Description of Renal Function among Patients Admitted with Myocardial Infarction

وصف وظائف الكلى عند مرضى احتشاء عضلة القلب لدى دخولهم المستشفى

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Abstract

The potential association between impaired renal function and the incidence of cardiovascular events has been thoroughly studied. The focus of this study was to describe the renal function for patients admitted with Myocardial Infarction (MI). This retrospective descriptive study was based on reviewing the medical files of MI patients admitted to the West Bank hospitals of Palestine between January 2012 and July 2014. Out of 320 MI patients' files, only 279 files were included in the study. Two hundreds and eighteen (78.1%) patients were males and the mean age was 59 ± 0.736 years and the majority of the patients (77.4%) attended governmental hospitals. The smoking history was documented in few files (50) and it was found that 42 (84.0%) of the patients were smokers. Regarding the patients' co-morbid diseases, diabetes mellitus status was reported in 113 files and 88 (77.9%) patients were diabetics. Hypertension was mentioned in 97 files (34.8%) and 84 (86.6%) patients were hypertensive. The lipid status was reported in 43 files with only 6

patients (14.0%) suffered from hyperlipidemia. Twenty five (52.1%) out of 48 patients suffered from previous ischemic heart disease, while 12 patients had a history of atherosclerosis. At admission, patients complained from many classical symptoms of MI. The majority of patients (n=220, 78.9%) suffered from chest pain, 48 (17.2%) patients experienced diaphoresis, 51 (18.3%) patients had nausea and 81 (29.0%) patients experienced dyspnea. Creatinine and Blood Urea Nitrogen (BUN) were the most commonly used tests to evaluate the kidney function. About 254 (91.0%) patients had been tested for their serum creatinine levels with 66 (26.0%) of these patients had high blood creatinine concentration. On the other hand, the BUN test was performed for 145 patients and 76 (52.4%) of these patients had elevated BUN. Uric acid was less commonly used and it was measured for 48 patients and 42 (87.5%) of these patients had normal blood uric acid. We concluded that MI is a multi-factorial disease and the impaired kidney function may significantly contribute to the occurrence of MI and patients with renal failure may have an extremely high risk of cardiovascular disease.

Keywords: Renal Function, Myocardial Infarction, Creatinine, Urea, Palestine.

ملخص

العلاقة ما بين اختلال وظائف الكلى وحدوث امراض القلب والأوعية الدموية يتم دراستها بشكل دائم وكبير. محور هذه الدراسة هو وصف حالة الكلى عند مرضى احتشاء عضلة القلب. تستند هذه الدراسة الوصفية على مراجعة الملفات الطبية لمرض احتشاء عضلة القلب الذين تم قبولهم في مستشفيات الضفة الغربية في فلسطين بين يناير 2012 ويوليو 2014. شملت الدراسة 279 من أصل 320 ملف لمرضى احتشاء عضلة القلب. غالبية افراد العينة (78٪) كانوا من الذكور، وكان متوسط عمر المرضى حوالي 59 عاما ومعظم (77.4٪) المرضى تم ادخالهم الى المستشفيات الحكومية. لقد تم توثيق تاريخ التدخين في بعض الملفات (عدد = 50) ووجد أن 42 (84.0٪) من المرضى هم من المدخنين. بالنسبة للامراض السابقة التي عانى منها المرضى فقد تم توثيق مرض السكري في 113 ملف و وجد أن 88 (77.6٪) من المرضى كانوا يعانون من مرض السكري. و تم توثيق مرض ارتفاع ضغط الدم في 97 ملف (34.8٪) و وجد أن 84 (86.6٪) من المرضى كان لديهم مرض ضغط الدم المرتفع. مستوى الدهون في الدم تم توثيقه في 43 ملف فقط ووجد أن 6 مرضى (14.0٪) كانوا يعانون من ارتفاع مستوى الدهون في

الدم. ووجد أن 25 مريض (52.1٪) من أصل 48 مريض يعانون مسبقا من مرض القلب الإقفاري، في حين أن 12 مريض فقط، اظهرت الملفات، انهم يعانون مسبقا من مرض تصلب الشرايين. اشتكى العديد من المرضى عند دخولهم للمستشفى من الأعراض الكلاسيكية لمرض احتشاء عضلة القلب. غالبية المرضى (عدد = 220، 78.9٪) كانوا يعانون من آلام في الصدر، وكان 48 (17.2٪) من المرضى لديهم تعرق غزير، وكان 51 (18.3٪) مريض يشعرون بالغثيان و81 (29.0٪) مريض يعانون ضيق التنفس. مستويات الكرياتينين واليوريا في الدم أعتمدت لتقييم وظائف الكلى. أُجري فحص الكرياتينين لنحو 254 (91.0٪) من المرضى وقد وجد أن 66 (26.0٪) مريض كانوا يعانون من تركيز الكرياتينين المرتفع في الدم. من ناحية أخرى، تم إجراء اختبار مستوى النيتروجين في الدم ل 145 مريض ووجد أن 76 (52.1٪) مريض كان يعاني من ارتفاع مستوى النيتروجين في الدم. استخدام فحص مستوى حمض اليوريك في الدم لتشخيص وظائف الكى هو أقل شيوعا، ولذلك فقد تم قياسه عند 48 مريض وجد أن غالبية المرضى (85.7٪) كان لديهم مستوى طبيعي من حمض اليوريك في الدم. أن مرض احتشاء عضلة القلب هو مرض متعدد الاسباب و يبدو ان اختلال وظائف الكلى قد يسهم بشكل كبير في حدوث مرض احتشاء عضلة القلب، وأن المرضى الذين يعانون من الفشل الكلوي قد يكون لديهم مخاطر كبيرة للغاية للتعرض لامرض القلب والأوعية الدموية.

الكلمات المفتاحية: وظيفة الكلى، احتشاء عضلة القلب، الكرياتينين، اليوريا، فلسطين.

Introduction

Patients with chronic kidney disease (CKD) are at greater risk for cardiovascular disease and death than the general population (Cea Soriano, Johansson, Stefansson, & Rodriguez, 2015; Torun, Yardim, Simsek, & Burgaz, 1998). Chronic kidney disease in heart failure has been recognized as an independent risk factor for adverse outcome, although the most important clinical trials tend to exclude patients with moderate and severe renal insufficiency (Palazzuoli, McCullough, Ronco, & Nuti, 2015). The potential association between impaired renal function and all-cause mortality and incidence of cardiovascular events has been thoroughly studied in the general population (Elley, Robinson, Kenealy, Bramley, & Drury, 2010; Go, Chertow, Fan, McCulloch, & Hsu, 2004; Hemmelgarn et al., 2010; Pizzarelli et al., 2009; Roderick et al., 2009; Weiner et al., 2009), in patients with cardiovascular diseases (Brown et al., 2008; Lin et al., 2009; Schou, Torp-Pedersen, Gustafsson, Abdulla, & Kober, 2008; Smith et al., 2006) and in those with impaired

renal function (Conway et al., 2009; He et al., 2009). Despite this common association, the precise pathophysiological connection and liaison between heart and kidney is only partially understood (Palazzuoli et al., 2015). The focus of this study was on determining the relation between renal dysfunction and the occurrence of Myocardial Infarction (MI) in the population of the West Bank region of Palestine.

Methodology

This retrospective descriptive study was based on reviewing medical files of 320 MI patients admitted to Palestinian hospitals between January 2012 and July 2014, using a data collection form. Any file with improper data entry was excluded. An automated software program was used to calculate the sample size. The socio-demographic information, the results of kidney function tests and past medical history were collected from patient's files.

An automated software program (Raosoft sample size calculator http://www.raosoft.com/samplesize.html) was used to calculate the sample size. Considering the population size 20000, margin error 5%, confidence level 90%, and response distribution 50%.

The Institutional Review Board (IRB) at An-Najah National University and the Palestinian Ministry of Health authorized all aspects of the study protocol, including access and use of the patient clinical information.

Results

As shown in Table 1, out of the 320 MI patients' files only 279 files were included in this study. About 78% of patients were males and about 22% were females and the mean age in years was 59.17± 0.736. The majority of the patients (77.4%) attended governmental hospitals, while 63 (22.6%) attended private hospitals. Smoking habits were mentioned only in 50 files with 42 patients (84.0%) reported as smokers.

Table (1): The patient's characteristics, type of hospital, and smoking habits.

Variables	Number (%)
Age	
< 60	150 (53.8)
> 60	129 (46.2)
Gender	
Male	218 (78.1)
Female	61 (21.9)
Hospitalization	
Governmental	216 (77.4)
Private	63 (22.6)
Smoking*	
Yes	42 (84.0)
No	8 (16)

*Smoking; missing files = 229 (82.1%)

Regarding the patient's co-morbid diseases, from the 279 files of MI included in this study (Table 2), 113 files reported the diabetic status of the patient and 88 (77.9%) patients suffered from diabetes whereas 25 (22.1%) patients were not diabetics. Ninety seven files (34.8%) mentioned the hypertensive history of the patients, reporting 84 (86.6%) patients with hypertension. Six patients (14.0%) out of 43 files that reported the lipid status of the patient had hyperlipidemia. Finally, ischemic heart disease was reported in 25 (52.1%) patients out of 48 files that mentioned the disease, while, 12 of these patients (4.3%) had a history of atherosclerosis.

Table (2): Co-morbid diseases among MI patients.

Co-morbid Diseases	Number (%)
Diabetes Mellitus [a]	
Yes	88 (77.6)
No	25 (22.4)
Hypertension [b]	
Yes	84 (86.6)
No	13 (13.4)
Hyperlipidemia [c]	
Yes	6 (14)
No	37 (86)
Ischemic heart disease[d]	
Yes	25 (52.1)
No	23 (47.9)
Atherosclerosis [e]	
Yes	12 (4.3)
No	267 (95.7)

[a] Diabetes; missing file = 166 (59.5%)
[b] Hypertension; missing files = 182 (65.2%)
[c] Hyperlipidemia; missing files = 236 (84.6%)
[d] Ischemic heart disease; missing file = 231 (82.8%)
[e] Atherosclerosis; missing files = 0 (0%)

Table 3 also shows patient's complains at the time of admission. More than half of the patients suffered from chest pain (n=220, 78.9%), 48 patients (17.2%) experienced diaphoresis, 51 patients (18.3%) had nausea and 81 patients (29.0%) experienced dyspnea.

Table (3): Patient's complaints at time of hospital admission.

Patient's Complaints at Admission	Number (%)
Chest pain	220 (78.9)
Diaphoresis	48 (17.2)
Nausea	51 (18.3)
Dyspnea	81 (29.0)

Different blood tests were used to assess the kidney function (Table 4). Creatinine and BUN were the most commonly used tests. About 254 patients (91.0%) had been tested for their serum creatinine levels with 66 patients (26.0%) reported with a high concentration. The BUN test was performed for about half of the patients (n= 145, 52.0%) and76 (52.4%) patients were reported with elevated BUN. Uric acid was measured for 48 patients and most of the tested patients (n=42, 87.5%) had normal blood uric acid level.

Table (4): Medical Tests of Kidney Function.

Variable	Total Number (%)
Creatinine [a]	
Normal	188 (74.0)
High	66 (26.0)
BUN [b]	
Normal	69 (47.6)
High	76 (52.4)
Uric Acid [c]	
Normal	42 (87.5)
High	6 (12.5)

[a] Creatinine; missing files = 25 (9.0%)
[b] Blood Urea Nitrogen (BUN); missing files = 133 (47.3%)
[c] Uric acid; missing files = 231 (82.8%)

Discussion

Elderly patients are more likely to experience an MI than younger patients (Shih, Lee, Lee, & Boyle, 2011). In MI, generally risk factors are more strongly associated with acute MI in younger (< 60 years) compared to older (≥60 years) (Anand et al., 2008). Our study showed that 150 (53.8%) patients diagnosed with MI were under the age of 60 years taking into consideration, the elderly population aged (65 years and over) constituted only 2.9% of the total population ((PCBS), 2014) ..

Woman experience their first acute MI on average 9 years later than men (Anand et al., 2008). Premenopausal women are protected against

coronary artery disease (CAD), because of the impact of sex hormones function (Kumar, Kaur, & Devi, 2012). A similar finding was observed in our study, since 218 (78.1%) patients were males, and only 61 (21.9%) were females, although the males to females ratio in Palestine is almost equal.

The majority of patients were admitted to governmental hospitals since almost all MI patients receive governmental sponsored treatment due to high cost. Even those admitted to private hospitals receive financial coverage from the government and have been transferred to private sector when the governmental facilities were fully occupied or unfit for certain kind of intervention.

Smoking is a risk factor for the development of MI (Jahangir, Siddiqui, Jehangir, & Sheikh, 2012). Globally, tobacco use is one of the most important causes of MI, especially in men (Teo et al., 2006). The current work showed that 42 (84.0%) patients were smokers or had a history of smoking. Consistently, several epidemiological studies have established worldwide that cigarette smoke exposure is an important cause of cardiovascular morbidity and mortality and increases the risk for myocardial infarction (Ambrose & Barua, 2004). Therefore, all forms of tobacco use should be discouraged to prevent cardiovascular diseases.

High blood pressure has consistently been associated with an increased risk of MI (Luepker et al., 2003). History of hypertension is a frequent finding in patients with acute myocardial infarction (AMI) (Pedrinelli et al., 2012). The majority of patients in this study (86.6%) suffered from hypertension. Therefore, the control of hypertension with appropriate medication and life style modifications could be very effective to significantly reduce the risk of MI.

Moreover, diabetes mellitus is a major risk factor for coronary artery disease and is associated with a higher incidence of MI and sudden death (Walker & Cubbon, 2015). Based on finding of this study, compared to individuals without diabetes, those with diabetes are more likely to have MI, which is in agreement with the other findings (Adams et al., 2014).

Regarding the symptoms at admission, patients with MI may present with various combinations of chest, upper extremity, jaw, or epigastria discomfort with exertion or at rest (Thygesen, Alpert, White, & Joint, 2007). The discomfort associated with MI was accompanied with dyspnea (29.0%), diaphoresis (17.2%), nausea (18.3%), or chest pain (78.9%). Chest pain, diaphoresis, nausea, and dyspnea were seen in patients at admission, with variations in their occurrence.

Several studies demonstrated that patients with kidney disease or impaired renal function are at greater risk for cardiovascular diseases and death than the general population (Parikh & Seliger, 2015). Creatinine has been found to be a reliable indicator of kidney function. Moderately elevated plasma creatinine level is associated with increased risk of MI, ischemic heart disease, and early death in the general population (Sibilitz, Benn, & Nordestgaard, 2014). More than one quarter of the tested patients in this study had high creatinine levels indicating that the renal dysfunction may be a significant participating risk factor for cardiac disease and MI. Moreover, the persistent worsening of the renal function is significantly associated with higher incidence of adverse cardiac events in acute coronary syndrome patients (Murata et al., 2015).

On the other hand, elevated BUN level is correlated with increased mortality in patients with acute heart failure (Cauthen et al., 2008; Fonarow et al., 2005; Hartz, Kuhn, Kayser, & Johnson, 1995; Iglesias, Hom, Antoniotti, Ayoub, & Levine, 2006; Shenkman, Zareba, & Bisognano, 2007; Yancy et al., 2006), chronic heart failure (Filippatos et al., 2007), and coronary artery bypass graft (Hartz et al., 1995). More than half of tested patients in this study had elevated BUN levels at time of admission. Therefore, BUN can be incorporated into risk prediction models in myocardial mortality rate.

Comparing the prognostic significance of blood urea versus creatinine levels for estimating the risk of developing MI, it may be concluded that an increased level of blood urea is a more significant risk factor for MI than that of creatinine, and this is in agreement with other studies (Levey et al., 1998).

Furthermore, serum uric acid levels are strongly associated with the occurrence of stroke and MI (Alderman, 2002; Grassi et al., 2013). It is also addressed as cardiovascular disease risk factor in numerous prospective and cohort studies (Parvaiz, 1987). Observational studies showed that serum uric acid concentrations are higher in patients with established coronary heart disease compared with healthy controls (Sathiya et al., 2014). In the current study 48 (17.2 %) patients out of the 279 patients, had their uric acid level been tested. Six (12.2%) patients had elevated level of uric acid. The lack of knowledge regarding uric acid as a risk factor for MI is a matter of concern and should be addressed by health care providers. Although, our results did not show a strong relationship between the uric acid level and the occurrence of MI as more than 87% of tested patients had normal serum uric acid level which could be due to the small number of tested patients.

Due to the limitation of many incomplete files and not-done kidney function tests in many cases, more long-term studies are needed to get a definite conclusion and well establish the relation between kidney function and incidence of MI.

Nevertheless, according to the previous findings and in view of our current results, it can be concluded that MI is a multi-factorial disease and the impaired kidney function may significantly contribute to the occurrence of MI.

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Conflict of Interest

The authors hereby state that they do not have any conflict of interest.

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