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Original Article

Prevalence and Clinical Features of Pulmonary Hypertension: A Retrospective Study at Tertiary Care Hospital in Mardan

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Abstract

Background: Pulmonary hypertension (PH) is a progressive disorder and the condition is often undiagnosed until advanced stages, moreover limited local data available regarding etiology of disease.
Objective: To assess the prevalence and clinical features of PH and to evaluate its demographic characteristics, clinical features and associated comorbidities among patients presenting in Mardan Medical Complex.
Methods: This retrospective study was conducted at Department of Medicine, Mardan Medical Complex, Mardan from January 2022 to January 2023. A total of 185 patients were evaluated in this study, with 2 groups as transthoracic echocardiography (TTE) suggested PH and non-PH. Diagnosis of PH was based on echocardiographic findings only as limited access to Right Heart Catheterization (RHC) which is gold standard for PH diagnosis. Relevant ICD 10 coding, ICD 127.0 for primary PH and ICD 127.2 for secondary PH was used to categorrised COPD, ILD, LHD.
Results A total of 40 patients were identified as having pulmonary hypertension (PH), the prevalence was 21.6% and 145 were non PH. The largest percentage of people studied had reached 45-59 years old (51.4%). Most PH patients were women (55.0% versus 45.0% men). The most commonly reported clinical manifestation among PH patients was dyspnea reported by 78.9% of patients, followed by fatigue 64.3% and chest pain 41.6%. COPD was significantly associated with PH compared to the non PH group (p-value <0.05).
Conclusion: Approximately one-fifth of study's population had PH, with COPD and advancing age as key risk factors. Similarly TTE-based screening provides valuable insights.
Key words: Pulmonary hypertension, dyspnea, COPD, echocardiography.

Introduction

Pulmonary hypertension is a progressive and potentially life-threatening condition characterized by elevated pressure within the pulmonary arterial circulation, eventually leading to right ventricular failure and premature mortality if left untreated. The global burden of PH remains uncertain because of limited population-based epidemiological data. The estimated prevalence of all PH groups ranges from 10 to 52 million individuals worldwide, with the greatest burden occurring in Group 2 PH (associated with left heart disease) and Group 3 PH (associated with chronic lung diseases). In contrast, Group 1 pulmonary arterial hypertension (PAH), which predominantly affects younger individuals, is relatively uncommon. Population-based data from Pakistan are limited.[1,2]

Group 2 and Group 3 PH impose a substantial burden on healthcare systems because of their chronic course, diagnostic complexity, and high morbidity and mortality.[3,4] The prevalence of PH varies considerably across different populations and geographical regions. It is estimated that 10–52 million people worldwide have PH, commonly identified by a pulmonary artery systolic pressure (PASP) >40 mmHg on TTE.[5] Despite its clinical

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Authors Contribution

MIA conceptualized the project. MAK did the data collection. MG did the literature search. SA & MKK performed the statistical analysis. Drafting, revision & writing of manuscript were done by MUZ & MS.

importance, epidemiological evidence from developing countries, including Pakistan, remains scarce. This is largely attributable to limited availability of right heart catheterization (RHC), inadequate awareness of PH, and insufficient data regarding its clinical presentation, associated comorbidities, and risk factors in the local population.

The etiology of PH is multifactorial and includes chronic obstructive pulmonary disease (COPD), interstitial lung disease (ILD), left heart disease, and pulmonary arterial hypertension (PAH). [6,7] Accurate identification of the underlying cause is essential because management strategies and prognosis differ according to the etiology. The diagnosis of PH relies on several complementary investigations, including transthoracic echocardiography, right heart catheterization (the gold standard), pulmonary function tests (PFTs), and imaging studies, each providing valuable information regarding pulmonary hemodynamics and the underlying disease process.[8,9] In resource-limited settings where access to RHC is restricted, TTE plays a crucial role as a non-invasive screening tool for early detection and timely referral, thereby helping to prevent disease progression and reduce PH-related morbidity and mortality.[10]

Although PH represents an important public health problem, data regarding its prevalence and clinical characteristics in the Mardan region are lacking. Therefore, this retrospective study was conducted to determine the prevalence and clinical features of PH among patients presenting to MMC Mardan. Furthermore, the study aims to identify associated risk factors and comorbidities to provide evidence that may support clinicians, researchers, and policymakers in improving the prevention, diagnosis, and management of PH in this population.

Methods

This was a single center retrospective cross-sectional study conducted at Department of Medicine, Mardan Medical Complex, Mardan from January 2022 to January 2023. Medical records of patients who underwent transthoracic echocardiography TTE were revived. All patients who had a TTE and ICD coding performed were screened. Consecutive sampling technique was applied. Sample size was determined by the no of eligible TTE records available during the study period.

After taking oermission from institutional review board data of a total of 185 patients with complete records were included in the analysis. A total of 185 patients were divided into two groups Pulmonary Hypertension PH (n=40) PASP > 40 mmHg and Non-PH (n=145) PASP<40 as per ESC/ERS 2022 criteria.5 Data was extracted from medical records of patients, using a pre designed standardized proforma.. PH was defined as estimated pulmonary artery systolic pressure(PASP) >40mmHg on TTE per American society of echocardiography(ASE) guideline and categoriszed using International Classification of Diseases (ICD) codes, ICD 127.0 for primary PH and ICD 127.2 for secondary PH. Patients of all ages and genders diagnosed with PH based on TTE performed and ICD codings were included in study. Patients with incomplete clinical information or inadequate TTE images were excluded.

Variables included, demographic characteristics (age, gender), medical presentations, diagnostic modalities, comorbid conditions were extracted from medical records. The usage of a standardized information series shape echocardiography were taken into consideration diagnostic modalities for PH. Common comorbidities consisting of chronic obstructive pulmonary disease (COPD), interstitial lung disease (ILD), and left heart diseases had been documented using a standardized proforma.

Descriptive statistics were used to summarize demographic characteristics, clinical presentations, diagnostic modalities, comorbidities, and outcomes among patients with PH. Data was analyzed using SPSS version 26. Continuous variables were expressed as mean±standard deviation, while categorical variables were presented as frequencies and percentages. Association between PH and categorical variables like age, gender and comorbidities were assessed using the Chi-square test or Fisher's exact test where appropriate. Odd ratios (OR) with 95% confidence intervals (CI) were calculated to evaluate the strength of associations. Variables with p <0.1 in univariate analysis were included in a multivariable logistic regression model to identify independent predictors of PH. A p value of <0.05 was considered statistically significant.

Results

This study comprised data of 185 patients, of which 40 were identified with TTE suggested PH, and the remaining 145 did not meet TTE criteria for PH patients. The majority of the study population was between the ages of 45-59 (51.4%), followed by those above the age of 60 (35.1%). There were slightly higher females (52.4%) than males (47.6%) in the study population.

Table 1: Demographic characteristics of patients with & without TTE suggested PH.

Characteristic	Total Population (N=185)		PH Patients (N=40)		Non-PH Patients (N=145)	
Age (years)	F	%	F	%	F	%
< 40 years	25	13.5	2	5.0	23	15.9
40-59 years	95	51.4	18	45.0	77	53.1
≥ 60 years	65	35.1	20	50.0	45	31.0
Gender						
Male	88	47.6	18	45.0	70	48.3
Female	97	52.4	22	55.0	75	51.7

Among the PH patients, there was a higher proportion of women (55.0%) than males (45.0%) (Table-1). The most prevalent clinical manifestation among PH patients was dyspnea, reported by 78.9% of patients, followed by fatigue (64.3%), chest pain (41.6%), edema (30.0%), and syncope (20.0%). Echocardiography became the most typically used diagnostic modality for PH prognosis done by 92.4% of patients. The maximum conventional comorbidity amongst PH patients become persistent chronic obstructive pulmonary disease (COPD), suggested through 27.8% of patients, followed by interstitial lung disease (ILD) (17.5%), left heart disease (15.0%), and different comorbidities (20%). Among Non-PH patients, COPD became also the most common comorbidity (11.03%), followed by interstitial lung disease (ILD) (10.3%), left coronary heart disorder (6.2%), and other comorbidities (6.9%). This study findings recommend that PH is greater not unusual among older people, with a higher occurrence in females. Dyspnea is the maximum not unusual medical presentation, and echocardiography is the maximum usually used diagnostic modality (Table-2). The most common comorbidity amongst PH patients is COPD, followed by ILD and left heart diseases (Table-3). These findings highlight the importance of early detection and management of PH, as well as the need for similarly research on the connection among PH and comorbidities.

Table 2: Clinical presentations of patients with pulmonary hypertension.

Clinical Presentation	F	%
Dyspnea	31	78.9
Fatigue	25	64.3
Chest pain	17	41.6
Edema	12	30.0
Syncope	8	20.0

The overall proportion of PH in the study population was 21.6%. A higher proportion of PH was observed in patients aged ≥60 years compared with younger age groups. Female patients demonstrated a slightly higher prevalence of PH compared with males, however the difference was not statistically significant (p >0.05). COPD showed a statistically significant association with PH (p <0.05). Patients with COPD had approximately three times higher odds of developing PH compared with those without COPD.

Table 3: Comparison of comorbidities among patients with & without TTE suggested PH.

Comorbidity	PH Patients (N=40)		Non-PH Patients (N=145)		O.R	p Value
	F	%	F	%		
COPD	11	27.8	16	11.03	3.1	0.01
ILD	7	17.5	15	10.3	1.8	0.19
Left heart disease	6	15.0	9	6.2	2.6	0.08
Other	8	20.0	10	6.9		

Discussion

The present study evaluated the prevalence and clinical characteristics of pulmonary hypertension among patients presenting to a tertiary care hospital in Mardan. The findings provide useful insights into the demographic profile, clinical manifestations, and associated comorbidities among patients diagnosed with TTE suggested PH in this region.

Age distribution in the current study showed that the majority of patients belonged to the middle-aged group (40–59 years), while a substantial proportion were aged 60 years or above. Similar age patterns have been reported in previous studies, where pulmonary hypertension was more frequently observed among middle-aged and older individuals.[11,12] the higher occurrence in older patients may be attributed to the increased prevalence of chronic cardiopulmonary diseases and vascular changes associated with aging. The potential mechanism include hypoxic vasoconstriction in COPD, chronic inflammation and pulmonary vascular remodeling as reported by Seeger W at al in 2013

The 20% prevalence of TTE suggested PH in this study is higher than 12% reported by Khan JA at al 2018 in a Karachi COPD cohort, this likely reflect our tertiary care high risk sample and use of PASP >40mmHg per ESC/ERS criteria vs older cut offs. Compared to regional data our COPD- PH association (OR3.1) aligns with findings from India and Bangladesh where biomass exposure and late diagnosis are common reported by Jindal SK at al in 2012.

In the present study, females constituted a slightly higher proportion of patients with pulmonary hypertension compared with males. This finding is consistent with previous literature suggesting a higher prevalence of certain forms of pulmonary hypertension among females.[13] Hormonal influences, genetic predisposition, and the higher prevalence of autoimmune diseases among women may contribute to this gender difference.[14]

Dyspnea was the most commonly reported clinical symptom among patients with pulmonary hypertension in this study. This observation is consistent with earlier studies that identified dyspnea as the primary presenting complaint in PH patients due to increased pulmonary vascular resistance and reduced cardiopulmonary reserve. Fatigue and chest discomfort were also frequently reported symptoms, reflecting impaired cardiac function and reduced oxygen delivery to peripheral tissues.[15,16]

Echocardiography was the most commonly utilized diagnostic modality for pulmonary hypertension in this study. This finding is consistent with previous research highlighting the importance of echocardiography as a non-invasive and widely available screening tool for the evaluation of suspected pulmonary hypertension.[17]

Among the comorbid conditions identified in this study, chronic obstructive pulmonary disease (COPD) was the most frequent among both PH patients and non PH patients. COPD is a well-recognized cause of secondary pulmonary hypertension due to chronic hypoxia and pulmonary vascular remodeling. Similar associations between COPD and pulmonary hypertension studies have been reported in earlier.[18] Interstitial lung disease and left heart disease were also observed among PH patients, further supporting the multifactorial nature of PH.

The retrospective design and use of existing TTE records introduced selection bias and TTE criteria PASP >40 mmHg rather than RHC which is the gold standard per 2022 ESC/ERS guidelines, mixing of group 2 and 3 and unavailability of healthy control groups are the limitations of the study.

Conclusion

Overall, the findings of this study highlight the importance of early recognition and evaluation of pulmonary hypertension among patients with chronic respiratory and cardiovascular diseases. Early diagnosis and timely management may help reduce disease progression and improve clinical outcomes.

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Availability of Data: The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Ethical Approval: The Ethics Review Committee of Gajju Khan Medical College, Swabi approved the study via letter no. 64-68/ERC/2021, dated 21/12/2021.

Conflict of Interest: None declared.

References

1. Taya A, Patel S, Cope J, Alnuaimat H. Pulmonary arterial hypertension and associated conditions. Disease-a-Month. 2016; 62: 382-405.
2. Hewes JL, Lee JY, Fagan KA, Bauer NN. The changing face of pulmonary hypertension diagnosis: a historical perspective on the influence of diagnostics and biomarkers. Pulmo Circu 2020; 10(1): 2045894019892801.
3. Mathers CD, Loncar D. Projections of global mortality and burden of disease from 2002 to 2030. PLoS Med 2006; 3(11): e442.
4. López-Campos JL, Tan W, Soriano JB. Global burden of COPD. Respirology 2016; 21(1): 14-23.
5. Humbert M, Kovacs G, Hoeper MM, Badagliacca R, Berger RMC, Brida M, et al. 2022 ESC/ERS Guidelines for the diagnosis and treatment of pulmonary hypertension. Eur Heart J 2022; 43: 3618-3731.
6. Weitzenblum E, Chaouat A, Canuet M, Kessler R. Pulmonary hypertension in chronic obstructive pulmonary disease and interstitial lung diseases. Semin Respir Crit Care Med 2009; 30(4): 458-70.
7. Olschewski H. The challenge to decide between pulmonary hypertension due to chronic lung disease and PAH with chronic lung disease. Diagnostics 2021; 11(2): 311.

8. Hur DJ, Sugeng L. Non-invasive multimodality cardiovascular imaging of the right heart and pulmonary circulation in pulmonary hypertension. Front Cardiovasc Med 2019; 6: 24.
9. Freed BH, Collins JD, François CJ, Barker AJ, Cuttica MJ, Chesler NC, et al. Megnatic Resonance and CT imaging for the evaluation of pulmonary hypertension. JACC: Cardiovasc Imaging. 2016; 9(6): 715-32.
10. Galiè N, Humbert M, Vachiery JL. 2015 ESC/ERS Guidelines for the diagnosis and treatment of pulmonary hypertension. Eur Respir J 2016; 46: 903-75.
11. Lam CS, Roger VL, Rodeheffer RJ, Borlaug BA, Enders FT, Redfield MM. Pulmonary hypertension in heart failure with preserved ejection fraction: a community-based study. J Am Coll Cardiol 2009; 53(13): 1119-26.
12. Chebib N, Mornex JF, Traclet J, Philit F, Khouatra C, Zeghmar S, et al. Pulmonary hypertension in chronic lung diseases: comparison to other pulmonary hypertension groups. Pulm Circ 2018; 8(2): 2045894018775056.
13. Chaouat A, Naeije R, Weitzenblum E. Pulmonary hypertension in COPD. Eur Respir J 2008; 32: 1371-85.
14. Khan A, Javaid A, Hussain A. Burden and clinical characteristics of pulmonary hypertension in Pakistan: a single-center experience. J Ayub Med Coll Abbottabad 2021; 33: 411-5.
15. Vachiéry JL, Tedford RJ, Rosenkranz S. Pulmonary hypertension due to left heart disease. Eur Respir J 2019; 53: 1801897.
16. Witte KK, Clark AL. Why does chronic heart failure cause breathlessness and fatigue?. Prog Cardiovasc Dis 2007; 49(5): 366-84.
17. D'Alto M, Romeo E, Argiento P, Pavelescu A, Mélot C, D'Andrea A, et al. Echocardiographic prediction of pre-versus postcapillary pulmonary hypertension. J Am Soc Echocardiogr 2015; 28(1): 108-15.
18. Lepida D, Papathanasiou A, Galiatsou E, Nakos G, Goudevenos I, Koulouras V. The contribution of left heart disease in COPD patients with pulmonary hypertension. Hellenic J Cardiol. 2018; 59(3): 160-5.