Clinico-Angiographic Profiles and In-Hospital Outcomes of non-ST Segment Elevation Myocardial Infarction in Kurdistan Region of Iraq

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Abstract

Objectives: This work aimed to study the clinical, angiographic profiles and in-hospital outcomes of NSTEMI cases in Duhok, Iraq.

Methods: This prospective study involved 283 patients with NSTEMI who were admitted to Azadi teaching hospital/Azadi heart center in Duhok, Kurdistan region of Iraq, between 2021 and 2022. The patient's demographic variables, major cardiovascular risk factors (smoking, hypertension, diabetes mellitus, hyperlipidemia and family history of coronary artery disease), clinical presentation, past history of myocardial infarction/previous percutaneous coronary intervention (PCI) and drug history were collected. The GRACE risk score was calculated for each patient. Patients were followed up regarding the management strategies (whether conservative or invasive approach), and in-hospital complications and outcomes.

Results: The mean GRACE score was 142 ± 26. 70% of cases underwent coronary angiography/angioplasty, with a mean time to the coronary intervention of 8 days. 17% of the sample had developed different cardiovascular complications, with heart failure being the most common. The mortality rate was 7.4%.

Conclusion: The study demonstrated higher complications and mortality rates, especially among patients with higher GRACE scores, compared to rates found in most available studies, particularly in western countries. This finding could be secondary to a suboptimal coronary intervention for NSTEMI in terms of time to intervention and the proportion of patients who underwent it.

Keywords: Non-ST elevated myocardial infarction, acute coronary syndrome, coronary intervention in NSTEMI

Introduction

Acute myocardial infarction remains the leading cause of death worldwide, including in Iraq.[1-3] However, despite the rate of ST-elevation myocardial infarction decreasing, the incidence of non-ST-elevation myocardial infarction (NSTEMI) is increasing.[4] This is believed to be due to many reasons, including the ageing of the population with a greater prevalence of diabetes and chronic kidney disease; and extensive use of troponin assays with higher sensitivity for myocardial injury, which move the diagnosis from unstable angina to NSTEMI.[5-7]

The risk stratification for cases with NSTEMI can be obtained from several prognostic scores like the TIMI (Thrombolysis in Myocardial Infarction) and GRACE (Global Registry of Acute Coronary Events) scores.[8,9] TIMI and GRACE scores can be determined from the patient's clinical characteristics, electrocardiographic and laboratory investigations performed on admission. They are satisfactorily simple and practical for risk assessments over a wide range of patients with NSTE-ACS.[10]

The fundamental step in the management of patients with NSTEMI is the initial assessment of hemodynamic and electrical stability, and calculation of the patient's overall risk to assist in treatment guidance.[11-13] There are two management strategies in NSTEMI; either an early invasive strategy with coronary angiography/revascularization (either PCI/coronary artery bypass grafting (CABG) as needed) or a conservative approach with medical therapy initially.[14,15] Regardless of which strategy is applied, both demand proper use of risk assessment and medications.[16,17] Being the NSTEMI has not been studied well in our region and Iraq, we aimed in this registry to look at the clinical, angiographic, management and in-hospital outcomes of NSTEMI patients in Duhok, Iraq.

Methods

In this prospective study, we enrolled cases of NSTEMI admitted at Azadi teaching hospital/Azadi heart center in Duhok, Kurdistan Region of Iraq, between 2021 and 2022. All recruited cases, both men and women, were followed up during the period of in-hospital stay.

The following data of cases were collected: patient's demographic variables, clinical presentations, major cardiovascular risk factors (smoking, hypertension, diabetes mellitus, hyperlipidemia and family history of coronary artery disease (CAD)), past history of myocardial infarction/previous PCI and drug history. The GRACE risk score was calculated for each patient. The patients were followed up during hospitalization with subsequent documentation of in-hospital major adverse cardiac events, namely heart failure, life-threatening arrhythmias, ischemic stroke and cardiac death.

For patients who underwent coronary angiography, time to intervention was documented, and the results of coronary angiography/angioplasty were collected and classified according to lesion significance, the number of coronary vessels involved, and the recommended management protocol; whether medical, PCI or CABG was addressed.

Ethical Approval

The study was approved by the research ethics committee of Kurdistan Higher Council of Medical Specialties. All patients enrolled in the study provided written informed consent.

Statistical Analysis

Collected data were entered into Microsoft Excel, and then transferred to SPSS version 26 for statistical analysis.

Frequency tables, range, mean and standard deviation (SD) were used to describe the data. Association between categorical data were analyzed by Chi-square test, while differences in means were analyzed by unpaired t-test. P values less than 0.05 were considered statistically significant.

Results

A total of 283 patients (191 males, 92 females) with a clinical diagnosis of NSTEMI were enrolled in the study with a mean age of 60.3 ± 12.8 years. Males were affected more than females. The common presenting symptom was ischemic chest pain. The cardiovascular risk factors were clustered, particularly hypertension and smoking.

About 70% of cases were newly diagnosed with CAD. The mean GRACE score was 142 ± 26. 70% of patients underwent coronary angiography/angioplasty. 17% of the sample had developed different cardiovascular complications. The mortality rate was 7.4%, as shown in Table 1.

The data from patients who underwent coronary intervention showed that (17.4%) had no significant coronary lesions. And the cases had undergone coronary angiography/intervention within a mean of 8 days after admission. Many of them received stents (65.1%), as shown in Table 2.

The comparison between conservative and intervention groups showed that the young cases underwent intervention significantly more than elderly ($P < 0.001$). Both genders received similar rates of intervention.

The coronary intervention was done more frequently for cases with higher GRACE scores compared to cases with lower grace scores ($P < 0.001$). Generally, the incidence of cardiovascular complications and mortality rate were higher among the conservative group ($P < 0.006$ and $P < 0.001$), respectively, as shown in Table 3.

The characteristics of patients in relation to GRACE scores revealed that the younger ages had lower GRACE scores than older ages ($P < 0.001$). Males made up the majority of the lower GRACE scores compared to the females ($P < 0.001$). Those cases presented with nonspecific presentations had higher GRACE scores. Almost all cardiovascular risk factors were significantly associated with higher rates of GRACE scores (P-values were significant for all except for hyperlipidemia). Furthermore, those cases with a positive history of prior MI/PCI had higher GRACE scores than cases without such past history (P-values were significant). The higher the GRACE scores, the greater the cardiovascular complications and mortality rates (P values of <0.001 for each), as shown in Table 4.

The characteristics of the intervention group based on GRACE scores demonstrated that extensive coronary lesions were significantly seen among GRACE scores of higher than 140 with a highly significant P-value <0.001. Regarding time to intervention and treatment modalities, there were no significant differences between the two groups of GRACE scores with (P values of 0.936 and 0.309) respectively, as shown in Table 5.

Discussion

The study was conducted to assess NSTEMI patient's characteristics, management strategy, complications and in-hospital outcomes. The mean age of presentation was comparable to

Table 1. Characteristics of all the patients

Characteristics		No. (283)	%
Age (years)	25–44	28	9.9
	45–64	155	54.8
	65–90	100	35.3
	Range; Mean ± SD	25–90; 60.3 ± 12.8	
Gender	Male	191	67.5
	Female	92	32.5
Main presentation	Chest pain	220	77.7
	Dyspnea	46	16.3
	Other	17	6.0
Cardiovascular risk factors			
Hypertension		140	49.5
DM		110	38.9
Hyperlipidemia		56	19.8
Smoking		132	46.6
Family history		20	7.1
Past medical history			
Previous PCI		48	17.0
Previous MI		36	12.7
Drug history			
Aspirin		107	37.8
ACE/ARB		89	31.4
Statin		103	36.4
Beta-blocker		38	13.4
Others		50	17.7
GRACE score (range; Mean ± SD)		81–218; 142.2 ± 26.3	
Management	Conservative	88	31.1
	Intervention	195	68.9
Complications	Heart failure	23	8.1
	Arrhythmias	8	2.8
	Heart failure + arrhythmias	14	4.9
	Heart failure + stroke	1	0.4
	Arrhythmias + stroke	1	0.4
	No complication	236	83.4
Survival	Alive	262	92.6
	Dead	21	7.4
Total		283	100.0

other studies from Iraq, including Mohammad et al.,[17] but was younger compared with western countries' age presentation of NSTEMI.[18-20]

The female percentage in our study was 32.5%, which was higher than Kinsara et al. from Saudi Arabia[21] and was comparable to Abdelmoneim et al. from Egypt.[22] Regarding clinical presentation, chest pain was the predominant symptom. However, females tend to present more with dyspnea than males, and this was comparable to other Iraqi[23] and Saudi Arabian trends.[21]

Table 2. **Characteristics of the intervention group**

Characteristics		No.	%
Angiographic findings	Single vessel	80	41.0
	Double vessels	48	24.6
	Triple vessels	33	16.9
	No significant lesion	34	17.4
Time to intervention in days (range; Mean ± SD)		1–21; 8.3 ± 4.2	
Treatment	Stenting	127	65.1
	CABG	30	15.4
	Medical	38	19.5
Total		195	100.0

Studying the cardiovascular risk factors for the cases, hypertension was the commonest risk factor, followed by smoking in the current study, this comes in agreement with Mohammad et al.,[17] but in the Mrsic et al. study from Bosnia, smoking was the commonest risk factor followed by hypertension.[24] Generally, the traditional cardiovascular risk factors are clustering with the increasing incidence among Iraqi patients with CAD.[25]

The management strategy applied in the current study showed that about 70% of cases were managed by an invasive interventional approach, and 30% were managed conservatively. However, the medical guidelines recommend a routine invasive strategy for almost all patients with NSTEMI within a limited time to improve the composite ischemic outcomes.[16,26]

Table 3. **Characteristics of the conservative group vs the intervention group**

Characteristics		Management				P-value*
		Conservative		Intervention		
		No.	%	No.	%	
Age (years)	25–44	2	2.3	26	13.3	
	45–64	35	39.8	120	61.5	<0.001
	65–90	51	58.0	49	25.1	
Gender	Male	58	65.9	133	68.2	0.703
	Female	30	34.1	62	31.8	
Main presentation	Chest pain	56	63.6	164	84.1	
	Dyspnea	26	29.5	20	10.3	<0.001
	Other	6	6.8	11	5.6	
Hypertension		57	64.8	83	42.6	0.001
DM		35	39.8	75	38.5	0.834
Hyperlipidemia		20	22.7	36	18.5	0.404
Smoking		36	40.9	96	49.2	0.194
Family history		4	4.5	16	8.2	0.266
Previous PCI		15	17.0	33	16.9	0.980
Previous MI		11	12.5	25	12.8	0.940
Aspirin		34	38.6	73	37.4	0.847
ACE/ARB		35	39.8	54	27.7	0.043
Statin		33	37.5	70	35.9	0.795
Beta blocker		16	18.2	22	11.3	0.115
Others		17	19.3	33	16.9	0.625
Grace score	<140	25	28.4	107	54.9	<0.001
	≥140	63	71.6	88	45.1	
Complications	Heart failure	5	5.7	18	9.2	
	Arrhythmias	4	4.5	4	2.1	
	Heart failure + arrhythmias	9	10.2	5	2.6	0.006
	Stroke	2	2.3	0	0.0	
	No complication	68	77.3	168	86.2	
Survival	Alive	69	78.4	193	99.0	<0.001
	Dead	19	21.6	2	1.0	
Total		88	100.0	195	100.0	

*Based on Chi-square test.

In terms of major adverse cardiovascular events and complications, we found that 17% of cases developed complications during the hospital stay. The most common one was heart failure, followed by arrhythmias. Its rates were comparable to the study by Dakhil et al.[27] and was higher than the study by Butt et al.[28]

Regarding NSTEMI mortality, the study demonstrated that the mortality rate was 7.4%. This rate was almost similar to a study by Hamid et al. from Iraq (7.7%),[29] but was higher than the GRACE registry (5%)[30] and Yusuf et al. (3.3%).[31]

In assessing the coronary lesions cases in the intervention group; 17.4% had no significant coronary lesions. This was higher than the rate mentioned in a study by Cortell et al. (13%),[32] and lower than the rate revealed in Mohammad et al. study (22.4%).[33]

The mean time to intervention was 8 days in the study. It was much longer than the mean times to intervention in most other studies like Milasinovic et al. (Time to coronary angiography varied from 0.5 to 24 h in the early and from 20.5 to 86 h in the delayed group).[34] This means that despite the rate of interventional approach for cases in our study, the time to intervention was significantly late and inconsistence with the recommended guidelines.

In regards to treatment modalities for cases underwent intervention in this study, 65% were treated by PCI and stenting, which was higher than the percentage found in a study from United States by B. Case et al. (53%).[35] Nevertheless, the CABG rates were similar in both studies (15.4% vs 15.1%).

In comparisons between conservative and intervention groups, the study showed that the younger age groups had a significantly higher rate of intervention than the elderly group ($P < 0.001$). This was comparable to Dakhil et al.[27] Those with higher GRACE scores received more intervention than cases with lower GRACE scores ($P < 0.001$). This was comparable to other studies, including Martinez et al. in Spain.[36]

Almost all cardiovascular risk factors in this study were associated significantly with higher rates of GRACE scores

Table 4. Characteristics of all cases (*n* = 283), based on Grace score

| Characteristics | | Grace score | | | | P-value* |
| | | <140 | | ≥140 | | |
		No.	%	No.	%	
Age (years)	25–44	28	21.2	0	0.0	
	45–64	98	74.2	57	37.7	**<0.001**
	65–90	6	4.5	94	62.3	
Gender	Male	106	80.3	85	56.3	**<0.001**
	Female	26	19.7	66	43.7	
Main presentation	Chest pain	113	85.6	107	70.9	
	Dyspnea	16	12.1	30	19.9	**0.006**
	Other	3	2.3	14	9.3	
Hypertension		48	36.4	92	60.9	**<0.001**
DM		35	26.5	75	49.7	**<0.001**
Hyperlipidemia		23	17.4	33	21.9	0.351
Smoking		73	55.3	59	39.1	**0.006**
Family history		16	12.1	4	2.6	**0.002**
Previous PCI		16	12.1	32	21.2	**0.043**
Previous MI		8	6.1	28	18.5	**0.002**
Aspirin		38	28.8	69	45.7	**0.003**
ACE/ARB		28	21.2	61	40.4	**0.001**
Statin		37	28.0	66	43.7	**0.006**
Beta blocker		16	12.1	22	14.6	0.547
Others		13	9.8	37	24.5	**0.001**
Complications	Heart failure	2	1.5	21	13.9	
	Arrhythmias	2	1.5	6	4.0	
	Heart failure + arrhythmias	2	1.5	12	7.9	**<0.001**
	Stroke	0	0.0	2	1.3	
	No complication	126	95.5	110	72.8	
Survival	Alive	131	99.2	131	86.8	**<0.001**
	Dead	1	0.8	20	13.2	
Total		132	100.0	151	100.0	

*Based on Chi-square test.

Table 5. **Characteristics of the intervention group (_n_ = 195), based on grace score**

Characteristics		Grace score				P-value
		<140		≥140		
		No.	%	No.	%	
Angiographic findings	Single vessel	55	51.4	25	28.4	
	Double vessels	18	16.8	30	34.1	**<0.001**[*]
	Triple vessels	10	9.3	23	26.1	
	No significant lesion	24	22.4	10	11.4	
Time to intervention in days (range; Mean ± SD)		1–20; 8.3 ± 4.7		1–21; 8.3 ± 3.4		0.936[**]
Treatment	Stenting	67	62.6	60	68.2	
	CABG	15	14.0	15	17.0	0.309[*]
	Medical	25	23.4	13	14.8	
Total		107	100.0	88	100.0	

[*]Based on Chi-square test. [**]Based on unpaired _t_-test.

(_P_ values were significant for all except for hyperlipidemia). This was in concordance with a study by Hall et al. in the UK, which showed that all cardiovascular risk factors were significantly correlated to higher GRACE scores (including hyperlipidemia).[37] Meanwhile, a study by Cakar et al. in Turkey showed a statistically significant relation between hypertension (but not smoking/diabetes) and high GRACE scores.[38] Patients with a past history of MI/PCI had higher GRACE scores (_P_-value was significant). This was comparable to Hall et al.[37] On the other hand, the extensive coronary lesions were significantly associated with GRACE scores of higher than 140. Such finding was also seen by Butt et al. and Rahmani et al.[28,39] The cardiovascular complications and death rates were also higher among GRACE scores of ≥ 140 with _P_ values (<0.001 for each). These findings were almost similar to rates found by Dakhil et al.[27] and Kumar et al.[40]

Conclusion

The coronary intervention for NSTEMI cases was suboptimal in our area, both in the time to intervention and the percentage of cases undergoing intervention. This might explain the higher mortality and adverse outcomes in this study compared to available data. It is worthy to say that the guideline-directed immediate and early invasive strategy in indicated NSTEMI cases and the revision of the current local NSTEMI management protocol might improve the outcomes of the cases in our countries.

Conflict of Interests

Nothing to declare.

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