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Outcome of Coronary Artery Bypass Graft Surgery in Elshaab and Ahmed Gasimhospitals (2012-2015)

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Methods: This was a retro-prospective study conducted in El shaab and Ahmed Gasim Hospitals from 2012 to 2015. Fifty nine patients were included in the study of whom 49(83.1%) were males and 10(16.9%) were females.

The study variables included; patients demographics, etiological risk factors, form of presentation, blood and imaging investigations, indications for coronary artery bypass graft (CABG) surgery, modalities of CABG surgery, prognostic risk factors and outcome of CABG.

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Cardiovascular disease is the leading cause of mortality and important cause of disability. Worldwide, cardiovascular disease (CVD) is responsible for 30% of all deaths and 10% of DALYs (disability-adjusted life Years). In Africa, the burden of cardiovascular disease is increasing rapidly and it is now a public health concern. It has a major socio-economic impact on individuals, families and societies in terms of health care cost, work absenteeism and national productivity.

Abstract- Objectives: The aim of this study was to reveal the mode of presentation of coronary artery disease (CAD) and the outcome of coronary artery bypass graft surgery (CABG)

Methods: This was a retro-prospective study conducted in Elshaab and Ahmed Gasim Hospitals from 2012 to 2015. Fifty nine patients were included in the study of whom 49 (83.1%) were males and 10 (16.9%) were females.

The study variables included; patients demographics, etiological risk factors, form of presentation, blood and imaging investigations, indications for coronary artery bypass graft (CABG) surgery, modalities of CABG surgery, prognostic risk factors and outcome of CABG.

Results: The ages of the patients ranged between (43 – 77 Years) with mean age of 60.23, 46 patients (78%) were from central part of Sudan, 15 patients (25.5%) had more than one risk factor, 34 patients (57.6%) had single risk factor and 10 patients (16.9%) had no identified risk factor. DM was found in 26 patients (44.8%) and so was HTN. 11 patients (18.7%) presented with MI. All patients underwent ECG, Echo., Blood tests and coronary angiography, 30 patients (50.8%) had 3 vessel disease., Thirty six patients (61.0%) underwent on-pump CABG, 23 patients (39%) underwent off-pump CABG. Six patients (10.2%) had small Rt. Coronary artery, 2 patients (3.4%) had severe pulmonary hypertension and 1 patient (1.7%) had raised serum creatinine. Fifty one patients (86.4%) were discharged within first seven postoperative days, 6 patients (10.2%) were discharged within more than 7 days and 2 patients (3.4%) died within first 7 postoperative days. All patients had sternal wounds healed within one Month postoperatively and those with coexisting leg wounds; 3 (5.1%) had leg wounds infection within this period, 51 patients (86.4%) had relieved angina, 52 patients (88.1%) had improved physical activity and the same number of patients achieved psychological improvement within the same period.

Conclusion: Patients with more than one risk factor presented with more severe form of CAD. Off-pump CABG

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had good results in some selected cases with regard to postoperative morbidity and mortality.

I. PATIENTS AND METHODS

a) Study Design

It is descriptive retro-prospective study

b) Study Area

A hospital based study that was conducted in Ashaab and Ahmed Gasim Hospitals

c) Study period

It was carried out during the period extending from 2012 to 2015 as one Year prospective and 2 Years retrospective.

d) Study Population

Adult patients who underwent CABG in the study area during research period.

e) Patients' selection

i. Inclusion criteria

Adult patients who underwent CABG regardless of their gender.

ii. Exclusion criteria

Adult patients who didn't undergo CABG and patients aged below 14 Years.

iii. Sampling

Non probability sampling technique

iv. Sample size

All patients who meet the inclusion and exclusion criteria during study period

v. Study technique

Research team

vi. Author

The Surgical Registrars who look after patients.

vii. Data collection

It was carried out using structured pretested questionnaire

viii. Data variables

It included personal data, etiological risk factors of CAD, mode of presentation, tools of diagnosis, modalities of CABG, indications for CABG, prognostic risk factors and outcome.

II. RESULTS

Fifty nine patients with CAD were enrolled in this study from 2012 - 2015. Of the total number; 49 patients (83.1%) were males and 10 patients (16.9%) were females.

Their ages ranged between (43 – 77 Years) with mean age of 60.29 and 8.305 Std. deviation. With regard to their geographical distribution; 46 patients(78%) were from central part of Sudan, 6 patients(10.1%) were from Northern Sudan, 5 patients(8.5%) were from Western Sudan, 2 patients(3.4%) were from Eastern Sudan and no patient from Southern included in the study.

a) *Etiological risk factors*

Diabetes mellitus represented risk factor in 26(44.8%) patients and it was the most common risk factor alone followed by hypertension, and in coexistence with other risk factors hypertension was the most common; as 13 patients(22%) were diabetic only, 12 patients(20%) were both diabetic and hypertensive and 1 patient(1.7%) was diabetic and smoker. 12 patients(20.3%) were hypertensive only, 2 patients(3.4%) were both hypertensive and smokers, 7 patients(11.9%) were smokers only, 2 patients(3.4%) had hyperlipidemia. There was no positive family history or hyperuricemia as CAD risk factor among the patients enrolled in the study and 10 patients(16.9%) did not have identified risk factor

b) *Form of presentation*

Thirty three patients(55.9%) presented with stable angina, 11 patients(18.7%) with unstable angina and other 11 patients(18.7%) with myocardial infarction. 4 patients(6.8%) had no angina or myocardial infarction. With regard to shortness of breathing according to American thoracic society scale; 6 patients(10.2%) with grade 0 dyspnea, 9 patients(15.3%) presented with grade 1 dyspnea, 4 patients presented with grade 2 dyspnea, 5 patients(8.5%) with grade 3 dyspnea, and other 4 patients(6.7%) with grade 4 dyspnea. And 31 patients(52.5%) had no dyspnea.

c) *Investigations*

All patients underwent ECG, echocardiogram, blood tests and coronary angiography.

d) *Modalities of CABG*

Thirty six patients(61.0%) underwent on pump CABG and 23 patients(39%) underwent off pump CABG. Indications of CABG: Three vessel disease represented indication of CABG in 30 patients(50.8%), critical artery disease untreated by catheter was indication in 14 patients(23.7%), two vessel disease with normal ejection fraction was indication in 11 patients(18.7%), Lt. main artery disease was indication in 3 patients(5.1%) and two vessel disease with decreased ejection fraction was indication in 1 patient(1.7%) (Table 6)

e) *Prognostic risk factors*

Concerning prognostic risk factors; severe pulmonary hypertension was found in 2 patients(3.4%), raised serum creatinine in 1 patient(1.7%), small Rt. Coronary artery was found in 6 patient(10.2%) and there was no identified prognostic risk factor in 50 patients(84.7%).

f) *Early outcome*

Fifty one patients(86.4%) were discharged within seven postoperative days from hospital, 6 patients(10.2%) were discharged within more than 7 postoperative days because of chest infection and all of them were above the age 60 Years, 2 male patients(3.4%) had died within first seven postoperative days(one (75 Years old) died on day zero in ICU because of respiratory failure and he was known diabetic and presented with unstable angina and grade 3 dyspnea according to ATSS preoperatively. The other patient(63 Years old) died on day 1 in ICU because of heart failure he was also diabetic presented with stable angina with grade 3 dyspnea preoperatively).

g) *Late outcome(one Month postoperative)*

All had sternal wounds healed within one month postoperatively as well as stable sternum and those with coexisting leg wounds, 3 of them had leg wound infection within one month postoperatively.

Fifty patients(84.7%) had decreased antianginal drugs within one month postoperatively, 9 patients(15.3%) did not have decreased antianginal drugs. Fifty one patients(86.4%) had relieved anginal pain, 8 patients(13.6%) were still suffering from variable range of severity of symptoms, 4 patients(6.7%) had recurrent angina and 3 of them underwent catheterization. 52 patients(88.1%) had improved physical activity and the same number of patients achieved psychological improvement within one Month postoperatively and no death occurred during this period.

Table 1 : Geographica distribution of CAD risk factors

	Center	North	West	East	Total
DM	10	2	1	0	13(22.4%)
HTN	10	2	0	0	12(20.3%)
smoking	6	0	1	0	7(11.9%)
hyperlipidemia	2	0	0	0	2(3.4%)
DM & HTN	9	1	1	1	12(20.3%)
DM & smoking	1	0	0	0	1(1.7%)
HTN & smoking	1	0	1	0	2(3.4%)
No risk factor	7	1	1	1	10(16.9%)
Total No. & (%)	46(78%)	6(10.2%)	5(8.5%)	2(3.4%)	59(100%)

Table 2 : Correlation between gender and CAD risk factors

Risk factors	Gender		Total No.& (%)
	Male	Female	
DM	10	3	13(22.1%)
HTN	19	3	12(20.3%)
smoking	7	0	7(11.9%)
hyperlipidemia	2	0	2(3.4%)
DM & HTN	10	2	12(20.3%)
DM & smoking	1	0	1(1.7%)
HTN & smoking	2	0	2(3.4%)
No risk factor	8	2	10(16.9%)
Total	49	10	49(100%)

III. DISCUSSION

Internationally, CAD affects women in postmenopausal age at the same frequency as men and in the Western World; it has now surpassed cancers of all types as a leading cause of mortality in females (Crouse and Kramer, 1996). It is known that when female patients present chest pain, they are more likely to have other problems than CAD compared to males with chest pain (Crouse and Kramer, 1996; Miller et al., 2001). This notion may probably be the cause of gender disparities noted in the management of female CAD population not only at primary health care level (Crilly et al., 2008; Bosner et al., 2009) but also at the level of diagnostic work up and choice of revascularization procedure. Under referral of female patients for exercise test and coronary angiography has not only been shown when they present with chest pain (Daly et al., 2006; D'Hoore et al., 1994; Petticrew et al., 1993) but also when they have proven CAD presenting in the form of acute MI (Ayanian and Epstein, 1991; Nguyen et al., 2008; Dellborg and Swedberg, 1993; Alpert and Dalen, 1993). Variability in the results of these studies could be explained by differences in practice patterns by different centres and could also be influenced by regional, cultural and socio-economical factors affecting the health care dynamics of female patients (Ghali et al., 2002). Since the interplay of the above factors is unique in each society, the results from any given study can not be universally applied. There is thus need to study local factors affecting any population

before health care practices and policies may be modified.

With reference to data from Sudan heart institute, CAD is predominantly male disease in Sudanese as is the case of the rest of the world the ratio was 28% females and 72% males in MI trial. And 32% females and 68% males in the CABG group. In our study 83.1% (n = 49 pt.) of the total number (59 pt.) were males and 16.9% (n = 10 pt.) were females. In MI group excluding those with previous history of IHD the mean age of patients was 57 Years, and the mean age of patients in CABG group was 61 Years same as age of South Asian patients and younger than European patients (1). In our study the mean age of the patients underwent CABG was 60.29 with standard deviation of 8.305 which is very close and also comparable to the mean age in CABG group.

With regard to the geographical distribution of CAD, 78% (n = 46) of patients who underwent CABG in our study were from central part of the Sudan; the fact that may support the incrimination of environmental risk factors like (sedentary life style, high fat diet, local tobacco abuse) as a cause beyond increasing incidence of CAD in developing World (1).

Globally, diabetics are at 4 folds increased risk of developing CAD than are normal individuals (2). Patients with type 2 diabetes without prior MI (mean age of 58 Years) are at the same risk of MI (20 – 19 percent) respectively and coronary mortality of (15 versus 16 percent) as patients without DM who had prior MI. (3) And hypertension accounts 47% of all IHD events globally (14). Fourteen studies were reviewed for the

association between smoking and risk of CAD. The definition of smoking applied varied between studies, which included former smokers and current smokers. Former smokers had a risk ratio of 0.68 for CAD when compared to never smokers, while current smokers had a risk ratio of 1.81. When stratified by diabetic and non-diabetic populations the adjusted risk ratios were not significant.

One study, in addition to reporting on the association of the risk factors of interest, also reported association between composite risk factors and risk of CAD. The composite risk factor was defined as having any 1, 2, or 3 of the conditions, which include hypertension, smoking, high TC, low HDL – C, diabetes and obesity. Among CAD patients, 83.7% had at least 1 risk factor, 47.6% had at least 2, and 18.5% had at least 3 risk factors. Among patients with no CAD, only 64.7%, 25.3%, and 6.6% had at least 1, 2, or 3 risk factors respectively. And these were each statistically different from the results for CAD patients. Of all patients with at least one risk factor, CAD patients had more additional risk factors than non CAD patients by a factor of more than 2, to 1. Additionally, each of the individual risk factors were significant contributors to the risk of CAD(4).

Twelve studies were selected for review on the association between lipid conditions and risk of CAD. Three studies reported the association between hyperlipidemia and risk of CAD, 2 between dyslipidemia and risk of CAD and 10 between values on total cholesterol (TC) and triglyceride (TG), LDL – C, HDL – C and risk of CAD. For the association between hyperlipidemia and the risk of CAD, significant crude and adjusted odds ratios were reported in only one case-control study conducted in Shenyang, where the crude OR was reported as 2.77 and adjusted OR as 2.63 (95% confidence interval [CI]: 2.32 – 2.99). The criteria for defining hyperlipidemia were not provided in this study(5).

In Sudan like many other less-developed countries, particularly in sub-Saharan Africa, most of data on disease burden come from extrapolations, as in the Global Burden of Disease Study (GBDS), which relies on cause of -death- models and expert opinion(8). According to Sudan Heart Journal 2013; a comprehensive search in the internet for any topic related to the epidemiology of CAD in Sudan was done, using terms such as prevalence, incidence, mortality, morbidity, risk factors, ischemic heart disease, coronary artery disease, myocardial infarction, acute coronary syndrome and angina with no joy. Website of the Sudanese Ministry of Health was also logged into looking for any statistics related to CAD in Sudan. The epidemiology of CAD in Sudan is derived exclusively from the United Nations projected global burden of CAD(2). In this retrospective study which depended on patients files and notes, the prevalence of risk factors in

CAD patients referred for CABG was as follows: diabetes 49%, hypertension 47%, tobacco abuse 41%, and family history(6) 23%.

In our study, 26(44%) were diabetics and the same ratio were hypertensive, 10 patients(16.9%) were smokers, 2 patients(3.4%) were hyperlipidemic all alone in addition to those with coexisting risk factors. DM was the most common single risk factor 22%(n = 13) followed by HTN 20.3%(n = 12), hyperlipidemia was the less common risk factor followed by smoking and no patients identified with hyperurecemia or positive family history for CAD and 10 patients had no risk factor.(Tables 1, 2, 5). Twenty one of diabetic patients(35.6%) underwent CABG were males and 5 patients(8.5%) were females, the ratios of gender distribution in hypertensive patients were the same as in diabetics. No females recorded with hyperlipidemia or history of smoking in our study. Thirty four patients(57.6%) presented with single risk factor and 15 patients(25.5%) presented with 2 risk factors.

According to patient data from National Registry of MI of USA, of the total number(1.14 million patients) in the study with acute MI, about 35% of patients with acute MI may not have chest pain upon their arrival to emergency department(7).

In our study, of the total number(59 patient) 18.7%(n = 11) of patients presented with MI, majority of them presented with composite risk factor(5 patients with both DM and HTN) and among single risk factors HTN was the most common(3 patients). Other eleven patients presented with unstable angina, 55.9%(n = 33) presented with stable angina and 6.7%(n = 4) had no angina. Table(3). With regard to shortness of breathing according to ATSS; Four patients(6.7%) presented with grade 4 dyspnea with 1 : 3 female to male ratio and 31 patients(52.6%) had no dyspnea table.

In a clinical study published in African Journals on line via Sudan Journal of Medical Science 2012; It was revealed that the Lt. anterior descending artery(LAD) was the most involved and the Lt. main artery(LM) was the least involved(6).

In our study, 30 patients(50.8%) presented with three vessel disease, 14 patients(23.7%) presented with critical artery disease untreated by catheter, 11 patients presented with 2 vessel disease with decreased ejection fraction, 3 patients(5.1%) presented with LM artery disease and 1 patient presented with 2 vessel disease with normal ejection fraction (Table 6). Over all, LAD was the most common vessel to be involved and LM was the least commonly involved as was the case in the study mentioned above.

There is general agreement that CABG improves prognosis in the early postsurgical Years in those patients with symptomatic LM coronary artery stenosis or stenosis of three main coronary vessels although this advantage is not to be significant after 10 – 12 Years(Cundiff 2002, Hlatky et al; 2004). However,

cardiac surgery has advanced to appoint where mortality rates have declined dramatically(8).

With reference to (PMC – US National library of medicine – National institute of health science); up to 25% of CABG operations are off pump, they are as safe as on pump and in experienced hands have less early postoperative complications. In our study, 36 patients(61.0%) underwent on pump CABG, 5 of them(8.4%) were females and 31(52.5%) were males. Twenty three patients(39%) underwent off pump CABG, an other 5 were female and 18(30.5%) were males and no patient with CAD underwent minimally invasive CABG (Tables 6, 7 ,8). Most of patients underwent on pump CABG 40.7%(n =24)were having 3 vessel disease and most of those underwent off pump CABG were those with critical artery disease untreated by catheterization 22.4%(n = 13) Table(6). Nine patients(15.3%) had ungraftable vessels, among them, 6 patients(10.2%) had small Rt. Coronary artery and 3(5.1%) had severely diseased circumflex artery. Left internal mammary artery graft was used in 53 patients(89%), bilateral internal mammary artery graft was used in one patient(1.7%) and this had severely calcified aorta and saphenous vein graft(SVG) was used in 18 patients(30,5%) in 2 patients the SVG was harvested infrainguinal and for the rest of them it was below knee. With regard to associated cardiac comorbidities, One(1.7%) female patient of 78 Years old presented with history of aortic valve replacement because of severe aortic stenosis and one male patient presented with Lt. ventricular thrombus, severe pulmonary hypertension and low ejection fraction.

With reference to Journal of Cardiothoracic Surgery published online in Dec.2014 areview of retrospective analysis in myocardial preservation techniques during coronary artery bypass graft surgery: are we protecting the heart?. Data was analized for 54 patient undergoing CABG surgery. Twenty eight patients received antegrade cold blood cardioplegia(group 1), 16 patients received cross clamp fibrillation(group 2) and 10 antegrade retrograde warm blood cardioplegia (group 3). No significant difference was found with respect to baseline patient baseline characteristics. Expectedly , cross-clamp time was significantly lower in group 2. However, all the remaining paramerters were similar among the 3 groups. In current practice the route of delivery is at the surgeons discretion and as such there is no consensus on using specific route to supply the cardioplegia into the myocardium. The most common technique used by the majority of cardiac surgeons is the antegrade route. Although significant clinical evidence favours the saftey of this method, severe coronary artery stenosis in patients undergoing CABG may prevent the uniform distribution of cardioplegicsolusion through the myocardium and, importantly,

sub-optimal or inadequate distribution to parts of the myocardium increases the risk for PMI. Aproposed solution to overcome this limitation is the retrograde rout of delivery⁽⁹⁾.

But finally, the population size in these studies was too small to come to ameaningful conclusion on the benefit of particular protection strategy. In our study, 54 patients (91.6%) underwent antegradecardioplegia and 5(8.4%) patients underwent retrograde cardioplegia because of severely stenosed coronary ostia⁽⁹⁾.

With regard to outcome of CABG, one study found that 50% of patients were significantly depressed 8 days postsurgery, but this declined substantially with time to 24% 8 weeks postsurgery and 22% at 12 Months(64,65). Assessment of quality of life(QOL) 3 Months before and after heart surgery found that physical mobility was improved in 77% of patients(Wilson-Barnett 1981). Upto 80 of CABG patiets were angina free upto 5 Years after surgery(Fihn et al 2001). Twenty three percent of CABG patients were rehospitalized in the first 6 Months following surgery, cardiac problems were responsible for 32% of problems: cardiac complications 14%, gastrointestinal difficulties 14% and problems in other organ systems 45%(Jenkins et al, 1983)

Concerning the outcome of CABG in our study; fifty one patients(86.4%) were discharged within the first seven postoperative days from hospital, 6 patients(10.2%) were discharged after more than 7 postoperative days because of chest infection, all of them were males and above the age of 60 Years, 3 of them underwent on pump CABG and the other 3 off pump CABG, three patients had single risk factor and other 3 had 2 risk factors,(2 of them were hypertensive an other 2 were both hypertensive and diabetic, 1 was only diabetic and an other one was both diabetic and smoker), HTN and DM were the most common risk factors both alone and in coexistence, and all patients without identified risk factor were discharged within first postoperative week. Two (3.4%) male patients had died within first seven postoperative days: one(75 Years old) died on day zero in the ICU because of respiratory faillture due to severe pulmonary hypertension. The other patient(63 Years old) died on day one in the ICU with heart faillture. Both patients were known diabetic, presented with grade 3 dyspnea according to ATSS and both of them underwent on pump CABG. The first patient presented with unstable angina and the second patient presented with stable angina. One Month postoperatively all patients had healed sternal wounds as well as stable sternums and those with coexisting leg wounds 3 patients(5.1%) had leg wound infection within this period and both were known diabetic and above 70 Years. Fifty patients(84.7%) had decreased their antianginal drugs,52 patients(88.1%) had improved their physical activity and the same number of

patients achieved psychological improvement, 51 patients (86.4%) had relieved anginal pain, 6 patients were still suffering from variable range of severity of angina 1 (1.7%) of them was females and 5 (8.4%) were males, 2 were hypertensive and diabetic, 1 diabetic only, 1 smoker and 1 had no risk factor, 2 presented with no dyspnea, 1 with grade 0, 1 with grade 1 and 2 with grade 4 dyspnea according to ATSS. Five of them underwent on pump CABG and 1 off pump CABG.

IV. COCLUSION

- Coronary artery disease was predominantly male disease in Sudanese patients in El shaab and Ahmed Gasim Hospitals
- Great majority of CAD patients were from central part of Sudan
- Diabetes and hypertension were equal in frequency as etiological risk factors followed by smoking and no patients with positive family history or hyperuricemia were identified in the study
- Significant number of patients had no identified etiological risk factor
- Stable angina was the most common form of presentation followed by equally frequent unstable angina and myocardial infarction
- Majority of patients presented with MI were those with more than single risk factor
- On pump CABG was the most common modality of surgical treatment and three vessel disease was the most common indication for CABG
- Off pump CABG had good outcome in some selected cases with regard to postoperative morbidity and mortality

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