and poorer outcomes. According to data from China, 61.1% of intensive care unit (ICU) patients and 54.3–57.3% of hospitalized patients were men [13]. According to Zheng et al., 62% of hospital fatalities in Wuhan were men [14]. Men are almost twice as likely to die from COVID-19 than women are, this has given rise to several hypotheses, including changes in lifestyle and chromosomal structure [15]. Growing evidence that sex differences exist in the biochemistry, hormones, and physiology of every organ system, and gender differences also exist in the presentation and prognosis of diverse diseases [16]. According to Betron et al., men are more likely to develop COVID-19 than

http://doi.org/10.33091/amj.2023.178119

Table 4. The correlation between the COVID-19 severity and timing of infection in 100 participants *.

Severity	Time of infection				
	Before taking vaccine Number(%)	After taking vaccine Number(%)	Before and after taking vaccine Number(%)	Not infected Number(%)	Before taking vaccine Number(%)
Mild	26 (61.9)	13 (31)	3 (7.1)	0 (0)	42 (100)
Moderate	16 (51.6)	12 (38.7)	3 (9.7)	0 (0)	31 (100)
Severe	6 (30)	8 (40)	6 (30)	0 (0)	20 (100)
Not Infected	0 (0)	0 (0)	0 (0)	7 (100)	7 (100)
Total	48 (48)	33 (33)	12 (12)	7 (7)	100 (100)

* P-value=0.0001

women because of a variety of variables, including male sex hormones, a higher smoking rate, respiratory and heart conditions, and a compromised immune system [17]. Moreover, it was documented that the age dependence of COVID-19 mortality is greater than that of all-cause mortality, and men are at increased risk relative to women, however, this excess risk is less prominent as people get older [18].

The impact of vaccination was variable and there is evidence that it offered some immunity. Regarding the association with gender, a recent study showed that females scored the highest percentage in vaccination than males [19]. These results were not compatible with our results which showed 92% of the participants were vaccinated, there was no obvious difference between gender and vaccination owing to the small number of individuals who were not vaccinated. Anyhow, There is uncertainty regarding the effect of the vaccine on pregnant and lactating women. According to studies conducted in France and the UK, the female gender was significantly related to COVID-19 vaccination skepticism and rejection [20]. This may be because many vaccination studies omitted pregnantly and nursing women, therefore there are no safety data for the vaccine for this group of women. For women in the reproductive age range who are worried about both their health and the health of their unborn child, this knowledge may not be comforting [21].

In comparison to males, women are known to have higher immunological reactions to self-antigens and foreign antigens, which makes them more susceptible to diseases and vaccination benefits. Even though immune responses change throughout a person's life, women have more potent innate (pattern recognition receptors, cytokines) and adaptive (humoral and cell-mediated, including immunoglobulin, B cell, and T cell) immune responses than males [22]. The two X chromosomes that women carry are the first genetic component of the female immune system. Numerous genes that control cellular and immunological activity, including the angiotensin-converting enzyme 2 genes, are found on the X chromosome [23]. Mild, moderate, and severe COVID-19 courses were reported in this study, this might depend on the difference in immune system response. Our study compared only the severity of COVID-19 with the timing of getting an infection (before, after, or both) following vaccinations (P-value = 0.0001).

Regarding age, it was recently reported that the incidence rates have confirmed an increased disease incidence in men older than 60 years [18]. Elderly people are at a higher risk of contracting COVID-19, which may be caused by a weakened immune system, ongoing illnesses, malnutrition, elevated ACE-2 expression, and organ failure. The majority of children and teenagers infected with SARS-CoV-2, as opposed to adults with COVID-19, had a milder illness and manifested with nasal congestion, rhinorrhea, pharyngeal erythema, diarrhea, and vomiting [24]. Children's lower SARS-CoV-2 susceptibility may be caused by decreased ACE-2 expression in the nasal epithelium, which would explain why COVID-19 infection is minimal or nonexistent in children [14, 25]. Our results revealed that there was no difference between the two age groups ($\leq$ 40 and $>$ 40 years) and infection with SARS-CoV-2. This result is due to that elderly and children were not enrolled in the study.

Diesel et al. showed that adults over 65 years had the greatest COVID-19 immunization coverage among U.S. individuals, while adults aged 18–29 years had the lowest coverage [26]. Similarly, a recent showed that COVID-19 vaccination coverage among healthcare workers was relatively high in the Iraqi Kurdistan population [27]. Our study revealed a rate of 92% of our participants were vaccinated.

In addition to the above-mentioned shortcomings of the study, the retrospective nature of the investigation was considered another limitation of the present study.

CONCLUSION

This study has shown a high rate of COVID-19 among the anesthesia staff that reached 93%. The prevalence of the disease cannot determine by age, gender, smoking habit, job title, service duration, and workplace. Most of the infected cases were with mild severity. The severity of the disease could be determined by the timing of the infection (before, after, and before and after vaccination). Vaccination could have a protective effect against the disease. However, owing to the small sample size, this result cannot be generalized.

ETHICAL DECLARATIONS

Acknoweldgements

Many thanks for all participants who responded to the survey.

Ethics Approval and Consent to Participate

Written approval had been gained from the Anbar Health Directorate Research Committee, Ramadi City, Iraq. Study data/information was used for the research purpose only. Informed consents from every participant was taken.

http://doi.org/10.33091/amj.2023.178119

Consent for Publication

Not applicable (no individual personal data included).

Availability of Data and Material

The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing Interests

The authors declare that there is no conflict of interest to disclose.

Funding

No funding.

Authors' Contributions

All the authors listed have made a substantial, direct, and intellectual contribution to the work, and approved it for publication.

REFERENCES

[1] Lingzhong Meng, Fang Hua, and Zhuan Bian. Coronavirus disease 2019 (COVID-19): emerging and future challenges for dental and oral medicine. *Journal of dental research*, 99(5):481–487, 2020.

[2] Joseph T Wu, Kathy Leung, and Gabriel M Leung. Nowcasting and forecasting the potential domestic and international spread of the 2019-nCoV outbreak originating in Wuhan, China: a modelling study. *The Lancet*, 395(10225):689–697, 2020.

[3] David S Hui *et al.* The continuing 2019-nCoV epidemic threat of novel coronaviruses to global healthThe latest 2019 novel coronavirus outbreak in Wuhan, China. *International journal of infectious diseases*, 91:264–266, 2020.

[4] Hazim Ghazzay, Raid M Al-Ani, Mothana A Khalil, and Ahmed Faeq Hammad. Socio-clinical characteristics of COVID-19 disease in Anbar Governorate, Iraq. *Journal of Emergency Medicine, Trauma and Acute Care*, 2021(1):8, 2021.

[5] Raid M Al-Ani. Smell and Taste Abnormalities due to COVID-19. *Al-Anbar Medical Journal*, 16(1):1–2, 2020.

[6] W. Guan *et al.* Clinical characteristics of coronavirus disease 2019 in China. *New England journal of medicine*, 382(18):1708–1720, 2020.

[7] Qingmei Han, Qingqing Lin, Shenhe Jin, and Liangshun You. Coronavirus 2019-nCoV: A brief perspective from the front line. *Journal of Infection*, 80(4):373–377, 2020.

[8] Dong Chen *et al.* Hypokalemia and clinical implications in patients with coronavirus disease 2019 (COVID-19). *MedRxiv*, 2020.

[9] Tigist W Leulseged *et al.* Laboratory biomarkers of COVID-19 disease severity and outcome: Findings from a developing country. *PloS one*, 16(3):e0246087, 2021.

[10] Subodh Kumar, Sanjeev Palta, Richa Saroa, and Sukanya Mitra. Anesthesiologist and COVID-19current perspective. *Journal of Anaesthesiology, Clinical Pharmacology*, 36(Suppl 1):S50, 2020.

[11] Can Aksu, Sevim Cesur, Alparslan Ku, and Kamil Toker. General anesthesia practices during the COVID-19 pandemic in Turkey: A cohort study with a national survey. *Cureus*, 12(10), 2020.

[12] Raid M Al-Ani and Amer Fakhree AL-Ubaide. Surgical Care and Resident Education during COVID-19 Pandemic. *Al-Anbar Medical Journal*, 17(2):49–54, 2021.

[13] Jiahao Wang *et al.* Acceptance of COVID-19 Vaccination during the COVID-19 Pandemic in China. *Vaccines*, 8(3):482, 2020.

[14] Fang Zheng *et al.* Clinical characteristics of children with coronavirus disease 2019 in Hubei, China. *Current medical science*, 40(2):275–280, 2020.

[15] Nancy Krieger, Jarvis T Chen, and Pamela D Waterman. Excess mortality in men and women in Massachusetts during the COVID-19 pandemic. *The Lancet*, 395(10240):1829, 2020.

[16] Evelyne Bischof, Jeannette Wolfe, and Sabra L Klein. Clinical trials for COVID-19 should include sex as a variable. *The Journal of clinical investigation*, 130(7):3350–3352, 2020.

[17] Myra Betron, Ann Gottert, Julie Pulerwitz, Dominick Shattuck, and Natacha Stevanovic-Fenn. Men and COVID-19: Adding a gender lens. *Global Public Health*, 15(7):1090–1092, 2020.

[18] Peter Bauer, Jonas Brugger, Franz König, and Martin Posch. An international comparison of age and sex dependency of COVID-19 deaths in 2020: a descriptive analysis. *Scientific reports*, 11(1):1–11, 2021.

[19] Mohamed O Nour and Hatim A Natto. COVID-19 vaccination acceptance and trust among adults in Makkah, Saudi Arabia: a cross-sectional study. *Journal of the Egyptian Public Health Association*, 97(1):17, 2022.

[20] Michaël Schwarzinger, Verity Watson, Pierre Arwidson, François Alla, and Stéphane Luchini. COVID-19 vaccine hesitancy in a representative working-age population in France: a survey experiment based on vaccine characteristics. *The Lancet Public Health*, 6(4):e210–e221, 2021.

[21] Faheem Ahamed, Subhashini Ganesan, Anila James, and Walid Abbas Zaher. Understanding perception and acceptance of Sinopharm vaccine and vaccination against COVID19 in the UAE. *BMC public health*, 21(1):1–11, 2021.

[22] Ashley L Fink and Sabra L Klein. The evolution of greater humoral immunity in females than males: implications for vaccine efficacy. *Current Opinion in Physiology*, 6:16–20, 2018.

[23] Eileen P Scully, Jenna Haverfield, Rebecca L Ursin, Cara Tannenbaum, and Sabra L Klein. Considering how biological sex impacts immune responses and COVID-19 outcomes. *Nature Reviews Immunology*, 20(7):442–447, 2020.

[24] Robert Koch Institute. Coronavirus disease 2019 (COVID-19): Daily situation report of the Robert Koch Institute. 2020.

[25] Shweta Jakhmola, Budhadev Baral, and Hem Chandra Jha. A comparative analysis of COVID-19 outbreak on

http://doi.org/10.33091/amj.2023.178119

age groups and both the sexes of population from India and other countries. *The Journal of Infection in Developing Countries*, 15(03):333–341, 2021.

[26] Jill Diesel *et al.* COVID-19 vaccination coverage among adultsUnited States, December 14, 2020May 22, 2021. *Morbidity and Mortality Weekly Report*, 70(25):922, 2021.

[27] Manhal Abdulkader and Muayad Merza. The evaluation of COVID-19 vaccination program in Duhok province, Iraqi Kurdistan: challenges and solutions. *Journal of Research and Health*, 12(4):2, 2022.