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Research Article

A Questionnaire-Based Survey to Assess the Timing of Intubation in Covid-19 Pneumonia

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ABSTRACT

Background: Many COVID19 pneumonia patients progress to Acute Respiratory Distress Syndrome (ARDS) and end up in Intensive Care Units. The progress of the disease, its management and associated outcomes are yet to be studied in detail. This survey aimed to assess the opinion regarding management of COVID 19 ARDS and the timing of intubation in those patients.

Methods: 292 clinicians including anesthesiologists, intensivists and others involved in managing COVID 19 ARDS patients at various centers were surveyed with web-based questionnaire cross sectionally within time period of 10th June 2020 to 31st August 2020 after taking prior consent.

Results: Among included participants, 172 intensivists, 84 anesthesiologists and rest were others. 67.1% of participants were agreed with patient induced self-inflicted injury could have happened in this disease. Around 91.8% of doctors involved in managing patients were believed that High Flow Nasal Cannula (HFNC) could be helpful if there were falling of saturation. 37% of participants were not agreed with early intubation, which may increase the risk of mortality and nosocomial infections.

Conclusions: There was confusion in most doctors with intubation timing even if there was an indication for intubation. These confusions may be due to non-availability of specific recommendation regarding intubation in COVID 19 severe ARDS patients.

Keywords: ARDS; COVID19; Pneumonia; Intubation; P-SILI

INTRODUCTION

On March 11th, 2020 World Health Organization (WHO) declared COVID-19 as a pandemic [1]. Nearly 5% of the total cases require admission in the Intensive Care Unit (ICU) [2]. Many of these patients who get admitted in the ICU subsequently go on to require some form of mechanical ventilation. The surviving sepsis campaign issued guidelines in which they stated that the mechanical ventilatory support in COVID-19 should be the same as that is being done in another Acute Respiratory Distress Syndrome (ARDS) patient [3].

The respiratory symptoms associated with COVID-19 have similarities with other forms of ARDS. COVID-19 associated hypoxemia is postulated to be due to 2 distinct forms of lung injury. One of the forms is the classical ARDS and the other is an effect on the microvasculature of the lungs resulting the formation of dead space [4]. Being a novel viral infection and the progress and outcome of the disease yet to be studied in detail with evidence, management of patients has varied from place to place and person to person.

With a sudden spurt in the number of patients being admitted to ICUs with pneumonia and ARDS, logistic factors (workforce and device availability) had to be considered while managing such patients. The pathophysiology of hypoxemia in COVID-19 is also multifactorial. All these factors taken together, there is a confusion regarding when to intubate these patients. There is a debate which is going on among the Critical Care physicians regarding the timing of intubation.

This survey was planned to assess the opinion and the practice among the critical care physicians in this aspect. The management of COVID-19 is still evolving as the pandemic progresses and we gain new insights into the pathophysiology and the management of the disease. Most of the centers that are managing COVID-19 patients are doing so, based on their institutional guidelines. This survey was planned to give us an idea regarding the Critical Care community's opinion about how to manage COVID19 patients with ARDS in ICU.

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METHODS

This web-based, multicenter, cross-sectional questionnaire study was conducted over three months (June to August 2020). Institutional ethics committee clearance was obtained before the start of the study. The questionnaires were sent to physicians involved in the care of COVID-19 patients.

Study design

The set of questions in the questionnaire was finalized by the Delphi method. Four critical care physicians were involved in the discussion and finalization of this questionnaire. The questions were selected to assess the demography, clinical experience in the management of COVID-19 patients and the opinion and practice regarding the timing of intubation in patients with COVID-19 pneumonia with ARDS. The questions were formulated based on the literature review. The draft questionnaire was sent to three critical care physicians not involved in the study, the feedback was taken and relevant changes made in the final questionnaire.

Data collection

The questionnaire was uploaded in a web-based platform, after which it was circulated among critical care physicians. Critical Care physicians from India, Singapore, Canada and the United Kingdom have taken part in the survey. Consent was taken from each respondent before he/she took part in the survey. Intensivists, Anesthesiologists and Physicians were included in the survey. The questionnaire included multiple choice questions. Participants were allowed to enter their own responses wherever it was appropriate. A responder was allowed to take the survey only once; repeated attempts were not allowed.

Statistical analysis

Since there has been no previous study on this topic, it was impossible to calculate the sample size. The data collected through web platform were entered into Microsoft excel. The categorical variables were expressed as frequency (percentage). A chi-square test was used to determine the correlation between respondents' demographic profiles with the timing of intubation in COVID-19 patients. The statistical analysis was performed by using statistical software IBM SPSS version 25.0.

RESULTS

The study was conducted from 10th of June 2020 to 31st of August 2020. 292 doctors took part in the survey after giving their consent. 172(58%) were intensivists, 84(28.8%) were anesthesiologist and rest belonged to other specialities. 75.3% of the participants had seen more than 100 cases of COVID in their practice. The responses to various questions are provided in Table 1. 240(82.2%) doctors felt COVID ARDS is different from other typical ARDS. Nearly two thirds of the respondents felt that Patient Self-Inflicted Lung Injury (P-SILI) is a clinical entity. 34.2% felt that delayed intubation was associated with higher survival or higher mortality was seen with earlier intubation. 82.2% felt that intubation increased the risk of developing Nosocomial pneumonia. 46.8% of clinicians agreed that higher mortality in COVID-19 caused due to disease process and 28.8% were agreed due to P-SILI or high transpulmonary pressure (Figure 1).

Table 1: Response to questions.

Questions		Count	N%
You are a/an	Anaesthesiologist	84	28.80%
	Intensivist	172	58.90%
	others	36	12.30%
How many cases of severe COVID-19 pneumonia (Requiring oxygen or greater support) have you managed?	<10	72	24.70%
	<100	116	39.70%
	<500	88	30.10%
	>500	16	5.50%
Do you believe that spontaneous prone is of value in COVID-19 ARDS?	Yes	260	89%
	No	32	11%
Do you believe that Covid-19 ARDS is different from other causes of ARDS	Yes	240	82.20%
	No	52	17.80%
Do you think patient induced self-inflicted injury can happen?	Yes	196	67.10%
	No	96	32.90%
Do you believe that spontaneous prone is of value in COVID-19 ARDS?	Yes	260	89%
	No	32	11%
Do you believe the High Flow Nasal Cannula (HFNC) is of value in Covid-19 ARDS if there is fall in saturation?	Yes	268	91.80%
	No	24	8.20%
If you think HFNC is of no value, what will you do if it fails	Intubation	116	43.30%
	NIV trial	152	56.70%
If you think HFNC is of no value, what will you do if patients hypoxia worsens	Intubation	16	66.70%
	NIV trial	8	33.30%
Do you think NIV increases the risk of P-SILI?	Yes	84	28.80%
	No	68	23.30%
	May be	140	47.90%
Do you think intubation increases the risk of N osocomial infection	Yes	240	82.20%
	No	16	5.50%
	May be	36	12.30%
In Covid-19 the longer I can avoid intubation, more chance my patient will survive	Yes	100	34.20%
	No	108	37%
	May be	84	28.80%
In Covid-19 the sooner I intubate, more chance my patient will survive	Yes	60	20.50%
	No	168	57.50%
	May be	64	21.90%
Mortality in Covid-19 ARDS is higher compared to other causes of ARDS?	Yes	164	56.20%
	No	76	26%
	May be	52	17.80%
In your opinion, are wearing and spontaneous breathing trials in Covid-19 different from other diseases?	Yes, this needs a very cautious approach	172	58.90%
	No, it is similar to my routine practice	120	41.10%
Did you experience a high incidence of extubated COVID-19 compared to other diseases?	Yes	88	30.10%
	No	204	69.90%
Did you experience a high incidence of post-extubation stridor in COVID-19 compared to other diseases?	Yes	44	15.10%
	No	248	84.90%

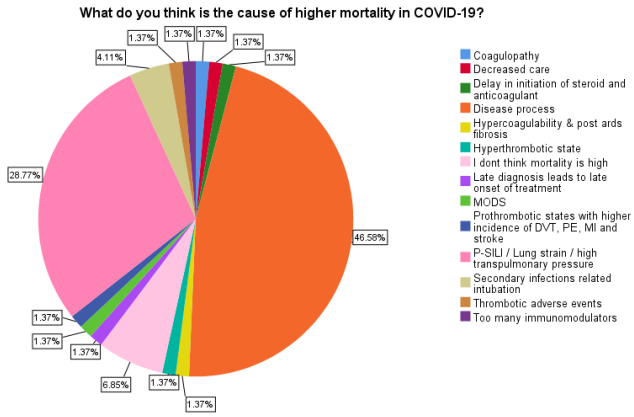

Figure 1: Causes of mortality in COVID-19.

In subgroup analysis, it was found that around 51.2% of intensivists had seen more than 100 severe pneumonia patients as compared to the anesthesiologist (14.3%) and others (11.1%). 83.7% of intensivists and 81% of anesthesiologist believed that COVID 19 ARDS is different from another form of ARDS. Likely, most of the anesthesiologists (66.7%) and intensivists (72.1%) agreed that P-SILI could happen in COVID 19 ARDS patients. Almost 97.7% of intensivists and 76.2% of anesthesiologists agreed that HFNC is valuable and should be used when patient develops hypoxia, if available (p value=0.008). Among those who agreed with HFNC as a modality during hypoxia early in the management, 47.6% of the intensivists and 43.7% of the anesthesiologists would opt for invasive mechanical ventilation. The rest preferred Non-Invasive Mechanical Ventilation (NIV) as the next step in managing, upon HFNC failure. However, among those who did not think that HFNC would be of any value in patients with worsening hypoxia, most of them preferred invasive mechanical ventilation. Very few participants (14.3% of the anesthesiologists, 32.6% of the intensivists and 44.4% of the others) thought that NIV could increase the P-SILI risk. Regarding nosocomial infections, around 85.7% of anesthesiologists, 76.7% intensivists, and all other participants felt intubation might cause nosocomial infection. Around 42.9% of anesthesiologists believed that patient is more likely to survive if invasive mechanical intubation is delayed or avoided, while 41.9% of intensivists believed the contrary. Regarding weaning; and re-intubation in extubated patients, most of the participants agreed that weaning needs a very cautious approach. They were not of the view that the rate of re-intubation is higher in extubated patients. Majority of the participants (95.2% anesthesiologists, 83.7% intensivists and 66.7% others) had not experienced post-extubation stridor in COVID 19 patients when compared to other diseases (Table 2).

DISCUSSION

COVID 19 is a new disease and a pandemic, it has affected almost every human on Earth either directly or indirectly [5]. Research in the field is ever increasing. There has been considerable confusion regarding the timing of intubation in COVID 19. Gattinoni et al. in 2020 published a letter to the editor, where they mentioned that patients with COVID 19 acute respiratory distress generally presented with hypoxemia, unusual lung compliance and preserved lung gas volume in CT thorax imaging [6]. That may lead to a substantial increase in minute ventilation and respiratory drive [6]. The increased respiratory drive present may amplify the risk of lung injury through P-SILI. If oxygen therapy, HFNC and NIV are unable to match or compensate for these increased respiratory efforts; patients may still need invasive mechanical ventilation even after resolution of hypoxemia [6]. This statement was also supported by observation obtained from hundreds of patients in Italy and the United Kingdom. In contrast, Tobin et al. criticized that P-SILI is a recent invention and there was not sufficient literature in support [7]. However, a recently published article showed a reduction in median oesophageal pressure in those patients of COVID 19 ARDS, who were on NIV support and had improved chest radiology [8,9]. So, confusion regarding the timing of incubation and invasive mechanical ventilation in Covid19 ARDS patients still lingers on.

Our survey found out that most physicians treating COVID 19 patients believe that COVID ARDS is different from typical ARDS, thus it makes them decide differently regarding the indications for intubation. 56.2% of all the respondents were of the view that mortality in COVID 19 ARDS is higher when compared to other forms of ARDS. Chiumello et al. in a study where they compared the CT findings of COVID 19 ARDS with historical controls found COVID 19 ARDS to be a subset of "typical" ARDS with better compliance, especially in early stages [10]. Considering the COVID 19 ARDS population is very homogeneous compared to a heterogeneous population of typical ARDS, some differences were expected between the two populations. Overall, there was however not much difference and the mortality rates in the study were also similar in the two groups. The differences that were observed did not affect the decision for intubation. They primarily suggested some differences in the ventilatory settings and avoidance of recruitment maneuvers.

67.1% of respondents agreed on P-SILI, even though it's something whose existence is disputed. It's a form of lung injury which has been documented quite recently though there have been some studies in late 1980s suggesting about it [11]. Nearly 90% of the respondents agreed on use of spontaneous awake proning in case of hypoxia and also in for of using High Flow Nasal Cannula (HFNC) if the hypoxia persisted. 56.3% preferred to give a trial of Non-Invasive Ventilation (NIV) if HFNC was unavailable or failed. 47.9% of these were unsure about the impact of NIV on development of P-SILI. Many have shared cases where patients on NIV developed subcutaneous emphysema and pneumothoraces.

Around 30% of patients with acute hypoxemic respiratory failure are treated with non-invasive ventilatory support. P-SILI can be reduced by use of high PEEP, but it is difficult to provide through NIV due to higher amount of leaks and interruptions in NIV as during feeding, patient discomfort and position changes. NIV failure is associated with mortality rates around 50% which in our opinion is usually because of delayed intubation [12]. This is mainly because of prolonged exposure of injured diseased lungs to high tidal volumes and trans-pulmonary pressure swings [13]. Treatment failure with NIV is more expected in patients with more severe disease: Partial pressure of oxygen/Fraction of inspired oxygen; PaO2/FiO2 <200 mmHg before treatment and higher SAPS II score (>35) are associated with higher risk of being intubated [13]. The real dilemma is how to know patient is going into NIV failure. There have been many proposed ways to decide on NIV failure like swing in Pes (Esophageal pressure-a surrogate of PL) or tidal volume more than 9-9.5 ml/kg. HACOR scoring which takes in to account heart rate, GCS, pH, P/f ratio and respiratory rate can also be used for this purpose [14]. For patients undergoing HFNC, a simple ROX index (ratio of SpO2/FiO2 to respiratory rate, evaluated continuously during treatment; where SpO2 is the oxygen saturation) has been tested and validated to predict treatment success and failure. Patients with ROX Index >4.88 after two hours of treatment are likely to avoid intubation, while those with a ROX <2.85, <3.47 and <3.85 after two, six and 12 hours of HFNC are at high risk of treatment failure and the need for endotracheal intubation and invasive mechanical ventilation [15].

Nosocomial Pneumonia is a major complication in ICU patients [16]. VAP rates have not come down in recent times despite adherence to various prevention bundles. Most of the clinicians in our survey; in spite of their doubts in NIV to cause P-SILI, still persisted with it as they feared higher incidences of Ventilator Associated Pneumonia (VAP) and other nosocomial infections if the patient got intubated. This fear was more driven due to shortage of adequately trained staffs in COVID ICUs. There are limited studies looking into the incidence of hospital acquired pneumonia in COVID ARDS patients. Whether use of NIV reduces risk of nosocomial pneumonia or not is not yet clear as per the available literature. The present of an endotracheal tube is expected to increase the risk of biofilm formation and colonization of the airways [17]. Diagnosis of VAP is very difficult in a patient of ARDS. These factors make it difficult for us to make a conclusion whether NIV is protective or not in development of VAP.

Table 2: Subgroup analysis.

		Anesthesiol		You are a/an intensivist		Others		
		Count	N%	Count	N%	Count	N%	p value
How many cases of severe COVID-19 pneumonia (Requiring oxygen or greater support) have you managed? (Approximately)	<10	36	42.90%	12	7%	36	66.70%	
	<100	36	42.90%	72	41.90%	8	22.20%	
	<500	12	14.30%	76	44.20%	0	0%	
	>500	0	0%	12	7%	4	11.10%	0
Do you believe that Covid-19 ARDS is different from other causes of ARDS	Yes	68	81%	144	83.70%	28	77.80%	
	No	16	19%	28	16.30%	8	22.20%	0.9
Do you think patient induced self-inflicted injury can happen? (it is barotrauma occurring in patients who are breathing spontaneously)	Yes	56	66.70%	124	72.10%	16	44.40%	
	No	28	33.30%	48	27.90%	20	55.60%	0.275
Do you believe that spontaneous prone is of value in COVID-19 ARDS?	Yes	76	90.50%	156	90.70%	28	77.80%	
	No	8	9.50%	16	9.30%	8	22.20%	0.513
Do you believe the High Flow Nasal Cannula (HFNC) is of value in Covid-19 ARDS if there is fall in saturation?	Yes	64	76.20%	168	97.70%	36	100%	
	No	20	23.80%	4	2.30%	0	0%	0.008
If you think HFNC is of no value, what will you do if it fails	Intubation	28	43.70%	80	47.60%	8	22.20%	
	NIV trial	36	56.20%	88	52.40%	28	77.80%	0.02
If you think HFNC is of no value, what will you do if patients hypoxia worsens	Intubation	12	60%	4	100%	0	0%	
	NIV trial	8	40%	0	0%	0	0%	0.041
Do you think NIV increases the risk of P-SILI?	Yes	12	14.30%	56	32.60%	8	44.40%	
	No	28	33.30%	28	16.30%	12	33.30%	
	May be	44	52.40%	88	51.20%	8	22.20%	0.189
Do you think intubation increases the risk of N osocomial infection	Yes	72	85.70%	132	76.70%	36	100%	
	No	4	4.80%	12	7%	0	0%	
	May be	8	9.50%	28	16.30%	0	0%	0.556
In Covid-19 the longer I can avoid intubation, more chance my patient will survive	Yes	36	42.90%	44	25.60%	20	55.60%	
	No	24	28.60%	72	41.90%	12	33.30%	
	May be	24	28.60%	56	32.60%	4	11.10%	0.344
In Covid-19 the sooner I intubate, more chance my patient will survive	Yes	16	19%	44	25.60%	0	0%	
	No	52	61.90%	96	55.80%	20	55.60%	
	May be	16	19%	32	18.60%	16	44.40%	0.3
Mortality in Covid-19 ARDS is higher compared to other causes of ARDS?	Yes	36	42.90%	104	60.50%	24	66.70%	
	No	20	23.80%	52	30.20%	4	1101%	
	May be	28	33.30%	16	9.30%	8	22.20%	0.149
In your opinion, are wearing and spontaneous breathing trials in Covid-19 different from other diseases?	Yes, this needs a very cautious approach	56	66.70%	92	53.50%	24	66.70%	
	No, it is similar to my routine practice	28	33.30%	80	46.50%	12	33.30%	0.531
Did you experience a high incidence of extubated COVID-19 compared to other diseases?	Yes	20	23.80%	64	37.20%	4	11.10%	
	No	64	76.20%	108	62.80%	32	88.90%	0.227
Did you experience a high incidence of post-extubation stridor in COVID-19 compared to other diseases?	Yes	4	4.80%	28	16.30%	12	33.30%	
	No	80	95.20%	144	83.70%	24	66.70%	0.126

LIMITATIONS

Our survey also has many limitations. The sample size is small and even though it included doctors from various countries it may not be reflective of the opinion of all the doctors. Since COVID 19 is a recent disease the participant's exposure to various literatures available may have been different and possibly past experience from other ARDS may have influenced their opinions.

CONCLUSION

Our survey concluded that, there was confusion among the practicing physicians regarding timing of intubation and initiation of invasive mechanical ventilation. Most of the clinicians believed that considering intubation earlier in the course of the disease may increase the mortality and risk of nosocomial infection. Further study of various management protocols and patient outcomes would gradually provide a clearer picture regarding initiation of invasive mechanical ventilation and its effects and adverse effects.

ETHICAL APPROVAL AND CONSENT TO PARTICIPATE

Ethical approval was taken from Institutional Ethics Committee of IMS and SUM Hospital, SOA deemed to be University, Bhubaneswar before starting of the study. Individual consent was taken from individual participants using google forms.

REFERENCES

1. World Health Organization (WHO). WHO Director-General's opening remarks at the media briefing on COVID-19. 2020; 4.
2. World Health Organization. Clinical management of severe acute respiratory infection when COVID-19 is suspected. WHO Rep. 2020; 1-21.
3. Alhazzani W, Moller MH, Arabi YM, Loeb M, Gong MN, Fan E, et al. Surviving sepsis campaign: Guidelines on the management of critically ill adults with Coronavirus Disease 2019 (COVID-19). Intensive Care Med. 2020; 46(5): 854-887.
4. Gattinoni L, Chiumello D, Caironi P, Busana M, Romitti F, Brazzi L, et al. COVID-19 pneumonia: Different respiratory treatments for different phenotypes? Intensive Care Med. 2020; 46(6): 1099-1102.
5. Harapan H, Itoh N, Yufika A, Winardi W, Keam S. Coronavirus disease 2019 (COVID-19): A literature review. J Infect Public Health. 2020.
6. Gattinoni L, Marini JJ, Busana M, Chiumello D, Camporota L. Spontaneous breathing, transpulmonary pressure and mathematical trickery. Ann Intensive Care. 2020; 10(1): 1-2.
7. Tobin MJ, Laghi F, Jubran A. Caution about early intubation and mechanical ventilation in COVID-19. Ann Intensive Care. 2020; 10(1): 4-6.
8. Yoshida T, Fujino Y, Amato MBP, Kavanagh BP. Fifty years of research in ards spontaneous breathing during mechanical ventilation risks, mechanisms, and management. Am J Respir Crit Care Med. 2017; 195(8): 985-992.
9. Yoshida T, Uchiyama A, Matsuura N, Mashimo T, Fujino Y. The comparison of spontaneous breathing and muscle paralysis in two different severities of experimental lung injury. Crit Care Med. 2013; 41(2): 536-545.
10. Chiumello D, Busana M, Coppola S, Romitti F, Formenti P, Bonifazi M, et al. Physiological and quantitative CT-scan characterization of COVID-19 and typical ARDS: A matched cohort study. Intensive Care Med. 2020; 46(12): 2187-2196.
11. Mascheroni D, Kolobow T, Fumagalli R, Moretti MP, Chen V, Buckhold D. Acute respiratory failure following pharmacologically induced hyperventilation: An experimental animal study. Intensive Care Med. 1988; 15(1): 8-14.
12. Nguyen T, Hoskote S. Patient self-inflicted lung injury: The case against early spontaneous ventilation in ards. Chest. 2019; 156(4): A1279.
13. Carteaux G, Millán-Guilarte T, De-Prost N, Razazi K, Abid S, Thille AW, et al. Failure of noninvasive ventilation for de novo acute hypoxemic respiratory failure: Role of tidal volume. Crit Care Med. 2016; 44(2): 282-290.
14. Marini JJ, Hotchkiss JR, Broccard AF. Bench-to-bedside review: Microvascular and airspace linkage in ventilator-induced lung injury. Crit Care. 2003; 7(6): 435-444.
15. Grieco DL, Menga LS, Eleuteri D, Antonelli M. Patient self-inflicted lung injury: Implications for acute hypoxemic respiratory failure and ARDS patients on non-invasive support. Minerva Anestesiol. 2019; 85(9): 1014-1123.
16. Udobi KF, Childs E, Touijer K. Acute respiratory distress syndrome. Am Fam Physician. 2003; 67(2): 315-322.
17. Bertoni M, Spadaro S, Goligher EC. Monitoring patient respiratory effort during mechanical ventilation: Lung and diaphragm-protective ventilation. Crit Care. 2020; 24(1).