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REVIEW ARTICLE

COMPREHENSIVE REHABILITATION OF PATIENTS WITH RHEUMATIC DISEASES IN A WARM CLIMATE: A LITERATURE REVIEW

Karin Öien Forseth, MD, PhD[1], Ingiäld Hafström, MD, PhD[2], Gunnar Husby, MD, PhD[3] and Christina H. Opava, RPT, PhD[4]

From the [1]Department of Rheumatology, Section for Climate Therapy, Oslo University Hospital, Oslo, Norway, [2]Department of Rheumatology, Division of Medicine Huddinge, Karolinska Institutet at Karolinska University Hospital, Stockholm, Sweden, [3]Faculty Division Rikshospitalet, University of Oslo, Oslo, Norway and [4]Department of Neurobiology, Care Sciences and Society, Division of Physiotherapy, Karolinska Institutet and Department of Rheumatology, Karolinska University Hospital, Stockholm, Sweden

Objective: **To present the evidence for the efficacy of comprehensive rehabilitation in a warm climate of patients with a wide variety of rheumatic diseases.**

Methods: **A systematic review of the literature was undertaken, searching in PubMed, Cinahl, Pedro, SweMed and Embase from 1970 to 2010, and using the GRADE (Grading of Recommendations, Assessment, Development and Evaluation system) criteria.**

Results: **Six studies met the inclusion criteria. For patients with rheumatoid arthritis, moderate evidence was found for reduction of disease activity, pain, fatigue, and global disease impact. The evidence was also moderate that comprehensive rehabilitation in a warm climate did not improve fitness or reduce activity limitation beyond levels reached by rehabilitation in Scandinavia. Among patients with ankylosing spondylitis, low evidence was found for reduction of disease activity, pain, joint range of motion, activity limitation, and global disease impact. In groups with mixed rheumatic diagnoses, low evidence was found for reduction of pain, activity limitation, global disease impact and improved health-related quality of life. No studies on psoriatic arthritis, osteoarthritis, fibromyalgia or osteoporosis were found.**

Conclusion: **Well-designed studies to validate and improve the low-to-moderate evidence found for the efficacy of comprehensive rehabilitation in a warm climate among patients with inflammatory rheumatic disease are greatly needed.**

Key words: arthritis; climate; exercise therapy; physical therapy; rehabilitation; rheumatic disease; tropical climate.

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Correspondence address: Christina H. Opava, Department of Neurobiology, Care Sciences and Society, Karolinska Institutet, 23100, SE-141 83 Huddinge, Sweden. E-mail: christina.opava@ki.se

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INTRODUCTION

It has been a tradition in Sweden and Norway since the 1960s to admit patients with rheumatic diseases to comprehensive rehabilitation in a warm climate (1, 2). This is generally provided at selected institutions in the Mediterranean area with warm and stable climatic conditions, by multidisciplinary rheumatology teams for periods of 4 weeks. In Sweden such rehabilitation is paid for by the healthcare system, and in 1997 the Norwegian Parliament decided to make this arrangement a permanent therapeutic option (2).

Rehabilitation in a warm climate was initially considered as an alternative to existing hospital treatment for patients with rheumatic diseases, and was occasioned by lack of sufficient capacity in the patients' country of residence. Gradually, as departments of rheumatology became more numerous in the Nordic countries, warm-climate rehabilitation increasingly became a supplementary regimen. Its long tradition and positive individual feedback from patients indicate that it is effective in some rheumatic diseases. Efficacy is often described in terms of improved body functions and activity performance as well as better health-related quality of life. All costs included, the current daily cost for rehabilitation in a warm climate is estimated as 90% and 60% of comparable rehabilitation in Norway and Sweden, respectively.

One important component of comprehensive rehabilitation is exercise, which has been systematically reviewed and found to be safe and efficient (3–5). Some evidence of positive outcomes of comprehensive rehabilitation (6) and multidisciplinary team care (7, 8) has also been presented; but the improvements are generally moderate (9) and climate aspects have not been included. In addition, although rehabilitation is widely applied, little is known about the possible long-term effects (10).

The therapeutic effect of a warm climate is not fully understood. It appears, however, that subtropical climates confer less pain and stiffness, and less fear of increased pain during exercise (11–13). Furthermore, heat is thought to increase the elasticity of tendons, muscles and other soft tissues. Another aspect of climate relates to ultraviolet A, which, under certain conditions, has an immunosuppressive action (14). Exposure to sun may therefore have an immunosuppressive effect in inflammatory rheumatic diseases, but this has, to our knowledge, not been studied.

Although patients with rheumatic diseases from Nordic countries have had the opportunity for comprehensive rehabilitation in a warm climate for approximately 40 years, no systematic review of scientific studies addressing its possible efficacy exists. Thus the Swedish and Norwegian Rheumatism Associations commissioned the 4 present authors to perform

such a review. The aim was to search the literature and present the evidence, in terms of impaired body function, activity limitation, perceived global disease impact, and disease activity, for the efficacy of comprehensive rehabilitation given in a warm climate to patients with rheumatic diseases.

MATERIAL AND METHODS

Definitions

Three critical terms were defined at the start of the work:

- *Rheumatic diseases* were defined as inflammatory joint diseases, osteoarthritis, musculoskeletal pain conditions such as fibromyalgia, and osteoporosis that are all listed by the World Health Organization (WHO) among "Diseases of the musculoskeletal system and connective tissue".
- *Comprehensive rehabilitation* was defined as systematic multidisciplinary treatment given by physicians and health professionals. Individual assessments and treatment plans targeting defined treatment goals were required. The rehabilitation programmes should include physical therapy with exercise aiming at improved aerobic fitness, muscle strength, mobility and balance, occupational therapy, and self-management programmes.
- *Warm climat*e was defined as a dry climate with several hours of daily sunshine and mean temperature $\geq 20°C$ during a minimum of 8 months a year.

Search strategy

A systematic search, using PubMed, Cinahl, Pedro, SweMed and Embase from 1970 to February 2010 was undertaken. Medical Subject Headings (MeSH) were applied. The key words searched for were: rheumatoid arthritis (RA), arthritis, polyarthritis, psoriasis arthritis (PsA), ankylosing spondylitis (AS), musculoskeletal pain, pain, fibromyalgia, osteoporosis, osteoarthritis, rheumatic diseases and physiotherapy, physical therapy, rehabilitation, exercise therapy and climate as well as tropical climate. The search was performed with every possible combination of 3 key words: 1 representing a diagnosis, 1 an intervention type and climate or tropical climate (e.g. polyarthritis + rehabilitation + climate).

Inclusion and exclusion criteria

To be included in the further assessments the studies should meet the definitions for patients with rheumatic diseases, comprehensive rehabilitation and warm climate presented above. Studies of spa treatment, also known as balneotherapy, hydrotherapy, or thermal therapy, without additional active rehabilitation were excluded. However, studies involving hydrotherapy in thermal water given in addition to comprehensive rehabilitation, as defined above, were accepted. The decision to include a study was based on titles and abstracts and was performed by one of the authors (IH).

Quality assessment

Studies likely to meet the above criteria were extracted. Each paper was read and scored for methodological quality independently by two authors according to a comprehensive checklist with 7 variables: design (i.e. randomized, controlled, prospective study), demography (i.e. sex, age, diagnosis), assessment methods, intervention (i.e. mode and frequency of training, health professionals involved), outcome (impairment, activity limitation, global disease and disease activity), scientific quality and conclusive comments. As the studies were heterogeneous no meta-analyses could be performed. Instead an overall quality of the

Table I. *Characteristics of the rehabilitation programmes in 6 assessed studies evaluating the efficacy of comprehensive rehabilitation of patients with rheumatic diseases in a warm climate*

Authors, year of publication	Location	Treatment duration and frequency	Intervention	Individual plan	Criteria for comprehensive rehabilitation
Johansson & Sullivan (16) 1975	Spain vs Sweden	6 weeks, frequency not reported	Exercise Individual PT Individual OT Hydrotherapy	Yes	Yes
Hafström (17) 1997	Montenegro Spain Canarias	3–6 weeks 5 days/week	Exercise Individual PT Individual OT Hydrotherapy Balneotherapy	Not reported	Yes
Hashkes (18) 2002	Israel	4 weeks 5 days/week	Exercise Individual PT Individual OT Hydrotherapy Balneotherapy	Yes	Yes
Cronstedt & Stenström (19) 2002	Canarias	3 weeks, 5 days/week	Exercise Individual PT Hydrotherapy Patient education	Yes	Yes
Hafstöm & Hallengren (20) 2003	Israel Canarias	4 weeks, 5 days/week	Exercise Individual PT Individual OT Hydrotherapy	Yes	Yes
Staalesen Strumse, et al. (21) 2008	Montenegro or Turkey vs Norway	4 weeks frequency not reported	Exercise Individual PT Hydrotherapy Balneotherapy Patient education	Yes	Yes

PT: physiotherapy; OT: occupational therapy.

evidence was assigned to each study in accordance with the GRADE approach (15). In this system the design, quality and quantity of studies, as well as the consistency across studies and directness of findings, are considered in the grading process. The quality evidence was thus graded as high, moderate, low or very low. Finally, the evidence assigned to each study was discussed in plenum.

RESULTS

Literature search

Ninety papers were found by applying the key words described above. Forty-two of them were not within the field of the present review, 13 did not comprise patients with rheumatic diseases, 8 did not describe a clinical study, 14 were studies on spa treatment only, 2 did not describe criteria for comprehensive rehabilitation, and 5 were not in English, German or French. Thus, 6 studies remained for review (16–21).

Description of studies

Comprehensive rehabilitation in a warm climate was carried out on the Spanish mainland, in Turkey, Montenegro, the Canary Islands, or Israel (Table I). In 2 studies the results were compared with similar treatment in Sweden or Norway (16, 21). The interventions lasted between 3 and 6 weeks, treatment generally given on 5 days per week. The treatment programmes comprised exercise, individual physiotherapy and occupational therapy sessions, hydrotherapy, balneotherapy, and patient education. The descriptions of the different components of rehabilitation varied considerably with respect to detailed information on mode of interventions, and so did information regarding the professional background of the staff involved. Five of 6 studies reported that patients had individual treatment plans, and all 6 fulfilled criteria for comprehensive rehabilitation (Table I).

The 6 studies included patients with RA, AS and/or juvenile idiopathic arthritis (JIA) (Table II). No studies on patients with psoriatic arthritis, connective tissue disease, osteoarthritis, fibromyalgia or osteoporosis were found. Four studies (17–20) were non-controlled intervention studies including 48–149 patients, while one cross-over study (16) included 79 female patients, and one randomized controlled study (21) included 72 patients in a Mediterranean treatment group. This was com-

Table II. *Characteristics of the 6 assessed studies evaluating the efficacy and GRADE evidence level of comprehensive rehabilitation of patients with rheumatic diseases in a warm climate (*p*-values given for comparisons between evaluation time-point and start of intervention)*

Authors, year of publication	Diagnosis, Number of patients (women/men)	Design	Times for follow-up (months post-discharge)	Outcome assessments	Effect at (p-values or % responders)	Quality
Johansson & Sullivan (16) 1975	RA $n=79$ (79/0)	Cross-over	0 and 4	LI	$p<0.05$ and ns compared with reference group	Low
				Grip strength	ns and $p<0.05$	
Hafström (17) 1997	RA $n=106$ AS $n=43$	Uncontrolled, prospective	0, 3 and 6	HAQ	$p<0.001$, 0.001 and 0.05	Low
				VAS global	$p<0.001$, 0.05 and 0.05	
Hashkes (18) 2002	RA $n=83$ AS $n=53$	Uncontrolled, prospective	0	VAS pain	$p<0.001$	Low
				ACR20 response (RA)	57%	
				AS20 response	60%	
Cronstedt & Stenström (19) 2002	AS $n=48$ (14/34)	Uncontrolled, prospective	0, 1 and 3	BASDAI	$p<0.001$, 0.001 and $=0.02$	Low
				BASMI	$p<0.001$, ND and ND	
				BASFI	$p<0.001$, 0.001 and ns	
				BASG-1	$p<0.001$, $=0.002$ and $=0.032$	
Hafström & Hallengren (20) 2003	RA/JIA $n=52$ AS $n=41$	Uncontrolled, prospective	0, 3 and 6	VAS pain	$p<0.001$	Low
				HAQ	$p<0.001$	
				NHP	$p<0.001$	
				VAS global	$p<0.001$	
Staalesen Strumse, et al. (21) 2008	RA $n=72$ (56/16) Mediterranean $n=52$ (41/11) Norway	Randomized, controlled, parallel groups	0 and 3	DAS28	$p<0.001$ and $=0.003$	Moderate
				6MW	ns	
				TUG	ns	
			0, 3 and 6	VAS pain	$p=0.002$, 0.005 and ns	
				VAS fatigue	$p=0.048$, 0.004 and 0.044	
				M-HAQ	ns	
				VAS global	$p=0.002$, 0.005 and ns all compared with control group	

RA: rheumatoid arthritis; AS: ankylosing spondylitis; JIA: juvenile idiopathic arthritis; *n*: number; Pt.: patient; LI: Lansbury's activity index; HAQ: Stanford Health Assessment Questionnaire; M-HAQ: Modified HAQ; VAS: visual analogue scale; ADL: activities of daily living; ACR: American College of Rheumatology; BASDAI, BASFI, BASMI, BASG: Bath Ankylosing Spondylitis – Disease Activity Index, – Functional Index, – Metrology Index and – Global score; DAS28: disease activity score calculated on 28 joints; NHP: Nottingham Health Profile, 6MW: 6-minute walk; TUG: Timed "Up&Go"; ns: not significant; ND: not done.

pared with a Norwegian treatment group of 52 patients. The 2 controlled studies (16, 21) included patients with RA only, while the cohort study (19) only included patients with AS. The remaining 3 included patients with different diagnoses; 1 (18) reported outcomes separately for diagnostic groups, while 2 did not (17, 20).

A wide variety of outcome assessments was used. Some were diagnosis-specific, but most were generic within rheumatology. Disease activity was evaluated in 4 studies (16, 18, 19, 21) using the Lansbury Articular Index (22), the ACR20/AS20 response criteria (23, 24), the Bath Ankylosing Spondylitis Disease Activity Index (25) or the Disease Activity Score 28 (26). Body functions evaluated were self-reported: pain on a visual analogue scale (VAS) in 3 studies (18, 20, 21) and fatigue on a VAS in 1 study (21). Body functions were tested in 3 studies (16, 19, 21) for joint range of motion (27), grip strength and general fitness (28, 29). Activity limitations were measured in 4 studies (17, 19–21) with questionnaires: the Stanford Health Assessment Questionnaire (HAQ) (30); the Bath Ankylosing Spondylitis Functional Index (31), or the modified HAQ (M-HAQ) (32). Health-related quality of life was measured in 1 study (20) with the Nottingham Health Profile (33) and general health perception was rated (34, 35) in 4 (17, 19–21) (Table II).

Evidence for the efficacy of comprehensive rehabilitation in a warm climate

For patients with RA, moderate evidence was found for reduction of disease activity, pain, fatigue, and global disease impact (21). The same study also provided moderate evidence for sustained effects at 3 months post-discharge from the warm climate for disease activity, pain, fatigue and global disease impact, and at 6 months for fatigue. The evidence was also moderate that comprehensive rehabilitation in warm climate did not improve general fitness or reduce activity limitation beyond that reached in rehabilitation in a cold climate (21). Low evidence was found for increased grip strength 4 months post-discharge (16).

Among patients with AS, low evidence was found for reduction of disease activity (18, 19), pain (18), joint range of motion (19), activity limitation (19), and global disease impact (19). Low evidence was also found for sustained effects on disease activity, activity limitation and global disease impact one month after the intervention (19) and for global disease impact 3 months after discharge (19).

In groups with mixed rheumatic diagnoses (RA+AS and RA/JIA+AS), low evidence was found for reduction of pain, activity limitation, and global disease impact (17, 20) and improved health-related quality of life (20). Low evidence was also found for sustained effects over 6 months in these mixed groups (17, 20).

DISCUSSION

Considering the long tradition of rehabilitation in warm climates, we found surprisingly few studies that met the inclusion criteria and thus could be included in our review. Only 2 (16, 21) of the 6 studies included were designed to evaluate whether the climate itself could contribute to the rehabilitation effects among patients with RA. One of these studies (21) met the criteria of moderate evidence. The large number of drop-outs, particularly among those allocated to rehabilitation in Norway, demonstrates the difficulty of performing randomized controlled trials in this area and may have biased the results. The other study (16) was assessed as having low evidence, as this cross-over study was biased by too short a time between the rehabilitation periods in Spain and in Sweden, and by the considerable differences between the rehabilitation programmes in the two countries. Thus, the evidence for the effectiveness of comprehensive rehabilitation in a warm climate is moderate-to-low for patients with RA, although more high-quality studies are needed to validate the findings of the above studies.

One important finding of the present review was that, although disease activity, pain and fatigue were reduced and general health perception improved among patients with RA following comprehensive rehabilitation in a warm climate compared with that in Norway, physical fitness and activity performance improved similarly in both climates (21). This implies that warm-climate rehabilitation perhaps should not be the first choice if the main targets are improvements in these areas.

Four of the 6 studies included in our review had low evidence, which indicates that the present evidence for comprehensive rehabilitation in a warm climate is still low for patients with AS and JIA. Note, however, that low evidence is not the same as ineffective rehabilitation, but rather that there are too few studies of good quality to support higher evidence. Furthermore, no studies of common rheumatic diseases, such as psoriatic arthritis, osteoarthritis, fibromyalgia or osteoporotic conditions, were identified in our search, although numerous patients with these diagnoses have received comprehensive rehabilitation in a warm climate over the years.

There are several possible mechanisms behind the efficacy of rehabilitation in a warm climate. Besides high temperature, sun (14) and hydrotherapy may have direct influence. Hydrotherapy is immersion of the entire body or parts of it in thermal water coming either from springs (mineral water) or other sources. Thermal water (between 30°C and 40°C) may increase the secretion of cortisol, adrenocorticotropic hormone (ACTH), growth hormone and prolactin and thus reduce levels of inflammatory compounds such as prostaglandins and leukotriene (36). In a review of balneotherapy, most studies reported beneficial effects, although all showed methodological weaknesses (37). Clearly, there is a need for well-designed studies to verify any mechanism behind reported clinical effects of rehabilitation in a warm climate of patients with rheumatic diseases.

The transferability of our results may be questioned considering the fact that the majority of the studies included in our review were performed before the new biological drugs had been introduced on a large scale. However, far from all patients benefit from these drugs (38) and well-controlled disease activity does not necessary exclude impairments (39). Furthermore,

many patients with rheumatic diseases and certainly not the large numbers of patients with osteoarthritis and fibromyalgia, do not use such medication. Patients with these diseases should undergo similar studies in a controlled fashion. If the efficacy can be justified, recommendations on comprehensive rehabilitation in a warm climate should be expanded to these diagnostic groups in the Nordic countries.

The small number of qualifying studies and heterogeneity of study designs, interventions and outcome variables made it impossible to perform a meta-analysis of rehabilitation in a warm climate. Well-designed studies to validate the moderate evidence found for patients with RA, to raise the low level of evidence found for patients with AS and JIA and to supply evidence for patients with other diagnoses on the possible efficacy of comprehensive rehabilitation in a warm climate are thus greatly needed. Randomized controlled studies would be preferred, but the study by Staalesen Strumse et al. (21) indicates that patient preferences need to be taken into account before randomization.

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