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Prevalence and Outcome of Cardiac Arrest in Medical Emergency Department at Baghdad Teaching Hospital

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***Abstract**:*
Background: In-hospital cardiac arrest is the prevalent cause of death among patients in emergency care centers of general hospitals. Return of spontaneous circulation represented the cornerstone in management of cardiac arrest.
Aim of study: To estimate the prevalence of in-hospital cardiac arrest patients in emergency medical department of Baghdad Teaching hospital and identification of emergency care outcome of cardiac arrest patients.
Patients and methods: The study is a single observational cohort study carried out in Emergency Medical department of Baghdad Teaching Hospital during the period from 1st of October, 2016 to 1st of October, 2017 on sample of 121 patients with cardiac arrest. Return of spontaneous circulation was checked by the researcher through palpable pulse and measurable blood pressure.
Results: The prevalence of in-hospital cardiac arrest patients presented to emergency department was 12.9 per 1000 admissions. Fifty four (44.6%) cardiac arrest patients had return of spontaneous circulation after resuscitation in emergency department. The fate of return of spontaneous circulation was admission to intensive care unit for 57.4% of cardiac arrest patients and death for 42.6% of them. Return of spontaneous circulation was significantly associated with ventricular fibrillation, hyperkalemia and longer duration of resuscitation.
Conclusions: Incidence rate of in-hospital cardiac arrest patients in emergency department of Baghdad Teaching hospital is relatively high.

Key words: *Cardiac Arrest , Medical Emergency,spontaneous circulation*

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I. Introduction

Cardiac arrest is the sudden cessation of cardiac mechanical function as evidenced by absence of detectable pulse, absent or gasping breath, and/or loss of consciousness . Initial survival after CPR is up to 50 %, but there is low survival to hospital discharge, ranging from 11 to 37 %(1). Considerable regional variation in the incidence and outcome of cardiac arrest within the United States has been reported (2,3,4). The primary goals of cardiac arrest treatment are reestablishing circulation (either manual or spontaneous) as quickly as possible, because survival decreases by approximately 10 percent per minute following arrest (5). Epidemiology In-hospital cardiac arrest occurs in approximately 200,000 patients annually in the United States (6). Despite a poor prognosis, survival for this condition varies by 3-fold across hospitals from 11% to 35% (7). Recently, the Institute of Medicine(8) issued a call to action on increasing our understanding of resuscitation practices to prompt renewed efforts for implementation research. Although several strategies, including bystander delivery of cardiopulmonary resuscitation and therapeutic hypothermia, have been linked to better outcomes for out-of-hospital cardiac arrest, resuscitation practices associated with higher survival for in-hospital cardiac arrest remain undefined. Use of feedback devices to optimize cardiopulmonary resuscitation quality (9) and immediate debriefing of team members after resuscitation(10) have been described in single-center studies, but neither is associated with overall survival. Determining which resuscitation practices distinguish hospitals with high survival rates for in-hospital cardiac arrest remains a critical next step to advancing care in these high-risk patients (11, 12). In-hospital cardiac arrest (IHCA) is a major cause of death among patients (13). Extensive research has been performed regarding out-ofhospital cardiac arrest (OHCA) (14), and efforts to improve prognosis have led to a dramatic increase in survival (15). However, IHCA has not been widely studied, and even basic data, such as incidence, has only been covered in a few reports. Previously, the IHCA incidence of

elderly patients was analyzed using Medicare data (16), and that of adults was based on the United Kingdom National Cardiac Arrest Audit database (17). Guidelines &Recommendations Guidelines for cardiac resuscitation have been implemented at an international level and have undergone several substantial changes (18). The institution of cardiac arrest teams for in-hospital resuscitation has become a standard for many medical centers worldwide. However, the reported survival rates vary significantly according to the center, patient and event characteristics (19). These large variations are primarily due to the absence of standardized data sets containing uniform definitions and reliable data abstraction across hospitals. In an effort to solve this problem, the American Heart Association (AHA) recently published recommendations aimed at measuring and optimizing outcomes after in-hospital cardiac arrest (IHCA)(20). Survival rates among patients with OHCAs have increased in the last decade due to improvements in resuscitation care(21, 22). It is commonly assumed that advances in OHCA care are directly applicable to the epidemiology and treatment of IHCA. Recent data from the Get with the Guidelines (GWTG)–Resuscitation registry based in the United States showed a rate of survival to hospital discharge for IHCA of 17.0%(23). Whether similar rates are observable in other regions remains largely unknown due to the different causes and burden of chronic illnesses that contribute to IHCA epidemiology, team configuration, and access to resources, especially in subSaharanAfrica(24).

Metabolic causes of cardiac arrest like hypovolemia, hypoxia, acidosis, hypokalemia, hyperkalemia, hypoglycemia, and hypothermia must be treated as soon as possible as they are reversible (25). Other treatable causes include tension pneumothorax, cardiac tamponade, pulmonary embolism, myocardial infarction, and toxins (26).

Aim of study: To estimate the prevalence of in-hospital cardiac arrest in emergency medical department of Baghdad Teaching hospital and identification of emergency care outcome of cardiac arrest.

PATIENTS &METHODS : This study is a single observational cohort study carried out in Emergency Medical Ward of Baghdad Teaching Hospital during the period from 1st of October, 2016 to 1st of October, 2017. A sample of 121 with cardiac arrest after their admission to Emergency Medical department of Baghdad Teaching Hospital were the study population. Inclusion criteria : Adults (age ≥18 years old),In-hospital cardiac arrest and Admitted to Emergency Medical department. Exclusion criteria : Patients of age <18 years old, Pregnant patients, Patients present with surgical emergency and Out of hospital cardiac arrest. The data was collected by researcher from the patients and/or their recorded information or their relatives and filled in a prepared questionnaire. The questionnaire was designed by the supervisor and researcher. The questionnaire included the followings.

1. Demographic characteristics: Age and gender. 2. Co-morbid diseases of cardiac arrest patients. 3. Past-surgical of cardiac arrest patients. 4. Drug history of cardiac arrest patients. 5. Causes of admission for cardiac arrest patients. 6. Electrocardiography findings of cardiac arrest patients. 7. Reversible causes of cardiac arrest. 8. Emergency care of cardiac arrest patients which include: a- Number of ROSC. b- Fate of ROSC. C- Resuscitation time. d- Resuscitation team (emergency or medical). 9. Suicidal attempt or not.

The admitted patients with in-hospital cardiac arrest were diagnosed by the researcher and emergency resident. The electrocardiography was conducted by a nurse in the Emergency Medical department. The electrocardiography equipment name is general electric MAC 1600.The resuscitation of in-hospital cardiac arrest patients was done by Emergency Medicine and Internal Medicine residents in Medical department. Return of circulation (ROSC) was checked by the researcher through palpable pulse, measurable blood pressure. The ethical approval was taken from Arab Board for Health Specialties and hospital authorities. ,The researcher assists other Physicians in resuscitation And verbal consent from all patients included in this study

Statistical analysis

All patients' data entered using computerized statistical software; Statistical Package for Social Sciences (SPSS) version 24 was used. Descriptive statistics presented as (mean ± standard deviation) and frequencies as percentages. Multiple contingency tables conducted and appropriate statistical tests performed, Chi square test was used for categorical variables (Fishers exact test was used when expected variable was less than 20% of total) and independent sample t-test was used to compare between two means. In all statistical analysis, level of significance (p value) set at ≤ 0.05 and the result presented as tables and/or graphs. Statistical analysis of the study was done by the community medicine specialist.

II. Results

The total number of patients presented to Emergency Department (ED) of Baghdad Teaching hospital through the period from 1/10/2016 to 1/10/2017 was 32795 and total number of patients with cardiac arrest in ED was424 patients. The incidence of cardiac arrest among patients presented to ED of Baghdad Teaching hospital was 12.9 per 1000 patients. (Table 1).

Table 1: Incidence of cardiac arrest patients presented to ED.

Total no. of cases presented to ED	Total no. of cardiac arrest patients presented to ED	Incidence of cardiac arrest patients presented to ED/1000
32795	424	12.9

A total of 121patients with cardiac arrest were included in this study with mean age of 53.1±16.8 years;11.6% of them were less than 30 years age, 12.4% of them were in age group 30-39 years, 12.4% of them were in age group 40-49 years, 19.8% of them were in age group 50-59 years and 43.8% of them were 60 years of age and more. Males with cardiac arrest were more than females with male to female ratio as 1.3:1. All these findings were shown in table 2.

Table 2: Demographic characteristics of cardiac arrest patients.

Variable	No.	%
Age mean±SD (53.1±16.8 years)		
<30 years	14	11.6
30-39 years	15	12.4
40-49 years	15	12.4
50-59 years	24	19.8
≥60 years	53	43.8
Total	121	100.0
Gender		
Male	69	57.0
Female	52	43.0
Total	121	100.0

The co-morbid diseases were absent among 17 cardiac arrest patients while the present co-morbid diseases were mainly DM (21.3%), cancer (19.4%), HT (18.8%), CKD (14.8%), IHD (6.6%), stroke (2.5%), AF (2%), HF (1.5%), etc. All these findings were shown in table 3.

Table 3: Co-morbid diseases of cardiac arrest patients.

Variable	No.	Cumulative %
Co-morbidity		
No	17	8.6
DM	42	21.3
Cancer	38	19.4
HT	37	18.8
CKD	29	14.8
IHD	13	6.6
Stroke	5	2.5
AF	4	2.0
HF	3	1.5
CLD	2	1.0
Peptic ulcer	2	1.0
DVT	2	1.0
Thalassemia	1	0.5
Asthma	1	0.5
Cardiomyopathy	1	0.5
Total	197	100.0

DM; diabetes mellitus HT:hypertensionCKD:chronic renal failure IHD:ischemic heart diseases AF:atrial fibrillation HF:heart failure DVT:deep vein thrombosis The common previous rhythm findings were sinus rhythm (49.6%), sinus tachycardia (29.8%), sinus rhythm & wide QRS (5.8%), sinus rhythm & sinus wave (5%), AF (4.1%), sinus tachycardia & wide QRS (1.7%), sinus rhythm & second degree AV block (1.7%), Sinus rhythm & low voltage (1.7%) and second degree block (0.8%). The main arrest rhythm findings were PEA (37.2%), asystole (27.3%), VF (20.7%) and pluseless VT (14.9%). All these findings were shown in table 4.

Table 4: Electrocardiography findings of cardiac arrest patients.

Variable	No.	%
Previous rhythm		
Sinus rhythm	60	49.6
Sinus tachycardia	36	29.8
AF	5	4.1
Second degree block	1	0.8
Sinus rhythm & wide QRS	7	5.8
Sinus rhythm & sinus wave	6	5.0
Sinus tachycardia & wide QRS	2	1.7

Sinus rhythm & second degree AV block 2			1.7
Sinus rhythm & low voltage	2	1.7	
Total	121	100.0	
Arrest rhythm			
VF	25	20.7	
Pulseless VT	18	14.9	
PEA	45	37.2	
Asystole33	27.3		
Total	121	100.0	

The reversible causes of cardiac arrest were hypoxia (23.7%), hypovolemia (22.3%), hyperkalemia (17.7%), thrombosis(coronary) (13.4%), thrombosis(pulmonary) (6.6%), hydrogen ion (4.4%), toxins (4.4%), tamponade (2.3%), and unknown (5.2%). There is sometimes more than one cause of cardiac arrest. All these findings were shown in table 5.

Table 5: Reversible causes of cardiac arrest.

Variable	No.	%
Reversible causes		
Hypoxia	32	23.7
Hpovolemia	30	22.3
Hyperkalemia	24	17.7
Thrombosis(coronary)	18	13.4
Thrombosis(pulmonary)	9	6.6
Hydrogen ion	6	4.4
Toxins	6	4.4
Tamponade	3	2.3
Unknown	7	5.2
Total	135	100.0

The ROSC was present in ED for 44.6% of cardiac arrest patients, the mean number of ROSC for each patients was 1±1.2 times; 19% one time, 16.5% 2times and 9.1% more than 2times. The fate of ROSC was admission to ICU for 57.6% of cardiac arrest patients and death for 42.6% of cardiac arrest patients. Mean time of resuscitation of cardiac arrest patients in ED was 26.7±5.4 minutes; 52.1% of them had resuscitation time of more than 25 minutes. The resuscitation team in ED for cardiac arrest patients was mostly ER residents (82.6%) and less common medical residents (17.4%). All these findings were shown in table 6Table 6:Emergency care characteristics of cardiac arrest patients.

Variable No. %
ROSC
Yes 54 44.6
No 67 55.4
Total 121 100.0
ROSC times mean±SD (1±1.2 times)
No 67 55.4
1time 23 19.0
2times 20 16.5
>2times 11 9.1
Total 121 100.0
Fate of ROSC
ICU 31 57.4
Died 23 42.6
Total 54 100.0
Resuscitation time mean±SD (26.7±5.4 minutes)
≤25 minutes 58 47.9
>25 minutes 63 52.1
Total 121 100.0
Resuscitation team
ER resident 100 82.6
Medical resident 21 17.4
Total 121 100.0

No significant differences were observed between patients with ROSC and those with no ROSC regarding their past-surgical and drugs history. All these findings were shown in table 7.

Table 7: Distribution of history according to ROSC.

Variable ROSC No ROSC P
No. % No. %
Past surgical history 0.4*NS
Positive 6 11.1 5 7.5
Negative 48 88.9 62 92.5
Drug history 0.09**NS Positive 40 74.1 40 59.7
Negative 14 25.9 27 40.3

*Fishers exact test, **Chi-square test, NS=Not significant.

No significant differences were observed between patients with ROSC and those with no ROSC regarding previous rhythm (p=0.1). There was a highly significant association between cardiac arrest patients with VF and ROSC (p<0.001). All these findings were shown in table 8

Table 8: Distribution of ECG findings according to ROSC.

Variable ROSC No ROSC P
No. % No. %
Previous rhythm 0.1*NS
Sinus rhythm 22 40.7 38 56.7
Sinus tachycardia 15 27.8 21 31.3
AF 4 7.4 1 1.5
Second degree block 1 1.9 0–
Sinus rhythm & wide QRS 5 9.3 2 3.0
Sinus rhythm & sinus wave 4 7.4 2 3.0
Sinus tachycardia & wide QRS 2 3.7 0–
Sinus rhythm & second degree block 0 - 2 3.0
Sinus rhythm & low voltage 1 1.9 1 1.5
Arrest rhythm<0.001** S
VF 21 38.9 4 6.0
Pulseless VT 13 24.1 5 7.5
PEA 14 25.9 31 46.3
Asystole 6 11.1 27 40.3

*Fishers exact test, **Chi-square test, NS=Not significant, S=Significant.

No significant differences were observed between patients with ROSC and those with no ROSC regarding hypovolemia, hypoxia, tamponade, thrombosis (coronary & pulmonary) and unknown causes. A significant association was observed between cardiac patients with hyperkalemia and ROSC (p=0.04). There was a significant association between cardiac arrest patients with hydrogen ion and no ROSC (p=0.02). A significant association was observed between cardiac patients with toxins and no ROSC (p=0.04). All these findings were shown in table 19.

Table 9: Distribution of reversible causes according to ROSC.

Variable	ROSC		No ROSC		P
	No.	%	No.	%	
Hpovolemia					0.3* NS
Yes	14	25.9	16	23.9	
No	40	74.1	51	76.1	
Hypoxia					0.3* NS
Yes	12	22.2	20	29.9	
No	42	77.8	47	70.1	
Hydrogen ion					0.02**S
Yes	0	-	6	9.0	
No	54	100.	61	91.0	
Hyperkalemia					0.04* S
Yes	15	27.8	9	13.4	
No	39	72.2	58	86.6	
Toxins					0.04**S
Yes	0	-	5	7.5	
No	54	100.0	62	92.5	
Tamponade 0.6** NS					
Yes	1	1.9	2	3.0	
No	53	98.1	65	97.0	
Thrombosis (coronary)					0.1* NS
Yes	11	20.4	7	10.4	
No	43	79.6	60	89.6	
Thrombosis (pulmonary)					0.4** NS
Yes	5	9.3	4	6.0	
No	49	90.7	63	94.0	
Unknown					0.09** NS
Yes	1	1.9	6	9.0	

No	53	98.1	61	91.0

*Chi square test, **Fishers exact test, S= Significant, NS=Not significant.

There was a highly significant association between longer resuscitation time of cardiac arrest patients and ROSC (p<0.001). No significant differences were observed between patients with ROSC and those with no ROSC regarding resuscitation team (p=0.8). There was a highly significant association between cardiac arrest patients admitted to ICU and ROSC (p<0.001). All these findings were shown in table 110

Table 10: Distribution of ED characteristics according to ROSC.

Variable	ROSC		No ROSC		P
	No	. %	No.	%	
Resuscitation time					<0.001*S
≤25 minutes	10	18.5	48	71.6	
>25 minutes	44	81.5	19	28.4	
Mean±SD (minutes)	29.7±4.9		24.3±4.3		<0.001**S
Resuscitation team					0.8*NS
ER resident	45	83.3	55	82.1	
Medical resident	9	16.7	12	17.9	
Fate of ROSC					<0.001*S ICU
31 57.4	0	–			
Died	23	42.6	67	100.0	

*Chi square test, ** Independent sample t-test, S= Significant, NS=Not significant.

No significant differences were observed between ICU admitted and died cardiac arrest patients regarding previous rhythm and arrest rhythm. All these findings were shown in table 11

Table 11: Distribution of ECG findings according to ROSC fate.

Variable	ICU		Died		P
	No.	%	No.	%	
Previous rhythm					0.6*NS
Sinus rhythm	12	38.7	10	43.5	
Sinus tachycardia	8	25.8	7	30.4	
AF	3	9.7	1	4.3	
Second degree block	0	-	1	4.3	
Sinus rhythm & wide QRS	4	12.9	1	4.3	
Sinus rhythm & sinus wave	3	9.7	1	4.3	
Sinus tachycardia & wide QRS	1	3.2	1	4.3	
Sinus rhythm & second degree block	0	-	0	–	
Sinus rhythm & low voltage	0	-	1	4.3	
Arrest rhythm					0.5* NS
VF	12	38.7	9	39.1	
Pulseless VT	9	29.0	4	17.4	
PEA	8	25.8	6	26.1	
Asystole	2	6.5	4	17.4	

*Fishers exact test, NS=Not significant. No significant differences were observed between ICU admitted and died cardiac arrest patients regarding hypovolemia, hydrogen ion, hyperkalemia, toxins, tamonade, thrombosis (coronary), thrombosis (pulmonary) and unknown causes. There was a significant association between cardiac arrest patients with hypoxia and death (p=0.01). All these findings were shown in table 12

Table 12: Distribution of reversible causes according to ROSC fat.

Variable	ICU		Died		P
	No.	%	No.	%	
Hpovolemia					0.2* NS
Yes	10	32.3	4	17.4	
No	21	67.7	19	82.6	
Hypoxia					0.01*S
Yes	3	9.7	9	39.1	
No	28	90.3	14	60.9	
Hydrogen ion					–
Yes	0	-	0	–	
No	31	100.0	23	100.0	
Hyperkalemia					0.3* NS
Yes	10	32.3	5	21.7	
No	21	67.7	18	78.3	
Hypoglycemia					–
Yes	0	-	0	–	
No	31	100.0	23	100.0	
Toxins					–
Yes	0	-	0	–	
No	31	100.0	23	100.0	
Tamponade					0.2** NS

Yes	0	-	1	4.3	
No	31	100.0	22	95.7	
Thrombosis (coronary)					0.2** NS
Yes	8	25.8	3	13.0	
No	23	74.2	20	87.0	
Thrombosis (pulmonary)					0.07** NS
Yes	1	3.2	4	17.4	
No	30	96.8	19	82.6	
Unknown					0.2** NS
Yes	0	-	1	4.3	
No	31	100.0	22	95.7	

*Chi square test, **Fishers exact test, S= Significant, NS=Not significant.

No significant differences were observed between ICU admitted and died cardiac arrest patients regarding resuscitation time, resuscitation team and ROSC times. All these findings were shown in table 13

Table 13: Distribution of ED characteristics according to ROSC fate.

Variable	ICU		Died		P
	No.	%	No	%	
Resuscitation time					0.6*NS
≤25 minutes	5	16.1	5	21.7	
>25 minutes	26	83.9	18	78.3	
Mean±SD (minutes)	30±5.6		29.3±4.1		0.6**NS
Resuscitation team					0.6*NS
ER resident	27	87.1	18	78.3	
Medical resident	4	12.9	5	21.7	
ROSC times					0.7*NS
No	0	-	0	–	
1time	14	45.2	9	39.1	
2times	10	32.3	10	43.5	
>2times	7	22.6	4	17.4	

* Fishers exact test, ** Independent sample t-test, NS=Not significant.

III. Discussion

Present study showed that the incidence rate of in-hospital cardiac arrest patients presented to ED of Baghdad Teaching hospital in a period of one year was 12.9 per 1000 admissions presented to ED. This incidence rate is higher than incidence rate for in-hospital cardiac arrest in single emergency department in Italy of 1.51 per 1000 admissions recorded by Radeschi et al (27). Our incidence rate is lower than incidence rate of in-hospital cardiac arrest cases of 23 per 1000 admissions in emergency department of tertiary hospital in Uganda(1). In USA, Chen et al (28) study reported an incidence rate of 4.02 per 1000 admissions of inhospital cardiac arrest in national registry included tens of hospitals for period from 2000 to 2009. In Iraq, there was only one previous study exploring the incidence rate of out-hospital cardiac arrest conducted in Babylon province and showed that 51% of 4049 cases recorded as sudden cardiac arrest during period of 2010-2015 was out-hospital cardiac arrest(29). In Australia, the incidence of in-hospital cardiac arrest was ranging from 1.3 to 6.1 per 1000 admissions(30). Choi et al (31) study in South Korea found an incidence rate of 2.46 per 1000 admissions for in-hospital cardiac arrest patients in national representative sample for one year period. Mean age of studied in-hospital cardiac arrest patients was 53.1 years with predominance of male gender, in addition to prevalent of co-morbidity with DM, cancer, HT and CKD. These findings are similar to results of Bergum et al (32) study in Norway.

The ROSC in current study for adult patients was detected for 44.6% of in-hospital cardiac arrest patients in ED. This finding is close to results of Nolan et al (17) study in UK which stated that ROSC rate after resuscitation of in-hospital cardiac arrest patients in ED after more than 20 minutes was 45%. Number of ROSC cardiac arrest patients was 54; 31 patients out of them were admitted to ICU and 23 were dead. The ROSC rate of our study is lower than rate of ROSC reported by Shin et al (33) study in South Korea for in-hospital cardiac arrest patients in single tertiary center which was ranging from 54.4% to 69.5% from 2005-2009. However, our study ROSC rate is higher than results of Rasheed et al (34) study in Saudi Arabia which found that the survival of in-hospital cardiac arrest adult patients in tertiary center after resuscitation was 30.5%. These differences in ROSC rates in different centers might be attributed to variations in quality of resuscitation and difference in incidence of inhospital cardiac arrest in addition to differences in methodology between different studies. To improve the ROSC of in-hospital cardiac arrest patients in ED, many factors affecting the ROSC and outcome of cardiac arrest must be identified and improved. The quality of cardiopulmonary resuscitation was proved to be correlated to ROSC rate(35,36). However, some literatures documented that chest compression rate and depth even if accomplished by experienced physician had no effect on ROSC rate(37,38). In present study, two and more ROSC was observed among 25.6% of in-hospital cardiac arrest patients with mean time of 26.7 minutes. This is similar to reports of updated guidelines by American Heart Association which stated that after

resuscitation of cardiac arrest patients, the recurrence is expected which need further resuscitation49. In more than half of studied cardiac arrest patients in our study, the ROSC period duration was more than 25 minutes. Goldberger et al (39) study in USA showed that 48.5% of cardiac arrest patients had ROSC with mean time of 12 minutes and reach 20 minutes for patients not survived after ROSC. Most of resuscitation team in ED in our study was emergency residents. This finding is due to fact that the ED of studied hospital is a tertiary teaching center and for training programs of EM of ARAB and IRAQI boards. Present study showed that cardiac arrest patients with VF were significantly associated with ROSC ($p<0.001$). This finding coincides with results of Lin et al (40) study in Taiwan which found that cardiac arrest patients with VF or PEA had significantly higher rates of sustained ROSC than patients with other abnormal cardiac rhythm. Cardiac arrest patients in current study with hyperkalemia had significantly higher rates of ROSC. This is consistent with results of Freitas et al (41)study in Portugal which documented that cardiac arrest with reversible cause of hyperkalemia had good rate of ROSC as it could be diagnosed rapidly. Despite this finding, our study is inconsistent with results of Chen et al (42) study in Taiwan which revealed that patients without hyperkalemia had higher rates of ROSC. This difference might be due to inclusion of outhospital cardiac arrest patients in Taiwan study. The potassium has a great function in cardiac activity and electrolyte balance. Many authors revealed that serum potassium level was elevated during the cardiac arrest and during the resuscitation (43).Cardiac arrest patients with hydrogen ions and toxins in present study were failed in ROSC. This finding is similar to results of Velissaris et al (44) study in Greece which reported that acidosis and toxicity are poor prognosis factors of cardiac arrest patients' resuscitation and urged on use of Sodium bicarbonate through resuscitation. Present study revealed that mean time of resuscitation for cardiac arrest patients with sustained ROSC was significantly longer than time for patients with no ROSC ($p<0.001$). This finding is in agreement with results of Goldberger et al (39) study in USA which stated that patients with longer duration of resuscitation after in-hospital cardiac arrest had significantly higher impact on ROSC and survival. Inconsistently, Taha et al (45) study in Egypt found that shorter resuscitation duration is a significant independent factor for higher rates of ROSC among inhospital cardiac arrest patients. This inconsistency might be attributed to discrepancy in quality of services of resuscitation in each center in addition to differences in causes of cardiac arrest. The fate of ROSC for in-hospital cardiac arrest patients in our study was death (42.6%) or ICU (57.4%). This outcome in present study is better than results Girotra et al (46) study in USA which revealed that 28.9% of in-hospital cardiac arrest patients during period from 2000-2009 were admitted to ICU after resuscitation in ED. In current American study by Chan et al (47) measured the outcome of in-hospital cardiac arrest patients based on national registry in USA (2013-2015) and reported that the median survival rate of them was 23.7%. Our findings regarding fate of ROSC is also better than results of Wachira et al (24) study in Kenya which recorded survival rate of in-hospital cardiac arrest patients after resuscitation of 11.1%. This difference in survival after resuscitation in our study might be related to many factors like development of Triage system in ED, increased emergency specialty trained medical staff and this study followed the patient to ICU not to discharge. Perman et al (48) study in USA reported that the survival rate after in-hospital cardiac arrest is dependable on location of hospital and the survival rate of inhospital cardiac arrest in ICU is higher than other locations of the hospital. In our study, no significant differences were observed between ICU admitted and died cardiac arrest patients regarding previous rhythm and arrest rhythm. Inconsistently, Keller et al (49)stated that higher incidence of PEA with decline of VF among cardiac arrest patients is related to success of treatment although dismal survival chances for patients with PEA arrest. Reversible factors of cardiac arrest like hypoxia, was significantly associated with death of patients after ROSC. This finding is similar to results of Youness et al(50) study in USA which reported that hypoxia and acidosis are poor prognostic markers for patients with cardiac arrest after ROSC. Present study showed no significant differences between ICU admitted and died cardiac arrest patients regarding resuscitation time, resuscitation team and ROSC times. This finding is inconsistent with results of Chen et al 66 study in Taiwan and Boyce et al (51)study in Netherlands which revealed significant relationship between resuscitation time and ROSC times with fate of ROSC.

IV. Conclusions

Incidence rate of in-hospital cardiac arrest patients in emergency department of Baghdad Teaching hospital is relatively high.

The death outcome of in-hospital cardiac arrest patients in emergency department of Baghdad Teaching hospital is relatively better than other emergency centers.

The good prognostic factors affecting the return of spontaneous circulation rate of in-hospital cardiac arrest patients were ventricular fibrillation, hyperkalemia and longer duration of resuscitation.

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