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Cardiometabolic risk factors and their effect on cardiac biomarkers in myocardial infarction: Clinical insights from Iraq

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Abstract

Background: Myocardial infarction refers to the death of the heart muscle tissue due to the sudden cessation of coronary blood flow. This condition stems from reduced blood supply to the heart, leading to increased mortality and morbidity rates. Cardiac troponin-1 (cTnI) and CK serve as specific indicators of myocardial damage.

Methods: This study was conducted between September 2024 and March 2025. Our study included 81 patients, comprising 51 with acute myocardial infarction (MI), and the results were compared with those of 30 healthy individuals.

Results: Age showed a positive and statistically significant correlation with triglyceride (TG), troponin, and CK levels. The Pearson correlation for age with TG is 0.430 ($p = 0.047$), for troponin it is 0.75 ($p = 0.007$), and for CK it is 0.47 ($p = 0.048$). The majority of patients in this study were aged between 51 and 60 years, indicating the prevalence of AMI. The study also showed a correlation between age and Troponin I levels in 51–60-year-olds, a correlation between age and TG in > 60-year-olds, and a correlation between age and CK in > 60-year-olds. Diabetic complications were most common among both male and female patients. Smoking was the second most common risk factor among men.

Conclusion: These findings suggest that, as age increases, the levels of TG, troponin, and CK also tend to increase in patients with AMI. There was no significant correlation between TG and the enzyme markers. Future markers may further enhance the diagnosis, prognosis, and predictive capabilities.

Keywords: Myocardial infarction; Troponin; Risk factors; Cardiac biomarkers

1. Introduction

Cardiovascular diseases (CVD) are the primary contributors to global mortality, resulting in approximately 18 million fatalities annually, accounting for approximately 32% of all deaths worldwide. Heart attack and stroke account for 85% of these fatalities [1]. The most common form of heart disease is coronary artery disease (CAD), which first manifests as stable angina pectoris (SAP), then progresses to unstable angina pectoris (UAP), and ultimately results in myocardial infarction (MI), a serious heart attack. This progression is triggered by breaking a fatty deposit in the artery and creating a blood clot that blocks the coronary artery supplying the heart, causing part of the heart muscle to die [2,3].

The majority of the risk of myocardial infarction, regardless of age or location, is caused by lipids, smoking, diabetes, or psychosocial variables [4]. This discovery raises the possibility that most occurrences of early myocardial infarction may be prevented if preventative methods are based on similar globally [5,6]. An acute thrombus that blocks an atherosclerotic coronary artery causes approximately 90% of myocardial infarctions [7]. The first few hours after the

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beginning of AMI are when the risk of death is greatest. Therefore, the successful treatment of individuals with AMI depends on the early detection of myocardial ischemia [8].

Higher D-dimer levels in the blood can suggest the presence of blood clots inside the coronary arteries or small blockages during unstable angina or acute coronary syndromes (ACS), and inflammation is often present in the coronary arteries [9].

Evaluation of blood biomarkers is crucial for diagnosing and managing angina pectoris. Key biomarkers included troponin I, creatine kinase-MB, myoglobin, and C-reactive protein [10]. Although they are crucial for identifying heart damage, high-sensitivity cardiac troponins cannot reveal its cause [11]. Acute heart failure, pericarditis, myocarditis, and arrhythmias are among the conditions that may cause them to rise [12]. The presence of a significant increase in cardiac troponin levels indicates an increased risk of acute coronary syndrome [9]

Diabetes mellitus (DM) significantly increases the risk of acute myocardial infarction (AMI) by promoting atherosclerosis and endothelial dysfunction [13]. Elevated triglyceride levels in diabetic individuals exacerbate acute myocardial infarction outcomes due to heightened residual lipoproteins, which facilitates endothelial dysfunction and inflammation. Lipid imbalances lead to plaque instability, endothelial dysfunction, and heightened inflammatory responses, rendering diabetic individuals more susceptible to acute myocardial infarction (AMI) [14].

Smoking is a major risk factor for heart diseases, whether acute or chronic. These illnesses account for approximately 20% of the total mortality [15]. Smokers with high blood pressure have an increased risk of developing severe types of hypertension, such as renovascular and malignant hypertension, probably caused by accelerated atherosclerosis [16].

This study aimed to investigate and evaluate the impact of major cardiovascular risk factors—including sex, age, smoking, diabetes mellitus, and dyslipidemia—on the incidence of acute myocardial infarction (AMI) in the Iraqi population

2. Materials and methods

The Cardiology Center in Najaf conducted this study between September 2024 and March 2025. The outcomes of 30 healthy individuals of the same age as the patients were compared to those of fifty-one AMI patients. The only inclusion criterion was an AMI diagnosis of acute myocardial infarction. The diagnostic criteria were as follows. Cardiac biomarkers exhibited an elevation (at least one instance of the upper normal value) or decline after an elevation (to at least one instance of the upper normal value). ii. At least one of the following traits was observed: the patient had clinical manifestations of myocardial ischemia and received an ECG diagnosis.

Triglycerides > 150 mg/dl, diabetes, and smoking were risk factors. The patient's medical history and computerized and paper records provided the sources of the data.

2.1. Statistical analysis

Patient and control group data were recorded electronically using Microsoft Excel 2010. Averages, standard deviations, and absolute and relative numbers were used in the data analysis and presentation. According to statistical significance, a p-value or probability level below 0.05 ($P<0.05$) was used

3. Results

This study included 51 AMI patients and 30 healthy individuals. The incidence of AMI was higher in males than females such as Table 1.

Table 1 Distribution of risk factors according to gender

Risk factor	Male	Female	p-value
smoked	1.73±0.501	1.03±0.498	.002*
diabetes	1.84±0.506	1.54±0.505	.042*
TG	131.85±70.2	133.2±52.45	.923
Age	53.9±13.72	52.27±13.5	.923
Socioeconomic factors	1.54±0.509	1.49±0.504	.683

Table 1 presents the distribution of various risk factors according to sex, comparing the male and female participants. For smoking, males exhibited a higher mean score (1.73 ± 0.501) than females (1.03 ± 0.498), with a statistically significant p-value of 0.002, indicating a notable gender difference in smoking behavior. Regarding diabetes, males showed a higher mean score (1.84 ± 0.506) than females (1.54 ± 0.505), with a p-value of 0.042, suggesting a significant difference in diabetes prevalence between the sexes. However, for triglyceride levels (TG), the mean scores for males (131.85 ± 70.2) and females (133.2 ± 52.45) are almost identical, and the p-value of 0.923 indicates no significant gender difference. The same trend is observed for age, where the mean ages of males (53.9 ± 13.72) and females (52.27 ± 13.5) are quite similar, and the p-value of 0.923 suggests no significant difference between genders. Finally, for socioeconomic factors, both males (1.54 ± 0.509) and females (1.49 ± 0.504) showed similar mean scores, with a p-value of 0.683, indicating no significant gender difference in this aspect.

Table 2 Mean value of Lipid profile in myocardial infarction and control groups

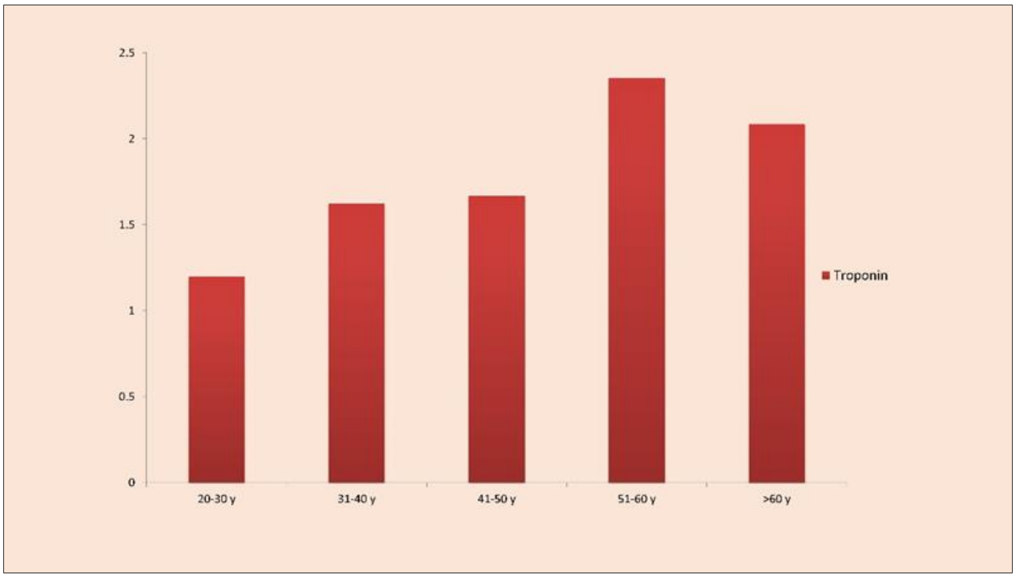
Parameters	Control Mean ± SD	Patients Mean ± SD	p-value
Troponin I	0.143±0.129	2.114±2.304	.000
CK	14.655±2.938	47.151±37.727	.000
TG	166.95±88.98	132.53±61.757	.045

Table 2 compares the mean values of the lipid profile parameters between the control group and the patients with myocardial infarction (MI). For Troponin I, the mean value in the control group was 0.143 ± 0.129, while in MI patients, it significantly increased to 2.114 ± 2.304, with a highly significant p-value of 0.000, indicating a substantial difference between the two groups. Similarly, for Creatine Kinase (CK), the control group had a mean of 14.655 ± 2.938, whereas the MI group showed a much higher mean of 47.151 ± 37.727 (p = 0.000), again reflecting a significant difference between the groups. For triglycerides (TG), the control group had a mean value of 166.95 ± 88.98, while the MI patients had a mean of 132.53 ± 61.757. A p-value of 0.045 suggests a statistically significant difference, indicating that triglyceride levels were lower in the MI group than in the control group.

Table 3 Statistical differences in serum lipids with marker enzymes in AMI patients between age groups.

Age	Troponin	Ck	TG
	Mean±SD	Mean±SD	Mean±SD
20-30	1.1980±1.17069	35.240±6.2360	133.60±35.732
31-40	1.6223±1.74472	37.454±42.5883	136.54±57.791
41-50	1.6676±.79819	39.280±32.4866	139.72±69.388
51-60	2.3529±2.63176	42.609±27.7209	148.29±78.487
>60	2.0861±2.59896	46.822±50.6224	152.70±64.168
Sig.	.046	.024	.042

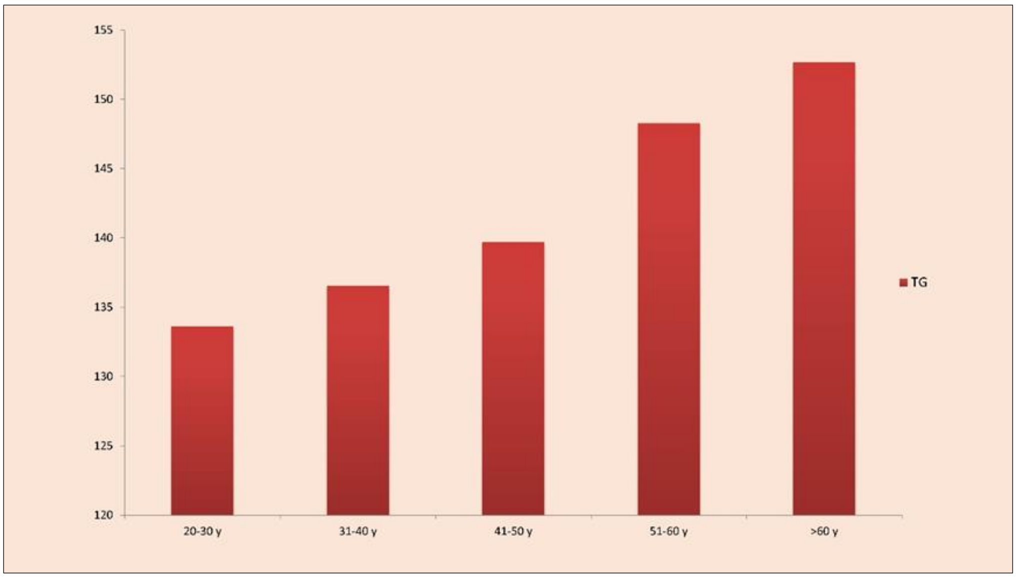
Table 3 illustrates the statistical differences in serum lipids and marker enzymes (troponin, CK, and TG) in patients with acute myocardial infarction (AMI) across different age groups. For Troponin I, the mean values increased with age, as shown in Fig. 1, starting from 1.1980 ± 1.17069 in the 20-30 age group to 2.3529 ± 2.63176 in the 51-60 age group and slightly decreased to 2.0861 ± 2.59896 in those over 60 years. A p-value of 0.046 indicated a statistically significant difference in troponin levels across age groups.



■ Troponin I level (ng/mL)

Figure 1 Distribution of patients according to age and Troponin I

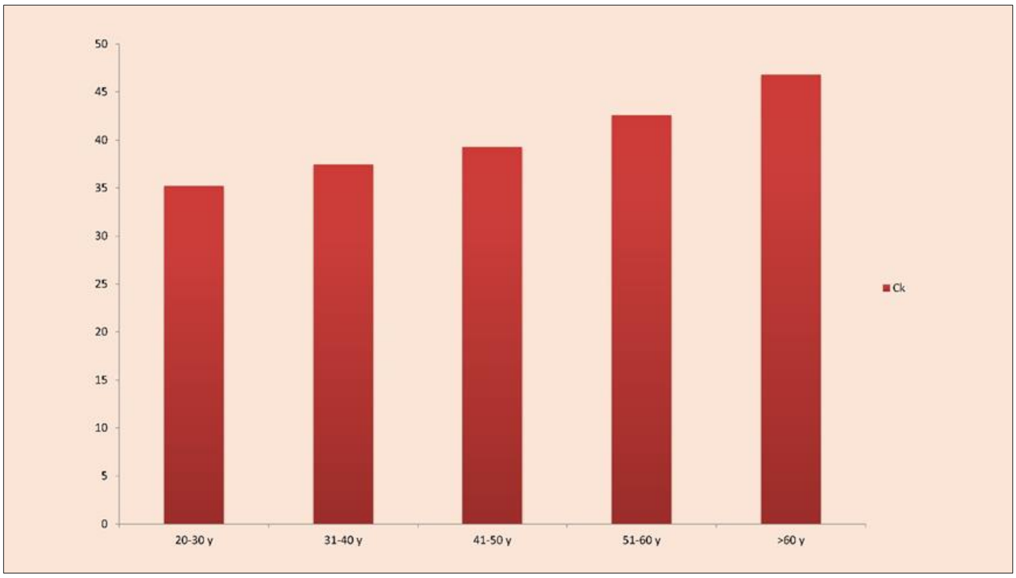
Observed as shown in Fig. 2. Similarly, for CK, the mean values increased with age from 35.240 ± 6.2360 in the 20-30 age group to 46.822 ± 50.6224 in those over 60 years. A p-value of 0.024 further confirmed the statistical significance of the difference in CK levels across age groups.



■ Triglyceride level (mg/dL)

Figure 2 Distribution of patients according to age and TG

Lastly, for triglycerides (TG), as shown in Fig. 3.and there is a gradual increase in mean values from 133.60 ± 35.732 in the 20-30 group to 152.70 ± 64.168 in the >60 group, with a significant p-value of 0.042, indicating a notable increase in TG levels with age. In summary, all three parameters— troponin, creatine kinase (CK), and triglycerides (TG) — showed significant age-related variations in AMI patients, highlighting the impact of age on these markers.



■ Creatine Kinase level (U/L)

Figure 3 Distribution of patients according to age and CK

Table 4 presents the correlation between serum lipids (TG), marker enzymes (Troponin and CK), and age in patients with acute myocardial infarction (AMI). The data revealed the following.

Table 4 Correlation between serum lipids with marker enzymes in AMI patients and their ages

		TG	troponin	Ck
Age	Pearson Correlation	0.430*	.75**	.47*
	Sig. (2-tailed)	.047	.007	.048
	N	81	81	81
TG	Pearson Correlation	1	.054	.049
	Sig. (2-tailed)		.632	.663
	N	81	81	81
Troponin	Pearson Correlation	.054	1	.413**
	Sig. (2-tailed)	.632		.000
	N	81	81	81

Age had a positive and statistically significant correlation with triglycerides (TG), Troponin, and CK levels. The Pearson correlation for age with TG is 0.430 ($p = 0.047$), for Troponin it is 0.75 ($p = 0.007$), and for CK it is 0.47 ($p = 0.048$). These correlations suggest that as age increases, the levels of TG, Troponin, and CK also tend to increase in patients with AMI.

TG showed weak, non-significant correlations with troponin (0.054, $p = 0.632$) and CK (0.049, $p = 0.663$), indicating that there was no meaningful linear relationship between triglyceride levels and these two markers in the study population.

Troponin has a moderate, statistically significant positive correlation (0.413, $p = 0.001$), indicating that as Troponin levels increase, CK levels also tend to rise in AMI patients. There was a significant positive relationship between age and the markers (Troponin, CK, and TG) as well as a strong relationship between Troponin and CK, while there was no significant correlation between TG and the enzyme markers.

4. Discussion

Myocardial infarction is the necrosis of myocardial cells resulting from chronic ischemia, which does not occur immediately upon ischemia but after a duration exceeding 6 hours. Atherosclerosis is the predominant cause of myocardial infarction. Risk factors for atherosclerosis include smoking, hypertension, hyperlipidemia, diabetes, sex, and age .This study examined the impact of sex, age, diabetes, smoking, and dyslipidemia as significant risk factors in patients with AMI in Iraq. The current data indicate a high incidence of acute myocardial infarction (AMI) in patients aged 51-60 years with Troponin I. In contrast, the peak incidence was observed in patients aged >60 years with CK. This finding suggests that acute myocardial infarction is more prevalent in older patients. The patterns of acute myocardial infarction (AMI) differ greatly worldwide; South Asians are affected by coronary artery disease at an earlier age than people in Western countries. Our results match those of Azab et al and Abbas et al [17,18]. According to the Brazilian Acute Myocardial Infarction Risk Factor Assessment (AFIRMAR), the leading causes of AMI are tobacco use, diabetes, obesity, high blood pressure, high cholesterol, and a personal or family history of coronary artery disease (CAD) [19]. Compared to previous studies in the area, our patients' mean age was somewhat greater; nonetheless, it was lower than that of the population in the West. The average age of patients diagnosed with AMI was 52.5 ± 10.8 years, according to Jafary et al (20).

In our study, smoking was the second most prevalent risk factor for acute myocardial infarction (AMI). Jafary et al. demonstrated the same findings [20]. showed how different risk variables are distributed by sex, contrasting male and female individuals. With a statistically significant p-value of 0.002, men had a higher mean score (1.73 ± 0.501) for smoking than women (1.03 ± 0.498). This finding was consistent with the results reported by Azab et al [17]. Smoking was the second most common risk factor for male patients (51.2%); however, none of the female patients in the sample smoked. Most Arab and Islamic nations do not allow women to smoke. Regarding diabetes, males show a higher mean score (1.84 ± 0.506) than females (1.54 ± 0.505), with a p-value of 0.042, suggesting a significant difference in diabetes prevalence between the genders. The results of the study by Abduelkarem et al were similarly consistent with those of the present study [21]. Triglycerides (TG) increased steadily, going from an average of 133.60 ± 35.732 in the 20–30 age group to 152.70 ± 64.168 in the over 60 age group, with a significant p-value of 0.042, showing that TG levels rise as people get older. In summary, for AMI patients, all three measures (troponin, CK, and TG) show important changes related to age, highlighting how age affects these indicators in Table 3. According to epidemiological research from many prior cohorts, serum triglyceride levels are directly correlated with the risk of coronary heart disease [22,23].According to recent randomized trials and genetic research, hypertriglyceridemia may contribute to cardiovascular diseases [24]. According to our study, some risk factors, such as male smoking and diabetes mellitus with advanced age in both sexes, may cause myocardial infarction in Iraqi patients.

5. Conclusion

These findings suggest that, as age increases, the levels of TG, troponin, and CK also tend to increase in patients with AMI. There was no significant correlation between TG and the enzyme markers. Cardiac biomarkers can significantly improve the diagnosis of acute myocardial infarction. Future markers may further enhance the diagnosis, prognosis, and predictive capabilities.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

Declaration of generative AI in scientific writing

During the preparation of this work the author did not use any generative AI tool for scientific writing. The author takes full responsibility for the content of the published article.

References

[1] Goldsborough E, Osuji N, Blaha MJ. Assessment of cardiovascular disease risk: a 2022 update. Endocrinol Metab Clin. 2022;51(3):483–509.

[2] Azami P, Mohammadzadeh S, Seirafi S, Razeghian-Jahromi I. A review of cutting-edge biomarkers for diagnosing coronary artery disease. Medicine (Baltimore). 2025;104(4):e41377.

[3] Braun MM, Stevens WA, Barstow CH. Stable coronary artery disease: treatment. Am Fam Physician. 2018;97(6):376–84.

[4] Domma AM, Gamal MA. Association between acute myocardial infarction, lipid profile and smoking habit. J Dent Med Sci. 2015;14(6):47–51.

[5] Yusuf S, Hawken S, Ôunpuu S, Dans T, Avezum A, Lanas F, et al. Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): case-control study. Lancet. 2004;364(9438):937–52.

[6] Xu Y, Ma G, Xie B, Zhao J, Liu X, Zhang J, et al. Correlation of blood lipids, glucose, and inflammatory indices with the occurrence and prognosis of lesion complexity in unstable angina, a retrospective cohort study. J Thorac Dis. 2025;17(1).

[7] Shaherawala J, Mangukiya K. The Study of the Association between Serum Bilirubin Levels and the Risk of Heart Disease in Hospitalised Patients.

[8] Reed GW, Rossi JE, Cannon CP. Acute myocardial infarction. Lancet. 2017;389(10065):197–210.

[9] Lin Y, Hu X, Wang W, Yu B, Zhou L, Zhou Y, et al. D-Dimer Is Associated With Coronary Microvascular Dysfunction in Patients With Non-obstructive Coronary Artery Disease and Preserved Ejection Fraction. Front Cardiovasc Med. 2022;9:937952.

[10] Munir A. The Use of Biochemical Cardiac Markers in Acute Coronary Syndrome. J Anim Plant Res. 2024;1(1).

[11] Piccioni A, Baroni S, Manca F, Sarlo F, Savioli G, Candelli M, et al. Multi-Marker Approach in Patients with Acute Chest Pain in the Emergency Department. J Pers Med. 2024;14(6):564.

[12] Agewall S, Giannitsis E, Jernberg T, Katus H. Troponin elevation in coronary vs. non-coronary disease. Eur Heart J. 2011;32(4):404–11.

[13] Scherer PE, Hill JA. Obesity, diabetes, and cardiovascular diseases: a compendium. Vol. 118, Circulation research. Lippincott Williams & Wilkins Hagerstown, MD; 2016. p. 1703–5.

[14] Goldberg RB, Temprosa M, Haffner S, Orchard TJ, Ratner RE, Fowler SE, et al. Effect of progression from impaired glucose tolerance to diabetes on cardiovascular risk factors and its amelioration by lifestyle and metformin intervention: the Diabetes Prevention Program randomized trial by the Diabetes Prevention Program Research Gro. Diabetes Care. 2009;32(4):726–32.

[15] Rahman M, Alatiqi M, Al Jarallah M, Hussain MY, Monayem A, Panduranga P, et al. Cardiovascular Effects of Smoking and Smoking Cessation: A 2024 Update. Glob Heart. 2025;20(1):15.

[16] Januszewicz A, Guzik T, Prejbisz A, Mikołajczyk T, Osmenda G, Januszewicz W. Malignant hypertension: new aspects of an old clinical entity. 2016;

[17] Azab AE, Elsayed AS. Acute myocardial infarction risk factors and correlation of its markers with serum lipids. J Appl Biotechnol Bioeng. 2017;3(4):75.

[18] Abbas S, Riaz A, Malik N. Risk factors for coronary artery disease. Pak Armed Forces Med J. 2003;53(1):12–9.

[19] Piegas LS, Avezum Á, Pereira JCR, Neto JMR, Hoepfner C, Farran JA, et al. Risk factors for myocardial infarction in Brazil. Am Heart J. 2003;146(2):331–8.

[20] Jafary MH, Samad A, Ishaq M, Jawaid SA, Ahmad M, Vohra EA. Profile of acute myocardial infarction (AMI) in Pakistan. Pakistan J Med Sci. 2007;23(4):485.

[21] Abduelkarem AR, El-Shareif HJ, Sharif SI. Evaluation of risk factors in acute myocardial infarction patients admitted to the coronary care unit, Tripoli Medical Centre, Libya. East Mediterr Heal J. 2012;18(4).

[22] Kasai T, Miyauchi K, Yanagisawa N, Kajimoto K, Kubota N, Ogita M, et al. Mortality risk of triglyceride levels in patients with coronary artery disease. Heart. 2013;99(1):22–9.

[23] Langsted A, Freiberg JJ, Nordestgaard BG. Fasting and nonfasting lipid levels: influence of normal food intake on lipids, lipoproteins, apolipoproteins, and cardiovascular risk prediction. Circulation. 2008;118(20):2047–56.

[24] Han SH, Nicholls SJ, Sakuma I, Zhao D, Koh KK. Hypertriglyceridemia and cardiovascular diseases: revisited. Korean Circ J. 2016;46(2):135–44.