Predictors of acute coronary syndrome in pre hospital patients with chest pain

Facteurs prédictifs du syndrome coronaire aigu chez les patients souffrant de douleur thoracique en pré hospitalier

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RÉSUMÉ

Introduction : La douleur thoracique non traumatique est un motif de recours fréquent en médecine d'urgence pré hospitalière. L'objectif de notre étude était d'identifier les facteurs prédictifs de SCA ST+ en régulation médicale de douleur thoracique aiguë.

Méthode : Nous avons mené une étude observationnelle prospective sur une période d'une année (du 1er décembre 2017 au 30 novembre 2018) dans le Service d'aide médicale urgente du Nord-Est (SAMU 01). Nous avons inclus tous les patients âgés de plus de 18 ans, appelant le centre de réception et de régulation des appels pour des douleurs thoraciques aiguës non traumatiques. Les paramètres recueillis étaient d'ordres démographiques et cliniques. Une étude multivariée a été réalisée à la recherche de facteurs prédictifs de survenue d'un SCA ST+.

Résultats: Nous avons inclus 368 patients. L'âge moyen était de 56 ± 15 ans, le sex-ratio était de 2,7. Le tabagisme était le facteur de risque cardiovasculaire le plus fréquent (41%) suivi de l'hypertension (31%) et de la coronaropathie (20%). La moitié des appels ont été fait par des médecins et 43% d'entre eux sont survenus au cours des deux premières heures de la douleur thoracique. L'examen clinique a révélé un arrêt cardiorespiratoire chez 10 patients, dont 6 étaient liés à STEMI. À l'arrivée de nos équipes mobiles d'urgence, un SCA ST+ a été identifiée chez 118 patients (32%), dont 37% ont été admis directement à la salle de cathétérisme.

En analyse multivariée, les facteurs prédictifs indépendants de SCA ST+ étaient : le diabète (OR = 5,25; IC: 1,61 - 17,06), tabagisme (OR = 2,78, IC: 1,03 - 7,5), douleur thoracique typique (OR = 4,68, IC: 1,09 - 21,67).), Persistance de la douleur de plus de 30 min (OR = 63,31, IC: 13,51 - 29,49).

Conclusion: Les antécédents de diabète, le tabagisme, la douleur thoracique typique et persistante étaient les principaux facteurs associés à un SCA ST+ en régulation médicale. L'identification précoce de ces facteurs par le médecin régulateur permet d'améliorer la prise en charge des SCA ST+ depuis la régulation médicale.

Mots-clés: douleur thoracique, régulation médicale, syndrome coronaire aigu

SUMMARY

Background: Non-traumatic chest pain is a common cause in pre hospital emergency medicine.

The objective of our study was to identify predictive factors of STEMI in patients with acute chest pain, on telephone interview.

Methods: We conducted a prospective observational study over a period of one year (december 2017 to november 2018) in the Emergency Care System of the North Est (SAMU 01) of Tunisia. We included all adults patients aged more than 18 years old, calling the emergency dispatch center for acute non traumatic chest pain (CP). The demographic and clinical data were collected and studied to identify the predictive factors for STEMI.

Results: We included 368 patients. The average age was 56 ± 15 years, the sex ratio was 2.7. Smoking was the most common cardiovascular risk factor (41%) followed by hypertension (31%) and coronary artery disease (20%). Half of calls were made by doctors and 43% of them were made within the first two hours of onset of the CP. Clinical examination showed cardio respiratory arrest in 10 patients, 6 of them were related to STEMI. On the arrival of our emergency mobile teams, an elevation of ST segment was identified in 118 patients (32%) of which 37% were admitted directly into the catheterization room.

In multivariate analysis, the independent predictive factors of STEMI were: diabetes (OR = 5.25; CI [1.61 - 17.06]), smoking (OR = 2.78, CI [1.03 - 7.5]), typical CP (OR = 4.68, CI [1.09 - 21.67]), CP persistence of more than 30 min (OR = 63.31, CI [13.51 - 29.49]).

Conclusion: History of diabetes, smoking, typical and persistent CP were the main factors associated with STEMI in patients calling the emergency dispatch center for an acute CP. The early identification of these factors by the emergency physician will improve the management of acute CP since the medical regulation

Key-words: chest pain, medical regulation, acute coronary syndrome

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INTRODUCTION

Chest pain (CP) is an important chief complaint at the emergency department and at the prehospial care. This symptom raises the problem of etiological diagnosis

In medical regulation, CP is a complex symptom to analyze because it is a telephone interview and the clinical presentation may be different for the same diagnosis or the same for different diagnoses.

Accurate collection of anamnestic and semiological data is essential in these conditions. It allows to establish a probabilistic clinical reasoning and to build the diagnostic hypotheses.

The identification of ST segment elevation myocardial infarction (STEMI) in case of an acute CP and ruling –out several differential diagnoses represents a challenge for all emergency physicians.

In the emergency care system, the diagnostic process should be quick and efficient since the prognosis improves when STEMI patients receive targeted treatment as early as possible [1].

The major steps in STEMI identification are : reporting medical history of cardiovascular risk factors, chest pain characteristics, clinical exam findings and electrocardiogram (EKG)

The EKG is an integral part of the work up of patients with CP [2]. The resting 12-lead EKG is the first-line diagnostic tool in the assessement of patients with suspected acute coronary syndrome [3]. It is recommended to be performed within ten minutes of the first medical contact. It should be interpreted immediately by a qualified physician in order to identify the type of ST-segment changes which provides key diagnostic and prognostic clues [2].

The identification of patients at high risk of STEMI during a call for acute CP is important in order to activate the coronary revascularization pathway and to ensure coordination between its different medical actors.

The aim of our study was to identify predictive factors of STEMI in patients with acute chest pain, on telephone interview.

METHODS

Study population

We conducted a prospective observational study over a period of one year (december 2017 to november 2018) in the Emergency Care System of the North Est (SAMU 01) of Tunisia. We included all adults patients aged more than 18 years old, calling the reception and regulation center for acute non traumatic CP

We excluded patients for whom the ambulance was not available and patients evacuated by other means before the arrival of the emergency mobile service (EMS)

Groups comparison

After the EMS intervention and the EKG interpretation, patients were divided into two groups in order to identify the factors predicting the occurrence of STEMI in front of acute CP:

- Group STEMI+: presence of STEMI
- Group STEMI-: absence of STEMI

Data collection

Data was collected as following : personal data, medical history and treatment, comorbidities and cardiovascular risk factors, CP characteristics, time from symptom onset to emergency care system call, physical examination characteristics, thrombolysis in myocardial infarction, anti-ischemic and anti-thrombotic treatment, revascularisation modalities, pre hospital orientation.

Pre hospital protocol

Any call for chest pain should be treated by an emergency physician. This determines the patient's medical history and cardiovascular risk factors. In addition, emergency physician analyzes symptoms presented by the patient and assesses their severity while privileging the interrogation of the patient himself or a direct witness.

If chest pain justifies the intervention of EMS, the emergency physician may issue advice such as non-mobilization of the patient and / or the administration of a platelet antiaggregant before the arrival of the EMS team.

After the clinical examination and the EKG, a report must be communicated by the intervention doctor to the medical regulation. The regulating physician must orient the patient in a structure adapted to his pathology and organized the direct admission in cardiac catheterization room in case of STEMI.

The guidelines of the European Society of cardiology 2017 were adopted in the treatment management.

Statistical analysis

We used SPSS, version 20.0 (IBM SPSS Inc, Chicago, Illinois, USA) for data analysis. The Kolmogorov-Smirnov test as used for variables distribution. Categorical values were assessed using a chi-square test (or Fisher's exact test when indicated) and continuous variables using a Student T test or Mann-Whithney test for trends in the absence of a normal distribution. Univariate analysis of baseline variables was performed by using a backward stepwise variable selection procedure to determine the predictive factors of STEMI in patients presenting with chest pain. To study the independent predictors of STEMI, multivariate analysis was performed with logistic regression by backward stepwise elimination. The odds ratio (OR) was expressed with the respective 95% CI. In all tests, a p value less than 0.05 was significant.

RESULTS

Baseline characteristics of the study population

During the study period, there were 392 calls for non traumatic CP. We didn't include 8 patients because the ambulance was not available. There were 376 patients eligible for inclusion. However 16 patients were excluded because they were not treated by our EMS teams.

A total of 368 patients (10% of all our interventions) were enrolled into the study (Figure 1)

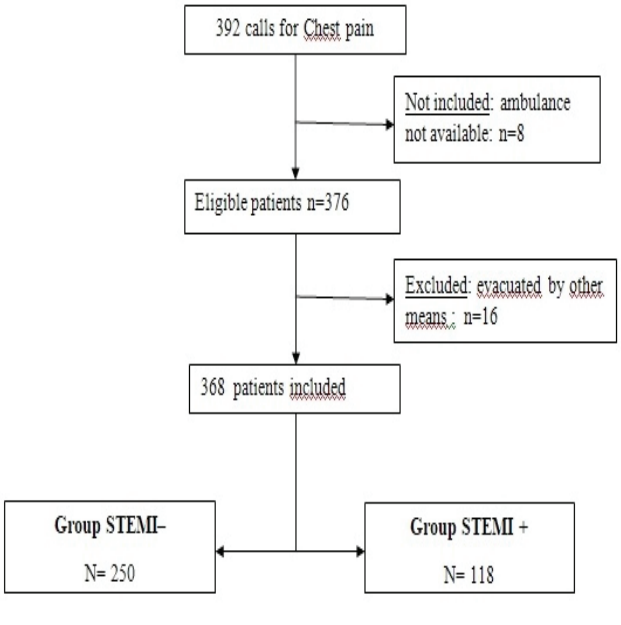

Figure 1. Inclusion algorithm

Mean age was 56±15 years. Twenty eight percent (n=103) were aged more than 65 years. Males were predominant (73%) with a sex-ratio=2.7

Fifty percent of the calls for CP were made by doctors, 4% by cardiologists (n=7) and 40% (n=147) occurred in the morning (8 am to 2 pm). Forty three percent (n=158) of calls were made within the first two hours of onset CP.

Active smoking was found in 41% of patients (n=151). While other comorbidities were as follow: hypertension (n=114; 31%), diabetes (n=96; 26%) and coronary artery disease (n=74; 20%). Characteristics of pain were: central chest pain (80%), arms radiation (28%) constriction (47%), and persistent more than 30 minutes (51%). The most frequent associated signs: sweating (30%) and nausea (22%). Clinical examination showed cardiac arrest in 10 patients, 6 of them were related to STEMI. On the arrival of our emergency medical teams, an elevation of ST segment was identified in 118 patients (32%) of which 37% (n=44) were admitted directly into the catheterization room.

The table 1 shows the demographic and clinical characteristics comparison of the two groups.

Table 1. Baseline characteristics of the study population and group comparison

variables	All N=368	STEMI+ N=124	STEMI- N=244	p
Mean age ±SD	56±15	62±13	55±15	0.2
Men n(%)	269(73)	89(72)	180(74)	0.47
Active smokers n(%)	151(41)	70(56)	81(33)	**0.02**
Median time to ECS call (hours)*	5[3-24]	5[3-18]	31[2-32]	0.42
Comorbidities				
Hypertension n(%)	114(31)	40 (32)	74(30)	0.52
Diabetes n(%)	96(26)	56(45)	40(16)	**<0.001**
Coronary artery disease n (%)	54(15)	32(26)	22(9)	0.9
Dyslipidemia n (%)	50(14)	18(14.5)	32(13)	0.25
Chest pain characteristics				
Typical CP n (%)	294(80)	122(98)	172(70.5)	**0.001**
Occurred during the effort n (%)	252(68.5)	52(42)	200(82)	**0.016**
Persistent more than 30 min n (%)	188(51)	120(97)	68(28)	**<0.001**
Without irradiation n (%)	224(61)	66(53)	158(65)	0.35
Radiation to the neck n (%)	14(4)	8(6.5)	6(2.5)	0.22
Radiation to the upper limbs n (%)	102(28)	40(32)	62(25)	0.18
Associated signs				
Dyspnea n (%)	72(19.5)	12(10)	60(24)	0.06
Palpitation n (%)	30(8)	4(3)	26(11)	**0.021**
Sweats n (%)	110(30)	48(39)	62(25)	0.32
Nausea n (%)	80(22)	50(40)	30(12)	**<0.001**

CP : Chest Pain ; ECS : Emergency Care System ; SD : Standard Deviation
*Time from onset of pain to emergency care system call

Predictors of STEMI

In univariate analysis, seven predictors were found to have significant association with STEMI diagnosis in patients managed by the EMS with acute CP.

Multivariate analysis identified four independent predictors of STEMI (adjusted OR ; (95%CI) ;p) : diabetes (5.2 ; [1.6-17.2];0.006), smoking (2.7 ; [1.3-7.5];0.04), Typical CP (4.6 ; [1.2-21.8];0.03), CP persistent more than 30 min (6.3; [1.5-29.4]; <0.001) (figure 2)

Table 2. Factors independently associated with STEMI

factor	Adjusted OR	[95% CI]	p
Diabetes	5.2	[1.6-17.2]	0.006
Smoking	2.7	[1.3-7.5]	0.04
Typical CP	4.6	[1.2-21.8]	0.03
CP persistent more than 30 min	6.3	[1.5-29.4]	<0.001

CP: chest pain; OR: Odds Ratio; CI: confidence interval

DISCUSSION

We studied a specific group of patients : those having acute CP suggestive of acute coronary syndrome and managed by our mobile emergency service. This category of patients usually represents a prognosis and diagnosis challenge especially when chest pain is related to STEMI.

In our emergency medical dispatch center, we found that CP persistent more than 30 min, typical CP, a medical history of diabetes, and smoking represented predictors of STEMI.

Guidelines recommend that individuals experiencing chest discomfort should call for an ambulance [4]. The chain of care starts at the emergency medical dispatch center which faces a difficult task in evaluating symptoms by telephone.

These diagnostic difficulties are increased by the frequency of typical presentations that can be encountered. It has been shown that 40% of patients with STEMI had a typical pain and that 35% of patients without STEMI had a typical pain. One in two myocardial infarctions seen in emergencies, would not have chest pain [5, 6].

Many studies are interested in factors predicting the occurrence of STEMI in the emergency medical dispatch center. Pradeau et al. In a study conducted in France over a 6-month period that included 300 calls for chest pain, showed that male sex, hypercholesterolemia, retrosternal pain, irradiation on the right arm and left arm were predictive factors of STEMI [7].

Another multicentre study done in India in 2007 involving 9130 patients over the age of 30 hospitalized for STEMI. Predictive factors found were age ≥ 62 years, burn-like pain and dyspnea [8]. Similarly, a study from the French DOLORS multicenter registry, with the collaboration of the French society of emergency medicine and the French cardiology society in 2009, including 1647 calls for non-traumatic chest pain, the predictive factors identified were retrosternal, persistent pain. (> 30 min), its occurrence on exertion and its irradiation on the upper left limb [9].

Rawshani et al. identified in their 7-month study in sweden in 2009 including 2,285 patients (out of 14,000 calls received for chest pain), the predictors identified were chest pain, coronary history, and sweat. The different assessment of pain by the elderly, diabetics and women was the major limitation of this study [10].

We have identified the predictive factors of STEMI in the medical regulation of acute chest pain. These factors could be incorporated into a tool to help emergency physician to dispatch ambulances.

To improve our practices, it is important, first to train the medical regulators so that all this data is not lacking in the telephone interrogation of acute CP.

Second the current situation can be improved by networking, in which emergency care system and hemodynamic centers cooperate closely. This system would provide access to primary angioplasty to the majority of patients within the recommended time frame [11-13]. Thus, some teams organized mutualized “interventional guards” guaranteeing a response 24/24 and 7/7 [14-16].

Study limitations

Our study has some limitations. First, we did not have the etiological diagnosis for four deceased patients before the arrival of our EMS teams. Second, we perform a mono center study ; multicenter protocol may increase the number of patients to better identify acute coronary syndrome patients among those with acute chest pain from the emergency medical dispatch center.

CONCLUSION

We identified two cardiovascular risk factors (diabetes and smoking) and tow semiological characteristics (typical and persistent) independently associated with STEMI in patients calling emergency medical dispatch center for

acute chest pain. A specific tool derivated from these results would be elaborated and integrated to a diagnosis algorithm.

It is necessary to continue the search for predictive criteria of STEMI for the medical regulation of chest pain, in order to maintain a good sensitivity of sending emergency mobile service and to improve the specificity.

Conflict of interest

The authors declare that no conflicts of interest exist

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