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ABSTRACT

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A KNOWLEDGE, ATTITUDE AND PRACTICE STUDY OF PRESCRIBING OXYGEN AMONGST INTERNS IN A TERTIARY CARE HOSPITAL

Background: Oxygen is one of the most frequently prescribed health-care interventions and resuscitative methods to patients visiting the emergency or while admitted to the hospital. The ongoing COVID pandemic has emphasized the importance of efficient and optimal oxygen utilization. The interns in a teaching hospital are often the first point of contact for patients.

Materials and Methods: A cross-sectional questionnaire-based study was done amongst 100 interns posted in areas where oxygen is routinely prescribed. For this study, a questionnaire was devised by the investigators to assess the Knowledge, Attitude and Practice of prescribing oxygen therapy. The questionnaire also included the validated acute oxygen therapy questionnaire (AOTQ).

Results: Knowledge of participants ascertained using the validated AOTQ questionnaire revealed a score of 16.59 ± 1.94 out of a maximum of 23 points suggesting that majority of participants possessed mediocre knowledge. The author's questionnaire showed significant gaps in knowledge and attitude; participants were relatively ill-informed about the interfaces used, the indications, and monitoring required while administering oxygen.

Conclusion: There is an admissible gap in knowledge, attitude and practices pertaining to oxygen therapy as compared to the ideal. The development of standard training guidelines and suitable methodologies is absolutely crucial so that optimal therapy can be provided by fresh medical graduates without compromising patient care.

Keywords: AOTQ, Oxygen therapy, Interns, Knowledge, Attitude, Practices.

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INTRODUCTION / ВСТУП

Oxygen is nearly always advised for the resuscitation of patients visiting the emergency. It is also frequently prescribed in admitted patients. This apparent abundance would suggest that health-care professionals would be knowledgeable and familiar with its uses, limitations and possible adverse effects. However, clinical audits have revealed poor prescribing practices among healthcare workers [1, 2, 3].

Oxygen as therapy is recognized as an essential tool in the management of a wide range of hospitalized patients. The British Thoracic Society (BTS) guideline for emergency oxygen use in adult patients emphasized the achievement of normal or near-normal oxygen saturation level for the majority of patients in an emergency department (ED) or intensive care unit [4]. Improved survival rates with oxygen therapy have been reported with target SpO₂ saturations between 94% and 98% for acutely ill patients; but, lower saturation, 88%–92% should be considered for patients with suspected risk of hypercapnic respiratory failure [4]. Optimal oxygen delivery entails selection of an apt oxygen delivery device & flow rate along with an understanding of the patients underlying pathophysiology, with continuous monitoring for the therapeutic goals and patient tolerance. The ongoing covid pandemic has exposed a major weakness in the current health systems – that of medical oxygen production and delivery [5]. This makes the efficient and optimal use of oxygen an important goal in the current settings.

However, despite being a drug, oxygen is often not prescribed appropriately, signed for on drug charts or regularly reviewed [6]. The knowledge and practice of healthcare workers regarding oxygen therapy have often been found to be relatively poor [7, 8, 9, 10]. The dangers of higher flow of oxygen in patients at risk of hypercapnia (chronic obstructive pulmonary disease (COPD) and obesity hypoventilation syndrome) have been well documented. Inappropriate and liberal use of oxygen in non-severely hypoxic patients at risk of

hypercapnia has been shown to increase the hypercapnia and even increase mortality [11, 12]. It has also been suggested that by identifying the gaps in KAP, it may be possible to address the problems associated with poor adherence to guidelines [13].

Interns form the future building blocks of the country's healthcare structure. During the internship, they are posted in various departments, including emergency, handling a vast array of patients requiring oxygen therapy. Hence, their knowledge of oxygen therapy should be sound enough to cater to emergency patients. However, there is a paucity of studies assessing Knowledge, Attitude and Practices (KAP) regarding oxygen therapy amongst interns in India. We conducted this cross-sectional questionnaire-based study to assess the KAP of interns while prescribing oxygen in a large tertiary care hospital in India.

MATERIAL AND METHODS

A cross-sectional questionnaire-based study was done after getting approval from the Institute's ethics committee (S. No. IEC/VMMC/SJH/project/2019-09/77). The interns posted in areas where oxygen is routinely prescribed Vardhman Mahavir Medical College and Safdarjung Hospital (VMMC & SJH), New Delhi were administered a questionnaire after taking informed consent. Participants who gave incomplete responses to the questionnaire were excluded from the analysis.

For the study, a questionnaire was devised by the investigators to assess the Knowledge, Attitude and Practice of prescribing oxygen therapy. This questionnaire was self-administered to the participants. The demographic data, the details regarding training on oxygen therapy, experience regarding prescribing oxygen, and questions to assess the KAP regarding the oxygen therapy. The questionnaire also included the validated acute oxygen therapy questionnaire (AOTQ) [14].

Data Analysis. All the data was collected in a predesigned proforma and transferred into an excel spreadsheet. Parametric data was represented as mean and standard deviations, and categorical data was presented as percentage.

RESULTS

An attempt was made to reach out to 180 interns with a response rate 55.5% and hence 100 interns of a tertiary care hospital were surveyed, the ages of whom ranged from 21–25 years with majority (53.5%) of the respondents being 23 years old; 65% of the respondents were males, the rest being female interns.

Acute Oxygen Therapy Questionnaire (AOTQ). Knowledge of participants regarding acute oxygen use was ascertained using the

validated AOTQ questionnaire [14], the results of which can be seen in Table 1. The mean knowledge revealed a score of 16.59 ± 1.94 out of a maximum of 23 points. No significant correlation was observed between the specific oxygen therapy training provided and the knowledge of participants who received the training as compared to those who didn't. No significant variations in knowledge levels were highlighted using gender and age of participants as categorical values.

Table 1 – Knowledge pertaining to oxygen therapy

	% response	
	No	Yes
Can a patient on nasal cannula be put on a flow rate of 8 L/min?	84	16
	64	36
Can nasal cannula deliver a high percentage of oxygen (> 60%)?	52	48
	50	50
Can a non-rebreathing face mask deliver high percentage of oxygen?	12	88
	48	52
Should a patient at risk of retaining CO ₂ , be given oxygen if the SpO ₂ is 92%?	46	54
	15	85
Should a patient of suspected ARDS be given high flow O ₂ to maintain a SpO ₂ of above 96%?	63	37
	41	59
Should the oxygen flow be reduced in a patient of COPD (with increased CO ₂) on O ₂ therapy once the SpO ₂ is above 95%?	24	76
	63	37
Oxygen is indicated in a patient with saturation 98% on room air if the patient is breathless?	41	59
	24	76
Oxygen should be given to all patients having an acute stroke regardless of oxygen saturation?	41	59
	24	76
Oxygen should be given to all patients having an acute myocardial infarction regardless of oxygen saturation?	41	59
	24	76

Findings of the AOTQ questionnaire (14) have been depicted in Figure 1, 2, 3, 4 and Table 1, 2, 3, 4. While the majority of the participants possessed adequate knowledge regarding various aspects of acute oxygen therapy, it was seen that 46% of respondents believed that oxygen is not a drug but a supportive therapy, 40% believed that there is no role of oxygen therapy in eclampsia and 60% answered incorrectly pertaining to the use of oxygen in children with restlessness and convulsions.

Author's Questionnaire

Besides the AOTQ, the authors formulated a set of questions of their own to be able to assess

knowledge pertaining to aspects of oxygen therapy not included in the AOTQ, the results of which have been tabulated in Table 1.

Knowledge regarding oxygen therapy

This self-made questionnaire depicted a significantly lower level of knowledge as compared to the standardized AOTQ. Participants were relatively ill-informed about interfaces used to administer fixed and high concentrations of oxygen. 52% of the respondents replied in affirmation when asked if oxygen therapy should be given to a patient at risk of retaining CO₂ if O₂ saturation is 92%. Only 54% of the participants

agreed that oxygen therapy should be given to an ARDS patient in order to keep the saturation above 95%. Majority of the interns believed that oxygen therapy is indicated in all patients with stroke, myocardial infarction irrespective of their O₂ saturation.

Attitude pertaining to oxygen therapy

A set of questions were also prepared by the authors to evaluate attitude of interns towards administration of oxygen therapy as shown in Table 2.

Table 2 – Attitude pertaining to oxygen therapy

	% response	
There is no such thing as too much oxygen – it is very safe	Disagree	80
	Agree	18
	Can't Say	2
Delivering oxygen has an impact on patient outcome	Disagree	2
	Agree	95
	Can't Say	3
The administration of oxygen relieves the symptom of dyspnoea (breathlessness) even if the SpO ₂ is normal	Disagree	40
	Agree	42
	Can't Say	18
The route (interface method) of delivering oxygen has an impact on patient outcome	Disagree	3
	Agree	97
	Can't Say	0
In a critically ill patient, should you routinely wait for an ABG before starting oxygen therapy?	Disagree	79
	Agree	17
	Can't Say	4
Before starting oxygen therapy, if ABG is not immediately available, then SpO ₂ oxygen saturation can be used to decide whether the patient needs it	Disagree	3
	Agree	94
	Can't Say	3
While on oxygen therapy, should the patient's SpO ₂ be monitored?	Disagree	1
	Agree	98
	Can't Say	1
If a patient's oxygen requirements increase, medical assessment is needed	Disagree	0
	Agree	98
	Can't Say	2
Should oxygen be prescribed like a drug?	Disagree	14
	Agree	79
	Can't Say	7
Oxygen administration to the patient can be dangerous	Disagree	4
	Agree	95
	Can't Say	1
Patients with severe lung disease need to be maintained at the prescribed oxygen saturation range	Disagree	0
	Agree	99
	Can't Say	1
Humidification of the oxygen is necessary while administering oxygen to prevent dryness of the mucous membrane	Disagree	1
	Agree	97
	Can't Say	2
A patient having oxygen therapy indicates that the patient is at the end stage of life	Disagree	90
	Agree	5
	Can't Say	5

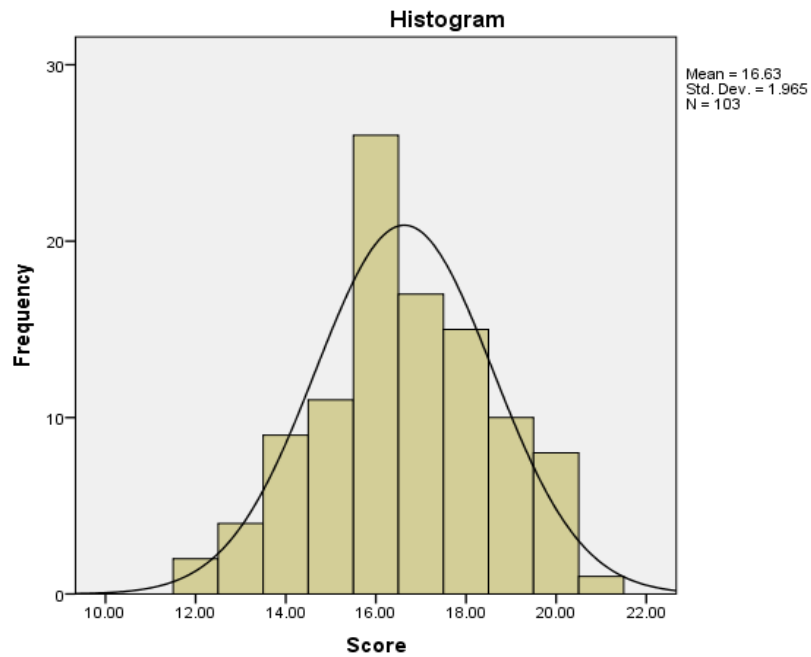


Figure 1 – Distribution of correct answers given by participants on a scale of 0–23 points

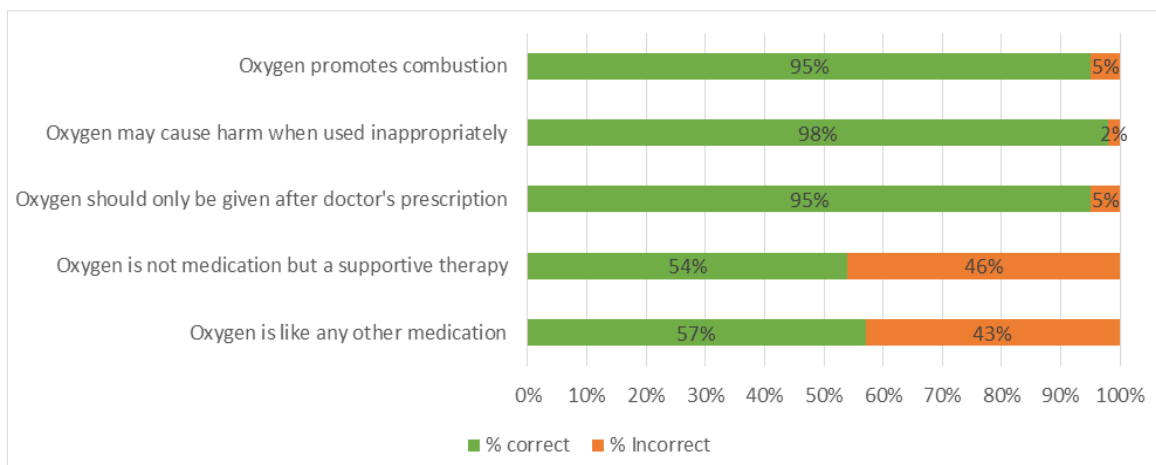


Figure 2 – Knowledge about oxygen use

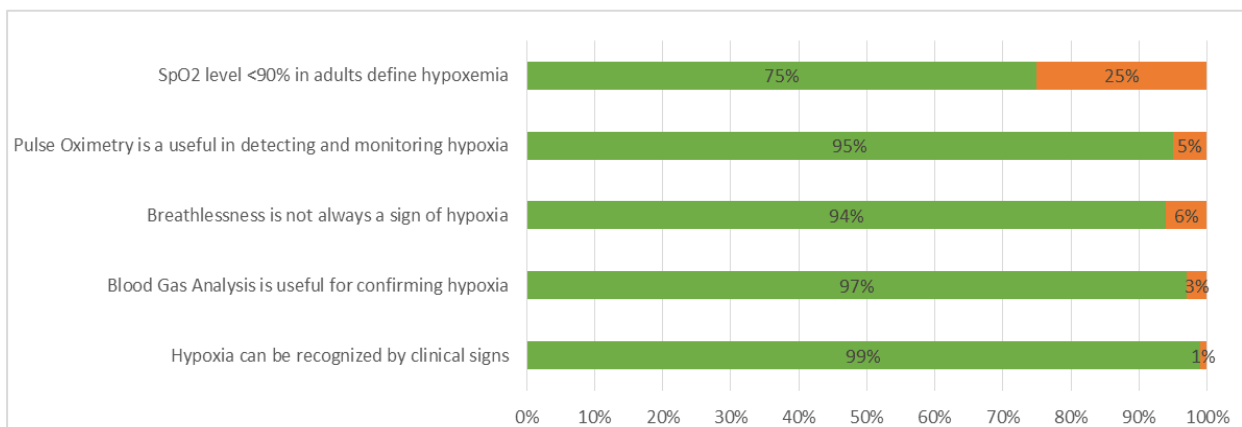
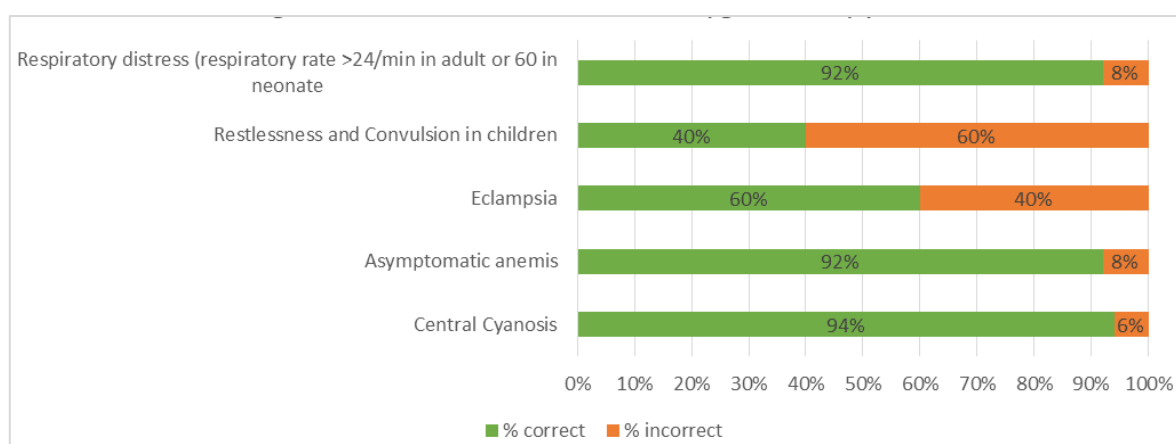


Figure 3 – Ability to recognize hypoxia

Table 3 – Practices pertaining to Oxygen Therapy

	% response	
Is oxygen therapy given to all patients with breathlessness?	No	64
	Yes	36
Are all oxygen devices (like a venturi mask/ non- rebreathing face mask) freely available at your place of work?	No	35
	Yes	65
Are SpO ₂ devices/probes freely available at your place of work?	No	30
	Yes	70
While using an SpO ₂ probe, do you assess the wave form and/or signal strength before a reading can be accepted?	No	52
	Yes	48
Do you check for any nail polish/paint before applying the SpO ₂ probe?	No	44
	Yes	56
Can the same interface (mask/ cannula) be used by multiple patients?	No	78
	Yes	22
Is arterial blood gas analysis freely available at your place of work?	No	2
	Yes	98
Can a nebulization face-mask be used in place of the oxygen face-mask?	No	36
	Yes	64
Do you regularly check for the water in the oxygen tubing?	No	35
	Yes	65
Do you use a nasal cannula with a low rate 6 L/min?	No	52
	Yes	48
Do you use a face mask with a flow rate < 3 L/min?	No	51
	Yes	49
Do you use nasal cannula in patients with nasal polyps and nasal edema?	No	90
	Yes	10
For critically ill patients, do you wait for an ABG before starting oxygen therapy?	No	88
	Yes	12
Do you routinely get arterial blood gas (ABG) analysis done for patients on O ₂ therapy?	No	3
	Yes	97
Do you look for the respiratory rate while the patient is on oxygen therapy?	No	5
	Yes	95
Do you look for the accessory muscle use while the patient is on oxygen therapy?	No	8
	Yes	92

**Figure 4 – Indicators of acute oxygen therapy****Table 4 – Documentation for delivery of oxygen**

	% responses
Q. Which of the following should be documented in the treatment/ monitoring chart of a patient?	
Oxygen flow rate or FiO ₂	95
O ₂ source and delivery device	82
Frequency of administration	78
Oxygen and nitrogen concentration	21
Oxygen Solubility	13
Oxygen Density	5
Oxygen diffusion rate	4
Oxygen Volume	1
Oxygen odour	1
Q. Which one of the following statement on the prescription of oxygen and delivery is correct?	
Oxygen prescription should be to a target saturation range rather than a fixed dose	66
Nasal catheter flow rate > 5l/min leads to rebreathing of CO ₂	24
Oxygen concentrator delivers maximum O ₂ content of 70%	10
Q. A 72-year-old farmer with COPD has carbon dioxide retention (type II respiratory failure). Which of these delivery device is appropriate for oxygen delivery achieve a target saturation of 88-92%?	
Nasal catheter at 1-2L/min in the absence of venturi masks	45
Oxygen mask with reservoir 6-9L/min	48
Nasal catheter at 16 L/min	7
Q. 12-year-old boy had type 1 respiratory failure, select one correct initial dose of oxygen to achieve a target saturation of 94-98%	
FiO ₂ of 60%	77
FiO ₂ of 20%	18
FiO ₂ of 150%	5
Q. Humidification is essential for patients receiving oxygen through one the following?	
Endotracheal tube or a tracheostomy	63
Nasal Prongs	14
Oxygen mask	23
Q. Regarding weaning and discontinuation of oxygen which of the following statement is correct?	
Weaning and discontinuation of oxygen therapy should be started if clinically stable on low-dose oxygen	95
Weaning of oxygen therapy should be started if clinically stable on high-dose oxygen	4
Weaning and discontinuation of oxygen therapy should be started after a new chest radiograph is normal	1

The majority of participants agreed that delivery and route of administering oxygen therapy have an impact on patient outcome, oxygen is drug and too much of it is not always safe to administer and should be prescribed like a drug. It was seen that 42% of respondents believed that oxygen relieves symptoms of breathlessness even if the SpO₂ is normal, which is a negative attitude. The majority of

participants also agreed that in case of a critically ill patient, there is no need to wait for results of ABG analysis before administering therapy and SpO₂ can be used to guide decision-making instead. 98% of respondents believed that patient oxygen should be monitored regularly and that medical assessment is needed if a patient's oxygen requirements increase.

Practices related to oxygen therapy

Participants were asked about which headings were routinely included in their oxygen prescriptions, the results of which have been depicted in Figure 5. While most of the respondents mentioned flow rate and device/ interface to be used in their prescriptions, it was seen that less than 65% of the respondents mentioned duration of

therapy, target oxygen saturation and frequency/technique of monitoring. The frequency of monitoring acute oxygen therapy by interns was also enquired, the results of which have been depicted in Figure 6. 74% of the participants reported using a face mask as their first choice device for administering therapy, with 21%

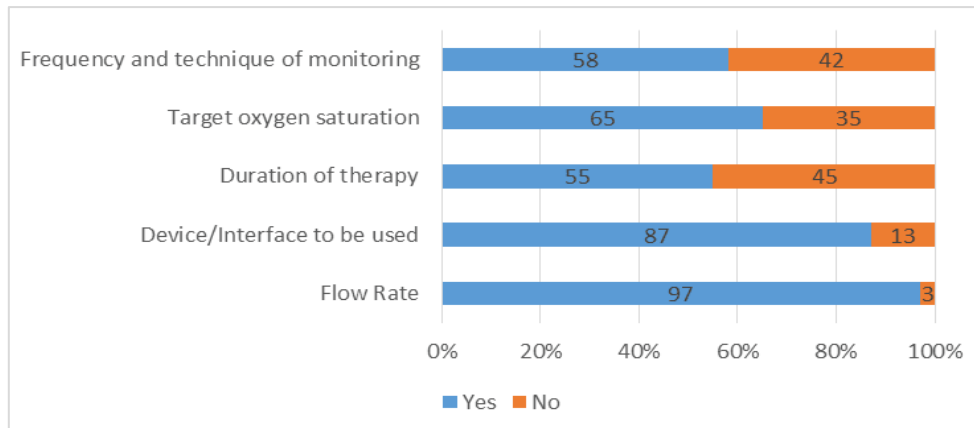


Figure 5 – Headings included in prescription of oxygen therapy

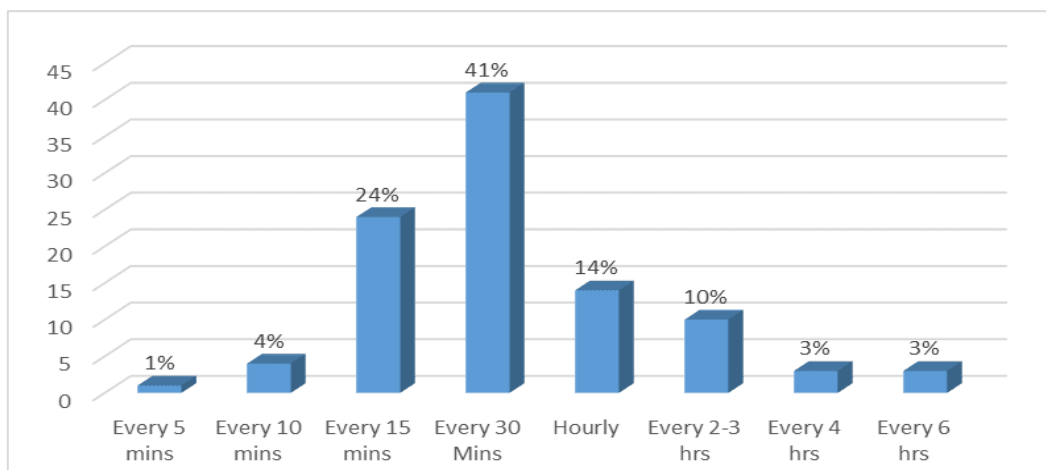


Figure 6 – Frequency of monitoring of acute oxygen therapy

choosing nasal cannula and a mere 5% preferred venturi masks. Insights were gained into practices related to oxygen therapy as depicted in Table 3. 36% of respondents reported administering oxygen therapy to all patients presenting with breathlessness, while more than 90% responded with affirmation if they checked for respiratory rate, accessory muscle use and routine ABG while providing therapy and 88% admitted to no waiting for ABG analysis results before administering oxygen in critical patients. It was observed that a sizable number of participants did not adhere to correct practices while using a pulse oximeter with 52% of participants accepting, they did not check for wave form before accepting a

reading and 46% not checking for nail polish before application of probe. 66% of participants believed that nebulization masks could be used instead of oxygen face masks if required. A number of respondents were found adhering to incorrect practices choosing devices for oxygen therapy, with 46% of respondents admitting using a nasal cannula with a flow rate of above 6 L/min and 49% using a face mask with an oxygen flow rate of less than 3L/min.

DISCUSSION

Our audit revealed that the majority of participants possessed mediocre knowledge pertaining to acute oxygen therapy as assessed by

AOTQ questionnaire [14]; however, significant gaps in knowledge and attitude were identified after further inquiry using our own questionnaire.

Participants lacked adequate knowledge of devices and interfaces used for oxygen therapy, with incorrect attitudes and practices prevailing, which may result in the usage of incorrect media not tailored to the patient's needs. Inadequate knowledge was reported pertaining to the usage of oxygen therapy in emergencies such as stroke, myocardial infarction, eclampsia, etc. Suboptimal prescription practices were also noted, with interns admitting to essential headings such as duration of therapy, frequency/technique of monitoring and target O₂ prescription not being mentioned in their prescriptions. This is despite various oxygen delivery devices, oxygen saturation probes and arterial blood gas analyzers being frequently available. Similar results have been reported in other studies evaluating the practice of prescribing oxygen amongst health care workers [8, 10].

It was observed that a sizable proportion of interns viewed oxygen as a supportive therapy and

not a drug in itself; such a belief may be responsible for the indiscriminate use of oxygen a number of interns admitted to prescribing oxygen with normal oxygen saturation; this concurs with a study from Australia [15] which found a “deeply entrenched culture of routine and indiscriminate administration of high-concentration oxygen to acutely ill patients”.

Given the above findings, the factors associated with poor Knowledge, Attitude and Practices (KAP) of oxygen therapy need to be addressed. Various aspects of oxygen therapy need to be targeted in future education practices to ensure optimal use of oxygen as an essential and valuable drug. It is imperative that interns, who usually are the first point of contact for patients in providing care, realize the potential hazards of using oxygen and exercise similar caution as they would if they used any other pharmacological agent. For this, institutions need to ensure regular education programs (conferences, courses, workshops, lectures and pre-employment training) on best practices of oxygen therapy and national societies need to develop clear policies/guidelines for the same.

CONCLUSIONS / ВИСНОВКИ

Our study acknowledges the presence of an admissible gap in knowledge, attitude and practices pertaining to oxygen therapy in our study participants as compared to the ideal. With the raging pandemic, it is more important than ever to address these gaps so that the adequate treatment can be provided with this life-saving therapy. Although inexperienced, interns and residents form

the backbone of the public hospital workforce in India and are always the first point of contact for patients in an emergency. The development of standard training guidelines and suitable methodologies in the form of hands-on workshops, seminars and training sessions by experienced authorities is absolutely crucial so that optimal therapy can be provided by fresh medical graduates without compromising patient care.

AUTHOR CONTRIBUTIONS / ВКЛАД АВТОРІВ

Name of Authors	The conception and design of the study, acquisition of data or analysis and interpretation of data	Drafting the article or revising it critically for important intellectual content	Final approval of the version to be submitted	Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved
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Dr. Rohit Kumar	Yes	Yes	Yes	Yes
Dr. Omkar Kalidasrao Choudhari	Yes	Yes	Yes	Yes
Dr. Amit Kumar	Yes	Yes	Yes	Yes
Dr. Pranav Ish	Yes	Yes	Yes	Yes
Dr. Nitesh Gupta	Yes	Yes	Yes	Yes

CONFLICT OF INTEREST / КОНФЛІКТ ІНТЕРЕСІВ

The authors declare no conflict of interest.

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None.

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