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ORIGINAL ARTICLE

Comparison between Triggered and non-triggered Myocardial Infarction and Relation to Short Term Prognosis.

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ABSTRACT

Background : Acute myocardial infarction can be triggered by various factors, such as physical exertion, stressful events, heavy meals, or increases in air pollution. Whether a correlation can be drawn between identifiable ischemic triggers and the nature of coronary artery disease (CAD) still remain unclear. we hypothesized that when comparing patients with MI that was preceded by triggering activities to MI without triggering factors, the former might have adistinct pathogenic basis exhibiting different angiographic and clinical features.

Aim: The aim of this study is to compare between triggered versus non-triggered myocardial infarction and the relation to short term prognosis in patients of either group (MACE during hospital course).

Patients and methods: this study was conducted in Cardiology Department, Zagazig University Hospitals, from December 2016 to December 2018 and included 110 consecutive patients were admitted to the Cardiology Departement with NESTEMI and STEMI and were submitted for coronary angiography for assessment of severity of coronary artery disease then data were collected for all patients before and after performing Coronary Angiography including history taking of traditional risk factors and triggering factors, physical examination ,twelve lead ECG,blood sampling of peak treponin,CKMB ,CRP and serum creatinine ,conventional echocardiography .after coronary angiography syntax and gensini score were calculated for assessement of severity of coronary artery disease

Results: potential trigger was identified in triggering group .Physical exertion was found to be the most dominant trigger(32.7%) followed by emotional stress (20%) and respiratory infection(18.2%),fatty meal (16.4%) ,sexual intercourse (5.5%),drug abuse (3.6%) and finally both traffic jam and witnessing car accident (1.8%). Non-triggered MI patients tended to be older, and more likely to have co-morbidities. triggered MI patients showed a higher rate of single vessel CAD (43.6% vs. 25.5%, P<0.05) and more likly to be presnted with STEMI on admission while non triggered MI patients were more prone to two and three vessel disease and more liable to NESTEMI on admission (p< 0.001). No specific trigger was found to predict independently the extent of CAD and MACE .

Conclusion: Non triggered MI were independant predictors of two and three vessel disease this can be attributed to comorbidites and advanced age in this group. physical exertion,emotional stress,respiratory infection and fatty meals were most prevalent among triggered group

Keywords: myocardial infarction ,coronary artery disease , major adverse cardic event ,potential trigger.

INTRODUCTION

Different physical, emotional and extrinsic triggers have been attributed to acute coronary syndrome. Whether a correlation can be drawn between identifiable ischemic triggers and the nature of coronary artery disease (CAD) still remain unclear [1]. A trigger is defined as an external stimulus,which produce apathological change leading to a clinical event. This direct association is made on the basis of a short temporal connection between stimulus and disease, examples of Known triggers of acute myocardial infarction Physical exertion,Emotional triggers,Drugs, Meals,coffee and alcohol,air pollution, infection and sexual activity [2].

A recognizable trigger has been demonstrated in almost half of acute MI patients, generally occurring during a hazard period of 1-2 hours prior to symptoms onset. [3] non-triggered symptoms were found to be an independent predictor of multi-vessel CAD in the setting of STEMI[4]. This finding correlates with the increased age and co-morbidities prevalence as well as the elevated CRP observed in the nontriggered STEMI patients,all previously associated with high extensiveness of CAD[5].

PATIENTS AND METHODS

A cross sectional study conducted in Cardiology Department, Zagazig University Hospitals, from December 2016 to December 2018 and included 110 consecutive patients were admitted to the Cardiology Departement with NESTEMI and STEMI.

The study was approved by the medical research and ethics committee of Faculty of Medicine, Zagazig University. The work has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans. A written consent was obtained from each patient after clear explanation of the study protocol.

Methods:

All cases were subjected to **Complete medical history** which included history of tradtional risk dactors , **h**istory of triggering factor ,***Physical examination*** and ***Resting 12 lead standards surface*** ECG with emphasis on Changes on ECG in patients with CAD include ST depression, ST-elevation, or new T-wave inversion **,** poor R progression , hyper acute T and pathological Q[6] and ***Laboratory Test***s which included cardiac biomarkers (Troponin), CKMB,C reactive protein and Serum creatinine.

Conventional Echocardiographic examination using " simens machine with 2.5 MHz probe"- was done with special attention to detect Abnormalities of wall motion,Estimation of left ventricular (LVEF) is useful prognostically,assessment LVESD ,LVEDD,assessment of evidence of diastolic dysfunction and assessment of regional wall mass stroke index

Digital coronary angiograms were analyzed offline with an automated edge detection system (Philips Integris 5000, Netherland) by using the dye-filled guiding catheter as a reference.

Coronary angiography was done for all patients using retrograde percutaneous transfemoral technique (Judkins technique). Judkins left catheter was used for left coronary angiography, Judkins or Amplatz right catheter was used for right coronary angiography. After insertion of the femoral sheath, a 100 cm long JL coronary catheter, preloaded with a 0.035 inch tapered, movable core J- wire was advanced through the sheath, and was used for left coronary angiography. Then, Judkins left coronary catheter was removed and then Judkins or AR catheter was used for right coronary angiography. Coronary angiography was performed in multiple projections for adequate analysis of target lesions [7].

According to angiographic resutls , different dicisions were taken according to severity of lesions as revascularization. It may guide to PCI or CABG . CABG is recommended if there are severe lesions such as Left main coronary artery stenosis >50%, Stenosis of proximal LAD and proximal circumflex >70% ,vessel disease in asymptomatic patients or those with mild or stable angina , 3vessel disease with proximal LAD stenosis in patients with poor left ventricular (LV) function ,1or 2-vessel disease and a large area of viable myocardium in high-risk area in patients with stable angina and >70% proximal LAD stenosis with either ejection fraction < 50% or demonstrable ischemia on noninvasive testing [8].

SYNTAX score is an angiographic grading tool to determine the complexity of coronary artery disease. The SYNTAX score was developed by the group at the Thoraxcenter. [8].

Gensini scoring system was used to evaluate the severity and extent of coronary stenotic lesions. Selective coronary angiography was performed in all patients using the Judkins technique. Left and right coronary angiographies were performed at various projections. Assessment of coronary stenosis by coronary angiography was done by two experienced cardiologists and a Gensini score was calculated for each patient according to coronary angiography results [9].

Statistical analysis

Analysis of the collected data was performed using statistical package for the social sciences (SPSS) version 23. Data was presented and suitable analysis was done according to the type of data obtained for each parameter. Descriptive statistics: Mean, Standard deviation (± SD) for numerical data. Frequency, percentage and chi square tests of categorical data. Analytical statistics: analysis of variance ANOVA was used to assess the statistical significance of the difference among the two groups. (P>0.05) was non-significant, (p <0.05) was significant.. Simple and binary regression was used to detect the associated independent triggers for MACE and severity of CAD .

RESULTS

The study was conducted with 110 consecutive patients were admitted to Cardiology Department with typical chest pain and were submitted to Coronary angiography in our cath. lab , and all of them had fulfilled the inclusion criteria.

Patients were classified into 2 groups according to presence or abscence of triggering factors;

Group (1) triggered group patients who had triggering factors for MI presenting with typical chest pain and were diagonsed as STEMI or NESTEMI.

Group (2) non triggered group : Patients presenting with no triggering factors for MI

Regarding to demographic data, there was statistically significant difference among the study groups regarding, age and hypertension ,DM and family history (p value<0.05).table 1

Regarding laboratory data there was statistically high significant mong the study groups regarding CRP (p value<0.001) and statistically significant difference regarding CKMB(p-value <0.05) but there was no statistically significant difference among the study groups regarding treponin , kidney function (p value > 0.05).

Regarding to ECG data there was statistically high significant difference among the study groups regarding, NESTEMI and STEMI (p value <0.001)***. table 2***

Regarding to cathetrization data (number of vessel involved) there was statistically significant difference among the study groups regarding one vessel disease which was more common in triggered group,(p< 0.05) while two and three vessel disease were more common in non triggered group with statistically non significant difference (p value >0.05)***.figure 1***

And as regard to culprit vessel there was statistically significant among both group with LAD as a culprit vessel was more prevalent in non triggered group and LCX as a culprit vessel was more prevalent in triggered goup (pvalue< 0.05) ***table 3.***

Different potential triggers were identified in triggering group Physical exertion was found to be the most dominant trigger(32.8%) followed by emotional stress (20%) and respiratory infection (18.2%),fatty meal (16.4%) ,sexual intercourse (5.5%),drug abuse (3.6%) and finally both traffic jam and witnessing car accident (1.8***%). Figure 2***

By binary logistic regression analysis we found that, No specific trigger was found to predict independently multi-vessel CADand MACE ***table4 &table5***.

Table (1): clinic demographic data of studied population:

		Group		Total N=110	X^2	P
		Triggered N=55	Non-Triggered N=55			
Sex	F	20 (36.4%)	22 (40.0%)	42 (38.2%)	0.01	0.844
	M	35 (63.6%)	33 (60.0%)	68 (61.8%)		
Age		52.8 ± 9.9	63.3 ± 9.8	58.1 ± 11.2	-5.6	**<0.001**
Diabetic	No	32 (58.2%)	18 (32.7%)	50 (45.5%)	6.2	**0.013**
	Yes	23 (41.8%)	37 (67.3%)	60 (54.5%)		
Hypertensive	No	29 (52.7%)	16 (29.1%)	45 (40.9%)	5.4	**0.02**
	Yes	26 (47.3%)	39 (70.9%)	65 (59.1%)		
Dyslipidemia	No	41 (74.5%)	40 (72.7%)	81 (73.6%)	0.03	0.829
	Yes	14(25.5%)	15 (27.3%)	29 (26.4%)		
Family history	NO	36(65.5%)	25(45.5%)	61 (55.5)	4,1	0.03
	YES	19 (34.5%)	30(54.5)	49 (44.5%)		
Smoking	No	26(47.3%)	23(41.8%)	49(44.5%)	0.01	0.442
	yes	29(52.7%)	32(58,2%)	61(55.5%)		

Table (2): Comparison of ECG Findings between both groups

		Group		Total N=110	X^2	P
		Triggered N=55	Non-Triggered N=55			
ECG	**NESTEMI**	10 (18.2%)	30 (54.5%)	40 (36.4%)	14.2	<0.001
	STEMI	45 (81.8%)	25 (45.5%)	70 (63.6%)		

		Group		Total N=110	X^2	P
		Triggered N=55	Non-Triggered N=55			
	ASWMI	38 (69.1%)	1 (1.8%)	39 (35.4%)	58.4	<0.001
	AWMI	0 (0.0%)	12(21.8%)	12 (10.9%)		
	Inferior STEMI	2 (3.6%)	8 (14.8%)	10(9.1%)		
	Inferior.Lateral STEMI	4 (7.3%)	1 (1.8%)	5 (4.5%)		
	Lateral STEMI	1(1.8%)	3 (5.5%)	4 (3.6%)		
	NESTEMI	10 (18.2%)	30 (54.5%)	40 (36.4%)		

STEMI:st elevation myocardial infarction,NESTEMI:non st elevation myocardial infarction

Table (3): Comparison of Cath data regarding the (culprit vessel) between both group

		Group		Total N=110	X^2	P
		Triggered N=55	Non-Triggered N=55			
LCX	Count	16	7	23	5.1	<0.05
	% in grouping	(29.1%)	(12.7%)	(20.9%)		
RCA	Count	19	15	34	2.4	>0.05
	% in grouping	(34.5%)	(27.3%)	(30,9%)		
LAD	Count	20	33	53	6.2	<0.05
	% in groupng	(36.4%)	(60%)	(48.2%)		

LCX:left circumflex coronary .RCA:right coronary artery,LAD :left anterior desending.

Table (4): Binary logistic regression of MI Triggers as potential predictors of Three Vessel Disease

Triggers	N. (%)	Three Vessel Disease	
		Sig.	OR
Physical activity	18 (32.8%)	0.737	**1.22**
Respiratory infection	10 (18.2%)	0.915	**0.93**
Fatty Meals	9 (16.4%)	0.632	**0.70**
Drug abuse	2 (3.6%)	0.999	**0.00**
Emotional	11 (20.0%)	0.156	**0.31**
Sexual Intercourse	3 (5.5%)	0.999	**0.003**
Traffic Jams	1 (1.8%)	1.00	**0.001**
Witnessing Car Accident	1 (1.8%)	1.00	**28.31**

Table (5):): MI triggers as predictors of major adverse cardiac events.

Triggering Factor	MACE		
	Odds ratio	P	95% confidence interval
emotional stress	2.8	0.448	(0.196-40.057)
physical activity	2.286	0.534	(0.169-30.959)
respiratory infection	2.4	0.522	(0.165-34.928)
Fatty meals	0.571	0.702	(0.032-10.069)
drug abuse	0.0001	0.87	(0.00004-0.0003)
sexual intercourse	4	0.423	(0.134-119.23)
Traffic jam	0.765	0.453	(0.23-6.343)
Witnessing car accients	0.001	0.434	(0.26-6.343)

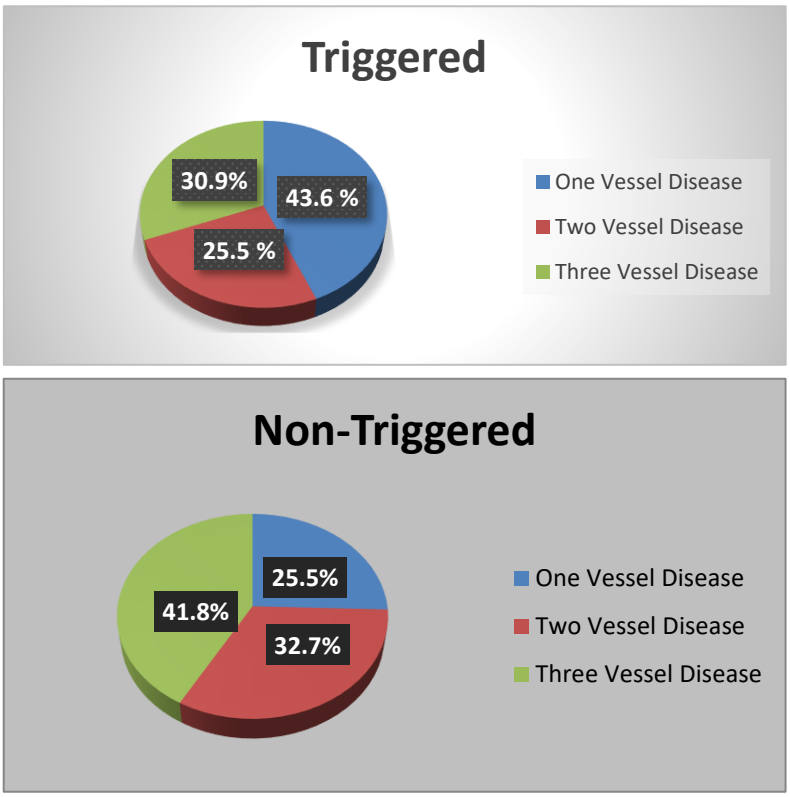

Fig. (1): ***Comparison of Catheterisation data (Number of the involved vessel) between both group***

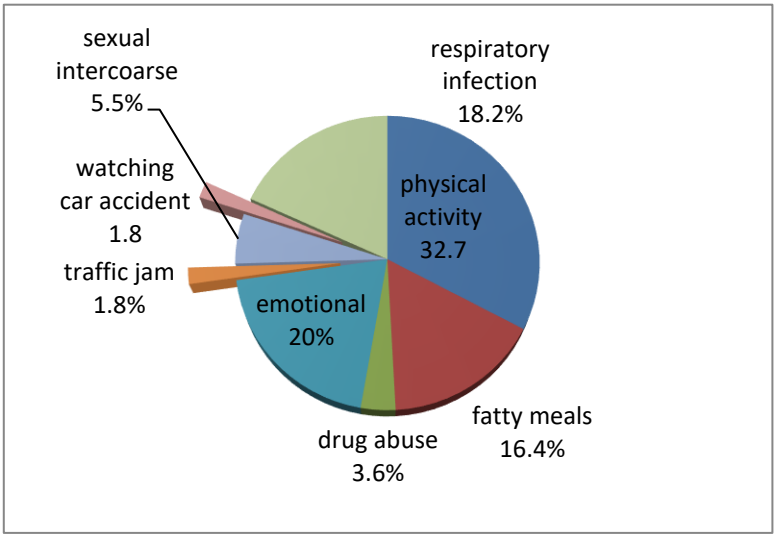

Fig (2): ***showing Prevalence of different MI triggers in triggered group***

DISCUSSION

The present study was conducted on 110 consecutive patients were admitted to Cardiology Department with typical chest pain and were diagnosed as STEMI or NESTEMI and were subjected to Coronary angiography in our cath. lab , and all of them had fulfilled the inclusion criteria. This study aimed to compare triggering and non triggering MI and degree of coronary artery narrowing and relation to short term prognosis In addition The present study aimed to assess prevalence and characteristics of acute triggering in MI patient

Patients in the present study were divided into two groups according to triggering factors , Group (I): triggering group of MI Group (II): non triggering group ofMI

Triggering factors include Physical exertion,Emotinal stress,Infections,Drugs,Heavy meals,Fatty meals,Witnessing car accidents and traffic jam .

There was statistically highly significant difference between the two studied groups as

regard age with statistically significant difference regarding DM,HTN, family history but regarding sex,smoking there was statistically non significant difference between both two groups..

This was concordant with **Ben-Shoshan et al. [10]** who found statistically significant difference regarding age, DM and hypertension and family history as aging is one of the risk factors of CAD and atherosclerosis in non triggered group DM and HTN and family history are common comorbities and risk factors in non triggeredgroup .

There was statistically significant difference among both groups in CKMB,CRP but regarding S.Creatinine ,peak troponin there was no statistically significant difference between the two studied groups. This was matched with **Buckley et al. [11] and** was disconcordant with **Ben-Shoshan et al. [10]**. Who found that higher CRP is associated with advanced age and other cormobities as DM ,HTN in non triggered group while in our study higher CRP was significant in triggered group mainly infection group which represent significant percentage of triggered group also CKMB was more elevated in triggered group as this group had statistically significant number of STEMI patients.

In addition, there was statistically significant difference among the study groups regarding ECG finding with NESTEMI more common in non triggered group(54.5%),STEMI more common triggered group this was concordant with **Ben-Shoshan et al. [10]** this explained as follow non triggered MI may result from a more latent, chronic process, leading to gradual plaque progression and erosion and eventually to surface thrombosis while triggered MI is more likely toresult from sudden rupture of a vulnerable plaque secondary to acute sympathetic surge

complications al so was concordant with with **Strike et al. [12]**,in which physical exertion and anger were more commonly associated with STEMI than with other forms of ACS

In addition This study showed , there was statistically non significant difference between both groups as regard MACE and Hospital course finding but bradyarrythemia was more common in non triggered group .This was concordant with **Brodov et al. [13]** who divided patients with acute MI with complete angiographic data into two groups, according to whether or not they reported the presence of specific unusual events or activities immediately preceding the onset of MI. re-ischemia and reinfarction ,pulmonary edema PAF, 30-day, 6 month and 1-year mortality was similar between the two groups and found statistically non significant difference between both group as regard these complications.

Also, there was statistically significant difference between the two studied groups as regard severity of vessel lesion with one vessel disease was more common in triggered group (p-value<0.05)and two vessel disease and three vessel disease were more prevalent in non triggered group (p-value>0.05). This was concordant with **Ben-Shoshan et al. [10]**.who found that patients in triggered group at high risk to develop one vessel disease while patients in non triggered group are at high risk to develop two and three vessel disease this finding can be explained as triggered-STEMI is more likely to result from sudden rupture of a vulnerable plaque secondary to acute sympathetic discharge while non triggered-STEMI may result from a more latent, chronic process, leading to gradual plaque progression and erosion and eventually to surface thrombosis and so more complex lesion **[14]**.

On the contrary, this was discordant with **Buckley et al. [11]**who compared the relative risk (RR) of MI following vigorous exertion between those with confirmed coronary occlusion and those with a non-occluded culprit artery on acute angiography this can be explained as this study compare coronary occlusion not severity of CAD following only one triggering factor (heavy physical exertion)

There was statistically significant difference between both group regarding the (culprit vessel) with LCX as culprit vessel was more common in triggered group and LAD as culprit vessel was more common in non triggered group .this was discordant with **Brodov et al. [13]** who studied 662 patients with ACS with complete angiographic data in two groups according to whether or not they reported the presence of specific unusual events or activities immediately preceding the onset of MI., and there was non significant difference of infarct related artery as regard LAD ,LCX but RCA was more prevalent in triggered group**.**

Different potential triggers were identified in triggering group Physical exertion was found to be the most dominant trigger(32.7%) followed by emotional stress (20%) and respiratory infection (18.2%),fatty meal (16.4%) ,sexual intercourse (5.5%),drug abuse (3.6%) and finally both traffic jam and witnessing car accident (1.8***%).*** This was concordant **Ben-Shoshan et al. [10]**.who reported that most frequent triggers were physical exertion, emotional stress and acute illness.

Also through simple and binary logestic regression analysis we found that, No specific trigger was found to predict independently multi-vessel CADand MACE . This was partially concordant with **Ben-Shoshan et al. [10]** who

found No specific trigger was found to predict independently multi-vessel CAD with no relation to short term prognosis as this study was retropective.

CONCLUSIONS

1- In triggered MI phyiscal exertion,emotional stress,respiratory infection and fatty meals were most prevalent as triggers of MI than other triggers.

2- No specific trigger was found to predict independently the extent of CAD and major adverse cardiac events.

3- non triggered MI were independant predictors of two and three vessel disease this can be attributed to comorbidites and advanced age in this group.

Conflict of interest

The authors declare no conflict of interests.

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