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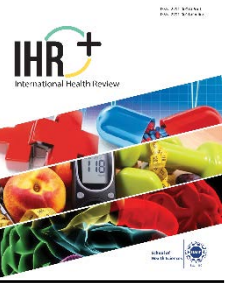

Title:	**Management of COVID ARDS: Highlighting the knowledge Gap among Pediatricians**
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Management of COVID ARDS: Highlighting the knowledge Gap among Pediatricians

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Abstract

To find out the gaps in the knowledge among pediatricians regarding the management of COVID ARDS. Cross-sectional descriptive study. Online survey was done through social media apps over the period of 2 months. Data was collected through a predesigned questionnaire that was circulated to Pediatrician electronically through social media. 147 doctors submitted their response; the Majority were females (65.3%); respondents include different cadres of doctors including consultants (32.7%), Postgraduate trainees (40.7%) and medical officers (26.5%). COVID knowledge score was obtained by the number of correct answers to 18 selected questions and it was 11.18 ± 2.35. Postgraduate trainees and those who are working in government hospitals have better knowledge scores as compared to others (p-value <0.05). Several areas of concern were revealed particularly only 34.7 % have the knowledge about in-line suction, 22.4 % have the expertise in video laryngoscopy, 42.9 % know that lower tidal volume ventilation should be done in COVID ARDS patients and only 12.2 % know that lower pH values are acceptable in such patients. 51 % of the respondents have been trained or attended courses on the management of COVID-19 patients and only 53 % feel comfortable managing pediatric COVID-19 patients. This study demonstrates an urgent need for awareness and training activities regarding the management of COVID-19 pneumonia and ARDS patients and about the protective measures in performing the procedures on such patients.

Keywords: COVID ARDS, pediatricians, knowledge

Introduction

The COVID-19 outbreak started in Wuhan city of China in December 2019 whose spread was rapidly declared as a global pandemic in March 2020

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[1]. Its severity may vary from a simple flu-like illness to severe pneumonia that may culminate in acute respiratory distress syndrome (ARDS) causing respiratory failure, septic shock, and multiorgan dysfunction depending upon age, nutritional status, immune function, and comorbidities [2].

COVID-19 pandemic has led to an outpouring of patients with ARDS in intensive care units across the world. The experience of managing patients with COVID-19-associated ARDS is growing gradually with a view to optimizing ventilator management, which has become the mainstay of treatment in ARDS [3]. ARDS develops in 42% of patients suffering from COVID-19 pneumonia, and 61–81% of those requiring intensive care [4]. Therefore, as the COVID-19 infection progressed, it became crucial to monitor the patient possessing ARDS for which respiratory rate and SpO2 are two important clinical parameters [5].

COVID-19 is a novel disease with an incompletely described clinical course, especially for children and vulnerable populations. The safety of supportive care strategies such as oxygen by high-flow nasal cannula and noninvasive ventilation is unclear. There are few recommendations for the specific treatment strategies and commonly used treatments as a majority are still under clinical trials [6].

As the disease is, novel and the management and preventive strategies are evolving so it is highly imperative to conduct a survey and know the knowledge of treatment and protective strategies among pediatricians regarding the management of critical patients of COVID-19 ARDS. This would reveal the gaps, which exists in their knowledge and practices regarding the management of COVID-19 patients. Thus, the essential needs regarding medical education sessions on COVID-19 would be identified in the current study.

Material and Methods

Inclusion and Exclusion Criteria

Pediatricians included in the study were defined as doctors working in children's wards including medical officers, postgraduate residents, senior registrars, consultants, and faculty members; who were working in administrative posts, as general physicians. However, house officers were excluded from the sample study.

Study Tool

An online questionnaire was designed on google forms comprising of 38 questions; containing the respondent's age, gender, job status, experience in pediatrics, knowledge regarding the management of COVID ARDS in pediatric patients, and the facilities available in his healthcare setup to manage such cases. COVID knowledge was determined by a score of 18 (range 0–18) based on answers given to 18 selected questions chosen before starting this study according to the estimation of the author of their importance in the management of COVID ARDS patients with reference to ventilation, medication, and supportive care with one point awarded for each correct answer. The correct answers to the questions included in the knowledge score were selected based on World Health Organization (WHO) guidelines on Clinical Management of COVID-19: Acute-respiratory distress syndrome (ARDS) [7].

Data Analysis

Data were analyzed in SPSS version 25. Data was stratified based on job status, training or attended course on COVID 19, and the number of years of working experience in pediatrics. The mean with a standard deviation of the knowledge score was calculated and the significance of the difference in various groups was calculated by applying chi-square test. A p value of <0.05 was taken as significant.

Results

A total of 149 responses were received, and two responses from general practitioners were excluded. A number of 147 responders were included, in which 96 (65.3%) were females, and 51 (34.7%) were males pediatricians. The majority of responders has an age range in between 30-50 years (59 %). 41 % post-graduate trainees in different hospitals, whereas 33 % were consultant pediatricians. 81.6 % of the respondents were working in the government sector. Demographic data are summarized in Table 1.

Table 1. Demographic Data

	Category	**Total n=147**
Age	Less than 30 years	57 (39%)
	30 – 50 years	87 (59%)
	More than 50 years	3 (6%)

Category		Total n=147
Gender	Male	51 (35%)
	Females	96 (65%)
Job Status	Post Graduate Trainee	60 (41%)
	Medical Officers	39 (26%)
	Consultant	48 (33%)
Health care Setup	Government	120 (82%)
	Private	24 (16%)
	Others	3 (2%)
Province	Punjab	138 (94%)
	Sindh	3 (2%)
	Kashmir	6 (4%)
Experience in Pediatrics	Less than 5 years	84 (57%)
	5 to 10 years	45 (31%)
	10 to 20 years	15 (10%)
	More than 20 years	3 (2%)

The mean knowledge score regarding COVID ARDS in pediatric patients among pediatricians was 11.18% ± 2.35% out of 18; the score was subdivided into three categories – Good (13-18), average (7-12), and poor (≤6) – 73.5% have the average knowledge score and only 24% have the good knowledge score. The knowledge score was compared between different variables and the difference was found to be significant among different cadres as post-graduate trainees have a better knowledge score as compared to consultants, medical officers, and those working in government hospitals have better than those working in private hospitals. The difference was not found to be significant among those who have attended the courses on COVID, working experience in pediatrics, and those who have the availability of institutional guidelines. (Table No 2)

Table 2. Differences in Knowledge Score among Different Groups of Study Participants

Knowledge scores	Good (13-18)	Average (7-12)	Poor (0-6)	p-value
Working status				
Postgraduate residents	21 (35%)	39 (65%)	0 (0%)	0.003

Knowledge scores	Good (13-18)	Average (7-12)	Poor (0-6)	p-value
Medical Officers	3 (8%)	36 (92%)	0 (0%)	
Consultants	12 (25%)	33 (69%)	3 (6%)	
Healthcare Working set up				
Government	30 (26%)	87 (74%)	0 (0%)	<0.001
Private set up	6(20%)	21 (70%)	3 (10%)	
Working experience in Pediatrics				
< 5 years	21(24%)	63(73%)	3 (3%)	0.015
5-10 years	6 (14%)	36(86%)	0 (0%)	
10-20 years	9 (60%)	6(40%)	0 (0%)	
>20 years	0 (0%)	3(100%)	0 (0%)	
Managed a case of COVID-19 ARDS				
Yes	18(33%)	36(67%)	0 (0%)	0.082
No	18(19%)	72(78%)	3(3%)	
Attended course onCOVID-19				
Yes	18(25%)	54(75%)	0(0%)	0.230
No	12(24%)	54(72%)	3(4%)	
Institutional guidelines available				
Yes	33(26%)	93 (72%)	3(2%)	0.548
No	3(17%)	15 (83%)	0 (0%)	

Total number of correct answers to the selected 18 questions is summarized in Table 3 is given below.

Table 3. Summary of Questions

Questions	Correct answer	Number (%)
Supportive care		
Do COVID ARDS patients require mechanical ventilation?	Should be in Negative balance without compromising perfusion	93 (63%)

Questions	Correct answer	Number (%)
Role of Neuromuscular blockage in COVID ARDS patients?	Should only be used in patients who have ventilator dyssnchrony despite sedation.	135 (92%)
What is your opinion regarding the need for sedation in patients with COVID pneumonia/ARDS?	All patients on mechanical ventilation should be sedated	72 (49%)
Medications		
Role of Corticosteroids in COVID ARDS patients?	Recommended	132 (90%)
What do you think about the role of Hydroxychloroquine in COVID pneumonia patients?	Not Recommended	117 (80%)
What do you think about the role of Zinc in COVID pneumonia patients?	Not Recommended	36 (24%)
What do you think about the role of Azithromycin in COVID pneumonia patients?	Not Recommended	111 (76%)
What do you think about the role of Anti-viral in COVID pneumonia patients?	Beneficial	84 (57%)
What do you think about the role of Toclizumab in COVID ARDS patients?	Beneficial	123 (84%)
What do you think about the role of IVIG in MIS-C:	Beneficial	96 (65%)
Ventilation		
What do you think should be the target Oxygen therapy in patients with COVID ARDS?	To maintain saturation > 94%	51 (35%)
When do you think the patients with COVID ARDS need Ventilation support?	If the patient continues to have increased work of breathing or hypoxemia even with oxygen inhalation of 10–15 L/min	132 (90%)
What do you think regarding the role of Non-Invasive ventilation in COVID ARDS patients?	Only in certain conditions if Negative pressures rooms are available	24 (16%)
During Mechanical ventilation of COVID ARDS patients, what do you think the Tidal volumes should be?	Low Tidal volumes (4-8ml/kg)	63 (43%)
During Mechanical Ventilation of COVID ARDS (moderate to severe) patients what do you think PEEP should be?	Higher PEEP should be used	117 (80%)

Questions	Correct answer	Number (%)
During Mechanical Ventilation of COVID ARDS patients, what should be the target Plateau pressures?	Around 30 cmH_2O	120 (82%)
For Mechanically ventilated patients of Severe COVID ARDS; what should be the Target pH values in ABGs?	Lower pH values around 7.25 – 7.35 are acceptable	18 (12%)
Which position will be more helpful in Severe COVID ARDS patients on Mechanical Ventilation?	Prone position	114 (78%)

Only 49% of the respondent's pediatricians have been trained or attended the course regarding the management of pediatric COVID patients; however, institutional guidelines on the management of COVID patients are available to 87.8% of the respondents. However, 64.7% use social media as the main source to keep themselves updated regarding COVID. Only 46.9% stated that they feel comfortable managing the patients of COVID ARDS patients.

Regarding the availability of facilities for managing COVID ARDS patients, 89.8% have the availability of sedation medication. A number of 73.5% have a team of nurses trained in mechanical ventilation. Whereas 77% have the availability of bedside X-ray machines in their Intensive Care Units (ICU), and 72% have the availability of Bedside Ultrasound Machines (BUM). A number of 85% stated that they know the safety precautions needed in the intubation and resuscitation of COVID patients, however, only 34.7% have the knowledge about the In-line suction, 18.4% have the availability of video laryngoscopy and 22.4% have the expertise of video laryngoscopy.

Discussion

To the best of the researcher's knowledge, this is the first study in Pakistan to analyze the gaps in knowledge among pediatricians regarding pediatric COVID-19 Pneumonia/ARDS. The study also highlighted the facilities available to these pediatricians for managing such patients.

The initial assumption of the author was that there are significant gaps in the knowledge among pediatrician regarding the management of pediatric COVID ARDS. As it is a novel disease, with relatively less number of pediatric cases as compared to adults and the lack of continuous medical

education activities due to social distancing owing to the current situation of the pandemic.

Although a median number of correct responses was not very low (62.1%), several areas of concern were revealed. Especially a low percentage of people (34.7%) have knowledge about in-line suctioning. In COVID-19 ARDS patients, In-line suctioning is recommended, as it is prudent to avoid unnecessary disconnection with the endotracheal tube in ventilated patients in order to avoid de-recruitment and unnecessary exposure of the virus to the environment [8, 9].

Regarding the ventilatory strategies in COVID ARDS patients, only 42% pediatrician knows that lower tidal volumes are recommended in such patients. Lung protective strategy in ARDS includes the low tidal volume (4-6 ml/kg), high PEEP (up to 10-12 cm H_2O), a slight rise in PCO_2 (permissible hypercarbia) and limited plateau pressure below 30 cm H_2O [10-12]. The majority 79.6% and 81.6% knew the right strategy of use of high PEEP and keeping plateau pressure around 30cmH_2O; regarding pH values for a patient of ARDS on mechanical ventilation lower pH values of around 7.15-7.30 is permitted [8, 13] but only 18 (12.2%) correctly answered about it.

Much of the debate surrounding the COVID-19 pandemic in the popular press has focused on invasive ventilation of severely sick patients and potential ventilator shortages. Amid increasing concerns from medical professionals about the harms associated with invasive ventilation, there is interest to explore the role of noninvasive positive pressure ventilation (NIPPV) in the treatment of acute respiratory distress syndrome (ARDS) due to COVID-19. Major concerns with NIPPV in COVID-19 patients are the aerosol produced by the use of NIPPV poses an increased infection risk for healthcare professionals. So the earlier recommendations by WHO were in favour of early intubation and the use of NIPPV only in specific circumstances where the facilities of negative pressures rooms are available; but owing to the ventilator-associated lung injury (VLI) with invasive mechanical ventilation in COVID ARDS patients, which further increase by the lack of specialized personnel (e.g. shortage of respiratory therapists and intensivists) and the lack of appropriate equipment -

Regarding the choice of sedatives in ventilated patients; different physicians may have different choices as per the drug availability and their personal

ease with the usage of that medicine. In our study majority, 38 % chooses midazolam as their preferred drug for sedation, whereas dexmeditomedine remained the second-best option 28 %. The majority of the guidelines recommended Dexmeditomedine or propofol as the first choice of sedation in mechanically ventilated patients with continuous midazolam infusion as the second choice [14-16].

When COVID-19 patients require intubation, they have a poor respiratory reserve; with very low oxygen, saturation, and loss of breathing as common presentations necessitate a careful airway management plan. PPE and the psychological stress of cross-infection could make easy intubation difficult. So, it is prudent to use video laryngoscopy rather than direct laryngoscopy for intubation [17, 18]. The majority of participants in our study either don't have the expertise of video laryngoscopy (78%) or don't have the availability (82%).

Since the time of COVID-19 Pandemic; many medicines have been tried on hit and trial basis but few of them proved to be useful and included in recommendations; currently, Remdesivir, an antiviral agent, is recommended for use in hospitalized patients who require supplemental oxygen [19]. Secondly, Dexamethasone, a corticosteroid, has been found to improve survival in hospitalized patients who require supplemental oxygen and mechanical ventilation, so strongly recommended in this setting [20]. The majority 89 % and 57 % participants in our study correctly know the role of corticosteroids and Remdesiver in severely affected patients of COVID-19. Azithromycin, Zinc and hydroxychloquine had been widely used initially in COVID 19 patients however till now none of them has been proven useful; Although, the trials are still going on they are not recommended for routine use outside the clinical trials [21]. Regarding the role of tocilizumab (IL-6 inhibitor), the initial studies showed promising results in severe COVID disease and CRS (Cytokine Release Syndrome) by reducing the risk of invasive mechanical ventilation and death [22, 23]. However, the recent trials have not shown any significant benefit of Tocilizumabrather it may increase morbidity and mortality by causing secondary infections. So once it became the off -label standard of care for COVID CRS patients is no more recommended for routine use outside clinical trials. [21, 24, 25)

Limitations

Some of the limitations of this study include the use of a convenient sampling method. The questionnaire was circulated to multiple social media groups so the exact percentage of responders and non-responder cannot be calculated. Secondly, it can be interpreted that those who did not respond may have little knowledge about the disease and its management. So, the current knowledge score may overrate the current prevailing situation of knowledge about this novel disease. Thirdly, the majority of the responders were from the Punjab region and very little participation from other regions was made; therefore, the results can not be generalized. Finally, as the disease is novel and evolving, different guidelines along with different recommendations, especially regarding non-invasive ventilation, target oxygen saturation, and the effectiveness of medicines like Tocilizumab – are recommended in the current study, which can be the reason for the low score overall.

Conclusion

This study has highlighted many gaps in the knowledge among pediatricians on pediatric COVID pneumonia/ARDS. It demonstrated an urgent need regarding awareness and training activities of the management of COVID-19 pneumonia and ARDS patients. Furthermore, the protective measures in managing such patients is also essentially required for further research.

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