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Study clinical profile and echocardiographic parameters in subjects with left bundle branch block

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***Abstract*---** Background: LBBB is associated with higher risk of cardiovascular manifestations. It is an important finding that affecting diagnostic and clinical management of many patients and adversely influencing their outcomes. Clinical profile and imaging parameters can give insight into pathophysiology and progression of LBBB. Aims And Objectives: Study clinical profile and echocardiographic parameters in subjects with left bundle branch block. Material and methods: Study design: This was a single centre, cross sectional, descriptive and observational study study done on 99 patients with LBBB in a tertiary care hospital over period of 18 months from October 2019 to March 2021. Enrolled patients underwent 2D echocardiography. Statistical analysis: Appropriate statistical tests were applied using SPSS trial v21 for analysis; p-value. Result: Out of total 99 patients with LBBB majority of patients belonged to age group of 61- 70 years (35.35%). It was observed that mean age group of all patients was 65.51± 10.70. Total 50 (50.51%) were males and 49 (49.49%) patients were females. Dyspnoea (57.58%) and cardiac chest pain (49.49%) were the most frequent presenting complains. The majority of patients presented in the study were Hypertensive (52.52), followed by coronary artery disease (44.44), diabetes (37.37). Echocardiography findings of a present study revealed that about half of patients had ejection fraction less than forty percent. Left ventricular hypertrophy was the most common finding and was present in three fourth of the study population with LBBB. Regional

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wall motion abnormality was present in one fifth of the patients and pulmonary hypertension was present in one fourth of the patients with LBBB.

***Keywords*---**LBBB, Hypertension, Diabetes Mellitus, 2D Echo, Left Ventricular Hypertrophy, Ejection Fraction.

Introduction

Atherosclerotic cardiovascular disease associated deaths were about one third of total mortality; among them 4/5th were in developing countries.[1] Average age-standardized death rate in India contributing to cardiovascular disease is much higher than rate of global deaths.[2]Acute myocardial infarction (AMI) is a grave clinical condition and remains a leading cause of mortality all over the world. Various types of conduction blocks develop following AMI and are associated with increased mortality rate.[3] Complete left bundle branch block (LBBB)is a dromotropic disorder that causing sequential biventricular activation with a consequent delay of the electrical activation between the septum and lateral wall of the left ventricle. [4,5].LBBB commonly appears in patients with underlying heart disease. Even among the patients, LBBB is associated with higher-than-normal risk of cardiovascular disease.[6] Clinical and diagnostic notion about LBBB phenomenon had evolved from just and electrocardiographic pattern to a critically important finding that affecting diagnostic and clinical management of many patients and adversely influencing their outcomes.[7] A major impact of LBBB lies in masking or simulating other electrocardiographic patterns.[6] Recent advances in imaging techniques significantly improved assessment of patients with LBBB and provide additional information into pathophysiological mechanisms of left ventricular remodelling.[8] The more pronounced the dyssyncrony the more the mortality in individuals with heart failure.[9] In older patients, LBBB indicates underlying progressive degenerative disease of ventricular myocardium.[10] An increasing number of papers, mostly based on epidemiology, have shown a strong association between LBBB (left bundle branch block) and cardiovascular disease, more specifically hypertension, cardiomegaly, coronary artery disease and heart failure. LBBB have also been associated with more complications and deterioration for cardiovascular disease than RBBB [11,12] The prevalence of LBBB in patients attending hospitals and various aetiologies of LBBB has not been studied previously. [13] Therefore, the present study was conducted to investigate cardiac features associated with LBBB patients and its correlation between echocardiography.

Material and Methods

Aim and objectives: Study clinical profile and echocardiographic parameters in subjects with left bundle branch block. *Study design:* This was a single centre hospital-based cross-sectional, observational, descriptive study done on patients diagnosed woith LBBB. This study was conducted in KIMS Hospital, Medicine department over period of 18 months. *Study sample:* The study was conducted in 99 patients presenting with metabolic syndrome in a tertiary care hospital. *Study setting:* This study was conducted in KIMS Hospital, over period of eighteen

months from October 2019 to March 2021. The Institutional Ethical committee approval was taken (IEC protocol number: 224/2019-2020). *Inclusion criteria:* Patients with ECG changes showing complete LBBB which is indicated by QRS duration of more than 120 ms.Parameters included were, clinical profile consisting of age, gender, symptoms, habits, comorbidities, ECG findings with QRS duration, P wave morphology and axis, 2 D Echocardiographic findings of Ejection fraction, Left ventricular hypertrophy, Regional wall motion abnormality, Diastolic Dysfunction, wall hypokinesia of left ventricle, pulmonary hypertension, Intraventricular septal paradox. Patients were diagnosed as LBBB if ECG criteria was met: (QRS duration of >0.12 sec, Broad monophasic 'R' waves in leads I, V_5 and V_6, Absence of Q waves in leads V_5 and V_6.) All subjects underwent resting transthoracic 2-dimensional Echocardiography. The data of clinical profile and was collected and entered into a proforma sheet made for the study. *Statistical analysis:* The statistical analysis was performed using the Statistical Package for Social Science (SSPS) trial version 21 for Windows. The mean, standard deviation and percentage were calculated for numerical (quantitative) variable. The 'p'-value of <0.05 was considered statistically significant.

Result

Out of total 99 patients with LBBB majority of patients belonged to age group of 61- 70 years (35.35%) followed by >70 years (29.29%), 51-60 years (28.28%), 41-50 years (5.05%) and <40 years (2.02%). It was observed that mean age group of all patients was 65.51± 10.70. Total 50 (50.51%) were males and 49 (49.49%) patients were females in present study population. In the present cohort of patients with LBBB, dyspnoea (57.58%) and cardiac chest pain (49.49%) were the most frequent presenting complains followed by presyncope, palpitations, dry cough, sweating. About half of the population had multiple complains. The majority of patients presented in the study were Hypertensive. Out of total 52 hypertensive patients 22 had hypertension only, 13 patients were hypertensive and coronary artery disease, 5 patients were hypertensive and diabetic, 12 patients had hypertension, diabetes and coronary artery disease. Total number of diabetic patients were 37, out of them only diabetic were 11 patients, diabetic and coronary artery disease were 10 patients. Total coronary artery disease patients were 44, out of them 17 patients were having only co morbidity of coronary artery disease. [Figure 1]

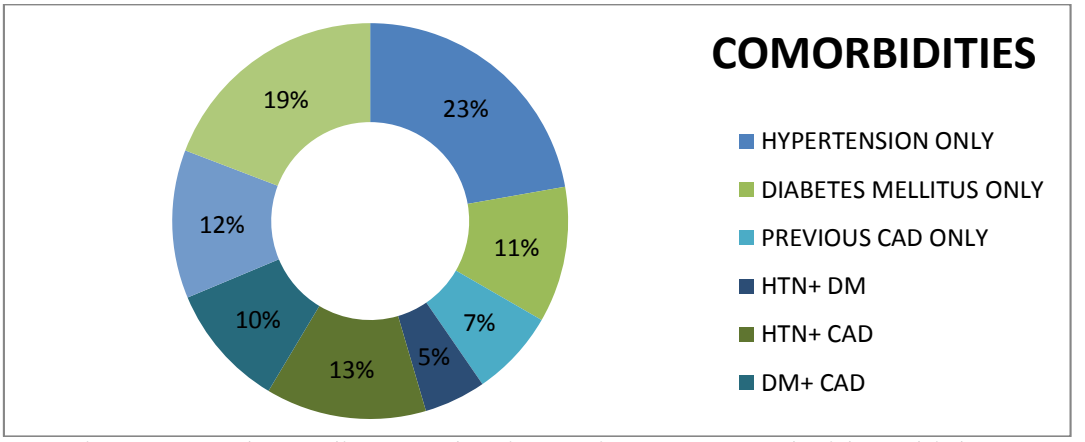

Figure 1: Sunburst diagram showing patients presented with multiple co morbidities

In the study, 27% patients were consuming tobacco (with smoke and smokeless) and 40% were consuming alcohol. Both tobacco and alcohol was consumed by 15% patients and 25% patients did not have any addiction. Total number of patients presented with aortic valve diseases are 38 (38.38%). Out of them most common presentation was aortic regurgitation (26.26%) followed by stenotic aortic valve (12.12%). Total number of patients presented with mitral valve diseases are 50 (50.51%). Out of them most common presentation was mitral regurgitation (46.46%) followed by mitral stenosis (4.04%). Total number of patients presented with tricuspid valve diseases are 20 (20.20%). Out of them most common presentation was tricuspid regurgitation (19.19%) followed by tricuspid stenosis (1.01%). The electrocardiographic profile suggestive of Left axis deviation 50.51%, Right axis deviation 9.09%, Normal axis in 40.40%. Left atrial enlargement is seen in 39.39% patients. The mean QRS duration was observed as Mean SD 145.92 msec. [Table 1]

Table 1
Distribution of patients according to *Electrocardiographic Profile*

Electrocardiographic Profile		N=99	Percent
ECG axis	LAD	50	50.51
	RAD	9	9.09
	Normal	40	40.40
Left atrial enlargement	Yes	39	39.39
	NO	60	60.61
QRS Duration	(Mean SD)	145.92	12.18

The echocardiography profile of patients presented with LBBB in this study when considering ejection fraction, most commonly patient had ejection fraction of >45% (40 patients) thereafter between 30-39% (31 patients), followed by in the range of 40-45% (21 patients). Least number of patients (7.07%) presented with ejection fraction of <30%. Other echocardiography findings were Regional wall motion abnormality (18.18%); Left Ventricular Hypertrophy (74.75%) ; Diastolic

dysfunction (60.61%) ; Wall Hypokinesia of left ventricle (44.44%), Pulmonary Hypertension (24.24%); Intraventricular septal paradox (42.42%).

The comparison between clinical profile and echocardiography profile of presented LBBB patients in the study. Clinical significant correlation is found between Ejection Fraction and Dyspnoea (0.024), Ejection Fraction and chest pain (0.031), Ejection Fraction and Tobacco (0.04), Ejection Fraction and Hypertension (0.041),Ejection Fraction and Coronary Artery Disease (0.037),Ejection Fraction and Diabetes Mellitus (0.028). With Regional Wall Motion Abnormality correlation found between RWMA and Dyspnoea (0.04), RWMA and Chest Pain (0.04),RWMA and Coronary Artery Disease (0.04). With Left Ventricular Hypertension correlation found between LVH and Age (0.02), LVH and Chest Pain (0.005),LVH and Tobacco (0.005),LVH and Coronary Artery Disease (0.02). For Pulmonary Hypertension significance found between PH and CAD (0.02). [Table 2]

Table 2
Comparison between Clinical profile and Echocardiographic profile

			EF		RWMA		LVH		DD		PH	
			>50%	<50%	Yes	No	Yes	No	Yes	No	Yes	No
			26	73	18	81	74	25	60	39	24	75
Age	>60	35	0.37		0.09		**0.02**		0.72		0.91	
	<60	64										
Gender	Male	50	0.33		0.62		0.77		0.26		0.36	
	Female	49										
Dyspnoea	Yes	57	**0.024**		**0.04**		**0.02**		0.16		0.45	
	No	42										
Chest Pain	Yes	49	**0.031**		**0.01**		**0.005**		0.1		0.62	
	No	50										
Tobacco	Yes	27	**0.04**		0.17		**0.04**		0.16		0.03	
	No	72										
Alcohol	Yes	40	0.53		0.46		0.57		0.18		0.4	
	No	59										
HTN	Yes	52	**0.041**		0.96		**0.005**		0.11		0.4	
	No	47										
CAD	Yes	44	**0.037**		**0.03**		**0.007**		0.68		**0.02**	
	No	55										
DM	Yes	37	**0.028**		0.28		0.56		0.39		0.4	
	No	62										

Discussion

In the study we have looked into the clinical profile and echocardiography parameters of patients presented with LBBB. We have evaluated total 99 patients. In the present study, mean age of patients was 65.51 ± 10.70 years and majority of them 35.35% belonged to the age group of 61 to 70 years. Majority 50.51% were males. Other studies which showed age distribution pattern in patients with LBBB suggestive of similar findings. However in the present study, no predilection for gender was seen among LBBB patients. This variation could be due to smaller

size of sample. Benjamin, B et al [13] showed that mean age was 62.7 years and 52.6% were males. Caio Assis Moura Tavareset al [14] showed that mean age was 78.4 years and 55.9% were females. PietroDelise et al (85) showed that (68%) were males and mean age at the time of discovery of LBBB was 37 ± 11 (median 40 years). Hasan Ashraf et al [15] showed that mean age was 67.5+14.4 years. 37.2% were males. Navneet Krishna Saxena et al [16] showed that majority were in age group of 10-20 years and 30-40 years.Augusto J. Lépori et al [6] showed that mean age was 68+12 years, and 57% were males. We found that in presented patients common symptoms seen were 57.58% dyspnoea, 49.49% cardiac chest pain, 9.09% presyncope, 8.08% palpitation. In a similar study of Benjamin, B et al [13] showed that 35.1% had dyspnoea, 22.8% had cardiac chest pain, 7% had angina. The results of the presenting study were consistent with the previous literature. Every patient of LBBB not necessarily experience symptoms, but in our study participants no patient found to be asymptomatic. However symptoms like presyncope, palpitations, dry cough which were present less frequently were not included in previous literature. While considering pre-existing co morbidities, common co morbidity majority 52.52% had hypertension (HTN), 37.37% had Diabetes Mellitus type 2 (DM), 44.44% had coronary artery disease (CAD). Benjamin, B et al [13] showed that 54.4% had hypertension, 17.5% had DM and 15.8% had CAD. 17.5% were tobacco chewers. Caio Assis Moura Tavareset al [14] showed that 73.5% had hypertension and 27.9% had DM and 47.1% had CAD. Hasan Ashraf et al [15] showed that 50.5% had HTN, 3.9% had DM. The study of Bhardwaj, R et al [17] showed that 48% patients with LBBB had hypertension, 23% patients had CAD.Augusto J. Lépori et al [6] showed that 85% had hypertension, 31% had DM and 62% had dyslipidaemia. We found that patients who were LBBB diagnosed, most of them were known hypertensive, but multiple co morbidities presentation were also common. These findings are consistent with previous literature.

Considering echocardiography findings, most patients were presented with valvular diseases. In presented study, on aortic valve lesions, 38.38% had total lesion, 26.26% had regurgitation, 12.12% had stenotic valve. On mitral valve lesions, 50.51% had total lesion, 46.46% had regurgitation, and 4.04% had stenosis. On tricuspid valve lesions, 20.20% had total lesion, 19.19% had regurgitation, and 1.01% had stenosis. Benjamin, B et al [13] showed that 56.17% had Concentric LVH, 10.5% had RWMA, 31.6% had mitral regurgitation, 22.8% had aortic regurgitation, 7% had aortic stenosis, 24.6% had sclerotic aortic valve, 24.5% had aortic valve disease. This finding was consistent with presented study. However, Caio Assis Moura Tavareset al [14] showed that 19.6% had aortic stenosis, 23.9% had mitral regurgitation and 8.7% aortic regurgitation. Navneet Krishna Saxena et al [16] showed that73.3% had mitral regurgitation, 10% had tricuspid regurgitation and pericardial effusion was seen in 6% of patients. In these studies, prevalence of aortic stenosis was more than that of aortic regurgitation. Augusto J. Lépori et al [6] showed that the prevalence of structural heart disease was 90%. Sixty (59%) patients presented TTE criteria of LVH.

Electrocardiographic Profile showed Left axis deviation (LAD = QRS axis ≥ −30°) among 50.51%, RAD in 9.09%. Left atrial enlargement was seen among 39.39% and mean QRS duration was 145.92+12.18. Benjamin, B et al [13] showed that mean QRS duration was 133.3ms which was less than value obtained from

presenting study, and only 15.8% patients had LAD. Also, Pietro Delise et al [18] showed that19 (34%), had a left axis deviation. Mean QRS duration was 149 ± 17 msec. In all cases, PR was normal. However, in presenting study, there is clear predominance of LAD presentation.

In the echocardiography findings, 40.40% had Ejection fraction >45, 21.21% had EF (Ejection Fraction) 40-45, 31.31% had EF 30-39 and 7.07% <30. RWMA (Regional Wall Motion Abnormality) was seen among 18.18%, LVH (Left Ventricular Hypertrophy) was seen among 25.25%, Diastolic dysfunction was present among 60.61%, Wall Hypokinesia of LV in 44.44%, 24.24% had PH (Pulmonary Hypertension) and 42.42% had Intraventricular Septal Paradox. Bhardwaj, R et al [17] showed that left ventricle systolic dysfunction was present in about 56% patients. The majority of their patients were aged 50 years or more. Caio Assis Moura Tavareset al [14] showed that mean EF was 46.5%, 46% had LAD which is similar to presenting study. Hasan Ashraf et al (86) showed that mean EF was 61.4+6.4. Navneet Krishna Saxena et al [16] showed thatmean LV ejection fraction was 30.87%. The left ventricular ejection fraction was less than 20% in 6% of patients. It was between 20-29% in 40%, between 30-39% in 35% of patients and between 40-45% in 15.2% of patients. Augusto J. Lépori et al [6] showed that the sensitivity, specificity, positive and negative predictive values of the signs for LVH diagnosis. In the presented study significance between LVH and HTN, DM, CAD were consistent with previous studies. Statistical significance was not seen for LVH and gender, LVH and alcoholic.

Table 3
Comparison of various studies with the present study

Study name	Aortic Valve Dis (%)	Mitral valve dis (%)	LVH (%)	RWMA (%)	LAD (%)	Mean QRS Duration (ms)	Mean LVEF (%)
Present study	AR:26.26 AS:12.12	MR:46.46 MS:4.04	25.25	18.18	50.51	148.35	43.36
Benjamin, B et al	-	-	56.17	10.5	15.8	133.3	-
Caio Assis Moura Tavareset al	AR:8.7 AS:19.6	MR:8.7	-	-	46	-	-
PietroDelise et al	-	-	-	-	-	149 ± 17	-
Hasan Ashraf et al	-	-	-	-	-	-	61.4±6.4
NavneetKrishna Saxena et al	-	MR: 73.3	-	-	-	-	30.87
Augusto J. Lépori et al	-	-	59	-	-	-	-
Bhardwaj, R et al	-	-	-	-	-	-	56

Study name	Mean Age (years)	Gender (%)	Dyspnoea (%)	Cardiac chest pain (%)	HTN(%)	DM(%)	CAD(%)
Present study	65.51 ± 10.70	50.51 males	57.58	49.49	52.52	37.37	44.44
Benjamin, B et al	62.7	52.6 males	35.1	22.8	54.4	17.5	15.8
Caio Assis Moura Tavareset al	78.4	55.9 females	-	-	73.5	27.9	47.1
PietroDelise et al	37 ± 11	68 males	-	-	-	-	-
Hasan Ashraf et al	67.5+14.4	37.2 males	-	-	50.5	3.9	-
NavneetKrishna Saxena et al	30-40	-	-	-	-	-	-
Augusto J. Lépori et al	68+12	57 males	-	-	85	31	-
Bhardwaj, R et al	-	-	-	-	48	23	-

Conclusion

Present study revealed that in LBBB diagnosed patients, majority of the patients had left axis deviation (LAD) on electrocardiography. In present study of patients with LBBB had dyspnoea as most common presenting complain followed by chest pain. Tobacco and alcohol consumption were present in nearly one half of patients in study population with LBBB. Hypertension and type 2 diabetes mellitus were the most frequent co-morbid condition in study population with LBBB. Echocardiography findings of a present study revealed that about half of patients had ejection fraction less than forty percent. Left ventricular hypertrophy was the most common finding and was present in three fourth of the study population with LBBB. Regional wall motion abnormality was present in one fifth of the patients and pulmonary hypertension was present in one fourth of the patients with LBBB.

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