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STUDY OF CLINICAL CORRELATION OF MICROALBUMINURIA AND CHRONIC OBSTRUCTIVE PULMONARY DISEASE BASED ON ITS SEVERITY

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ABSTRACT

Background:

Chronic Obstructive Pulmonary Disease (COPD) is a major global health concern, projected to become the third leading cause of death by 2030. COPD is characterized by systemic inflammation, contributing to increased cardiovascular morbidity and mortality. Microalbuminuria (MAB), a marker of endothelial dysfunction, has been linked to heightened cardiovascular risk in COPD patients. This study explores the correlation between microalbuminuria and COPD severity using the Global Initiative for Chronic Obstructive Lung Disease (GOLD) staging.

Methodology:

A cross-sectional study was conducted at Basaveshwara Medical College and Hospital, Chitradurga, on 58 COPD patients diagnosed according to GOLD 2023 criteria. Patients were categorized by GOLD stages I-IV, and MAB levels were measured. Exclusion criteria included bronchial asthma, renal disease, cardiovascular disease (CVD), diabetes, urinary tract infection, and malignancy. Statistical analysis was performed using SPSS software, with a p-value of <0.001 considered statistically significant.

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Results:

The study found that MAB levels increased with COPD severity. In GOLD stage I (mild COPD), the mean MAB was 32 mg/day, while in GOLD stage IV (very severe COPD), the mean MAB was 190.53 mg/day. The overall mean MAB for the study population was 144.07 mg/day. The results suggest that endothelial dysfunction and vascular damage increase as COPD progresses, with microalbuminuria serving as a potential indicator of disease severity.

Conclusion:

This study demonstrates a significant correlation between microalbuminuria and COPD severity, suggesting that MAB could serve as a non-invasive marker for identifying patients at risk for cardiovascular and renal complications. Routine monitoring of MAB in COPD patients may improve early detection of systemic complications and enhance patient management.

Keywords:

Chronic Obstructive Pulmonary Disease (COPD), Microalbuminuria, GOLD Staging, Endothelial Dysfunction, Systemic Inflammation, Cardiovascular Risk.

Introduction

As per World Health Organization (WHO), the third leading cause of death in the world by 2030 will be chronic obstructive pulmonary disease (COPD). In COPD, inhaled particles and gases lead to chronic inflammation of the airways with airflow limitation, which is not fully reversible. COPD is a disease having systemic inflammation. Circulating pro-inflammatory cytokines and C-reactive protein (CRP) are important markers of systemic inflammation. Cardiovascular disease is most common cause of mortality in COPD. Chronic

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Obstructive Pulmonary Disease (COPD) is a prevalent and progressive respiratory condition characterized by airflow limitation, significantly impacting global health, with an estimated 3 million deaths annually attributed to the disease worldwide【1】. Recent studies have highlighted the potential role of microalbuminuria, a marker of endothelial dysfunction, as an emerging risk factor for cardiovascular comorbidities in COPD patients【2】. Microalbuminuria reflects systemic inflammation and vascular damage, both of which are prevalent in advanced COPD stages【3】. The association between microalbuminuria and COPD severity has garnered attention, suggesting that endothelial dysfunction may exacerbate the cardiovascular risks commonly observed in COPD patients【4】. Furthermore, microalbuminuria might provide early indicators of renal impairment, which can complicate COPD management【5】. Understanding this relationship may offer novel insights into early detection and management of complications in COPD patients, as microalbuminuria could serve as an indicator of disease severity and progression【6,7】. Thus, this study aims to explore the clinical correlation between microalbuminuria and the severity of COPD to enhance diagnostic and therapeutic strategies, ultimately improving patient outcomes.

Objectives:

- To study presence of microalbuminuria in COPD patients.
- To determine the relationship of microalbuminuria with severity of COPD using GOLD 2023 staging.

Materials and Methods

The cross-sectional study was done in the Department of General Medicine in Basaveshwara medical college and Hospital, Chitradurga.

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- The study was conducted on 58 patients with COPD diagnosed according to GOLD 2023 criteria.
- Study design: Cross sectional study
- Period of study: OCT 2023 to JAN 2024

INCLUSION CRITERIA

- Age > 18years
- Diagnosed case of COPD
- Using GOLD criteria 2021

EXCLUSION CRITERIA

- spirometry proven bronchial asthma
- inability to perform spirometry
- renal disease, CVD
- UTI , malignancy
- Diabetes mellitus
- Urine spot albumin measurement, pulmonary function tests, spirometry were done. Severity of COPD was assessed by GOLD staging. Statistical analysis was performed using SPSS software. Data was analysed by descriptive statistics and relation between microalbuminuria in various stages of patients with COPD was studied using ANOVA and pearson correlation test p- value of <0.001 was considered statistically significant.

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RESULTS

Table:1 COPD Severity by GOLD stage

GOLD STAGE	Fev 1	Frequency
I	>80	5
II	50-80	22
III	30-50	24
IV	<30	07
TOTAL		58

The table presents the distribution of COPD patients based on the Global Initiative for Chronic Obstructive Lung Disease (GOLD) classification system, which categorizes COPD severity according to post-bronchodilator Forced Expiratory Volume in 1 second (FEV1) as a percentage of the predicted value. The four stages—GOLD I, II, III, and IV—represent increasing severity of airflow limitation. In this study of 58 COPD patients, the frequency of patients in each GOLD stage is shown, providing an overview of the disease burden among the participants.

- **GOLD Stage I**: Patients in this category have an FEV1 of greater than 80% of the predicted value, indicating mild COPD. There were 5 patients (8.6%) in this stage, suggesting that fewer patients were in the early stages of the disease.

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- **GOLD Stage II**: With an FEV1 between 50-80%, this stage represents moderate COPD. The study recorded 22 patients (37.9%) in this group, making it the second-largest group, reflecting a substantial portion of patients in the moderate phase of the disease.
- **GOLD Stage III**: In this stage, patients have an FEV1 between 30-50%, indicating severe COPD. This was the largest group in the study, with 24 patients (41.4%), showing a high prevalence of severe disease among the cohort.
- **GOLD Stage IV**: Patients in this category have an FEV1 of less than 30%, indicating very severe COPD. Seven patients (12.1%) fell into this stage, demonstrating a smaller yet significant representation of those with advanced disease.

Fig:1 COPD Severity by GOLD stage

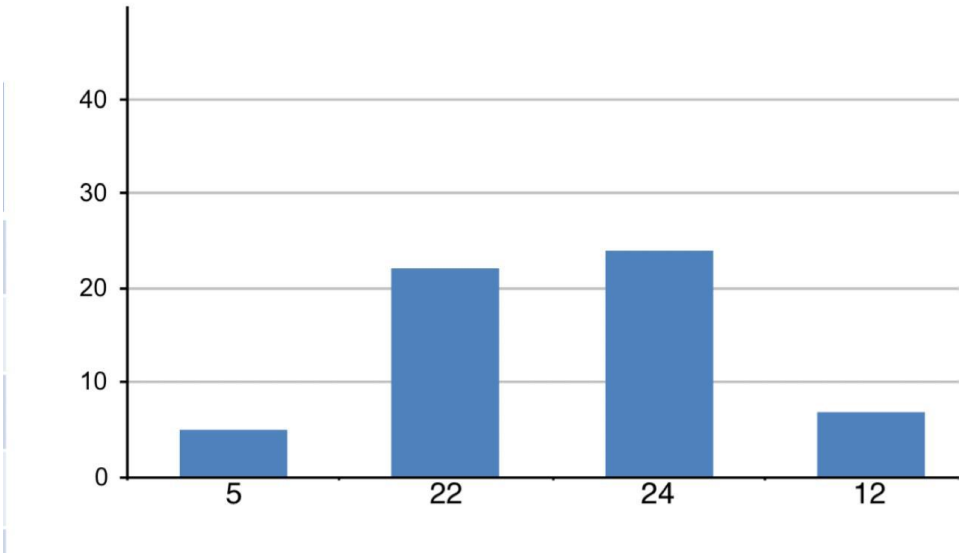

Table 2: Microalbuminuria-in the surgery population:

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MAB	FREQUENCY
0-50	6
50-100	6
101-150	17
150-200	17
200-300	12

The table shows the distribution of microalbuminuria (MAB) levels in COPD patients, reflecting blood vessel damage. Six patients had low MAB (0-50 mg/day), indicating minimal damage, likely in early COPD. As MAB levels increase (101-300 mg/day), more patients are observed, with 17 in both the 101-150 mg/day and 150-200 mg/day ranges, suggesting worsening blood vessel damage in more advanced stages. Twelve patients had the highest MAB (200-300 mg/day), likely indicating severe COPD. This trend highlights the link between increasing MAB levels and COPD severity.

Fig 2: Microalbuminuria-in the surgery population:

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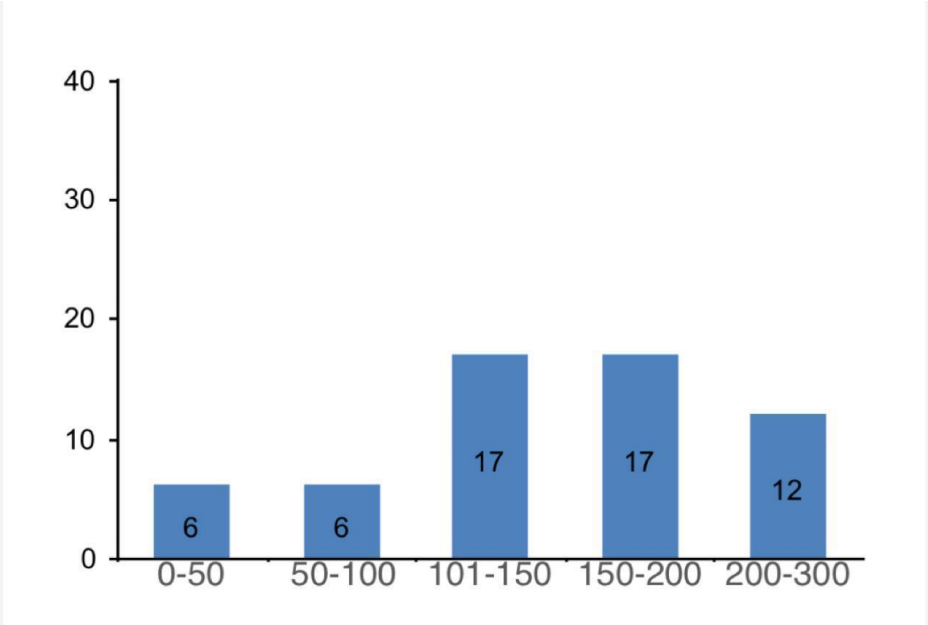

Table 3: Association between MAB and severity of COPD using GOLD stage :

		0-50	51-100	101-150	151-200	201-300	mean
	I Mild(5)	5	0	0	0	0	32
GOLD Stage	II Moderate (22)	0	4	13	5	0	125.71
	III severe (24)	1	2	4	12	5	171.73
	IV very severe (7)	0	0	0		7	190.53
Total	58						144.07

The table shows the relationship between microalbuminuria (MAB) levels and the severity of COPD, using the GOLD staging system. MAB is a measure of protein in the urine, which can

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indicate damage to blood vessels. As COPD becomes more severe, MAB levels tend to increase.

- GOLD Stage I (Mild COPD): All 5 patients had low MAB levels (0-50 mg/day) with a mean of 32 mg/day, suggesting little to no vascular damage at this stage.
- GOLD Stage II (Moderate COPD): Of the 22 patients, MAB levels ranged from 51-200 mg/day, with most patients in the 101-150 mg/day range. The mean MAB was 125.71 mg/day, indicating moderate vascular stress as the disease progresses.
- GOLD Stage III (Severe COPD): In this group of 24 patients, MAB levels were higher, with many patients having MAB between 151-200 mg/day and a mean of 171.73 mg/day. This suggests increased vascular damage in severe COPD.
- GOLD Stage IV (Very Severe COPD): All 7 patients had the highest MAB levels (201-300 mg/day), with a mean of 190.53 mg/day, indicating significant vascular damage in very severe cases.
- Overall: The total mean MAB for all 58 patients was 144.07 mg/day, showing a clear trend: as COPD severity increases, so do MAB levels. This suggests that monitoring MAB could help assess the severity of COPD and the risk of related complications, such as cardiovascular problems.

Discussion

Chronic Obstructive Pulmonary Disease (COPD) is a complex and progressive disorder that not only affects the respiratory system but also has systemic implications, especially on cardiovascular health. The association between microalbuminuria

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(MAB) and COPD severity, as demonstrated in this study, underscores the increasing recognition of COPD as a systemic disease with far-reaching consequences beyond the lungs. The results show that as COPD severity increases, MAB levels tend to rise, indicating a potential link between vascular damage and airflow limitation【8】.

The presence of microalbuminuria, a known marker for endothelial dysfunction, has been increasingly studied in COPD patients due to its association with heightened cardiovascular risk. Studies suggest that systemic inflammation, common in COPD, may contribute to endothelial dysfunction, leading to increased microalbuminuria【9】. This is supported by findings from our study, where patients in the more severe stages of COPD (GOLD III and IV) demonstrated higher mean MAB levels, suggesting a more pronounced systemic involvement in these stages. Elevated levels of circulating inflammatory markers, such as C-reactive protein (CRP) and cytokines, are known to drive this endothelial dysfunction【10】.

In mild COPD (GOLD I), the mean MAB level was low (32 mg/day), which aligns with the notion that vascular damage may be minimal at this stage. However, in moderate to very severe COPD (GOLD II-IV), MAB levels increased significantly, reaching a mean of 190.53 mg/day in GOLD IV patients. This trend suggests that microalbuminuria could serve as a non-invasive marker to identify patients at higher risk for cardiovascular complications【11】. Previous research has shown that microalbuminuria is predictive of both cardiovascular morbidity and mortality in COPD, making it a valuable tool for risk stratification【12】.

Furthermore, our findings align with earlier studies that highlight the role of microalbuminuria as an early indicator of renal impairment in COPD patients, which could complicate the management of the disease. Renal dysfunction is often overlooked in COPD, but its occurrence increases as the disease progresses, and microalbuminuria may offer an

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early warning sign【13】. Monitoring MAB in COPD patients could help clinicians identify those at greater risk for developing cardiovascular or renal complications, allowing for earlier interventions and potentially improved outcomes.

Conclusion

This study supports the growing body of evidence that microalbuminuria is associated with COPD severity and can serve as an indicator of systemic involvement, particularly vascular and renal complications. Incorporating MAB monitoring into routine clinical practice for COPD patients could improve early detection of these complications, thereby enhancing overall patient management and outcomes.

References

1. Barnes PJ. Chronic obstructive pulmonary disease: effects beyond the lungs. PLoS Med. 2010;7(3).
2. Dursun B, Ozben B, Uyanik A, Dursun E, Suleymanlar G. Microalbuminuria and impaired kidney function in patients with chronic obstructive pulmonary disease. Ren Fail. 2005;27(6):673-679.
3. Rabe KF, Hurd S, Anzueto A, et al. Global strategy for the diagnosis, management, and prevention of chronic obstructive pulmonary disease: GOLD executive summary. Am J Respir Crit Care Med. 2007;176(6):532-555.
4. Cazzola M, Rogliani P, Matera MG. Endothelial dysfunction in COPD: a link between systemic inflammation and cardiovascular diseases? Respir Med. 2011;105(8):1140-1141.

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5. Mannino DM, Buist AS. Global burden of COPD: risk factors, prevalence, and future trends. Lancet. 2007;370(9589):765-773.

6. De Lucas-Ramos P, Izquierdo-Alonso JL, Rodríguez-Gonzálezmoro JM, et al. Cardiovascular risk factors in chronic obstructive pulmonary disease: results of the ARCE study. Arch Bronconeumol. 2008;44(5):233-238.

7. Sabit R, Bolton CE, Edwards PH, et al. Arterial stiffness and osteoporosis in chronic obstructive pulmonary disease. Am J Respir Crit Care Med. 2007;175(12):1259-1265.

8. Barnes PJ. Chronic obstructive pulmonary disease: effects beyond the lungs. PLoS Med. 2010;7(3).

9. Dursun B, Ozben B, Uyanik A, Dursun E, Suleymanlar G. Microalbuminuria and impaired kidney function in patients with chronic obstructive pulmonary disease. Ren Fail. 2005;27(6):673-679.

10. Cazzola M, Rogliani P, Matera MG. Endothelial dysfunction in COPD: a link between systemic inflammation and cardiovascular diseases? Respir Med. 2011;105(8):1140-1141.

11. Sabit R, Bolton CE, Edwards PH, et al. Arterial stiffness and osteoporosis in chronic obstructive pulmonary disease. Am J Respir Crit Care Med. 2007;175(12):1259-1265.

12. Mannino DM, Buist AS. Global burden of COPD: risk factors, prevalence, and future trends. Lancet. 2007;370(9589):765-773.

13. De Lucas-Ramos P, Izquierdo-Alonso JL, Rodríguez-Gonzálezmoro JM, et al. Cardiovascular risk factors in chronic obstructive pulmonary disease: results of the ARCE study. Arch Bronconeumol. 2008;44(5):233-238.