**Total Cholesterol (TC)**

**Kinosian B et al (1995)** 56 observed in their study that TC was the better predictors of risk for coronary heart disease than LDL cholesterol.

**Peter W. F et al (1998)** 77 showed that total cholesterol and LDL cholesterol effectively predict CHD risk in a middle-aged white population.

**Wang TD et al (2001)** 78 in their study showed that TC was the strong predictor of risk for coronary heart disease.

**Zhang X et al (2003)** 79 showed in their study that in both Asian and non-Asian populations in the Asia-Pacific region, total cholesterol is similarly strongly associated with the risk of CHD.

**Hisako Tsuji et al (2011)** 80 in their study showed that TC was the strong predictor of risk for CHD.

**Nagasawa SY et al (2012)** 81 showed in their study that high serum TC levels are associated with coronary heart disease in middle-aged Japanese men and women.

**Low density lipoprotein cholesterol (LDL-C)**

**Shunichi Toshima et al (2000)** 82 showed in their study that LDL as a strong, independent predictor of CHD.

**Barbara V. Howard et al (2000)** 83 found in their study that a 10-mg/dl increase in LDL cholesterol was associated with a 12% increase in CVD risk. Thus, even at concentrations well below the National Cholesterol Education Program target of 130 mg/dl, LDL cholesterol is a strong independent predictor of coronary heart disease in individuals with diabetes, even when components of diabetic dyslipidemia are present.

**Paul Holvoet et al (2001)** 84 observed in their study that there was a significant correlation between the LDL-C and CHD.

**Ren J et al (2010)** 95 shown in their study that elevated LDL cholesterol levels were the major risk factor for CHD.
Gang Hu et al (2013) \(^{85}\) suggested an inverse association between HDL cholesterol and CHD risk and a direct association between LDL cholesterol and CHD risk, independent of other risk factors.

*High Density Lipoprotein Cholesterol (HDL-C)*

Curb JD et al (2004) \(^{86}\) in their study showed that HDL-C remains an important risk factor for CHD.

Olsson AG et al (2005) \(^{87}\) in their study observed that HDL-C was a better risk predictor for CHD than LDL-C.

De Faria Yeh D et al (2007) \(^{88}\) observed in their study that HDL-C was a strong predictor of CHD risk.

Alber HF et al (2008) \(^{89}\) showed that HDL-C and CRP are independently associated with the prevalence of CHD and are better risk predictors for CHD.

Asaf Bitton, et al (2010) \(^{90}\) in the Framingham study, observed that low HDL-C levels were associated with increases in risk for CHD of approximately 70\% in men and of more than 100\% in women.

Guenther Silbernagel et al (2013) \(^{91}\) observed in their study that High-density lipoprotein (HDL) cholesterol is a strong predictor of cardiovascular risk.

*Very Low Density Lipoprotein Cholesterol (VLDL-C)*

Frank M et al (2002) \(^{92}\) found that plasma concentrations of VLDL particles and apoC III in VLDL and LDL are more specific measures of coronary heart disease risk than plasma triglycerides.

Koba S et al (2002) \(^{93}\) found in their study that an increased number of VLDL particles is strongly associated with CHD, independently of traditional risk factors or newly recognized atherogenic lipoproteins, such as IDL or small, dense LDL, in Japanese men.

Liu J et al (2006) \(^{94}\) suggested in their study that VLDL was the better predictor of CHD risk than LDL-C.
Ren J et al (2010) observed in their study that elevated VLDL cholesterol was found to be significantly associated with elevated CHD risk, similar to that observed with LDL cholesterol. CHD risk was further amplified when elevated VLDL cholesterol was combined with elevated LDL cholesterol and/or the presence of major CVD risk factors.

**Triglycerides (TG)**

Ballantyne CM et al (2001) showed that elevated LDL-C, low HDL-C, and elevated triglycerides were more likely than patients with isolated LDL-C elevation to have other characteristics of the metabolic syndrome, had increased risk for CHD events.

Sarwar N et al (2007) showed in their study that elevated triglycerides levels had highly significant associations between triglyceride values and coronary heart disease risk.

Arsenault BJ et al (2009) showed in their study that elevated TG levels were associated with increased CHD risk.

Carey VJ et al (2010) showed in their study that high TGs levels were greater importance in patients with optimal rather than greater LDL cholesterol concentrations.

**Apolipoprotein B and A-1 as CHD risk marker:**

The results of various epidemiological studies have shown that apolipoprotein B and apolipoprotein A-1 are better predictors of cardiovascular risk than conventionally measured lipids, specifically LDL cholesterol and HDL cholesterol.

Walldius G, et al (2001) concluded in their study that there was strong correlation between the apolipoprotein B and apolipoprotein A-1 with CV events both have excellent predictive power for CV events.

Talmund et al (2002) showed in Second Northwick Park Heart Study (NPHSII) that the apolipoprotein B, apolipoprotein A-1, and their ratio was a strong predictor of CHD in the healthy middle-aged men.

Yusuf et al (2004) in INTERHEART study assessed the relative importance of risk factors for CHD and showed that the apolipoprotein B and apolipoprotein A-1 were the strongest risk factors in predicting CVD.
Shai et al (2004) in Nurses’ Health Study evaluated the relative risk for lipids and apolipoproteins as predictors of CHD and concluded that apolipoprotein B levels were more strongly associated with increased CHD incidence than was LDL cholesterol.

Ridker et al (2005) found in the Copenhagen City Heart Study, that apolipoprotein B levels had a significant association with the cardiovascular events.

Walldius et al (2006) in their study concluded that apolipoprotein B, apolipoprotein A-1 and apolipoprotein B/apolipoprotein A-1 ratio were all highly significant predictors of CV events in both men and women.

Chien K et al (2007) found apolipoprotein as a better predictor of CHD than other lipid markers in Chinese.

Markus J et al (2008) concluded in their study that levels of apolipoprotein B and apolipoprotein A-1 had a significant correlation with development of subclinical atherosclerosis in adulthood.

Seth S. Martin et al (2009) in their study concluded that plasma apolipoprotein B, levels was particularly useful in assessing CHD in the patients with concomitant alignments like diabetes.

Charles R. Harper et al (2010) found in their study that apolipoprotein B is superior than LDL-C and suggested that emphasis should be given on the use of apolipoproteins as a risk marker for better prediction of CHD.

Jae-Hong R et al (2011) in their study strongly suggested that apolipoprotein B is independently related to the risk of CHD in healthy Korean men.

Sokhanvar et al (2012) concluded in their study that apolipoprotein B levels was an appropriate indicator of cardiovascular events in patients after MI. In the study apolipoprotein B levels were significantly higher in patients with the events including coronary artery bypass grafting (CABG), percutaneous coronary intervention (PCI) and malignant arrhythmias.

Pan J et al (2012) investigated in their study that in comparison with lipid parameters of total cholesterol, triglycerides, HDL-C, LDL-C, apolipoprotein B, apolipoprotein A-1 was more closely associated with CHD in type 2 diabetic patients.
Shilpasree AS et al (2013) found in their study that the measurement of apolipoprotein A-1, the protein part of HDL, is a better predictor of stroke and apolipoprotein B, the apolipoprotein B/apolipoprotein A-1 ratio could also be used as the predictors of Stroke.

**Non-HDL- Cholesterol as CHD Risk marker**

Ridker PM et al (2001) concluded in their study that the non-HDL-C and the ratio of total cholesterol to HDL-C were as good as or better than apolipoprotein fractions in the prediction of future cardiovascular events.

Yadong Cui et al (2001) in their study concluded that non–HDL-C level is a better predictor of CVD mortality than LDL-C level and screening for non–HDL-C level was useful for CV risk assessment.

Vera Bittner et al (2002) found in their study that non-HDL-C was a strong and independent predictor of nonfatal myocardial infarction.

Lu et al (2003) in the Strong Heart Study found that non-HDL cholesterol is a strong predictor of CV events in men and women with diabetes and is particularly indicative of coronary events.

Nishizawa Y et al (2003) reported in their study that non-HDL-C in predialysis serum was a significant and independent predictor of CV mortality in hemodialysis patients.

Bos et al (2004) concluded in the Hoorn study that non-HDL cholesterol contributes considerably to the risk associated with the hypertriglyceridemic waist and is a better predictor for the “bad” triglycerides, which are associated with increased risk of CV events.

Kawamoto et al (2005) in their study found non-HDL as a potential predictor of risk factor for carotid atherosclerosis in the elderly. In men, an increased risk for carotid atherosclerosis was associated with increased levels of low-density lipoprotein cholesterol (LDL-C) and non-high-density lipoprotein cholesterol (non-HDL-C).

Seki et al (2007) concluded in their study that evaluation of non-HDL cholesterol for early prediction of CV events in the age group of 7-17 years was a better and less costly method.
Arsenault et al (2009)\textsuperscript{98} described in the EPIC -Norfolk study, that the increasing levels of non-HDL-C was better predictor of risk for future CHD than LDL-C, triglycerides and total cholesterol/HDL-C ratio.

**Renault BJ et al (2010)**\textsuperscript{117} found in their study that non–HDL-C was strong predictor of severity of coronary atherosclerosis and CHD events particularly in people who have elevations in both TC and TG.

**Van Deventer HE et al (2011)**\textsuperscript{118} concluded in their study that non–HDL-C showed overall the best concordance with the reference measurement procedures (RMP) for CVD risk score classification of both normal and hypertriglyceridemic individuals.

**Orakzai SH, et al (2012)**\textsuperscript{119} concluded in their study that non-HDL-C was more strongly associated with subclinical atherosclerosis and CHD events than all other conventional lipid values.

**Mahajan N et al (2012)**\textsuperscript{120} concluded in their study that non-HDL cholesterol is the strongest predictor among the lipid risk factors of incident CHD in patients with established CHD.

**Manoj S et al (2012)**\textsuperscript{121} concluded in their study that in comparison with LDL, non-HDL-C was better and predict CVD events more accurately in both male and female.

**Sondermeijer BM et al (2013)**\textsuperscript{122} concluded in their study that non-HDL-C and apolipoprotein B both was excellent predictor of CHD events and both were comparable in their ability to predict risk of future CHD.

**Garg et al (2013)**\textsuperscript{123} found in their study that non-HDL is significantly associated with the metabolic syndromes and is a simple screening tool to identify individuals with clustering metabolic abnormalities which increase the predisposition for CHD.

**Lipoprotein (a) as CHD Risk Marker**

**Danesh J et al (2000)**\textsuperscript{124} demonstrated in their study a clear and significant association between Lp(a) and CHD.

**Eckardstein et al (2001)**\textsuperscript{125} in their study observed that elevated Lp(a) evolved as an important independent CHD factor that aggravates the coronary risk exerted by elevated
LDL cholesterol (as estimated by the Friedewald formula), low HDL cholesterol, hypertension or the combined effects of multiple risk factors.

**Luc G et al (2002)** concluded in their study that the Lp(a) was a better risk factor for CHD and angina pectoris, especially in men with a high LDL-cholesterol level.

**Tandon H et al (2003)** concluded in their study that the Lp(a) had a significant relation with the CV events.

**Singh et al (2004)** concluded in their study that the incidence of lipoprotein(a) excess and mean concentration of lipoprotein(a) was significantly greater in the acute CAD group compared with control subjects.

**Sofi et al (2005)** found a significant association of high levels of lipoprotein (a) with CVD in University of Florence study.

**Kamstup et al (2008)** in the Copenhagen City Heart Study (CCHS) found that extreme Lp(a) levels > 95th percentile predict a 3 to 4 fold increase in risk of myocardial infarction (MI).

**Riche DM et al (2008)** found in their study that Lp(a) was a good risk factor for the prediction of CVD. Elevated Lp(a) has been implicated as both an independent and an additive risk factor for CVD and stroke, particularly in women.

**Mallat Z et al (2010)** reported in their study that Lp(a) was associated with a significantly higher risk of CAD events as compared with the other risk factors.

**Salim S. Virani et al (2012)** concluded in their study that Lp(a) levels were positively associated with CVD events.

**Ashfaq F et al (2013)** found in their study that Lp (a) was considered an independent predictor for severity of CAD and higher levels of Lp (a) levels were associated with severe patterns of coronary atherosclerosis.

**Hikita H, et al (2013)** concluded in their study that Elevated serum Lp(a) levels are associated with the number of plaques and plaque morphology which increased the risk of CV events. Patients with a high Lp(a) level during AMI require more intensive treatment for plaque stabilization.
Lipid and lipoprotein ratios as CHD risk marker

Ratio TC/HDL-C

Lemieux I et al (2001) \(^{55}\) concluded in their study that variation in TC/HDL-C ratio was better predictor for CV risk and to the insulin resistance syndrome than variation in the LDL-C/HDL-C ratio.

Rianne M W et al (2001) \(^{135}\) concluded in their study that variation in TC/HDL-C ratio was better predictor for CV risk.

Wang TD et al (2001) \(^{78}\) in their study concluded that as compared with the LDL cholesterol TC/HDL-C ratio was better predictor for CV risk.

Nair D et al (2009) \(^{136}\) concluded in their study that TC/HDL-C ratio was better predictor for CV risk.

Benoit J. Arsenault et al (2009) \(^{98}\) concluded in their study that the ratio of TC/HDL was significantly associated with the increased risk of CHD.

Michael F et al (2009) \(^{137}\) in their study showed that the total cholesterol/HDL ratio was the best single measure of all-cause mortality risk and CV events among the various lipid tests.

Aryal M et al (2010) \(^{138}\) demonstrated in their study that TC: HDL-C ratio was simple, cost-effective and cumulative marker of CVD events in diabetes mellitus.

Ratio LDL-C/HDL-C

Stampfer et al (1991) \(^{139}\) in the Physicians’ Health Study concluded that the ratio of LDL-C/HDL-C was strongly associated with the CV events.

Manninen et al (1992) \(^{60}\) in the Helsinki Study concluded that, the LDL-C/HDL-C ratio had more prognostic value than LDL-C or HDL-C alone. The ratio was especially accurate at predicting risk among those who also had elevated triglyceride levels.
Bruce Kinosian et al (1995) concluded that LDL-C/HDL-C ratio had a greater correlation with cardiovascular disease and are therefore was the better predictor of cardiovascular disease than simple lipid parameters.


Packard CJ et al (2005) in the PROSPER study found that the ratio of LDL-C/HDL-C was the most powerful and reliable measure of CV events.

Ridker et al (2005) in their study demonstrated that LDL/HDL ratio was to be superior to HDL or LDL alone.

Nicholls SJ et al (2007) concluded in their study that HDL/LDL cholesterol ratios were powerful predictors of CV diseases.

Fernandez ML et al (2008) concluded in their study that the LDL/HDL ratio was a valuable predictor of CV events in all type of population.

Enomoto M. et al (2011) concluded in their study that the LDL-C/HDL-C ratio is a better predictor of IMT progression than HDL-C or LDL-C alone. The result showed that Statin-induced changes in the ratio of LDL-C to HDL-C (LDL-C/HDL-C) predicted atherosclerosis progression better than LDL-C or HDL-C alone.

Ratio TG/HDL-C

Stampfer MJ et al (1991) concluded in their study that the ratio of TG/HDL was significantly associated with the CHD events was a better predictor of the severity of CV events.

J. Michael Gaziano et al (1997) showed in their study that the ratio of triglycerides to HDL was a strong predictor of myocardial infarction.

Robert B et al (2000) concluded in their study that the evaluation of TG/HDL-C associated with the CHD events was a better predictor of the severity of CHD events.

Mehdi H et al (2004) in their study concluded that in their study that TG/HDL-C ratio was simple, most significantly related with the mortality and cost-effective marker of CVD events in diabetes mellitus.
Hanak V et al (2004)\textsuperscript{146} in their study showed that the ratio of TG/HDL was better a better predictor of CV events.

Protasio L et al (2008)\textsuperscript{147} concluded in their study that the ratio of TG/HDL was robustly associated with CV diseases. Elevation in the ratio of TG to HDL-C was the single most powerful predictor of extensive coronary heart disease among all the lipid variables examined.

Quijada Z et al (2008)\textsuperscript{53} in their study concluded that TG/HDL-C ratio was a better risk marker for cardiovascular diseases.

Hadaegh F et al (2009)\textsuperscript{148} concluded in their study that the evaluation of TG/HDL-C ratio should be considered for CHD risk prediction in male population with a high prevalence of metabolic syndromes.

Vera Bittner et al (2009)\textsuperscript{149} in their study concluded that among women with suspected Ischaemia, the TG/HDL ratio is a powerful independent predictor of all-cause mortality and cardiovascular events.

Roa Barrios M et al (2009)\textsuperscript{150} stated and concluded in their study that the TG/HDL-C ratio could be considered as a useful and practical method to identify an increased risk of cardiovascular disease in patients with PCOS.

Procolo Di Bonito et al (2012)\textsuperscript{151} found in their study that TG/HDL-C ratio was useful in clinical practice to detect children with a worsened cardiometabolic rate profile who need monitoring to prevent cardiovascular disease in adulthood.

Teresa C. Hill et al (2012)\textsuperscript{152} concluded in their study that the triglyceride to HDL ratio was the stronger predictor of heart disease, much more so than "just" high cholesterol and LDL/HDL ratios.

Urbina EM et al (2013)\textsuperscript{153} suggested in their study that the use of TG/HDL-C was helpful in identifying young adults requiring aggressive intervention to prevent atherosclerotic CV diseases.

Z. Yunke et al (2013)\textsuperscript{154} concluded in their study that the ratio of TG/HDL-C ratio was significantly associated with the CHD events was a better predictor of the severity of CHD events.
**Ratio of apolipoprotein B/apolipoprotein A-1**

**Walldius et al (2001)** reported in AMORIS: Apolipoprotein-Related Mortality Risk study that the apolipoprotein B/apolipoprotein A-1 ratio is of potentially greater value than LDL cholesterol for predicting risk for fatal MI in men and women. In an updated analysis of AMORIS after a mean follow-up of 10.3 years, the apolipoprotein B/apolipoprotein A-1 ratio was again shown to be a strong predictor of strokes.

**Talmud et al (2002)** confirmed the results from the AMORIS study and found that the apolipoprotein B/apolipoprotein A-1 ratio was a better predictor of cardiac risk than LDL-C, and that both apolipoprotein B with TG and found to have the strongest associations with CHD.

**Durrington et al (2004)** reported in ARDS: Collaborative Atorvastatin Diabetes Study that in the CARDs patients, that apolipoprotein B/apolipoprotein A-1 ratio predicted CV events and total mortality better than other lipoprotein variables in patients with type 2 diabetes.

**Anderson et al (2004)** showed in an analysis of IDEAL trial (The Incremental Decrease in Events Through Aggressive Lipid Lowering) study that apolipoprotein B/apolipoprotein A-1 was superior to LDL/HDL cholesterol in predicting the reduction in risk for major cardiac events achieved by statin therapy in the IDEAL trial.

**Rasouli M, Kiasari AM et al (2006)** in their study concluded that the apolipoprotein B/apolipoprotein A-1 ratio, was independent risk factor for CAD and was superior to any of the other cholesterol ratios.

**Vander Steeg et al (2007)** evaluated the predictive ability of apolipoprotein B/apolipoprotein A-1 in relation to traditional lipid measures in EPIC-Norfolk study and reported that the apolipoprotein B/apolipoprotein A-1 ratio was an independent predictor of cardiovascular events.

**Clarke et al (2007)** reported in Whitehall Cardiovascular Cohort study that the apolipoprotein B/apolipoprotein A-1 ratio was a significant independent predictor of CHD.

**Liem AH et al (2000)** showed in their study that apolipoprotein B/apolipoprotein A-1 is positively associated with clinical events in statin-treated patients with known CHD.
The apolipoprotein B/apolipoprotein A-1 ratio was associated with clinical outcome when corrected for standard risk factors.

**Matthew J et al (2008)** reported in their study that the non-fasting apolipoprotein B/apolipoprotein A-1 ratio was superior to any of the cholesterol ratios for estimation of the risk of acute myocardial infarction in all ethnic groups, in both sexes, and at all ages, and it should be introduced into worldwide clinical practice.

**Sarah Parish et al (2009)** concluded in their study that there was strong positive association between the apolipoprotein B/apolipoprotein A-1 ratio and relative risk of MI.

**Rajni Dawar et al (2010)** reported in their study that the apolipoprotein B/apolipoprotein A-1 ratio was the best predictor of myocardial infarction, than any of the conventional lipid ratios.

**Min Lu et al (2011)** in their study concluded that apolipoprotein B and apolipoprotein A-1 were simple clinical indicators, and the apolipoprotein B/apolipoprotein A-1 ratio was closely related with CHD in the overweight group. The apolipoprotein B/apolipoprotein A-1 ratio increase indicated an increased risk of CHD and may provide some useful information in the differential diagnosis.

**Y. Sáez et al (2012)** in their study demonstrated that apolipoprotein B/apolipoprotein ratio, apolipoprotein B and apolipoprotein A-1 were independent predictors of CHD severity.

**Mahjoub H et al (2013)** reported a strong association between increased apolipoprotein B/apolipoprotein A-1 ratio and the risk of developing structural valve degeneration (SVD) among patients with aortic bioprosthetic valves.

**Ratio NON-HDL-C/HDL-C**

**Eliasson B et al (2013)** more recently in an observational study concluded that lower levels of non-HDL: HDL is a better risk marker for CHD than LDL-cholesterol below 3mmol/l.

**Kim SW et al (2013)** concluded in their study that non-HDL-C/HDL-C ratio is a better marker for identifying insulin resistance and metabolic syndrome.