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Highlights

Cardiac Rehabilitation Program

Etiological Spectrum of Obstructive

Discovering Thoughts, Inventing Future

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Etiological Spectrum of Obstructive Jaundice in a Tertiary Care Hospital

By Bimal Chandra Roy, Md. Abu Hanifa, Md. Shafiul Alam, Saimun Naher
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Abstract- Background: Jaundice due to biliary obstruction may be caused by a heterogeneous group of diseases that include both benign and malignant conditions. As patients with obstructive jaundice have high morbidity and mortality, early diagnosis of the cause of obstruction is very important especially in malignant cases, as resection is only possible at that stage.

Objectives: To determine the etiological spectrum of obstructive jaundice in a tertiary care hospital.

Methods: Cross sectional observational study was done in this study. A detailed history and thorough physical examination followed by investigations including liver function test, ultrasonography of whole abdomen & in some selective cases CT scan was done. The data had collected in a pre designed data collection sheet.

Keywords: *obstructive jaundice, etiological spectrum, tertiary care hospital, morbidity and mortality.*

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Etiological Spectrum of Obstructive Jaundice in a Tertiary Care Hospital

Bimal Chandra Roy ^α, Md. Abu Hanifa ^σ, Md. Shafiu Alam ^ρ, Saimun Naher ^ω & Prosannajid Sarkar PhD [¥]

Abstract- Background: Jaundice due to biliary obstruction may be caused by a heterogeneous group of diseases that include both benign and malignant conditions. As patients with obstructive jaundice have high morbidity and mortality, early diagnosis of the cause of obstruction is very important especially in malignant cases, as resection is only possible at that stage.

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Methods: Cross sectional observational study was done in this study. A detailed history and thorough physical examination followed by investigations including liver function test, ultrasonography of whole abdomen & in some selective cases CT scan was done. The data had collected in a pre designed data collection sheet.

Results: 29 patients (58%) had malignant obstructive jaundice and 21 patients (42%) had benign causes of obstructive jaundice. Amongst the malignancies, carcinoma head of the pancreas was the commonest, 15 patients (30%) followed by the carcinoma gall bladder 8 patients (16%). Regarding the benign cause's choledocholithiasis was most common cause, 11 patients (22%) followed by 4 patients (8%) stricture of common bile duct. Amongst the common symptoms anorexia, weight loss and clay colored stool were more frequent in patients with malignant disease and abdominal pain and fever were in benign conditions.

Conclusion: Obstructive jaundice in our setting is more prevalent in females and the cause is mostly malignant. Carcinoma head of pancreas is the commonest malignancy while choledocholithiasis is the commonest benign cause.

Keywords: obstructive jaundice, etiological spectrum, tertiary care hospital, morbidity and mortality.

I. INTRODUCTION

Obstructive jaundice is a common surgical problem that occurs when there is an obstruction to the passage of conjugated bilirubin from liver cells to intestine.¹ It is among the most challenging conditions managed by general

surgeons and contributes significantly to high morbidity and mortality.² The management of obstructive jaundice poses diagnostic and therapeutic challenges to general surgeons practicing specially in resource-limited area.² There is huge discrepancy between the recognized causes of obstructive jaundice at various centers and it is mandatory to determine pre-operatively the existence, the nature of obstruction because an ill-chosen procedure can lead to high morbidity and mortality.³

Jaundice due to biliary obstruction may be caused by a heterogeneous group of diseases that include both benign and malignant conditions.⁴ The surgical jaundice can be caused by the obstruction of the bile duct due to some benign causes like as stone in common bile duct, strictures and some malignancy, such as cholangiocarcinoma, periampullary carcinoma, carcinoma gall bladder and carcinoma head of pancreas.⁵

The symptoms of obstructive jaundice include jaundice with or without pain, dark urine, pruritis, pale stools, weight loss and anorexia.⁶

Obstructive jaundice is characterized by the raised levels of serum alkaline phosphatase rather than aspartate transaminase.⁷ There are various investigations which could be carried out for the diagnosis of obstructive jaundice like ultrasonography,⁸ which can pick up stones, dilated intra-extra hepatic channels, any mass in the abdomen and presence of fluid in the peritoneal cavity, but the gold standard is Endoscopic Retrograde Cholangiopancreatography (ERCP).⁹ ERCP can pick up choledocholithiasis, strictures of CBD, any obstruction of the CBD as well as helps in taking the brushing cytology. Another important non-invasive procedure is Magnetic Resonance Cholangiopancreatography (MRCP). Computerized Tomography (CT), Endoscopic ultrasound and Percutaneous Transhepatic Cholangiopancreatography (PTC) can also be used when required.¹⁰ Invasive tests may cause cholangitis and imaging techniques like computed tomography (CT) scan, PTC, ERCP and MRCP are expensive and are not readily available in most centers.¹¹

Surgery in jaundiced patients is associated with a higher risk of postoperative complications compared with surgery in non jaundiced patients.¹² These complications primarily consist of septic complications (cholangitis, abscesses and leakage), hemorrhage, impaired wound healing and renal disorders.¹² Understanding factors responsible for increased

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morbidity and mortality in these patients will better guide appropriate management.¹³

II. OBJECTIVE OF THE STUDY

The main objective of this study was to determine the etiological spectrum of obstructive jaundice in a tertiary care hospital.

III. MATERIALS AND METHODS

A Cross sectional observational study was done in the Department of Surgery, Rangpur Medical College Hospital, Rangpur, during July-2012 to June-2014. Patients of obstructive jaundice admitted in different surgical wards of Rangpur Medical College Hospital, Rangpur were included in this study. The sample size was 50. Purposive sampling method was used as per inclusion and exclusion criteria. All patients were given an explanation of the study and informed written consent was taken. None of the names were used in the data bases.

After proper counseling a detailed history was taken and a thorough physical examination was done to detect the causes of obstructive jaundice. Routine investigations including ultrasonography of whole abdomen specially hepatobiliary system & pancreas to detect the cause & level of biliary obstruction and liver function test. When cause of biliary obstruction could

not be ascertained by sonographically then CT scan was done with all possible means a pre-operative diagnosis was made. The final diagnosis was based on per-operative findings and histopathological findings of the resected specimen.

Data was collected by pre design data collection sheet. Appropriate statistical analysis of the data was done using computer based SPSS (Statistical Program for Social Science) version-16.0. For comparison of data Chi-square probability test was performed. For each analytical test level of significance was 0.05 and $p < 0.05$ was considered significant. The study was done with existing facilities in Rangpur Medical College Hospital.

IV. RESULTS

The mean age was 50.40 (29-70years), $SD \pm 10.92$. Majority of benign cases was seen in 31-40 years of age, while the malignant cases were more common above 50 years old. Female are more prevalent both in benign and malignant. The male to female ratio for benign jaundice was 1:1.33, while it was 1:1.23 for the malignant obstructive Jaundice. 37 (74%) number of the patients in this study belong low socio-economical conditions. Among them malignant patients are more (42%).

Among distribution of various causes with nature (n=50)

Nature	Causes	No. of patients	Percentage (%)	Total (n=50)
Benign	Choledocolithiasis	11	22	21 42%
	Post cholecystectomy biliary stricture	4	8	
	Post cholecystectomy CBD stone	2	4	
	Worm in CBD	2	4	
	Choledochal cyst	2	4	
Malignant	Carcinoma head of the Pancrease	15	30	29 58%
	Carcinoma GB	8	16	
	Cholangiocarcinoma	3	6	
	Periampullary carcinoma	3	6	

$n = \text{number of patient}$

Benign in 21 (42%) cases, whereas 29 (58%) patients had malignant cause. Choledocholithiasis was the commonest benign cause whereas carcinoma head of the pancreas was commonest in malignant group.

Among distribution of association of symptoms and signs with diagnosis, itching was present in 32 patients (64%). In benign-66.66% and 62.02% in malignant condition which is statistically not significant. Clay coloured stools was present in 35 patients (70%). In benign condition, it was 11 patients (52.38%) and in malignant condition 24 patients (82.75%) and statistically significant. Pain abdomen was present in 27 patients (54%). 19 patients (90.47%) with benign and 8 patients (27.58%) with malignant etiology presenting with this symptom. Pain is predominantly present in

case of benign diseases and it was statistically significant. Anorexia was present in 29 patients (58%). In benign condition it was 5 patients (23.80%) and in malignant condition it was 24 patients (82.75%) and statistically significant in case of malignant.

Weight loss was present in 30 patients (60%). In benign condition it was 4 patients (19.04%) and in malignant condition it was 26 patients (89.65%) and statistically significant for a malignant etiology. Fever was present in a total of 27 patients (54%) with benign condition 17 patients (80.95%) and malignant condition 10 patients (34.48%) which was statistically significant for benign disease. Gall bladder was palpable in 14 patients (28%). In patients with benign condition 1 patients (4.76%) and malignant condition 13 patients

(44.82%) which was statistically significant for a malignant etiology.

In evaluation of imaging techniques for diagnosis, all patients underwent USG, 41 patients (82%) revealed cause of obstruction but in case of 9 patients (18%) exact cause of obstruction could not be ascertained and 12 patients underwent CT scan, most of them were malignant cases and detect accurate cause of obstruction in 11 patients (91%). Sensivity of ultrasonogram was 82% but CT scan 91%. Almost all benign cases diagnosed were made correctly pre-operatively but in malignant, some cases confirmed diagnosis made after histopathology.

Regarding treatment, all choledocholithiasis patients were treated by choledocholithotomy and insertion of T-tube. After laparotomy 4 cases of carcinoma gall bladder were found such an advanced stage that only biopsy specimen were taken, other 4 cases of carcinoma gallbladder were treated with extended cholecystectomy, other than this all malignant cases were treated as palliative surgery like double or triple bypass. Maximum palliative surgery done by double bypass procedure in the form of hepaticojejunostomy and jejunojunctionostomy.

V. DISCUSSIONS

The mean age of the patients with the benign or malignant etiology of obstructive jaundice was 50.40 (29-70years), $SD \pm 10.92$. Most of the patients with the benign jaundice were between 31–40 years of age while malignant causes were more common in the older patients and were maximally seen >50 years of age. The increased incidence of malignant obstructive jaundice with the increasing age has also been reported by various study.^{6, 14, 15}

In this study, both the benign and malignant obstructive jaundice are found more commonly amongst the females than males. The male to female ratio for benign jaundice was 1:1.33, while it was 1:1.23 for the malignant obstructive Jaundice. The increased incidence of obstructive jaundice amongst the females is due to the fact that gall stones are frequently found in them.^{16,17} Some study support this findings.^{14,16} In case of nature, malignant obstructive jaundice was more common than benign, 58% Vs 42% which is in agreement with other studies reported elsewhere.^{1,16,18-20} but in contrast to Bekele *et al*⁵ in Ethiopia who reported benign obstructive jaundice as the most common cause of obstructive jaundice. Regarding the benign causes choledocholithiasis was most common cause, 11 patients (22%) followed by 4 patients (8%) stricture of common bile duct, 2 patients (4%) post cholecystectomy CBD stone, 2 patients (4%) worm in CBD, 2 patients (4%) choledochal cyst. Choledocholithiasis was also found to be the commonest benign cause in others study.^{14,18-21} Amongst the malignancies,

Carcinoma head of pancreas was the commonest, 15 patients (30%) followed by the carcinoma gall bladder 8 patients (16%), cholangiocarcinoma 4 patients (8%) and periampullary carcinoma 2 patients (4%). Similar incidence of various malignancies in patients of obstructive jaundice has been seen in various studies.^{14,20,21} These observations reflect differences in etiological spectrum from one centre to another. Among the symptoms, pruritis was present in 32 patients (64%) which was near to equally in both the benign 14 patients (66.66%) and 18 patients (62.02%) in malignant cases. Clay coloured stools was present in 35 patients (70%). In benign condition, it was 11 patients (52.38%) and more commonly by patients with the malignant jaundice 24 patients (82.75%).

The pain in the abdomen was present in 27 patients (54%) and it was more frequently seen amongst the benign causes 19 patients (90.47%) and almost always present in every case of choledocholithiasis. While 8 patients (27.58%) with malignancy also had abdominal pain on presentation possibly due to advanced disease.¹⁶

Anorexia was present in 29 patients (58%) and was more frequently seen amongst the patients of malignant jaundice, 24 patients (82.75%) and it was statistically significant. In benign condition it was 5 patients (23.80%). Weight loss was present in 30 patients (60%). In benign condition it was 4 patients (19.04%) and in malignant condition it was 26 patients (89.65%). Fever was present in a total of 27 patients (54%) with benign condition 17 patients (80.95%) and malignant condition 10 patients (34.48%) which statistically significant for benign etiology. Gall bladder was palpable in 14 patients (28%). The palpable gall bladder was appreciated in 13 patients (44.82%) with malignancy thus supporting the 'Courvoisier's law'^{16,22}, and only 1 patients (4.76%) gall bladder palpable in cases benign condition.

Amongst the radiological investigations ultrasonogram was the initial imaging investigation for all cases of obstructive jaundice to diagnose the cause of obstruction. Forty one patients (82%) USG revealed cause of obstruction but in case of 9 patients (18%) exact cause of obstruction could not be ascertained. CT scan has several advantages over USG. CT scan was done in patients mostly suspecting of malignancy in USG. Tumor size, its local, regional and distant spread can more accurately be determined by CT scan. CT scan done in 12 patients and detect accurate cause of obstruction in 11 patients (91%). ERCP cannot performed as because this facility was not available in our hospital. Though ERCP has been defined as a 'Gold Standard' for the diagnosis of obstructive jaundice.²³ The final diagnosis was then made based upon the results of histopathology and then results were drawn.

Justification of treatment modalities in the biliary obstruction depend on the site and nature of

obstruction. All choledocholithiasis patients were treated by choledocholithotomy and insertion of T-tube. In all cases of malignancies surgical resection were try to done but not possible as because malignant patients came to our hospital with advanced stage. This delayed presentation of patient to the physician probably due to social and cultural factors and also nature of the disease itself. So all malignant cases were treated as palliative surgery like double or triple bypass. Maximum palliative surgery done by double bypass procedure in the form of hepaticojejunostomy and jejunojunctionostomy.

VI. LIMITATIONS

We have some limitations of this study like, small sample size, as the study was hospital based cross sectional study-it is difficult to generalize the findings to the whole community population and ERCP has been defined as a 'Gold Standard' for the diagnosis of obstructive jaundice but this facility is not available in our hospital.

VII. CONCLUSION

Carcinoma of the head of pancreas is the commonest malignant cause of jaundice whereas stones in the bile duct the commonest benign etiology. Most of patients with malignant obstructive jaundice present late with advanced disease and the only treatment modality for these patients was palliative surgery. In this area latest investigating technology facilities are not available or affordable. Majority of the patients were diagnosed by history, clinical examination, liver function test and ultrasonogram.

Conflict of Interests

The authors declare that there is no conflict of interests regarding the publication of this paper.

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Late Outcome of Direct Vision Urethrotomy in Patients with Urethral Stricture at Kilimanjaro Christian Medical Center (KCMC), Moshi-Tanzania

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Dilation and direct vision urethrotomy are now regarded as neither cost effective nor efficacious as long term strategy for management of urethral stricture disease.

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Keywords: urethral stricture, outcome.

GJMR-I Classification: NLMC Code: WP 175



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Njiku Kimu ^α, Obadia Venance Nyongole ^σ, Bright Frank ^ρ & Jasper Mbwambo ^ω

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Methodology: This is a hospital based retrospective cohort study that involved patients who presented to urology department at KCMC with urethral stricture and underwent direct vision urethrotomy from January 2006 to December 2013.

Results: A total of 648 cases of urethral stricture disease were managed at KCMC between January 2006 and December 2013, out of these 365 (56.3%) underwent DVU and 283 (43.7%) underwent urethroplasty. Of the patients who underwent urethroplasty, 191 (67.5%) underwent anastomotic urethroplasty, 64 (22.6%) underwent staged urethroplasty and 28 (9.9%) underwent substitutional urethroplasty. Out of 365 patients who underwent DVU during the study period 227 (62.2%) met the inclusion criteria, and 138 (37.8%) did not meet the inclusion criteria. Eighty six point four percent of participants were 40 years or older. One hundred and three participants (45.4%) had urethral strictures from iatrogenic causes. Most strictures were located in the bulbous part of urethra (63.9%). The majority of participants (66.1%) had strictures 1cm long or shorter. Most participants (90.8%) had a single stricture. Out of the 227 participants, 102 (44.93%) needed a re-operation. Of the 102 patients who required re-operation; 59 (57.84%) required the operation within six months; 18 (17.65%) within one year; 9 (8.82%) within two

years; 12 (11.76%) within five years; and 4 (3.92%) required the operation beyond five years.

Conclusion: DVU is still the commonest treatment option for patients with urethral stricture at KCMC. Most patients (63%) who underwent DVU were 60 years or above.

The overall long term success rate of DVU was 55.07%

The outcome of DVU was good when stricture was single, the length was 1 cm or less and located in the bulbous urethra.

Recurrence of urethral stricture post DVU is significantly high for strictures which are long, multiple and located in other sites apart from bulbous urethra.

Age of the patient and etiology of the urethral stricture have no influence on the outcome of DVU

Keywords: urethral stricture, outcome.

I. BACKGROUND AND LITERATURE REVIEW

Since the introduction of DVU by Sachse in 1974, the wheel has come a full circle. Earlier studies demonstrated excellent outcomes following DVU and poor success of urethroplasty techniques. However the last two decades have witnessed a revolution in techniques of urethroplasty and many state-of-art centers have reported excellent long-term outcome coupled with the expansion of urethroplasty techniques, studies have highlighted extremely poor long-term outcomes for DVU [Lumen et al, 2009].

Dilatation and DVU are the most common procedures used by the majority of urologists in the United States. Recently, several authors analyzed the trends in male urethral stricture management in the United States using the data from the 1992-2001 Medicare claims. These authors concluded that despite the poor overall efficacy of dilation and DVU, urethroplasty rates were the lowest of all treatments [Barbagli et al, 2012].

Optical urethrotomy is a widely accepted treatment in approximately 80% of patients with urethral strictures. Repeated dilatation and open urethroplasty are other treatment procedures for urethral strictures. Optical urethrotomy (OU) has been performed either under general or spinal anesthesia. There are few excellent reports on use of local anesthesia. Generally

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optical urethrotomy is considered ideal for short segments (less than 2 cm). However, some authors believe that length is not a limiting factor for urethrotomy of anterior urethral strictures. OU has many advantages including day care procedures, early mobilization, shorter period of indwelling catheter and good short term results. However, significant percentage of patients recurs following OU. Most of these patients require either self-dilatation, dilatation by urologist in clinic, repeat OU or open urethroplasty [Zehri et al, 2009].

In a study done in Dar es Salaam a total of 111 patients with urethral strictures were recruited into the study, all were male with age range of 10 – 97 years with a mean of 52.7 years. DVIU was the most performed procedure accounting for 73 (65.8%) of all patients followed by primary urethroplasty at 31 (27.9%) and multistage urethroplasty at 7 (6.3%) [Nyongole et al, 2013].

In a study done at KCMC DVU was done in 50% of cases of urethral stricture [Mteta et al, 2009].

Visual internal urethrotomy provides a safe first line therapeutic option for pediatric urethral stricture shorter than 1 cm, independent of etiology and location. For patients with more than one recurrence or with strictures longer than one centimeter, who are at high risk for recurrence after internal urethrotomy, open Urethroplasty remains the treatment of choice [Hafez et al, 2005].

The classical DVIU includes a single cut made at 12 o'clock position in the scar tissue, till the scar is incised completely. Concerns have been raised about the correct position of the incision. Some authors advocate multiple radial incisions for better incision of the scar. However, there is no reported difference in the outcome of single versus multiple incisions [Santucci et al, 2010].

Laser urethrotomy using different lasers has been attempted to improve outcomes. One prospective study demonstrated superior outcomes using a neodymium-doped yttrium aluminium garnet laser. In this study, recurrence rates following laser urethrotomy were 30% compared to 65% with DVIU over 12-month follow up. However other studies have reported similar success rates after laser and cold knife incision [Turek et al, 1992; Kamp et al, 2006].

In a double-blind, randomized, placebo-controlled study it was shown that injection of triamcinolone acetonide did not improve significantly the outcome of DVU. [Tavakkoli et al, 2011].

The reported duration following urethrotomy ranges from one day to three months. As yet there is no convincing evidence that extending the duration of catheterization has an impact on the outcome. Contrary to the popularly held belief, leaving the urethral catheter in place for three days or less is associated with lower recurrence rate (34%), compared to leaving it for four to seven days or more than seven days (recurrence rates

of 43% and 65% respectively). Most studies have reported catheterization duration of one to four days [Dubey, 2011].

Various techniques have been employed to follow patients following visual internal urethrotomy. These include urethral calibration with a catheter, uroflowmetry, flexible cystourethroscopy, AUA symptom index, urethrographic studies and the need for a repeat procedure. There is no uniformly accepted method of follow-up. Using a peak flow rate of less than 15 ml/sec, stricture recurrence could be diagnosed in 84% patients who had stricture recurrence [Pandasoro et al, 1996].

A retrospective study done in Detroit, Michigan from January 1994 through March 2009 to assess the success of DVIU in series of 76 patients with simple urethral strictures, in this study Time to Recurrence (TTR) was defined as the time from urethrotomy until first subjective or objective sign of recurrence (if known), or actual date of subsequent repeat urethrotomy. Sign of recurrence included decreased force of stream, incomplete bladder emptying, recurrent urinary tract infections, increased post-void residual urine, obstructive pattern on uroflow study or definitive radiographic or cystoscopic evidence or recurrent stricture [Santucci et al, 2010].

In a study done in Germany including two university hospitals, Mainz university (group 1) and Bonn University (group 2) with a mean follow up of 4.6 years in group 1 and 3.2 years in group 2. The stricture recurrence rate in Group 1 was 26.9%, whereas in Group 2 was 44.6%. Subgroup analysis revealed a higher preponderance of idiopathic stricture in Group 1 and iatrogenic strictures in Group 2. Theses authors concluded that idiopathic strictures have a more favorable prognosis [Albers et al, 1996].

In a study done in Italy, 224 patients were followed for longer than 60 months after optical urethrotomy and a preoperative peak flow of less than 15 millilitres per second. The mean patient age was 62 years. The success rate (peak flow rate of more than 15 millilitres per second) was 32% overall, and 42%, 16% and 11% among patients with bulbar, penile and penile bulbar strictures respectively [Pansadoro et al, 1996].

Stricture recurrence has been shown to be directly proportional to stricture length. It has been shown that recurrence rate is high with strictures longer than 1cm. In a study done in Italy success rate was 71% for strictures shorter than 1cm versus only 18% for longer strictures [Pansadoro et al, 1996].

In a study by Albers et al, 1996 which was done in Germany, stricture length was analyzed by retrograde urethrography. The recurrence was 27.8% for strictures less than 1cm which was less compared to long strictures of which recurrence was 50.5% following internal urethrotomy.

In a study done in Nigeria a total of 23 patients needed a repeat urethrotomy within 48 months of follow up (recurrence of 32.9%) [Ramyil et al, 2007].

In another study by Zehri et al, 2009 it was shown that strictures length more than two centimetres was significantly associated with recurrence following DVU, (P Value 0.0001).

A study by Javier et al, 2014 in patients who underwent urethrotomy, the procedure was performed a mean of 1.32 ± 0.94 times; in 20% of the subjects, the treatment included urethroplasty due to the poor results of the previous endoscopic treatment. Analysis of the studied parameters revealed that the length of the stricture was the only factor that influenced sole treatment or treatment with urethrotomy and subsequent urethroplasty.

In a study by Mandhani et al, 2005 the degree of spongiofibrosis associated with strictures may also predict stricture recurrence. However, spongiofibrosis is difficult to quantify. Percentage narrowing on retrograde urethrography can be used to predict stricture recurrence. From January 1991 to June 2002 patients with primary bulbar urethral strictures who underwent DVU were selected for the study. Patients with a history of intervention, complete block of the urethral lumen and stricture greater than 2 cm were excluded from study. Urethral diameter at the area of maximum stenosis and at the normal distal urethra was measured on RGU with Vernier caliper and percentage narrowing was derived. Patients were followed 3 times monthly with symptoms, calibration and whenever required with RGU. Recurrence of symptoms, failure to self-calibrate and the need for secondary procedure were considered treatment failure. Complete follow up data were available in 105 patients (44 grade 1 and 61 grade 2). Mean bulbar urethral stricture length was 0.86 cm. Inflammation was the cause of stricture in 83 (79%) and trauma the cause in 22 (21%) patients. In the Cox proportional hazards model only grade of narrowing had a significant impact on outcome. There were 41 cases of treatment failure in the total follow up of 46 +/- 9 months. Mean recurrence-free duration +/- SD was 13 +/- 15 and 44.52 +/- 19 months in cases of treatment failure and success, respectively ($p < 0.0001$). Mean percentage narrowing was significantly higher with treatment failure (69.9% +/- 16.1% vs 48.55% +/- 17.3%, $p < 0.0001$). A cutoff of 74% for urethral narrowing was derived to predict the outcome with 78% probability.

In a study done by Albers et al, 1996 in Germany strictures were in bulbous urethra in 52.6% of the cases and multiple in 21.9%. Penile strictures (28.6%) had the highest recurrence rates (42.5%), bulbar strictures had the lowest recurrence rate (34.3%). Location did not significantly influence recurrence rate.

The location of the stricture did not influence outcome of DVU. Among short strictures those in the

bulbar showed lower recurrence rates than, for example, those in the penile urethra, which may be explained by the better vascularization of the proximal urethra. Nonetheless, the process and scarring certainly depend more on aetiology than stricture location [Albers et al, 1996].

In a systematic review by Dubey, some studies have found that iatrogenic strictures had higher recurrence rates than inflammatory or traumatic strictures, whereas another study showed better results for iatrogenic strictures. Inflammatory strictures occurring after long-term catheterization or genital infection were found to be associated with higher chance of recurrence. Others have found no relationship between stricture etiology and risk of recurrence. There is no consensus on whether stricture etiology predicts recurrence, as different studies have proposed different aetiologies as poor responders to DVU.

In a study by Heyns et al, 1998 a single dilatation or a DVU, not followed by restricting at 3 months, the stricture recurrence rate was 55-60% at 24 months and 50-60% at 48 months. After a second DVU for stricture recurrence at 3 months, the stricture-free rate was 30-50% at 24 months and 0-40% at 48 months. After a third dilatation or DVU for stricture recurrence at 3 and 6 months, the stricture-free rate at 24 months was 0. Urethrotomy has no role when stricture recurrence occurs within 3 months of DVU or recurs after a second urethrotomy.

In a study by Pansadoro et al, 1996 only 2 of the 47 patients treated with multiple urethrotomies achieved a good result and a third or fourth urethrotomy always failed. In a study involving 126 patients who underwent internal urethrotomy and got recurrence underwent either a subsequent urethrotomy or urethroplasty. It was demonstrated that repeat urethrotomy was neither cost-effective nor clinically effective.

In a study by Kjaergard et al, 1988 43 patients were randomized to either weekly CISC for one year or no CISC. The stricture recurrence was 68% in those who did not perform CISC versus 19% in those who did, clearly demonstrating the beneficial effects for CISC.

In a study by Bubey, 2011 it was shown that biweekly intermittent self-dilation (ISD) when continued for longer than 12 months, had a much lower rate of stricture recurrence (16%) when compared with the group that performed ISD for 6 months (40%). There is no role for short-term ISD following urethrectomy.

II. METHODS

a) Study design

This was a retrospective hospital based cohort study conducted at KCMC, which is a tertiary referral hospital receiving patients from districts and regional hospitals from the Central and northern zone of Tanzania but also from other zones and neighboring

countries. It involved all patients who had urethral stricture and underwent DVU with a follow of at least six months at KCMC from January 2006 to December 2013.

Patients with incomplete information (incomplete investigation, incomplete surgical operation report) and those who were lost to follow up were excluded from the study.

b) Ethical issues

Ethical clearance was approved by KCMU College Research and Ethics Review Committee for ethical clearance. All patients' information were kept confidential and not to be accessed by people not involved in the study

c) Data processing and analysis

All the collected data were recorded into the extraction form and were checked by the researcher for completeness and consistency. Data from patient record extraction forms were entered into excel spreadsheet and then transferred into SAS (version 9.3) statistical software (SAS Institute, Cary, NC, USA) for

analysis. Proportions were used to describe the basic characteristics of the study participants and the patient long term outcomes. Statistical significance was considered when the respective p value was less than 0.05.

III. RESULTS

A total of 648 cases of urethral stricture disease were managed at KCMC between January 2006 and December 2013, out of these 365 (56.3%) underwent DVU and 283 (43.7%) underwent urethroplasty. One hundred ninety one (67.5%) patients underwent anastomotic urethroplasty, 64 (22.6%) underwent staged urethroplasty and 28 (9.9%) underwent substitutional urethroplasty. Out of 365 patients who underwent DVU during the study period 227 (62.2%) met the inclusion criteria, and 138 (37.8%) did not meet the inclusion criteria. Sixty three percent of participants were aged 60 years or above 60 years as shown in **Figure 1**;

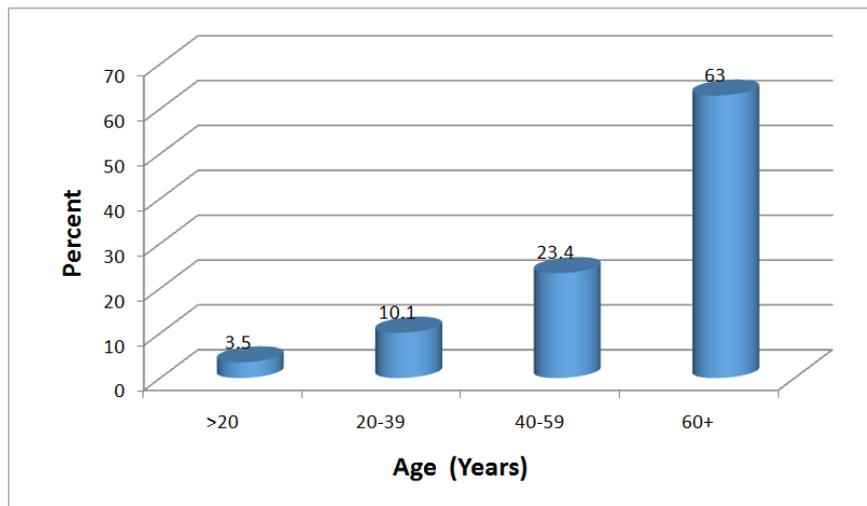


Figure 1: Bar chart showing age distribution of patients who underwent DVU (N=227).

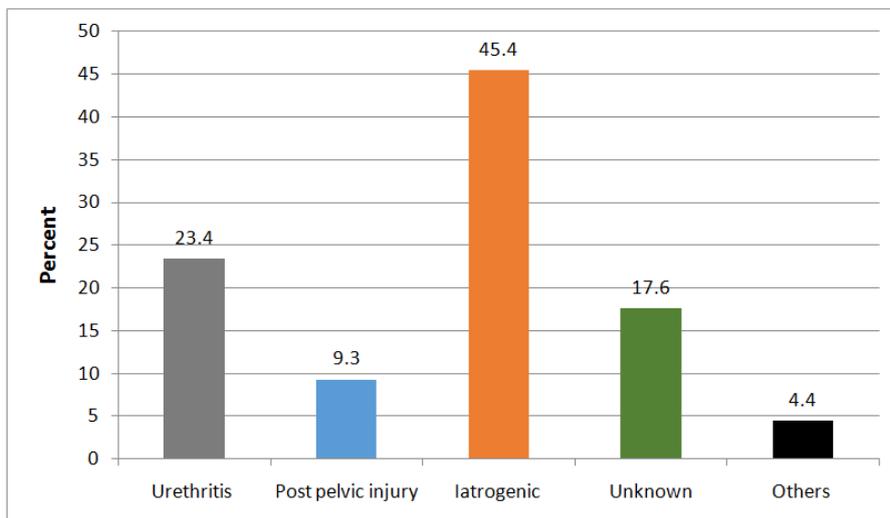


Figure 3 : Aetiologies of urethral stricture in patients who underwent DVU (N=227).

Iatrogenic urethral injuries were found to be the main cause of urethral strictures in 45.4% cases as shown in Figure 3.

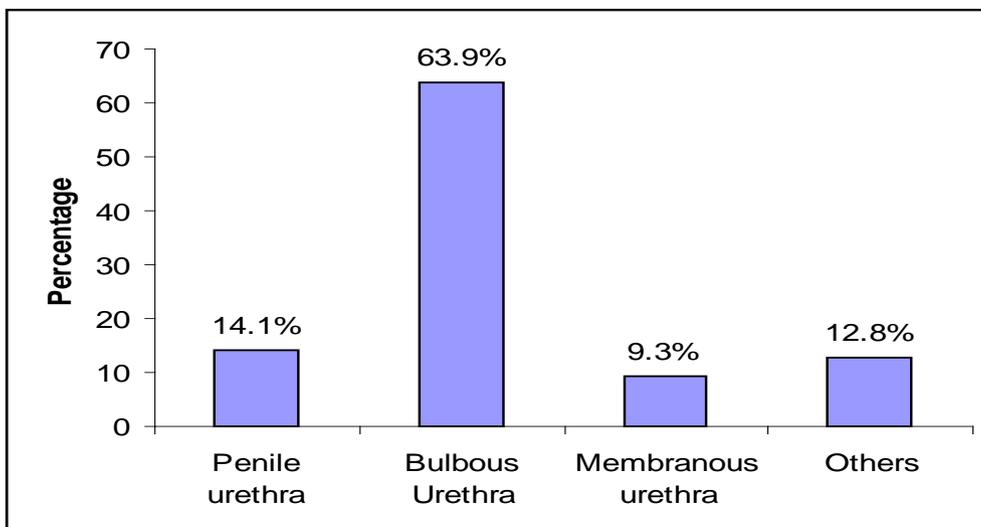


Figure 4 : Site of urethral strictures in patients who underwent DVU (N=227).

One hundred forty five (63.9%) of those who underwent DVU had strictures located at the bulbous part of urethra as shown in figure 4 above.

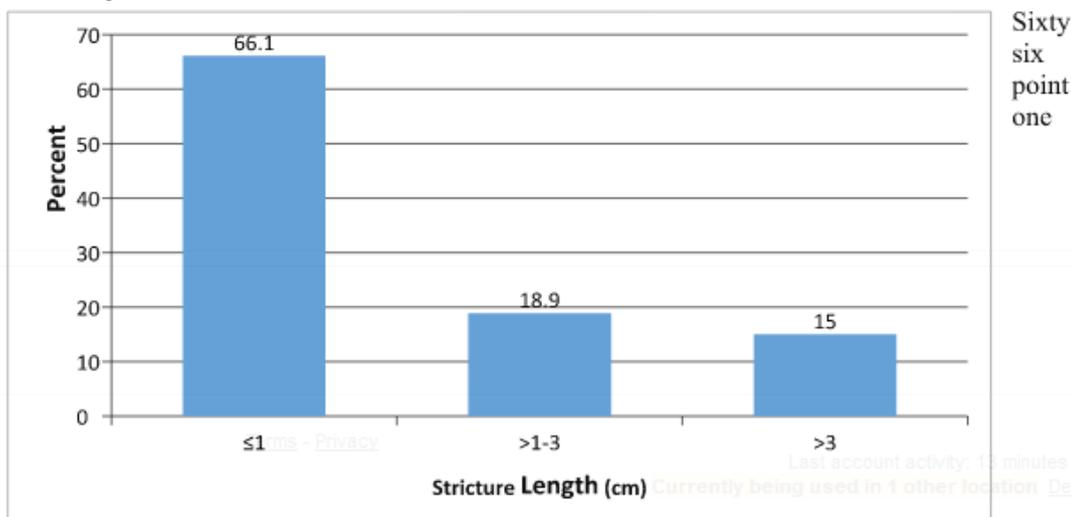


Figure 5 : Length of urethral strictures in patients who underwent DVU (227).

Sixty six point one participants had strictures of 1 cm long or less than 1cm as shown in figure 5 above.

Table 1 : Late DVU outcome among Patients Undergoing DVU at KCMC (227).

	Number	Percent
DVU Outcome		
Need re-operation	102	44.9
No re-operation	125	55.1
Need of re-operation		
Within six months	59	57.8
Within one year	18	17.7
Within two years	9	8.8
Within five years	12	11.8
Beyond five years	4	3.9

Out of the 227 participants, 102 (44.9%) needed a re-operation. Of the 102 patients who required re-operation; 59 (57.8%) required the operation within six months; 18 (17.7%) within one year; 9 (8.8%) within two

years; 12 (11.8%) within five years; and 4 (3.9%) required the operation beyond five years as shown in table 1 above.

Table 2 : Outcome of DVU with age

Age group	Outcome of DVU		
	Recurrence	No Recurrence	Total
<20	5 (62.5%)	3 (37.5%)	8 (3.52%)
20-39	10 (43.48%)	13 (56.52%)	23 (10.13%)
40-59	25 (47.17%)	28 (52.83 %)	53 (23.35%)
≥60	62 (43.36%)	81 (56.64%)	143 (63.00%)
Total	102 (44.93%)	125 (55.07%)	227 (100%)

There was no statistical significant difference in the outcome of DVU in the different age groups (using Fisher's Exact Test P value 0.77)

Table 3 : Outcome of DVU with length of urethral stricture

Length of stricture (cm)	Outcome of DVU		
	No Recurrence	Recurrence	Total
<1	76 (80.00%)	19 (20.00%)	95 (41.85%)
1-3	45 (37.5%)	75 (62.5%)	120 (52.86%)
>3	4 (33.33%)	8 (66.67%)	12 (5.29%)
Total	125 (55.07%)	102 (44.93%)	227 (100%)

The recurrence of stricture following DVU increased proportionally to stricture length. Stricture recurrence rates were 20%, 62.5% and 66.67% for

strictures less than 1 cm, 1 to 3 cm and above 3 cm respectively. The difference was statistically significant. (Chi-Square 41.1251, DF 2, P value < 0.0001)

Table 4 : Outcome of DVU with stricture location

Stricture Location	Outcome of DVU		
	No Recurrence	Recurrence	Total
Bulbous	90 (62.07%)	55 (37.93%)	145 (63.88%)
Others	35 (42.68%)	47 (57.32%)	82 (36.12%)
Total	125 (55.07%)	102 (44.93%)	227 (100%)

Bulbous urethral strictures showed a better outcome compared to strictures at other sites. Recurrence of stricture following DVU for bulbous

stricture was 37.93% while for other sites was 57.32% as shown in Table 4. This difference is statistically significant. (Chi-Square 7.9557, DF 1, P value 0.005)

Table 5 : Outcome of DVU with number of urethral strictures

Number of strictures	Outcome		
	No Recurrence	Recurrence	Total
Single	118 (57.28%)	88 (42.72%)	206 (90.75%)
Multiple	7 (33.33%)	14 (66.67%)	21(9.25%)
Total	125 (55.07%)	102 (44.93%)	227 (100%)

Single strictures had better outcome after DVU compared to multiple strictures. Stricture recurrence was 42.72% for single strictures compared to 66.67% for multiple strictures and the difference is statistically significant. (Chi Square 4.4172, DF 1 P value 0.04)

The mean age is higher compared to findings in other African countries whereby the mean age was younger. In Nigeria the mean age was 30.6 years [Ramyil et al, 2007] and in Ethiopia the median age was 43 years [Hagos, 2008].

IV. DISCUSSION

In this study patients with urethral stricture treated by DVU at KCMC had age range from 4 years to 93 years with a mean age of 61.9 years. Age distribution of patients who underwent DVU at KCMC is similar to the findings in most studies done in developed countries (Italy, the mean age of patients was 62 years, range 11 to 90 years, Pansadoro et al, 1996)

The difference in mean age between this study and the ones done in other African countries could be explained by the etiological factors of urethral strictures, whereby in these other African countries infection was the leading cause of urethral stricture (61.4% in Nigeria and 82.4% in Ethiopia). In this study infection contributed only 23.4% of urethral strictures while majority of urethral strictures were caused by iatrogenic injuries (45.4%). These findings are similar to the ones in

studies done in developed world where iatrogenic causes accounted for 45% of urethral strictures while urethritis accounted for 20% of cases [Tritschler et al, 2013]. In another study done in Europe iatrogenic causes accounted for 45.5% of strictures. In patients younger than 45 years the main causes were idiopathic, hypospadias surgery and pelvic fracture. In patients older than 45 years the main causes were transurethral resection and idiopathic [Lumen et al, 2009].

Most patients in this study had strictures located in bulbous urethra (63.9%) which is higher compared to results found in other studies, (Pansadoro and Emilliozi 49%, Albers 52.6% and Tritschler et al 50%).

In this study it was found that overall stricture recurrence rate was 44.9% which is similar to what was found by a study by Albers et al (44.8%) and Tritschler et al (50%). Other studies had very high stricture recurrence rates of up to 93% to 94%. In a study by Santucci et al stricture free rate (SFR) at five years was 7% and in the one done by Pansadoro et al it was 6%. In both these two studies the sample sizes were small, 76 cases and 47 cases respectively.

The long term outcome of DVU was found to be better for strictures located in bulbous urethra and this difference was statistically significant (P value 0.005). Albers et al found less recurrence with bulbous urethral strictures but without statistical significance. This is explained by more cases of urethral stricture in this study being bulbous and most of them were short compared to other studies and which explains the better results in this site.

In this study length of urethral stricture was associated with recurrence following DVU and this finding was statistically significant (P-Value less than 0.0001). The chance of urethral stricture recurrence is directly proportional to stricture length. This finding is similar to the ones found in other studies [Albers et al, 1996; Pansadoro et al, 1996].

Urethral stricture aetiology was found not to influence the outcome of DVU in this study (P value 0.21), this is similar to what other studies found. Albers et al found that iatrogenic strictures had less recurrence rate with statistical significance.

Patients with multiple strictures who underwent DVU showed poorer outcomes compared to those with a single stricture, this difference was found to be statistically significant (P value 0.04). This is similar to what Pansadoro et al found.

a) Study limitations

Inadequate documentations of patients' case notes especially on the symptoms/ clinical findings at surgery, significant number of patients were lost to follow up post operatively and some of the urethrograms reports were very deficient.

V. CONCLUSION

DVU is still the commonest treatment option for patients with urethral stricture at KCMC. Most patients (63%) who underwent DVU were 60 years or above.

The overall long term success rate of DVU was 55.07%

The outcome of DVU was good when stricture was single; the length was 1 cm or less and located in the bulbous urethra.

Recurrence of urethral stricture post DVU is significantly high for strictures which are long, multiple and located in other sites apart from bulbous urethra.

Age of the patient and etiology of the urethral stricture have no influence on the outcome of DVU

VI. RECOMMENDATION

DVU should be the first line treatment only for short urethral strictures, single and located in the bulbous urethra.

Prospective studies are needed to assess the long term outcome post DVU in patients with urethral stricture including validation of a tool for outcome measure.

Competing interests

The authors declare no competing interests.

VII. ACKNOWLEDGEMENT

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Long Term Effect of Cardiac Rehabilitation Program on Patients with Percutaneous Coronary Intervention

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Abstract- Background: Cardiovascular disease (CVD) is a major health problem worldwide. Cardiac rehabilitation (CR) is mainly involved with secondary prevention which relies on early detection of the disease process and application of interventions to prevent the progression of disease. These interventions include education; counseling and behavioral strategies to promote lifestyle change and modify risk factors. The aim of this study was to determine the long term effect of CR on patients with percutaneous coronary intervention (PCI).

Subjects and Methods: Sixty patients of both sexes (41 men and 19 women) had been recruited from National Heart Institute, Cairo. All patients underwent PCI. They were randomly assigned to two equal groups in number.

Keywords: *percutaneous coronary intervention, cardiac rehabilitation, functional capacity, cardiovascular risk factors, quality of life.*

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Abstract- Background: Cardiovascular disease (CVD) is a major health problem worldwide. Cardiac rehabilitation (CR) is mainly involved with secondary prevention which relies on early detection of the disease process and application of interventions to prevent the progression of disease. These interventions include education; counseling and behavioral strategies to promote lifestyle change and modify risk factors. The aim of this study was to determine the long term effect of CR on patients with percutaneous coronary intervention (PCI).

Subjects and Methods: Sixty patients of both sexes (41 men and 19 women) had been recruited from National Heart Institute, Cairo. All patients underwent PCI. They were randomly assigned to two equal groups in number. Study group was 30 patients (21 men and 9 women, mean age was 52.6 ± 5 years) that had been received aerobic mild to moderate intensity exercise training on bicycle ergometer for 50 minutes, 3 times/week, for 6 months and educational program of secondary prevention, and was followed up after one year, while control group was 30 patients (20 men and 10 women, mean age was 53.8 ± 5 years) that had been received instructions about risk factors after PCI once and followed up after one year. Functional capacity was evaluated by 6-minutes walking test (6MWT), quality of life (QoL) was assessed by 36-Item Short- Form Health Survey (SF-36) and different risk factors e.g. smoking status, body mass index(BMI), fasting blood glucose, blood pressure, blood lipid levels, were assessed before and after the CR for both groups.

Results: After CR, a significant increase was observed in 6 MWT ($P < 0.05$), significant improve in cardiovascular risk factors(smoking status, body mass index, fasting blood glucose, blood pressure, blood lipid levels) and QoL were increased in the study group ($P < 0.05$) compared to control group.

Conclusion: Cardiac rehabilitation significantly improves functional capacity and cardiovascular risk factors and QoL after percutaneous coronary intervention. It is recommended not to miss referral to rehabilitation units.

Keywords: percutaneous coronary intervention, cardiac rehabilitation, functional capacity, cardiovascular risk factors, quality of life.

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I. INTRODUCTION

Coronary artery disease (CAD) is the main cause of death worldwide. (1) It is potentially fatal disease with high lifetime prevalence. In terms of mortality it represents the most important disease in the group of all CVD, which, in turn, are responsible for most of the deaths in developing and in industrialized countries. (2) In Egypt, and Similar to other Arab countries, ischemic heart disease and stroke are the second and fourth common cause of death in 1990 but in 2010 they shifted to be the first and second cause respectively. CAD mortality accounts for 46% of total deaths, all ages and both sexes, according to WHO (2014). Trends in CAD mortality in the last few years show a minor reduction due to preventive efforts especially against smoking, an operational action plan to reduce the burden of tobacco use. (3)The development of CAD is multicausal and is related to a variety of risk factors, many of them strongly influenced by individual behavior, such as smoking, exercise, diet, diabetes mellitus, hypertension and hypercholesterolemia. (4) It has been suggested that modification of these modifiable risk factors could reduce the burden of CAD by approximately 90%. These risk factors, however, also strongly influence the prognosis of patients with established CAD. In addition to the well established pharmacological management of patients with CAD, behavioral changes to modify these lifestyle factors in affected individuals are therefore recommended to form the basis of all secondary prevention strategies of CAD. (2)

Cardiac rehabilitation programs have become an integral part of the standard of care in modern cardiology. Their scope has shifted from the emphasis on exercise therapy to comprehensive secondary prevention strategies managing risk factors, nutritional, psychological, behavioral and social factors that can affect patient outcomes. While the importance of primary prevention measures aimed at delaying or preventing the onset of cardiovascular disease is obvious and cannot be emphasized enough, CR is mainly involved with secondary prevention which relies on early detection of the disease process and application of

interventions to prevent the progression of disease. These interventions include education, counseling and behavioral strategies to promote lifestyle change and modify risk factors. Clinical trials have proven that strategies for the detection and the modification of risk factors can slow, stabilize or even modestly reverse the progression of atherosclerosis and reduce cardiovascular events. In most current guidelines of cardiovascular societies worldwide, CR is a class I recommendation. (5)

The American Heart Association (AHA) defined CR as a “medically supervised program to help heart patients recover quickly and improve their overall physical and mental functioning”. (6) Goals for CR include improving aerobic endurance and muscular strength, and modifying cardiovascular risk factors, including losing weight, lowering cholesterol, improving blood glucose, controlling blood pressure, and smoking cessation. (7) Recent research has shown that people who have experienced cardiac events can handle more frequent and intense exercise than originally thought. (8) (9)

Quality of life reflects the functional effect of an illness and its therapy from the patient’s point of view. Poor QoL has been associated with poorer outcomes, such as lower survival rates, increases in the number of hospitalizations, decreased capacity to perform activities of daily living, and decreased compliance with treatments in other populations like cardiac patients. (10) This study was conducted to find out the long term effect of CR on patients with PCI, and the potential effect CR to improve functional status, cardiovascular risk factors presented with these patients, and its effect to improve their QoL.

II. PATIENTS AND METHODS

This study was conducted in physiotherapy department of National Heart Institute (NHI). 60 Patients of both sexes, their age was 40-60 years old, within the first year after PCI, their mean BMI was $\leq 35\text{Kg/m}^2$, were selected and assigned to two equal groups in number. The study group (30 patients, 21 men and 9 women) that had been received aerobic mild to moderate exercise training and educational program of secondary prevention, while the control group (30 patients, 20 men and 10 women) that had been received instructions about risk factors after PCI once and were followed up after one year.

Exclusion criteria were patients with renal failure, chronic liver disease, Patients with arrhythmia, Chest disease, and patient who could not fulfill the questionnaire or cooperate through the performed procedures.

Before starting the study, a meeting was done for all patients to record demographic data and risk factors (smoking status, BMI, fasting blood glucose,

systolic and diastolic blood pressure, and blood lipid levels) presented with each patient. In that stage a face to face instructions and administration of SF- 36 questionnaire to all participants was given. 6-MWT was introduced to each patient along the 20 m straight corridor of the physiotherapy department of NHI. All patients were taking their medications normally. Participants in the CR program were requested to attend their exercise program three times/week for a period of six months.

Mild to moderate intensity exercise is prescribed based on Borg’s rating of perceived exertion (RPE) scale. The scale is comprised of 15 points where a rating of 6 means no exertion and a rating of 20 means maximal exertion. Patients were encouraged to achieve a rating between 11 (fairly light) and 14 (hard), as many cardiac patients may use beta blockers in their treatment medications, that work to reduce resting and maximal heart rate. (11) For participants in the CR program involved in this study, each exercise session is comprised of a 5 - 10 minute warming up, 5-10 minutes cooling down, and approximately 30 minutes of aerobic exercise. Aerobic exercise was the dominant mode of exercise which implemented using bicycle ergometer in the CR program 3 times/week for 6 month. Patients were given an idea about risk factors control and secondary prevention according to AHA guidelines for secondary prevention 2011. (12) After one year, risk factors were measured, and also SF- 36 and 6 MWT were measured again.

Data were analyzed with SPSS software version 17. Parametric data was analyzed using the student t-test. Non parametric data was analyzed using McNemar test for the same group, and Mann-whitney test to compare between both groups. The level of significance was set at $P < 0.05$. Paired t-test was applied for each group to compare pre and post values within the same group. Unpaired t-test was applied to compare pre and post values between both groups of the study.

III. RESULTS

Base line measurements had shown no statistical significant differences between both groups ($P > 0.05$). The baseline and final values of each group (Table 1) had shown highly significant differences in 6MWT, smoking cessation rate, BMI, TC, HDL and LDL ($P < 0.001$), FBG and TG had improved significantly ($P < 0.05$), SBP and DBP did not improve significantly in the study group ($P > 0.05$). The control group had shown significant improves in 6MWT and BMI, other parameters did not change significantly ($P > 0.05$).

All risk factors were improved significantly in the study group when compared with the control group after the program ($P < 0.05$). The increase in 6MWT was highly significant ($P < 0.001$).

As shown in (table 2) the 8 domains of SF-36 of the study group had increased highly significantly ($P < 0.001$). The control group had shown highly significant increase in PF and GH ($P < 0.001$), and significant increase in E/F ($P < 0.05$), other parameters did not increase significantly ($P > 0.05$).

All domains of SF-36 were improved significantly in the study group when compared with the control group after the program ($P < 0.05$), and EW increased highly significantly ($P < 0.001$).

Table (1) : Changes of risk factors from baseline to the end of the program within each group and between groups

Variables	Study group			Control group			P value for both groups after program
	Pre program	Post program	P Value	Pre program	Post program	P Value	
	Mean \pm SD	Mean \pm SD		Mean \pm SD	Mean \pm SD		
6MWT (m)	414.8 \pm 57.4	\uparrow 489 \pm 54.8	0.000*	419 \pm 50.2	\uparrow 430.5 \pm 47.3	0.01*	0.000*
Smoking	67%	\downarrow 17%	0.000*	63.3%	\downarrow 50%	0.13	0.007*
BMI (Kg/m ²)	30.8 \pm 1.9	\downarrow 28.2 \pm 2.6	0.000*	30.2 \pm 1.7	\downarrow 29.6 \pm 2.1	0.03*	0.03*
FBG (mg/dl)	131.7 \pm 47.3	\downarrow 106.8 \pm 36.5	0.01*	128.5 \pm 54.5	\downarrow 127 \pm 38.3	0.86	0.04*
SBP (mm/Hg)	129.2 \pm 18.7	\downarrow 123.8 \pm 13.5	0.22	128.5 \pm 16.6	\uparrow 131.2 \pm 14.6	0.47	0.05*
DBP (mm/Hg)	81.3 \pm 8.8	\downarrow 79.2 \pm 7.8	0.31	82.8 \pm 9.2	\uparrow 84.6 \pm 8.2	0.38	0.01*
TC (mg/dl)	199.1 \pm 48.9	\downarrow 176.3 \pm 42.1	0.000*	198.8 \pm 41.7	\downarrow 197.3 \pm 39.4	0.71	0.05*
TG (mg/dl)	148.2 \pm 34.2	\downarrow 132.1 \pm 28.8	0.01*	151.1 \pm 32.5	\downarrow 149.8 \pm 35.1	0.65	0.04*
HDL (mg/dl)	35.6 \pm 8.5	\uparrow 37.5 \pm 8.8	0.001*	33.3 \pm 7.8	\downarrow 32.1 \pm 7.4	0.72	0.01*
LDL (mg/dl)	134 \pm 49.1	\downarrow 112.1 \pm 44.6	0.000*	135.2 \pm 45.3	\uparrow 136 \pm 41.5	0.88	0.04*

SD=Standard Deviation, 6MWT= 6 minutes walking test, BMI=Body mass index, FBG=Fasting blood glucose, SBP= Systolic blood pressure, DBP= Diastolic blood pressure, TC=Total cholesterol, TG=triglyceride, HDL=High density lipoprotein, LDL=Low density lipoprotein, Significant level: $P < 0.05$.*

Table (2) : Changes of 8 domains of SF-36 from baseline to the end of the program within each group and between groups

Variables	Study group			Control group			P value for both groups after program
	Pre program	Post program	P Value	Pre program	Post program	P Value	
	Mean \pm SD	Mean \pm SD		Mean \pm SD	Mean \pm SD		
PF	64.3 \pm 7.1	\uparrow 83.5 \pm 6.5	0.000*	63.2 \pm 6.9	\uparrow 76.7 \pm 10.6	0.000*	0.01*
RLPH	35 \pm 24.2	\uparrow 62.5 \pm 23.4	0.000*	40.8 \pm 23.2	\uparrow 50.8 \pm 20.2	0.11	0.04*
RLEP	34.1 \pm 23.7	\uparrow 61.1 \pm 21.6	0.000*	41.8 \pm 21.1	\uparrow 49.9 \pm 19.1	0.09	0.04*
E/F	51.7 \pm 7.8	\uparrow 66 \pm 11.1	0.000*	51.3 \pm 7.9	\uparrow 57.7 \pm 11.7	0.01*	0.01*
EW	61.3 \pm 6.2	\uparrow 69.5 \pm 2.6	0.000*	59.1 \pm 6.1	\uparrow 61.5 \pm 7.5	0.18	0.000*
SF	50.9 \pm 10.5	\uparrow 67.5 \pm 19	0.000*	51.7 \pm 10.9	\uparrow 56.3 \pm 16.3	0.23	0.02*
P	65.2 \pm 9.7	\uparrow 79.6 \pm 18.4	0.000*	62.7 \pm 10.2	\uparrow 67.9 \pm 15.9	0.07	0.01*
GH	28.2 \pm 5	\uparrow 43 \pm 7.9	0.000*	27.3 \pm 4.8	\uparrow 38.5 \pm 8.8	0.000*	0.04*

SD=Standard Deviation, PF=Physical functioning, RLPH=Role limitations due to physical health, RLEP=Role limitations due to emotional problems, E/F=Energy/ fatigue, EW=Emotional wellbeing, SF=Social functioning, P=Pain, GH=General health. Significant level: $P < 0.05$.*

IV. DISCUSSION

The benefits of exercise-based CR on cardiovascular risk factors, QoL, exercise tolerance, cardiac morbidity and mortality have been widely

established in CAD patients. (1) The aim of this study was to determine the long term effect of CR on patients with PCI, and its potential effect on risk factors control and the subsequent improvement in their QoL. The results of the current study showed significant

improvement of functional status, risk factors of CVD and QoL in the study group. The following is a detailed discussion of the different variables of the study.

About smoking, percent of reduction were 75% ↓ and 21% ↓ in the study and control groups respectively. Reduction in the study group was statistically significant and also, comparison between both groups after CR. The results were supported by Wood et al. The proportions of patients with CHD who quit smoking at 1 year were significantly higher in the study group than in usual-care group. In the intervention group, 58% of the volunteers were not smokers at 1 year compared with 47% in the usual-care group. (13) Along with the same results Redfern et al. had reported significant reductions in smoking behaviors in the study group compared to the control group. (14) Although Judith et al. had reported a non significant difference between intervention and control groups at one year about smoking cessation, he reported a significant improvement results at two and three years. (15)

In current study the patients of study group revealed highly significant increase in their functional capacity, and control group increased significantly, Percent of change was (18% ↑ and 3% ↑) respectively, when measured by 6-MWT, that was reflected in improvement of the physical functioning score section of SF-36 for both groups (Percent of change was 29.8% ↑ and 21.4% ↑) respectively. Changes in control group reflected the positive effects of PCI on physical function of the patients. Comparison of both groups revealed highly significant increase in the study group at the end of the program, which, in turn reflect the more beneficial effect of CR on patient when added to PCI effect. Supporting the study results Fatimah et al. revealed an increase in functional capacity after the CR program measured by 6-MWT and no significant differences were seen in their control group and mean distance walked was increased 19.3% in the study group. (16) Raymond et al. had shown significant improvement in exercise capacity after CR including low risk individual, exercise capacity parameters such as 6MWT and treadmill exercise test were statistically significant after the program. (17) In a study by Viviane et al. both aerobic interval training and continuous training equally improved aerobic exercise capacity in patients with CAD and self perceived QoL increased significantly ($P < 0.05$) and to a similar extent after both types of training. (1)

Consequently, the results was coincided with results achieved by Yu et al. who showed significant improvement in the frequency, duration of physical activities and total score of self efficacy scale in the experimental group, which can effectively improve the patients exercise compliance, promote the willingness of physical exercise and help the patients establish healthy behaviors. (18) As a result, promoting the recovery of cardiac function. Consistent with the results, Judith et al. who reported significant improvements in the study

group compared to the control group in maximal workload. (15)

In current study, following CR program, study group achieved positive reduction in weight and BMI. BMI was decreased highly significantly in the study group, also control group decreased significantly. Comparing two groups showed four times reduction in study group more than control group, Percent of reduction was (8.4 % ↓ and 2% ↓) for study and control groups respectively. Masoumeh et al. showed that obese patients in the study group had greater improvement in weight reduction and subsequent BMI that was statistically significant when compared with control group. (19) Another study by Manzoni et al. showed the positive effects of short term CR program on weight reduction and functional capacity in obese patients with CAD. (20) In contrast, results of Kiat et al. suggested CR program didn't had effect on weight reduction, while it is useful in increasing levels of functional capacity. (21) Pantaleo et al. estimated that at baseline, there was no significant difference in BMI between the study and usual care groups, at 6months, it increased by 0.7% in the study group and 0.9% in the usual care group, there was a 0.2% lower increase in BMI in the study group. At the end of his study, BMI increased by 1.7% and 2.1% in the study and usual care groups, respectively, a difference that was statistically significant. (22)

Fasting blood glucose was highly significantly reduced in the study group after the program, without significant change in the control group. Percent of reduction was (18.8 % ↓ and 1.2% ↓) for study and control groups respectively; comparison of both groups had showed significant decrease in the study group after program.

Both SBP and DBP changed to levels that were statistically significant when comparing both groups after the program, although changes in both groups separately were not significant. Percent of change in SBP was (4.2 % ↓ and 2.1% ↑) and DBP was (2.6% ↓ and 2.3% ↑) for study and control groups respectively. Improvement of study group and deterioration of control group showed the positive effect of CR program. Diabetes mellitus is a chronic condition with devastating cardiovascular complications, the prevalence of diabetes was reported as 13.5% in Egypt and it is closely associated with a concomitant rise in obesity rates. (23) (24) Going with the same effects of CR on FBG and blood pressure control Bestehorn et al. mentioned that at discharge FBG values decreased to 104 mg/dl (108 mg/dl at entry), mean SBP and DBP decreased also to 122/73 mmHg (131/77 mmHg at entry) which were statistically significant. (25) Again Redfern et al. had concluded significant difference in SBP among study group compared to control group patients at three months and 12 months. (14) Fatemeh et al. results showed that CR to have significant effects

on hemodynamic responses such as resting and maximum systolic and diastolic blood pressure. (16) In a systemic review by Judith et al. significant improvements in SBP and DBP in study group patients compared to control groups, at one, two, and three years were seen. (15)

The results of this study indicated that exercise and educating patients of PCI during CR program could improve lipid profile levels. The patients of the study group had achieved significant reductions in TC, TG and LDL levels and significant increase in HDL levels, no significant changes were seen in control group. Significant improvements were seen in the study group when compared to the control group after the program. Percents of changes were (11.5% ↓ and 0.75% ↓ for TC, 10.9% ↓ and 0.86% ↓ for TG, 5.3% ↑ and 3.6% ↓ for HDL, and 16.3% ↓ and 0.44% ↑ for LDL) for study and control groups respectively. Both groups were taking lipid lowering drug therapy as prescribed by the physicians, which explains the effect of exercise training and awareness program on lipid profile for the study group. The greater effect of exercise and education on the study group suggests a possible additional effect on adherence to physical activity, prescribed medications and healthy life style. Masoumeh et al. presented significant improvements in all lipid profiles in non obese patients, and in obese patients, this positive improvement was only perceived in TC. (19) Results of the current study were more supported by Viviane et al. that found that both aerobic interval training and continuous training improved HDL levels significantly in both groups. (1)

Bassem et al. mentioned affection in the QoL in patients with CAD in the form of presence of symptoms limiting their activity, such as chest pain due to angina attacks, shortness of breath, palpitation. Also, the daily activities may be limited in usual daily activities as moderate activities. Lifting or carrying groceries, climbing several flights of stairs, climbing one flight of stairs, bending, kneeling, stooping, walking for a bus station distance, bathing or dressing himself, and sexual dysfunction, and recurrent sick leaves due to his or her heart condition. (26)

The results obtained in the present study revealed statistical significant increases in SF-36 variables. Percent of changes were (29.8% ↑ and 21.4% ↑ for PF, 78.6% ↑ and 24.5% ↑ for RLPH, 79.2% ↑ and 19.4% ↑ for RLEP, and 27.9% ↑ and 12.5% ↑ for E/F, 13.4% ↑ and 4.1% ↑ for EW, 32.6% ↑ and 8.9% ↑ for SF, 22.1% ↑ and 8.3% ↑ for P, and 52.5% ↑ and 41% ↑ for GH) for study and control groups respectively. CR has large effects on improving different domains of SF-36 as presented in results of study group, although some domains like PF, E/F and GH had increased significantly in the control group reflecting the positive effect of PCI, they were not as large as improvements of study group. Supporting current results, Marzieh et al. had shown that

scores of all physical domains of the SF-36 were significantly improved in all patients compared to the baseline. Patients with age < 65 years had greater improvements in mental health and social function than patients with age ≥ 65 years. Women had greater improvement in PF, vitality and mental health compared to men. Furthermore he concluded from his results that CR can improve QoL in cardiac patients especially in women. Elderly patients get benefit the same as other patients in physical domains. On the other hand, increasing exercise capacity improves patients' ability for daily living activities, work and leisure activities, which in turn results in improving QoL. (27) A systematic review article Taylor et al. indicated that home based CR and center based CR both improve QoL. CR can decrease psychological stress of cardiovascular diseases and improve QoL in cardiac patients. (28) Marzieh et al. pointed out that 12 months CR improves physical index and QoL of cardiac patients. (27)

Roberto et al. published the results of a study designed to compare the effect on QoL of CR programs shorter than 6 months, longer than 6 months, or no CR. Nine months after completion of the different programs, QoL was significantly higher among patients who had undergone CR, regardless of duration, and there were no significantly different effects between CR programs of more than or less than 6 months, also he note that the increased patient compliance observed in the shorter programs. (29) Yohannes et al. results demonstrated the benefits of CR in improving QoL and physical activity, and in reducing anxiety and depression. Furthermore, these benefits were maintained at 12 month follow up. (30)

There is a significant and positive relationship between changes in secondary prevention and changes in QoL. Patients started the study with low level of QoL scores and had shown significant increases in QoL scores following the CR programme. Also, the ability of patients to exercise had increased significantly. As the physical abilities of patients increased, they reported feeling less pain, more energy and better emotional state. Increased physical ability was associated with a brighter outlook on current and expected future health status.

V. CONCLUSION

It was concluded that long term CR program and secondary prevention according to the guidelines of AHA has a positive effects in improving risk factors in PCI patients who presented with uncontrolled cardiovascular risk factors, also QoL was improved, further more CR is a good method that improve adherence to healthy life style, orientation and ability of the patient to cope with the disease.

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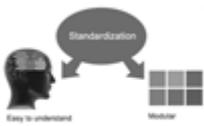
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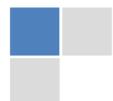
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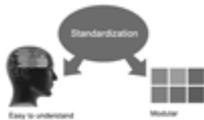


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- It may take the discovery of only one relevant paper to let steer in the right keyword direction because in most databases, the keywords under which a research paper is abstracted are listed with the paper.
- One should avoid outdated words.

Keywords are the key that opens a door to research work sources. Keyword searching is an art in which researcher's skills are bound to improve with experience and time.

Numerical Methods: Numerical methods used should be clear and, where appropriate, supported by references.

Acknowledgements: Please make these as concise as possible.

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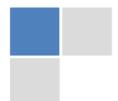
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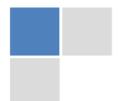
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<i>Methods and Procedures</i>	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
<i>Result</i>	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
<i>Discussion</i>	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
<i>References</i>	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring



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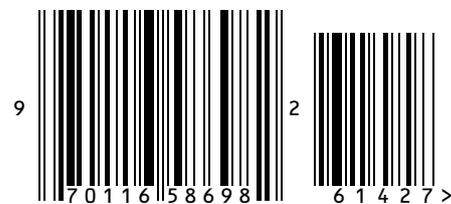
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