

Experience with pulmonary rehabilitation program in a tertiary care center in Saudi Arabia

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ABSTRACT

الهدف: الهدف من هذه الدراسة هو استعراض خبرة مركز طبي متقدم في المملكة العربية السعودية عن برنامج التأهيل التنفسي.

الطريقة: تم دراسة البيانات الخاصة بالمرضى الذين تم تحويلهم إلى مركز التأهيل التنفسي بمدينة الملك عبد العزيز الطبية بالرياض لفترة ٣٠ شهرا بدايتها يوليو ٢٠٠٤. وتم تقديم برنامج التأهيل التنفسي المعتاد لهؤلاء المرضى. صنف المرضى الذين حضروا بمنتظمين أو غير منتظمين. وتم تحليل بيانات المرضى، وكذلك أسباب عدم الالتزام.

النتائج: من مجموع ١٢١ مريضا تمت دعوتهم إلى برنامج التأهيل التنفسي خلال فترة الدراسة، ٨٩ (٧٣،٦٪) حضروا إلى البرنامج و٣٢ (٢٦،٤٪) لم يحضروا. من ٨٩ مريضا حضروا برنامج التأهيل التنفسي، ٥١ (٥٧،٣٪) كانوا منتظمين، في حين أن ٣٨ (٤٢،٧٪) حضروا ولم يكونوا منتظمين. البيانات الديموغرافية والفسولوجية الأساسية لكلتا المجموعتين لم تكن مختلفة. أسباب عدم الانتظام هي: صعوبة المواصلات (٣٤،٢٪)، أو التنويم في المستشفى (٢٣،٧٪)، أو أسباب غير محددة (٤٢،١٪). عند إكمال برنامج التأهيل التنفسي، أظهرت قياسات الجهد تحسنا كبيرا في مسافة السير لمدة ستة دقائق، والمسافة والوقت الذي يقضيه المريض في جهاز المشي الآلي ودراسة الذراع والدراجة العادية.

خاتمة: تنفيذ برنامج التأهيل التنفسي في مركز طبي متقدم في المملكة العربية السعودية مجد وأدى إلى تحسن ملحوظ في أداء التمارين وممارسة اللياقة البدنية عموما.

Objective: To present the experience with the first pulmonary rehabilitation (PR) program in Saudi Arabia.

Methods: The prospectively collected data of patients referred to PR program in Saudi Arabia over 30 months starting on July 2004, were reviewed. A standard outpatient PR was offered to those patients with chronic lung diseases. Those patients attended to were classified as adherent or non adherent. There data were analyzed, as well as, the reasons for non-adherence.

Results: Out of 121 patients referred to the PR center during the study period, 89 (73.6%) attended PR program and 32 (26.4%) did not attend their initial appointment. Among 89 patients who attended the PR program, 51 (57.3%) were adherent, while 38 (42.7%) attended but were non-adherent. The demographic data and the basic physiological parameters of both groups were not significantly different. Reasons for non-adherence were: difficulties in transportation (34.2%), admission to the hospital (23.7%), and no specific reason (42.1%). Upon completion of the PR, the exercise parameters in the adherent group showed significant improvement in the 6 minutes walk distance, and the distance and time spent in the treadmill, arm ergometer, and bicycle.

Conclusion: Implementing a PR program in a tertiary care centre in Saudi Arabia was feasible and led to marked improvement in exercise performance and overall physical fitness.

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Based on growing scientific evidence, pulmonary rehabilitation (PR) is regarded as a standard component of a comprehensive management care plan for chronic obstructive pulmonary disease (COPD) and other chronic lung diseases (CLD).¹⁻⁵ Its importance has emerged as the morbidity caused by CLD represents a public health challenge and also has a significant impact on the health system expenditure and the individual quality of life.^{6,7} Moreover, COPD was recognized as the only disease with increasing prevalence among the

top 10 diseases in the USA.⁸ It is the consensus that PR will lead to greater effect to patients with CLD as manifested by improvements in exercise performance, health-related quality of life and health care expenditure.⁹ These benefits were confirmed in a recent multi-centre study that showed PR will lead to less utilization of health care services and the benefits will be sustained for at least 18 months.¹⁰ A recent report from Saudi Arabia showed that 15% of patients admitted to general medical wards were due to CLD.¹¹ Approximately 60% of those patients would be considered potential candidates to PR. Despite that the available data clearly indicate that PR is an essential component of the management of patients with CLD, it is not yet widely utilized in many developing countries.¹² The primary objective of this paper was to present the experience with the first PR center in Saudi Arabia based on prospectively collected data. The secondary objective was to discuss the process of launching and implementing PR.

Methods. This study presented the experience with PR based on prospectively collected data of patients referred to the PR Program at King Abdulaziz Medical City, Riyadh, Saudi Arabia for the period from 1st July 2004 until the end of December 2006. The study included adult patients aged more than 18 years with CLD. All patients were referred from either a pulmonary clinic or a family medicine clinic after being evaluated by a pulmonary physician. After optimization of pharmacological therapy by a pulmonary physician, patients were referred to participate in a PR program. Patients were invited to participate after review and approval of the request by the medical director. A PR physiotherapist initially interviewed the participating patients. No quality of life measures were conducted, as it was not available in Arabic during the study period. Criteria for referral included patients with CLD with moderate to severe disability as judged by the managing physician. Patients were considered ineligible only if they had severe co-morbidity which significantly interfered with their ability to participate in the program, for example; symptomatic ischemic heart disease, severe left ventricular dysfunction, severe leg claudication, or their survival over one year was likely to be adversely influenced.

Pulmonary Rehabilitation. The PR protocol is designed to be attended 2-3 visits per week over 8-12 weeks period for total of 18-24 sessions in an outpatients setting. Pulmonary rehabilitation was offered to patients without payment as part of eligibility policy of our institute. The program provided exercise therapy consisting of combination track or treadmill walking, upright cycling, stair stepping and arm ergometer. The intensity of exercises was tailored to each particular

patient's tolerance based on patient's physiological parameters and PR physiotherapist judgment. Aerobic exercises included lower extremity, upper extremity, flexibility, and strength. Selected patients offered resistive exercises training that included hand weights and elastics bands. Later, the PR physiotherapist decided to conduct direct small group sessions, as group educational sessions were not well attended by the participants in the initial period of the PR program (2001-2003). Nutritional and psychosocial assessment and counseling were likewise offered to active participants whenever deemed necessary. Education modules were offered throughout programs covering obstructive and restrictive lung diseases, pulmonary hygiene, breathing retraining, risk factor modification, dietary modification, pulmonary medications and equipment, stress management/relaxation, exercise benefits, smoking cessation advise, musculoskeletal injury prevention, and overall pulmonary disease intervention. These topics were available in Arabic language.¹³ The PR was conducted by 2 PR physiotherapists under the supervision of a trained pulmonary physician which in this case is the medical director himself.

Data collection. For the purpose of this study, demographic data were collected including age, gender, diagnosis, forced expiratory volume in one second (FEV1), adherence, and reason of non-adherence. At the initial visit, the following data were collected: 6 minutes walk distance (6MWT) and the distance and duration spent on the treadmill, arm ergo meter, and bicycle. The previous parameters were repeated at the end of PR protocol for adherent patients. The FEV1 was performed by Jaeger Master Lab, Germany. Forced expiratory volume in one second was calculated from the best of at least 3 trials as recommended by the American Thoracic Society (ATS).¹⁴ The 6MWT was performed according to the ATS guidelines and it was supervised by a PR physiotherapist throughout the test.¹⁵

Adherence and non-adherence. The PR staffs were responsible for evaluating all referral forms. Eligible patients were invited to attend at booked appointments. Invited patients who did not attend and declined to take part in the PR program were described but were not analyzed. Adherent group (AG) was defined as those who completed the requirements of PR protocol which is defined as 2-3 visits per week over 8-12 weeks period for total of 18-24 sessions. Non-adherent (NAG) was defined as those who attended without fulfilling the minimum requirements of the aforementioned criteria.

Statistical Analysis. Calculating the mean and the standard deviation summarized continuous variables, whereas calculating the number and percentage summarized categorical variables. The association

between different categorical variables was assessed using the Chi-square test, whereas the paired and unpaired T-test was used for the association with the continuous variables. A p -value of <0.05 was regarded as statistically significant.

Results. Out of 121 patients referred to the PR center during the study period, 89 (73.6%) attended PR program and 32 (26.4%) did not attend their initial appointment and declined to take part in the PR program after they have accepted the referral. The characteristics of those 32 patients who did not attend the PR program were as follows: age was 60.4 ± 12.4 years, men were 15 (46.9%), women were 17 (53.1%), and FEV1 of 56.2 ± 16.3 years. None of these parameters were significantly different from those who attended the program. Among 89 patients who attended the PR program, 51 (57.3%) were adherent and completed the requirements, while 38 (42.7%)

attended but were non-adherent to the approved PR requirements. The demographic characteristics of both groups were not significantly different (**Table 1**). There was also no significant difference between both groups regarding initial 6MWD and other exercise parameters applied in PR protocol (**Table 2**). Reasons for non-adherence are: difficulties in transportation 13 patients (34.2%), admission to the hospital 9 (23.7%), and no specific reason 16 (42.1%). Upon completion of the PR, the exercise parameters in the AG showed marked significant improvement in the 6MWD, and the distance and time spent in the treadmill, arm ergometer, and bicycle (**Table 3**). There was a tendency towards better improvement in physiological parameters among non-COPD subgroup; no statistical analysis was applied due to the small size number (**Table 4**). The presented data did not show significant correlation between the indication for referral and adherence to PR (**Figure 1**). On patients with chronic asthma and

Table 1 - Demographic data among 89 patients attended the PR program.

Characteristics	Adherent group	Non-adherent group	Total
Number of patients (%)	51 (57.3)	38 (42.7)	89 (100)
Age (mean \pm SD)	59.7 \pm 14.2	64 .1 \pm 13.1	
<i>Gender (%)</i>			
Men	20 (39.2)	17 (44.7)	37 (41.6)
Women	31 (60.8)	21 (55.3)	52 (58.4)
Forced expiratory volume in the first second (mean \pm SD)	54.5 \pm 21.1	50.0 \pm 17.2	
Indication for pr referral			
Chronic obstructive pulmonary disease	22 (43.1)	21 (55.3)	43 (48.3)
Bronchiectasis	11 (21.6)	4 (10.5)	15(16.9)
Chronic asthma	4 (7.8)	2 (5.3)	6 (6.7)
Interstitial lung diseases	10 (19.6)	10 (26.3)	20 (22.5)
Kyphoscolosis	4 (7.8)	1 (2.6)	5 (5.6)

Table 2 - Initial exercise parameters among 89 patients attended pulmonary rehabilitation (PR) program.

Characteristics	Adherent group	Non-adherent group	P -value
6 MWD	216 \pm 110	178 \pm 118	0.235
Treadmill			
Time	5.43 \pm 1.8	5.22 \pm 1.3	0.194
Distance	112 \pm 76	154 \pm 180	0.065
Hand ergometer			
Time	5.25 \pm 0.99	5.21 \pm 0.88	0.690
Distance	571 \pm 212	547 \pm 229	0.885
Bicycle			
Time	5.31 \pm 1.4	5.1 \pm 1.4	0.531
Distance	1105 \pm 640	1074 \pm 505	0.373

Data are expressed as mean \pm SD

Table 3 - Exercise training parameters prior and after pulmonary rehabilitation (PR) of 51 patients in the adherent group.

Characteristics	Prior to PR	After PR	P value
Six minute walk distance (meter)	216 ± 110	544 ± 269	<0.001
<i>Treadmill</i>			
Distance (meter)	112 ± 75	364 ± 196	<0.001
Time (minutes)	5.43 ± 1.8	12.1 ± 3.3	<0.001
<i>Hand ergometer</i>			
Distance (meter)	571 ± 214	1306 ± 551	0.002
Time (minutes)	5.25 ± 0.99	11.88 ± 3.1	0.013
<i>Bicycle</i>			
Distance (meter)	1105 ± 640	2734 ± 1336	<0.001
Time (minutes)	5.31 ± 1.4	11.5 ± 3.2	0.005

Data are expressed as mean±SD

Table 4 - Comparison between chronic obstructive pulmonary disease (COPD) and non-COPD group among 51 adherent patients.

Characteristics	COPD	Non-COPD	All
Number of patients	22 (43.1)	29 (56.9)	51 (100)
Age	65.5 ± 11.8	55.3 ± 14.1	59.7 (± 14.2)
Gender			
Men	13 (59.1)	7 (24.1)	20 (39.2)
Women	9 (40.1)	22 (75.9)	31 (60.8)
Duration of PR (days)	62 ± 15	67 ± 17	65 ± 16
No. of sessions	18.4 ± 1.4	17.9 ± 0.55	18.1 ± 0.98
Forced Expiratory Volume in the first second	51.4 ± 22.7	56.6 ± 19.9	54.5 ± 21.1
Improvement in 6MWD (meter)	123 ± 65	113 ± 42	117 ± 48
Improvement in Treadmill			
Distance (meter)	244 ± 160	258 ± 160	251 ± 158
Time (minutes)	6 ± 2	7 ± 3	7 ± 3
Improvement in Hand ergometer			
Distance (meter)	591 ± 377	819 ± 570	720 ± 504
Time (minutes)	6 ± 3	7 ± 3	7 ± 3
Improvement in Bicycle			
Distance (meter)	1444 ± 1065	1770 ± 1152	1629 ± 116
Time (minutes)	6 ± 3	7 ± 3	6 ± 3

6MWD - 6 minutes walk distance

bronchiectasis, the observed difference in adherence did not reach significant difference that is probably related to the small sample size (**Figure 1**).

Discussion. Implementing a PR program in a tertiary care center in Saudi Arabia was feasible and led to marked improvement in exercise performance and overall physical fitness. Pulmonary rehabilitation is defined as a multidisciplinary program for patients with chronic respiratory impairment that is individually tailored and designed to optimize physical and social performance. The goals of PR are to reduce symptoms,

improve daily activity and restore the highest level of independent functioning in patients with respiratory disease.¹⁶ All the available data clearly indicates that PR is an essential component of the management of patients with chronic lung diseases.¹⁻⁵ Nevertheless, it is not yet widely utilized in many developing countries.¹² In this study, the experience with the first PR program in Saudi Arabia is presented. The proposal for PR program at King Abdulaziz Medical City, Riyadh, Saudi Arabia, was first submitted and approved on 1998. The submitted proposal for PR program included the benefits, limitations, policy and procedure, space required,

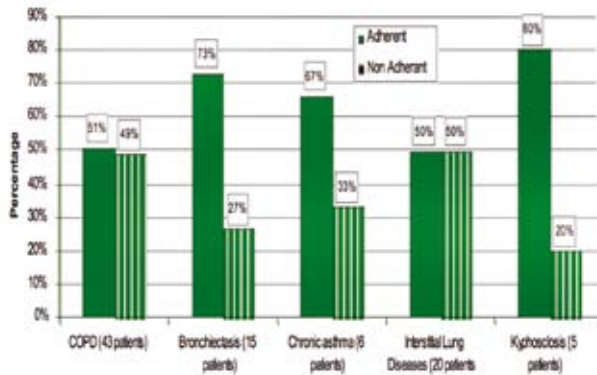


Figure 1 - The distribution of patients in relation to the indication for referral to pulmonary rehabilitation program.

manpower and total costs. Due to limitation with space, it was first implemented on year 2001. The PR was launched with an interested physiotherapist under the supervision of a trained pulmonary physician. This study covers 30 months period starting on July 2004. Typical candidates referred to PR were symptomatic patients with CLD who were aware of their disability and are motivated to participate actively in their health care. The data in this study demonstrates a substantial proportion of otherwise eligible patients who are adherent, non-adherent, or refused participation. The program was not limited to COPD but included a heterogeneous group of patients with chronic lung diseases, for example; lung fibrosis, bronchiectasis, and kyphoscoliosis. It was found that PR is effective in improving exercise endurance, quality of life, and reducing hospital admissions in patients with significant restrictive lung disease.⁵ Moreover, a recent statement by the American Thoracic Society and European Respiratory Society on Pulmonary Rehabilitation has recommended PR in the comprehensive management of patients with CLD.⁸ In this study, almost one quarter of the patients referred to PR declined attending the PR after their initial agreement. This category did not include those offered PR and refused immediately on the spot. There was no specific correlation between refusals to attend PR with the demographic data or indication for PR. The data in the literature did not describe this category well as some studies document a significant withdrawal rate; others just report the data on subjects completing a program.^{16,17} Prospective studies in COPD patients showed that almost one third will eventually participate in PR.^{18,19} A study by Young et al²⁰ showed that almost one third of referred COPD patients would decline taking care in PR. Forty percent of patients attended PR in this study were non-adherent. There

was no correlation between non-adherence with the indication for PR, demographic data or physiological parameters. This is consistent with other studies where no physiological or demographic parameters predicted adherence to the PR.^{5,18-21} In this study, the most common reason for non-adherence was difficulty in transportation and interruption due to admission to the hospital. Nevertheless, the majority of patients did not report specific reason for non-adherence. Different studies identified “deficient disease-specific social support” as an essential factor to predict adherence. Factors that were identified to be associated with non-adherence in the developed countries included: unstable marital status, living alone, continuous smoking, non-compliance with medications.²⁰⁻²² As the reason of non-adherence was an open-ended statement in this study, specific reasons were not documented unless verbalized by the participants. The adherent group completed 18 sessions on an average duration of 65 days. This would fulfill the recommendation from the latest update of the Global Initiative for Obstructive Lung Disease that recommends duration of 2 months.²³ The PR protocol in this study was based mainly on endurance exercises with strength exercises offered to few selected patients. The strength exercises were shown in a randomized study that it would not translate into additional improvement on exercise performances.²⁴ The Saudi community rely more on personal transportation in performing daily living activities that will affect their fitness and exercise performance and limits the utilization of exercise parameters from other societies for comparison. There are scanty data on the baseline exercise parameters for patients with lung diseases in Saudi Arabia; Al-Ameri²⁵ reported that the average 6MWD was 341 meter in a population of Saudi patients with heterogeneous pulmonary diseases who have a mean FEV1 of 73%. The participants in this study represented a group of patients with severe disease as manifested with a mean FEV1 of 54% and limited average 6MWD to 117 meters. Nevertheless, those who completed PR had marked and interesting improvements in the distance and time spent on treadmill, arm ergometer, and bicycle. A finding that supports implementing PR for Saudi patients would improve their endurance and will be reflected positively on their fitness and daily performance and activities.²⁶ There was an observation that non-COPD patients would benefit more from PR, however, this finding can not be concluded due to the small sample size in each group. Health-related quality of life instruments have a definite role to assess severity and progression of the disease and are often impaired in proportion to lung function impairment.²⁶ One of the weaknesses of this study is the unavailability of these instruments in Arabic during the study period

which limits the described benefits to the measured exercise physiological parameters. Another limitation was the effect of PR on the utilization of resources and health system expenditure; it was not included as these are beyond the objectives of this study. The available evidence showed that PR is regarded as a standard component of a comprehensive management care plan for chronic lung diseases. Launching a PR program does not require expensive equipment; it can be started with treadmill machines, arm ergometers and stationary bicycles. Pulmonary rehabilitation program needs a multidisciplinary team led by an interested physiotherapist or respiratory therapist with a chest physician.^{1-5,12} In conclusion, implementing a PR program in a tertiary care centre in Saudi Arabia was feasible and led to marked improvement in exercise performance and overall physical fitness.

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