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Coronary angiographic profile in patients with serious cardiac arrhythmias in the sitting of acute coronary syndrome

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Abstract
In addition to ST segment changes, bradyarrhythmias (heart rate < 50 bpm) or tachyarrhyhmias (heart rate > 100 bpm) are frequently present in acute myocardial ischemia and this can lead to further ischemia, with or without left ventricular dysfunction. Among the most important problems in intensive care and in emergencies are the patients with recurrent ventricular tachycardia VT or ventricular fibrillation VF and rapid AF 8. Despite of a number of studies suggest that the disorder is common, the correlation between cardiac dysrhythmias and different types of ACS also angiographic profile in those patients are not yet well identified which is the aim from current study.
Design single center case-series
Prospective study Setting Coronary care and cardiac catheterization units of Sohag University Hospital.
Study Population: the first 100 Patients (from January 2015 to June 2015) presented with ACS associated with serious cardiac arrhythmias then subjected to elective percutaneous coronary angiography.
Results and Conclusion arrhythmias are the most serious complication of acute coronary syndrome, 74% of patients above the age of (45 years in men and 55 years in women). Serious arrhythmias in patients with ACS are more common in males. The most common arrhythmias in patients with acute coronary syndrome is RAF 29%, the least common type is heart block 11%, the most serious type is VT (18%) which is more common patients presented by cardiogenic shock. According to the coronary angiographic evaluation ACS patients presented with serious arrhythmias are more prone to have 3 vessels disease and LAD is critically diseased in most of those patients (72%).

Keywords: Coronary angiographic, bradyarrhythmias, tachyarrhyhmias

Introduction and aim of the work

The earliest change in the electrocardiogram (ECG) in acute coronary syndrome ACS following myocardial ischemia is deviation of the ST segment from the isoelectric line. In addition to ST segment changes, bradyarrhythmias (heart rate <50bpm) or tachyarrhyhmias (heart rate >100bpm) are frequently present in acute myocardial ischemia and this can lead to further ischemia, with or without left ventricular dysfunction 1-3. In acute myocardial infarction (MI) sudden cardiac death due to ventricular tachycardia, ventricular flutter, or ventricular fibrillation occurs in approximately 50% of all patients as the first sign of coronary artery disease 4-5.

To avoid sudden cardiac death it is necessary to recognize the high-risk patients. The emergence of conduction disturbances between the sinus node and the right atrium and between the atrium and ventricles in the acute phase of MI is of prognostic and therapeutic significance. The site of block is related to the particular occluded coronary artery 6. There are several conduction disturbances that arise from the sinus node or the surrounding area. These arrhythmias are sinus bradycardia, sinoatrial block, sinus arrest, or bradycardia/tachycardia syndromes, Possible mechanisms for sinus bradycardia after an acute MI are neurologic reflexes (Bezold-Jarisch reflex), coronary chemoreflexes (vagally mediated), humoral reflexes (enzymes, adenosine, potassium), oxygen conserving reflex ('diving' reflex), or infarction or ischemia of the sinus node or the surrounding atrium 7.

Among the most important problems in intensive care and in emergencies are the patients with recurrent ventricular tachycardia VT or ventricular fibrillation VF and rapid AF 8. Despite of a number of studies suggest that the disorder is common, the correlation between cardiac dysrhythmias and different types of ACS also angiographic profile in those patients are not yet well identified which is the aim from current study.

Patients and method

Design single center case-series Prospective study.
Setting Coronary care and cardiac catheterization units of Sohag University Hospital.
Study Population the first 100 Patients (from January 2015 to June 2015) presented with acute coronary syndrome associated with serious cardiac arrhythmias.
Inclusion criteria All patients admitted to the hospital with presumptive diagnosis of acute coronary syndrome, (duration from onset less than 14 days) and associated serious cardiac dysrhythmias (VT, multifocal premature ventricular ectopics PVCs more than 50/min, 2nd and 3rd degree heart block HB, atrial fibrillation AF, supraventricular tachycardia SVT) during patient admission course.
Exclusion criteria Patients with prior history of congenital and valvular heart diseases besides patients with a missing or incomplete data. Patients with benign reperfusion arrhythmias after thrombolytic therapy also were excluded.

All patients included in the study were subjected to 1
A detailed history of age, sex, history of diabetes mellitus, hypertension, dyslipidemia, family history of premature ischemic heart disease and duration of chest pain before arrival at the emergency room. 2. Events recorded during the hospital stay and subsequent arrhythmic outcomes.3. All medical records pertaining to acute coronary syndrome treatment, including 12-lead ECG recording of arrhythmias and reperfusion therapy were collected. 4. Coronary angiography was performed using Toshiba instrument (Biplane Infinix CB, Japan) (Seldinger's technique). The procedures and lesions identifications are performed by expert interventional cardiologists. Preprocedural preparation include: Informed consent: A detailed discussion with the patient and family for indications, benefits, potential complications. Significant coronary artery disease CAD was defined as lesion on angiography ≥ 70% diameter narrowing (≥ 50% for left main).

Statistical analysis
Statistical package for social sciences (IBM-SPSS), version 19 IBM- Chicago, USA was used for statistical data analysis. Data were expressed as mean, standard deviation (SD), number and percentage. Mean and standard deviations were used as descriptive value for quantitative data. Student t test was used to compare the means between two groups, and one-way analysis of variance (ANOVA) test was used to compare means of more than two groups. P-value <0.05 was considered as significant.

Results
A prospective single center study over 100 patients diagnosed as serious arrhythmias in the sitting of ACS, whom admitted to Sohag University Hospital, Coronary Care Unit then subjected to elective percutaneous coronary angiography. As regards the characters of study population: In table (1) and figure (1) (n = 100, 72 males and 28 females). Age ranged from (37-86) years, mean age ±SD (56.14±10.27) years. 74% of patients above 45 years in males and 55 years in females. As regard risk factors, history of diabetes mellitus in (58%) of patients, hypertension in (38%), smokers (37%) and dyslipidemia in (36%) of patients.

Table 1: Demographic Characteristics of studied population

Characteristics	Summary statistics
Age	
Mean±(SD)	56.14±(10.27)years
Median (range)	54 (37-86) years
Age more >45 if male or >55 years in females	74 (74%)
Gender	
Females	28 (28%)
Males	72 (72%)
DM	58 (58%)
Hypertension	38 (38%)
Smokers	37 (37%)
Hyperlipidemia	36 (36%)

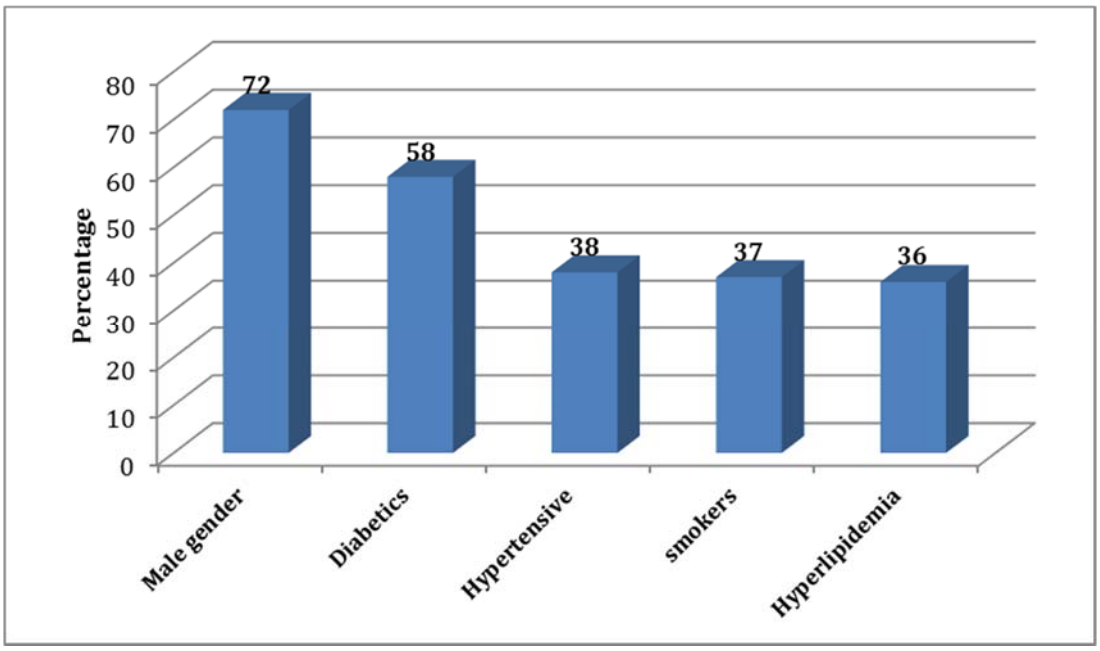

Fig 1: Demographic Characteristics of studied population

Presentation of acute coronary syndromes among study population
73% of patients of study patients were presented by unstable angina UA while the remaining 27% were presented by MI (Figure 2).

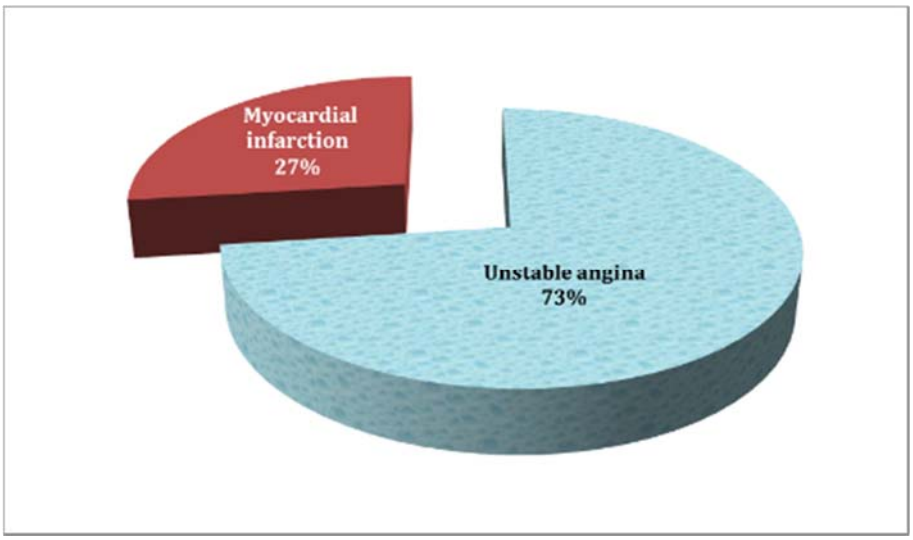

Fig 2: Presentation of acute coronary syndromes among study population

Correlation between arrhythmias and type of acute coronary syndrome

Table 2 and figure 3 showed that 18 patients were presented by VT (7 patients (38.89%) with UA and 11 patients (61.11%) with MI). 28 patients were presented by SVT (26 (92.86%) patients with UA and 2 (7.14%) patients with MI). In RAF (29 patients) 27 (93.10%) presented with UA and only 2(6.90%) patients presented with MI. In heart block (12 patients) 2 patients (16.67%) presented with UA and 10 patients (83.33%) presented with MI and in PVCs (13patient) 11 patients (84.62%) presented with UA and 2 patients (15.38%) with MI.

Table 2: Correlation between arrhythmias and type of acute coronary syndrome

Characteristics	PVCs	HB	RAF	SVT	VT
Unstable angina	11 (84.62%)	2 (16.67%)	27 (93.10%)	26 (92.86%)	7(38.89%)
Myocardial infarction	2 (15.38%)	10(83.33%)	2 (6.90%)	2 (7.14%)	11(61.11%)

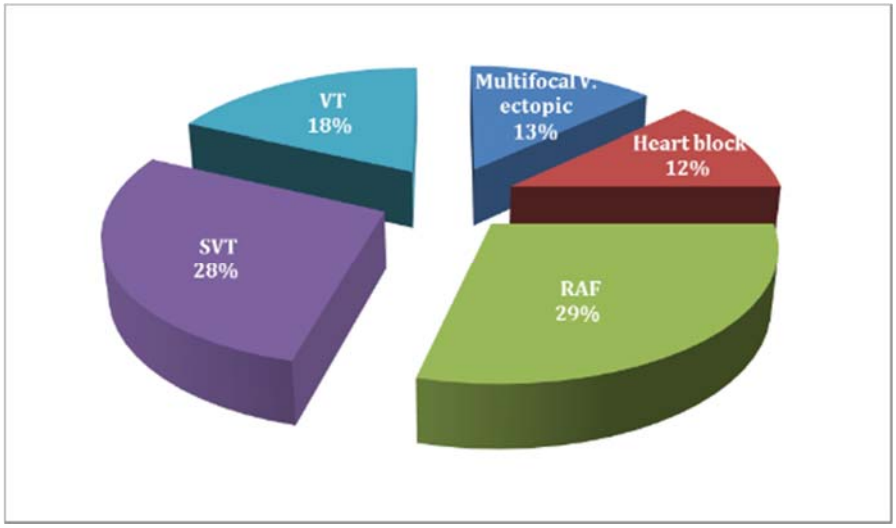

Fig 3: Correlation between arrhythmias and type of acute coronary syndrome

Coronary angiographic findings among studied population.

One vessel was significally diseased in 62 (62%) patient, two vessels in 15(15%) and three vessels in 23 (23%) patient, according to the culprit artery left anterior coronary artery LAD was affected in 72 (72%) of patients, LCX left circumflex artery in 55 (55%) of patients and the RCA right coronary artery was the culprit artery in 37 (37%) of patients assessed by coronary angiography CA shown in (Table 3 and figure 4/5).

Table 3: Coronary angiographic profile among patients with arrhythmias and ACS

Characteristics	Number (%)
Number of vessels diseased	
1vessel	62 (62%)
2 vessels	15 (15%)
3 vessels	23 (23%)
LAD	72 (72%)
LCX	55 (55 %)

(S= significant, N.S= non-significant, LAD= left anterior descending artery, LCX= left circumflex artery, RCA= right coronary artery)

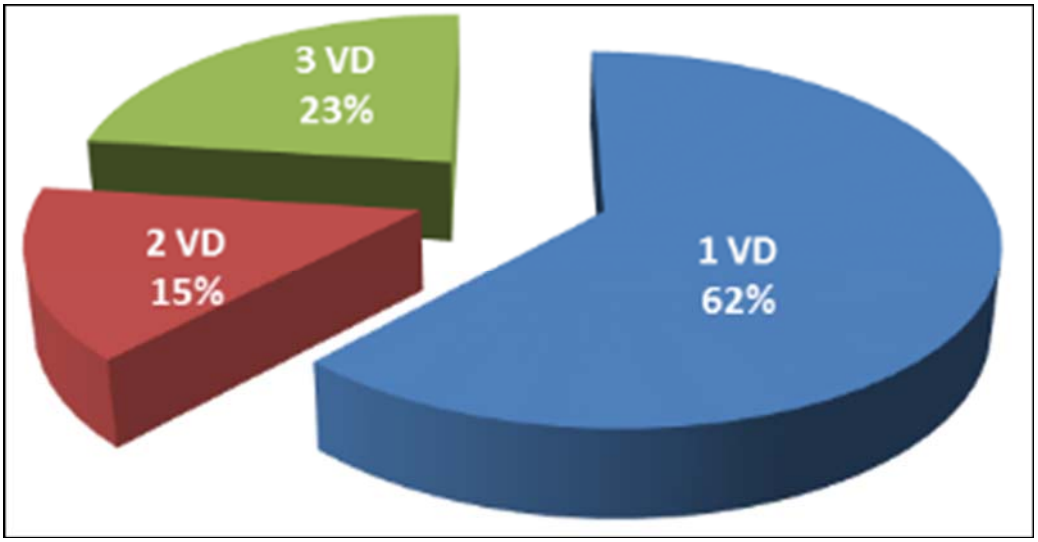

Fig 4: showing the distribution of patients according to number of vessels affected

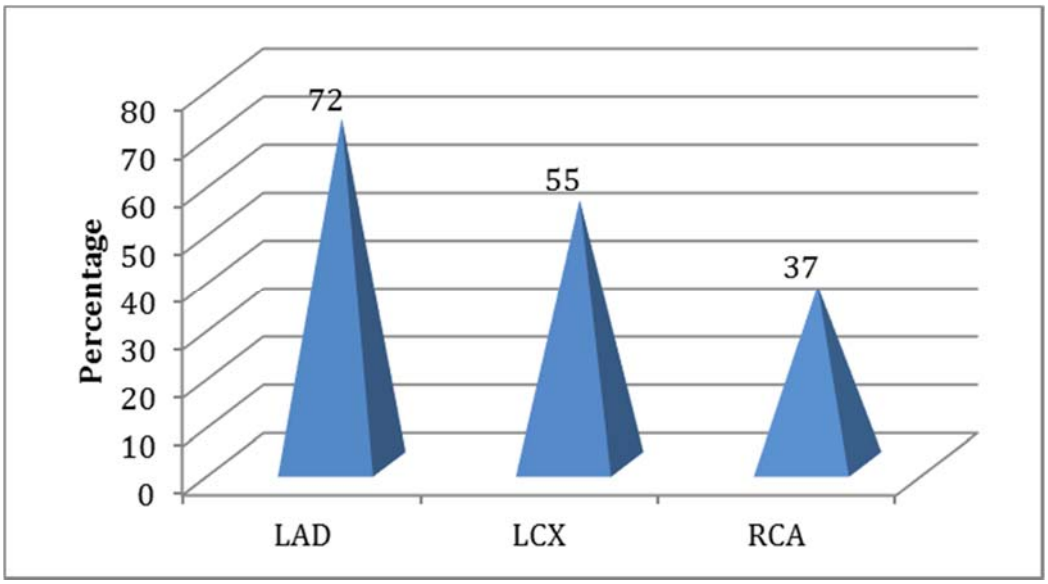

Fig 5: showing the distribution of patients according to culprit artery affected

PVCs and heart block according to presentation and angiographic findings

Table 4 showed that no significant difference between PVCs and HB as regard the culprit artery but patients with HB showed an interesting finding that 10 out of 11 patients (83.33%) presented with MI (P value 0,002). Also according to the number of blood vessels affected, In heart block 12 patients (100%) one vessel diseased, there was a significant difference in number of blood vessels between multifocal ventricular ectopics and heart block (p value 0.01) and that might be due to the absence of ischemia preconditioning and sudden closure of the culprit artery leads to sudden ischemia of the conduction system and eventually HB.

Table 4: showing Comparison between multifocal ventricular ectopic and heart block according to presentation and angiographic findings

Characteristics	PVCs	Heart block	Odds ratio (95%confidence interval)	P value
Diagnosis				
Unstable angina	11 (84.62%)	2(16.67%)	1	0.002 (S)
Myocardial infarction	2 (15.38%)	10 (83.33%)	27.5 (3.24-233.47)	
Number of vessels affected				
1	6 (46.15%)	12 (100%)		0.01 (S)
2	3 (23.08%)	0	Can't calculated	
3	4 (30.77%)	0		
LAD affected				
No	1 (7.69%)	4 (33.33%)	1	0.14 (N.S)
Yes	12 (92.31%)	8 (66.67%)	0.17 (0.02-1.78)	

LCX affected				
No	6 (46.15%)	9 (75.00%)	1	
Yes	7 (53.85%)	3 (25.00%)	0.29 (0.05-1.57)	0.15 (N.S)
RCA affected				
No	8 (61.54%)	10 (83.33%)	1	
Yes	5 (38.46%)	2 (16.67%)	0.32 (0.05-2.10)	0.24 (N.S)

(S= significant, N.S= non-significant, LAD= left anterior descending artery, LCX= left circumflex artery, RCA= right coronary artery)

PVCs and rapid atrial fibrillation (RAF) according to presentation and angiographic findings

In table 5 there was no statistically significant difference between the two groups as regard presentation and angiographic profile also.

Table 5: Comparison between multifocal ventricular ectopic and rapid atrial fibrillation (RAF) according to presentation and angiographic findings

Characteristics	PVCs	RAF	Odds ratio (95% confidence interval)	P value
Diagnosis				
Unstable angina	11 (84.62%)	27 (93.10%)	1	0.40 (N.S)
Myocardial infarction	2 (15.38%)	2 (6.90%)	0.41 (0.05-3.27)	
Number of vessels affected				
1	6 (46.15%)	18 (62.07%)	1	
2	3 (23.08%)	5 (17.24%)	0.56 (0.10-3.05)	0.50(N.S)
3	4 (30.77%)	6 (21.43%)	0.5 (0.10-3.05)	0.39(N.S)
LAD affected	12 (92.31%)	18 (62.07%)	0.14 (0.02-1.20)	0.07 (N.S)
LCX affected	7 (53.85%)	16 (55.17%)	1.05 (0.28-3.92)	0.94 (N.S)
RCA affected	5 (38.46%)	14 (48.28%)	1.49 (0.39-5.67)	0.56 (N.S)

(N.S= non-significant, LAD= left anterior descending artery, LCX= left circumflex artery, RCA= right coronary artery)

PVCs and SVT are according to presentation and angiographic findings

From table 6, there was no statistically significant difference between the two groups as regard presentation and angiographic findings also.

Table 6: Comparison between PVCs and SVT according to presentation, angiographic findings

Characteristics	Multifocal V. ectopic	SVT	Odds ratio (95% confidence interval)	P value
Diagnosis				
Unstable angina	11 (84.62%)	26 (92.86%)	1	
Myocardial infarction	2 (15.38%)	2 (7.14%)	0.42 (0.05-3.39)	0.42 (N.S)
Number of vessels affected				
1	6 (46.15%)	15 (53.57%)	1	
2	3 (23.08%)	6 (21.43%)	0.8 (0.15-4.29)	0.79 (N.S)
3	4 (30.77%)	7 (25.00%)	0.7 (0.15-3.30)	0.65 (N.S)
LAD	12 (92.31%)	21 (75.00%)	0.25 (0.03-2.28)	0.22(N.S)
LCX	7 (53.85%)	17 (60.71%)	1.32 (0.35-4.99)	0.68 (N.S)
RCA	5 (38.46%)	10 (35.71%0	0.88 (0.23-3.46)	0.87 (N.S)

(N.S= non-significant, LAD= left anterior descending artery, LCX= left circumflex artery, RCA= right coronary artery).

VT and PVCs according to presentation and angiographic findings, cardiogenic shock

From table (6) there was significant difference in presentation of ACS between two groups with (P value 0.02) and interestingly 11 of 18 patients (62.11%) presented with MI and as regard cardiogenic shock, in VT 16 of 18 patients came with cardiogenic shock and in PVCs no patients presented with cardiogenic shock (p value <0.0001).

Table 6: VT and PVCs according to presentation and angiographic findings

Characteristics	Multifocal V. ectopic	VT	Odds ratio (95% confidence interval)	P value
Diagnosis				
Unstable angina	11 (84.62%)	7 (38.89%)	1	0.02 (S)
Myocardial infarction	2 (15.38%)	11 (61.11%)	8.64 (1.46-51.2)	
Shocked				
Non	13 (100%)	2 (11.11%)	1	<0.0001 (S)
Yes	0	16 (88.89%)	Can't calculated	
Number of vessels affected				
1	6 (46.15%)	11 (61.11%)	1	
2	3 (23.08%)	1 (5.56%)	0.18 (0.01-2.15)	0.18(N.S)

3	4 (30.77%)	6 (33.33%)	0.82 (0.16-4.09)	0.81(N.S)
LAD affected				
No	1 (7.69%)	5 (27.78%)	1	
Yes	12 (92.31%)	13 (72.22%)	0.22 (0.02-2.13)	0.19 (N.S)
LCX affected				
No	6 (46.15%)	6 (33.33%)	1	
Yes	7 (53.85%)	12 (66.67%)	1.71 (0.40-7.43)	0.47 (N.S)
RCA affected				
No	8 (61.54%)	12 (66.67%)	1	
Yes	5 (38.46%)	6 (33.33%)	0.8 (0.18-3.54)	0.77 (N.S)

(S= significant, N.S= non-significant, LAD= left anterior descending artery, LCX= left circumflex artery, RCA= right coronary artery)

HB and RAF according to presentation and angiographic findings

Table 7 showing that RAF is interestingly also more common in patients with UA while according to the number of blood vessels affected, in heart block 12 patients (100%) one vessel diseased affected. In RAF 18 of 29 patients (62.07%) one vessel diseased, 5 of 29 patients two vessels diseased, (17.24%) and 6 of 29 patients (21.43%) three vessels diseased. there was a significant difference in number of blood vessels between RAF and heart block (P value 0.045). While there was no significant difference between two groups as regard culprit artery.

Table 7: HB and RAF according to presentation and angiographic findings

Characteristics	Heart block	RAF	Odds ratio (95% confidence interval)	P value
Diagnosis				
Unstable angina	2 (16.67%)	27 (93.10%)	1	
Myocardial infarction	10 (83.33%)	2 (6.90%)	0.01 (0.002-0.12)	<0.0001(S)
Number of vessels affected				
1	12 (100%)	18 (62.07%)	1	0.045(N.S)
2	0	5 (17.24%)	Can't calculated	
3	0	6 (21.43%)	Can't calculated	
LAD affected				
No	4 (33.33%)	11 (37.93%)	1	
Yes	8 (66.67%)	18 (62.07%)	0.82 (0.20-3.36)	0.78 (N.S)
LCX affected				
No	9 (75.00%)	13 (44.83%)	1	
Yes	3 (25.00%)	16 (55.17%)	3.69 (0.83-16.50)	0.09 (N.S)
RCA affected				
No	10 (83.33%)	15 (51.72%)	1	
Yes	2 (16.67%)	14 (48.28%)	4.66 (0.87-25.14)	0.07 (N.S)

(S=significant, N.S= non-significant, LAD= left anterior descending artery, LCX= left circumflex artery, RCA= right coronary artery)

Discussion

The term "acute coronary syndrome" is commonly used to signify the ST segment elevation myocardial infarction, non-ST elevation myocardial infarction, and UA 9. Cardiac arrhythmias are commonly described in acute ST elevated myocardial infarction10. Serious cardiac arrhythmic complications, i.e., cardiac arrest, ventricular tachycardia fibrillation, atrio-ventricular block, rapid atrial fibrillation, supraventricular tachycardias and ventricular ectopics were associated with a higher in hospital mortality11. Although cardiac arrhythmias are commonly described in acute coronary syndrome, the data on correlation between cardiac arrhythmias and atherosclerotic burden, assessed angiographically, is scant12. Thus, it is unclear whether cardiac arrhythmias are associated with special patterns of coronary angiography so we aim from this work to assess the relation between occurrence of serious dysrhythmias in patients presented with acute coronary syndrome and the coronary angiographic findings of these patients and to clarify the impact of coronary angiographic findings in terms of the number, distribution and morphological severity of coronary artery disease on the extent of the arrhythmic complications of ACS.

The first 100 patients admitted with acute coronary syndrome and serious arrhythmias were included in this study. 72% of those patients are males coincide with the results were seen in the framingham heart study13. Patients age ranged from (37-86 years) mean age 56, 14 years maximum age incidence 74% above the age of 45 years in males and 55 years in females the youngest age 37 years while the oldest age 86 years.

Mohit J Shah *et al*., 201414 in a study conducted on patients with ACS showed similar results, patient's age ranged from (34-90 years) a maximum age incidence 41% above the age of 60 years the youngest age 34 years while the oldest age 90 years.

Risk factors were presented in this study as follow, DM in 58% patients, hypertension in 38% patients, dyslipidemia in 36% patients and smokers in 37% patients, a non explained significant correlation between hypertension and all types of arrhythmias (P value <0,0001) was noticed.

Winkeler *et al*, 201415 noted that hypertension is presented in 76% of patients, DM in 29% of patients, dyslipidemia in 63% of patients, x-smoker in 20% of patients. Current study showed that 73% of patients with acute coronary syndrome and serious arrhythmias are presented with unstable angina, 27% presented with myocardial infarction in a manner similar to the results of

(Winkler *et al*., 201415) who showed in his study that 65% of patients are presented by arrhythmia and unstable angina, 27% presented with non ST segment elevation myocardial infarction and 9% presented with ST segment elevation myocardial infarction.

However arrhythmias are the most serious complication of acute coronary syndrome and the most common cause of death, a higher rate of morbidity and mortality16.

The most common type of arrhythmias in the current study is rapid atrial fibrillation RAF which represents 29% of patients, the least common type is heart block which represents 11% of patients, other types of arrhythmias, supra ventricular tachycardia (SVT) represents 28% of patients, ventricular tachycardia (VT) 18% of patients, multi focal ventricular ectopics in 13% of patients, while in (Winkler *et al*. 201415), premature ventricular conduction (PVs)>50 per hour represents 22% of patients, ventricular tachycardia (VT) 16%,supra ventricular tachycardia (SVT) 13%, heart block 18% and rapid atrial fibrillation (RAF)10%.

Also (Mohit J *et al*. 2014) 14 showed that the most common type of arrhythmias is PVCs 31%, the least common arrhythmias is VT 2%, other types of arrhythmias including VT 12%, HB 11%and AF 4%. (Jewitt DE *et al*. 196917) study also showed a similar high percentage of patients presented by AF (up to 20%).

In this study, 19% of patients with serious arrhythmias in acute coronary syndrome came with cardiogenic shock, their was a significant higher incidence of VT in patients with cardiogenic shock (P value<0, 0001). While In (Winkler *et al*. 201415) the incidence of cardiogenic shock was only 2%.

Although there are many advances in modalities for evaluation of coronary lesions, however the coronary angiography remains the "gold standard" for identifying the presence or absence of stenosis in coronary arteries and meanwhile provides reliable information during percutaneous coronary intervention18.

In the current study, 62% of patients had one vessel critically diseased while 15% of patients had two vessels and 23% of patients had three vessels critically diseased based on coronary angiography.

As regard to the relation between culprit artery and arrhythmias in acute coronary syndrome 72 patients (72%) the (LAD) is significally diseased, 55(55%) for the (LCX) and 37(37%) for the (RCA).

Ahmed H *et al*., 201219 studied the coronary angiographic findings for patients with ACS but without focusing on patients with serious arrhythmias. This study showed that only 6.7% of patients had 3 vessels diseased also the culprit artery was the LAD in only (45.4%) of patients, while (13.6%) for LCX and 36.3% for RCA. In comparison with our study 23% of patients had 3 VS disease and LAD considered as the culprit artery in 72%.

Ventricular tachycardia (VT) is one of the most serious arrhythmic complication of acute coronary syndrome, it represents 18% of all types of arrhythmias, however in the current study there was a significant increase of VT in patients with cardiogenic shock compared with other types of arrhythmias(P value <0.0001). 11 patients of them (61.11%) was presented by MI, 7 patients (36, 89%) presented with UA, 16 patients (88.89%) came with cardiogenic shock so there was a high incidence of cardiogenic shock with VT. And as regards to coronary angiographic findings 13 patients (72, 2%) LAD affected, 6 patients (33.33%) RCA affected, 12 patients (66.67%) LCX affected, according to the number of blood vessels affected (62.11%) of patient's one vessel disease affected.

In Patrizio *et al*, 2009 study LAD affected in (49%) of patients, LCX in (13%) of patients, RCA in (32%) of patients, according to the number of blood vessels affected (43%) of patients one vessel disease affected.

Conclusion

Arrhythmias are the most serious complication of acute coronary syndrome, 74% of patients above the age of (45 years in men and 55 years in women). Serious arrhythmias in patients with ACS are more common in males.

The most common arrhythmias in patients with acute coronary syndrome is RAF 29%, the least common type is heart block 11%, the most serious type is VT (18%) which is more common patients with cardiogenic shock.

According to the coronary angiographic evaluation acute coronary syndrome patients presented with serious arrhythmias are more prone to have 3 vessels disease and LAD is critically diseased in most of those patients (72%).

References

1. Arntz HR. Acute coronary syndrome german interdisciplinary journal of emergency medicine. 2004; 7:468-74.
2. Bestehorn HP, Neumann FJ. Akutes Koronarsyndrom, Myokardinfarkt, instabile Angina pectoris In: Burchardi H, Larsen R, Kuhlen R, Jauch KW, Schölmerich J, editors. Die Intensivmedizin. überarbeitete und erweiterte Auflage. Berlin-Heidelberg-New York: Springer-Verlag 2007; 10:408-28.
3. Jiménez RA, Myerburg RJ. Sudden cardiac death. Magnitude of the problem, substrate/trigger interaction, and populations at high risk. In: Akhtar M, editor. Cardiology Clinics - cardiac arrhythmias and related syndromes. Philadelphia: WB Saunders Company, 1993, 1-9.
4. Stangl K, Koronare Herzkrankheit. In: Zerkowski HR, Baumann G, editors. HerzAkutMedizin 2. Darmstadt: Auflage, Steinkopff-Verlag, 2006, 185-206.
5. Wellens HJ, Brugada P. Sudden cardiac death: a multifactorial problem. In: Brugada P, Wellens HJ (Hrsg), editors. Cardiac arrhythmias. Where to go from here? Mount Kisco, New York: Futura Publishing Company, 1987, 391-400.
6. Rosenfeld LE. Bradyarrhythmias, abnormalities of conduction, and indications for pacing in acute myocardial infarction. In: Cabin HS, editor. Cardiology clinics. Philadelphia: WB Saunders Company, 1988, 49-61.
7. Wellens HJ. Determining the size of the area at risk, the severity of ischemia, and identifying the site of occlusion in the culprit coronary artery. In: Wellens HJ, Gorgels AP, Doevendans PA, editors. The ECG in acute myocardial infarction and unstable angina. Diagnosis and risk stratification. Boston/Dordrecht/ London: Kluwer Academic Publishers, 2003, 5-42.
8. Marik PE, Varon J. Cardiopulmonary resuscitation: lessons from the past and trends for the future. In: Vincent JL, editor. 2000 Yearbook of intensive care and

emergency medicine Berlin-Heidelberg-New York: Springer, 2000, 649-57.
9. Amit Kumar, MD Christopher, P Cannon, MD Mayo Clin Proc. Acute Coronary Syndromes: Part I, Diagnosis and Management 2009; 84(10):917-938.
10. Newby KH, Thompson T, Stebbins A, Topol EJ, Califf RM, Natale A. Sustained ventricular arrhythmias in patients receiving thrombolytic therapy: incidence and outcomes. The Gusto Investigators. Circulation 2008; 98:2567-73.
11. Granger CB, Goldberg RJ, Dabbous O, Pieper KS, Eagle KA, Cannon CP *et al.* Predictors of hospital mortality in the global registry of acute coronary events. Arch Intern Med 2003; 163:2345-53.
12. Al Khatib SM, Granger CB, Huang Y, Lee KL, Califf RM, Simoons ML *et al*. Sustained ventricular arrhythmias among patients with acute coronary syndromes with no ST-segment elevation: incidence, predictors, and outcomes. Circulation 2002; 106:309-12.
13. American Heart Association: Heart and Stroke Statistical update, 2004.
14. Mohit J Shah, Nikita R Bhatt, Ajay Dabhi, PB. Thorat, Ketan Chudasama, Jigar Patel. A Study of 100 Cases of Arrhythmias in First Week of Acute Myocardial Infarction (AMI) in Gujarat: A High Risk and Previously Undocumented Population J Clin Diagn Res. 2014; 8(1):58-61.
15. Catherine Winkler, Mph Phd, Rn Marjorie Funk Phd, Rn Daniel M, Schindler Ms, Rn Jessica Zegre Hemsey, Phd RN Rachel *et al*. RNd Arrhythmias in Patients with Acute Coronary Syndrome in the First 24 Hours of Hospitalization Heart Lung. Author manuscript; available in PMC, 2014 Nov 1.
16. Bezzina CR, Pazoki R, Bardai A, Marsman RF, de Jong JS, Blom MT *et al*. Genome-wide association study identifies a susceptibility locus at 21q21 for ventricular fibrillation in acute myocardial infarction. Nat Genet 2010; 42:688-91.
17. Br Heart J, Jewitt DE, Kishon Y, Thomas M, Shillingford J. Right atrial electrocardiogram in the analysis of arrhythmias following acute myocardial infarction 1968; 30(1):97-104.
18. Eugene B, Doughles Z, Peter L. Acute myocardial infarction. In: Braunwald heart disease. Textbook of Cardiovascular Medicine, 6th edition, WB. 2Saunders Company, 2001, 1114-1211.
19. Ahmed HH El-Adawey, Gamal F Gomaa, Essam M Mahfouz. Qualitative and Quantitative Coronary Angiography in patients with Acute Coronary Syndrome (ACS) Egyptian Journal of Chest Diseases and Tuberculosis 2012; 61(3):209-215.
20. Patrizio Pascale, Jürg Schlaepfer, Mauro Oddo, Marie-Denise Schaller, Pierre Vogt, Martin Fromer OI: http://dx.doi.org/10.1093/europace/eup314 First published online: Ventricular arrhythmia in coronary artery disease: limits of a risk stratification strategy based on the ejection fraction alone and impact of infarct localization, 2009, 1639-1646.