



Research Article

Prevalence and Clinical Characteristics of Autopsy-confirmed Fatal Pulmonary Thromboembolism in a Tertiary Healthcare Center: A Retrospective Study

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ABSTRACT

Objective: A catastrophic consequence of venous thromboembolism is pulmonary embolism. Autopsy remains invaluable and is the gold standard method of ascertaining cause of death due to pulmonary. The aim of this study is to determine the prevalence and clinical characteristics of fatal pulmonary embolism in a retrospective autopsy-based study.

Method: This is a seven-year (January 2010 to December 2016) retrospective study of all autopsy cases in which deaths were caused by pulmonary embolism following a deep vein thrombosis. Data retrieved were analysed using the SPSS software version 20. Figures were presented in tables, percentiles and bar charts. Chi square was used to test for level of significance and p value <0.05 was considered to be statistically significant.

Results: A total of 82 cases of fatal pulmonary embolism were seen out of 6150 autopsies giving a prevalence of 1.3%. The age ranged from 7 to 84 years, mean age 52 ±16 years with male to female ratio 1:1. Pulmonary embolism was commonest in the sixth decade (23.2%), followed by the fourth and fifth decades having the same frequencies (20.7%) while it was least common before the third decade. Most of the deaths were due to medical conditions (70.8%) while 29.3% represented surgical cases. 57.1% of deaths occurred within 24 hours while 28.6% died within 7 days. Only 2.4% of the patients died after 28 days. Approximately half of the study population had heart failure from hypertension as the underlying illness, while those who had prolonged immobilization due to fractures from road traffic accident (RTA) accounted for 17.1%.

Conclusion: This study revealed very low prevalence with pulmonary embolism in our environment. The most common age at presentation was the 6th decade of life. Heart failure secondary to hypertension was the major underlying factor and most of the deaths due to thromboembolism occurred within 24 hours.

INTRODUCTION

Venous thromboembolism is a significant cause of morbidity and mortality in both surgical and non-surgical conditions.[1-2] A catastrophic consequence is pulmonary embolism which usually accounts for approximately 10% of deaths of all hospitalized patients.[3] The American College of Chest Physician guidelines for venous thromboembolism recommended prophylactic treatment for surgical and medical conditions. Such conditions include congestive heart failure (CHF), severe sepsis, bed-ridden patients, patients with cancer and severe neurological conditions. Other conditions include severe respiratory distress and previous episodes of venous thromboembolism and inflammatory bowel disease.[4] Despite the administration of prophylaxis in some of these high risk patients, the diagnosis of pulmonary embolism usually presents as a clinical challenge [5-6] and recent studies have revealed it as one of the most frequently missed ante-mortem diagnosis.[7-9] Autopsy

remains invaluable and is the gold standard method of ascertaining cause of death due to pulmonary embolism. This is achieved by a demonstration of large coiled thromboemboli in the pulmonary trunk or its major branches. Seldomly, dissection of the segmental or lobar branches will reveal smaller emboli.[10] Regrettably, due to the low autopsy rate in most centres in Nigeria and Africa at large, the autopsy data regarding pulmonary embolism has been extremely low.

The aim of this study is to determine the prevalence and clinical characteristics of fatal pulmonary embolism in a retrospective autopsy-based study.

MATERIALS AND METHOD

This is a seven-year (January 2010 to December 2016) retrospective study of all autopsy cases in which deaths were caused by pulmonary embolism following a deep vein thrombosis. The autopsies were conducted in the Department of Pathology and Forensic Medicine, Lagos State University

Teaching Hospital, Ikeja, Lagos, Nigeria. This department conducts autopsy services for the teaching hospital as well as coroner's autopsy for the entire State. In addition, bodies from neighbouring states are also brought for post mortem examination.

The standard routine autopsy and dissection methods were followed during these autopsies. Calf veins were dissected in each case to confirm the presence of deep vein thrombosis. Fatal pulmonary embolism was taken as an embolism occluding the proximal pulmonary arteries and determined by pathologist performing the autopsy that pulmonary embolism had largely contributed to death. Small pulmonary emboli in distal branches of the artery were not considered to be fatal. The autopsy reports of these cases were retrieved and other clinical information were extracted. Clinical evidence of accompanying illness such as diabetes mellitus and hypertension was also retrieved from the clinical notes.

The data retrieved were analysed using the Statistical Package for Social Science (SPSS) Software version 20. These were presented in tables, percentiles, and bar charts. Chi square was used to test for level of significance and p value of <0.05 was considered to be statistically significant.

RESULT

The total number of deaths in the hospital was 16,528 with 6150 autopsies giving an autopsy rate of 39.3% for the study period. A total of 82 cases of fatal pulmonary embolism were seen out of 6150 autopsies thus giving a prevalence of 1.3%. The age ranged from 7 to 84 years with mean age of 52 ± 16 years. Males constituted 52.4% while females accounted for 47.6% with male to female ratio of 1.1:1. Pulmonary embolism was most common in the sixth decade (23.2%). This was closely followed by the fourth and fifth decades having the same frequencies (20.7%) while it was least common before the third decade. A case of a -seven year old male and another eighteen year old female were each documented. See Figures 1 and 2.

Furthermore, table 1 shows that deaths from pulmonary thromboembolism was more common in males below 30 years and adults above 50 years than those seen in females. On the other hand deaths from pulmonary thromboembolism were more common amongst females in younger adult age groups than deaths seen in males $p < 0.05$. This is statistically significant.

Figure 3 shows that the study comprised of three categories of patients namely; those who were admitted in the hospital where the study was carried out (LASUTH) constituting 51.2%; brought-in-dead (BID) accounted for 36.6% while 12.2% were referred from peripheral hospitals.

It was also observed in this study that most of the deaths from PE were due to medical conditions (70.8%) while 29.3% represented surgical cases. See Figure 4. In considering those who were hospitalized in LASUTH, most deaths occurred within 24 hours (57.1%) while approximately one-third of the patients (28.6%) died within 7 days. Only 2.4% of the patients died after 28 days. See Figure 5

Fig 6 shows approximately half of the study population had heart failure from hypertension as the underlying illness, while those who had prolonged immobilization due to fractures from road traffic accident (RTA) accounted for 17.1%. Other underlying illnesses that

contributed to deaths included sepsis, post-operative conditions and cerebrovascular accidents (CVA) accounting for 14.6%, 12.2% and 7.3% respectively.

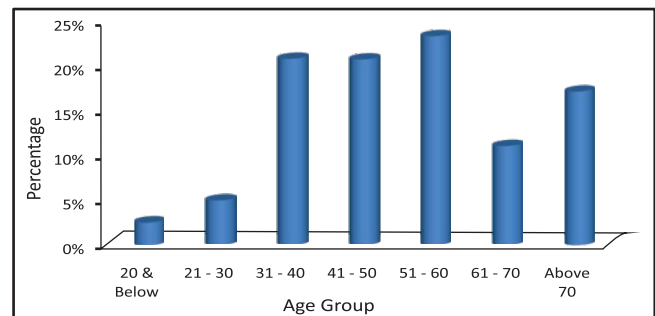


Figure 1: Age Group distribution

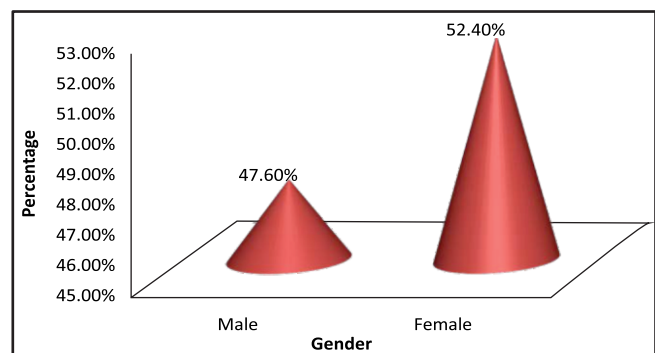


Figure 2: Gender distribution

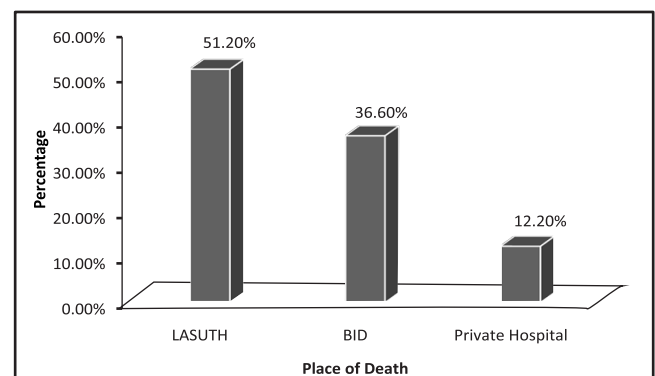


Figure 3: Place of death

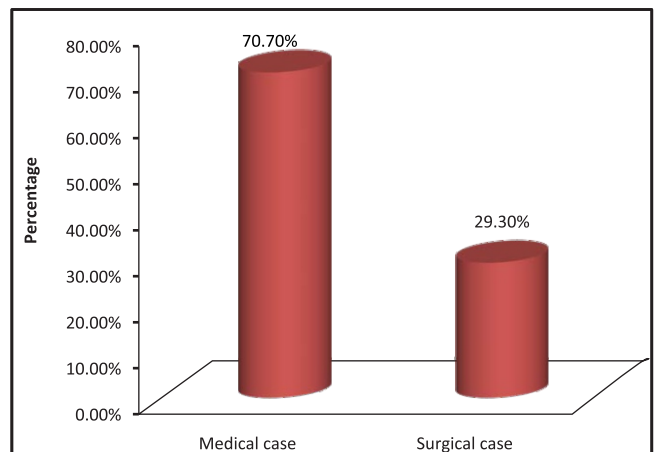


Figure 4: Type of cases causing thromboembolism

Table 1: Age distribution within gender (n = 82, P = 0.007)

Gender	20 & Below	21 - 30	31 - 40	41 - 50	51 - 60	61 - 70	Above 70
Male	1 (50.0%)	3 (75.0%)	2 (11.8%)	6 (35.3%)	10 (52.6%)	6 (66.7%)	11 (78.6%)
Female	1 (50.0%)	1 (25.0%)	15 (88.2%)	11 (64.7%)	9 (47.4%)	3 (33.3%)	3 (21.4%)
%Total (n)	2 (2.4%)	4 (4.9%)	17 (20.7%)	17 (20.7%)	19 (23.2%)	9 (11.0%)	14 (17.1%)

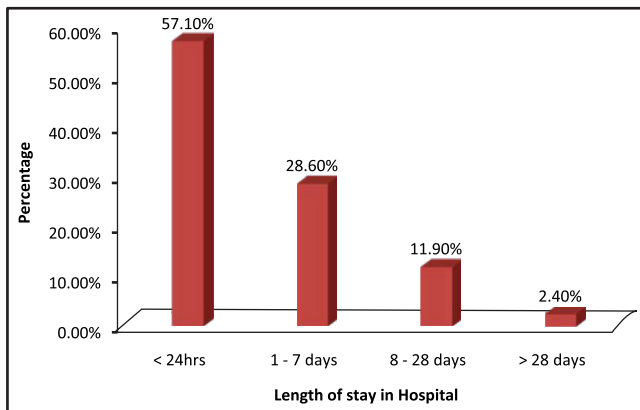


Figure 5: Length of hospitalization (for those who died in LASUTH)

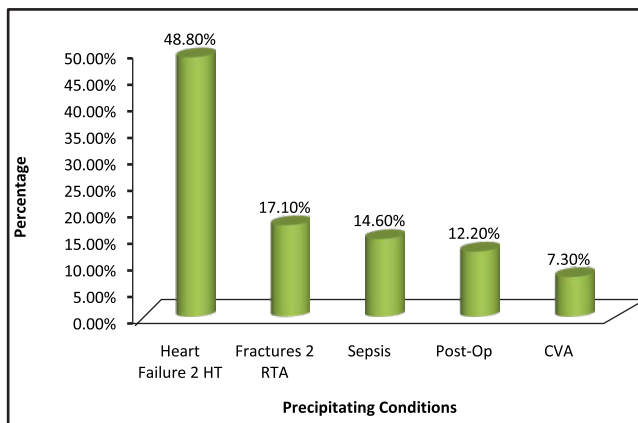


Figure 6: Precipitating conditions

DISCUSSION

Pulmonary embolism is an important cause of mortality among in-patients due to the fact that most cases could be missed clinically.[7-9] Although, some research works had been done on the prevalence of pulmonary embolism in the western countries, only very few had however been done in Africa and particularly in Nigeria. Due to the sustained high rate of missed clinical diagnosis, autopsy is the gold standard for determining the cause of death.[7-9]

In this study, the prevalence of pulmonary embolism was 1.3%. This is very close to the findings of a related 10 years study by Kane *et al.* in Senegal which reported a prevalence of 1.9%.[11] An earlier study done in Ibadan, South West Nigeria about 25 years ago[12] revealed a prevalence of 3.8% and a mean age of 47 years. Although the mean age of this present study (52 years) is fairly close to the study in Ibadan, a lower prevalence was observed in ours. This could be attributed to the greater use of prophylactic anticoagulants and the high index of clinical suspicion advocated for by the previous authors.[11-12] Similar

reduction in prevalence was demonstrated by Cohen *et al* in from 6.1% to 2.1% attributable to thrombo- prophylactic measures.[13] In the same vein, Steiner *et al.* demonstrated a reduction in the prevalence over a period of 45 years. (1960-2005) from 19.2% to 16.2%.[14]

It is no longer controvertible that most cases of pulmonary embolism are caused by deep vein thrombosis. The works of Sandler *et al.* in Royal Hallamshire Hospital, Sheffield, reported a prevalence of pulmonary embolism as high as 10% about 28 years ago in which DVT was present in 83% of patients who had a fatal PE.[3] This high prevalence was very close to the observation of Pineda *et al.* (9.1%).[15] The works of Baglin *et al.* (2%), Rubinstein *et al.* (3.4%) and Golin *et al.* in Sao Paulo (4.7%) have however, reported a low prevalence.[16-18] The relatively low autopsy rates in the latter studies could be responsible for the low incidence.

Various studies have reported that the incidence pulmonary embolism is also associated with increasing age. Patients who are older than 40 years have higher incidence than younger patients and that the incidence is doubled for each 10-year increase in age.[19-20,21]

In this current study, pulmonary embolism was most common in the 6th decade (52 ± 16 years). Males constituted 52.4% while females accounted for 47.6%. This is far lower to the 72 years reported by Sandler *et al.*[3] and Alikhan *et al.*[22] in a 10- year study with over 80% greater than 60 years (mean age 72 ± 14 years) and a slightly higher female to male ratio. Alikhan *et al.* also reported no deaths in patients below 18 years. This is in agreement with this present study which identified only two deaths in patients below 20 years. A case of a seven-year old male and another eighteen-year old female were each documented. This is further corroborated by Rajpurkar *et al.*[23] who revealed the rarity of PE in children. Recent study has however revealed pulmonary embolism in children to be on the increase.[24] Awotedu *et al.* showed a similar male predominance.[12]

We have also observed that not all the patients in this study were hospitalized. Approximately half (63.4%) were patients on admission, while 36.6% were brought-in-dead (BID) or found dead at home without significant clinical information. This finding is higher than the works of Kane *et al.* in Senegal who reported 41.1% from the outside.[11] Gong *et al.* in Republic of China reported a figure of 73.2% from outside and 28.6% in the hospital.[25] This finding in China is similar to the report of a prospective study by in Seville, Spain, by Lucena *et al.*[26] which showed that 78% were those that died in transit or at home. Tardiness in clinical suspicion might likely be responsible for these high in-patients deaths in this current study. On the other hand, little use of fibrinolytic therapy in serious cases resulting in haemodynamic complications and eventual fatality could be another major reason for the high hospital deaths in our study.

Predisposing factors such as vascular endothelial damage, hypercoagulability of blood and stasis of blood are known to cause pulmonary embolism. In this present study,

the most common cause was heart failure secondary to hypertension. Other causes were fractures from road traffic accidents and sepsis. These observations are similar to previous research works that identified cardiovascular causes, trauma and infections as the underlying causes of pulmonary embolism.[18, 27-29]

The period of death after injury is rarely discussed in most studies. In this current study, 57.1% and 28.6% of deaths occurred within the first 24 hours and the within 2-7 days respectively. In going through the clinical notes, it was discovered that little or no clinical suspicion was made in those who died within 24 hours. This brings to fore the need for high index of suspicion of pulmonary embolism in those who are admitted with a working diagnosis of heart failure. Gong reported that 57.7% of deaths occurred within the first week.[25] Similarly, other research works have reported almost the same period of death although these were mainly pulmonary embolism resulting from trauma cases only[30-31] in contrast to our study which dealt with both surgical and medical cases. Advocacy for the frequent use of temporary and retrievable inferior vena cava filters in preventing pulmonary embolism during high risk situations has been established by recent studies[32-33] although migration/tilt, haematoma at site of filter insertion, ipsilateral limb deep vein thrombosis and pulmonary embolism are known complications.[34]

In conclusion, this study revealed a very low prevalence with pulmonary embolism in our environment. The most common age at presentation is the 6th decade of life. Heart failure secondary to hypertension was the major underlying factor and most of the deaths due to thromboembolism deaths occurred within 24 hours.

LIMITATIONS

The autopsy rate in this study was 39.3% with a prevalence rate of 1.3%. There is a possibility of dealing with a relatively higher prevalence rate if we had a high autopsy rate since most deaths without autopsy could have been missed.

Conflict of Interest

The authors declare no competing interests.

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