Left Ventricular Thrombus among patients undergoing Transthoracic Echocardiography in a north - western Nigerian tertiary health institution.

Saidu H.[1], Mijinyawa MS.[2], Ahmad MY.[3], Sani MU.[2]

Abstract

Objective: Left Ventricular Thrombus (LVT) is a well recognized complication of various cardiac conditions, particularly following an acute anterior myocardial infarction and in those with systolic congestive heart failure. Transthoracic echocardiography (TTE) remains the most common imaging modality to make the diagnosis of LVT. This study aims to determine the prevalence and aetiology of LVT among patients undergoing echocardiography in our centre.

Methods: We reviewed echocardiographic reports and case notes of 1012 patients aged ≥15 years, who had echocardiogram between September 2011 and August 2014 (3 years). The reports and case notes were reviewed for demographic parameters, indications for the procedure, main echocardiographic diagnoses, presence of LVT and the presence of associated thrombo-embolic complication. Mean±SD were derived for continuous variables and comparison was made using students't- test.

Results: The mean age of the 1,012 individuals studied was 41.28±16.25 years. There were 330 males and 682 females. 861(85.1%) had abnormal echocardiography out of which 79 (9.2%) had LVT. The highest prevalence of 61(77.2%) was observed in patients with Peripartum cardiomyopathy (PPCM), followed by Dilated cardiomyopathy (DCM) 10 (12.7%). Hypertensive heart disease (HHD) accounted for 4 (5.1%) while Rheumatic heart disease (RHD) and Myocardial infarction (MI) accounted for 2 (2.5%) each.

Conclusion: LVT is common among patients undergoing echocardiography with PPCM being the most common underlying aetiology, followed by DCM.

Key words: Prevalence, Aetiology, Left Ventricular Thrombus, Echocardiography.

Correspondence Author: Dr. Hadiza Saidu. E- mail: hsaidu2006@yahoo.com

[1]Department of Medicine, Bayero University / Murtala Muhammad Specialist Hospital, Kano, Nigeria.
[2]Department of Medicine, Bayero University / Aminu Kano Teaching Hospital, Kano, Nigeria.
[3]Public Health and Diagnostic institute, College of Medical Sciences, North- West University, Kano.

Ventriculaire gauche thrombus chez les patients subissant une échocardiographie transthoracique dans un nord - Nigerian établissement de santé tertiaire occidental.

Saidu H.[1], Mijinyawa MS.[2], Ahmad MY.[3], Sani MU.[2]

Resume

Objectif: Ventricular Gauche thrombus (LVT) est une complication bien connue de diverses affections cardiaques, notamment à la suite d'un infarctus du myocarde antérieure aiguë et chez ceux qui systolique insuffisance cardiaque congestive. Échocardiographie transthoracique (TTE) reste la modalité d'imagerie la plus commune pour faire le diagnostic de LVT. Cette étude vise à déterminer la prévalence et l'étiologie des LVT chez les patients subissant une échocardiographie dans notre centre.

Méthodes: Nous avons examiné les rapports échocardiographiques et les notes de cas de 1012 patients âgés ≥15 ans, qui avaient échocardiogramme entre Septembre 2011 et Août 2014 (3 ans). Les rapports et les notes de cas ont été examinés pour les paramètres démographiques, les indications relatives à la procédure, les principaux diagnostics échocardiographiques, présence de LVT et la présence de complications thrombo-emboliques associés. Moyenne ± SD ont été dérivées pour les variables continues et la comparaison a été faite en utilisant le test students't-.

Résultats: L'âge moyen des 1.012 individus étudiés était 41,28 ± 16,25 années. Il y a eu 330 hommes et 682 femmes. 861 (85,1%) avaient une échocardiographie anormale dont 79 (9,2%) avaient LVT. La plus forte prévalence de 61 (77,2%) a été observée chez les patients atteints de cardiomyopathie péripartum (CMPP), suivie par une cardiomyopathie dilatée (DCM) 10 (12,7%). Cardiopathie hypertensive (HHD) représentait 4 (5,1%), tandis que les maladies cardiaques rhumatismales (RHD) et l'infarctus du myocarde (IM) représentaient 2 (2,5% chacun).

Conclusion: LVT est fréquente chez les patients subissant une échocardiographie avec PPCM étant la étiologie sous-jacente la plus fréquente, suivie par DCM.

Mots clés: Prévalence, Étiologie, Gauche ventriculaires thrombus, échocardiographie.

Auteur correspondant: Dr. Hadiza Saidu. E- mail: hsaidu2006@yahoo.com

[1]Department of Medicine, Bayero University / Murtala Muhammad Specialist Hospital, Kano, Nigeria.
[2]Department of Medicine, Bayero University / Aminu Kano Teaching Hospital, Kano, Nigeria.
[3]Public Health and Diagnostic institute, College of Medical Sciences, North- West University, Kano.

INTRODUCTION

LVT is a frequent complication observed in patients with systolic heart failure and following acute anterior myocardial infarction (AMI) due to severely impaired left ventricular systolic function (1,2). In patients with DCM, the frequency ranged from 10 to 30%, while in patients with acute AMI, the incidence has reduced from 30 to 40% to 5 to 15% with advent of early revascularization and more aggressive anticoagulation (3, 4, 5).

Transthoracic Echocardiography remains the most common imaging modality to make a diagnosis of LVT, being the most widely available and relatively cheaper than other imaging modalities such as cardiac CT scan and MRI (6,7). In addition it has the ability to provide important ancillary information on cardiac structure and function. When images are adequate, it has a sensitivity of 90 to 95% and specificity of 85 to 90% when compared to findings at autopsy and surgery (6, 7).

The main risk of LVT remains systemic embolization, particularly to cerebral circulation. In a meta- analysis of studies performed in patients after AMI, the estimated odds ratio (OR) for the increased risk of emboli in the presence of echocardiographically demonstrated LVT was 5.45 (95% CI, 3.02 – 9.83) (8).

Characteristics of thrombi that are associated with high risk of embolization include mobility, protuberance, immaturity, filamentous nature, variable echo density with central liquefaction and irregular boarders. Studies have shown that 55% of mobile thrombi and 45% of protruding thrombi embolize compared to 10% immobile and 7% non- protruding thrombi respectively (9, 10).

Early detection and use of thrombolytics has reduced the incidence of thromboembolic complications associated with LVT (3, 4). There is paucity of data on the aetiology and prevalence of LVT in north- western Nigeria. We therefore sought to determine the aetiology and prevalence of LVT among patients undergoing echocardiography in a north – western Nigerian tertiary health institution.

METHODOLOGY

This is a retrospective study of patients' case notes and echocardiographic data of 3 years period. The echocardiographic reports of all the patients who had echocardiography between September 2011 and August 2014 were retrieved. The reports of those who had LVT and their corresponding case notes were analysed. The study was carried out at Murtala Muhammed Specialist Hospital, Kano, a tertiary health institution established in 1928 and the largest Government owned hospital in Northern Nigeria. Ethical approval was obtained from the institutions health research ethics committee.

Baseline clinical and demographic characteristics were obtained from the subjects' records in their case notes. These include: age, gender, comorbidities and indication for the echocardiogram.

Echocardiography was carried out using Toshiba HDI Machine and a 2.5 to 5.0Hz linear array transducer. All the echocardiographic diagnoses were based on standard criteria.

The diagnosis of LVT was made when a distinct echogenic mass was seen within the LV cavity (may be sessile, protruding or mobile) that was contiguous with, but acoustically distinct from the underlying endocardial surface, on multiple plane views throughout the cardiac cycle and associated with underlying global hypocontractility or regional wall motion abnormality (usually severe hypokinesis, akinesis or aneurysmal dilatation) (14,15).

Dilated Cardiomyopathy (DCM) was diagnosed when there was dilated heart chambers with normal or reduced wall thickness as well as LV systolic dysfunction with ejection fraction <40% (16).

Peripartum Cardiomyopathy (PPCM) was diagnosed based on the temporal relation of heart failure to last pregnancy and delivery as proposed in the European Society of Cardiology (ESC) working group on PPCM guidelines (17).

Hypertensive Heart Disease (HHD) was diagnosed in the presence of any or combination of the following abnormalities: LV systolic dysfunction (EF< 50%), Left Ventricular Hypertrophy (LVH) and enlarged left atrium (LA); LA diameter in women > 3.8cm and in men >4.2cm. LV geometric patterns were defined according to Ganau et al (18).

Rheumatic Heart Disease (RHD) was made using the World Heart Federation criteria (19).

Myocardial infarction was diagnosed based on the combination of documented history of chest pain that was characteristic of ischemia, typical rise in biomarkers, ECG abnormalities and segmental wall motion abnormalities (20).

DATA ANALYSIS

Data analysis was performed with SPSS version 18. Continuous variables were expressed

as mean±SD (Standard deviation) and categorical variables expressed as percentages. Differences in categorical variables were assessed by chi- square analysis. P value of ≤0.05 was considered to be significant.

RESULTS

A total of 1012 reports were analysed. Of these, 891(88.0%) had abnormal echocardiograms while 121(12.0%) had normal echocardiograms. Analysis of the abnormal echocardiograms showed that there were 307(35.0%) males and 584 (65.0%) females (ratio 1:2); and their age ranged from 15 – 90 years (mean 41.28±16.25) years. Of the abnormal echocardiograms, 79(8.7%) cases of LVT were identified. The mean age of all the subjects with LVT was 28.92±13.82 years. Most of the cases were recorded in females (68 (86.7%) while only 11(13.3%) were recorded in males. Male subjects with LVT were significantly older than females (56.33±6.50 years Vs 25.12±9.61 years, P=<0.0001).

The demographic and echocardiographic diagnoses of the subjects with and without LVT are as shown in Table1.

The highest prevalence 61(77.2%) was observed in patients with PPCM followed by DCM with a prevalence of 10 (12.7%). HHD accounted for 4(5.1%) of the LVT while RHD and MI each accounted for 2 (2.5%).

The gender based distribution of the different aetiologies of LVT is as shown in Figure 1.

The various locations of the LVT are illustrated in figure 2. Apical solitary LVTs were identified in 54 (68.3%) of the cases while multiple apical LVTs were recorded in 19 (24.1%). Coexisting left atrial thrombus was observed in 4 (5.1%) and biventricular in only 2 (2.5%) of the cases.

The mean Left ventricular end diastolic dimension (LVEDD) in subjects with LVT was 68.49±6.9 mm with 72 (91%) having LVEDD >56mm. Left ventricular ejection fraction (LVEF) of <35% was recorded in 67 (84.5%) while 62 (78.5%) had LVEF <30%.

Forty two (53.2%) of the 79 cases of LVT presented with thrombo-embolic complications and all these 42 patients were from the PPCM cohort. There were 41(97.6%) cases of stroke and 1(2.4%) case of peripheral gangrene. All patients with thrombo-embolic complications had LVEF of<35%.

DISCUSSION

We reported a prevalence rate for LVT among patients with abnormal echocardiogram over a 3 year period at Murtala Muhammad Specialist Hospital, Kano. The highest prevalence of 77.2% was recorded among patients with PPCM. This finding differs from previous reports, with LVT being most prevalent among patients with idiopathic DCM (22,23). The reason for this disparity may be explained by the high prevalence of PPCM (32.0%) we reported, most of whom presenting late, with complications. A previous report in the same locality similarly showed a higher prevalence rate of LVT of 54.6% among patients with PPCM (21). Lower prevalence rates of 12.3% in Sokoto, also North-western Nigeria, and 21.4% by Talle et al, in Maiduguri, North- eastern Nigeria were found (22,23) .Our findings therefore suggest the need to carry out studies and update findings on the demographic and clinical characteristics of patients with PPCM. The formation of thrombus in the setting of PPCM is attributed to stasis consequent upon the poor myocardial contractility as well as the hypercoagulable state of pregnancy for up to six weeks postpartum.

In the Western world however, the highest rate of LVT was reported in up to 30 – 40% of patients with acute anterior MI in the pre-thrombotic era but reduced to 5 – 15% in the thrombotic era, and DCM accounting for 10 – 30%, similar to what was obtained in our study (14,24,25,26). The prevalence of 12.7% reported in our study is lower than what was reported by Talle et al (39.29%) (23). The associated dilatation of both right and left ventricles with resultant biventricular stasis promotes thrombus formation (27). The thrombus formation is most frequently in the left followed by the right (27). We report biventricular thrombus in only 2 (2.5)% of the patients, lower than what was reported by Talle et al (4.5%) (23).

Previous studies reported increased LVEDD and low LVEF as independent predictors of LVT formation. This is also demonstrated in our study. Although HHD constituted the most common diagnosis among the cases reviewed, the prevalence of LVT was low, accounting for only 4 (5.1%). Eccentric hypertrophy was found in 40.4% while 30.6% had concentric hypertrophy. Similar to what was previously documented; all the cases of LVT occurred in those with eccentric LVH and impaired LV dysfunction (22). RHD was an uncommon cause of LVT in our study, accounting for 2 (2.5)%. This

is similar to what was obtained in previous studies (22,23). Both patients had mitral valve disease with severe chronic mitral regurgitation, with dilated LV and poorly contractile ventricles. The LVT observed in these patients is attributed to the increased LVEDD and low LVEF rather than the rheumatic aetiology. Intracardiac thrombi in setting of RHD is commonly observed in Left atrium and left atrial appendage in patients with mitral stenosis, better visualized using transeosophageal echocardiography (28).

Contrary to what was reported in the western world, myocardial infarction was also an uncommon cause of LVT with a prevalence of 2(2.5%) seen in patients with extensive anterior MI. This was lower than what was previously reported in the country (22,29). Talle et al, reported up to 28.9% of LVT among MI patients undergoing TTE in University of Maiduguri Teaching Hospital, while Sani et al, reported a prevalence of 6.7% in a teaching hospital that is located in same region(22,29). This may be explained by the low prevalence of MI (1.4%) reported at the centre (30).

We recorded more cases of MI among males reflecting high incidence of MI among males similar to what had been previously documented (22,23,24,31). LV anterolateral wall MI results in large area of wall motion abnormality, favouring stasis and resultant thrombus formation (31). A combination of wall motion abnormality, LV dilatation with reduced EF and inherent risk of thrombosis associated with the development of MI contributes to the formation of LVT (31).

Forty-two (53.2%) of the patients with LVT all of whom had PPCM, presented with thrombo-embolic complications. There were 41(97.6%) cases of stroke and 1(2.4%) case of peripheral gangrene. Talle et al however reported lower prevalence of thrombo-embolic complications of only 13.1%, of which 54.5% were cases of stroke, 36.4% peripheral gangrene and 9.1% pulmonary thrombo-embolism (23). Although reports on the factors associated with increased risk of embolism are inconsistent, characteristic associations include large thrombus size, protrusion into LV cavity, diffuse LV dilatation and impaired systolic function among others (32). Our patients presenting with thrombo-embolic complications had many of these features.

Given the high prevalence of LVT particularly in patients with PPCM and those with severe systolic dysfunction of other aetiologies, we recommend focused assessment of LVT using TTE since contrast echo is not available. This aims at early detection and prevention of complications. We also recommend early use of antithrombotic agents in these patients.

Our study has a number of limitations. Being a retrospective study, we were not able to get complete records of some patients. We were also not able to assess for the outcome of these patients. As with previous documentations, it was difficult to determine cases with preexisting asymptomatic cardiomyopathy that might have deteriorated late in pregnancy or post natal period with actual PPCM. The prevalence of LVT in our study may also be under estimated, as small and laminar thrombi may be missed as contrast echo is more sensitive. Assessment of other risk factors associated with intracardiac thrombus has also not been done.

Conclict of interest: No conflict of interest was declared.

REFERENCES

1. Asinger RW, Mikell FL, Elsperger J, Hodges M. Incidence of left ventricular thrombus after acute transmural myocardial infarction. Serial evaluation by two – dimensional echocardiography. N Engl J Med 1981; 305:295 – 302.
2. Kalra A, Jang IK. Prevalence of early left ventricular thrombus after primary coronary intervention for acute myocardial. J Thromb Thrombolysis 2000; 10: 133 – 136.
3. Greaves SC, Zhi G, Lee RT. Incidence and natural history of left ventricular thrombus following anterior wall myocardial infarction. Am J Cardiol 1997; 80: 442 – 448.
4. Nayak D, Aronow WS, Sukhija R, Mc Clung JA, Monsen CE, Belkin RN. Comparison of frequency of left ventricular thrombi in patients with anterior wall versus non – anterior wall acute myocardial infarction treated with antithrombotic and antiplatelet therapy with or without coronary revascularization. Am J Cardiol 2004; 93: 1529 – 1530.
5. Ciaccheri M, Castelli G, Cacchi F. Lack of correlation between intracavitatory thrombosis detected by cross sectional echocardiography and systemic emboli in patients with dilated cardiomyopathy. Br Heart J 1989;62: 26 – 29.
6. Visser CA, Kan G, David GK, Lie KL, Durrer D. Two dimensional echocardiography in the diagnosis of left ventricular thrombus. A prospective study of 67 patients with anatomic

validation. Chest 1983; 83: 228 – 232.
7. Cacciapuoti F, Varrichio M, D'Avino M, Gentile S, Lama D, Cotrufo M et al. Post necrotic endoventricular thrombosis. Comparative evaluation of the diagnostic reliability of two – dimensional echocardiography and cine ventriculography .G Ital Cardiol 1986; 16: 344 – 349.
8. Viatkus PT, Barnathan ES. Embolic potential, prevention and management of mural thrombus complicating anterior myocardial infarction: a meta analysis. J Am Coll Cardiol 1993; 22: 1004 – 1009.
9. Johannessen KA, Nordrenhaug JE, Von der Lippe G, Vollset SE. Risk factors for embolization in patients with left ventricular thrombi and acute myocardial infarction. Br Heart J 1988; 60: 1988 – 90.
10. Jugdutt BI, Sivaram CA, Wortman C, Trudell C, Penner P. Prospective two – dimensional echocardiographic evaluation of left ventricular thrombus and embolism after acte myocardial infarction. J Am Coll Cardiol 1989; 13: 554 – 564.
11. Sahn DJ, De Maria A, Kisslo J, Weyman A. The committee on M – mode standardization of the American Society of Echocardiography. Recommendation regarding quantitation in M – mode echocardiography measurements. Circulation 1978; 58:1072 – 1083.
12. Quininones MA, Otto CM, Stoddard M, WA Zoghbi, SF Nagueh. Reccommendation for quantification of Doppler Quatification Task force of the Nomenclature and Standards Committee of the American Society of echocardiography. J Am Soc Echocardiogr 2002; 15(2):167 – 184.
13. Ganau A, Devereux RB, Roman MJ, G de Simone, Pickering TG, Saba PS,et al: Pattern of left ventricular hypertrophy and geometry in essential hyprtension. J Am Cardiol 1992, 19: 1550 – 1558.
14. Billingsley IM and Leong – Poi H," Left ventricular thrombus: diagnosis, prevention, and management." Cardiology Rounds vol. X, no. 7, 2005.
15. Armstrong WF and Ryan T. "Masses, tumors and source of embolism." In Feigenbaum's Echocardiography, pp. Lippincott Williams& Wilkins, Philadelphia,Pa, USA, 7th edition, 2010.
16. Cardiomyopathies : Report of a WHO Expert Committee. World Health Organ Tech Rep Ser 1984; 697: 7 – 64.
17. Sliwa K, Hilfiker – Kleino D, Petrie MC. Current state of knowledge on aetiology, diagnosis, management and therapy of peripartum cardiomyopathy: a Position statement from the Heart failure Associations of the European Society of Cardiology Working Group on peripartum cardiomyopathy." European Journal of Heart failure 2010,8: 767 – 778.
18. Ganau A, Devereux RB, Roman MJ, G de Simone, Pickering TG, Saba PS, et al. Pattern of left ventricular hypertrophy ang geometry in essential hyprtension. J Am Cardiol 1992, 19: 1550 – 1558.
19. Remenyi B, Wison N, Steer A, Ferreira B, Kado J, Kumar K, et al. World Heart Federation criteria for echocardiographic diagnosis of rheumatic heart disease – an evidence – based guideline. Nature Reviews Cardiology 2012; 9: 297 – 309.
20. Armstrong WF, Ryan T. 'Echocardiography and coronary heart disease' in Feigenbarun's Echocardiography, PP 427 – 472, Lippincott Williams and Williams, Philadelphia, Pa, USA, 7th edition, 2010.
21. Karaye KM, Sani MU. Factors associated with poor prognosis among patients admitted with heart failure in a Nigerian tertiary medical center : a cross sectional study. BMC Cardiovascular Disorders, 2008; 6: 16.
22. Talle MA, Buba F, Anjorin CO. Prevalence and Aetiology of Left Ventricular Thrombus in patients undergoing Transthoracic Echocardiography at the University of Maiduguri Teaching Hospital. Advances in Medicine doi: 10.1155/ 2014/ 731936.
23. Isezuo SA, Abubakar SA. Epidemiologic profile of peripartum cardiomyopathy in a tertiary care hospital. Ethnicity and Disease 2007; 17:228 – 233.
24. Nayak D, Aronow WS, Sukhija R, McClung JA, Monsen CE, Belkin RN.Comparison of frequency of left ventricular thrombi in patients with anterior wall versus non- anterior wall myocardial infarction treated with antithrombotic and antiplatelet therapy with or with out coronary revascularization. Am J Cardiol.2004; 93:1529 – 1530.
25. Ciachei M, Castelli G, Cecchi F. Lack of correlation between intracavitatory thrombus detected by conventional echocardiographyand systemic emboli in patients with dilated cardiomyopathy. Br Heart J 1989; 62:26 – 29.
26. Gottdiener JS, Gay JA, Van Voohees L, Di Bianco R, Fletcher RD. Frequency and embolic potential of left ventricular thrombus in dilated

cardiomyopathy: assessment by 2- dimensional echocardiography. Am J Cardiol 1983; 52: 1281 – 1285.
27. Loh E, Sutton C, Wun C. Ventricular dysfunction and the risk of stroke after myocardial infarction. New England Journal of Medicine 1997; 336:251 – 257.
28. Walter BF, Gridder L, Rohr TM, Mc Laughin T, Taliercio CP, Felters J. Intracardiac thrombi: Frequency, location, aetiology and complication; a morphologic review, part IV, Clinical cardiology. 1995; 11:669 – 674.
29. Sani MU, Adamu B, Mijinyawa, Abdu A, Maiyaki MB, Borodo MM et al. Ischaemic heart disease in Aminu Kano Teaching Hospital Kano, Kano, Nigeria: A 5 year review. Nigerian Journal of Medicine. 2006; 15: 128 – 131.
30. Saidu H, Sani MU, Mijnyawa MS, Yakasai AM. Echocardiographic pattern of heart diseases in a North western Nigerian tertiary health institution Nigerian Journal of basic and clinical health sciences. 2005; 12: 39 – 42.
31. Delewi R, Zijlstra F, Piek JJ. Left ventricular thrombus formation after acute myocardial infarction. Heart. 2012; 98: 1743 – 1749.
32. Vandvik PO, Lincoff JM, Gore JM, Gutterman DD, Sonnenberg FA, Alonso – Coello P, et al. Primary and secondary prevention of Cardiovascular Disease. Antithrombotic Therapy and prevention of thrombosis, 9th ed: American College of Chest Physicians. Evidence based Clinical Practice Guidelines. Chest 2002; 141: e637s – e668s.

Table 1: Baseline characteristics and Echocardiographic diagnoses in subjects with and without LVT

Characteristic	With LVT (n=79)	Without LVT(n=891)	P=value
Age(years)	28.92±13.82	41.28±16.25	<0.001
Female	68	516	<0.001
Male	11	296	<0.001
PPCM	61	262	<0.001
DCM	10	50	<0.001
HHD	4	404	<0.001
RHD	2	45	<0.001
IHD	2	12	<0.001
PCD	-	16	-
Cor pulmonale	-	10	-
Others	-	13	-

Key: LVT, left ventricular thrombus; PPCM, peripartum cardiomyopathy; DCM, dilated cardiomyopathy; HHD, hypertensive heart disease; RHD, rheumatic heart disease; IHD, ischaemic heart disease; PCD, pericardial disease.

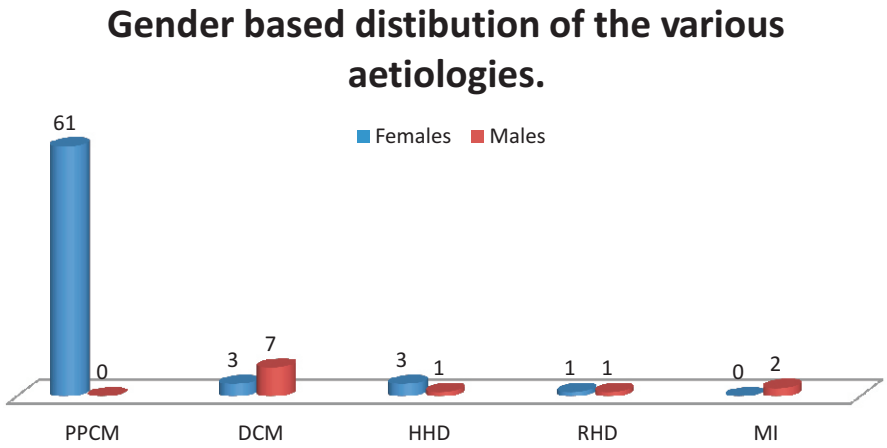

FIGURE 1: Gender based distribution of the various aetiologies of LVT.
KEY: PPCM, peripartum cardiomyopathy; DCM, dilated cardiomyopathy; HHD, hypertensive heart disease; RHD, rheumatic heart disease; MI, myocardial infarction.

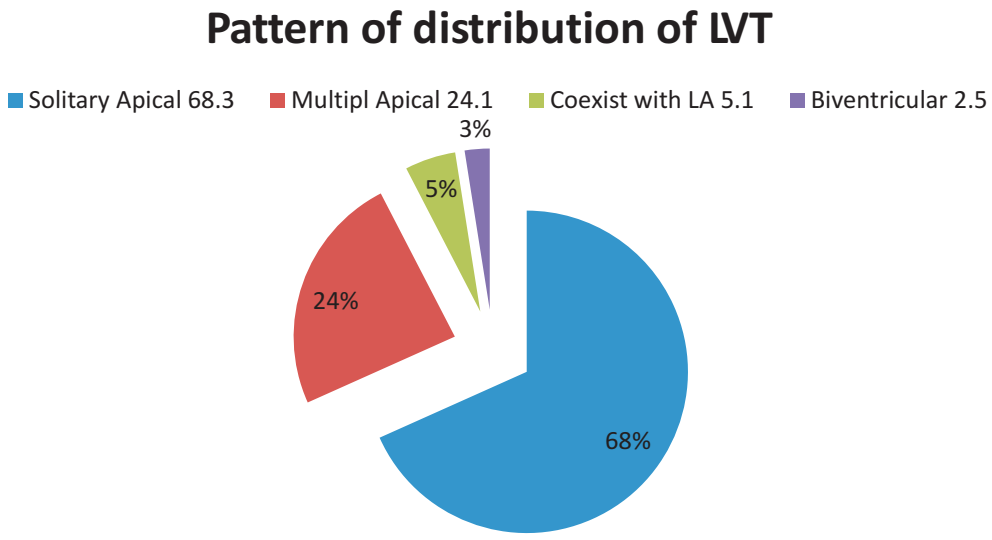

Figure 2: Pattern of distribution of LVT
KEY: LVT, left ventricular thrombus; LA, left atrium.