

# The increasing trend and the seasonal variation in attendance of diffuse parenchymal lung disease patients presenting to a pulmonary clinic in Eastern India

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## ABSTRACT

**Background:** Diffuse parenchymal lung disease (DPLD) is not an uncommon problem in clinical practice. Although the exact prevalence of DPLD in India is not known, the relative etiological distribution in DPLD in India has been reported. There has been no information as regards the seasonality of the disease. **Patients and Methods:** The archive of the Institute of Pulmocare and Research, Kolkata, was searched for the number of new patients registered at the outpatient department to a single consultant (practicing in the same style on appointment only) over years from 2009 to 2019. The attendance (absolute and relative) was arranged year wise and then month wise to look for the annual and seasonal trends, if any. **Results:** A total of 2226 patients were registered from 2009 to 2019. There has been a steady increase in both the absolute number (104 in 2009 to 204 in 2019) and the relative percentage of attendance (4.36% in 2009 to 6.9% in 2019) of new registration of DPLD patients over the years. Regarding seasonal variation, two consistent peaks in attendance have been observed as December–January and April–May over the years with dips in February and September; the first being more consistent than the latter. **Conclusions:** The increase in relative attendance in the DPLD patients over the years needs further investigation to establish a rising trends in incidence and prevalence of DPLD. The unequivocal trend in seasonal variation needs attention and further research.

**KEY WORDS:** Connective tissue disease-interstitial lung disease, diffuse parenchymal lung disease, high resolution computerized tomography, hypersensitivity pneumonitis

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## INTRODUCTION

Diffuse parenchymal lung disease (DPLD) or interstitial lung disease (ILD) consists of an array of variably fibrotic and progressive noninfective lung parenchymal disorders. The etiology of DPLD varies across the globe, while (idiopathic pulmonary fibrosis) has been described as the most common ILDs in the western world,<sup>[1-3]</sup>

the condition is commonly caused by hypersensitivity pneumonitis, collagen vascular diseases, sarcoidosis in India as per the ILD-India registry.<sup>[4]</sup> The epidemiological data from India on DPLD are mostly individual center based,<sup>[5,6]</sup> and the evaluation algorithm of the disease

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has changed over years with regular statements from international societies in the recent past.<sup>[2,7]</sup>

There has been a progressive increase in the prevalence and incidence of DPLD. The age-standardized incidence rate and age-standardized prevalence rate of DPLD have shown a consistent and progressive increment in the prevalence.<sup>[8]</sup> Such increase has been likely influenced by the environment as it is hypothesized that the interaction between genetic predisposition and environmental factors is important in the pathogenesis of DPLD.<sup>[9]</sup> The environmental factors may play a significant role on not only the development but also the etiological distribution, and the progress of the disease, especially when it evolves through inhalational injury of the lungs.<sup>[10]</sup> While the inhalation of inorganic dusts and particles can cause DPLDs such as silicosis, the organic antigens, or elements and even chemicals can lead to hypersensitivity pneumonitis.<sup>[10,11]</sup> It is possible that the chance of exposure to organic antigens that lead to DPLD from HP has increased recently from the obvious increase in population density and the fast changes in their living environment. The latter includes focal crowding, changes in dwelling conditions, and lifestyle like frequent use of artificial cooling of households and offices.

Therefore, it may be worthwhile to look for the change in number of the patients attending a specific pulmonary outpatient department (OPD) over a decade and also look for the presence of any seasonal pattern in their seeking of medical consultations. In the manuscript, we would like to display our experience of dealing with the number and the seasonality of newly registered DPLD patients from 2009 to 2019.

## PATIENTS AND METHODS

With proper ethical approval (EC registration no-ECR/159/Inst/WB/2013/RR-20), we looked at the retrospective data of patients' of DPLD registering at our OPD starting from 2009 to 2019. The registry includes only the new patients were attending the OPD and their subsequent diagnosis, and we have included the record of the patients seen by a single full-time specialist. The diagnosis of DPLD was accepted always on agreement of a radiologist and the concerned pulmonologist on findings of high-resolution computerized tomography of chest.

The numbers of new DPL registrations were first screened out along with total number of new patients been seen for a year. The relative percentage of OPD attendance by new DPLD in each year has been calculated from the absolute number of new registration of patients of DPLD and the total new patients attending the OPD. Following that, the number of patients of DPLD been registered in different months of each year was looked for. The derived numbers (both year wise and month wise) for the period

of observation and the relative annual attendance status have been presented with figures.

## RESULTS

The study included 2266 cases of DPLD presenting over 11 years. There has been a consistent upward trend in the year-wise attendance both in terms of the absolute number (though not statistically significant) and the relative frequency of DPLD as a diagnosis [Figures 1 and 2]. The latter (the annual relative attendance of DPLD-patients) at the outpatient clinic has been varying from a minimum of 2.87% in 2010 to a maximum of 7.58% in 2017, and it dropped to 6.9% in 2019 [Figure 2]. The pace in increase has been slower in the initial 5 years with a relatively higher out-patient registration [Figures 1 and 2].

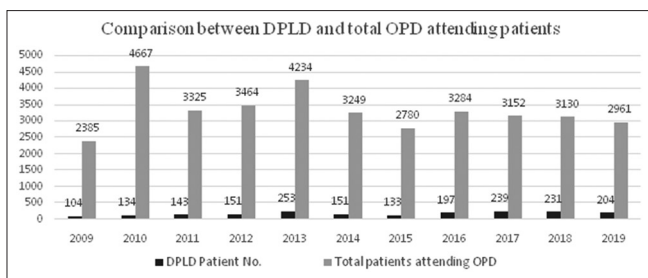
A look at the month-wise attendance of DPLD shows two distinct peaks in the months of December-January and in April-May both in the number and percentage of clinic attendance of new DPLD patients. There are also two clear dips in months of February and September [Figure 3]. The increment in the months of December-January has been consistent from the beginning but that of April-May have been obvious and increasingly noteworthy from 2013 onward [Figure 3].

## DISCUSSION

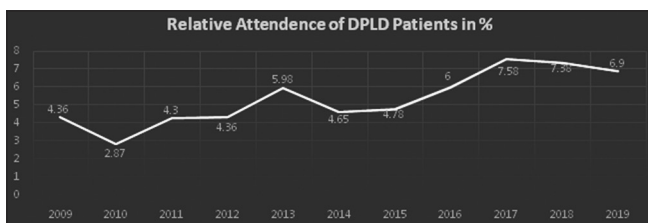
This single-center observation reveals two important facts as (a) there has been a rising trend of attendance of new DPLD patients attending the referral respiratory outpatient clinic [Figure 1 and 2], and (b) that DPLD attendance to a specialist in our part of the world has a seasonal variation [Figure 3]. The clear trend of increment in both the absolute number and the relative percentage of attendance of patients with DPLD has been obvious. The relative percentage in attendance has risen from 4.3% in 2009 to 6.9% in 2019 making it a 1.60-fold rise from the 1<sup>st</sup> to the last year under consideration. If one takes the minimum (2.67% in 2010) to maximum (7.58% in 2017) percentage in attendance, the change has been far more marked as 2.84-fold increase [Figure 2].

Another interesting facet of the observation is that the DPLD attendance-percentage shows clear seasonal variations. The lowest attendance is observed in the month of February and September while the highest attendance has been observed in the months of April-May and December-January. The first peak is discernible from 2013 onward, while the winter peak is far more consistent from the beginning. There are also two dips in months of February and September.

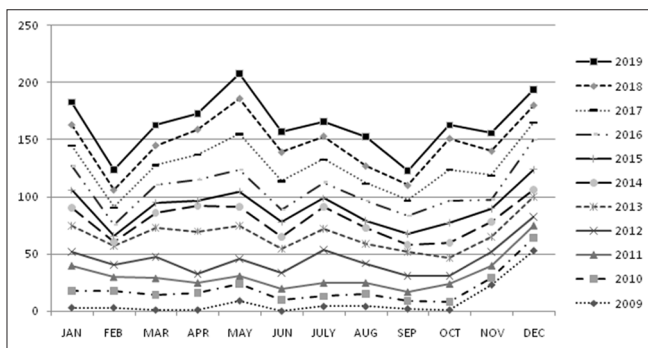
The rising trend in outpatient attendance raises the relevant question whether the change observed is really reflective of an increasing incidence and prevalence of DPLD. Clearly, we do not have categorical answer to it. We



**Figure 1:** Outpatient attendance of diffuse parenchymal lung disease patients over years from 2009 to 2019: the shaded bars show the total number of patients and the dark bar represent the diffuse parenchymal lung disease patients month by month for last 11 years



**Figure 2:** The relative status of diffuse parenchymal lung disease-patients as out-patient attendance in last 11 years



**Figure 3:** The trend of month-wise change in numbers of diffuse parenchymal lung disease-patients attending the out-patient clinic

can merely argue that the patients have been seen at the clinic in a fixed protocol of functioning that started years before the initiation of the recording, and the patients have been diagnosed in the same fashion over the years. It is also unlikely for the consultant to have a lower threshold for suspicion of DPLD in the initial years.

The consultant concerned has been practicing as a general pulmonologist all along, and we have included all the confirmed new cases of DPLD without any etiological elaborations. Since the basic diagnostic workup remained unchanged for years, it can be presumed that the diagnosis of DPLD has been uniformly accomplished. Clearly, periodic epidemiological studies are required to reach an answer regarding the rise in prevalence and such data are scanty even in the developed countries. The prevalence of the disease is in rise globally. A likely increase in prevalence has been observed over a decade from 1984 to 1994 in the USA,<sup>[12]</sup> and a consistent and progressive increment in the global prevalence of DPLD is recently published.<sup>[8]</sup> In India,

the ambient air pollution has been found to increase the risk of development of HP, the most commonest etiology of DPLD in ILD-India registry.<sup>[13]</sup> Therefore, increasing pollution level over the recent decades could have been causal for the upsurge infrequency of DPLD in our record.

The other revelation of a consistent seasonality in attendance over years is intriguing and, to our knowledge and enquiry, not been documented so far. There are several possible explanations for this seasonality. First, several environmental exposures may act as potential triggers for the initiation and development of DPLD or even for DPLD exacerbations. Thus, it is possible that the seasonality in the prevalence and exacerbation of DPLD may reflect the seasonal variation in the presence in our clinic. Sarcoidosis and hypersensitivity pneumonitis can have seasonal variations in prevalence. For sarcoidosis, the seasonal difference could be from excess Vitamin D<sub>3</sub> synthesis in summer months.<sup>[14]</sup> The secreted 1-alpha-hydroxylase from the sarcoid granulomas is responsible for the increases conversion of 25-hydroxy-Vitamin D<sub>3</sub> to 1-25-dihydroxy-Vitamin D<sub>3</sub> to result in hypercalcemia that makes patients to seek medical attention. Both 1,25-dihydroxy-Vitamin D<sub>3n</sub> and serum calcium levels are found elevated in the summer time in sarcoid-patients.<sup>[14]</sup>

For hypersensitivity pneumonitis, the major etiology of DPLD in ILD-India registry, the risk has been increased in users of forced air heating or air conditioning through the use of air coolers and air conditioners.<sup>[15]</sup> There has been an increased odd for the user of air coolers and air conditioners in a multivariate analysis in the development of HP in India; the odds ratios 2.23 ( $P < 0.001$ ), and 1.45, ( $P < 0.05$ ) for has been conditioners and air-coolers, respectively<sup>[16]</sup> Forced air heating or air-conditioning systems were detected to result in HP as early as 1976.<sup>[17]</sup> The use of air coolers and conditioners are mostly done in the summer months that correspond to the peak in May, the hottest month across the country. The mechanism could be that they lead to focal spread of fungal spores and other different microbes in closed rooms. The exposure to this increased concentration of organic antigens can lead to the development or exacerbation of hypersensitivity pneumonitis from different etiologies. The increasing trend of DPLD attendance to us in the summer months is obvious in the past 7 years (from 2013 onward) the cause of which can be a matter of guess for anyone. It may have developed from some possible change in the home environment and possibly increasing use of the air-cooling systems in the community. The conjecture, though attractive needs field research to be substantiated. On the other hand, the winter peak is clearly consistent over the years. It is possible that households having relatively closed environments in the winter months with or without air heating might have allowed certain preconditions (like abundance of different microbes and fungi) for the development of the disease. This issue of seasonality demands research to understand not only the reasons for the trend but also the answers for its prevention. In ILD-India registry, aspergillus antigen-induced HP has

been mentioned as a cause and again it may be related to the use of air coolers and conditioners.<sup>[17]</sup> Since India harbors HP and sarcoidosis as constituting roughly 60% of the etiology of its DPLD as per the ILD registry,<sup>[4]</sup> the likely predominance of these two conditions in our patients could be contributing to the seasonal variation. Unfortunately, we have no idea of seasonal variation of sarcoidosis and HP in India. Unfortunately, again, we do not have details of the etiological diagnosis of the patients to substantiate the conjecture. Incidentally, the seasonal variation in the mortality of ILD has also been observed.<sup>[18]</sup> Theoretically, it is also possible that seasonal variation of exacerbation of DPLD might have played a role to influence the outpatients attendance. There has been no publication to our knowledge regarding the seasonal difference of exacerbation rate of ILD. This area also needs to be investigated. Finally, our data are reflective of a local phenomenon; it will be unwise to generalize it for the subcontinent as whole without similar evidence from other parts of the country.

## CONCLUSIONS

Increasing attendance of DPLD patients with a clear seasonal pattern in eastern India needs attention and demands further scientific investigations.

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## Conflicts of interest

There are no conflicts of interest.

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