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ORIGINAL RESEARCH

The beneficial learning by simulation in the acquisition of non-technical skills among medical students

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Abstract

Introduction: Medical simulation is a new learning method recently introduced in medical education and has grown tremendously. "Never the first time on the patient", it is with this objective that medical simulation has become for several years an essential teaching method for health professionals and medical students. It is proven to improve both technical and non-technical skills (NTSs).

Methods: We carried out a pre-experimental study at the simulation center of the emergency medical service of the eastern center of Tunisia and the simulation center of the Faculty of Medicine of Sousse during the academic year 2020-2021. Our target population was students in the third year of the second cycle of medical studies.

We led four days of simulation-based training; it was included the community health program of the Faculty of Medicine of Sousse. NTSs were evaluated by the Anesthesia Non-Technical Skills (ANTS) score, at the start of the training (t0) (Workshop 2), at the end of the training (t1) (Workshop 6-7), and during the practical exam (t2).

Results: Our study population consisted of 67 medical students from the Faculty of Medicine of Sousse. Most students were females (67.7%). The mean age was 23.16 (±0.7).

The mean ANTS score before training at (t0) was 30.85+/- 10.8. At the end of the training, the mean ANTS score (t1) became 44.36+/- 8.8 ($p < 0.001$). At the final assessment, the mean ATNS score at (t2) was 48.99+/-11.8. The difference in mean between the assessment at t0 and t1 and the final assessment (t2) was statistically significant with $p < 0.001$. We compared the means of different items of the ANTS score, during the training to the end, and we found a significant improvement in work organization (10,03,10,94 and 15,79), teamwork (9,96,13,96 and 14,6) situational awareness (4,61, 8,91 and 9,25) and Decision-making (5.34, 7.66 and 9.34) with $p < 0.001$.

Conclusion: Simulation-based training for the medical and paramedical public contributes to patient safety and more effective care provided in critical situations. Our study confirmed the importance of this teaching method in acquiring and strengthening NTS.

Keywords: Crisis Resource Management; High Fidelity simulation training; Medical students

INTRODUCTION

Medical simulation is a new learning method recently introduced in medical education and has grown tremendously.

Simulation-based teaching in the health sciences is defined by the High Authority of Health (HAS) as being “the use of equipment, virtual reality or a standardized patient to reproduce situations or healthcare environments, to teach diagnostic and therapeutic procedures, to repeat processes and medical concepts, or decision-a making by a health professional or team of professionals” [1].

"Never the first time on the patient", it is with this objective that medical simulation has become for several years an essential teaching method for health professionals and medical students. It is proven to improve both technical and non-technical skills.

Medical studies mainly focus on individuals gaining theoretical, procedural, and technical knowledge. Non-technical skills (NTS) are rarely acquired by traditional methods of teaching. Several studies have proven that these skills improve the quality of teamwork, which helps to avoid human errors in patient care [2].

Simulation-based learning offers the possibility to acquire NTS in a psychologically safe environment allowing control of the situation and constructive discussion of errors without negative consequences.

The Cardiopulmonary resuscitation (CPR) training is a simulation-based training recently introduced (in 2020) in the Sousse medical school program for DCEM 3 students.

We can evaluate the impact of simulation in acquiring and improving NTS through different scores: Measurement scale for the evaluation of an emergency team (TEAM scale), OTPA grid (Obstetric Team Performance Assessment) [3], Ottawa CRM score, and the Anesthesiologists’ Non-Technical Skills score (ANTS) which is validated [4].

Our study aimed to study the evolution of the total NTS scale along the study and the score of each item of the ANTS scale by comparing the NTC score before the simulation-based training with that during and after the training.

METHODS

Type of study: We carried out a pre-experimental study at the simulation center of the Emergency Medical Service of the eastern center of Tunisia (CESU 03) and the simulation center of the Faculty of Medicine of Sousse (CESIM) during the academic year 2020-2021.

Study population: Our target population was the third year of the second cycle of medical students, in the faculty of medicine of Sousse. They were divided into four different groups. Students who had or were suspected to have COVID-19 were excluded due to safety measures.

Measurement: We used the «ANTS» score which is validated by the learned societies of emergency and resuscitation which are: SRLF/ SFAR/ SFMU/ SoFra.SimS [4]. The total score is 60 points according to 4 items: task management which was noted on 16 points, teamwork (20 points), situational awareness (12 points), and decision making (12 points).

Program of the training: We led four days of training by simulation "CPR" which is part of the 5.2 community health program of the Faculty of Medicine of Sousse.

The CPR training consisted of different practical workshops. These workshops were led by qualified instructors in simulation teaching. All stages of the simulation session were respected; a briefing, clinical scenario, and constructive debriefing. The workshops were as above:

- Workshop 1: Basic Life Support "BLS" and defibrillation.
- Workshop 2: Management of a critical patient using the ABCDE approach.
- Workshop 3: Airway Management and Intra-Bone Access
- Workshop 4: ECG monitoring and rhythm recognition.
- Plenary session: Advanced Life Support «ALS» algorithm with a demonstration presented by the trainers.
- Workshop 5: Shockable rhythms and post-resuscitation care.
- Workshop 6: Non-shockable rhythms and Decision making.
- Workshop 7: Special circumstances: Anaphylaxis, Asthma, Electrolytic disorders.

During this training, 30 clinical scenarios were carried out. Each student played the role of the team leader in teamwork for the care of a patient in critical condition in at least 5 different scenarios. These CNTs will be evaluated by the ANTS score, at the start of the training (t0) (Workshop 2), at the end of the training (t1) (Workshop 6-7), and during the practical exam (t2). The practical exam was carried out two weeks away from the training days.

Data analysis: The results were analyzed using SPSS software, version 23. Qualitative variables were represented by numbers and percentages. Quantitative variables were represented by means and standard deviations. We used the non-parametric "Wilcoxon" test to study correlations of the mean score of ATNS. The significance level was set at a p-value < 0.05.

RESULTS

Our study population consisted of 67 medical students from the Faculty of Medicine of Sousse. Most students were females (67.7%) with a sex ratio of 0.59. The mean age was 23.16 (±0.7) years with extremes ranging from 22 to 26 years.

The mean ANTS score before training at (t0) was 30.85+/- 10.8 with a minimum of 17 and a maximum of 51. At the end of the training, the mean ANTS score (t1) became 44.36+/- 8.8. The maximum score was 59 and the minimum was 30 ($p < 0.001$).

At the final assessment during the exam, the mean ATNS score at (t2) was 48.99+/-11.8 with a minimum of 33 and a maximum of 62. The difference in mean between the assessment at t0 and t1 and the final assessment (t2) was statistically significant ($p < 0.001$).

We compared the means of different items of the ANTS score. The items were work organization, teamwork, situational awareness, and decision-making. During the training to the end, we noted a significant improvement in work organization (10,03,10,94 and 15,79), teamwork (9,96,13,96 and 14,6) situational awareness (4,61, 8,91 and 9,25), and Decision-making (5.34, 7.66 and 9.34) with $p < 0.001$.

Table 1: The mean ANTS score of different items before, during, and at the end of training

Non-technical skills	T0	T1	p	T2	p
Work Organisation l (/16)	10.03	10.94	0.001	15.79	0.001
Teamwork (/20)	9.96	13.96	0.001	14.6	0.001
Situational awareness(/12)	4.61	8.91	0.001	9.25	0.001
Decision-making (/12)	5.34	7.66	0.001	9.34	0.001
Total score (/60)	30.85	44.36	0.001	48.99	0.001

DISCUSSION

Our work aims to evaluate NTS acquisition among medical students of Sousse Medical School during simulation-based training.

We conducted a pre-experimental study. Most students were females (67.7%), with a 23-year mean age.

We found a statistically significant improvement in ANTS scores from the beginning to the end of the training. The mean score at the beginning of training (t0) was 30.85+/- 10.8, 44.36+/-8.8 at the end of training (t1), and 48.99+/-11.8 at the final exam (t2).

It was the same for all the different items of the ANTS score, as we assessed their mean score separately at the beginning, at the end of the training, and during the final exam.

Our results were consistent with various studies that showed medical simulation to be an essential tool in the acquisition of NTS.

In the literature, learning through simulation, allows students to develop the expected behaviors towards critical situations in the professional environment in the most pragmatic way possible. Indeed, simulation helps to develop clinical reflexes and improve them [5].

A meta-analysis including 619 studies did a comparison between traditional learning and simulation and found simulation was systematically associated with the better acquisition of knowledge, and clinical skills NTS [6].

Another meta-analysis published in 2010 [7] demonstrated that simulation-based teaching can improve individual performance in technical tasks and management of critical events [8,9].

In the early 2000s, the committee responsible for the quality of health care in America published a report “To Err is Human” [4] showing the importance of the human factor in medical errors. Over 70% of adverse medical events were reported to be related to communication and coordination problems [10].

In Tunisia, a study conducted at EMS 03 in Sousse evaluating the impact of a simulation training accredited by the European resuscitation council “Immediate Life Support ILS’’ on practical acquisition found a significant improvement in both technical skills (TS) and NTS with a great increase in the ANTS score from the beginning to the end of training [16].

A study carried out in Morocco also confirmed the educational contribution of simulation in the improvement of knowledge and practical acquisitions [17].

A recent study conducted in the USA did a 10-month simulation training program for 231 medical students from Texas. It found a statistically significant improvement in NTS from the 6th session [18].

The General Medical Council of the UK strongly recommends medical simulation be taught in the first year to familiarize all young medical students with this method of learning [15].

In the literature, several studies demonstrated that simulation replicating real critical situations and focusing on teaching verbal and non-verbal communication or leadership has become an essential tool in error reduction strategies [19].

In a study conducted in France with 3 months of simulation training, MOTTIER et al. [20] also confirmed that simulation training allows improvement in NTS, which corresponds to level two of the Kirkpatrick scale. Given these results, other studies would be necessary to assure long-term retention of these new skills [21].

Further, Thomas et al. [22] showed in their study that a combination of theoretical training with simulation improved team-related TLCs compared to those based solely on simulation.

Moreover, a meta-analysis published in 2017 showed that simulation improves skills but not knowledge acquisition [23]. This leads us to conclude that a duality in teaching methods is necessary for better medical learning.

However, an American study revealed in the Journal of the Society for Simulation in Healthcare that the ANTS score was complex, even experienced clinicians and simulation instructors may have difficulty using it, and suggested that BARS '' Behavioral-anchored rating scales would be an alternative to the ANTS scale for NTS assessment [24].

Study Limitation: The sample of our study was small including only 67 students; a study with a larger sample would have yielded more meaningful results.

The evaluation of NTS acquisition in our study was done over a short period; only 4 days of simulation training. A long-term evaluation may also be proposed.

CONCLUSION

Simulation training for the medical and paramedical public contributes to patient safety and more effective care provided in critical situations. Our study confirmed the importance of this teaching method in acquiring and strengthening NTS.

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Acute cerebral insults in the emergency department: epidemiology and predictive factors of highly sensitive troponin level's increase

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Abstract

Objectives : This study aimed to describe the clinical and epidemiological characteristics of acute neurological disease and to determinate the predictive factors of highly sensitive troponin elevation

Methods: this is a prospective and analytic study conducted at The Emergency Department of The Military Hospital of Tunis. It included 106 patients diagnosed with acute cerebral disease and having highly sensitive troponin measurement at admission over a period of 10 months. A multivariate analysis was conducted to identify the predictive factors of troponin elevation.

Results: The mean age of our patients was 62±19 years and the gender ratio was 1.4. Hypertension was the most common cardiovascular risk factor (46%). The most common acute neurological diseases were ischemic stroke (47%) followed by seizures (14%) and hemorrhagic stroke (13%). Thirty-six patients (35%) had a high troponin level, 18 patients (17%) had repolarization abnormalities and 8 patients (8%) had both troponin elevation and ST segment abnormalities. A high troponin level was found in 50% of patients with brain tumors, 47% of patients with seizures, 38% of patients with ischemic stroke and 33% patients with subarachnoid hemorrhage.

In this multivariate analysis, the independent predictive factors of troponin elevation in patients with acute neurological disease were: age greater than 65 (OR=2.75, CI: 2.801-5.456), diabetes (OR=1.47, CI: 1.546-3.956) and Glasgow Coma Scale (GCS) less than 15 (OR=0.53, CI: 2.213-4.329)

Conclusion: The troponin level was high in 35% of patients with acute neurological disease. Predictive factors of troponin elevation were: age greater than 65, diabetes, history of atrial fibrillation and a GCS under 15.

BACKGROUND

Acute brain insults are a frequent cause of patients presenting to the ED. It is also an important cause of functional disability and mortality among these patients. Numerous acute brain injuries such as stroke, subarachnoid hemorrhage, and seizures were associated with transitory heart malfunction with simultaneous troponin level increase [1]. Many studies showed that an increase in plasma catecholamine occurs after acute brain insults causing acute myocardial damage with elevated troponin levels. The increase in troponin levels could allow us to identify the patients having an acute brain insult with cardiovascular consequences. However, the cardiac repercussions of neurological insults are often unknown by the different stakeholders (emergency physician, neurologist, cardiologist). Also, increased troponin levels can occur in some conditions other than coronary artery disease whose symptoms can be atypical or hidden by the neurological signs. The challenge for the emergency physician is to recognize patients at high risk of myocardial repercussions because it is associated with poor prognosis.

Therefore, the management of these patients should be multidisciplinary. Our study aims to identify the epidemiological and clinical features of brain insults as well as to determine the predictive factors of troponin elevation among these patients.

METHODS

Patients and data acquisition: Consecutive patients admitted with acute brain insult were prospectively enrolled over 10 months in a database and followed during their hospitalization in the ED. We included 106 patients diagnosed with ischemic or hemorrhagic stroke, spontaneous or post-traumatic subdural and extradural hematoma, seizures, expansive intracranial process, and post-traumatic cerebral hematoma. Data prospectively collected included the following parameters: age, gender, medical history, clinical examination data, and laboratory data including cardiac Troponin I (cTNI) levels and brain imaging results. According to the final diagnosis, the patient was subsequently oriented towards the appropriate hospital department.

Blood samples: For the measurement of cTNI levels, the automated benchtop immunoanalyzer VIDAS based on the Enzyme Linked Assay (ELFA) technology was used. According to the local standards, a cTNI cut-off level of ≥ 19 ng/ml was considered a significant elevation; values of 19 ng/ml on admission were rated as increased when the second sample confirmed an elevation of ≥ 10 ng/ml.

Statistical analysis: We calculated the absolute frequencies and the relative frequencies (percentages) for the qualitative variables. We calculated means, medians, and standard deviations and determined the extreme values for the quantitative variable.

The comparisons of the percentages of independent series were carried out by the Chi-square test of Pearson, and in the event of invalidity of the previous test, we used the two-tailed Fisher test.

The comparisons of means of independent series were carried out with the student's t-test, and in the event of this test not being valid, we used the nonparametric test of Mann and Whitney.

To identify the factors of troponin elevation during acute brain insults, we compared two groups:

- G1: acute cerebral insults and positive troponin
- G2: acute cerebral insults and negative troponin

We conducted a multivariate, step-wise, decreasing logistic regression analysis. The multivariate analysis made it possible to calculate adjusted odds ratios, measuring the proper role of each factor.

For all statistical tests, the significance level "p" was fixed at 0.05.

RESULTS

Among the 106 patients who were included in the final analysis, the mean age was 62 years (SD ±19); the gender ratio was 1.4. The most common cardiovascular risk factor was hypertension (46%) followed by Diabetes (41%). Thirty-eight patients had at least two cardiovascular risk factors. In our study, 14% of patients had a medical history of coronary disease, and 5% had valvular disease with atrial fibrillation. A medical history of stroke was found among 23 patients. The reason for consultation was a motor deficit (41%) and an altered state of consciousness (34%). On admission, neurological examination showed a GCS of 9/15 in 11% of cases. The mean GCS was 14±3. A motor deficit was found in 49% of cases divided as follows: hemiparesis (49%), hemiplegia (36%), and monoparesis (15%). Ten patients had mental confusion and 7 patients had seizures. An ECG was performed for all patients showing: atrial fibrillation (21%), repolarization disorder (17%), tachycardia (27%), and bradycardia (2%). A cranial CT scan was also performed for all patients. It was normal for 34% of patients. Otherwise, it showed ischemic stroke (27%), hemorrhagic stroke (13%), subarachnoid hemorrhage (11%), extradural hematoma (3%), subdural hematoma (3%), intracranial hemorrhage (8%), and expansive intracranial process (1%).

Troponin levels were high for 36 patients. The average troponin value was 166±39 ng/l. High Troponin levels were found in patients with an expansive intracranial process (50%), seizures (47%), ischemic stroke (38%), and subarachnoid hemorrhage (33%).

Repolarization disorders were present in 22% of patients with ischemic strokes. These disorders were T-wave inversion in 6 patients and ST segment depression in 5 patients.

Table 1 resumes the different repolarization disorders associated with high troponin levels among patients with acute brain insults.

Table 1: the different repolarization disorders associated with high troponin levels among patients with acute brain insults.

Type of repolarization disorders	High troponin levels N (%)
T wave inversion	4 (11)
ST segment depression	4 (11)
T wave inversion with ST-segment depression	1 (3)

The duration of hospitalization was less than 12 hours for 90% of our patients. Seventy-six percent of patients diagnosed with ischemic stroke were hospitalized in the neurology department and 91% of those diagnosed with

subarachnoid hemorrhage were hospitalized in the neurosurgery department. The death rate in the ED was 3%. Troponin levels were normal among the patients who died.

Age over 65 and diabetes were significantly associated with high troponin levels (significance levels were respectively p=0,016 and p=0,032). Also, GCS under 15 was significantly associated with high troponin levels (p=0,04). Independent factors associated with the elevation in troponin levels among patients having brain insults were: age over 65, diabetes, atrial fibrillation, and GCS under 15 (Table 2).

Table 2: Independent factors associated with the elevation in troponin levels among patients having brain insults

	p	OR	CI
Age over 65	0,033	2,79	[2.801-5.456]
diabetes	0,048	1,47	[1.546-3.956]
GCS under 15	0,006	0,53	[2.213-4.329]
History of AF	0,04	0,05	[1,185-3,387]

DISCUSSION

In our study the mean age of patients having acute brain insults was 62±19 and the gender ratio of 1, 4. This is consistent with the findings of Sandhu and al [1]. who included 175 patients admitted for ischemic stroke, 107 patients admitted for brain hemorrhage, and 96 patients admitted for subarachnoid hemorrhage where the mean age was respectively 67, 61, and 51.

The most common cardiovascular risk factor in our study was hypertension (46%). It was also the case in the study of Tsivgoulis and al [2]. that included 703 patients for acute brain insults where hypertension was the first cardiovascular risk factor with a rate of 81%. Concerning atrial fibrillation, it was found among 27% of our patients while it was present among 28% of the patients included in Anders and al.'s study[3] that also found 17% of patients with ischemic stroke history.

In a prospective metacentric study conducted in Brazil by Carvalho and al (4), including 2407 patients for acute brain insults, motor deficit was the most frequent reason for consultation (71%) followed by headaches (27%). This result is close to our: motor deficit (41%) and headaches (25%). Ischemic stroke (47%) was the most common acute brain insult diagnosed among our study population preceding hemorrhagic stroke (13%). This finding is similar to both results from Carvalho and al [4] . and Tsivgoulis and al.'s works[2].

Troponin levels can rise without necrosis or ischemia but it always indicates the presence of acute or chronic myocardial injury. The importance of myocardial involvement during

brain injury is highlighted in autopsy studies in which the frequency of transmural myocardial injury is more important after death of neurological origin [5].

The nerve center controlling the cardiovascular system is located in the brainstem and hypothalamus. The right insula is involved in the cardiac sympathetic nervous activity while the left insula regulates the cardiac parasympathetic nervous activity. The damage in one of these areas causes an imbalance in the sympathetic/parasympathetic cardiac nervous activity [6]. The amygdala, located in the internal part of the temporal lobe, inhibits the Nucleus Tractus Solitarii and activates the lateral rostroventral segment of the brainstem leading to the decrease of parasympathetic activity and the increase of sympathetic activity [7].

The increase in troponin levels during stroke can be caused by an ischemic myocardial injury secondary either to the erosion of an atherosclerotic plate in coronary arteries or the imbalance between oxygen demand and supply. The myocardial injury during stroke can also be caused by a neurogenic myocardial cytolysis. Sympathetic hyperactivity occurs during stroke leading to a catecholamine discharge that causes myofibrillary degeneration which is responsible for non-ischemic myocardial injury and troponin liberation.

According to the literature, almost 19% of patients develop severe cardiac complications in the first few weeks following the ischemic stroke with a maximum frequency in the first 3 days. Cardiac-related death occurs in 4% of patients [8].

The rise in troponin levels is common after an ischemic stroke. It is found in 5 to 34% of patients. It predicts a poor prognosis for mortality and neurological outcomes [9]. In our study troponin levels were high in 38% of patients diagnosed with ischemic stroke.

The incidence of troponin level increase tends to vary across studies. It is influenced by the characteristics of the study population. Some studies excluded patients having renal failure or a history of heart disease. A literature review was conducted by Kerr and al [10]. including 15 studies that showed a high troponin level in 18% of cases. There was no significant difference between studies including or excluding patients with anterior renal failure.

Concerning hemorrhagic stroke, the physiopathological mechanism is similar to the ischemic stroke [11]. Hays and al [12] included 235 patients having hemorrhagic stroke in their study. 36% of them had high troponin levels. In another study including 208 patients with hemorrhagic stroke conducted by Tummala and al [13], the rate of cases with increased troponin levels was 49%. These outcomes are deemed to be higher than the results from our work where the rate of patients with hemorrhagic stroke associated with increased troponin level was 14%. The liberation of troponin in subarachnoid hemorrhage is the consequence of adrenergic myocarditis whose mechanism is very close to that observed in encephalic death [14]. The increase in troponin levels is frequently

observed among patients with hemorrhagic stroke secondary to ruptured aneurysm (68%). It is an early and specific marker of heart involvement. Its peak plasma concentrations occur in 2 days [15]. In a literature review that included 12 studies conducted on 2214 patients admitted for subarachnoid hemorrhage, troponin level increase was found in 21 to 25% of cases with a mean rate of 30% [16]. In our study, this rate was of 33%.

After a seizure, cytosolic troponin is liberated from the cardiomyocytes [17]. In our study increased troponin levels were found among 47% of patients with seizures. This outcome is considered to be higher than the results established by the literature where this rate was 8% [18] and 11% [19]. Namely in these studies, as in ours, patients with chronic renal failure and acute coronary syndrome were not included.

Traumatic brain injury generates an important catecholamine discharge that enhances the cardiac and cerebral oxygen requirements and causes an increase in troponin levels [20,21].

In the work of Prathep and al [22], troponin levels were high among 22% of patients hospitalized for post-traumatic brain injury. However, no patient with subdural, epidural, or cerebral hematoma was registered with high troponin levels in our study. This may be explained by the small number of cases included with these conditions.

Concerning the cases of intracranial expansive processes included in our study, the rate of high troponin levels was 50%. Unfortunately, the troponin level's increase in the intracranial expansive process has been poorly studied up to this point.

Cardiac electrical abnormalities are frequent after acute brain insults (90%) even in patients with no history of heart disease [23]

In our study, repolarization disorders were present in 22% of patients with ischemic stroke. They were represented by T wave inversion (12%) and ST segment depression (10%). Our results are close to those found by Faiz and al. (24) where T wave inversion and ST segment depression were observed in respectively 15% and 14% of the ischemic stroke cases included.

However, only 7% of cases with hemorrhagic stroke were registered with repolarization disorder which contrasts with the results from literature where this rate amounts to 64% [24]. Regarding subarachnoid hemorrhage, the most common repolarization disorder is T wave inversion (17%) followed by ST segment depression (14%). In our study, these rates were both of 8%. Other ECG modifications can be can be registered such as QT prolongation [25, 26].

Among our study population, 13% of seizure cases had T-wave inversion. This disorder was reported in 3 to 8% of cases in the literature [27,28].

We registered 33% cases of repolarization disorders among patients with epidural, subdural, and brain hematoma while Busl and al [29]. registered 11% of cases.

Concerning expansive intracranial process, repolarization disorders were registered in 13% of cases included in our study against 24% in the study of Povoa and al [30]. that excluded patients with hypertension, valvular, and coronary disease.

Table 3 summarizes the studies that analyzed the independent predictive factors of troponin levels increase in acute brain insults and compares them to our study.

Table 3: Independent predictive factors of troponin levels increase in acute brain insults in other studies compared to our study.

Study	Brain insult	Number of cases	Predictive factors of troponin levels increase
Abdi et al [62]	ischemic stroke	114	Age over 70, renal failure, repolarization disorder, NHISS score over 9
Batal et al [25]	ischemic stroke	1718	Advanced age, Hypertension, smoking, congestive heart failure, high NHISS score
Faiz et al [27]	Ischemic stroke	287	Age over 76, congestive heart failure, diabetes, renal failure, coronary disease
Tanabe et al [41]	Subarachnoid hemorrhage	103	Severe neurologic symptoms evaluated by Hunt Hess score
Miketic et al [42]	Subarachnoid hemorrhage	239	Severe neurologic symptoms evaluated by GCS
Sieweke et al [49]	seizures	741	Presence of cardiovascular risk factors
Chung et al [72]	Hemorrhagic stroke	253	Hypertension, masculine gender
Salim et al [58]	Brain Trauma	420	Severe neurologic symptoms evaluated by GCS
Our study	Stokes, subarachnoid hemorrhage, Brain trauma, intracranial expansive process	106	Age over 65, diabetes, history of atrial fibrillation, GCS under 15

According to the literature, the increase in troponin levels during acute brain insults is of bad prognosis leading to a higher mortality rate and severe neurological squeals. Early mortality (in less than 30 days) was significantly higher [31] as well as the mortality rate observed within a 5-year follow-up [9]. There is also an increase in the in-hospital deaths among these patients [1,12]. High troponin levels predict poor neurological recovery [32]and dependency on third parties [33].

CONCLUSION

In conclusion, assaying troponin levels is advisable in any patient admitted to the ED for acute brain insult. The different stakeholders (emergency physicians, neurologists, neurosurgeons, cardiologists, and radiologists) should be involved in the management of these patients for better evaluation and decision-making.

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Can we predict the clinical scenario of acute heart failure based only on NT proBNP rate without using echocardiography?

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Abstract

Background: The acute heart failure (AHF) is a common pattern to seek care in the emergency department (ED). The objective of our study was to investigate the relationship between NT pro-BNP and acute heart failure (AHF) syndrome in the emergency department (ED).

Methods: We conducted a descriptive prospective study over eight months. Were included all patients who presented to the emergency department (ED) with dyspnea and in whom the diagnosis of acute heart failure (AHF) was made. All patients had an NT pro-BNP laboratory test and underwent echocardiography.

Results: One hundred seven patients were included. Mean age was 65 ± 12 years. Sex ratio was 2.34. A clinical scenario CS1 was noted in 28% of cases, CS2 in 36% of cases, CS4 in 16% of cases, CS3 in 12% of cases and CS5 in 8% of cases. Thirty percent of patients had preserved left ventricular ejection fraction (LVEF) with diastolic dysfunction and 70% had a reduced left ventricular ejection fraction (LVEF). Elevated left ventricular filling pressures were found in 95% of patients. Disorders of wall motion in 14% of cases and isolated right heart failure in 12% of cases. The median natriuretic brain peptides (NT pro-BNP) level was higher when left ventricular ejection fraction (LVEF) was preserved: 4073 [410 – 25 550] pg/ml vs2025 [409 – 25 200] pg/ml (p=0,043).

Conclusion: Natriuretic brain peptides level was a good predictor of the clinical scenario CS1 with a cut-off at 5565 pg/ml. Though, the potential clinical applications of B-type natriuretic peptide in AHFS should be more studied.

Keywords: Echocardiography; Emergency; Heart Failure; Natriuretic Peptides.

BACKGROUND

Acute heart failure (AHF) is increasingly common among emergency department (ED) patients. It is a major problem on several levels: for the individual patient, for the healthcare system due to the complexity of diagnosis and treatment, and for society because of its high costs.

The term acute heart failure includes a wide variety of clinical presentations ranging from AHF de novo, acute decompensated heart failure, isolated right heart failure, and cardiogenic shock.

The diagnosis of AHFS is sometimes difficult in emergency situations. Emergency physicians have often recourse to specific diagnostic methods: biochemical by NT pro-BNP dosage, or imaging: transthoracic Doppler echocardiography.

The dosage of NT pro-BNP is simple to realize but it does not completely dispense echocardiography. Echocardiography provides powerful assessment of cardiac function: systolic dysfunction, diastolic dysfunction or right heart failure.

The relationship between the rate of NT pro-BNP and AHFS is not well studied in the literature.

Some studies have shown that a very high rate of NT pro-BNP would orient towards left ventricle (LV) systolic dysfunction and lower rates would rather be related to diastolic dysfunction.

The objective of our study was to investigate the relationship between the rate of NT pro-BNP and the AHFS, referring to echocardiography data. In other words, can we predict the clinical scenario of acute heart failure based only on NT pro-BNP rate without using echocardiography?

METHODS

Design: A prospective observational study was conducted over a period of 8 months. The study was approved by the hospital's Research Ethics Committee.

Participants: The study was conducted in the ED of the military hospital of Tunis, the capital of Tunisia. The ED has an active teaching program. The ED had approximately 38,000 patient visits per year. We included all patients aged of 18 years and more, who presented to the ED with acute dyspnea and in whom the diagnosis of AHF was retained.

The AHF was defined based on the recommendations of the European Society of Cardiology [1].

Were not included all the patients aged below 18 years and those with known significant valve disease.

Were excluded the patients with negative rate of NT pro-BNP for AHF:

- NT pro-BNP below 300 pg / ml [2].
- NT pro-BNP in the gray area, and negative after adjusting according to age [3].
- NT pro-BNP in the gray area, and negative after adjusting according to creatinine clearance (<60 ml / min [3,4]). (figure 1)

- Patients in which echocardiography was not in favor of AHF.

- Patients lost or with incomplete data.

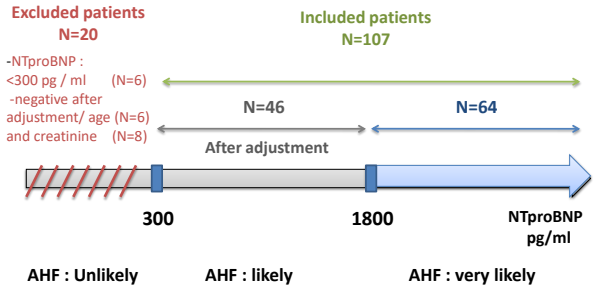

Figure 1: Distribution of patients according to NT proBNP rates

Study design: The study design is summarized in Figure 2.

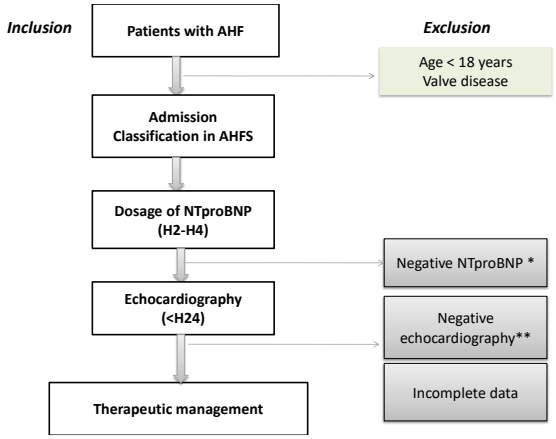

Figure 2: study design

Each patient was classified according to AHFS classification. We adopted for all patients; a classification proposed by an international, multidisciplinary group of experts [5].

This classification is based primarily on systolic blood pressure (SBP), the presence of peripheral signs of shock, the association with acute coronary syndrome (ACS), or an isolated right heart failure. These five clinical scenarios (CS) define the AHFS (Table 1).

Table 1: Clinical scenarios in acute heart failure syndrome, Critical Care 2008 [5]

Clinical scenario	Characteristics
CS1	SBP > 140mmHg Symptoms develop abruptly Predominantly diffuse pulmonary edema Minimal systemic edema (patient may be euvolemic or hypovolemic) Acute elevation of filling pressure often with preserved LVEF Vascular pathophysiology
CS2	SBP 100-140 mmHg Symptoms develop gradually, together with a gradual increase in body weight Predominantly systemic edema Minimal pulmonary edema Chronic elevation of filling pressure, including increased venous pressure and elevated pulmonary arterial pressure Manifestations of organ dysfunction (renal impairment, liver dysfunction, anemia, hypoalbuminemia)
CS3	SBP < 100 mmHg Rapid or gradual onset of symptoms Predominantly signs of hypoperfusion Minimal systemic and pulmonary edema Elevation of filling pressure Two subsets : Clear hypoperfusion or cardiogenic shock No hypoperfusion/cardiogenic shock
CS4	Symptoms and signs of acute heart failure Evidence of ACS Isolated elevation of cardiac troponin is inadequate for CS4 classification
CS5	Rapid or gradual onset No pulmonary edema Right ventricular dysfunction Signs of systemic venous congestion

Appropriate therapeutic management for all patients has been started by emergency physicians.

All patients had a dosage of NT proBNP within 2 to 4 hours, and an echocardiography, performed by the same operator, within a period not exceeding 24 hours.

The echocardiography was performed according to the American recommendations (ASE) [6, 7] by Vivid 7 Dimension Echocardiographic.

Were noted all the demographics, clinical, biological, echocardiographic, and outcomes criteria.

Statistical analysis: Statistics were calculated by SPSS (version 20.0).

Dichotomized data were analyzed by the Chi2-test. The level of significance was p =0.05.ROC (Receiver Operator Characteristics) analysis was performed to calculate sensitivity, specificity, negative and positive predictive values, and an optimal cut-point of NT proBNP to detect AHFS.

RESULTS

During the study period, the AHFS accounted for 6.8 % of consultants to the ED.

One hundred and seven patients were enrolled. The patient flow diagram is summarized in Figure 3.

The Mean age was 65 ± 12 years. The sex ratio was 2.34. Patient characteristics are summarized in Table 2.

Based on the clinic hypertensive heart failure (CS 1) was noted in 28% of cases, normotensive heart failure (CS2) in 36%, and heart failure associated with acute coronary syndrome (CS4) in 16 % of cases. Hypotensive heart failure (CS3) was noted in 12% of cases and isolated right heart failure (CS5) in 8% of cases.

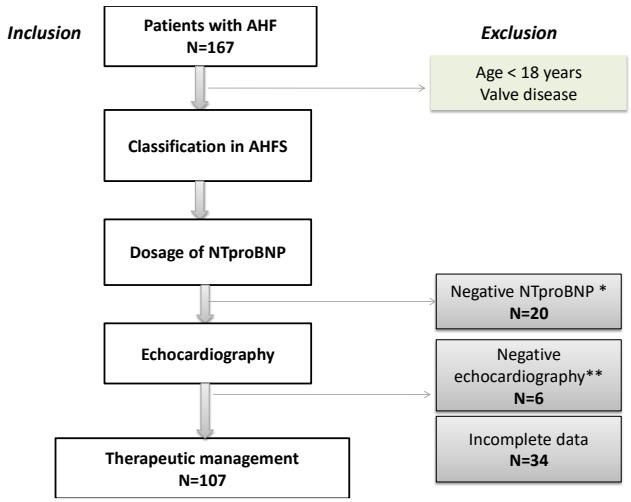

Figure 3: Patient flow diagram

** NT pro-BNP negative: NT pro-BNP<300 pg/ml (6 patients) or NT pro-BNP in the gray zone and still negative after adjustment according to age (6 patients) and to creatinine clearance (8 patients)*

*** Echocardiography not in favor of AHF*

NT pro-BNP median rates were 4576 [780 – 25 550] pg/ml for CS1 group, 2370 [410 – 25 500] pg/ml for CS2 group, 1324 [409 – 14 205] pg/ml for CS3 group, 1404 [457 – 19 889] pg/ml for CS4 group and 2394 [1150 – 15 291] pg/ml for group CS5.

Concerning the echocardiography data, 30% of patients had preserved left ventricular ejection fraction (LVEF) with diastolic dysfunction and 70% had a reduced LVEF.

Elevated LV filling pressures were found in 95% of patients. Disorders of wall motion in 14% of cases and isolated right heart failure in 12% of cases.

Table 2: Patients comorbidities

Comorbidities	N (%)
Hypertension	55 (51)
Diabetes	57 (53)
Cardiopathy	48 (50)
Heart failure	56 (52)
Dyslipidemia	29 (27)
Respiratory insufficiency	14 (13)
Chronic renal failure	11 (10)
Valvulopathy	7 (6)
Arrhythmia	23 (21)
Smoking	51 (48)

The most important level of NT pro-BNP was associated with a restrictive profile and an E / E'> 15 (Figures 4, 5).

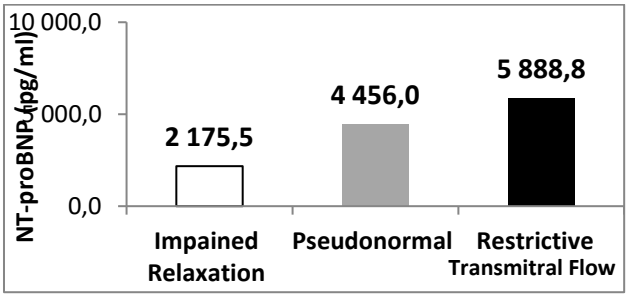

Figure 4: NT pro-BNP and transmitral flow

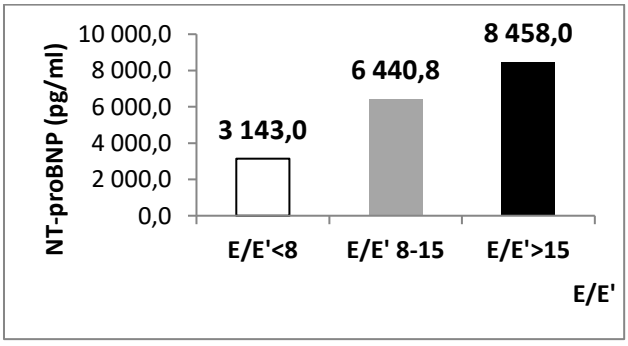

Figure 5: NT proBNP and E/E' ratio

The median NT pro-BNP level was higher when LVEF was preserved: 4073 [410 – 25 550] pg/ml vs2025 [409 – 25 200] pg/ml (p=0,043).

The median NT pro-BNP level significantly differs according to the clinical scenario and to the LVEF (figure 6).

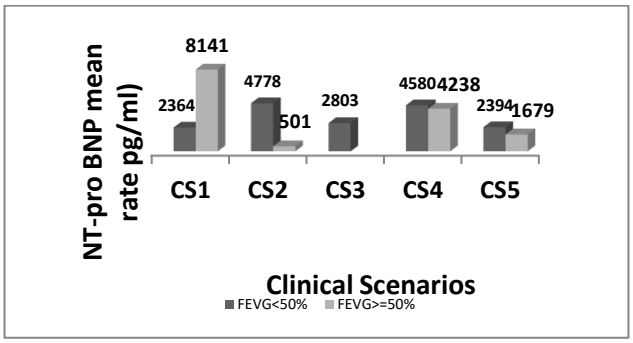

Figure 6: Distribution of the mean rates of NT proBNP according to clinical scenarios and echographic data

The NT pro-BNP is a good predictor of CS1with a cut-off of 5565 pg/ml, with an area under the curve (AUC) of 0.69; p = 0.002; confidence interval (CI) 95% [0.58 to 0.80]; 52% sensitivity; a specificity of 86%, a likelihood ratio (LR) Positive LR + 3.71 and a negative LR to 0.26.

Regarding the other clinical scenarios, the difference was not statistically significant.

DISCUSSION

This study showed that the mean NT pro-BNP was higher when LVEF was preserved. We found that the NT pro-BNP could predict the clinical scenario CS1 from a threshold of 5565 pg/ml.

Acute heart failure is a major healthcare problem. It represents more than 26 million visits to the ED worldwide [2] and more than 1 million hospitalizations annually in the United States and Europe [8,9].

In Tunisia, we do not have yet a heart failure registry. However, in a study conducted in the ED of Ben Arous Regional Hospital in Tunisia in 2009 [10], the prevalence of AHFS was 5.5 % of consultants. Our results were similar to previous findings.

Regarding the clinical distribution of AHFS, the majority of our patients had a clinical scenario CS2 (36%) which was in line with previous findings [11-13].

Concerning the mean rates of NT pro-BNP in each clinical scenario, unlike other studies [14-16], the highest levels of NT pro-BNP were found in hypertensive heart failure (CS1). Besides, the LV filling pressures in CSA were the highest. Indeed, according to Throughton [17], the rates of NT proBNP increase proportionally to the LV filling pressures. He demonstrated that E ' and the ratio E / E' were associated with high levels of NT-pro-BNP. In our study, the highest NT pro-BNP rate (8454 pg/ml) was found in patients who had an E / E '> 15 (Figure 3,4).

This difference could be explained by the fact that most similar studies were conducted in cardiology departments or Intensive care units (ICU) and only a few in the ED [14-16]. The acute phase has already been subdued and the LV filling pressures were no longer elevated.

Tshöpe [18] had also shown that the rate of NT pro-BNP increased with the severity of the diastolic dysfunction with a rate of 151.6 pg/ml for the patients who had the relaxation disorders vs 308.1 pg / mL for the pseudonormal profile and 2307.1 pg/ml for those with a restrictive profile. These rates were lower compared to those found in our study: 2175 pg/ml in case of relaxation disorders, 4456 pg/ml for pseudo-normal profile, and 5888 pg/ml for restrictive profile (Figure 4). The Tshöpe study was also conducted in the cardiology department, the dosage of NT pro-BNP was made after adequate treatment was introduced.

Another explanation suggested by Solomon [19]: Apart from acute decompensation, patients with hypertension have higher NT pro-BNP baseline rates than those with chronic heart failure. During Acute Decompensated heart failure, NT pro-BNP rates increase with the elevation of LV filling pressure. The LV filling pressures are more pronounced for CS1 compared to CS2. This could explain the higher rates of NT pro-BNP for hypertensive AHF in our study. However, in our population, the baseline NT pro-BNP rates were missed.

In our study, an NT pro-BNP cut-off of 5565 pg/ml was predictive of CS1. To our knowledge, the level of NT pro-BNP for each clinical scenario has not been studied yet.

Further studies are warranted to identify a cut-off of NT pro-BNP that could predict the clinical scenario of AHFS.

LIMITATIONS

Some limitations of our study should be addressed. In our study, the mean NT pro-BNP was higher when LVEF was preserved. The NT pro-BNP could predict the clinical scenario CS1 but it did not predict other clinical scenarios considering the small sample size.

Indeed, the number of patients included was low compared to other international studies. larger-scale studies, including multicenter, are needed.

Concerning the NT pro-BNP levels, it would have been interesting to have the basic rate of NT pro-BNP for all patients to calculate the delta NT pro-BNP.

CONCLUSION

In conclusion, the mean NT pro-BNP was higher when LVEF was preserved. The NT pro-BNP could predict the clinical scenario CS1 from a threshold of 5565 pg/ml.

Peptide measurements provide information complementary or incremental to echocardiography for assessment of cardiac function, clinical status, and outcome. Tough, the potential clinical applications of B-type natriuretic peptide in AHFS should be more studied.

What is known about this topic

- Acute heart failure (AHF) is a public health issue characterized by high mortality and a high rate of hospital admissions and re-hospitalizations.
- The diagnosis of AHF may not be straightforward and at times may be difficult in an undifferentiated patient with acute dyspnea, especially in patients with advanced age and comorbid disease.
- Some studies have shown that a very high rate of NT pro-BNP would orient towards left ventricle (LV) systolic dysfunction and lower rates would rather be related to diastolic dysfunction.

What this study adds

- The NT pro-BNP could predict the clinical scenario CS1 but it did not predict other clinical scenarios considering the small sample size.
- Peptide measurements provide information complementary or incremental to echocardiography for assessment of cardiac function, clinical status, and outcome

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Predicting diabetic ketoacidosis severity score: proposal of a therapeutic strategy adapted to emergency department

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Abstract

Background: We investigated independent severity predictors of diabetic ketoacidosis and developed a prediction rule for emergency physicians to classify patients into severity groups.

Methods: This study was done in a university-affiliated medical center. Consecutive adult patients (>15 years old) visiting the emergency department (ED) between July 2016 and July 2018 were enrolled when they met the criteria of DKA. Hospitalization in an intensive care setting was the primary endpoint.

Results: We included 176 patients diagnosed with DKA in the ED. We found 7 independent severity predictors: Altered mental status, venous pH, bicarbonate level, blood glucose, Serum creatinine, H4 serum chloremia and effective serum osmolality at admission. After assigning weights to each predictor, we developed a predicting DKA severity score that stratifies patients into groups: low severity (score<3): treatment in a general ward or the ED; and high (score≥3): treatment in the ICU. The area under the curve for the rule was 0.863.

Conclusions: The score is a simple and rapid rule for predicting severity and classifying patients with DKA.

Keywords: Diabetic Ketoacidosis; Score; Outcomes; Emergency

INTRODUCTION

Diabetes is a public health problem and pathology burdened with significant morbidity and mortality due to its acute and chronic complications.

Diabetic ketoacidosis (DKA) is a serious, potentially lethal complication of diabetes and may be the initial mode of presentation for patients with new-onset T1D. It results from an absolute or relative insulin deficit with the immediate consequence of hyperglycemia and ketosis, which is itself responsible for water depletion and hydro-electrolyte disorders [2]. Regardless of the observed decrease in the death rate, DKA remain a serious health problem, especially in developing and undeveloped countries [1].

A better understanding of the pathophysiology combined with more uniform diagnostic and therapeutic treatment has led to a marked decline in developed countries, where its mortality varies between 0% and 5% [3, 4, and 5]. This metabolic disorder constitutes one of the main reasons for admission to the emergency department (ED) [1]. Several series studied mortality predictors and classified them in scores [6, 7, 8, and 9].

This study aimed to identify the

clinical and evolutionary profile of the

population admitted to the ED with a diagnosis of DKA, and use multivariate logistic regression analysis to investigate independent severity predictors and develop a prediction rule useful for ED physicians, one that allows them to classify patients with DKA into severity groups, and that allows them to make an appropriate management decision (treatment in the ICU, a general ward, or only in the ED).

METHODS

Study design, setting, population, and selection of participants: This study was done in a university-affiliated medical center in Tunisia with an ED staffed with board-certified emergency physicians. Consecutive adult patients (>15 years old) visiting the ED between July 2016 and July 2018 were enrolled when they met the following criteria [3]: DKA was defined as plasma glucose >2.5g/L, a high anion gap metabolic acidosis (serum HCO3 <15 mmol/L, and pH >7.3), and positive urine ketones or serum ketones. Any other mode of decompensation: simple hyperglycemia, simple ketosis, hyperosmolar, a combination of hyperglycemia-hyperosmolar state (osmolarity> 320 mOsm/L) or a mixed syndrome ketoacetic and hyperosmolar was excluded. The effective serum osmolality was calculated with the formula: 2[measured Na+ (mEq/L)] + [glucose (mg/dL)]/18.

Data collection: Patients were prospectively selected in the ED. Insufficient information was retrospectively collected by checking medical records after the patients had been discharged from the hospital. The processing of the files was carried out based on a pre-established sheet. The data has been grouped into five themes: General data (age, sex, background, and the evolutionary profile of diabetes); clinical data; biological data at admission, at H4, at H8 and H12; and the analysis of triggering factors (therapeutic errors, infectious states, etc.). Therapeutic management and progressive characteristics (length of stay, mortality, and complications) were noted. We collected the quantity of insulin administered during the first 24 hours, the methods of its administration, as well as the other adjuvant therapies: rehydration, and antibiotic treatment.

Statistical analysis: All analyses were done using SPSS 25.0 for Windows. Descriptive statistics (mean and standard deviation [SD] for continuous variables and frequencies and proportions for categorical variables) were calculated.

Comparisons between the two groups were made using either an independent-samples t-test (assuming normal distribution) for the continuous variables.

Either a $\chi 2$ test was used for categorical variables.

Odds ratios (ORs), along with the corresponding 95% confidence intervals (CIs), were also computed as appropriate. The area under the receiver operating characteristic (ROC) curves was used to compare a model's specifications along with its sensitivity and specificity. The results of the multivariate stepwise (forward) logistic regression analysis were then used to develop a prediction rule. Weights were assigned to each predictor according to their predicting β values of multiple logistic regression analysis. A Predicting DKA severity score was calculated for each patient. The scores on each different weight were used to determine their respective cutoff points for risk stratification by the ROC curve with the highest sum of sensitivity and specificity. For all analyses, a result was considered statistically significant at the $P < .05$ level of significance.

RESULTS

A total of 176 cases of DKA were included from 2016 to 2018. The mean age was 35.3 +/- 18.6 years, 32.4% were aged from 20 to 30 years, and 77 patients were male (sex ratio = 0.77). Diabetes was known in 150 patients (85.2%) of whom 60.8% were type 1 diabetics. 14.8% of patients were admitted for a primary diagnosis of DKA. The most common symptoms at presentation were abdominal pain (41.5%), and lethargy (13.1%). Other signs and symptoms at presentation were fever (9.1%), polyuria and polydipsia (8%), Kussmaul breathing (5.7%), and chest pain (1.7%). The most frequent decompensation factors were infection in 36.9% and discontinuation of treatment in 23.9% of cases.

The average blood glucose was 28 +/- 7.6 m mol/L, the mean venous pH was 7.14+/- 0.12, and blood HCO3- was 7.9 +/- 3.98 m mol / L. The main hydration solution was a 0.9% saline solution. The mean serum amount infused was 3.90±2.02 L / 24h. The mean dose of intravenous insulin infused in the first 24 hours was 43.94±12.74 IU / 24h. The mean time to switch to subcutaneous insulin therapy was 24.8±16.4 hours. Only five patients with hypoglycaemia were noted during treatment (2.8%). The length of stay in the ED was 16.1±13.5 hours. 19.7% of patients were discharged out of the ED, after clinical and biological recovery as well as the control of the cause of decompensation. In contrast, 121 patients (68.8%) were transferred to an endocrinology ward, and 13 (7.4%) were admitted to the intensive care unit. The average total hospital length of stay was 6.41±6 days. Five cases of death (2.8%) were described in our study. Then patients were prospectively assigned to 2 groups as follows: *1*) the first group consisted of 13 patients who were admitted to the intensive care unit; *2*) the second group consisted of 121 patients who were admitted to the General ward (endocrinology). They were compared to detect patients requiring intensive care upon admission to the emergency room (Table 1).

A multiple logistic regression analysis with stepwise variable selection using backward selection was performed and odds ratios with 95% confidence intervals were calculated for each predictor.

Table 1: Comparison between the ICU group and the Endocrinology Ward Group

Measures	Patients in ICU	Patients in Ward	P Values
Number	13	121	-
Age	37.2±19.2	35.1±18.6	0.694
DM duration	7.5±5.8	7±6.8	0.773
Males	7.8%	62.3%	0.106
PR	107.5±20.5	109.2±21.1	0.784
SBP	12.7±1.7	12.1±2.3	0.395
DBP	6.8±1.4	4±1.4	0.693
RR	27.8±3.8	25.9±6.8	0.297
GCS	14.2±2	14.8±0.7	0.002
Blood glucose	34.3 ± 8.5	27.6 ±7.4	0.002
Urea	11.7 ± 11	7.2± 4.8	0.02
Serum creatinine	166±196	94.7±89.4	0.025
Na+	132.3±6.4	131.6±4.8	0.62
K+	4.7±0.9	4.5±0.9	0.3
pH H0	7±0.10	7.20±0.10	p<0.001
HCO3- H0	4.5±3.4	8.2± 3.9	0.001
Osmolarity	298.9±14.4	290.7±10.7	0.01
pH H4	7.20 ± 0.10	7.30 ± 0.10	0.001
HCO3- H4	8.1 ± 3.5	12.6± 4.7	0.001
Na+ H4	134.1 ± 6.4	134±4.6	0.95
K+ H4	4 ± 0.8	3.7± 0.8	0.218
Cl H4	110.1 ± 6.4	103.7± 3.7	0.005
pH H8	7.20± 0.10	7.30 ±0.10	<0.001
HCO3- H8	10.3 ±4.3	14.5 ±4.3	0.002
pH H12	7.20 ± 0.10	7.30 ± 0.10	0.003
HCO3- H12	11.2 ± 5.1	15.2 ± 4.2	0.007
Na+ H12	133.8 ± 6.4	135± 4.2	0.396
K+ H12	3.8± 0.9	3.7 ±0.7	0.466
Cl H12	111 ± 5.4	105 ± 6.4	0.007
Mortality rate	4	1	<0.001

DM= diabetes mellitus; ICU= intensive care unit; PR=pulse rate; RR= respiratory rate; SBP= systolic blood pressure; DBP=diastolic blood pressure;

The results were used to develop a clinical and biological severity score, to detect patients who need admission in ICU.

After this analysis, 7 independent severity predictors were retained: Altered mental status, venous pH, bicarbonate level, blood glucose, Serum creatinine, H4 serum chloremia, and effective serum osmolality at admission. A weight was assigned to each element of this score according to its predictive β value (table 2).

Table 2: Predicting DKA Severity Score

Variable	weights
Glasgow Coma Scale (GCS) < 15	1
Venous pH < 7.14	2
Serum HCO3- < 7.7 m moles/l	1
Blood glucose > 28,1 m moles/l	1
Serum creatinine > 100	1
Chloremia at H4 > 104	1
Serum Osmolarity> 291m osm/l	1

Low severity: score<3; High severity: score≥3

This score will allow ED physicians to classify patients according to their clinical and biological gravity and therefore to better manage them in the most appropriate environment. Finally, it was calculated for each patient in our population. The mean score was 5.5 ± 1.4 for those who were admitted to the intensive care unit, and 2.8 ± 1.9 for the rest of the patients (p = 0.0001).

Our population can then be classified into two severity groups: low with a score of <3 and high with a score ≥3 [OR (95% CI), 10.7 (1.36-84.5)]. A Score greater than 3 is predictive of severity. It has a high predictive power (The area under the ROC curve is 0.863, with 100% sensitivity and 71.2% specificity) (Figure 1).

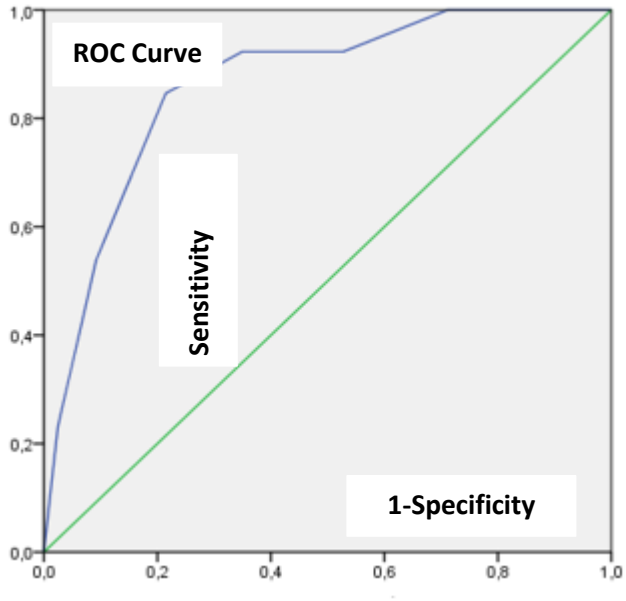

Figure 1: Presentation of the sensitivity and specificity of the severity score

DISCUSSION

In Tunisia, the prevalence of diabetics was passed from 9% in 2007 to 15% in 2017. The age of onset is getting younger and younger, which exposes people to more acute and chronic complications [10,11,12]. Acute complications of diabetes are a reason for frequent consultation and hospitalization in emergency departments [12,13]. Among these complications, is ketoacidosis (DKA) which is an acute and severe complication, given the importance of its morbidity and mortality [3,14]. Its annual incidence in the USA is estimated between 4.6 and 8 episodes/1000 diabetics with a constant increase [10,12,15,16]. This incidence is even greater in other countries, notably in England, Sweden, and the developing countries [15]. In a large study published in December 2015, admissions for DKA represented 1.1% of all ICU admissions in Australia and New Ireland between 2000 and 2013 [17].

In prior studies, predictors of DKA mortality were studied and scored: A study carried out in Parakou Hospital ICU in Benin over a period of 10 months, showed that the occurrence of complications was associated with advanced age, low socioeconomic level, high serum osmolarity, and long consultation time. It objectified a mortality rate of 14%, having as predictive factors the advanced age and long period before consultation [6]. Another study done in Taiwan developed a mortality predictor score (PHD) finding 6 independent mortality predictors: Absent tachycardia, Hypotension, Anemia, Severe coma, Cancer history, and Infection [7]. The study by Stéphanie T. Chung (Jamaica 2006) concluded that mortality increased significantly with age and that the main mortality predictors were altered mental status on admission, co-morbidity, age, diabetes duration, and association of DKA with hyperosmolar syndrome [8]. For Stamatis P. et al, mortality predictors were co-morbidity, pH <7.0, a total dose of IV insulin injected in the first 12 hours> 50 IU, blood glucose> 16.7 mmol / L after 12 hours of treatment, altered mental status, and persistent fever after 24 hours [18]. Several series studied mortality predictors and ranked them as scores, but there were enough series that studied severity predictors and admission risk ICU.

We developed a novel decision rule to predict severity and manage ED patients with DKA. ED and ICU physicians can usefully evaluate 7 variables. Patients with a high score should be

deemed critically ill and sent to the ICU for advanced treatment such as aggressive fluid resuscitation, strict intravenous insulin control, detailed investigation and management of the precipitating factors, and careful prevention of possible treatment complications. For patients with low scores, a general ward admission or ED treatment may be sufficient, which would help preserve medical resources for patients in greater need.

Blood PH at admission, with a high β-value, was the strongest severity predictor. Altered mental status has been proposed as the only independent severity predictor, which is easier to quantify in clinical practice. Blood PH and effective serum osmolality are important for evaluating DKA; these two factors appear to be significant severity predictors in our study. Blood creatinine, which reflects the importance of water deficit, can be at the origin of functional renal failure [19]. It can also be falsely high due to the presence of ketone bodies. Chloremia at H4 is a variable that was kept in our score as a severity factor. Indeed, rehydration with isotonic saline serum promotes the appearance of hyperchloremic acidosis which should be avoided [3].

LIMITATIONS

This study has several limitations. First, some clinical presentations or records may not have been completely documented. Second, this was a single-center study. Third, the sample size might not be large enough to make conclusions with good statistical power. Additional studies with larger sample sizes are necessary. Fourth, although we have validated the prediction rule in a prospective cohort, external validation in other populations is necessary.

CONCLUSION

Diabetic ketoacidosis occurs in young people treated with insulin therapy. Infection appears to be the most implicated factor in decompensation. A Score greater than 3 is predictive of severity, requiring care in an ICU with a mortality rate remaining low thanks to this score.

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A measles outbreak in Tunisia: Experience of an Emergency Department in Sousse

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Abstract

Background: Measles is one of the most contagious diseases of humans. It is caused by the measles virus and occurs as a seasonal disease in endemic areas[1]. We describe the epidemiologic features of a measles outbreak in Tunisia, specifically in the city of Sousse within the Emergency Department (ED) of Farhat Hached.

Methods: We performed descriptive analyses of data on demographic characteristics, clinical and laboratory evaluations, clinical outcomes of all declared measles cases and containment measures in the ED of Farhat Hached in Sousse during the period of two months (March to April 2019).

Results: During the current ongoing measles outbreak in Tunisia, a total of 57 confirmed measles cases have encountered our ED and have been declared. 61.4% of the studied population were men and 31.6% were unvaccinated. The median age of measles patients was35 years [16;55].12.3% of them were health care providers working at the ED of Farhat Hached.

The main clinical presentations were eruptive fever (64.9%), eruptive fever with gastrointestinal disorders (21.1%) and eruptive fever with dyspnea (14%).35.1% of all patients were hospitalized with a mean hospital length of stay of 4.53 days ($\pm$1.92).

The vaccination status of infected patients seemed to their hospitalization rate as 44.4% of the unvaccinated patients were admitted to the infectious diseases ward while only 27% of the vaccinated patients were hospitalized.

Conclusion: Up to this date, measles cases including health care professionals are still being diagnosed in the ED of Farhat Hached in Sousse. Thus, response strategies should provide a better vaccination coverage within the exposed population as well as effective containment measures.

Keywords: Measles; Outcomes; Epidemiology; Emergency

BACKGROUND

Measles is a highly contagious, albeit vaccine-preventable, disease that can lead to serious complications [2]. The average age for acquiring measles depends on biological and epidemiological factors, mainly population immunity and birth rate. As vaccination coverage increases, the average age of measles infection can shift to adolescents and young adults. These older groups remain susceptible because they had not been vaccinated or exposed to the wild-type measles virus due to decreased transmission among younger vaccinated groups. In the absence of efforts to vaccinate the older susceptible populations, measles virus introduction can result in an outbreak, reflecting the immunity gaps among these age cohorts [1]. In Tunisia, measles vaccination was first

introduced in 1979 and since 1981; two doses of measles vaccine were given at 9 and 15 months of age as part of the routine vaccination schedule. Since then, two outbreaks were observed: in 1981 (2870 cases) and in 1985 (4766 cases). From 1987 to 1998, the annual incidence of reported measles cases considerably declined. Only one major outbreak was observed during this period, in 1992, with 11,872 reported cases [3]. Another measles outbreak began in Tunisia in January 2019. We report measles cases confirmed in the Emergency Department (ED) of Farhat Hached in Sousse between March and April 2019.

METHODS

Definitions and diagnostic features: The WHO definition of suspected measles is a case with fever and maculopapular (non-vesicular) rash or a case where a health-care worker suspects measles. Laboratory confirmation of measles is based on the detection of anti-measles virus IgM antibodies by enzyme-linked immunosorbent assay (ELISA), or the detection of measles virus RNA by reverse transcriptase polymerase chain reaction (RT-PCR) in throat swaps, oral fluid, or nasopharyngeal mucus or urine [1].

Data collection: We prospectively obtained, from the 1st of March to April 30th, patients demographic characteristics, medical history, vaccination status, date of symptoms onset, and their clinical outcomes using both face-to-face interviews.

We did not include children aged less than 16 years.

Statistical analysis: We performed descriptive analyses, and reported the results as frequencies and proportions for categorical variables and as median values and ranges for continuous variables. Analyses were performed with the use of SPSS software version 22.

RESULTS

During the period of the study, 57 cases of measles were confirmed and declared. They were men in 61.4% of the cases. The median age was 35 years [16; 55]. The subjects were in 12.3% of the cases health care providers, working in the ED of Farhat Hached during the outbreak's period. As for the vaccination status of the case patients, 31.6% of them were not vaccinated. Out of 7 infected healthcare providers, only 2 were not vaccinated. The vaccination status of case patients is shown in the figure below (Figure 1).

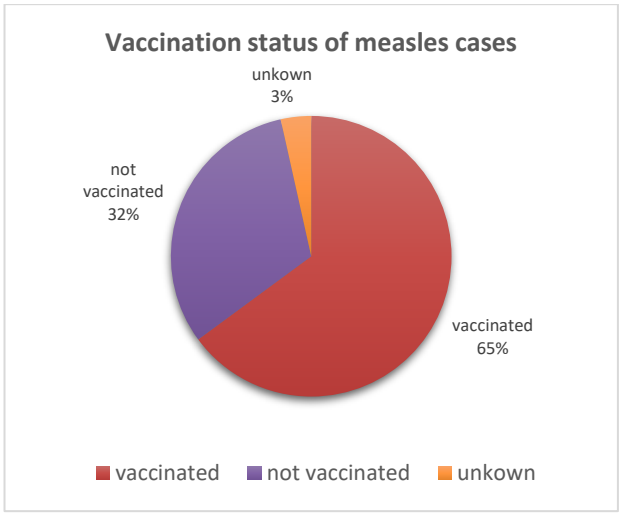

Figure 1: Vaccination status of measles cases

The source patient who was an unvaccinated 40-year-old woman, encountered the ED on March 10th. The chronology of the outbreak is detailed in Figure 2.

Three main clinical presentations were observed during the outbreak period: Eruptive fever in most of the cases, eruptive fever with gastrointestinal disorders, and eruptive fever with dyspnea. More details are shown in the figure below (Figure 3).

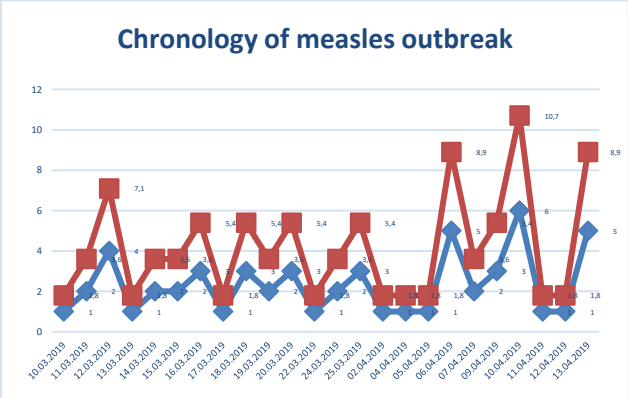

Figure 2: Chronology of measles outbreak

During the study period, 35.1% of the case patients were admitted to the infectious diseases ward. Only one patient who was a 55-year-old doctor working in the outbreak's ED, was admitted to the ICU (Intensive Care Unit) and stayed there for 4 days.

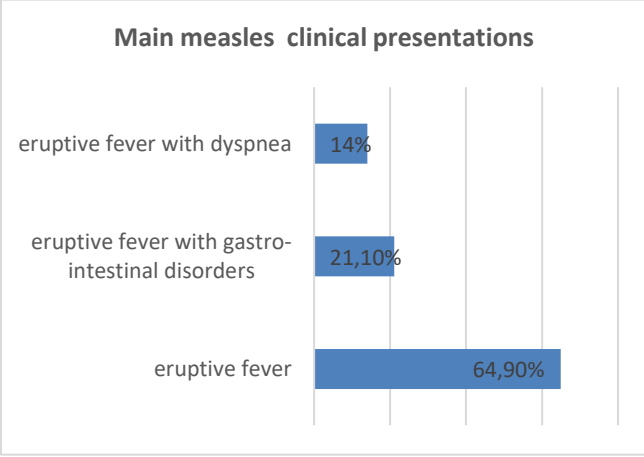

Figure 3: Main measles clinical presentations

The vaccination status of infected patients seemed to have an impact on their hospitalization rate as 44.4% of the unvaccinated patients were admitted to the infectious diseases ward while only 27% of the vaccinated patients were hospitalized. The vaccination status of hospitalized case patients is shown in the figure 4.

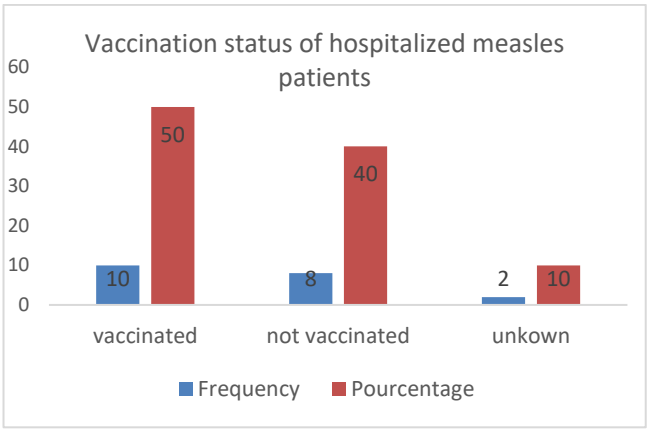

Figure 4: Vaccination status of hospitalized measles patients

DISCUSSION

Despite the increasing vaccination coverage in Tunisia since the introduction of measles vaccination (two doses of measles vaccine at 9 and 15 months of age), this outbreak proves that measles is still endemic in our country. This could be explained by the immunity gaps among older groups of age who had not been vaccinated or exposed to the wild-type measles virus type due to the decreased transmission among younger vaccinated groups [1].

In the last few years, some measles outbreaks around the world have been reported [8-10]. A lot of them occurred in countries where measles is considered to be eradicated [5-7], such as the case of Measles outbreak in a refugee settlement in Calais, France (January to February 2016), where 13 confirmed measles cases were identified among migrants, healthcare workers in

hospital and volunteers working on-site [4]. In the United States (US) as well, a measles outbreak within an under-immunized Amish Community in Ohio was reported in the year of 2014. Even though measles was considered to be eradicated in the US since 2000, an outbreak of measles originated from two unvaccinated Amish men whom measles was incubating at the time of their return to the United States from the Philippines [2].

In this study, the source of the measles outbreak in the ED of Farhat Hached has not been identified.

Measles case patients did include healthcare providers who were infected independently of their vaccination status. The measles spread among health care providers has been limited to 7 case-patients thanks to the containment measures conducted in the ED's outbreak, such as the use of isolation facial masks by the medical and the paramedical staff, the creation of a quarantine unit where all measles case-patients stayed as well as the vaccination campaign conducted in the hospital of Farhat Hached that included all healthcare providers born after 1980.

As for measles case patients' outcomes, the majority of them were admitted to the infectious diseases ward except for one patient who was admitted to the ICU. All of the admitted case patients presented to the ED with complicated clinical presentations (eruptive fever with either gastrointestinal disorders or dyspnea).

The vaccination status of infected patients seemed to have an impact on their hospitalization rate as 44.4% of the unvaccinated patients were admitted to the infectious diseases ward while *only 27%* of the vaccinated patients were hospitalized. This means that unvaccinated patients are more prone to having measles-related complications. Thus, more attention and healthcare resources should be given by health authorities to improve vaccination coverage, especially among susceptible populations such as healthcare providers and other exposed populations.

LIMITATIONS

One of the study's limitations is that it did not discuss the exact origins of the measles outbreak nor its spread on the national level. This may be due to the lack of data available on the national situation of the outbreak.

In this study, we did not cover the measles spread among children aged less than 16 years because they did not encounter the ED of Farhat Hached.

CONCLUSION

Up to this date, measles cases including health care professionals are still being diagnosed in the ED of Farhat Hached in Sousse.

Thus, response strategies should provide better vaccination coverage within the exposed population as well as effective containment measures.

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Epidemiological and prognostic factors associated with road traffic accidents occurring in the Center East of Tunisia.

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Abstract

Introduction: Road Traffic accidents (RTAs) are a major public health concern associated with significant morbidity and mortality. The objective of this study was to describe the epidemiological aspects of RTAs and their prognostic factors in the center east of Tunisia.

Methods: This was a prospective cross sectional descriptive study conducted in the Emergency Medical Services area 03 of the center east of Tunisia for a period of 18 months from February 1 2020 to July 31 2021.

Results: Three hundred forty five patients were included. Among them 82.8% were male (Mean age: 33±17.2 years). The injured patient was the driver in 57.1% of cases. Traffic accidents involving pedestrians and motorists were the most frequent types of accident (18.8%). Traffic accidents often occurred on Monday and Saturday (18.2% and 16.8%) between 6 p.m. and midnight (36.2%). In 54.4% of cases, injured patients did not meet effective safety measures such as helmet use and seat belt. Etiological events related to the patients that lead to traffic accident were, alcoholism is 29 cases (26.1%), excessive speed in 25 cases (22.5%). Etiological events related to the road were poor road conditions in 34 cases (39.5%). Etiological climate related events were rainy weather in 33 cases (47.1%). Thirty-one victims were died in the first 24 hours (8.9%). Univariate analysis of epidemiological factors of victims of RTAs showed 4 factors significant predicting mortality included in our study: location of the traffic accident in the city of "Kairouan" (p=0.005), road related factors: low-light areas (p=0.029), weather related factors: rainy weather (p=0.003) and patient related factors: alcoholism (p=0.044).

Conclusion: Road Traffic accidents are of considerable socio-economic importance for our community. It is necessary to know how to manage a RTA's victim through the circumstances of the accident and its risk factors.

Keywords: Emergency Medical Services; Epidemiology; Traffic accidents

INTRODUCTION

Road Traffic accidents (RTAs) are a major public health problem; they are responsible for high rates of mortality and morbidity [1].

It is the leading cause of death in young people aged between 15 and 29 years. According to the July 2017 World Health Organization (WHO) Report, over 1.3 million people die, every year, from RTAs and 20-50 million people suffer from traumatic consequences [2].

Tunisia has the second-highest mortality prevalence in the Maghreb region. RTAs are the fifth leading cause of death, responsible for 3.3% of all observed deaths in Tunisia [3]. The 2016 National Road Safety Observatory announced around 1,505 deaths related to RTAs [3].

In Tunisia, there are around thirty accidents per day; these accidents are responsible for around four deaths and about forty serious and minor injuries per day. These figures are 50% higher than the European average [3].

This carnage strikes a considerable human heritage, which is thus destroyed with very heavy social and economic consequences. Indeed, for each person killed, injured, or disabled by a traffic accident, a whole group of other people including the family and the entourage of the person concerned are deeply affected [4].

However, we have noted a drop in the incidence of RTA since the SARS-CoV-2 pandemic, which could be explained by the confinement procedure imposed by several countries.

In Tunisia, the incidence of RTA has dropped reaching 23.4% during the confinement period; from March to June 2020. The epidemiological characteristics have also been modified [5].

We conducted this study to describe the epidemiology of RTAs in the east center of Tunisia and to investigate its associated and gravity factors. This study may help in better health resource allocation and policymaking.

METHODS

Type of study: A cross-sectional descriptive study was carried out by the emergency medical services of the East Center of Tunisia (EMS 03) during a period of 18 months; from February 1, 2020, to July 31, 2021.

The study population: Our study population was a non-probability sample of convenience.

We included all victims of RTAs occurring in the territory of the EMS 03 and which the regulation room played a part in the decision of transport. This territory of EMS 03 includes four governorates: Sousse, Monastir, Kairouan, and Mehdia. It represents 8.16% of the total surface of Tunisia.

Victims of RTCs off territory, victims of other types of accidents, and victims who died before the intervention of the EMS03 were not included in this study.

Collection of data: The data was collected from the regulation files and the intervention forms

filled by the mobile intensive care unit (MICU) at the scene of the accident. The data has been aggregated on a pre-established data collection" sheet for the study. The circumstances of the RTA were grouped into three categories: related to the patient, related to the state of the road, and related to the climate.

We did a 24-hour follow-up of victims who were transported to the emergency departments or the intensive care unit (ICU).

RESULTS

We included 345 RTA victims, 82.8% of them were male with a sex ratio M/F of 4.84.

The mean age of the victims was 33 +- 17.2 years with extremes ranging from 2 to 81 years. Victims were mainly young subjects aged between 15 and 29 years with a prevalence of 36.2%.

The majority of victims had no medical history (72.1%). Diabetes represented the most common comorbidity among victims with past medical history (35.4%). Most of the identified victims were drivers (57.1%) followed by pedestrians (24.6%) then vehicle passengers (18.3%). (Table 1)

The city of Sousse had the highest prevalence of RTA with a rate of 57.1%. In the governorate of Sousse, the "Sahloul" region had the highest prevalence of RTAs (16.7%).

In our study, we noted that the prevalence of RTAs was higher on Monday (18.2%) and Saturday (16.8%), however, it was the lowest on Wednesday (12.4%).

Table 1: Socio-demographic characteristics of the study population.

	Injured n (%)	Deceased n (%)	P
Age			
< 15 years	70 (20.2)	3 (9.6)	0.656
15 – 29 years	125 (36.2)	10 (32.2)	0.723
30 – 59 years	115 (33.5)	12 (38.7)	0.919
>60 years	35 (10.1)	6 (19.3)	0.917
Gender			
Male	286 (82.8)	28 (90.3)	0.116
Female	59 (17.2)	3 (9.7)	0.102
Comorbidities			
No	249 (72.1)	22 (70.9)	0.841
Yes	96 (27.9)	9 (29.1)	0.286
Diabetes	34 (35.4)	2 (22.2)	0.845
	23 (23.9)	1 (11.1)	0.586
Cardiovascular			
hypertension	9 (9.3)	0	-
Neurological	9 (9.3)	1 (11.1)	0.586
Psychiatric	7 (7.2)	0	
Others	5 (5.6)	4 (44.4)	0.336
Unknown	9 (9.3)	1 (11.1)	0.586
Type of road user			
Pedestrians			
Drivers	85 (24.6)	6 (19.3)	0.714
Passengers	197 (57.1)	22 (70.9)	0.569
	63 (18.3)	4 (12.9)	0.189

According to the hours of occurrence of RTA, we found that the highest rate of RTAs was during the time interval between 6 p.m. and midnight (36.2%).

Regarding the flow of accident victims, we found that the peak of accidents was in the month of February 2020 with a percentage of 27%

while the lowest accident rate was in the month of April 2020 with a percentage of 9.2 %.

Table 2: Epidemiological characteristics of RTA

	Injured n (%)	Deceased n (%)	p
Hour			
06h-12h	71 (20.5)	7 (22.5)	0.832
12h-18h	114 (33)	8 (25.3)	0.823
18h-00h	125 (36.2)	13 (41.9)	0.489
00h-06h	35 (10.3)	3 (9.6)	0.479
Day			
Monday	63 (18.2)	4 (12.9)	0.616
Tuesday	44 (12.7)	3 (9.6)	0.624
Wednesday	43 (12.4)	6 (19.3)	0.324
Thursday	44 (12.7)	4 (12.9)	0.227
Friday	48 (13.9)	4 (12.9)	0.227
Saturday	58 (16.8)	7 (22.8)	0.345
Sunday	45 (13.3)	3 (9.6)	0.624
Place			
Governorate			
Sousse	197 (57.1)	10 (32.2)	0.071
Monastir	41 (11.8)	5 (16.1)	0.116
Mahdia	49 (14.2)	4 (12.9)	0.189
Kairouan	58 (16.9)	12 (38.4)	**0.005**
Urban	238 (68.9)	15 (48.3)	0.187
Rural	107 (31.3)	16 (51.7)	0.194
Type of RTA			
Pedestrian ***light vehicle***	65 (18.8)	4 (12.9)	0.196
Two wheels ***light vehicle***	62 (17.9)	7 (22.5)	0.140
Two wheels	56 (16.2)	1 (3.22)	0.199
Light vehicle	47 (13.6)	6 (19.3)	0.148
Light vehicle ***light vehicle***	49 (14.2)	5 (16.1)	0.096
Pedestrian ***two wheels***	16 (4.6)	0	0.646
Two wheels ***two wheels***	14 (4)	2 (6.4)	0.646
Light vehicle ***heavy vehicle***	15 (4.3)	2 (6.4)	0.646
Light vehicle ***van***	6 (1.7)	2 (6.4)	0.199
Two wheels ***van***	4 (1.1)	0	0.199
Two wheels ***heavy vehicle***	5 (1.4)	1 (3.22)	
Heavy vehicle	2 (0.5)	0	
Pedestrian ***heavy vehicle***	2 (0.5)	1 (3.22)	
Pedestrian-bus	1 (0.2)	0	
Bus	1 (0.2)	0	

The most prevalent type of accident was a crash between light vehicles (VL) against pedestrians with a prevalence of 18.8%, followed by two wheels -VL (17.9%) (Table 2).

actors related to victims were found in 32.2% of cases. The factor with the highest prevalence of RTA injuries was alcohol consumption (26.1%) followed by speeding (22.5%), drug intake (neuroleptics, opiates: codeine, anxiolytics) (15.3%), fatigue (12.6%), and mental state (8.1%).

Regarding weather-related factors, rainy weather had the highest prevalence of RTAs (47.1%), followed by foggy weather (27.1%) than other weather conditions such as the presence of clouds or storms (25.8%). Weather-related factors were found in 20.3% of cases.

As for factors related the road conditions which were present in 25% of cases, RTAs were more likely to happen when driving on a road with basic conditions (39.5%). Poor lighting was involved in 34.8% of cases and 18.6% of cases, the road surface was slippery. Other road conditions were present in 7.1% such as traffic and roadwork.

Concerning safety measures among the drivers, only 45.4% of them wore helmets or seat belts.

According to “Vittel” criteria, regarding RTAs' kinetic elements; 54.6% of victims did not respect safety measures (no helmet or seat belt), 22.5% of RTAs were associated with high speed, 11.8% of victims were ejected, 7.6% of RTAs

were deadly for another passenger in the same accident and in 4.4% of RTAs, the car was significantly deformed.

According to the victim's type of transport, 58.5% of victims were transported by the mobile care unit team, 31.1% of them were transported by civil protection, and 10.4% by a type B ambulance or by simple means.

In our study, we had 31 (8.9%) victims died in the first 24 hours after the accident.

Most of them are young (38.7% aged between 30-59 years); male (90.3%); drivers (70.9%) and most of the drivers deceased (16 victims) did not respect safety measures (72.7%).

We conducted an analytical study focused on mortality risk factors based on the statistical significance of Pearson's chi-squared test.

The univariate analysis of the epidemiological factors of road accident victims showed only 4 statistically significant predictors of death in our population: Place of occurrence of the accident according to the governorate: Kairouan; Road related factor: Poor lighting; Weather condition: Rainy; Circumstances related to the victim: Alcohol consumption. Table 3 details these results.

DISCUSSION

In our study, we found that men are 4 times more exposed to the risk of RTAs than women are. Such a predominance has been reported in several studies: according to road safety in France in the report on accident rates of the year 2018, death on the road occurred three times more in men (2,492) than in women (756). This ratio was found in other occidental countries [6].

Table 3: Special circumstances related to RTAs

Factors	Injured n (%)	Deceased n (%)	
Related to the victim			
No particular factor	234 (67.8)	18 (58)	0.274
With particular factor	111 (32.2)	13 (42)	0.454
Alcohol consumption	29 (26.1)	2 (15.3)	0.044
Speeding	25 (22.5)	1 (7.6)	0.668
Medication	17 (15.3)	3 (23)	0.945
Mental state	14 (8.1)	1 (7.6)	0.668
Fatigue	9 (12.6)	3 (23)	0.945
Others	17 (15.3)	3 (23)	0.945
Related to weather			
No particular factor	275 (79.7)	24 (77.4)	0.012
With particular factor	70 (20.3)	7 (22.6)	0.018
Rainy	33 (47.1)	7 (100)	0.003
Foggy	19 (27.1)	0	
Others (clouds, storms)	18 (25.8)	0	
Related to the road condition			
No particular factor	259 (75)	19	0.004
With particular factor	86 (25)	(61.2)	0.013
Poor lighting	30 (34.8)	12 (38.8)	0.029
Bad road state	34 (39.5)	2 (16.6)	0.278
Slippery surface	16 (18.6)	9 (75)	0.378
Others (Traffic, roadworks)	6 (7.1)	1 (8.3) 0	

Similarly, in most countries in the world, we found that the young population was the one to pay the heaviest price in terms of traffic accidents. In our series of studies, the average age was 33 years and the most affected age group was between 15 and 29 years. In the "road safety in France "report on accident rates for the year 2018, in terms of the number of deaths and injuries, people aged between 20-24 years were the most affected by road accidents; followed by the ones aged between 15-19 year and between 25-29 years [6].

Regarding the flow of accident victims, we found that the peak of accidents was in the month of February 2020 with a percentage of 27% while the lowest accident rate was in the month of April 2020 with a percentage of 9.2 %.

These results were not found in the literature; In fact, the traffic accident rate is classically higher during summer. A study carried out in France in 2001 found that the winter months (January to March) were at a low level of accidents followed by a rise in the spring that culminates during the summer with a gradual descent during the fall [7].

The differences between our results and those found in the literature can be explained by the lockdown implemented in April 2020 for the fight against the COVID-19 pandemic; therefore, the month of February 2020 represents the most accident-prone month in our study.

The days of the week with the highest numbers of traffic accidents were Monday and Saturday.

The most accident-prone time interval during the day was from 6 p.m. to midnight, while the time interval with the lowest number of accidents was from 6 a.m. to 12 p.m.

Similar results have been found in other studies: in fact, a study carried out in France by Gayrard A et al; showed that the days at the start of the week had a lower average number of deceased accident victims at 17 deaths per day. Weekends had an average of 27 deaths per day [7]. The 2018 study by Bernagaud AS et al; showed that there was an increase of 18% in the number of accidents during the morning rush hour (7 a.m. to 9 a.m.) and 52 % during the evening rush hour (5 p.m. to 7 p.m.) [6].

In our study, the third of the RTAs had special circumstances: the most important one was alcohol consumption in 26.1% of cases, and excessive speed in 22.5% of cases, several other studies have found similar results [8-9-10].

The subject of the contributing factors to RTAs is both complicated and recurrent in the field of road safety [11]. In fact, in the search for the causal factors of RTAs, there are several factors related to both the driver and the environment. The contribution of human factors in traffic accidents is far from being easy to isolate in accidental mechanisms. In fact, among the main human factors contributing to road accidents, we typically find speeding and alcohol consumption. Each of these variables has been the subject of abundant literature, which has largely proven their harmful effect on driving activity.

In our sample, it was found that 24% of RTAs occurred under poor weather conditions and 29.5% of RTAs were influenced by road-related factors. Among the road deaths in our study, 36.8% were associated with particular weather conditions, and 21% were associated with road-related conditions.

Several other studies showed the impact of these conditions on the incidence and severity of road accidents; A Finnish study published in 2018

assessed the relative accident risk of different road and weather conditions. The study analyzed traffic accidents on 43 major Finnish roads between the years 2014-2016 [12]. To simplify the analysis, the potentially dangerous conditions were combined into five categories: slippery road, very slippery road, poor visibility, icy rain, and slush. All road weather conditions had an increased relative crash risk of more than 50%

In our study, 54.6% of victims did not respect safety measures (no helmet or seat belt). Among the deceased victims, most of them (16 victims) did not take road safety measures, in particular wearing a helmet or a seat belt.

Similar results have been found in the literature: It was the case of the accident rate report for 2018 in France, which insisted on the importance of wearing seat belts as well as helmets. In the period 2013-2017 [6], 1,779 people who died in road accidents were not wearing their seatbelts.

LIMITATIONS

Our study was conducted during the COVID-19 lockdown, for that reason; the size of our sample was small. This may influence research findings by making p-values stray from significance affecting the ability to study associations. It is more difficult to distinguish between a real effect and a random variation.

Despite these limitations, this study offers a picture of the epidemiology of RTA and its associated factors in Tunisia, which may aid in identifying factors suitable for the development of preventive programs and the allocation of resources by Tunisian health authorities.

CONCLUSION

Our study focused on a series of 345 victims of RTAs in the territory of EMS 03 in the Center East of Tunisia. We described the epidemiological and prognostic characteristics of the RTAs. The results showed the circumstances and etiological factors of RTAs as well as the epidemiological and clinical profiles most frequently found.

The majority of victims were males (82.8%), and young with an age between 15 and 29 years (36.2%). In 18.8 % of cases, the victim was a pedestrian hit by VL, and in 17.9% of cases; the victim was a driver of a two-wheeled vehicle hit by a light vehicle. Safety measures were taken only in 45.4 % of drivers victims.

Weather-related factors were found in 20.3% of cases. Road-related factors were found in 25% of cases.

Accidents took place most frequently in Sousse (57.1%), on Monday and Saturday (18.1 and 16.8%) of cases. The injured person was taken to the emergency department by the mobile care unit team in almost half of the cases.

Through this study, we were able to identify the severity and the mortality predictive factors. Thus, all measures that can preserve life must be implemented, such as adapting the traffic environment to users and educating and training

drivers and pedestrians to change their behavior in the desired direction.

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Overview of the post-night shift syndrome in the COVID-19 pandemic era: predictors in a North African sample of physicians

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Abstract

OBJECTIVES: This study aimed to detect the post-night shift syndrome among physicians and to evaluate its predicting factors.

METHODS: Observational cross-sectional study involving physicians working night shifts during the study period (December 2019-February 2021). The post-night shift symptoms are divided into four dimensions: somatic, behavior, mood, and psychological.

RESULTS: Sixty-five participants have developed PNS syndrome (25.70%).

The independent predictors of developing PNS syndrome were working in a COVID-19 unit, the number of admissions, and the number of sleeping hours.

CONCLUSION: The night shift is a condition that primarily affects physicians. The PNS may cause several disorders and may decrease the physicians' well-being. At the beginning of the COVID-19 pandemic, working in a COVID-19 unit was a predictor of the development of PNS syndrome.

KEYWORDS: Post-night shift syndrome; Symptoms; COVID-19; Predictors.

INTRODUCTION

Physician well-being is an increasing focus in the medical community. Increased workload and long work hours among residents can contribute to increased stress. Past studies have shown that night shift work is a major factor in career dissatisfaction, burnout, work-family conflict, and dysphoria [1]. Furthermore, the risk of night shifts is such that the World Health Organization International Agency for Research of Cancer has listed it as a possible Carcinogen [2].

Post-night shift syndrome was recently described in an observational, multicentric study in the emergency units of Hérault and Gard [3]. In addition, there is no room for doubt that COVID-19 has introduced unique stresses to the healthcare system, namely to caregivers. It is, therefore, argued that the experience of a global pandemic like COVID-19 could be considered a mass traumatic event [4,5]. In this view, it is unsurprising that night shifts during the pandemic could be more stressful and disturbing.

A few studies have investigated post-night shift syndrome, particularly during the COVID-19 pandemic [6–8]. This study aimed to detect the post-night shift syndrome among physicians and to evaluate its predicting factors.

METHODS

It was an observational cross-sectional study conducted in the two university hospitals, including all the physicians working night shifts during the study period.

We have enrolled 253 physicians who agreed to participate in the study. Inclusion criteria concerned all physicians (intern, resident, university hospital doctors, specialists, generalists) working night shifts whatever their specialty or department.

This study was conducted for 15 months, from December 2019 to February 2021, 3 months before the pandemic, and 12 months after the beginning of the pandemic in Tunisia(Figure 1) [9].

A computerized and anonymized questionnaire was spread among all physicians via Google Forms. It was published on Facebook and via e-mail.

The questionnaire consisted of 2 parts: the first for a normal day and the second for a post-night shift.

During a normal day, we assessed the Perceived Stress Scale (PSS), and a questionnaire compiled the post-night shift symptoms divided into four dimensions: somatic, behavior, mood, and psychological. Symptoms collected were based on a synthesis of questionnaires elaborated by a recent study ([3].

We have used the visual analogical scale (VAS) to rate the different symptoms felt. Higher scores indicated greater levels of irritability, anxiety, etc.

VAS is less sensitive to confusion bias and is quick and easy to perform [10]

After a night shift, another questionnaire gathered the shift feelings, the day after shift feelings, and data about the shift.

- Used scales:
  - The Perceived Stress Scale is the most widely used psychological instrument for measuring the perception of stress. The original version of the PSS was shortened from 14 to 10 items to improve completion rates and ease of scoring. It has been proven that the shorter version has higher internal consistency and

construct validity and is thus psychometrically superior [11].

Participants were asked about their feelings and thoughts during the past and to indicate how often they felt or thought a certain way in response to 10 questions.

Each item was rated 0 (never), 1 (rarely), 2 (sometimes), 3 (fairly often), or 4 (very often), four items were reverse coded (On questions 4, 5, 7, and 8 the scores are changed like this: 0 = 4, 1 = 3, 2 = 2, 3 = 1, 4 = 0), and all items were summed to obtain scale scores. The total scores range from 0 to 40, with higher scores indicating greater perceived stress (11).

- Scores ranging from 0-13 would be considered low stress.
- Scores ranging from 14-26 would be considered moderate stress.
- Scores ranging from 27-40 would be considered high perceived stress.

The internal validity of the PSS score was verified, with an alpha Cronbach coefficient of 0.92

- Post-nightshift symptoms and attitude: To be able to assess, compare, and analyze the characteristics of the post-nightshift syndrome, we have chosen to establish a score. The VAS of the different symptoms (somatic, behavior, mood, psychological) collected were averaged and reduced to a score out of 200.
  - Somatic symptoms: tiredness, discomfort, gastralgia, headaches, diffuse pain.
  - Behavioral symptoms: unfinished activities, reckless spending, Verbal fluency disorders, over-commitment, Cynicism.
  - Mood disorder: irritability, mood swings, intolerance, anxiety, Impulsivity.
  - Psychological symptoms: attention disorder, memory disorder, Word finding difficulties, feeling of being easily influenced, Slow thinking.
  - Consumption: tea, coffee, tobacco, alcohol, stimulant drugs, hypnotic drugs.

We have chosen the highest quartile as a cut-off to indicate PNS syndrome. The internal validity of the PSS score was verified, with an alpha Cronbach coefficient of 0.94.

- Data about the shift
  - The number of night shifts per month, and duration of the night shift.
  - Compensatory rest before and or after the night shift.
  - The number of doctors per night shift.
  - The number of sleep hours, and admissions (planned and unplanned) during the night shift.
  - Time of each meal, if taken.

- Accessibility to additional exams, quality of teamwork, and accessibility to specialist advice.

- Data added after the COVID-19 pandemic: when the COVID-19 pandemic began, we decided to add these parameters to the questionnaire.
  - The number of COVID-19 samples was carried out personally.
  - The number of suspected patients with a COVID score is greater than 4.
  - The number of COVID + patients.
  - In this section, we compared the group of participants with PNS syndrome to those with no PNS syndrome.
  - Statistical analyses: Spearman correlation was realized to describe the relationship between the PNS and each item of the same questionnaire and the total score of PSS. The level of significance was set at 0.05.

To compare qualitative variables, we used the Person Chi-square test and the Fisher exact test. Considering the small number of senior physicians answering the questionnaire, we have chosen to exclude them from this analytical study; only the residents' and interns' data were analyzed (n=244).

To compare quantitative variables, we used the Mann–Whitney U test. In the multivariate analysis, we used a multiple logistic stepwise regression procedure to elucidate the independent predictors of developing PNS syndrome. Odds ratios were estimated from the b coefficients obtained, with respective 95% confidence intervals (CI 95%). The significance level was a two-sided $p < 0.05$ for all the used tests.

RESULTS

Among the six hundred and twelve physicians invited to participate in the study, 253 completed the questionnaire representing a 41.34% response rate (Figure 1).

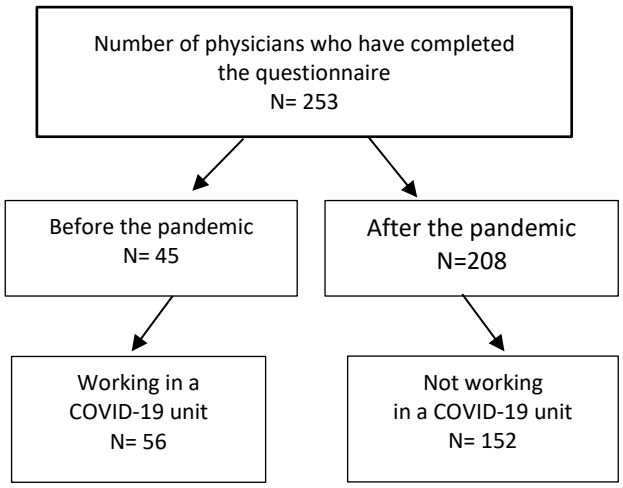

Figure: Study's flow chart

The median age of the participants was 27 years [26-28.5] with an M/F sex ratio of 0.77 (143 women). The residents represented the most responding participants (196, 77.6%), among whom 28.5% were second-year residents. The most represented specialties among residents, specialists, and university hospital physicians (n=202) were family medicine (64, 25.3%) and emergency medicine (22, 8.7%). Fifty-one participants have not indicated their specialty. The median number of shifts per month was 6

[4.75-7]. Two hundred and eight of the physicians included have had shifts after the beginning of the COVID-19 pandemic (82.21%).

Table 1. Correlation between PNS scale and sociodemographic and shifts' characteristics

	***PNS scale* p (r)**
Sociodemographic characteristics	
Age	0.40 (0.05)
Number of children	0.41 (0.05)
Marital status	NS
Data about the shift	
Number of shifts per month	0.002 (0.20)
Number of physicians per shift	0.57 (0.036)
Compensatory rest before the shift	10^{-3} (-0.23)
Compensatory rest after the shift	0.59 (-0.03)
Number of sleep hours	10^{-3} (-0.26)
Number of admissions	10^{-3} (0.29)
Planned admissions	10^{-3} (0.24)
Unplanned admissions	0.002 (0.20)
Quality of teamwork	0.072 (-0.17)
Accessibility to complementary exams	10^{-3} (-0.25)
Accessibility to specialist advice	0.01 (-0.164)
Data related to COVID-19	
Number of COVID-19 samples carried out personally	0.008 (0.32)
Number of suspected patients with a COVID score greater than 4	0.002 (0.22)
Number of COVID + patients	10^{-3} (0.30)

The median PNS score was 85 [57.00-111.50] ranging from 7 to 200. Considering the highest quartile (111) as the cutoff to indicate a PNS syndrome, we have found that 65 physicians have developed PNS syndrome (25.70%).

The post-night-shift scale was correlated neither with age nor with the number of children. Data related to the COVID-19 pandemic were strongly correlated with the PNS scale mainly the number of COVID-19 patients seen during the shift (10^{-3}) (Table 1). The PSS was correlated with the PNS scale (p=0.01) but this correlation was weak (r=0.162).

Table 2. Correlation between the four dimensions of the PNS scale with the overall

Post nightshift symptoms	PNS scale P (r)
Somatic symptoms	
Tiredness	10^{-3} (0.65)
Discomfort	10^{-3} (0.71)
Gastralgia	10^{-3} (0.61)
Diffuse pain	10^{-3} (0.68)
Headaches	10^{-3} (0.63)
Behavioral symptoms	
Unfinished activities	10^{-3} (0.61)
Verbal fluency disorders	10^{-3}(0.66)
Over-commitment	10^{-3} (0.50)
Cynicism	10^{-3} (0.51)
Reckless spending	10^{-3} (0.45)
Mood disorders	
Irritability	10^{-3} (0.80)
Mood swings	10^{-3} (0.73)
Intolerance	10^{-3} (0.76)
Anxiety	10^{-3} (0.70)
Impulsivity	10^{-3} (0.69)
Psychological symptoms	
Attention disorder	10^{-3} (0.76)
Word finding difficulties	10^{-3} (0.75)
Memory disorder	10^{-3} (0.73)
The feeling of being easily influenced	10^{-3} (0.62)
Slow thinking	10^{-3} (0.73)

The median libido away from a night shift was 6 [3-8] and on post-nightshift was 4 [1-7]. Concerning the variation of libido, 48 participants have had an increase in libido The delta libido was correlated with the PNS scale (p=0.007).

Table 3. Predictors of PNS syndrome

	PNS syndrome (n=61) Mean rank	*No PNS syndrome (n=183) Mean rank*	*Mann- Whitney U*	*P value*
Age	128.20	120.60	5234.00	0.46
Gender	107.00	127.67	4636.00	0.021
Number of children	125.43	121.52	5402.50	0.48
Number of shifts per month	143.65	115.45	4291.50	0.006
Compensatory rest before the shift	116.50	124.50	5215.50	0.074
Compensatory rest after the shift	125.00	121.67	5429.00	0.71
Number of COVID-19 samples carried out	48.08	32.90	197.00	0.007
Number of suspected patients with a COVID score greater than 4	111.58	86.86	2641.50	0.004
Number of COVID+ patients	110.73	84.93	2525.50	0.002
number of physicians per shift	117.20	124.27	5258.00	0.49
Number of sleep hours per shift	88.26	113.21	3378.00	0.008
Number of admissions	139.22	116.93	4561.50	0.032
Planned admissions	147.31	114.23	4068.00	0.001
Unplanned admissions	129.02	120.33	5184.00	0.40
Accessibility to complementary exams	106.15	127.95	4584.00	0.035
Quality of teamwork	115.30	124.90	5142.00	0.35
Accessibility to specialist advice	110.97	126.34	4878.00	0.137
Consumption of hypnotic drugs	122.00	122.67	5246.00	0.111
Consumption of stimulant drugs	120.50	123.17	5520.50	0.75
PSS	134.58	118.47	4844.50	0.120

We have found that coffee, tobacco, and alcohol consumption increased after a night shift. Tobacco consumption was 5.34 (± 9.86) on a normal day ranging from 0 to 30 cigarettes while it was 6.43 (± 13.11) on post-night-shift ranging from 0 to 60 cigarettes.

The four dimensions of the PNS scale were strongly correlated with the overall scale (Table 2). The number of shifts per month, the number of sleep hours, as well as the number of admissions and planned admissions (U=4068.00, p=10-3), were associated with a higher risk of developing PNS syndrome (Table 3). The number of suspected patients with a COVID-19 infection (U=2641.50, p=0.004), the number of COVID+ patients (U=2525.50, P=0.002), as well as the number of samples carried out (U=197.00, p=0.007 were predictors of developing PNS syndrome (Table 3). Working during the pandemic was not correlated with the development of PNS syndrome (p=0.194) while working in a COVID-19 unit was a strong predictor of PNS syndrome (10-3).

Table 4: Independent predictors of Post-night shift

	p-value	*Odds ratio*	*Confidence interval*
Working in a COVID-19 unit	10^{-3}	1.44	[1.09 ,1.92]
The number of admissions	10^{-3}	1.52	[1.21 ,1.90]
The number of sleeping hours	10^{-3}	1.40	[1.10 ,1.80]

The independent predictors of developing PNS syndrome were working in a COVID-19 unit, the number of admissions, and the number of sleeping hours (Table 4).

DISCUSSION

Post-night-shift syndrome can lead to major health concerns and can negatively impact physicians' performance. Our study has confirmed that the night shift is not just a hard-working circumstance but also a highly distressing condition that can lead to a defined syndrome: the post-night-shift syndrome. Most of the physicians have had moderate stress.

Physicians' wellness is frequently discussed, though it is not sufficiently prioritized. The necessity of providing uninterrupted healthcare services worldwide requires many healthcare professionals to work in the night-shift system. Nighttime duty is an important component of physicians' training in most specialties.

During the night shift, physicians are on duty during their biological resting phase and are forced to schedule sleep to their biological active phase. Post-night-shift syndrome was recently described in an observational, multicentric study in the emergency units of Hérault and Gard [3]. Its mechanisms are still debated. It seems to be related to increased levels of Interleukin-8, measured as a stress biomarker, after working a 24-hour shift, indicating an increase in inflammatory processes [12]. Moreover, circadian rhythms [diurnal rhythms of cortisol] alert us in the morning hours [pre-shift] but cause us to feel fatigued as cortisol concentrations gradually decline over the day [post-shift] [13]. For example, it has been reported that one night of sleep deprivation increases cortisol release [14]. Human physiology is arranged to sleep at night and to be awake in the daytime. This can be evidenced by hormones released in the circadian rhythm. Among these hormones, melatonin is released during nighttime sleep, but not during daytime sleep. Sudden changes in melatonin release can produce a jet-lag-like condition, disrupting human mental health and sleep rhythm [8].

Furthermore, according to Cakan et Yildiz, a whole-night shift lowered platelet numbers, visual attention, and estradiol levels but increased NRBC, IL-1β, TNF-α, and IL-6 levels. All of these data suggest that night shifts disrupt homeostatic and circadian mechanisms, but the effects of whole-night shifts were much more dramatic than half-night shifts [15]. Furthermore, recent research conducted by Cuesta et al. showed that after a night shift, cytokine release was partly altered in response to the change in the sleep-wake cycle [16]. Another study provides the first time evidence that insufficient sleep restoration over circumscribed cortical areas leads to aberrant behavior. In chronically sleep-restricted subjects, low slow-wave sleep intensity over the right prefrontal cortex - which is linked to risk behavior – may lead to increased and subjectively unnoticed risk-seeking [17].

The COVID-19 pandemic may allegedly have exacerbated occupational fatigue and burnout among doctors. Several studies have found that the COVID-19 pandemic has had an impact on

physicians' well-being [15,16]. We have assessed stress among physicians working nightshifts using the perceived stress scale. We have found that most of the residents have had moderate stress [80.24%]. Similarly, in a cross-sectional study including resident physicians working night shifts, Hassan et al. found that most of the residents have had moderate job stress [18].

In our study, age was not correlated with the development of PNS syndrome. Leso et al demonstrated that shift work (particularly night shifts) has serious immediate negative effects on cognitive functions, especially regarding the cognitive domains related to attention, memory, and response inhibition. These findings found that increasing age is the most important risk factor for cognitive detriment [6]. Gender differences in work injury risk among shift workers have also been explored. However, there is limited empirical evidence showing an interaction between shift work and gender that definitively points to shift work as more adverse for either women or men. In our study, gender was not associated with PNS syndrome. In contrast, Wong et al have proven that shift work is a greater challenge for women than men due to cyclical menstrual changes [19][20].

We found that the number of sleep hours during the shift is a strong predictor of PNS syndrome [p=0.008]. Similarly, the results of Wali et al' study indicate that the factor that significantly affects mood and performance post-night-shift is the number of hours slept during the night shift [P = 0.03] [21]. Furthermore, Osterode et al have found in their series, including physicians from different departments, that although mean sleep deprivation during night-shift was relatively small [1.5 h] the impairment in participants' mental state was high in all three dimensions [mood, vigilance, and agitation]; $p \leq 0.001$ [22]. Thus, it is crucial to fight against sleep deficiency during night shifts. Indeed, the Accreditation Council for Graduate Medical Education Task Force has recommended strategic napping for residents, especially after 16 hours of continuous duty and between 10 PM and 8 AM [23].

The number of shifts per month was also correlated with PNS syndrome. Several studies have found that physicians working 1 to 4-night shifts per month have lower stress compared to those working more than 9 shifts per month [22-24]. Besides, work control includes also the number of physicians. Being a single resident is associated with job stress [18]. Oppositely, in our study, the number of physicians per shift was not associated with the development of PNS syndrome.

The total number of unplanned admissions also seems to be an important parameter. It was directly linked with tachycardia in emergency physicians working night shifts: each admission increased

the number of minutes of tachycardia ≥100 bpm by 2.0 min [p < 0.019],

and increased the number of minutes of tachycardia ≥ 120 bpm by 0.2 min [p < 0.027] [25]. In contrast, in our study, the number of total admissions and planned admissions were associated with the development of PNS syndrome. Yet, the number of unplanned admissions was not associated with the development of PNS syndrome. This result may be explained by the fact that unplanned admissions concern mainly emergency physicians who are more comfortable with unplanned visits than other specialists.

When caring for patients during a pandemic, physicians are exposed to repeated and prolonged stressors, while their health is endangered due to direct exposure to an infectious disease. It is therefore expected that these stressors have an impact on mental health. In a tertiary infectious disease hospital for COVID-19 in China, the incidence of anxiety was as high as 23.04%, and the incidence of post-traumatic stress disorder was estimated at 27.39% [26]. We have found that the median PNS scale was 85 [57.00-111.50]. Similarly, Fasula et al found that the median PNS scale was 89 among emergency physicians [73.5-157.5] [3]. Indeed, the high-risk contacts [working in the department of respiratory, emergency, intensive care unit, and infectious disease staff were twice more likely to suffer anxiety [p=0.01] and depression [p=0.02] than the non-clinical staff [working in administrative, technical operations] [5]. In a cross-sectional study conducted by Abdulah et Musa, the physicians who dealt with suspected or confirmed cases of COVID-19 were more likely to develop sleep problems and stress after the night shift [27].

LIMITATIONS

A few limitations are to be highlighted. First, the study was conducted on a single site. The results may not reflect the shift conditions across Tunisia. Second, this study was limited by the small size of the sample. Indeed, although physicians tend to adapt to technological advances, it should be kept in mind that some of them have limited technological literacy and do not utilize social media. The results should be replicated in larger samples to validate the contribution of the analyzed variables. Finally, we cannot exclude the possibility that other factors not assessed in our study, such as patient-doctor communication and social support, may also contribute to the development of PNS syndrome.

Despite the limitations abovementioned, we hope that our study findings will provide data support for the targeted interventions on psychological health in Tunisian physicians, especially during the COVID-19 pandemic.

CONCLUSION

The night shift is a condition that primarily affects physicians. The PNS may cause several disorders and may decrease the physicians' well-being. At the beginning of the COVID-19 pandemic, working in a COVID-19 unit was a

predictor of the development of PNS syndrome, as well as the number of COVID-19 patients confirmed and suspected and the number of samples carried out.

These findings suggest the need to reappraise the efficacy and feasibility of current policy regulating the scheduling of physicians and, if warranted, place further limitations on working hours and increase the number of junior physicians

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Serious abdominal traumatic emergencies in the emergency department of a "Trauma Center" hospital of Libreville (Gabon): Epidemiological, diagnosis and outcomes aspects

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Abstract

Background: Abdominal trauma (AT) represents about 15-20% of lesions observed in traumatology. It may be serious and a life-threatening condition. This study aimed to describe the epidemiological, diagnosis and outcomes aspects of severe AT (SAT) admitted to the emergency department of Owendo University Hospital (Gabon).

Methods: A cross-sectional and descriptive study with retrospective collection of data. It was conducted over a period of twenty-four months, in the Emergency Department of the CHUO. Only patients with traumatic abdominal pathology classified as serious were included. The variables of the study were: age, sex, mechanism of trauma, pre-hospital management, clinical signs, paraclinical assessment carried out, surgical treatment and evolution. The data were analyzed by Microsoft Excel Pro version 2019 software.

Results: during this period, 4.6% (n=105) of patients presented with abdominal trauma. The average age of the patients was 29.8 ± 13.8 years. In 70% of cases (n=49), road traffic accidents (RTA) were the main etiologic mechanism, then assaults (11.4%). In per operative settings, the splenic lesions were the most found in 60% (n=42) of the cases. Crude mortality was 20% (n=14). Deaths occurred in 64.2% of patients during the first forty-eight hours.

Conclusion: Serious abdominal trauma is still responsible for high mortality in Gabon, as in other African countries, and the above-mentioned factors remain the cornerstone. Improving its management requires better development of pre-hospital medicine in Gabon, emphasis on training in the use of "Fast-echo" in emergencies and perhaps by strengthening surgical practices such as "damage control" or "abbreviated laparotomy".

Keywords: Abdomen; Serious; Owendo; Outcomes; Trauma; Emergency.

INTRODUCTION

Traumatic pathology is the first cause of death in young adults and abdominal trauma represents about 15-20% of the lesions observed in traumatology, and is associated with high mortality, of the order of 20% [1-2]. The frequency of blunt abdominal trauma is predominant and estimated between 70 and 86% of abdominal trauma [2]. Traumatic abdominal emergencies are characterized by their immediate severity, extreme in the event of damage to the large vessels, the liver, or the spleen. The management of these traumas requires a multidisciplinary collaboration which begins from the prehospital phase with continuity in hospital reception, until the treatment of the lesions and their specific monitoring. The hospital phase requires, if possible, a hospital specializing in severe traumatology such as a "Trauma Center" with an appropriate technical platform and a team well-trained in the management of traumatological emergencies. The objective of this work is to describe the epidemiological, diagnostic, and evolutionary aspects of serious traumatic abdominal emergencies admitted to the emergency department of the University Hospital Center of Owendo, a hospital with the vocation of "Trauma Center" in Libreville (Gabon).

METHODS

This was a cross-sectional and descriptive study with retrospective data collection. It took place over a period of twenty-four months, from January 1st, 2021, to December 31st, 2022. The emergency, operating theater, and intensive care service of the Owendo University Hospital Center (CHUO), "Trauma Center" in Libreville, served as a place of study. Only patients with abdominal traumatic pathology classified as serious based on the presence of a failure of at least one vital function with proven abdominal morphological lesions were included. All other traumatic emergencies (thoracic trauma, polytrauma without abdominal injury) admitted in emergency care during the same period were excluded from this work. The variables of the study were: age, sex, mechanism of trauma, pre-hospital management, clinical signs, paraclinical assessment carried out, surgical treatment, and outcomes. The data were analyzed by Microsoft Excel Pro version 2019 software. This work was carried out according to the recommendations of the Declaration of Helsinki on the use of human beings. The authorizations of the officials of the University Hospital Center of Owendo have been obtained.

RESULTS

During the study period, 2300 patients were admitted to the emergency department for trauma. Among the latter, 4.6% (n=105) had abdominal trauma, including 66.7% (n=70) with disruption of at least one vital function. The average age of the patients was 29.8 ± 13.8 years. The male gender was predominant in 80% of cases (n=56) with a sex ratio of 4M/1F. In 70% of cases (n = 49), road traffic accidents (RTA) were the main etiological mechanism, followed by assaults (11.4%) (Table 1). Only 8.6% of cases (n=6) had benefited from medical transport.

Table 1: Retailing of patients according to etiological mechanisms

Etiological Mechanisms	Number (n)	Percentage (%)
Public road accident	**49**	**70**
• Car-Car	16	32,7
• Car-pedestrians	14	28,6
• Car-motorbikes	10	20,4
• Car-hurdles	09	18,3
Falls	11	16
Assaults	08	11
Sport	01	1,5
Work accident	01	1,5
Total	**70**	**100**

The majority (82.9%) of these abdominal trauma emergencies were blunt, and only 5 were penetrating (7.1%). On admission to the emergency department, the main functional sign found was abdominal pain in 87.1% (n=61) of patients. Skin hypoperfusion criteria were observed in 25.8% of cases, and 66% of patients (n=46) presented with tachycardia ≥ 120 bpm. The majority of patients (n= 46) had SBP ≤ 90 mmHg (Table 2).

Table 2: Retailing of patients according to hemodynamic and respiratory parameters

Hemodynamic and respiratory parameters	Number (n)	Frequency (%)
Cardiac frequency (bpm)		
90 ≤ Fc ≤ 99	07	10
100 ≤ Fc ≤ 109	12	17
110 ≤ Fc ≤ 119	05	7
Fc ≥120	46	66
Systolic blood pressure (mmHg)		
100 ≤ PAS ≤ 110	24	34
80 ≤ PAS ≤ 90	05	7
60 ≤ PAS ≤ 70	16	23
Respiratory frequency (cpm)		
12 ≤ FR ≤ 18	37	52,9
19 ≤ FR ≤ 25	08	11,4
26 ≤ FR ≤ 30	15	21,4
FR > 30	10	14,3

On the respiratory, 14.3% (n=10) of the patients had a respiratory rate higher than 30 cycles/min. An altered state of consciousness with a Glasgow score between [9-12] was noted in 14.3% (n=10) of patients. On the digestive level, evisceration was found in 5.7% of cases (n=04), abdominal defense in 80% of cases (n=56), and navel pain in 75.5% of cases (n=53). At the morphological paraclinical level, the “Fast-echo” was performed in 66% of cases (n=46), conventional ultrasound in 34% of cases (n=24), and abdominal computed tomography in 10% (n=07) of patients. Hemoperitoneum was found in all patients who underwent ultrasound. The average hemoglobin level was 7.2 g/dl with extremes ranging from 3g/dl to 12g/dl. The time to surgery was less than 2 hours in 2.8% (n=02) of patients, between 3-6 hours in 37.14% (n=26) of patients, and more than 24 hours in 11 % (n=08). In per operative setting, the splenic lesions were the most found in 60% (n=42) of the cases. (Table 3). Total splenectomy was the rule in case of splenic involvement (100%), the retroperitoneal hematomas had been respected and a nephrectomy had been performed in front of the bursting of the kidney. (Table 3). In intensive care after the block, the average length of stay was 3.9 days with a mortality rate of 20% (n=14) of patients.

Deaths occurred in 64.2% of patients during the first forty-eight hours.

Table 3: Retailing of patients according to lesions and surgical procedure

Damage	Number (n)	Surgical act
Rupture of the spleen	30	Splenectomy
Spleen crack	12	Splenectomy
Mesenteric wounds	12	Suture
Liver wounds	02	Packing
Liver crack	04	Suturing + surgical
Liver contusion	04	No movement
Colon wounds	08	Excision - suturing
Kidney burst	01	Nephrectomy
Kidney contusion	03	No movement
Hail wounds	04	Excision - suturing
Retroperitoneal hematoma	04	No movement
Bladder wounds	03	Suture
Diaphragm wounds	02	Suture

DISCUSSION

Serious abdominal traumatic emergencies represent 4.6% of all traumatic emergencies and 2.3% of admissions to the CHUO emergency care. They generally concern the young adult male population. Abdominal traumas are lesions observed in the abdomen, its contents, or its walls, by a mechanism that may or may not have respected parietal continuity. They can be isolated (sports accident, aggression), or more frequently, in the context of polytrauma [3]. The prevalence shown by our results is not very far from that of Itéké et al in the DRC with 10.9% of traumatic emergencies and 2.7% of admissions to emergency departments [4]. Among the mechanisms involved, TRA ranks first (70%, n=49), explaining the seriousness of the injuries. TRAs are also incriminated in the work of Ndong A in Senegal with 54.1% of cases [5]. The lack of pre-hospital care in this study reflects the under-medicalization of trauma transport in sub-Saharan Africa in general, most often contributing to the worsening of patients' states and the delay in medical care. This observation was also made by Choua O in Chad and Obame R in Gabon. In this study, thirty-six patients (51.4%) had benefited from an abdominal ultrasound including the "Fast-echo" used in 61.1% (n = 22) of cases [2-6]. "Fast" type ultrasound is of great importance in the initial evaluation of abdominal trauma patients. It aims at detecting post-traumatic peritoneal effusions and also looks for the presence of pleural effusion, however, it does not identify the damaged organs. This underuse of ultrasound finds its root in the lack of extension of its practice among general practitioners working in the emergency department. The majority of emergency services in the sub-Saharan African context are run by general practitioners barely out of medical school. There is also the fact that some serious pictures of patients in shock were immediately taken to the operating room for an exploratory laparotomy leaving no time for this examination to be carried out. The stabilization of vital distress must be done without delay. In this study, only 2.8% (n=02) of the patients had a delay in treatment in the operating room of less than 2 hours. The block delay was between 3 and 6 hours in 37.14% (n=26) of the patients. These delays are still acceptable given the results of Belemlilga in Bobo-Dioulasso which were

beyond 24 hours in 22.2% of patients [7]. Several factors could explain this delay in care in our context, in particular, the unavailability of surgical equipment (gowns, gloves) and consumables during the period of this work, which have been to be brought by the patient's relatives. Early management of operable lesions is a good prognostic factor in this type of traumatic pathology. Surgical management remained classic; a laparotomy had been performed in the face of any clinical or paraclinical picture suggestive of frank haemoperitoneum. The surgical procedures performed depended on the lesions observed. In this work, splenectomy was the rule (42/42), a result close to that of Bio Tamou Sambo et al (17/18) in Benin. [8]. None of the patients had undergone "damage control" or "shortened laparotomy" often recommended in trauma patients presenting with major abdominal bleeding with a risk of coagulopathy [9]. The average length of stay in intensive care was 3.94 days. It can be explained by the effectiveness of the reanimation undertaken but also because of the insufficient number of postoperative complications. The prognosis of a traumatic hemoperitoneum, whatever the circumstances of occurrence, is conditioned by the speed and accuracy of the diagnosis of the lesion and also by the therapeutic option [10]. The mortality rate found was 20%. This rate is similar to that found by Itéké (20.6%) [4], but higher than the rate of Rakotoarivony et al (6.7%) in Madagascar [11]. Among the deaths, 9 cases (35.2%) occurred before the first 48 hours. This observation had already been made by Itéké et al in Congo, which recorded a mortality rate of 42.9% within the same period. Indeed, uncontrolled post-traumatic hemorrhage is the main cause of this mortality [4]. The concept of "damage control" or "shortened laparotomy" is not yet well practiced by CHUO surgeons, despite the indications; this may also be an explanation for the irreversibility of these hemorrhagic shocks on severe abdominal trauma.

CONCLUSION

Serious abdominal traumatic emergencies affect an almost young, male population with the circumstances of occurrence being road accidents and falls. It is characterized by a glaring insufficiency of pre-hospital care with the consequence of a worsening of the vital prognosis, which leaves little chance for hospital practitioners. On one hand, prehospital care sets difficulties but on the other hand, it makes the hospital improve in the diagnostic means as well as in the surgical relay and resuscitation. The accession of FAST-type ultrasound greatly facilitates early diagnosis and surgical management. Serious abdominal trauma is still responsible for high mortality in Gabon, as in other African countries, and the above-mentioned factors remain the cornerstone. Improving its management requires better development of pre-hospital medicine in Gabon, emphasis on training in the use of "Fast-echo" in emergencies, and perhaps by strengthening surgical practices such as "damage control" or "abbreviated laparotomy".

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Evaluation of initial medical certificates delivered by emergency doctors

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Abstract

OBJECTIVES: The initial medical certificate (IMC) is the first document delivered to an injured person. In this work, we propose to analyze the quality redaction of IMC written by emergency doctors and to propose writing recommendations in order to guarantee a better quality of IMC.

METHODS: This is a retrospective and descriptive study of all IMCs written by emergency doctors in Mahares Emergency Unit and collected at the regional Hospital of Mahres in Sfax, Tunisia, over a period of 22 months (January 1, 2019 - October 31, 2020).

We included initial medical certificates issued for intentional assault and battery (assaults) and unintentional (primarily traffic accidents, workplace accidents,). We excluded all initial medical certificates that were totally illegible.

RESULTS: During this period, we collected 506 IMCs. They were all hand written according to the pre-established model for public sector. 83% of the certificates were perfectly legible. 46% of the physicians used abbreviations in the IMCs.

The surname and first name of the physician were mentioned on 457 certificates (90% of the cases) and his complete identity with his grade and professional address in 6.7% of the cases only. The signature of the physician was present in the vast majority of the certificates (97%), and the stamp was present in only 8% of the cases. The victim's identification (name and surname) was noted in almost all the certificates. However, neither the address nor the occupation of the victim was included in 506 certificates. The majority of prescribing physicians had mentioned the date of clinical examination, the date of the event, as well as the date of writing the IMC (84.8%). The duration of total temporary disability was specified in 91.3% of the cases.

CONCLUSION: In our study, the IMC is generally imperfectly and insufficiently written by the doctor. This can have serious medico-legal repercussions for both victim and doctor. Indeed, the victim may lose his rights to compensation and the doctor may be held medical liability.

KEYWORDS: Trauma; Incapacity; Medical liability; Initial medical certificate.

INTRODUCTION

The initial medical certificate (IMC) is the first document delivered to an injured person, or his/her legal representative. It is a particularly frequent and serious act of medical practice as forensic consequences can arise when it's written imperfectly. It may engage the medical liability of the doctor. Therefore, this act must obey writing rules and objective quality criteria to avoid such negative consequences.

In this work, we propose to analyze the quality of IMC-written emergency doctors and to propose writing recommendations to guarantee a better quality.

METHODS

This is a retrospective and descriptive study of all IMC delivered by emergency doctors and collected at the Emergency unit of the Regional Hospital of Mahres in Sfax, Tunisia, over a period of 22 months (January 1, 2019 - October 31, 2020).

We included initial medical certificates issued for intentional assault and battery (assaults) and unintentional (primarily traffic accidents, and workplace accidents,). We excluded all initial medical certificates that were illegible.

Quantitative variables were expressed as mean with standard deviation. Qualitative variables were expressed in proportions observed in the sample.

RESULTS

In total, we collected 506 descriptive certificates during the study period.

In our series, all the certificates were written on the official model of the Ministry of Health, brought by Circular No. 2000-72 of 01/09/2000 [1]. In addition, 83% of the certificates were perfectly legible. For the remaining 27%, we had difficulties deciphering some words even after soliciting another reader. Moreover, 46% of the physicians used abbreviations in drafting IMC.

Evaluation of IMCs content:

- ***Administrative data:***

We noted that the hospital structure and the department, as well as the receipt number, were mentioned in the majority of cases (87% and 89% respectively) (Table). However, the requestor of IMC was identified in only 56% of cases. It was the victim or his/her legal guardian in 49% of the cases, and it was a certificate on judicial request in 7% of the cases (Table 1).

- ***Identity and professional data relating to the writing doctor:***

The name and the surname of the physician were mentioned on 457 certificates (90% of the cases). However, his complete identity with his grade and professional address were mentioned in only 6.7% of the cases. The signature of the physician was present in the vast majority of the certificates (97%); however, the stamp was present in only 8% of the cases (Table).

- ***Data relating to the patient:***

The victim's identification (name and surname) was noted in almost all the certificates. However, neither the address nor the occupation of the victim was included in 506 certificates (Table).

Table 1: Evaluation of IMC content

Variable	Modality	Mentioned		Not mentioned	
		n	%	n	%
Administrative data	Hospital and department	440	87	66	13
	Patient file number	396	78	110	22
	Receipt number	449	89	57	11
	Certificate requestor	281	56	225	44
Identity and professional data relating to the doctor writing the IMC	Name and surname	457	90	49	10
	Grade	45	9	461	91
	Place of practice	440	87	66	13
	Mention of the parameters	34	6.7	472	93.3
	Signature	489	97	17	3
	Stamp	39	8	467	92
Data relating to the patient	Name and surname	501	99	5	1
	Age or date of birth	451	89	55	11
	The patient's or legal representative's identity card number (or passport)	402	79	104	21
	Profession	0	0	506	100
	Patient's address	0	0	506	100

- ***Date mentioned on the IMC:***

The date of the accident, the date of the initial examination, and the date of writing the CMI were mentioned in 99.6%, 94.3%, and 98.4% of cases respectively. The dating was complete (three dates together) in 429 certificates (84.8% of cases).

- ***Anamnesis data***

The facts and the mechanism of the violence were reported by the victim in 71% of cases. The medical and surgical history was mentioned in 19 certificates (i.e. 4% of cases). The victim's complaints were included in 224 certificates (44% of cases).

- ***Clinical examination data:***

Among the 506 certificates, the general clinical examination (blood pressure, pulse, temperature, auscultation, palpation,) was specified in only 43 certificates (8.5% of cases). The general condition (good general condition, altered general condition, conscious and cooperative, Glasgow coma scale...) was reported in 99 certificates (19.6%).

The psychological evaluation was specified in 32 certificates (6.3% of cases). For physical consequences, the nature of traumatic lesions was mentioned in 80% of the cases. The seat of the lesions was noted in the majority of cases (95%). However, the size and shape of the lesions were only mentioned in 20.8% and 19.6% respectively.

- ***Complementary examinations:***

Complementary examinations were done and mentioned in 42.3% of the IMCs, but the result was reported in the IMCs in 39.7% of cases. 175 physicians requested a specialist opinion (34.6% of the cases).

- ***Treatments:***

The treatments were specified in 22.7% of the certificates.

Conclusion of the IMC:

The causing agent was specified in only 143 of the IMC (28.3% of cases).

The doctor assigned a total temporary disability in 462 certificates (91.3% of cases).

The expression "subject to complications" appeared on all the certificates.

DISCUSSION

The issuance of medical certificates is an act dictated by deontology (according to article 27 of the Tunisian Code of Medical Deontology) [2] Thus, the doctor needs to know the rules that authorize the drafting of such certificates and their content.

- ***Writing rules of the initial medical certificate***

1.1- Effective examination of the patient

First, the doctor must carry out an anamnesis and an effective personal clinical examination of the patient before writing the certificate.

However, according to circular n°2000/72 of the Minister of Public Health, the initial medical certificate in hospital emergency rooms is not necessarily issued by the doctor who examined the patient. Indeed, any doctor on duty in the emergency room can issue this certificate retrospectively based on the findings made and noted on the medical file or the emergency register by his colleague, the doctor who initially examined the victim.

In our study, the doctor specified the origin of the request of the IMC in 56% of cases.

The certificate must be delivered by hand to the person concerned, except for the minor or the adult lacking legal capacity. In these last two cases, it is the legal representative who must receive the certificate. If the doctor gives the certificate to a person not authorized to receive it, he risks the implication of his medical liability for disclosure of medical confidentiality [3].

1.3- Form rules of the IMC:

In our study, the certificates were written on the official model of the Ministry of Health, under Circular No. 2000-72 of 01/09/2000 ([1], in all the cases. In addition, 83% of the certificates were perfectly legible. For the remaining 27%, we had difficulties deciphering some words even after soliciting another reader. Moreover, 46% of the physicians used abbreviations in drafting IMC.

The use of the official model of IMC can help doctors to not miss certain necessary elements for good writing IMC especially of illegibility. Thus, an initial medical certificate must obey certain formal rules. It must be clear, precise, complete, measured and fair.

1.4- Basic rules of an IMC:

- ***Identity and professional data relating to the medical officer***

The name and the surname of the physician were mentioned on 457 certificates (90% of the cases), however, his complete identity with his grade and professional address was mentioned in only 6.7% of the cases. Complete doctor identification was found in 74% of the study carried out by M. Soumah [4] and 96% in the study carried out by Z. Elleuch [5].

It should be remembered that doctors authorized to write IMC must hold medical doctor's degrees following the provisions of decree n° 93-1440 of 23 June 1993 relating to specialization in

medicine and the legal status of residents [6], of Circular No. 1990/70 [7] and Circular No. 2000/72 of the Minister of Public Health [1]. Residents and interns who do not have a doctorate in medicine are not authorized to issue IMCs.

The signature of the physician was present in the vast majority of the certificates (97%); however, the stamp was present in only 8% of the cases. It was found in published studies [4,8] that the signature and stamp of the doctor were present in all the certificates studied. The signature of the document must be handwritten [9]. This is an ethical obligation according to Article 27 of the Code of medical deontology [2].

- ***Data concerning the victim***

The patient's name and first name were mentioned on all certificates in our study, just like the study carried out by F. Doriat [8], M. Soumah [4], and Z. Elleuch [5]. Indeed, the absence of this parameter cancels the validity of the IMC.

The patient's or legal representative's identity card number was mentioned in 79% of cases in our study and 80.7% of certificates in the study carried out by Z. Elleuch [5]. The doctor must obligatorily require an identity document from the patient. In the absence of a national identity card, the doctor must assume the identity of the patient by writing "the patient declaring him to be named ..." In fact, from a deontological point of view, the 27 articles of the Tunisian code of medical deontology provide: "all documents must contain the exact identity of the patient" [2].

From a legal point of view, and concerning the public official doctor, the 195 article of the Tunisian penal code provides: "is punished by six months to one year of imprisonment and a 120 dinars fine, the public official who will have issued a certificate to a person who is unknown to him without having taken care to have his identity certified by two witnesses. The penalty is three years imprisonment and a fine of two hundred and forty dinars if the official was aware of the assumed name "[10].

The age [or date of birth] of the patient was mentioned in 89% of the IMC in our study and the same in 87% of the study by Mr. Soumah [4]. However, neither the address nor the occupation of the victim was included in 506 certificates. The study by M.Soumah [4] found that the patient's address and profession were mentioned in 62% and 1% respectively. The lack of precision of the patient's address, as well as the profession in our study, can be explained by the fact that these parameters are not mentioned in the official ministerial model of the IMC.

1.5- Dates mentioned on the initial medical certificate

The date of the accident, the date of the initial examination, and the date of writing the CMI were mentioned in 99.6%, 94.3%, and 98.4% of cases respectively. The dating was complete (three dates together) in 429 certificates (84.8% of cases). These dates are important to specify because they constitute the proof of the trauma, allow us to date the injury, and establish the imputability of the alleged facts [4]. As for the

date of writing the IMC, it must be mentioned as disposal Article 27 of the Tunisian code of medical deontology: "documents issued by a doctor must include the date of their issue" [2].

1.6- Anamnesis data

The facts and the mechanism of the violence were reported by the victim in 71% of cases. According to M. Graser et al [11], the evaluation of a patient's bodily injury may vary depending on the circumstances in which the injury occurred. The victims, with identical functional sequelae, can be assigned a variable compensation depending on the type of accident [5,12].

The victim's complaints were included in 224 certificates [44% of cases]. M Soumah [4] found that 15% of certificates did not mention the victim's complaints. The fact of noting discrepancies between the complaints and the clinical examination testifies to the objectivity of the doctor, his seriousness, and also of his desire to remain in compliance with ethics and medical deontology.

1.7- Clinical examination data

Among the 506 certificates, the general clinical examination [blood pressure, pulse, temperature, auscultation, palpation,] was specified in only 43 certificates [8.5% of cases]. The general condition [good general condition, altered general condition, conscious and cooperative, Glasgow coma scale...] was reported in 99 certificates [19.6%]. The psychological and physical consequences are important to mention because they may indicate the mechanism of injury and more exactly the injurious object which is responsible for it.

1.8- Complementary examinations

Complementary examinations were mentioned in 42.3% of the IMC, but the result was mentioned in 39.7% of cases. 175 physicians requested a specialist opinion [34.6% of the cases]. They were absent in the study carried out by M. Soumah [4] and Z. Elleuch [5] in 83% and 53.3% of the certificates respectively. The mention of complementary examinations is mandatory because it allows us to avoid missing a lesion (Fracture, dislocation) and thus prolong the duration of the TTD. Furthermore, they must be mentioned to be part of a subsequent compensation.

1.9- Treatments

The treatments were specified in 22.7% of the certificates. The treatments were mentioned in 58.4% of the certificates. The mention of treatment is important and may influence the duration of the TTD. Indeed, Lasseuguette has shown that the duration of TTD is increased by the duration of hospitalization and by the duration of immobilization of a limb depriving the person of certain autonomy for the elementary acts of daily life [13].

1.10- Conclusion of the IMC

In our study, the causing agent was specified in only 143 of the IMCs (28.3% of cases). In the study by Soumah et al [4], the type of weapon used appeared on 244 certificates (98%). The use or attempted use of a sharp force or firearm is of

paramount importance from a legal point of view. Sometimes it proves difficult to pronounce the type of weapon, especially when the victim consults late or when there has been a surgical intervention that has modified the initial appearance of the lesions.

The doctor assigned a total temporary disability in 462 certificates (91.3% of cases). TTD wasn't mentioned in 8.7% of the cases. This can be explained by a lack of understanding of the notion of TTD in its criminal sense. Treating doctors often assess the duration of time required for stabilization of injuries, rather than evaluating the TTD which is defined as the time during which the victim is incapacitated and cannot perform the acts of everyday life [4]. Currently, there is no objective scale for evaluating the TTD available to doctors who are required to write IMC. Despite the existence of recommendations from the High Health Authority (HHA) since 2011 [14], confusion continues to reign among doctors around the concept of total temporary disability. The TTD estimation must take into account the objective lesions (seat, nature, and severity of the lesions), their functional impact, and the duration of care needed[15].

RECOMMENDATIONS

The drafting of initial medical certificates is an act of daily practice.

Our study showed that the quality of writing the IMC suffered from several shortcomings. We therefore offer some recommendations to guarantee a better quality of writing:

- ✓ Provide continuing medical education about writing IMC
- ✓ Using the official model of the Ministry of Health is helpful. Indeed, this form avoids the omission of certain necessary elements that the doctor must mention. However, the current form requires some correction. It is considered necessary to:

•Add a section devoted to the patient's complaints

•Allocate more space for writing to allow the doctor to make a good description of the lesion and to mention the specialist's opinions as well as the results of the complementary examinations carried out.

• Separate the duration of total temporary disability and the duration of work stoppage so that the patient understands that these two entities are different.

- ✓ Making an indicative scale of evaluating TTD.

CONCLUSION

According to our study, the IMC is generally poorly and insufficiently written by the doctor. This can have serious medico-legal repercussions for both the victim and the doctor. Indeed, the victim may lose his rights to compensation and the doctor may be held medical liability. Therefore, we encourage doctors to know and respect the writing rules of

the IMC, and this through continuing medical training.

Declaration of interest: none

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Cade oil poisoning in pediatrics: about 12 cases

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Abstract

Traditional therapy is a practice that is attracting more and more people, thus reinforcing the crisis of confidence between patient and treatment.

In this context, we propose to study the Tunisian recourse to the use of a type of tar "cade oil" advised sometimes by charlatans by habits and beliefs.

The diagnoses retained in these patients in association with tar poisoning were acute dehydration and febrile gastroenteritis. No specific treatment or antidote for tar was administered. The evolution was favorable for ten patients and fatal for two children.

The use of cade oil is currently rapidly growing. Its irrational use leads to serious, even fatal adverse events as noted in the literature and observed in our study. Preventive measures are required, including awareness-raising action: information and communication, Scientific action

Health action Regulatory action Legal action

Keywords: Cade oil; Poisoning; Epidemiology; Emergency; Outcomes.

INTRODUCTION

One of the changes observed in recent decades in medical practice in Tunisia is the emergence of conduct not justified by science dictated sometimes by charlatans, sometimes by habits rooted in certain ethnic groups.

Grouped in the box of traditional therapy according to its members, and quackery according to science, these practices are attracting more and more people who prefer it to conventional treatments based on chemicals, thus reinforcing the crisis of confidence between patient and medical treatment which continues to grow (1).

Traditional therapy, as a solution to physical, mental or social health problems, is deepening more and more in Tunisian culture.

The danger is that these practices are shared between ancestral knowledge of medicinal herbs and quackery using methods and preparations to have potions and potentially toxic products.

One of the practices more and more observed in Tunisia is that of parental use of "cade oil" commonly called "camel soaps" "tars" or "القطران" to treat their children

It is not uncommon to receive patients who are victims of these practices in hospital. It is in this

the context that we propose to study is the Tunisian recourse to the use of a type of tar "cade oil" advised sometimes by charlatans by inherited habits and beliefs. We report the observations of patients suffering from tar poisoning, collected in the pediatrics, emergency, and pediatric resuscitation departments of the CHU Hédi-Chaker Hospital in Sfax during the period from January 2011 to December 2018. It is a retrospective study and the data was collected and analyzed from the hospitalization records of the patients.

CASES' PRESENTATIONS

Over a 7-year study period, 12 cases were collected at a frequency of 1 to 2 cases each year. The average age was 14 months 20 days with a minimum age of one month and a maximum of 4 years. The distribution of patients by sex was 9 boys and 3 girls, a sex ratio of 3. Three children were of urban origin, or ¼. The remaining 9 patients were from rural areas of Sfax governorate in 5 cases. The socio-economic level was average for all patients.

Two modes of administration have been observed: Inhalation and the transcutaneous route. These two modes in combination were observed in 4 children. Scarification followed by cutaneous application of tar was present in only one case. According to the parents, they used tar to regulate transit and for antipyretic purposes for all of the patients. An analgesic goal has been reported in only one patient. The treatment time was on average 22:43 minutes with extremes of 4 hours to 3 days. Six patients consulted the emergency room within 24 hours.

A chart of gastroenteritis including diarrhea, vomiting, and fever was the reason for consultation in the most frequent emergency room (6 patients).

Neurological manifestations were present in 9 patients (such as

drowsiness, nystagmus, axial hypotonia, asthenia, and listlessness).

Signs of dehydration (tachycardia, dry mucous membranes, depressed fontanelles, skin fold) were present in 7 patients.

Signs of impaired respiratory mechanics (snoring groans, crackling signs of respiratory struggles) have been described in 5 patients.

The tar was applied in several places for the same patient. The parents applied tar to the ear lobule, all around the nostrils, the forehead, the chest, and all 4 limbs. Scarification lesions in the trunk and the 4 limbs have been described in one patient.

For biological abnormalities, biological inflammatory syndrome (in 7 patients), as well as metabolic acidosis (in 5 patients), were noted. Amino acid chromatography (CAA) was done for a single patient and was normal.

The chest X-ray was done in all the patients and was normal in 10 patients.

Only one patient presented with a pulmonary focus and another presented with bronchial syndrome. The brain scan was performed on 3 patients.

A medium abundance subarachnoid hemorrhage was observed in one patient.

In another patient, a hypo-dense appearance of the caudate nuclei and the lenticular nuclei was noted and for the third patient, the CT scan was normal. Brain MRI was done for a single patient, showing the presence of Lactates in spectrometry with an appearance suggestive of a toxic or metabolic origin.
The diagnoses retained by these patients in association with tar poisoning are detailed in Table 1.

Table 1: Diagnosed syndromes

diagnoses retained	Number of patients
Acute dehydration stage 1	**2** patients
Acute dehydration stage 2	**2** patients
Acute dehydration stage 3	**2** patients
Febrile gastroenteritis	**4** patients
Asthma attack	**1** patient
Febrile gastroenteritis+ altered state of consciousness	**1** patient

All patients received intravenous hydration. Antibiotic therapy was given to 4 patients due to the presence of an infectious focus and a biological inflammatory syndrome. No specific treatment or antidote for tar was administered. The evolution was favorable for 10 patients who were put out. Two patients had an enameled course of complications such as hemodynamic instability and a state of epilepticus and died.

DISCUSSION

Tar is defined by its method of preparation. They are obtained from fuels brought to high temperatures. Hence there are several types of fuel such as plants (pine, cedar, cade, ...), coal, or shale.

The tars are divided into 3 groups:

• wood tars (pine tar, cedar oil, cade oil, etc.).

• fossiliferous tars (coal tar).

• sedimentary tars (shale combustion for example ...)

When combustion takes place at high temperatures, several gases are produced with a dark, insoluble liquid that overcomes water. This is what is known as tar, it has a brown color, a high density, and a strong aromatic odor (2). The stars differ from each other by their compositions, their methods of production, and their degree of purity [2]. In our study, we are going to focus on cade tar, the essential and main composition of which is cade oils with other compositions that are being researched. This

product is widely used by parents in pediatric settings as part of traditional medicine.

Figure 1: Commercialized Cade

This type of tar is produced locally by herbalists and sold in several commercial spaces, especially in downtown Sfax (Sfax medina, rue SIDI BELHSAN).

Cade oil, which is the basis of the composition of cade tar, is a viscous liquid extracted from the wood of the juniper oxycèdre "Juniperus oxycedrus". (Figure 2)

It is a liquid rich in aromatic molecules, dark brown in color [3,4] (Table 2).

Table 2: Physical characteristics [3-4]

Features	Specifications
Appearance	Oily Liquid
Color	Dark brown
smell	Smoke
Boiling point	184 ° C at 760 mmHg
Solubility in water	Very slightly soluble
Solubility in ethanol	Partially soluble

Our cade tar, which we are going to talk about, is blackish in color and has an intense smell.

Its clientele appears to be very diverse and includes all levels of the population, whether rural or urban. Consumers are found especially in traditional and conservative cultural circles, loyal to folk medicine, and all those who cannot access modern care which agrees with our series, 3/4 of the patients were of rural origin

Figure 2: Juniperus oxycedrus branch [1]

The chemical composition of cade oil is a bit complex. Indeed, it is a complex resin, having in its composition several substances. This complexity is partly due to its composition and partly to its extraction protocol [5].

It is a product of heterogeneous composition. Its formula is variable, depending on the raw materials, regions, climates, and extraction processes.

The characteristic constituents are cadinene (which is a hydrocarbon) and cadinol (which is an alcohol).

Cade oil also contains:

- cyclic and polycyclic hydrocarbons: benzene, toluene, naphthalene, methyl-naphthalenes, and phenanthrene.

- phenols including guaiacol, cresol, and resorcinol [4].

From these components follow the clinical features and the objectives of the use of this type of tar. Cade oil was widely used in human medicine.

Cade tar is considered an external remedy, it has several therapeutic actions:

- it has long been used to treat scabies in sheep and goats. [4-6]

- in cosmetology, cade tar is used in shampoo for dandruff care, scaly conditions, itchy scalp, and milk crusts [4]

- it is also considered as a treatment applied against psoriasis. [7]

- in veterinary medicine, until the 19th century, cade tar was used as a treatment against ringworms and eczema of animals. It has also been used to heal cracks in horses' hooves. [6-8]

- currently, it is used in the treatment of parasitic infections, by application every 48 hours in sick areas. Cade tar, especially thanks to its major constituent, cade oil, acts quickly and effectively in the treatment of rebellious dermatoses and various scaly conditions. It seems to affect ulcers and torpid lesions ["static" lesions] by applying a light film of oil. [8-9-10]. the association of cade oil with olive oil [0.25 to 0.5 g of cade oil in a spoon of olive oil] could be effective as an anthelmintic against intestinal worms. Diluted cade oil would cure chronic rhinitis and coryzas. [10]

- this oil would also have a repellent effect against various insects, which would be beneficial to humans since there are several diseases transmitted via them. This action could in particular be taken advantage of in the pricking of hens as well as in the treatment of plants to protect them against various animal aggressions. [8]

In various ancient beliefs and traditions, it was believed that cade oil could help ward off illnesses, depressing emotions, negative thoughts, and also harmful spirits [13].

Grandmothers were very familiar with cade oil [13]. In our study, for example, grandmothers were prescribers of cade oil in 5 of the 12 cases collected.

Cade tar toxicity: The toxicity of any composition is first determined by the relative toxicities of its various constituents. But interactions, either of synergy or antagonism should not be overlooked [11]

Cade oil has in its composition various classes of substances with proven toxicity [9-11] (Table 3). The Phenols and sesquiterpene alcohol toxicity which is an important component of cade oil has different toxic effects such as [9-11]: irritating the mucous membranes and respiratory tract; has a lethal dose from 0.043g / kg. toxic to all cells; corrosive to the skin and mucous membranes; renal involvement and necrosis of the liver; eye irritation; hemorrhage of the pleura and pericardium; splenomegaly; methemoglobinemia. In our series, the observed neurological signs are apathy, asthenia, and clouding.

Table 3: Cade oil toxicity [9-11]

Hydrocarbons	Toxic effect
Cadinene	- hepatocellular necrosis. - dilation of the bile ducts. - disruption of liver enzymes.
Benzene	carcinogenic and very toxic aromatic hydrocarbon. -causes respiratory disorders. -paralysis. -anemia
Toluene	toxic of the central nervous system. - chronic exposure causes neurological disorders, mental confusion, memory loss, and headaches. - responsible for hematological damage
Naphthalene	lesions of the respiratory system. - formation of tumors of the upper respiratory tract.

One patient had epilepsy and one had a change in consciousness in another.

These neurological signs were caused according to the above tables by the various components of cade oil such as hydrocarbons.

The respiratory signs and hemodynamic signs found have been linked to causative diseases. However, these deductions are always limited, since the blood tests for these materials were not carried out on the one hand, on the other hand,

the symptoms can be correlated with the initial disease.

In this context, we can report from the literature two cases of poisoning with Cade oil: - a 40-day-old newborn who was treated by skin application with Cade oil, for seborrheic dermatitis, manifested an hour and a half later, a convulsion accompanied by a hypotonic coma and dyspnea. [12]; - a 30-year-old woman who, after having drunk half a glass of cade oil, to treat headache, had epi gastralgia associated with headache, low blood pressure, and respiratory distress. [12]

this intoxication is so unknown that no cases of such poisoning have been found in the literature.

Cade tar is known, above all, for dermatological conditions. For this, the most recognized and recommended mode of administration by herbalists is the skin mode.

Indeed, the application of cade oil on the skin has no immediate effect, even at a high concentration, only heat is felt at the time of application.

But it has a particular way of acting, these properties do not appear at the time of application. After a certain time after application, the penetration of the active ingredient into the seed coat becomes possible [7].

In our series, dermal application was the most frequent mode of administration, associated with inhalation by application of cade tar all around the nostrils. As the response time was relatively short and the contact surface area was limited, the clinical signs associated with tar poisoning were absent.

On the other hand, only one case had a wide cutaneous application including the trunk and the 4 limbs on lesions of scarification, with a rather prolonged time of assumption of responsibility (24 hours). The clinical picture was severely severe with a fatal outcome. We can deduct from these observations that several factors determine the severity of the clinical picture, we cite above all: the extent of the application, the presence or absence of scarifications, and the treatment time.

CONCLUSION

The application of cade tar was formerly rarely seen but it is still encountered especially in rural areas, where old beliefs and quackery dominate. From these observations, we were able to extract some epidemiological, clinical, and progressive characteristics of tar poisoning which were in most cases of favorable evolution but sometimes the evolution was fatal. From this work, we can pay attention to the education of parents and the awareness of practices whose results we do not know. Parents should be made aware of the dangers involved by using products and applications of which the components are unknown, or the components are being researched. These means of education must be present in district hospitals, educational establishments, and the media, which must play an important role in raising awareness of these habits to prevent health risks or even human catastrophes.

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Kahler's disease revealed by acute pancreatitis: A case report

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Abstract

Background: The circumstances of the discovery of Kahler's disease are multiple but acute pancreatitis has rarely been described as a pathology revealing this disease. **Case report:** We report the case of a patient who presented with acute pancreatitis, revealing Kahler's disease. **Conclusion:** Kahler's disease is rarely manifested as acute pancreatitis, hence the importance of complementary examinations in this case, especially when no one of its common etiological factors is found and when other nonspecific signs are present.

Key words: Acute Pancreatitis; Kahler's Disease; Hypercalcemia

INTRODUCTION

Kahler's disease or multiple myeloma is a malignant medullary proliferation of plasma cells secreting a monoclonal immunoglobulin. This is the second most common hematological disorder (10%) after non-Hodgkin's lymphoma.

The circumstances of the discovery of Kahler's disease are multiple. Rheumatologic manifestations are the most frequent due to tumor infiltration of bone tissue. Nevertheless, pancreatitis has rarely been described as a pathology revealing this disease.

We report the case of a patient who presented with acute pancreatitis, revealing Kahler's disease.

CASE REPORT

A 58-year-old patient without a past medical history was admitted at the emergency department for an altered conscious state which appeared a week previously and which was accompanied by cough and vomiting. At the examination, the respiratory rate was 24 cpm, and the peripheral oxygen saturation at the ambient air was 88%. The pulmonary auscultation objective crackles on the right pulmonary base. The blood pressure was 100/60 mmHg, the heart rate was 100 bpm. The Glasgow scale was 14 with agitation. The abdomen examination revealed a tender but soft abdomen in all areas. The capillary blood glucose was amounted to 1.19 g/L. The patient was febrile with a temperature amounted to 38.2°C. The chest X-ray showed a right basal alveolar syndrome (Figure 1).

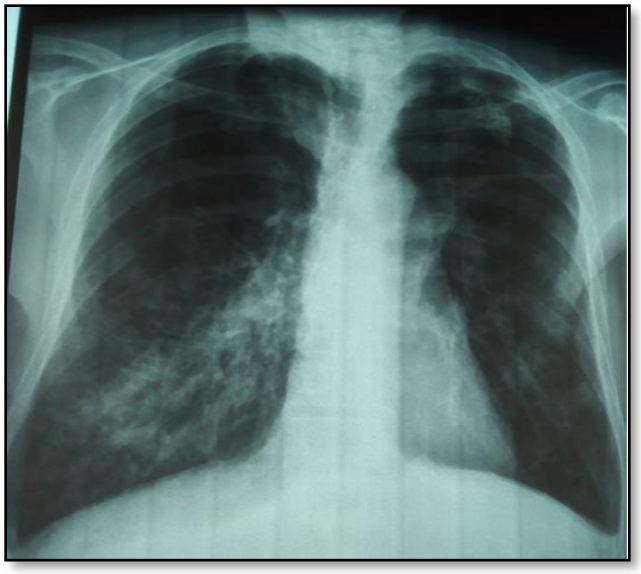

Figure 1: The chest X-ray showing the right basal pneumonia

The cerebral CT scan showed a heterogeneous aspect of the bone structure with no other abnormalities. The Blood tests showed: Leucocytes=16930/mm3, Hb=8.1 g/dL, Platelets=389000/mm3, Creatinine=658 µmol/L, Direct Bilirubin=7.9 umol/L, AST=61 UI/L, ALT=27 UI/L, Lipase level >1200 UI/L.

The abdominal ultrasound examination showed a hyperechogenic appearance of the renal cortex. The diagnosis of pulmonary sepsis associated with acute pancreatitis has been made and adequate treatment was performed. Twenty-four hours later, the patient had a persistent altered conscious state and renal function. A second cerebral CT scan was then achieved and showed the presence of limited gaps of non-specific appearance in the bone structure of the head. The serum calcium concentration was then measured and its level was 4.07 mmol/L.

The diagnosis of acute pancreatitis due to hypercalcemia was then established. A crane radio was performed. It showed multiple geodes combined with demineralization suggestive of Kahler's disease (Figure 2).

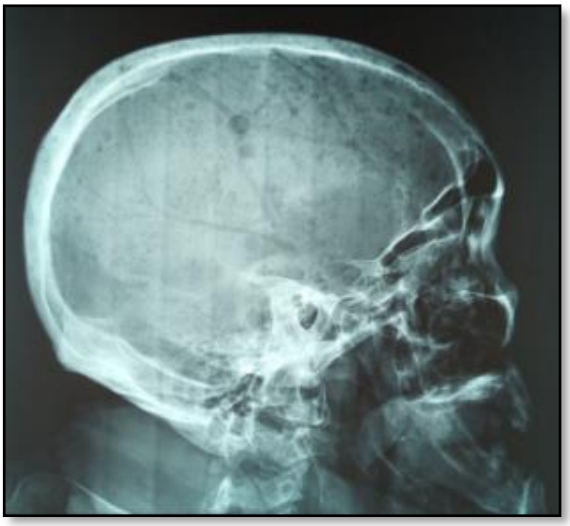

Figure 2: The crane radio showing the holes consecutive to bone destruction

The medical team decided to expand the patient's water intake to 6L/24h and to administer corticoids and diuretics.

The consciousness state of the patient has normalized in parallel with the calcium blood level normalization. The patient was then addressed to the hematology consultation for further explorations to confirm the diagnosis

Thereafter, a serum protein electrophoresis was performed and revealed a marked gamma globulin spike (Figure 3).

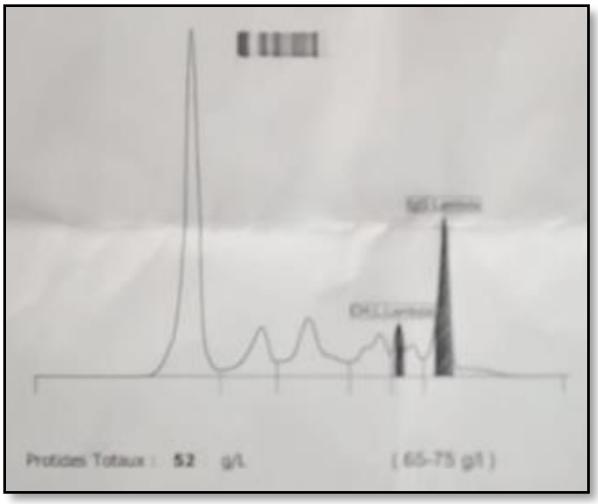

Figure 3: The serum protein electrophoresis revealing a marked gamma globulin spike

Immunofixation of serum proteins was also achieved showing a peak of Lambda light chains associated with an IgG Lambda monoclonal peak.

The immunofixation of urinary proteins revealed proteinuria with the presence of a peak of Lambda light chains.

The patient was hospitalized in the hematology department and he had a good outcome.

DISCUSSION

The common etiological factors of acute pancreatitis are alcohol, gallstone disease, drugs, trauma, viral infection, and hyperlipidemia, but those etiologies are not always identified, and acute pancreatitis is often classified as idiopathic.

Thus, hypercalcemia must be systematically sought in the presence of acute pancreatitis, when there is no obvious cause.

The presentation of multiple myeloma as acute pancreatitis is rarely reported in the literature [1-2].

Multiple myeloma is a complex disorder that causes a multitude of clinical symptoms and signs mediated through a variety of mechanisms.

It is a cancer of the plasma cells in which abnormal plasma cells multiply uncontrollably in the bone marrow, and sometimes in other parts of the body.

It usually evolves from an asymptomatic premalignant stage of clonal plasma cell proliferation termed “monoclonal gammopathy of undetermined significance” (MGUS) [3].

MGUS is present in more than 3% of the population above the age of 50 years and progresses to myeloma or related malignancy at a rate of 1% per year.

The cause of multiple myeloma is unknown. However, there are no known risk factors for multiple myeloma. Researchers suggest that genetic abnormalities, such as c-Myc genes or environmental exposures, may play a role.

The most frequent symptoms of multiple myeloma are bone pains and weakness [3]. Its manifestations are summarized by the "CRAB symptoms": hypercalcemia, Renal failure, Anemia, and Bone lesions. Hypercalcemia is related to osteolysis phenomena [4].

Increased infection susceptibility is also one of the features of this disease [5].

The multiple myeloma is diagnosed with serum or urine protein electrophoresis or immunofixation and bone marrow aspirate analysis.

Skeletal radiographs are important in staging multiple myeloma and revealing lytic lesions, vertebral compression fractures, and osteoporosis.

Magnetic resonance imaging and positron emission tomography or computed tomography were emerging as useful tools in the evaluation of patients with myeloma [6].

Multiple myeloma is considered treatable, but generally incurable. Remissions may be brought about with steroids, chemotherapy, targeted therapy, and transplants. Bisphosphonates and radiation therapy are sometimes used to reduce pain from bone lesions [6-7].

Five-year survival rates approach 33 percent, and the median survival rate is 33 months [6].

In the case of our patient, the diagnosis of Kahler's disease was suspected based on biological and radiologic findings. Once the diagnosis was made, we were able to link each of the unexplained patient's disorders to one of the mechanisms of this disease, such as his confusion, his pneumonia, his renal failure, his anemia, and especially his acute pancreatitis. Hence the originality of our case where the initial clinical presentation of Kahler's disease was atypical and included all of the signs which was rarely described in the literature.

CONCLUSION

Patients with Kahler's disease have hypercalcemia, but it's rarely manifested as acute pancreatitis. Hence the importance of complementary examinations in case of acute pancreatitis, especially when no one of its common etiological factors is found and when other nonspecific signs are present.

This case shows the role of the emergency physician in the early recognition and management of malignant hypercalcemia signs. Its etiologies are multiple; Khaler's disease is one of them.

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A total volvulus of the small intestine on malrotation in adults: A case report.

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Abstract

Background: Total small-intestinal volvulus on malrotation (TSIVM) classically presents in the neonatal period; it occurs much less frequently in adult age.
We report a case of a total volvulus of the small intestine on malrotation in adult diagnosed in the emergency department.
Conclusions: Adult congenital midgut volvulus is often manifested with symptoms related to intestinal obstruction. Surgery should be conducted in an early stage, including intestine volvulus reduction, The outcomes of these surgical procedures are favorable.

Keywords: Intestine Volvulus; Diagnosis; Adults; Outcomes; Emergency

INTRODUCTION

Total small-intestinal volvulus on malrotation (TSIVM) classically presents in the neonatal period; it occurs much less frequently in adult age and is often misdiagnosed. Its prognosis is directly related to the risk of ischemia [1]. It is estimated that the prevalence of these congenital malformations in adulthood is in the range of 0.2% and 0.5% [2]. The diagnostic circumstances of this pathology may be an acute bowel obstruction syndrome or a circulatory shock [1]. We report a case of a total volvulus of the small intestine on malrotation in an adult diagnosed in the emergency department of the University Hospital Center Farhat Hached Sousse.

CASE PRESENTATION

A 38-year-old woman presented with acute abdominal pain and an occlusive syndrome evolving 24 hours before admission in the context of apyrexia and an altered general state. Physical examination on admission revealed abdominal bloating and signs of circulatory shock: blood pressure=80/40mmHg, heart rate = 140 beats per minute, hypothermia at 36°C, and a Glasgow Coma Scale at 14. Routine laboratory analysis revealed elevated

inflammatory markers. The patient required admission to a resuscitation unit (monitoring, oxygen therapy, central venous catheter, gastric and urinary catheter). The patient was oligoanuric and required fast vascular filling (physiological serum at 20ml/kg) and inotropic medication (Noradrenalin 3mg/h on the electric syringe pump). The patient was stabilized and an abdominal computerized scan with contrast was performed and showed a whirl sign on the first jejuna loop (Figure 1).

Figure 1. CT showing the ''whirl'' sign.

The diagnosis of occlusion on incomplete mesentery was confirmed and the patient was admitted urgently to the operating room under antibiotic coverage based on Ceftriaxone and Metronidazole. Surgical exploration found signs of suffering in all the transverse small intestines. The patient underwent a total resection of the small intestine with jejuno-colic anastomosis. She developed a short bowel syndrome and required parenteral nutrition.

DISCUSSION

Intestinal malrotation results from failure of normal rotation and mesenteric fixation of the gut during embryonic development. A lack of normal peritoneal attachment or a narrow mesenteric base can create abnormal mobility of the midgut, easily leading possibly to volvulus The incidence rate of malrotation is highly variable depending on whether the data are clinical or from autopsies, but it is estimated that it represents the cause of about 3-5% of cases of mechanical obstructions and 5% of cases of appendicitis and appears in 0.5% of radiological digestive series [2]. Studies on the incidence of malrotation in mixed populations show the influence of ethnic factors, radioactive or toxic substances, and low birth weight, but not of sex or number of siblings [2]. The incidence of TSIVM is 0.5-1 per 10000 births [3]. TSIVM occurs during the first month of life in 80% of cases [4]. In older children, malrotation is much less commonly diagnosed and is complicated with total small intestine volvulus in only a third of cases [5]. In adults, TSIVM is very rare but the increased recognition of intestinal malrotation in adults may be explained by the more frequent use of abdominal CT-scan and the refinements of the methods that visualize more correctly the variations in the abdominal anatomy [6-8]. Intestine malrotation in adults has multiple presentations and the symptoms are non-specific. The clinical diagnosis in adolescents and adults is difficult because it is rarely suspected on clinical grounds [7]. The clinical

symptoms of malrotation are less specific in adults than in children [1,7]. Thus, in infants under one year, total small intestine volvulus is the most common clinical manifestation, with a clinical presentation of proximal obstruction dominated by early bilious vomiting. However, in adults, TSIVM is less often associated with complications, and more commonly presents with isolated recurrent abdominal pain or combined with other signs such as frequent diarrhea, abdominal bloating, early satiety, food intolerance, upper or lower gastrointestinal bleeding, constipation, etc. [9]. Some patients may even carry diagnostic labels of functional or psychosomatic pain [10, 11]. Patients may have been treated elsewhere for other misdiagnoses such as tuberculous peritonitis, acute pancreatitis, or severe gastro-oesophageal reflux [12]. The majority of adults with congenital intestinal malrotation and volvulus have acute abdominal symptoms and even intestinal strangulation and necrosis [11]. Imaging examinations such as CT and color ultrasonography play an important role in the diagnosis of adult congenital intestinal malrotation. Small bowel follow-through is often enough to recognize the type of malrotation, but multimodal imaging offers a better definition of this abnormality. For some conditions, such as this, in which the transverse colon has a posterior location behind the superior mesenteric artery, CT can help to define the type of malrotation by adding additional anatomical information [13]. The main specific sign for TSIVM on CT is the ‘‘whirl-wind’’ sign, corresponding to the winding of the superior mesenteric vein around the superior mesenteric artery [14]. Many authors advocate surgical correction of malrotation due to the difficulty in predicting who will be a victim of torsion of the intestine, bringing an urgent, life-threatening condition in the future. So, in the case of TSIVM, surgery is indicated in extreme urgency [6, 15]. the need for an emergency operation because of the possibility that there may be massive necrosis of the intestine. The success of surgical treatment lies in judging the rotation form and degree and the correct knowledge of rotation form is the premise of successful lysis and reduction. Another critical aspect is the complete lysis of the Ladd’s band, which removes the membranaceous adhesion of peritoneal bands and upper jejunum pressing the duodenum. All surgical procedures should be carefully performed. During lysis, the superior mesenteric vein and artery should be paid special attention to prevent any damage. In some patients, rotation leads to compression and deformation of the superior mesentery vein, which is often erroneously identified as adhered bands. The vein damage induces the intestine resection will result in short bowel syndrome. The appendix is also resected during surgery to avoid delayed diagnosis due to positional variation of the cecum [11]. The majority of adult congenital intestine volvulus has a good prognosis. Only those with extensive bowel necrosis have to receive surgical resection [11].

CONCLUSION

Adult congenital midgut volvulus is often manifested with symptoms related to intestinal obstruction. To Some patients it's complicated in malnutrition and intestinal necrosis; if required, surgery should be conducted in an early stage, including intestine volvulus reduction, Ladd's band loosening, and appendectomy. The outcomes of these surgical procedures are favorable. Color ultrasonography and CT scans are helpful for preoperative diagnosis and positional crossing and whirlpool volvulus of the superior mesenteric vein and artery are the characteristic manifestations of congenital mid-gut malrotation. A surgeon's ignorance of this diagnosis can result in potentially fatal extensive small intestinal necrosis or result in short bowel syndrome.

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Neurologic Manifestations of Infective Endocarditis.

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Abstract

Infective endocarditis (IE) is a life-threatening condition often manifesting as a multisystem disease. The clinical presentations are heterogeneous making the diagnosis sometimes difficult. We report the case of a 59-year -old presented to the emergency department with acute abdominal pain. In this context, endocarditis was suspected. Transesophageal echocardiography (TOE) was realized confirming the diagnosis and the abdominal pain was explained by to mesenteric ischemia.

Neurologic manifestations of IE mainly occur before antibiotic treatment is began, thus reinforcing our belief that rapid diagnosis and initiation of antibiotic therapy may still be the most effective way to prevent neurologic complications.

Keywords: Infective endocarditis; Diagnosis; Neurologic Manifestations; Emergency

INTRODUCTION

Infective endocarditis (IE) is an infection of the endocardial surface of the heart which may include one or more heart valves, the mural endocardium, or a septal defect. Its intracardiac effects include severe valvular insufficiency, which may lead to intractable. congestive heart failure and myocardial abscesses. It is a life-threatening condition often manifesting as a multisystem disease. Diagnosis is often challenging due to its heterogeneous features and is often delayed due to the non-specific nature of its presentations.

CASE PRESENTATION

A 59-year-old man from a nursing home presented to the emergency department with acute abdominal pain over the past few hours. The patient described his pain as severe, without exacerbating or relieving factors, and associated with one episode of non-bloody, non-bilious vomiting. He has no past medical history. He was a lifelong nonsmoker, and non-alcoholic. On physical examination; slight dyspnea, pulsed oxygen saturation was 99%, the hemodynamic state was correct, conscious patient, pinpoint pupils, and the temperature was 39, and diffuse abdominal pain, especially in the epigastric area. However, these physical findings did not correlate with his abdominal pain which he described as severe. Thus, he received a morphine injection. Initial laboratory tests showed a white blood cell count of 12700, no liver or pancreatic dysfunction, hypokalemia at 3,4, and no further metabolic dysfunction. Urine analysis showed 230 leukocytes per µL with negative culture. Peritonitis was suspected. An abdominal computed tomography (CT) with contrast ruled out this diagnosis. Meanwhile, the patient's clinical condition deteriorated; his state of consciousness was altered with a Glasgow Coma scale at 12 without focal neurologic deficits or clinical meningeal syndrome. We performed a non-contrast cerebral CT scan that showed no stroke or recent trauma. Blood testing for drugs was negative. A lumber puncture was realized; leukocytes <1, no hyperproteinorrachy, and a normal glucose ration. A cerebral MRI was performed, it was also negative, excluding maxillary sinusitis (Figure 1).

Figure 1: First cerebral MRI, with no obvious abnormalities

Three days after; the state of consciousness has deteriorated; a cerebral computed tomography (CT) with contrast showed no specific lesions. The second cerebral MRI confirmed the presence of rhombencephalitis with bi-thalamic involvement. We suspected infective encephalitis and realized a Second lumber punction which was negative. PCR herpes, Serology for HIV, hepatitis B virus, hepatitis C virus, enterovirus, West Nile virus, and listeria were negative. Drug-induced encephalitis was suspected; the toxicological blood test was negative. A third cerebral MRI showed multiple vascular ischemic strokes (Figure 2).

In this context, echo-doppler of the supra-aortic vessels was realized for suspicion of thrombosis and was normal. An endocarditis was suspected transthoracic echocardiography TTE performed the same day didn't objectify vegetations or valvulopathy neither left auricular/ventricular thrombus and no dilatation of left auricular. That's why transoesophageal echocardiography (TOE)was realized showing interauricules septum aneurysm of 14 mm and mitral valve leak

that could explain the origin of the stroke, abdominal pain due probably to mesenteric ischemia.

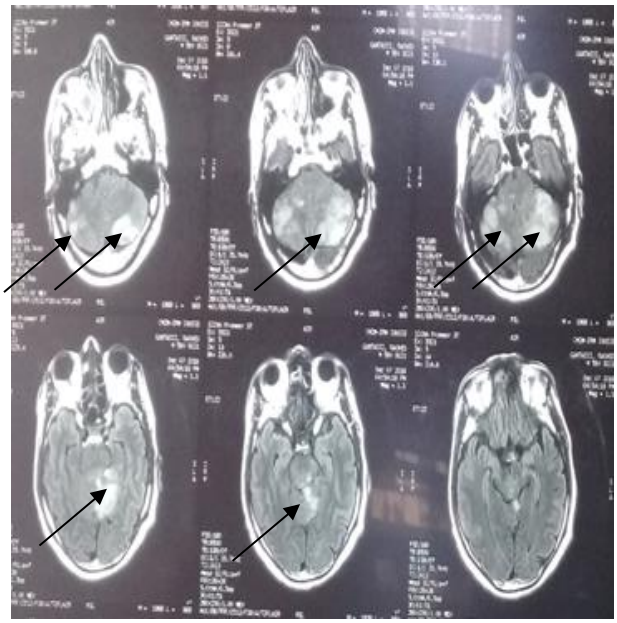

Figure 2: Cerebral MRI showing multiple vascular ischemic stroke (↓)

The clinical diagnostic threshold for possible infective endocarditis was reached using the modified Duke criteria with three minor criteria; fever at 39; metastatic embolization (cerebral and abdominal infarcts) and positive echocardiography. Treatment was initiated with empiric antibiotic therapy for septic urines, aciclovir for suspicion of encephalitis; and secondarily curative treatment.

DISCUSSION

Infective endocarditis (IE) is a rare disease, but its impact is significant [1]. It affects 3 to 10 per 100,000 per year in the population at large, and epidemiological studies suggest that the incidence is rising [2–3]. Reaching a rapid and accurate diagnosis in cases of suspected IE is the challenge. Delayed diagnosis and initiation of therapy lead to complications and worse clinical outcomes [4–5].IE can present acutely or insidiously with non-specific systemic symptoms and/or variable organ pathologies due to complications of septic embolism, hematogenous seeding, immunological phenomena, and, rarely, vasculitis, in addition to its cardiac manifestations. Clinical diagnosis is based on the Modified Duke's criteria: two positive blood cultures for a microorganism typical of IE (or two positive cultures drawn 12 h apart for other microorganisms consistent with IE or a single blood culture or serology consistent with Coxiella burnetti infection), together with evidence of endocardial involvement (2 major criteria). Alternatively, various minor criteria, of which 5, or 3 with 1 of the 2 major criteria, are considered diagnostic [6]. There are a few concerns about the reliability of Duke's criteria. Failing to realize a blood culture due to initial lack of suspicion of Infectious Endocarditis, while giving empiric antibiotic therapy, may result in subsequent negative cultures after an organism has been isolated. In the case that we report here, the initial presentation of acute abdominal pain in the context of fever with good hemodynamic respiratory and neurological state did not raise the suspicion of endocarditis in the first instance. Echocardiography remains the cornerstone of imaging and is rapid, straightforward, and, in many cases, diagnostic (9). Transthoracic echocardiography (TTE) is the recommended

initial modality of choice for both native valve infective endocarditis (NVE) and PVE [10]. For suspected NVE, TTE has a sensitivity of 50% to 90% and a specificity of 90%. For suspected PVE, the sensitivity of TTE is lower, at 40% to 70%, and it provides value in the assessment of ventricular size and function, hemodynamic severity of valve lesions, and in the diagnosis of anterior prosthetic aortic valve abscesses, which may be difficult to visualize on transesophageal echocardiography (TOE). TEE is indicated when TTE is positive or nondiagnostic, when complications are suspected, or when intracardiac devices are present. For suspected NVE, TEE has a sensitivity of 90% to 100% and a specificity of 90% for the detection of vegetations, and it is superior to TTE for the detection of complications, such as perforations, abscesses, and fistulae (11, 12, 13). In PVE, a recent meta-analysis reported a sensitivity of only 86% (95% confidence interval [CI]: 77% to 92%) for TEE in making the diagnosis, and other imaging modalities are emerging to help make or exclude the diagnosis in cases TEE is non-diagnostic. Even when abnormalities are detected, it can be difficult to differentiate nodules from small vegetations or distinguish signs of infection from post-operative change (1). The neurologic complications were classified into the following categories: (1) embolic brain infarction, (2) TIA, (3) cerebral hemorrhage, (4) meningitis, (5) brain abscess, (6) toxic encephalopathy, and (7) headache. Neurological complications occur in 20–40% of cases and are the presenting features in approximately half of these patients with an embolic event as the most frequent manifestation 42% [2,6,14]. The risk of stroke is highest at diagnosis and decreases rapidly after the initiation of antibiotic therapy. Although not explicitly recommended in the European Society of Cardiology's previous guidelines which only stated that "systematic abdominal and cerebral CT scan may be helpful",[7] CT scans or MRI are common and now recommended diagnostic procedures in patients with IE, even in the absence of neurological symptoms. In the 2008 French survey on IE, [8] 70% of the patients with left-sided IE had neuroimaging procedures, of whom 65% had t in the absence of any neurological symptom. These systematic imaging procedures aim to assess the existence of asymptomatic complications of IE, which may both support the diagnosis and modify the therapeutic strategy. The visualization of large vegetation often leads practitioners to perform such examinations. Morphine sulfate intoxication may be responsible for leuko encephalopathy which results in hyper-intense T2 signals in the white matter of the semiovascular center, corpus callosum, and cerebellum. Otherwise, in our patient, the lesions are bithalamic and in the cerebellar peduncles.

CONCLUSION

In conclusion, neurologic manifestations of IE mainly occur before antibiotic treatment is begun, thus reinforcing our belief that rapid diagnosis and initiation of antibiotic therapy may still be the

most effective way to prevent neurologic complications. These data relate the importance of diagnostic alertness to the prognosis of patients with IE.

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Aneurysmal subarachnoid hemorrhage with electrocardiographic abnormalities: A case report

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Abstract

Background: The interaction between cardiovascular system and cerebral damage in patients with subarachnoid hemorrhage (SAH) have been described frequently. Electrocardiographic (ECG) alterations occurring during the course of SAH have been previously reported.

Case report: we report a case of woman who had electrocardiographic abnormalities. Computer tomography (CT) angiography revealed subarachnoid hemorrhage (SAH) with cerebral artery aneurysm. ST-elevation regressed later after intubation.

Conclusion: This case illustrates the importance of neurological injury as one of the differential diagnoses while managing ECG changes in cardiovascular disease.

Key-words: *Aneurysm, Electrocardiography, Subarachnoid hemorrhage*

INTRODUCTION

Subarachnoid hemorrhage (SAH) is a relatively rare pathology, it mainly affects healthy young adults. More than 50% of patients hospitalized for SAH are under 50 years old and are mostly women (about 60%). SAH is responsible for a mortality rate of around 50%, of which 10% before arrival at the hospital and 25% in the first 24 hours. Among the survivors, 60% have more or less disabling sequelae [1, 2].

SAH neurological complications are, there,

rebleeding, vasospasm and delayed cerebral ischemia, hydrocephalus, increased intracranial pressure and seizures. However, there are non-neurological complications that can worsen the prognosis for these patients. These extra neurological complications are mainly, respiratory, metabolic and cardiovascular such as electrocardiographic changes, left ventricular dysfunction, and troponin elevations mimicking myocardial ischemia can also occur [3].

CASE PRESENTATION

A 58-year-old woman was referred by the emergency medical service team to the emergency department for a witnessed loss of consciousness on the beach. The patient was with a medical history of controlled hypertension. No illicit or recreational drug use was known. When we arrived at the scene, a physical examination revealed a reduced level of consciousness (Glasgow Coma Scale 7/15) and, high blood pressure of 220/100. Heart sounds were regular with no murmurs and the lungs were clear to auscultation bilaterally. pupils were dilated with minimal pupillary response. The electrocardiogram (ECG) showed normal sinus rhythm, with a heart rate of 140 bpm and extended ST-elevation in the anterior territory with systematized ventricular bigeminy (Figure 1).

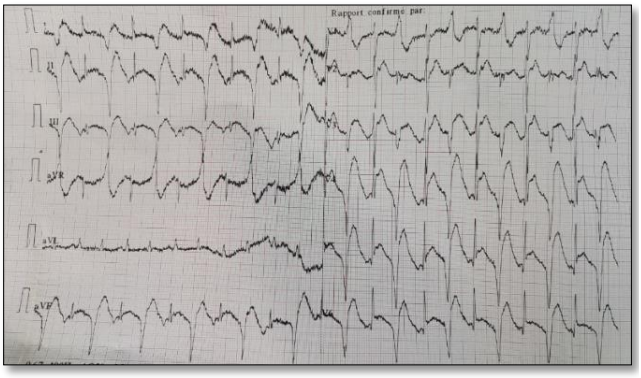

Figure 1: Electrocardiogram showing normal sinus rhythm, with extended ST-elevation in the anterior territory and ventricular bigeminy.

The patient was transported to the emergency department (ED) after having been stabilized (he was intubated, ventilated, and sedated on scene).

After intubation, ECG showed normal sinus rhythm, with 100bpm heart rate with extended ST-elevation in the anterior territory, however, there was ventricular extrasystoles disappeared without any administered antiarrhythmic medication (Figure 2).

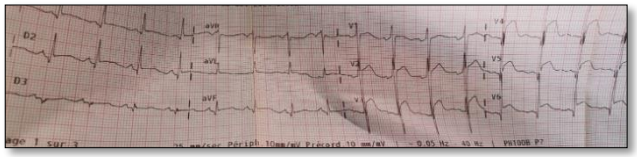

Figure 2: Electrocardiogram showing normal sinus rhythm, with 100bpm heart rate and extended ST-elevation in the anterior territory.

In the ED, Laboratory exams showed increased levels of high sensitive cardiac troponin T-sampled 2 times in an interval of 4 hours (526ng/l then 1200ng/l). Acute coronary angiography was performed, which revealed normal coronary arteries. For further diagnostic workup, cerebral computed tomography with angiography was performed showing subarachnoid hemorrhage (SAH) with cerebral artery aneurysm (Figure 3).

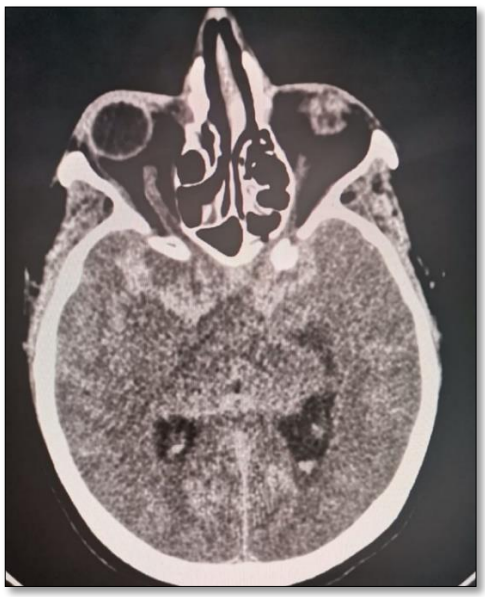

Figure 3: Cerebral computed tomography with angiography showing SAH with cerebral artery aneurysm.

Due to severe subarachnoid hemorrhage and loss of brainstem reflexes, no additional intervention was recommended by neurosurgery. For further care, the patient was transferred to the intensive care unit. On follow-up, the patient presented Staphylococcus aureus ventilator-associated pneumonia with hemodynamic instability but quickly resolved by optimizing the hemodynamic status with secondarily adapted empirical antibiotic therapy.

Neurologically, without any sedation, the patient kept a minimal state of consciousness (an outline of opening and closing of the eyes but very invariable with facial expressions) with tetraplegia.

The patient has been discharged tracheostomized under ventilation at home.

DISCUSSION

The interaction between the cardiovascular system and cerebral damage could explain the existence of arrhythmias, or even cardiac arrest during the occurrence of significant psychological stress. Electrocardiographic (ECG) alterations occurring during the course of SAH have been previously reported. Clinically, the neurocardiogenic effects of subarachnoid hemorrhage may present with electrocardiographic changes, elevations of troponin and/or brain-type natriuretic peptide, as well as regional wall motion abnormalities, including Takotsubo cardiomyopathy.

SAH-induced ECG abnormalities can be transitory, and the frequency of ECG abnormalities in prospective SAH studies increases to near 100% when serial ECG monitoring is used [4, 5]. These ECG abnormalities are nonspecific and tend to change with time;

Several mechanisms for the occurrence of cardiac complications after SAH have been suggested, but none has been proven. However, a generally accepted hypothesis is that sympathetic stimulation induces catecholamine release in the myocardium, which may lead to impaired systolic and diastolic function, repolarization abnormalities, and myocardial damage. The first descriptions concerned electrocardiographic changes (changes: T wave, ST and QT segments, arrhythmias) as well as an elevation of myocardial biomarkers ([6]. These abnormalities are very frequently found (25 to 100% depending on the studies), but they seem, fortunately, rarely linked to myocardial damage [7].

Repolarization disorders are present in 30% of patients [8], QT prolongation is rarer, but favors the appearance of arrhythmias (4% of patients) [9]. ECG abnormalities are diffuse and more frequent in cases of severe neurological impairment.

Several studies have not found a correlation between the sudden rise in catecholamine levels and the electrical changes [10, 11].

BNP is also released in the acute phase of SAH and its elevation is linked to that of troponin [12]. Elevated troponin and BNP are both associated with mortality, but only troponin is associated with poor neurological outcomes.

Echocardiography is strongly recommended in the acute phase [13]. Contraction abnormalities are observed in 13 to 38% of patients and a decrease in ejection fraction < 50% in 15 to 32% of them [14, 15]. This complication is not limited to a single coronary territory. These abnormalities most often recover within a few days but could be predictive of delayed cerebral ischemia. Coronary angiography is normal, confirming that myocardial cell necrosis is related to elevated catecholamines [16].

In case of myocardial dysfunction, cardiac output monitoring should be considered [13]. Similarly, blood volume must be monitored. The treatment of serious cardiac complications is that of acute heart failure, favoring inotropic agents. Hemodynamic control can delay the treatment of the aneurysmal sac, without exceeding a few hours.

CONCLUSION

Assessing ECG changes during cerebral damage is important. SAH studies show that catecholamine toxicity is the most probable cause of cardiac injury temporally related to an explosive increase in intracranial pressure. Evaluation and management of patients with SAH and cardiac dysfunction should be aimed at reducing the risk for symptomatic cerebral vasospasm. Newer therapeutic approaches should incorporate this evolving understanding of the pathophysiology.

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Acute myocarditis complicating severe chloralose intoxication: A case report

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Abstract

Background: Chloralose self- poisoning is frequent in Tunisia. Neurological signs are the most common. Cardiac toxicity is potentially serious and rarely reported. Its mechanism is not well known.

Case report: We report here a case of chloralose rodenticide voluntary intoxication complicated by myocarditis and an acute heart failure five hours after admission. Echocardiography showed diffuse hypokinesia and decreased left ventricular ejection fraction. The evolution was favorable within five days.

Why should an emergency physician be aware of this? Cardiac toxicity following acute chloralose poisoning remains a life-threatening condition. This cardiomyopathy is usually reversible in a few days when management is early.

Keywords: Intoxication; Chloralose; Acute Heart Failure; Myocarditis; Shock

INTRODUCTION

Alpha chloralose is a rodenticide commonly used in pesticide phytosanitary preparations in the fight against rodents. The toxic or lethal threshold of chloralose in humans is difficult to state due to variable subject sensitivity. The rate of chloralose poisoning is estimated to be 1000 hospitalizations yearly in Tunisia [1]. The toxidrome consists namely of neurological signs. Cardiac toxicity is a life-threatening presentation and is rare. The mechanisms of this cardiac toxicity are not yet well established. We report a case of acute myocarditis secondary to chloralose intoxication.

CASE PRESENTATION

A 26-year-old woman, with no medical history, was admitted to the emergency department for a suicidal attempt. She had ingested one hour before hospitalization one sachet (4 grams) of chloralose rodenticide (4g) (Figure1).

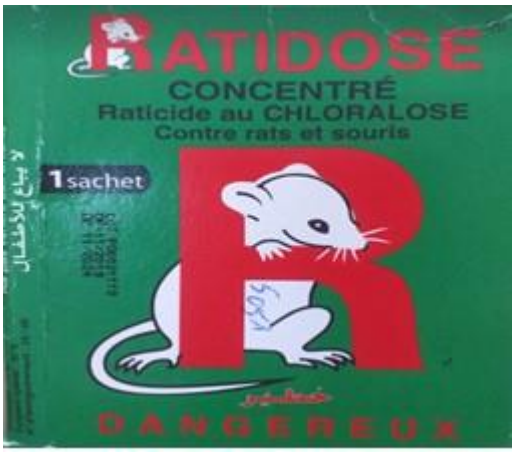

Figure 1: Ingested chloralose

On admission, her Glasgow coma scale score was 13/15. She had myoclonic jerks and pinpoint pupils. The respiratory rate was at 20 breaths per minute with pulse oximetry at 98 % in ambient air. There were no hemodynamic disorders (arterial blood pressure at 130/70 mm Hg and heart rate at 80 b/min). Within the first hour of admission, we performed an electrocardiogram and blood tests performed. They all had no abnormalities.

Two hours after admission, both neurological and respiratory states were deteriorating, and we performed urgent invasive mechanical ventilation. After intubation, we indicated an abundant gastric lavage (18 liters) with the administration of activated charcoal (50g).

Three hours later, the patient developed bradycardia at 50 b/min and shock (blood pressure:70/55 mmHg). The control ECG showed an ST-segment depression in V2-V4 leads (Figure 2). Control blood test analyses have shown heart injury with lactic acidosis (Table 1).

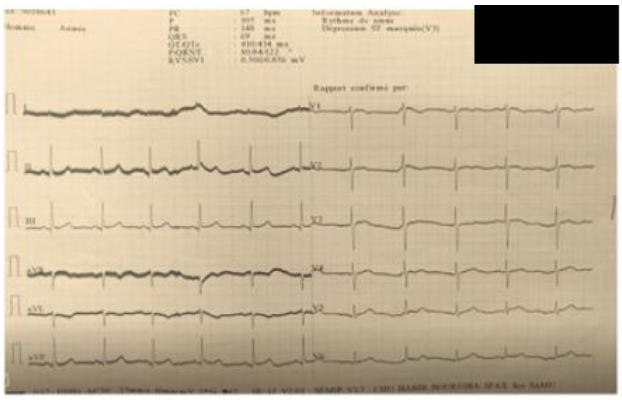

Figure 2: The control ECG showing an ST-segment depression in V2-V4 leads

Chest X-ray bilateral pulmonary edema. Transthoracic echography showed acute heart failure with a left ventricular ejection fraction (LVFE) at 32% and diffuse hypokinesia.

A fluid replacement was administered (40ml/kg). Regarding persisting low blood pressure, with ECG and echography findings, we also decided to begin continuous intravenous perfusion of adrenaline (2.5mg/hour).

The patient's respiratory and hemodynamic status has progressively improved. Extubation had been successful five days after admission. The cardiac troponin level declined to 0.023, and the control echocardiography on day 6 showed an improvement of the LVFE to 65%. She was discharged home without sequels.

DISCUSSION

Alpha chloralose is a rodenticide formed by condensing chloral with a pentose or hexose sugar.

Table1. Results of the biological tests

	Reference Range	On admission	At h-6 of hospitalization	At h-12 of hospitalization
Sodium, mmol/L	136-145	139	138	136-145
Potassium, mmol/L	3.5-5.1	3.7	4.3	3.5-5.1
Chloride, mmol/L	98-107	100	105	98-107
PH	7.38-7.42	7.28	7.38	7.38-7.42
PaCO2, mmHg	38-42	36	36	38-42
PaO2, mmHg	≥80	87	82	≥80
bicarbonates level, mmol/l	22-26	16	23.6	22-26
Base excess		-8.6	0.3	
Creatinine, µmom/l	62-106	24	22	62-106
Alanine transaminase, IU/L	10-41	32	37.7	10-41
Aspartate transaminase, IU/L	10-37	34	36.8	10-37
Lactate, mmol/L	0.50-2.20	0.68	0.79	0.50-2.20
Lipase, U/L	13-60	247	49	13-60

Formerly used medicinally for its sedative and hypnotic properties, chloralose is commonly used in pesticide phytosanitary preparations in the fight against rodents. The rate of chloralose poisoning is estimated to be 1000 hospitalizations yearly in Tunisia [1].

Mortality rates are estimated to be 0.4% [2, 3]. The toxic or lethal threshold of chloralose in humans is difficult to state due to variable subject sensitivity. Richet has set the minimum active dose in adults at 0.004 g/kg, the toxic dose at 1 g, and the lethal dose at 0.1 g/kg, with large individual variations [3,4]. The precocity of clinical signs seems to be proportional to the dose. The severity of the clinical manifestations depends on the ingested dose and the product concentration in chloralose[3,5].

The toxidrome consists namely of neurological signs. In this type of intoxication, hemodynamic tolerance is usually good. A collapsed circulatory system with low central venous pressure and shock has been described as massive intoxication [6,7]. Cardiac toxicity is a life-threatening presentation and is rare. The mechanisms of this cardiac toxicity are not yet well established. Moderate sinus tachycardia was consistently found. Arrhythmias have also been reported. These ECG abnormalities have often been explained by electrolyte disturbances, and acid-base balance troubles due to cellular anoxia, as well [6, 8].

Several mechanisms explaining the direct cardiac dysfunction in chloralose poisoning are worth to be mentioned. First, a transient negative inotropic effect was described in the first few minutes after intoxication. This effect is often masked by early increased heart flow and rate, secondary to stimulating endogen catecholamines. This adaptation mechanism is transient [3, 9]. Second, chloralose has direct toxicity on the

cardiomyocytes, which is usually reversible within a few days [1]. Third, sudden emotional stress, also named Takotsubo cardiomyopathy, induces myocardial stunning [10, 11]. That induces cardiac ischemia, via three pathways: 1) epicardial coronary arterial spasm; 2) alteration of the coronary flow (via microvascular spasm, or sympathetic mediated microcirculation dysfunction); 3) and direct myocyte injury [1]. In our case, the echocardiography findings evoked a cardiac dysfunction due to intoxication.

The prognosis depends on the early management after ingestion; including gastric decontamination, and symptomatic procedures [3]. Intubation and mechanical ventilation are required in case of neurologic and/or respiratory distress. The restlessness, myoclonus, and seizures are usually improved by benzodiazepines. Fluid replacement is commonly sufficient to restore blood pressure. The rare cases of sustaining cardiovascular collapse are successfully managed with vasoactive agents, as in our case [3, 12]. The gastric decontamination has to be early achieved. Gastric lavage is still performed in some countries [13]. A single dose (50 g) administration of activated charcoal is nowadays more recommended and safer, within two hours of ingestion and in the absence of contraindications [3, 14].

CONCLUSION

Cardiac toxicity following acute chloralose poisoning remains a life-threatening condition. Its mechanism is still poorly understood. Direct cardiac toxicity has to be evoked in case of electrocardiogram abnormality, hemodynamic disorders, troponin elevation, or chest x-ray abnormality. Echography confirms the diagnosis. This cardiomyopathy is usually reversible in a few days when management is early.

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