



CORRELATION OF D-DIMER LEVEL WITH THE PRESENCE AND SEVERITY OF PULMONARY EMBOLISM ON COMPUTED TOMOGRAPHY PULMONARY ANGIOGRAPHY

Cardiology

Mantavya Patel*	PG Resident, Dept. Of General Medicine, Geetanajali Medical College and Hospital, Udaipur, India, 313002. *Corresponding Author
Sanjay Paliwal	Professor, Dept. Of General Medicine, Geetanajali Medical College and Hospital, Udaipur, India, 313002.
Rachit Saxena	PG Resident, Dept. Of General Medicine, Geetanajali Medical College and Hospital, Udaipur, India, 313002.

ABSTRACT

Introduction: Early diagnosis of pulmonary embolism can reduce morbidity and motility. D-dimer is well known parameter having high negative prediction value. This study focused on role of D-dimer in early prediction of presence and severity of pulmonary embolism.

Material and Methods: Thirty patients with clinical suspicion of pulmonary embolism along with high D-dimer value were included in this study. All selected patients underwent computed tomography pulmonary angiography assessment. D-dimer value was correlated with presence and proximity of pulmonary embolism.

Results: Out of thirty selected patients 50% had pulmonary embolism on computed tomography pulmonary angiography assessment. D-dimer value correlated well with presence and proximity of pulmonary embolism.

Conclusion: D-dimer value more than 4000 ng/ml had high positive prediction value (79%) in suspected clinical cases. Value more than 8000 ng/ml further improve value to nearly 100% in suspected cases.

KEYWORDS

Pulmonary embolism, Computed Tomography Pulmonary Angiography, D-dimer.

INTRODUCTION AND BACKGROUND

Acute venous thromboembolism has incidence of 1–2 cases per 1,000 persons per year in the general population. 1-4A cute Pulmonary Embolism (APE) is one of its entity with potentially high morbidity and mortality with an incidence of 0.6–0.7 per 1,000 persons per year. 1,3 The mortality rate of APE ranges from 1% to up to 30%. D-dimer is a fibrin degradation fragment that is released endogenously through fibrinolysis. D-dimer is well known parameter for its high

to New York Heart Association (NYHA) Functional Classification.⁵ D-dimer values were correlated with presence, location of pulmonary embolism and grading of shortness of breath. Statistical analysis was done.

RESULTS

Thirty patients with suspicion of pulmonary embolism had raised D-dimer (>250 ng/ml), participated in this study. Male female ratio was nearly 1:2.3. Age ranges from 34 years to 81 years. Twenty patients were Hindu with male female ratio nearly 1:2. Ten patients were Muslims with male female ratio 1:4 (Table 1).

After CT pulmonary angiography assessment of thirty patients with suspicion of pulmonary embolism along with raised D-dimer, it was found that 15 patients had no pulmonary embolism and 15 patients had pulmonary

Table 1: Age, sex, religion wise distribution of study population

Age groups	Male		Female	
	Hindu	Muslim	Hindu	Muslim
30-39	1	1	1	
40-49			4	1
50-59	2	1	2	
60-69	3		2	4
70-79	1	1	2	2
>80	2			
Total	7	2	13	8

negative predictive value in excluding the presence of Pulmonary Embolism (PE). There can be other useful aspects of D-dimer. Our study investigated the correlation between the concentration of D-dimer and the presence and severity of PE.

MATERIAL AND METHODS

Study type- This study was descriptive type of observational study.

Duration- The study was conducted between 1st January to 31st May, 2020 at General Medicine department of Geetanajali Medical College and Hospital, Udaipur.

• **INCLUSION CRITERIA:** All suspected case of pulmonary embolism based on presenting signs and symptoms like sudden shortness of breath, laboured breathing, coughing, haemoptysis, tachypnoea, tachycardia not explained by other systemic diseases along with raised D-dimer value (>250 ng/ml).

• **Exclusion Criteria: Patients refused for consent.**

Approach: Individuals suspected for pulmonary embolism along with raised D-dimer value as per inclusion criteria included in current study. Written consent was taken from all the individuals. Detailed history was obtained and clinical examination was done. CT pulmonary angiography assessment of all selected individual was done. D-dimer level was determined by rapid automated quantitative latex-based immune agglutination assay. Shortness of breath was graded according

Table 2: Distribution of D-dimer values according to presence and proximity of pulmonary embolism

D- dimer value (ng/ ml)	Pulmonary embolism (No. of cases)	
	Absent	Sub Segmental segmental
250-1999	8	0
2000-3999	3	0
4000-5999	2	2
6000-7999	2	4
8000-9999	0	0
≥10000	0	0
Total	15	6

embolism with male female ratio of 1:2. Among 15 patients of confirmed pulmonary embolism 6 patients had sub segmental pulmonary embolism (distal) and 9 patients had segmental pulmonary embolism (proximal). Mean D-dimer value of study population was 5163 ng/ml. After CT pulmonary angiography assessments mean D-dimer value of patients with absent pulmonary embolism, sub segmental pulmonary embolism, segmental pulmonary embolism was 2500, 5913, 9100 ng/ml respectively. No patient had pulmonary embolism on CT pulmonary angiography assessment with D-dimer value less than 4000 ng/ml. Among patients (n=13) with D-dimer value 4000 to 7999 ng/ml, 31% (n=4) patients had absent pulmonary embolism, 46% (n=6) patients had sub segmental embolism and 23% (n=3) patients had segmental embolism. Among patients (n=6) with D-dimer value equal or more than 8000 ng/ml all patients (100%) had segmental embolism.

These results showed that D-dimer value equal and more than 4000 had high positive prediction value (79%) of presence of pulmonary

embolism. D-dimer value also correlated well with proximity and size of pulmonary embolism. (Table 2)

Among patients (n=15) with confirmed pulmonary embolism on CT pulmonary angiography 3 patients were having NYHA class III symptoms and 12 had NYHA class IV symptoms. Among 3 patients with NYHA class III symptoms all (100%) had segmental (proximal) embolism with mean D-dimer value 8067 ng/ml. Among 12 patients with NYHA class IV symptoms 7 (58.3%) had sub segmental (distal) embolism with mean D-dimer value of 5069 ng/ml and 5 (41.7%) had segmental (proximal) embolism with mean D-dimer value of 10260 ng/ml.

Table 3: Correlation of NYHA class with presence and proximity of pulmonary embolism along with mean D-dimer values

Pulmonary embolism				
NYHA class	N	Without	Sub- segmental	Segmental
I	0	0	0	0
II	0	0	0	0
III	9	6	0	3 (8067)
IV	21	9	7 (5069)	5 (10260)

Mean D-dimer value ng/ml in parenthesis

Thus all (n=7) sub segmental (distal) embolism cases had NYHA class symptoms on the contrary all (n=3) NYHA class patients had segmental (proximal) embolism with tendency of raised D- dimer value with proximity of embolism. These results showed that proximity of embolism as well as D-dimer values did not correlate with severity of symptoms (Table 3).

DISCUSSION

In current study among 15 confirmed cases of pulmonary embolism on CT pulmonary angiography assessment male female ratio was 1:2. In study by Quinn DA et al⁶ male female ratio in confirmed cases of pulmonary embolism was 3:2. According to Yousuf et al⁷ male female ratio was 6:5. Further studies are needed in same region to establish higher incidences in females.

In current study among patients with suspected pulmonary embolism along with raised D-dimer 50% had confirmed pulmonary embolism on CT pulmonary assessment showing positive predictive value of D-dimer for pulmonary embolism. Raised D-dimer value found common in unexplained dyspnoea. When D- dimer values were more than 4000 ng/ml positive prediction value improved to 79%. D-dimer value more than 8000 ng/ ml had 100% prediction value for pulmonary embolism in current study. According to Yousuf et al⁷ positive prediction value of D-dimer was 67.7% and in patients with high clinical suspicion positive prediction value was 100% for pulmonary embolism. Few studies had reverse results like according to Chopra et al⁸ positive prediction value of D-dimer was only 4.2 %. According to Vicente Gomez V et al⁹ only 40% patients had pulmonary embolism among patients with D- dimer value more than 8000 ng/ml.

In current study D-dimer value also correlate well with proximity and size of pulmonary embolism but not correlate well with symptoms (NYHA class). According to Coskun et al¹⁰ D-dimer value correlate well with massive pulmonary embolism. Blamoun J et al¹¹ also supported this results and showed D- dimer concentration value correlate well with severity of pulmonary embolism.

CONCLUSION

Although D-dimer value is not gold standard diagnostic test for pulmonary embolism but cut off value of more than 4000 ng/ml can give good positive prediction of pulmonary embolism in suspected cases. D- dimer value also correlate well with size and proximity of pulmonary embolism that can help to assess outcome.

REFERENCES

1. Bělohávek J, Dytrych V, Linhart A. Pulmonary embolism, part I: Epidemiology, risk factors and risk stratification, pathophysiology, clinical presentation, diagnosis and nonthrombotic pulmonary embolism. *Exp Clin Cardiol* 2013; 18:129-38.
2. Cohen AT, Agnelli G, Anderson FA, et al. Venous thromboembolism (VTE) in Europe. The number of VTE events and associated morbidity and mortality. *Thromb Haemost* 2007; 98:756-64.
3. Oger E. Incidence of venous thromboembolism: a community-based study in Western France. EPI-GETBP Study Group. Groupe d'Etude de la Thrombose de Bretagne Occidentale. *Thromb Haemost* 2000; 83:657-60.
4. Spencer FA, Emery C, Lessard D, et al. The Worcester Venous Thromboembolism study: a population based study of the clinical epidemiology of venous

thromboembolism. *J Gen Intern Med* 2006; 21:722-7.

5. The Criteria Committee of the New York Heart Association. Nomenclature and Criteria for Diagnosis of Diseases of the Heart and Great Vessels. Boston: Little, Brown & Co.1994; 9:253-256.
6. Quinn DA, Fogel RB, Smith CD, Laposata M, Thompson BT, Johnson SM, Waltman AC, Hales CA. D-Dimers in the diagnosis of pulmonary embolism. *Am J Respir Crit Care Med* 1999; 159:1445-1449.
7. Abdel Rahem I, Youssif et al. Diagnostic accuracy of D-dimer assay in suspected pulmonary embolism. *Egyptian Journal of Chest Diseases and Tuberculosis* 2014; 63:411-417.
8. Chopra N, Doddareddy P, Grewal H, Kumar PC. An elevated D-dimer value: a burden on our patients and hospitals. *International Journal of General Medicine* 2012; 5:87-92. doi:10.2147/IJGM.S25027.
9. Vicente Gomez V, de Miguel-Diez J, Portillo AK, Nieto R, Garcia L, et al. D-Dimer Specificity for the Diagnosis of Acute Symptomatic Pulmonary Embolism. *J Hematol Thrombo Dis* 2014; 2:177. doi:10.4172/2329-8790.1000177 P.
10. Coskun F, Yilmaz D, Ursavas A, Uzaslan E, Ege E. Relationship between disease severity and D-dimer levels measured with two different methods in pulmonary embolism patients. *Multidisciplinary Respiratory Medicine* 2010; 5:168-172.
11. Blamoun J, Alfakir M, Sedfawy AI, Moammar MQ, Maroules M, Khan MA, DeBari VA. The association of D-dimer levels with clinical outcomes in patients presenting with acute pulmonary embolism. *Lab Hematol* 2009; 15:4-9.