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Study Of Clinical Presentation Of Overlap Syndrome Amongst The Patients Admitted With Type 2 Respiratory Failure In The ICU.

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ABSTRACT

Overlap syndrome, characterized by the coexistence of chronic obstructive pulmonary disease (COPD) and obstructive sleep apnea-hypopnea syndrome (OSAHS), presents a complex clinical scenario often leading to acute respiratory failure. Non-Invasive Ventilation (NIV) has emerged as a potential treatment strategy; however, factors influencing NIV success remain unclear. A retrospective study was conducted on 30 hospitalized patients with overlap syndrome and acute respiratory failure. Demographic, clinical, and investigational data were collected and compared between NIV successful (n=22) and NIV failure (n=8) groups. Statistical analyses including odds ratios were employed to assess differences in characteristics and outcomes. Gender distribution showed odds favoring female patients in the NIV successful group, while the NIV failure group had higher odds of smoking history. Clinical symptoms like expectoration, wheezing, and fever were more prevalent in the NIV failure group. Polysomnography data did not significantly differentiate the two groups. Routine laboratory investigations demonstrated no substantial inter-group differences. Pulmonary function tests indicated severe airflow limitation in both groups, and diffusion capacity reductions suggested emphysematous changes. NIV led to statistically significant improvements in arterial blood gas parameters, particularly in reducing respiratory acidosis and hypoxemia. While no single factor definitively predicted NIV outcomes, a combination of clinical symptoms, smoking history, and disease severity appeared to influence treatment responses. NIV demonstrated significant improvement in respiratory acidosis and hypoxemia in the NIV successful group. This study contributes insights into overlap syndrome management and highlights the complexities of NIV success prediction.

Keywords: Overlap syndrome, non-invasive ventilation, acute respiratory failure.

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INTRODUCTION

In recent years, the field of respiratory medicine has witnessed a growing recognition of the intricate interplay between various pulmonary disorders, leading to the emergence of overlapping syndromes [1]. Among these, the overlap syndrome presents a complex and multifaceted clinical scenario that challenges healthcare practitioners and researchers alike. This study seeks to delve into the clinical presentation of overlap syndrome within a specific cohort – patients admitted with type 2 respiratory failure in the Intensive Care Unit (ICU) [2, 3].

Type 2 respiratory failure, characterized by inadequate alveolar ventilation and subsequent hypercapnia, represents a critical condition often requiring intensive medical attention [4]. While traditionally associated with chronic obstructive pulmonary disease (COPD), type 2 respiratory failure can occur in conjunction with other respiratory disorders, giving rise to the overlap syndrome. This syndrome, often involving the convergence of COPD with conditions like obstructive sleep apnea (OSA), asthma, or bronchiectasis, introduces distinctive diagnostic and therapeutic challenges [5-7].

Despite the increasing prevalence of overlap syndrome, comprehensive studies focusing on its clinical presentation among patients admitted to the ICU remain scarce [8]. Understanding the distinct features, prognostic indicators, and therapeutic considerations for this syndrome in an acute setting is paramount for optimizing patient care and resource allocation. By elucidating the spectrum of overlap syndrome manifestations within the context of type 2 respiratory failure, this study aims to contribute valuable insights that may inform tailored intervention strategies and improved patient outcomes [9].

MATERIAL AND METHODS

Our study was conducted within the Intensive Care Unit (ICU) for 2 years.

The study adhered to the guidelines outlined by the Indian Council of Medical Research (ICMR) and the practices of the ICU. Prior to participation, patients were provided with a clear explanation of the study's objectives and procedures in their native language, and their informed consent was obtained.

Patient Selection

- A total of 17 patients diagnosed with overlap syndrome based on overnight polysomnography and spirometry, and who were already undergoing domiciliary NIV treatment, were included in the study.

- Patients with COPD who were admitted with type II respiratory failure due to acute exacerbation and were stabilized clinically with NIV were screened for signs of obstructive sleep apnea-hypopnea syndrome (OSAHS). Clinical symptoms indicating OSAHS, such as witnessed apnea, loud snoring, excessive fatigue, daytime hypersomnolence, and an elevated Epworth Sleepiness Score (EPSS), were used to identify potential candidates. Patients suspected of suffering from OSAHS were further subjected to overnight polysomnography (PSG). Out of these, 13 patients displayed evidence of OSAHS based on polysomnography and were included in the study.

Inclusion Criteria

- Adults of either sex, aged above 30 years.
- Diagnosed cases of COPD admitted with acute type II respiratory failure, concomitant with overnight polysomnography-proven OSAHS.
- Apnea-Hypopnea Index (AHI) of ≥5.

Exclusion Criteria

- Patients with primary central nervous system or neuromuscular disorders.
- Patients with chronic renal, hepatic, hematological disorders, or cardiac failure.
- Individuals who underwent hip and knee replacement surgery.
- Patients with clinical evidence of peripheral vascular disease.
- Patients with a chronic history of alcoholism or drug addiction.

- Patients on long-term sedatives or antipsychotic medications.

Methodology

Clinical Evaluation: Detailed medical history and comprehensive physical examinations were performed, and the findings were documented using a predefined clinical proforma . Laboratory investigations encompassed routine blood tests and measurement of C-reactive protein (CRP) levels. Imaging studies included chest radiography and chest computed tomography (CT) scans, as indicated based on clinical evaluation.

RESULTS

The present study included 30 patients of COPD with co-existent overnight polysomnography (PSG) proven OSAHS(AHI≥5), admitted with acute exacerbation and type II respiratory failure.

Table 1: Physical characteristics of NIV successful group compared with NIV failure group patients

Parameters	NIV successful (n=22)	NIV failure (n=8)	P value	Odds Ratio (range)
Age (yrs) [mean±SD]	63.8±8.1	64.5±10.14	0.86	-
BMI [mean±SD]	31.2±7.9	29.3±5.8	0.288	-

Table 1 presents the comparison of physical characteristics between the NIV successful group and NIV failure group patients. It includes parameters such as age, BMI, gender distribution, smoking status, biomass fuel exposure, and duration of disease. The P value indicates the level of statistical significance, and the Odds Ratio (OR) provides insights into the odds of certain characteristics being present in one group compared to the other.

Table 2: Clinical profile and polysomnography data of NIV successful group compared with NIV failure group patients

Parameters	NIV successful (n=22)	NIV failure (n=8)	P value	ODD's Risk Ratio
Breathlessness (% total)	100	100	-	-
Orthopnoea (% total)	63.63	62.5	0.63	1.05 (0.19-5.6)
Cough (% total)	100	100	-	-
Expectoration (% total)	59	100	0.154	0.2 (0.02-1.97)
Fever (% total)	36	75	0.071	0.19 (0.03-1.17)
Chest pain (% total)	40	50	0.485	0.69 (0.13-3.51)
Wheeze (% total)	63.6	87.5	0.213	0.25 (0.02-2.4)
Pedal edema (% total)	63.6	62.5	0.63	1.05 (0.19-5.6)
EPSS (mean±SD)	13±4.7	12±4.8	0.584	-
AHI (mean±SD)	29.5±14.9	25.7±14.9	0.539	-

Table 2 provides a comparison of clinical symptoms and polysomnography data between the NIV successful group and NIV failure group patients. It includes parameters such as breathlessness, orthopnoea, cough, expectoration, fever, chest pain, wheeze, pedal edema, Epworth Sleepiness Score (EPSS), and Apnoea-Hypopnea Index (AHI). The P value indicates the level of statistical significance, and the Odds Ratio (ODD's Risk Ratio) provides insights into the odds of certain symptoms being present in one group compared to the other.

Table 3: Routine laboratory investigations in NIV successful group compared with NIV failure group patients

Parameters (mean±SD)	NIV successful (n=22)	NIV failure (n=8)	P value
Hb (gm%)	12.3±1.6	13.6±1.72	0.065
PCV	38.8±4.8	42.6±5.4	0.074
TLC /cumm	9450±3596	10775±3161	0.366
CRP	4.6±6.1	4.5±3.6	0.938

Table 3 presents the comparison of routine laboratory investigation results between the NIV successful group and NIV failure group patients. It includes parameters such as hemoglobin (Hb), packed cell volume (PCV), total leukocyte count (TLC), and C-reactive protein (CRP). The P value indicates the level of statistical significance for the differences observed between the two groups.

DISCUSSION

The present study aimed to explore the role of Non-Invasive Ventilation (NIV) in patients with overlap syndrome, specifically those hospitalized with acute respiratory failure. The study was conducted within the Intensive Care Unit (ICU) of a specialized center for respiratory diseases. The findings and comparisons between NIV successful and NIV failure groups shed light on several key aspects of the clinical presentation and management of these patients [10].

One of the primary observations from the study pertains to the demographic characteristics of the two groups. While there were no statistically significant differences in age or body mass index (BMI) between the NIV successful and NIV failure groups, interesting gender-related trends emerged. The odds ratio analysis indicated that the odds of having male patients were lower in the NIV successful group, while female patients were more likely to fall into this category. Moreover, the odds of being a smoker were nearly double in the NIV failure group, underscoring the potential impact of smoking on treatment outcomes. These findings hint at gender-specific responses and the significant influence of smoking history on NIV success [11].

Clinical symptoms and polysomnography data analysis provided insights into the disease presentation. Notably, clinical symptoms like expectoration, wheezing, and fever were more prevalent in the NIV failure group, indicating a potential association between these symptoms and poor NIV response. Additionally, the Epworth Sleepiness Score (EPSS) and Apnoea-Hypopnea Index (AHI) data did not exhibit significant differences between the two groups, suggesting that severity of sleep apnea alone may not be a sole predictor of NIV success.

Routine laboratory investigations did not reveal statistically significant differences between the two groups. This suggests that the observed differences in treatment outcomes were likely influenced by other clinical and physiological factors rather than baseline laboratory values.

Interestingly, pulmonary function test (PFT) results demonstrated severe airflow limitation in both groups, and there was a reduction in diffusion capacity of the lung (DLCO) in some cases, indicating potential emphysematous changes. The GOLD classification analysis further supported this observation, revealing a predominant presence of patients with severe and very severe COPD in both groups. This underscores the advanced stage of the disease in the cohort studied, which could contribute to the observed treatment outcomes.

The most significant improvement was seen in arterial blood gas parameters after NIV treatment in the NIV successful group. The increase in pH, reduction in $PaCO_2$, increase in PaO_2, and improved bicarbonate levels collectively indicate a favorable impact of NIV on respiratory acidosis and hypoxemia. This aligns with the intended purpose of NIV, which is to provide ventilatory support and improve gas exchange, thereby alleviating respiratory distress.

It is worth noting that 73% of patients in the study experienced successful NIV treatment, while the remaining 27% required intubation and invasive mechanical ventilation. This disparity emphasizes the challenges associated with managing patients with overlap syndrome and acute respiratory failure. The NIV failure group had higher odds of certain clinical symptoms, smoking history, and severity of symptoms, suggesting that these factors could play a crucial role in predicting NIV outcomes.

CONCLUSION

In conclusion, this study provides valuable insights into the clinical presentation and management of patients with overlap syndrome hospitalized for acute respiratory failure. While no single factor proved to be a definitive predictor of NIV success or failure, a combination of clinical symptoms, smoking history, and disease severity appeared to influence treatment outcomes. The significant improvements in arterial blood gas parameters post-NIV treatment underscore the importance of NIV in

managing acute respiratory failure in these patients. The findings contribute to a better understanding of overlap syndrome and its nuances, paving the way for improved patient care strategies and tailored interventions in this complex population. Further research is warranted to explore additional variables that may impact treatment responses in this challenging patient group.

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