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Original Research Article

A Study of Serum Bilirubin in Coronaryartery Disease Patient in Age Group of 35-70 in a Tertiary Medical Centre

Goutham Kumar A.P[1], Suresh Kanna. S[2], Kosuri Akhila[3]

[1]Post graduate, Department of General Medicine, Shree Balaji Medical College and Hospital, Chennai, India

[2]Associate Professor, Department of General Medicine, Shree Balaji Medical College and Hospital, Chennai, India

[3]Post graduate, Department of General Medicine, Shree Balaji Medical College and Hospital, Chennai, India

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Corresponding author: Dr. Goutham Kumar A.P

Conflict of interest: Nil

Abstract: Coronary artery disease (CAD) is a major cause of morbidity, mortality, and healthcare expenditure. A number of environmental and genetic risk factors have been known to contribute to CAD. More recently, a number of studies have supported as well as opposed a possible protective benefit of bilirubin in CAD, since it has anti-inflammatory, antioxidant, and antiaggregatory properties that may reduce atherogenesis. It also shares associations with different forms of CAD, namely stable CAD, unstable angina pectoris, stable angina pectoris, and acute myocardial infarction. Lack of sufficient evidence, however, has failed to elucidate a causal relationship between serum bilirubin level and risk of CAD. Therefore, in this update, we attempted to simplify this intricate relationship between bilirubin and CAD, revisit the pathophysiology of disease, how bilirubin may be protective, and to summarize the findings of the current literature.

Keywords: Coronary Artery disease (CAD), Bilirubin, Atherosclerosis, CAD risk ratio.

Introduction

Bilirubin is the main pigment in bile. Bilirubin is a by product of heme degradation. It was formerly thought that bilirubin was a hazardous by product of metabolism. Recent studies, however, have shown that bilirubin is physiological antioxidant, disproving the notion that it is a particularly effective one. Bilirubin protects against atherosclerosis, inflammation, and coronary artery disease. Lipid oxidation and oxygen radicals have been linked to the development of coronary artery disease. There are two primary causes of atherosclerosis and the formation of arterial plaque: oxidation of lipids and the production of oxygen radicals. Oxygen and peroxyl radicals cause inflammation and atherosclerosis. The antioxidant capabilities of bilirubin are well established. It protects against atherosclerosis by limiting the production of oxidised low density lipoprotein. When it comes to scavenging peroxyl radicals, bilirubin is a powerful ally. A spike in blood levels of bilirubin makes this possible. There is physiological evidence that bilirubin in the bloodstream protects against illnesses in which oxygen and peroxyl radicals play a role. Ischemic heart disease is mostly caused by three major risk factors: Trifecta of health hazards: tobacco use, excess cholesterol, and hypertension.

Materials and Methods

Setting: Sree Balaji Medical College and Hospital.

Study design: Descriptive analytical study.

Period of study: 2020 -2022.

Sample size: 83 subjects.

The purpose of this research is to ascertain whether or not elevated blood bilirubin levels are associated with an increased risk of coronary artery disease.

We are also interested in determining whether or not serum bilirubin levels are influenced by demographic factors such as age, sex, blood pressure, dyslipidemia, diabetes, smoking, and coronary heart disease. The cases were investigated using the following methods: 1) A thorough medical history was obtained, including the patient's age, gender, race/ethnicity, current and past medical conditions, and lifestyle habits (such as smoking, drinking, and jaundice). 2) A complete physical assessment Three) A comprehensive analysis (Fourth) A blood pressure cuff Method 5: Determining Your BMI Number of RBCs in the

Blood 7) Diagnosis of renal function Total protein, albumin, and globulin; total bilirubin, direct bilirubin, indirect bilirubin; total protein; liver enzymes (AST, ALT, SAP); HBsAg, HCVIgM, and other viral markers 10- Total cholesterol, LDL, and HDL levels during a fast. ECG with 12 leads, number 11 Instance No. 12: Echocardiography

Results

Table 1: Mean and S.D of TB, DB and IB

Liver Tests	Mean	Sd	S. Error
TB	0.46	0.12	0.013
DB	0.08	0.09	0.009
IB	0.39	0.11	0.012

The above table gives data on bilirubin levels of study subjects. Total bilirubin had a mean value of 0.46 ± 0.12. The standard error was 0.013.
Average direct bilirubin levels were 0.08 ± 0.09. The standard error was 0.009.
Indirect bilirubin mean value was 0.39 ± 0.11. The standard error was 0.012.

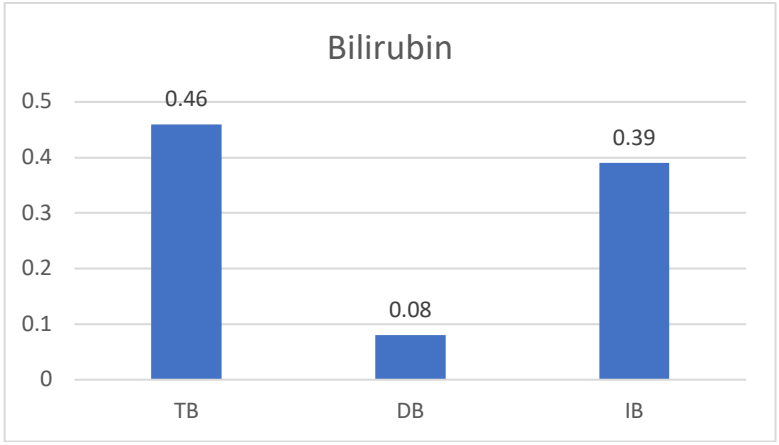

Figure 1: Mean and S.D of TB, DB and IB

Table 2: Mean and S.D of AST and ALT

Liver Enzymes	Mean	Sd	S. Error
AST	11.05	4.56	0.500
ALT	11.69	5.47	0.600

The above table gives data on liver enzyme levels of study subjects. The mean value of aspartate transferase (AST) was 11.05 ± 4.56. The standard error was 0.500.
The mean value of alanine transaminase was 11.69 ± 5.47. The standard error was 0.600.

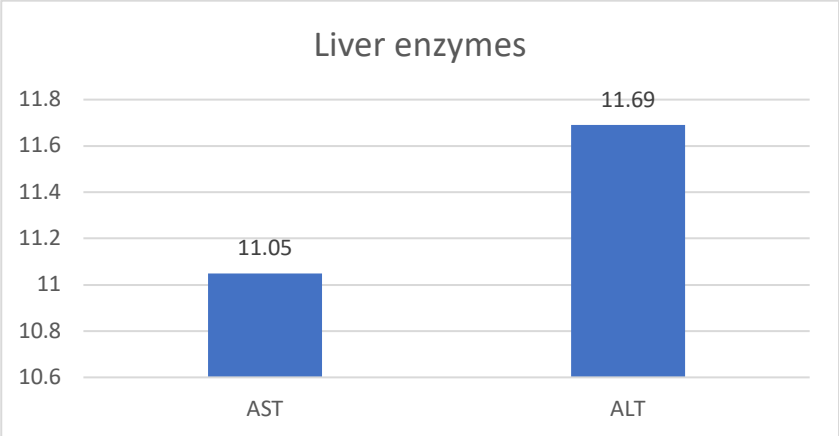

Figure 2: Mean and S.D of AST and ALT

Table 3: Comparison of abnormalities in Bilirubin and total cholesterol

Bilirubin levels	Abnormal (>200 mg/dl)	Normal (<200 mg/dl)	P-Value
Low (<0.5 mg/dl)	19 (90.48%)	39 (62.90%)	0.001
Normal (0.5-0.8 mg/dl)	2 (9.52%)	23 (97.09%)	
Total	21	62	

The above table gives data on comparison of abnormalities in bilirubin and total cholesterol. Among 21 subjects with abnormal total cholesterol values, 19 subjects (90.48%) had low bilirubin and 2 subjects (9.52%) had normal bilirubin levels. Among 62 subjects with normal total cholesterol values, 39 subjects (62.90 %) had low bilirubin and 23 subjects (97.09 %) had normal bilirubin levels. The computed p value of 0.001 demonstrated a statistically significant split between the distributions of patients with high and low bilirubin levels and those with high and low total cholesterol.

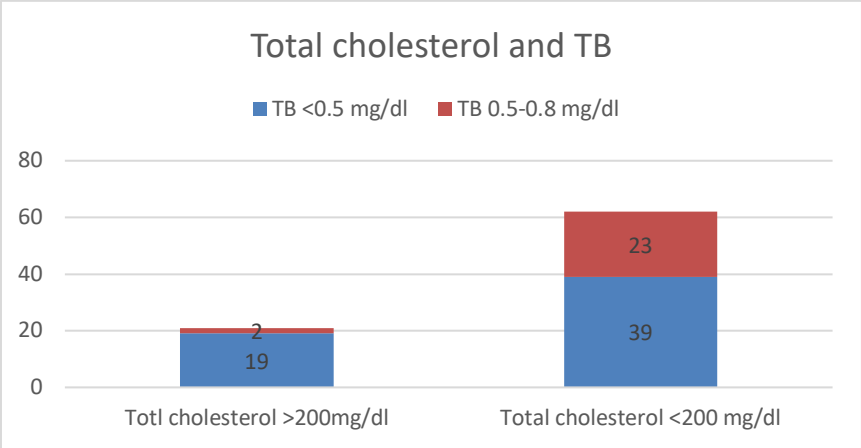

Figure 3: Comparison of abnormalities in Bilirubin and total cholesterol

Table 4: Comparison of abnormalities Bilirubin and LDL

Bilirubin levels	Abnormal (>130 mg/dl)	Normal (<130 mg/dl)	P-Value
Low (<0.5 mg/dl)	30 (78.94%)	28 (62.22%)	0.01
Normal (0.5-0.8 mg/dl)	8 (21.05%)	17(37.78%)	
Total	38	45	

The above table gives data on comparison of abnormalities in bilirubin and low-density lipoproteins.

Among 38 subjects with abnormal low density lipoprotein values, 30 subjects (78.94 %) had low bilirubin and 8 subjects (21.05 %) had normal bilirubin levels.

Among 45 subjects with normal low density lipoprotein values, 28 subjects (62.22 %) had low bilirubin and 17 subjects (37.78 %) had normal bilirubin levels.

A statistically significant difference was seen in the distribution of patients based on bilirubin and low-density lipoprotein values (p = 0.01).

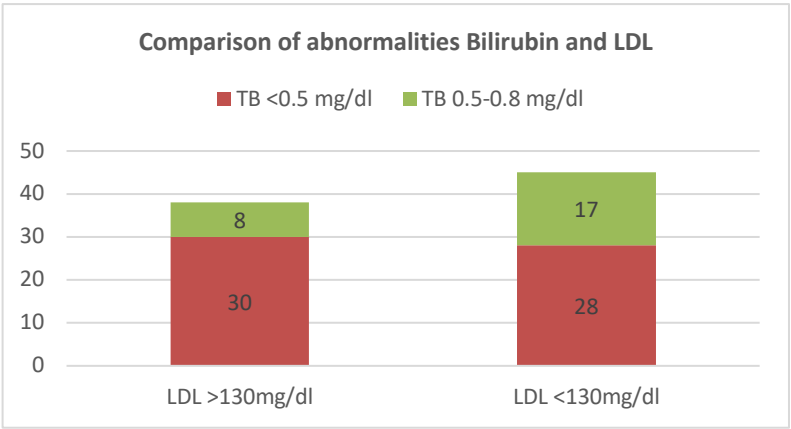

Figure 4: Comparison of abnormalities Bilirubin and LDL

Table 5: Comparison of abnormalities Bilirubin and HDL

Bilirubin levels	Abnormal (<40 mg/dl)	Normal (>40 mg/dl)	P-Value
Low (<0.5 mg/dl)	27 (84.37%)	31 (60.78%)	0.001
Normal(0.5-0.8 mg/dl)	5 (15.62%)	20 (39.22%)	
Total	32	51	

The above table gives data on comparison of abnormalities in bilirubin and high-density lipoproteins. Among 32 subjects with abnormal high density lipoprotein values, 27 subjects (84.37 %) had low bilirubin and 5 subjects (15.62 %) had normal bilirubin levels. Among 51 subjects with normal high density lipoprotein values, 31 subjects (60.78 %) had low bilirubin and 20 subjects (39.22 %) had normal bilirubin levels. When comparing the distribution of participants based on bilirubin and high-density lipoprotein values, the p value was 0.001, indicating a statistically significant difference.

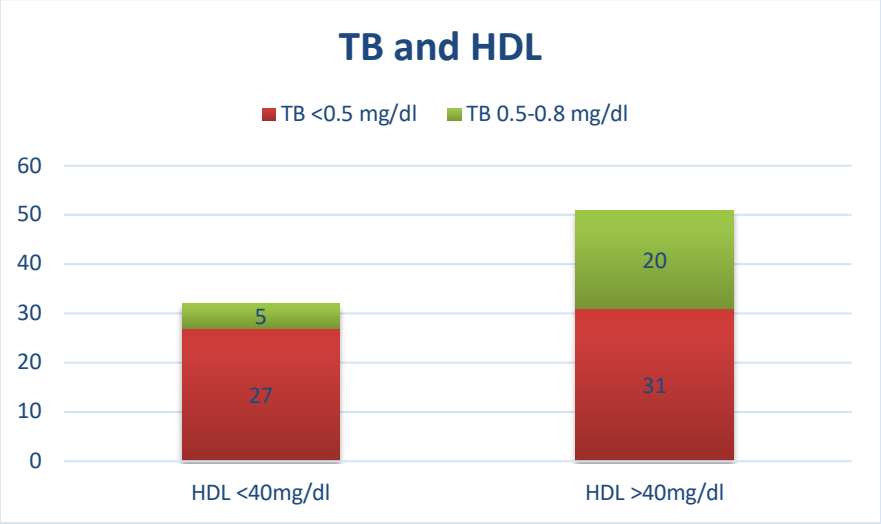

Figure 5: Comparison of abnormalities Bilirubin and HDL

Discussion

The primary bile pigment, bilirubin, is the byproduct of heme catabolism. Previously, bilirubin was considered a potentially harmful byproduct. New research challenges long-held assumptions by showing that bilirubin really functions as a physiological antioxidant, rather than a free radical scavenger. Bilirubin protects the cardiovascular system against atherosclerosis, inflammation, and coronary artery disease. Oxidised lipids and free radicals play a major role in the progression of coronary artery disease. Arterial plaque and atherosclerosis are caused primarily by lipid oxidation and oxygen radical generation. The creation of oxygen and peroxyl radicals is linked to inflammation and atherosclerosis. It is generally known that bilirubin has antioxidant effects. By preventing the formation of oxidised LDL, bilirubin has a preventative function in the atherosclerotic process.

It is possible for bilirubin to have a strong scavenging effect on peroxyl radicals. This capacity results from an increase in circulating bilirubin. The circulatory bilirubin has a physiological function in preventing illnesses caused by oxygen and peroxyl radicals. Smoking, high blood cholesterol levels, and high blood pressure are the major causes of ischemic heart disease.

Dietary antioxidants and endogenous antioxidants both have protective properties. As a result, preventing LDL oxidation increases blood bilirubin content, which eventually lowers the risk of ischemic heart disease. This study's main goal was to evaluate the idea that coronary artery disease is associated with low serum bilirubin levels.

In addition, the research found that blood bilirubin is linked to a host of other factors, including age, sex, family history of CHD, smoking, hypertension, diabetes mellitus, and lipid profile.

The following is a comparison of the study's findings to those of previous research efforts along these lines:

Mean Total Bilirubin, Direct Bilirubin And Indirect Bilirubin

Total bilirubin had a mean value of 0.46 ± 0.12. The standard error was 0.013.

Average direct bilirubin levels were 0.08 ± 0.09. The standard error was 0.009.

Indirect bilirubin mean value was 0.39 ± 0.11. The standard error was 0.012.

Our findings were consistent with those of the following studies: Wang, W76, Schwertner, H. A.77, Madhavan, M78.

Table 6:

Study by	Mean values of (mg/dl)		
	Total bilirubin	Direct bilirubin	Indirect bilirubin
Wang, W76	0.45 ± 0.10	0.07 ± 0.05	0.35 ± 0.12
Schwertner, H. A.77	0.43 ± 0.13	0.08 ± 0.05	0.39 ± 0.11
Madhavan, M.,78	0.44 ± 0.11	0.07 ± 0.04	0.35 ± 0.12
Present study	0.46 ± 0.12	0.08 ± 0.09	0.39 ± 0.11

Mean AST and ALT

The mean value of aspartate transferase (AST) was 11.05 ± 4.56. The standard error was 0.500.
The mean value of alanine transaminase was 11.69 ± 5.47. The deviation was 0.600 times the mean. Our findings were consistent with those of the following studies: Wang, W76, Schwertner, H. A.77, Madhavan, M78.

Table 7:

Study by	Mean values of (IU/l)	
	AST	ALT
Wang, W76	10.06 ± 4.57	12.68 ± 5.45
Schwertner, H. A.77	11.05 ± 4.58	11.69 ± 5.46
Madhavan, M.78	10.06 ± 4.57	10.68 ± 5.45
Present study	11.05 ± 4.56	11.69 ± 5.47

Comparison of Abnormalities in Bilirubin and Total Cholesterol

Among 21 subjects with abnormal total cholesterol values, 19 subjects (90.48%) had low bilirubin and 2 subjects (9.52%) had normal bilirubin levels.

Among 62 subjects with normal total cholesterol values, 39 subjects (62.90 %) had low bilirubin and 23 subjects (97.09 %) had normal bilirubin levels.

The computed p value of 0.001 demonstrated a statistically significant split between the distributions of patients with high and low bilirubin levels and those with high and low total cholesterol.

Our findings were consistent with those of the following studies: Schwertner H80, Levinson S. S81, Djousse L.82.

Comparison of Abnormalities Bilirubin and LdL

Among 38 subjects with abnormal low density lipoprotein values, 30 subjects (78.94 %) had low bilirubin and 8 subjects (21.05 %) had normal bilirubin levels.

Among 45 subjects with normal low density lipoprotein values, 28 subjects (62.22 %) had low bilirubin and 17 subjects (37.78 %) had normal bilirubin levels. A statistically significant difference was seen in the distribution of patients based on bilirubin and low density lipoprotein values (p = 0.01). Our findings were consistent with those of the following studies: Schwertner H80, Levinson S. S81, Djousse L.82.

Comparison of Abnormalities Bilirubin and HdL

Among 32 subjects with abnormal high density lipoprotein values, 27 subjects (84.37 %) had low bilirubin and 5 subjects (15.62 %) had normal bilirubin levels.

Among 51 subjects with normal high density lipoprotein values, 31 subjects (60.78 %) had low bilirubin and 20 subjects (39.22 %) had normal bilirubin levels.

When comparing the distribution of participants based on bilirubin and high density lipoprotein values, the p value was 0.001, indicating a statistically significant difference.

Our findings were consistent with those of the following studies: Schwertner H80, Levinson S. S81, Djousse L.82.

Comparison of Bilirubin Based on Cholesterol Levels

Total bilirubin was 0.49 ±0.12 in those with normal total cholesterol and 0.38 ± 0.06. in people with abnormal total cholesterol. The estimated p value of 0.0003 showed that the mean total bilirubin readings of individuals differed significantly according to their total cholesterol levels.

The mean direct bilirubin in subjects with normal total cholesterol was 0.07 ± 0.06 and that in subjects with abnormal total cholesterol was 0.08 ± 0.13. Mean direct bilirubin readings were not significantly different across individuals based on total cholesterol levels (p = 0.8509).

The mean indirect bilirubin in subjects with normal total cholesterol was 0.41 ± 0.11 and that in subjects with abnormal total cholesterol was 0.33 ± 0.05. There was a statistically significant difference in the mean indirect bilirubin values of patients based on their total cholesterol levels, as evidenced by the p value of 0.0022. Our findings were consistent with those of the following studies: Troughton J83, Perlstein TS84, Gokce N85.

Table 8:

Study by	Total cholesterol	Mean bilirubin levels (mg/dl)		
		Total	**Direct**	**Indirect**
Troughton J83	Normal	0.41 ±0.15	0.09 ± 0.03	0.42 ± 0.10
	Abnormal	0.39 ± 0.05	0.09 ± 0.14	0.31 ± 0.04
	P value	0.0001	0.9167	0.0023
Perlstein TS84	Normal	0.49 ±0.12	0.06 ± 0.05	0.45 ± 0.12
	Abnormal	0.37 ± 0.06	0.07 ± 0.13	0.35 ± 0.06
	P value	0.0002	0.7932	0.0035
Gokce N85	Normal	0.45 ±0.13	0.08 ± 0.05	0.40 ± 0.10
	Abnormal	0.35 ± 0.05	0.08 ± 0.12	0.35 ± 0.03
	P value	0.0001	0.8305	0.0040
Present study	Normal	0.49 ±0.12	0.07 ± 0.06	0.41 ± 0.11
	Abnormal	0.38 ± 0.06	0.08 ± 0.13	0.33 ± 0.05
	P value	0.0003	0.8509	0.0022

Conclusion

Patients with coronary artery disease were found to have abnormally low blood bilirubin levels, according to the study's findings. The findings were elaborated when the serum bilirubin level of patients with coronary artery disease were matching with cofounding factors. Since bilirubin was shown to have a preventive effect against the development of coronary artery disease, this may be the most important takeaway from our research. Therefore, patients who are under high risk for development of coronary artery disease can be subjected to serial monitoring of serum bilirubin levels for risk assessment.

By this study we can conclude that serum bilirubin levels can be used as a marker for atherogenic risk. Drugs that can therapeutically increase bilirubin levels in mild to moderate levels can be used to prevent the progression of atherosclerosis in future.

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