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Original Article

The Cardiac Risk Factors of Coronary Artery Disease and its relationship with Cardiopulmonary resuscitation: A retrospective study

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ABSTRACT

Background: Cardiovascular diseases are considered as the most prevalent serious disease in developed countries, and act as the number one cause of death among men and women in all ages and from all races.
Aim: The present research aims at determining the relationship between risk factors of cardiovascular diseases and consequences of cardiopulmonary resuscitation (CPR).
Methods: The present study is a retrospective analytic-cross sectional research performed on 100 patients in need for CPR (successful and unsuccessful) during March 2017 – June 2017. As research instrument, a pre-designed checklist was used including demographic information, clinical and medical information, and the information related to modifiable and non-modifiable risk factors of cardiovascular diseases.
Results: Obtained results indicated that, 57.1% of the successful CPR cases were administered on men, while 55.1% of unsuccessful CPR cases were administered on women. The patients diagnosed with myocardial infarction were in further need for CPR (rate of successful CPR: 66.7%, and rate of unsuccessful CPR: 61.9%). Significant associations were found between CPR duration, post-CPR survival time (survival time after CPR), systolic blood pressure, diastolic blood pressure, triglyceride level, diabetes, fasting blood sugar level, and body mass index, in one hand, and type of CPR, on the other hand ($p < 0.05$).
Conclusion: Results of the present research showed that, there is a significant relationship between modifiable risk factors of cardiovascular diseases and consequences of CPR.

1. Introduction

Nowadays, Coronary Artery Diseases (CAD) have been regarded as the most prevalent serious disease of advanced countries. They are considered as the first mortality factor among men and women from all ages and races.[1] Results of studies in USA showed that one out of three Americans dies due to CAD. In 2013, CAD-related mortalities were 222.9 per 100,000 Americans among which 269.8 people were men and 184.8 people were women.[2] Based on world health organization (WHO), in 2014, this disease was the cause of death in 46% of deaths in Iran.[3] Studies in Iran have shown that the prevalence of CAD from 5.7% in 1995, reached to 17.8% in 2006 which is substantial increase. On the other hand, in comparison with other diseases, CADs possessed the highest mortality rate.[4] Based on WHO reports about health habits in 35 countries, about 60% of health and quality of life depends on life style and behavioral habits. Unhealthy life style and weak health habits play a very important role in development and intensifying of cardiac coronary diseases. Lack of physical activity, obesity, unhealthy diet, smoking and lack of proper rest and peace are among the risk factors on CADs.[5] CADs are among life style-related diseases and atherosclerosis[6]; it includes modifiable and non-modifiable risk factors. Non-modifiable risk factors are age, sex, race and family history of CAD while modifiable risk factors include high blood pressure, blood cholesterol level, blood triglyceride level, diabetes, alcohol consumption, opium consumption and smoking. Controllable risk factors can be controlled to some extent by changing the lifestyle.[6] As the final death manifestation of many CADs is sudden death, to reduce the death rates of these diseases, attention to Cardiopulmonary resuscitation (CPR), its success factors and measures to enhance its efficiency have been in the focus of the researchers.[7]

Cardiac arrest is prevalent in the hospitals which is generally associated with low survival chance. On the other hand, the

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information regarding sex and race relationship with survival chance following a cardiac arrest within the hospital is limited. Moreover, the influence of body mass index (BMI) on cardiac arrest outcome in a hospital has remained unclear. In many cases, performance of cardiopulmonary resuscitation on patients with high or low BMIs would have destructive effect. Numerous reasons have been proposed on why BMI can potentially affect the quality and effectiveness of cardiopulmonary resuscitation.[8,9] In the Asia, obesity, diabetes, dyslipidemia, and high blood pressure have been recognized as the major risk factors of CADs; however, no study has explicitly addressed the association of these factors with CPR outcome.[6] Considering the fact that various personal, social and clinical factors along with therapeutic processes are effective on CPR outcome, there is little information about the impact of risk factors on CPR outcomes and this issue has been less addressed by researchers. In this regard, given the prevalence of CADs in the our country, whose some of risk factors are modifiable in the community and on the other hand, considering that the most important cause of mortality in our country is CADs, the researchers decided to conduct a study on the relationship between CADs' risk factors and CPR outcomes.

2. Methods

The present study with ethical code of IR.GUMS.REC.1395.379 from research and technology deputy of Gilan medical sciences university is an analytical-cross sectional study which was performed in a retrospective manner. Files of 100 patients who underwent CPR in Heshmat educational cardiology center in Rasht from March 2016 to June 2017 were randomly investigated in this research. The sample size of the present study was determined equal to 100 based on study of Krityafung with a probability of 95% and test coefficient of 90%.[10] Among the examined samples, 50 patients experienced successful CPR (i.e., they discharged from the hospital with proper brain function); the other 50 had complete asystole and died after cardiopulmonary resuscitation based on cardiologist diagnosis. The patients admitted with cardiopulmonary arrest outside the hospital were excluded from the study. Data collection was carried out by collecting the medical records of patients who suffered from inter-hospital cardiopulmonary arrest and experienced CPR in 2016–2017. In this study, the data were collected through a researcher-made checklist containing three parts: 1. Demographic information (age and sex). 2. Clinical and hospital information (type of CAD, hospitalization duration, frequency of CPR, duration and outcome of CPR). 3. Information regarding modifiable risk factors of CAD (systolic and diastolic blood pressure, blood cholesterol levels, determination of LDL, HDL, TG, FPG levels, history of diabetes, history of smoking, alcohol and opium and family history of CAD). The collected data were analyzed by SPSS Ver 21 software using descriptive statistics (frequency and percentage), Chi-square and Mann-Whitney tests (with significance level of less than 0.05).

3. Results

In the presented retrospective study, medical records of 100 patients with in-hospital cardiopulmonary arrest were investigated in which 50 cases had successful CPR (patients with proper brain function) and 50 experienced unsuccessful cardiopulmonary resuscitation (cardiopulmonary arrest and death) in a 4-month periods.

The results indicated that 57.1% of the patients with successful resuscitation were men and 55.1% of women had unsuccessful resuscitation. Among the studied patients, those diagnosed with myocardial infarction were more in need of cardiopulmonary resuscitation than the others. They also scored the highest percentage of successful cardiopulmonary resuscitation (66.7%) and highest percentage of unsuccessful cardiopulmonary resuscitation (61.9%) as listed in (Table 1).

Table 1
Frequency and percentage of disease diagnosis in successful and unsuccessful CPR.

Disease diagnosis	Frequency (%)	
	Successful CPR	Unsuccessful CPR
Myocardial infarction (MI)	30 (66.7)	26 (61.9)
Cardiomyopathy	3 (6.7)	3 (7.1)
Heart valve disorders	5 (11.1)	4 (9.5)
Congestive heart failure	1 (1.1)	0 (0)
Cardiomyopathy along with valve disorders	2 (4.4)	3 (7.1)
Coronary diseases	4 (8.9)	5 (11.9)
Myocardial infarction and valve disorders	0 (0)	2 (2.4)

Type of CPR exhibited significant relationships with the time of CPR, survival duration after CPR, systolic blood pressure, diastolic blood pressure, triglyceride, diabetes, FBS and IBM (Table 2).

4. Discussion

A substantial percentage of patients who experienced successful cardiopulmonary resuscitation (39.6%) had survival duration of over 29 days, which was consistent with a large number of studies.[11–15] However, the results of other studies in Iran reported a low percentage of success and survival of patients after CPR.[16–18] Different results can be attributed to the effect of enhancement of access to facilities, increased knowledge of physicians, nurses and therapeutic team on patients management at the onset of cardiovascular and respiratory arrest,[19] as well as the alignment of care and life-saving measures with global standards.

The most common cause of cardiopulmonary arrest in patients with successful and unsuccessful CPR was myocardial infarction, which is in line with the results of other studies.[15,20] But in a study conducted by Kamran Keivanhaei et al., The results revealed that the most prevalent cause of cardiac arrest was the incidence of cardiac arrhythmias.[21] As myocardial infarction is one of main causes of cardiac arrhythmias, hence it can be said that in this study myocardial infarction is the hidden factor of the need for CPR. Since modifiable risk factors of CADs are responsible for 90% of myocardial infarctions[22] and on the one hand, myocardial infarction is the most common diagnosis in patients admitted in developed and developing countries,[23] as well as the results of the studies indicating that the most important cause of patients' need for CPR is myocardial infarction, therefore, attention to the prevention and control of CADs' risk factors can dramatically reduce the incidence of myocardial infarction and subsequently reduce the need for CPR.

In our study, age and sex showed no significant relationship with CPR success, which was in agreement with the results of the other studies.[7,20,21,24–26] However the research conducted by Dhaval Kolte et al.[8] indicated that the rate of successful CPR operation in higher among women.

The results of present study revealed that the highest percentage of successful cardiopulmonary resuscitation was observed in the age group of 61–80 years old, which is compatible with the report of Satya Krishna Ramachandran et al. and Breimnejad et al.[16,27] Since aging increases the growth rate of coronary artery and this growth could enhance the chances of heart muscle blood supply in case of blockage in other vessels, it can play a key role in accomplishment of CPR among patients with older ages. Furthermore, the study of Satya Krishna Ramachandran et al.[27] reported a significant relationship between hospitalization time and CPR outcome, which contradicted with our results.

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Table 2
Relationship between the risk factors of cardiovascular diseases and type of CPR.

Investigated variables		Frequency (%)		p-Value
		Successful CPR	Unsuccessful CPR	
Age	18–40	3 (6.2)	0 (0)	0.3
	41–60	10 (20.8)	11 (22.9)	
	61–80	29 (60.4)	28 (58.32)	
	Over 80	6 (12.5)	9 (18.8)	
Sex	Male	28 (57.1)	22 (44.9)	0.1
	Female	21 (42.9)	27 (55.1)	
Family history of CVDs	Yes	8 (19.5)	7 (17.9)	0.3
	No	33 (80.5)	32 (82.1)	
Systolic blood pressure	40–59 mm-Hg	0 (0)	2 (4.7)	0.04
	60–79 mm-Hg	27 (56.2)	30 (69.8)	
	80–99 mm-Hg	10 (20.8)	9 (20.9)	
	Over 100 mm-Hg	11 (22.9)	2 (4.7)	
Diastolic blood pressure	40–59 mm-Hg	3 (6.2)	3 (7)	0.05
	60–79 mm-Hg	15 (31.2)	22 (51.2)	
	80–99 mm-Hg	19 (39.19)	16 (37.2)	
	Over 100 mm-Hg	11 (22.9)	2 (4.7)	
Cholesterol	60–119 mg/dl	5 (13.5)	14 (37.8)	0.09
	120–179 mg/dl	21 (56.8)	16 (43.2)	
	180–239 mg/dl	10 (27)	7 (18.9)	
	Over 239 mg/dl	1 (2.7)	0 (0)	
HDL Cholesterol	15–29 mg/dl	1 (2.7)	8 (21.1)	0.06
	30–44 mg/dl	27 (73)	26 (68.4)	
	45–59 mg/dl	7 (18.4)	3 (7.9)	
	Over 59 mg/dl	2 (5.4)	1 (2.6)	
LDL Cholesterol	10–49 mg/dl	4 (10.8)	7 (18.4)	0.3
	50–99 mg/dl	19 (51.4)	20 (52.6)	
	100–149 mg/dl	13 (35.1)	8 (21.1)	
	Over 149 mg/dl	1 (2.7)	3 (7.9)	
Triglyceride	10–49 mg/dl	0 (0)	3 (7.5)	0.04
	50–99 mg/dl	19 (51.4	15 (37.5)	
	100–149 mg/dl	9 (24.3)	18 (45)	
	Over 149 mg/dl	9 (24.3)	4 (10)	
Diabetes	Yes	10 (38.5)	35 (72.9)	0.04
	No	16 (61.5)	13 (27.1)	
FBS	10–49 mg/dl	0 (0)	1 (2.6)	0.04
	50–99 mg/dl	4 (10.3)	8 (20.5)	
	100–149 mg/dl	22 (56.4)	10 (25.6)	
	Over 149 mg/dl	13 (33.3)	20 (51.3)	
Smoking	Yes	17 (35.4)	15 (34.9)	0.5
	No	31 (65.6)	28 (65.1)	
Oral opium	Yes	12 (25.5)	7 (16.7)	0.2
	No	35 (74.5)	35 (83.3)	
BMI	18.5–24.9 Kg/m^2	10 (83.3)	7 (36.8)	0.03
	25–28,4 Kg/m^2	1 (8.3)	5 (26.3)	
	Over 28.4 Kg/m^2	1 (8.3)	7 (36.8)	

Smoking and oral consumption of opium showed no impact on success or failure of CPR. Although some studies have suggested that people who smoke have higher rate of survival after CPR. Moreover, this study revealed that CADs' risk factors (except family history of CAD) are higher in non-smoking patients as compared with those who smoke. This is called "smoker's paradox" phenomenon among the researchers.[28,29]

Regarding the role of BMI in success of CPR, the results of our study were in line with the work of Mohammad Shahriary et al,[24] so that in patients with higher BMI, success of CPR comes down. This problem in obese patients could be associated to factors like placement of defibrillator pads and access to vessels an physiological and biological factors of high or low BMI which can influence the quality of chest massage. On the other hand, the failure of CPR in these patients could be due to non-proportionality of dose-independent drug dosages or defibrillator ability in these patients.

Results of our study indicated that there exists a significant relationship between comorbid diseases like diabetes and FSB with outcomes of CPR. Patients suffering from diabetes showed higher failure in CPR which was in contrary with the results of the only similar study conducted by Seyed Javadi et al. In the mentioned study, in line with our study, it was expressed that there is a significant relationship between systolic and diastolic blood pressure and CPR outcomes.[26] Our study also detected a significant relationship between high levels of triglyceride and CPR outcomes in a way that patients with triglyceride level of 50–99 mg/dl showed more successful CPR outcomes while those having triglyceride level of 100–149 mg/dl exhibited the higher rate of failure in CPR.

5. Conclusion

Despite the fact that this study can't certainly deny or confirm the negative or positive effects of these factors on CPR outcome.

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The results of our study unravel a significant relationship between some of the modifiable risk factors of CADs and CPR outcome. Moreover, given that the results of various studies have indicated that little attention has been paid to the role of modifiable CADs' risk factors in the outcome of CPR, further studies are recommended in this area.

Conflict of interest

The authors declare they have no conflict of interest in the research domain.

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References

1. Alters S, Schiff W*Essential concepts for healthy living*. 4th ed. Jones and Bartlett; 2006:5 [Chapter 1].
2. Mozaffarian D, Benjamin EJ, Go AS, Arnett DK, Blaha MJ, Cushman M. Executive summary: heart disease and stroke statistics-2016 update: a report from the American heart association. *Circulation*. 2016;133(4):447.
3. Riley L, Cowan M. *Noncommunicable diseases country profiles 2014*. Geneva: World Health Organization; 2014.
4. Moaddab F. Survey of predictive factors of self-care in patients with heart failure that referred to Dr. Heshmat Hospital of Rasht; 2102:13.
5. Zou H, Tian Q, Chen Y, Cheng C, Fan X. Coping styles mediate the relationship between self-esteem, health locus of control, and health-promoting behavior in Chinese patients with coronary heart disease. *J Cardiovasc Nurs*. 2017;32(4):331–338.
6. Mohammadnezhad M, Mangum T, May W, Lucas JJ, Ailson S. Common modifiable and non-modifiable risk factors of cardiovascular disease (CVD) among pacific countries. *World*. 2016;6(11):153–170.
7. Jaberi Y, Changizian L, Mazlomzadeh S. Predictors of outcome in in-hospital cardio-pulmonary resuscitation. *ZUMS J*. 2011;19(75):48–57.
8. Kolte D, Khera S, Aronow W, Mujib M, Palaniswamy C, Jain D. Gender and racial/ethnic differences in survival after cardiopulmonary resuscitation for in hosoital cardiac arrest. *J Am College Cardiol*. 2014;63(2 Supplement):A341.
9. Jain R, Nallamothu BK, Chan PS. American heart association national registry of cardiopulmonary resuscitation I. body mass index and survival after in-hospital cardiac arrest. *Circulat Cardiovasc Qual Outcomes*. 2010;3(5):490–497.
10. Krittayaphong R, Saengsung P, Chawaruechai T, Yindeengam A, Udompunturak S. Factors predicting outcome of cardiopulmonary resuscitation in a developing country: the Siriraj cardiopulmonary resuscitation registry. *J Med Assoc Thai*. 2009;92(5):618–623.
11. Bellomo R, Goldsmith D, Uchino SH, Buckmaster J, Hart GK, Opdam H. A prospective before and after trial of a medical emergency team. *MJA*. 2003;179(6):283–287.
12. Sandroni C, Ferro G, Santangelo S, Tortora F, Mistural L, Cavallaro F. In hospital cardiac arrest: Survival depends mainly on the effectiveness of the emergency response. *Resuscitation*. 2004;62(3):291–297.
13. Cooper S, Evans C. Resuscitation predictor scoring scale for in hospital cardiac arrests. *Emerg Med J*. 2003;20(1):6–9.
14. Peberdy MA, Kaye W, Ornato JP, Larkin GL, Nadkarni V, Mancini ME. Cardiopulmonary resuscitation of adult in the hospital: A report of 14720 cardiac arrest from the national registry of cardiopulmonary resuscitation. *Resuscitation*. 2003;58(3):297–308.
15. Salari A, Mohammadnezhad E, Vanaki Z, Ahmadi FE. Survival rate and outcomes of cardiopulmonary resuscitation. *Iranian J Crit Care Nurs*. 2010;3(2):45–49.
16. Berim Nezhad L, Rasouli M, Berim Nezhad, Sameie S. Frequency of some factors affecting the outcome of cardiopulmonary resuscitation in Imam Khomeini Hospital of Tehran University of Medical Sciences in 2003. *JRUMS*. 2003;4(4):228–235.
17. Ajbagheri MA, Akbari H, Mousavi GA. Survival after in hospital cardiopulmonary resuscitation. *JRMS*. 2005;10(3):156–163.
18. Dolatabadi A, Setayesh A, Zare M, Hosseinnejad A, Bozorgi F, Farsi D. Descriptive analysis of contributing factor in outcomes of emergency department CPRS. *Crit Care*. 2005;9(1):302–307.
19. Sandroni C, Nolan J, Cavallaro F, Antonelli M. In-hospital cardiac arrest: incidence, prognosis and possible measures to improve survival. *Intensive Care Med*. 2007;33(2):237–245.
20. Eliezer A, Rozenbaum MD, Louis Shenkman MD. Predicting outcome of inhospial cardiopulmonary resuscitation. *Crit Care Med*. 1988;16(6):583–586.
21. Keyvan Pazhouh K, Rahimi rad MH, Farrokh Eslamlou HR. Quality and outcome of cardiopulmonary resuscitation in Imam Khomeini Educational Center of Urmia - Report Based Utstein style. *Urmia Med J*. 2011;22(4):346–352.
22. Hatmi Z, Tahvildari S, Motlag AG, Kashani AS. Prevalence of coronary artery disease risk factors in Iran: a population based survey. *BMC Cardiovasc Dis*. 2007;7(1):32–37.
23. Kasper D, Fauci A, Hauser E, Longo D, Jameson L, Loscalzo J. In: *Harrisons Principles of Internal Medicine (Cardiovascular Disorders), Translate to Persian: Khodaei M, Tayebi Khameneh P*. 19th ed. Tehran: Arjmand; 2015:446.
24. Shahreyar M, Dang G, Bashir MW, et al. Outcomes of in-hospital cardiopulmonary resuscitation in morbidly obese patients. *JACC: Clin Electrophysiol*. 2017;3(2):74–183.
25. Setayesh A, Arhami Dolatabadi A, Farsi D, Hossein Nejad A, Zare M. Evaluation of cardiopulmonary and cerebral resuscitation (CPCR) outcome in emergency department of Hazrat Rasoul-e-Akram Hospital from June 2003 to April 2004. *Razi J Med Sci*. 2006;13(52):135–144.
26. Javadi MS, Mohammadi R, Javadi MS, Oory MJF, Yengejeh MY. Study of Pre-Hospital Cardio Pulmonary Resuscitation (CPR) Outcomes and Relevant Factors in Ardabil City between 2012 and 2013. *Global J Health Sci*. 2016;8(12):258–265.
27. Ramachandran SK, Mhyre J, Kheterpal S, et al.. Predictors of Survival from perioperative cardiopulmonary arrests a retrospective analysis of 2,524 events from the get with the guidelines-resuscitation registry. *Anesthesiol: J Am Soc Anesthesiolog*. 2013;119(6):1322–1339.
28. Gupta T, Kolte D, Khera S, et al.. Relation of smoking status to outcomes after cardiopulmonary resuscitation for in-hospital cardiac arrest. *Am J Cardiol*. 2014;114(2):169–174.
29. Ruiz-Bailén M, de Hoyos EA, Reina-Toral A, Torres-Ruiz JM, Álvarez-Bueno M, Jiménez FJG. Paradoxical effect of smoking in the Spanish population with acute myocardial infarction or unstable angina: results of the ARIAM Register. *Chest*. 2004;125(3):831–840.

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