Review Article

Lipid profile in hypertension: A meta-analysis using western countries data

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Abstract

Introduction: Cardiovascular disease (CVD) remains the leading cause of mortality and morbidity in the world **Aims and Objectives:** To Study Lipid profile in hypertensive patients by a meta-analysis using western countries data **Methodology:** This meta-analysis study involves hypertensive persons and their lipid profile in western population of 13 years i.e. from 2002 to 2015 published studies involving western population comprising 4953 hypertensive and 5014 non hypertensive population. For selecting these article various search engines like PubMed, Medline, Mendlay Library, Cochrane Library, Embase search, Google Scholar, Index Copernicus, Science Direct etc were use. The Statistical analysis was done by the Comprehensive Meta-Analysis Software (CMA Software). **Results:** It has been observed that high Cholesterol level, high Triglyceride level, high Low Density Lipoproteins level were observed in Hypertensive patients and high HDL level found in Normotensive individuals. **Conclusion:** As per the new studies in western population Hypertensive patients in Western world have a close association with dyslipidemia and need measurement of blood pressure and lipid profile at regular intervals to prevent cardiovascular disease, stroke, and other comorbidities.
Keywords: Risk factors, Cardiovascular diseases, dyslipidemia, blood pressure.

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INTRODUCTION

Cardiovascular disease (CVD) remains the leading cause of morbidity and mortality in the world[1,2]. The high prevalence of CVD is attributed to multiple modifiable cardiovascular risk factors, such as hypercholesterolemia, smoking, hypertension, diabetes, and obesity[3,4]. Many of these risk factors tend to cluster and coexist in the same individual[5–9]. Hypertension and hypercholesterolemia are the most co-prevalent of these risk factors[8,9] and are estimated to contribute to 7.1 and 4.4 million deaths per year, respectively[10]. The risks associated with concomitant hypertension and dyslipidemia are greater than the sum of the risks from hypertension or dyslipidemia alone[11,12]. Even though there are no specific cholesterol targets for hypertensive individuals, the treatment of concurrent hypercholesterolemia is a part of the integrated management of cardiovascular risk in these patients. Clinical trials have consistently demonstrated that pharmacologic treatments that lower blood pressure (BP) and cholesterol levels reduce the risk of cardiovascular events[13–16]. Based on these evidences, several clinical guidelines recommended therapeutic targets for BP and cholesterol[17,18]. Despite these recommendations, the suboptimal use of antihypertensive and lipid modifying therapies is common[19,20] contributing significantly to a low level of attainment of therapeutic targets in real world clinical practice [12,21–23].

MATERIAL AND METHODS

This is a meta-analysis involving hypertensive persons and their lipid profile in western population of 13years i.e. from 2002 to 2015 of online published studies. Journal of Clinical and Diagnostic Research[3] Of the western world population involving 4953 hypertensive

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and 5014 non hypertensive population was selected for the study. For selecting these article various search engines like PubMed, Medline, Mendlay Library, Cochrane Library, Embase search, Google Scholar, Index Copernicus, Science Direct etc. to study the Articles with Key Words like Hyperlipidemia, Hypercholesterolemia, Hypertriglyceridemia, Hypertension, Cardio vascular diseases, Lipid Profile of Hypertensives, Hypertension in Western Population. Out of 393789 articles, near about 100 studies were selected by using various filters like hypertension and hyperlipidemia and western population. These 100 studies were reviewed by a team of experts for the inclusion and exclusion of studies ; inclusion criteria like all the study patients should be hypertensive and study of lipid profile i.e. Sr. Cholesterol, Sr. Triglyceride, High Density Lipoproteins, Low Density Lipoproteins and those studies not involving lipid profile, not involving hypertensive patients etc. Lipid profile was expressed in one unit i.e. mg/dl and the values which were expressed in the mmol/L were converted to mg/dl 42. So at the end total 14 studies were selected for Meta-analysis. The Statistical analysis done by the Comprehensive Meta-Analysis Software (CMA Software). All studies having various lipid profile were compared in hypertensive and non hypertensives. Lastly the new effect size summary of each variable expressed by red Diamond in Forest plots, both models like fixed effect and random effect models were studied. The hypertensive group is expressed in Forest Plot as 'A' and non hypertensive as 'B'.

OBSERVATION AND RESULTS

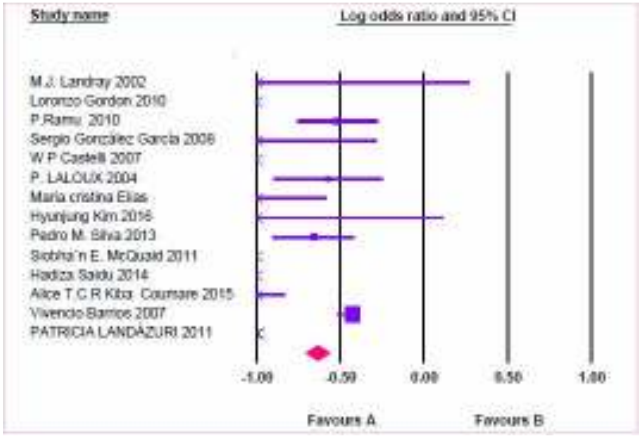

Figure 1: Forest plot showing relationship of sr. total cholesterol in hypertensive (a) and normotensive (b) western population

From Figure 1: In the effect- size analysis summary it is clear that as the Higher Total cholesterol level is found in the Hypertensive patients as compared to normotensive individuals it means high Cholesterol level favors to Hypertension (Favors A) vice versa respectively. Journal of Clinical and Diagnostic Research.

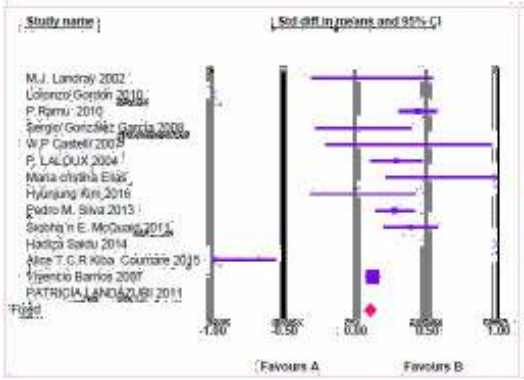

Figure 2: Forest plot showing relationship of sr. Hdl in hypertensive (a) and normotensive (b) western population

From Fig .2: In the effect- size analysis summary it is clear that as the Higher HDL level is found in normotensive individuals as compared to Hypertensive patients it means high HDL level favors to Normotensive individuals (Favors B) vice versa respectively.

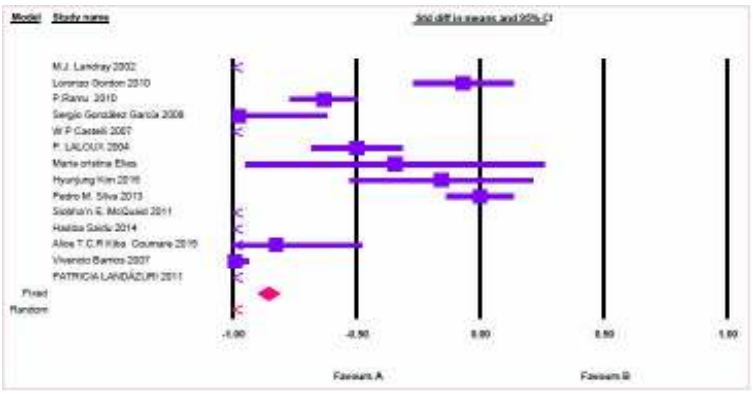

Figure 3: Forest plot Showing relationship of Sr. Triglyceride in Hypertensive (A) and Normotensive (B) Western Population

From Fig.3: In the both the effect- size analysis i.e. Fixed and Random model. In the summary, it is clear that as the Higher Sr. Triglyceride level is found in Hypertensive patients as compared to normotensive individuals and it means high Triglyceride level favors to Hypertension (Favors A) vice versa respectively. Journal of Clinical and Diagnostic Research5

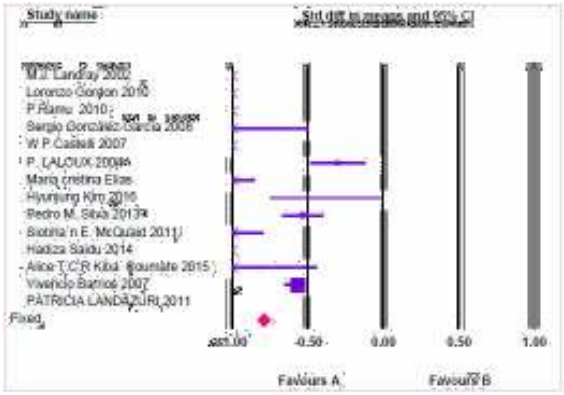

Figure 4: Forest plot Showing relationship of Sr. LDL in Hypertensive (A) and Normotensive (B) Western Population

Figure 4 In the Fixed effect- size analysis model; in the summary it is clear that as the Higher Sr. LDL level is found in Hypertensive patients as compared to normotensive individuals and it means high Low Density Lipoproteins level favors to Hypertension (Favors A) vice versa respectively.

DISCUSSION

In this study, we investigated the relationship between serum lipid profile and hypertension among western population. Results of this study revealed that the mean values of serum TC, TG, and LDL were significantly higher among the hypertensive patients compared to normotensives. The mean HDL level was lower in the hypertensives compared to normotensives and was statistically significant the reference figures of these studies are [24 -38]

Table 1:

Author 1	**M.J. Landray 2002[24]**			
Sample Size	**86**			
Hypertension	**H (45)**		**N (41)**	
Lipid profile	**Mean**	**SD**	**Mean**	**SD**
Total Cholesterol (mg/dl)	222.35	22.5	216.55	19.5
Triglyceride (mg/dl)	140.83	12.3	109.83	13.4
HDL- Cholesterol (mg/dl)	52.2	9.5	53.36	10.2
LDL- Cholesterol (mg/dl)	149.26	8.5	134.57	9.5
Author 2	**Loronzo Gordon 2010 [27]**			
Sample Size	**408**			
Hypertension	**H (154)**		**N (254)**	

Lipid profile	**Mean**	**SD**	**Mean**	**SD**
Total Cholesterol (mg/dl)	155	61	122	23
Triglyceride (mg/dl)	131	38.97	129	23
HDL- Cholesterol (mg/dl)	109	28.61	38	12
LDL- Cholesterol (mg/dl)	160	30	96	19
Author 3		**P.Ramu 2010 [28]**		
Sample Size		**893**		
Hypertension	**H (432)**		**N(461)**	
Lipid profile	**Mean**	**SD**	**Mean**	**SD**
Total Cholesterol (mg/dl)	176	11.5	172.7	11.7
Triglyceride (mg/dl)	120	2.9	118.3	2.5
HDL- Cholesterol (mg/dl)	40.8	0.4	41	0.5
LDL- Cholesterol (mg/dl)	115.5	1.3	109.2	1.5
Author 4		**Sergio González García 2008[30]**		
Sample Size		**140**		
Hypertension	**H(61)**		**N (79)**	
Lipid profile	**Mean**	**SD**	**Mean**	**SD**
Total Cholesterol (mg/dl)	214.23	32.2	199.14	29.2
Triglyceride (mg/dl)	193.97	23.5	171.83	22.1
HDL- Cholesterol (mg/dl)	44.85	15.5	45.63	11.1
LDL- Cholesterol (mg/dl)	134.18	38.2	105.18	31.3
Author 5		**A Poorabbas 2007 [27]**		
Sample Size		**51**		
Hypertension	**H (33)**		**N (18)**	
Lipid profile	**Mean**	**SD**	**Mean**	**SD**
Total Cholesterol (mg/dl)	238	57.12	135.66	10.71
Triglyceride (mg/dl)	298.3	116.5	120.17	22.59
HDL- Cholesterol (mg/dl)	36.67	8.34	39.61	6.62
LDL- Cholesterol (mg/dl)	160	20.63	75.67	18.63
Author 6		**P. LALOUX 2004[29]**		
Sample Size		**485**		
Hypertension	**H (243)**		**N (242)**	
Lipid profile	**Mean**	**SD**	**Mean**	**SD**
Total Cholesterol (mg/dl)	217	49.7	202	45.8
Triglyceride (mg/dl)	156	67.8	123.79	61.9
HDL- Cholesterol (mg/dl)	41.5	12.1	45.9	17.7
LDL- Cholesterol (mg/dl)	144.6	44	132	40.3
Author 7		**Maria cristina Elias [25]**		
Sample Size		**43**		
Hypertension	**H (20)**		**N(23)**	
Lipid profile	**Mean**	**SD**	**Mean**	**SD**
Total Cholesterol (mg/dl)	177	10	168	9
Triglyceride (mg/dl)	103	10	99	13
HDL- Cholesterol (mg/dl)	39	3	42	4
LDL- Cholesterol (mg/dl)	119	9	106	8
Author 8		**Hyunjung Kim 2016[31]**		
Sample Size		121		
Hypertension	**H (45)**		**N (76)**	
Lipid profile	**Mean**	**SD**	**Mean**	**SD**
Total Cholesterol (mg/dl)	133.3	37.1	123.6	28.2
Triglyceride (mg/dl)	123.5	73.3	112.9	65.4
HDL- Cholesterol (mg/dl)	36.6	13	37.2	9.2
LDL- Cholesterol (mg/dl)	75.7	56.9	61.2	22.8
Author 9		**Pedro M. Silva 2013[29]**		
Sample Size		916		
Hypertension	**H (348)**		**N (568)**	
Lipid profile	**Mean**	**SD**	**Mean**	**SD**
Total Cholesterol (mg/dl)	204.94	23.1	197.21	20.2

Triglyceride (mg/dl)	132.86	12.1	132.86	15.4
HDL- Cholesterol (mg/dl)	46.4	14.5	50.27	13.4
LDL- Cholesterol (mg/dl)	123.74	23.1	112.14	21.2
Author 10	**Siobha´n E. McQuaid 2011[33]**			
Sample Size	454			
Hypertension	**H (244)**		**N (210)**	
Lipid profile	**Mean**	**SD**	**Mean**	**SD**
Total Cholesterol (mg/dl)	220.42	22.1	204.94	18.5
Triglyceride (mg/dl)	141.71	15.2	97.43	17.2
HDL- Cholesterol (mg/dl)	42.54	19.3	50.27	20.3
LDL- Cholesterol (mg/dl)	132.2	29.2	105	25.4
Author 11	**Hadiza Saidu 2014 [34]**			
Sample Size	66			
Hypertension	**H (33)**		**N (33)**	
Lipid profile	**Mean**	**SD**	**Mean**	**SD**
Total Cholesterol (mg/dl)	180.97	4.21	153.13	7.4
Triglyceride (mg/dl)	152.34	6.7	106.28	8.3
HDL- Cholesterol (mg/dl)	66.51	5.8	80.04	3.4
LDL- Cholesterol (mg/dl)	116.39	3.9	49.88	5.8
Author 12	**Alice T.C.R Kiba Coumare 2015 [35]**			
Sample Size	201			
Hypertension	**H (158)**		**N (43)**	
Lipid profile	**Mean**	**SD**	**Mean**	**SD**
Total Cholesterol (mg/dl)	208.43	34.5	181.36	29.5
Triglyceride (mg/dl)	109.83	15.5	97.43	13.4
HDL- Cholesterol (mg/dl)	59.16	12.5	47.56	14.3
LDL- Cholesterol (mg/dl)	132.25	9.7	124.9	8.4
Author 13	**Vivencio Barrios 2007 [43]**			
Sample Size	5866			
Hypertension	**H (2933)**		**N (2933)**	
Total Cholesterol (mg/dl)	237	40.9	227.3	42.2
Triglyceride (mg/dl)	192.3	92.2	120.1	46.6
HDL- Cholesterol (mg/dl)	47.8	93.5	58.5	76
LDL- Cholesterol (mg/dl)	154.2	17	144.8	16.4
Author 14	**PATRICIA LANDÁZURI 2011[38]**			
Sample Size	237			
Hypertension	**H (204)**		**N (33)**	
Total Cholesterol (mg/dl)	200	3.9	157.4	7.8
Triglyceride (mg/dl)	169	6.4	109.1	10.3
HDL- Cholesterol (mg/dl)	41.5	0.9	39.7	2.1
LDL- Cholesterol (mg/dl)	127.2	3.4	95.9	7.1

(H-Hypertensive, N-Normotensive)

Hypertension is recognized globally as a major risk factor for CVD, stroke, diabetes, and renal diseases.39About 80% of hypertensive persons have comorbidities such as obesity, glucose intolerance, abnormalities in lipid metabolism, among othears. A large scale study conducted in Mexico by Aguilar-Salinas CA 40 showed that the most prevalent abnormality in Mexican urban adults, aged 20–69 years, was HDL cholesterol below 0.9 mmol/L (46.2% for men and 28.7% for women). Hypertriglyceridemia (>2.26 mmol/L) was the second most prevalent abnormality (24.3%). Increased LDL (≥4.21 mmol/L) was observed in 11.2% of the sample. Half of the hypertriglyceridemic subjects had a mixed dyslipidemia or low HDL cholesterol. More than 50% of the low HDL cases were not related to hypertriglyceridemia.40 The pan-European Survey of HDL measured lipids and other cardiovascular risk factors in 3,866 patients with type 2 diabetes and 4,436 nondiabetic patients undergoing treatment for dyslipidemia in eleven European countries, and showed that diabetic Hypertensive patients had lower HDL (1.22±0.37 mmol/L versus 1.35±0.44 mmol/L, P<0.001) and higher TG (2.32±2.10 mmol/L versus 1.85±1.60 mmol/L,P<0.001) than non-hypertensive diabetic patients .41 More hypertensive diabetic compared to nondiabetic patients had low HDL (45% versus 30%, respectively), high TG (≥1.7 mmol/L; 57% versus 42%, respectively), or both (32% versus 19%, respectively). HDL <0.9

mmol/L was found in 18% of diabetic and 12% of nondiabetic subjects.[41]

CONCLUSION

As per the new studies in western population Hypertensive patients in Western world people have a close association with dyslipidemia and need measurement of blood pressure and lipid profile at regular intervals to prevent cardiovascular disease, stroke, and other comorbidities.

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