J Rehabil Med 2006; 38: 329–332

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IMPACT OF POST-POLIO-RELATED FATIGUE ON QUALITY OF LIFE

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Objective: **To assess the impact of post-polio-related fatigue on quality of life.**
Design: **Cross-sectional case control study.**
Subjects: **Patients without additional health problems that may induce fatigue were selected from among 82 polio survivors. Twenty-six patients with post-polio syndrome and 10 without post-polio syndrome were included. Control group consisted of 30 healthy volunteers.**
Methods: **We assessed presence and severity of fatigue by Fatigue Severity Scale, quality of life by Nottingham Health Profile, and impact of fatigue on quality of life by Fatigue Impact Scale. Leg muscle strength was measured by manual muscle testing.**
Results: **Strength of leg muscles showed no differences between the patients with and without post-polio syndrome. Patients with post-polio syndrome reported significantly higher levels of fatigue and reduced quality of life compared with both patients without post-polio syndrome and control group. Fatigue Impact Scale revealed that fatigue did not significantly impair mental health, but had a negative impact especially on physical and psychosocial functioning of the patients with post-polio syndrome.**
Conclusion: **Post-polio-related fatigue seems to be an important factor for further impairment of quality of life in polio survivors.**

Key words: polio, post-polio syndrome, fatigue, quality of life.

J Rehabil Med 2006; 38: 329–332

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Submitted October 7, 2005; accepted March 21, 2006

INTRODUCTION

Fatigue is one of the most frequent complaints of post-polio syndrome (PPS) (1, 2) and the majority of patients identify fatigue as their most troubling symptom (3). Although significantly higher levels of fatigue have been reported previously in patients with PPS compared with controls (4, 5), the impact of fatigue on quality of life (QoL) has not been defined clearly in the literature. New symptoms associated with PPS have been shown to impact negatively on functional status and decrease life satisfaction, with the greatest impact on mobility-related activities (6–9). However, previous studies have focused mainly on physical mobility problems as a result of new or increased muscle weakness, but relatively little attention has yet been paid to the impact of other features on their life. One study demonstrated that new muscle weakness or disability only partly explains impaired QoL (3). This finding supports the hypothesis that factors other than neurological disability, such as fatigue, may play a role in the QoL of patients with post-polio syndrome. Thus we aimed to evaluate the severity of fatigue and its impact on QoL in the patients with PPS without additional health problems that may induce fatigue. With this aim, we used validated fatigue and QoL scales and compared the results with those obtained from stable functioning polio survivors and controls.

METHODS

Patients were selected from among the voluntary members of the regional disabled patient unions. A total of 110 patients with a history of past paralytic poliomyelitis were identified and invited to our clinic to be examined. A total of 82 patients responded our invitation. We screened the patients for any concomitant disorder. After a detailed physical examination, electromyography, blood tests and radiographic investigations were performed and the patients were consulted when necessary. We excluded any disorder that was known to induce fatigue, such as fibromyalgia, chronic fatigue syndrome, depression, hypertension, diabetes, hepatic or renal diseases, rheumatological diseases, other neurological disorders and radiculopathy. The patients taking any medication that could induce fatigue and alter QoL were also excluded. This led to exclusion of 46 (56.1%) of the patients. Out of the 36 remaining patients, 26 met the criteria of PPS (10) and constituted the PPS group. The remaining 10 polio survivors without any new symptoms formed the non-PPS group. The control group consisted of 30 healthy volunteer, without any systemic, orthopaedic, neurological or psychiatric disorder. They were selected from the employees in our hospital and caregivers. Following signing of the informed consent, the second author, who was blinded to the clinical course, interviewed the subjects for fatigue and QoL on the same day.

Presence and severity of fatigue were assessed using the Fatigue Severity Scale (FSS). This is a self-administered questionnaire developed to measure fatigue in medical and neurological diseases (11). The scale has been used also to measure general fatigue in PPS (4, 5, 12–15). A score of 1–7 is obtained, a higher score indicating more fatigue. We defined persons as having significant fatigue if their mean FSS score was 4 or more.

Impact of fatigue on health-related QoL was assessed using the Fatigue Impact Scale (FIS). The FIS was originally developed for patients with multiple sclerosis (16), and has been used in several disorders (17, 18). The scale consists of 40 statements that assess perceptions of functional limitations due to fatigue on cognitive (10 items), physical (10 items) and psychosocial (20 items) functioning during the past 4 weeks including the day of testing. The respondent is asked to rate the appropriate response for each item thus: 0 = no problem, 1 = small problem, 2 = moderate problem, 3 = big problem, 4 = extreme problem. The possible range of scores for the total FIS scale is 0–160, 0–40 for the cognitive and physical dimensions and 0–80 for the psychosocial dimension. Lower scores reflect decreased impact of fatigue.

Health-related QoL was measured using the Nottingham Health Profile (NHP) in a Turkish validated version (19). NHP is one of the

 ISSN 1650-1977
DOI: 10.1080/16501970600722395

most frequently used instruments to assess QoL of polio survivors (3, 8, 9). It assesses QoL in 6 dimensions: emotional reaction, sleep, energy, pain, physical mobility and social isolation. A 0–100 score can be calculated for each of the 6 dimensions, a higher scores indicating greater level of distress.

Muscle strengths of the hip flexors, knee extensors, knee flexors, ankle dorsal flexor and plantar flexors were measured bilaterally by manual muscle testing (MMT), according to the Medical Research Council Scale. A sum score (MMT sum) was obtained by adding the scores of all muscle groups tested (maximum score = 50).

Statistical analyses were performed with the SPSS 10.0 statistical software package. Mann-Whitney *U* test was used to evaluate differences between the PPS and non-PPS group regarding their MMT sum scores. Differences regarding gender and presence of fatigue across groups were assessed by the χ^2 test. Kruskal-Wallis one-way analysis of variance by ranks was used to test the null hypothesis that all 3 groups were identical regarding their age and NHP, FIS and FSS scores. If rejected, further analyses using the Mann-Whitney *U* test were undertaken to compare one group with each other. An alpha level of $p < 0.05$ was used for significance.

RESULTS

The demographic and clinical characteristics of the patients and controls are summarized in Table I. The patients in the PPS group were on average 6.1 years older than those in the non-PPS group ($p < 0.05$). Difference with regard to gender did not reach a significant level between the groups ($p > 0.05$). MMT sum scores of the patients with PPS were not statistically different than those in the non-PPS group ($p < 0.05$).

The presence of significant fatigue (FSS score > 4) was significantly higher in the PPS group (76.9%) than both the non-PPS (30%) and the control group (23.3%) (Table II, $p < 0.05$); while there was no statistically significant difference between the non-PPS group and the control group ($p > 0.05$). The PPS group reported significantly higher levels of fatigue than both the non-PPS and control groups, as revealed by the higher scores of FSS ($p < 0.05$). No statistically significant differences were found between the non-PPS and the control group for the FSS scores ($p > 0.05$).

The median values of the FIS in the patients and the control group are given in Table II. Only the scores of the cognitive dimension were not significantly different between the groups ($p > 0.05$). Physical, psychosocial dimension scores and the total score were significantly higher in the PPS group than both the non-PPS and the control group ($p < 0.05$), while there were no statistically significant differences between the non-PPS and the control group ($p > 0.05$).

NHP demonstrated significant differences between the groups in all dimensions except sleep (Table II). Although the patients without PPS tended to have higher scores compared with the control group, the difference reached the significant level only for the physical mobility and the total score ($p < 0.05$). The NHP scores were significantly higher in the patients with PPS than in the control group ($p < 0.05$). Patients with PPS had significantly higher levels of distress in the dimensions of physical mobility, energy, pain and emotional reaction, compared with the patients without PPS ($p < 0.05$).

DISCUSSION

This study supported the previous studies demonstrating high incidence and level of fatigue (4, 5, 12–15) and decreased quality of life (3, 8, 9, 20) in the patients with PPS. The most important finding of this study is that, post-polio-related fatigue does influence QoL, as revealed by the high scores of the FIS.

To our knowledge, there is no study that used FIS to assess fatigue in polio survivors. We reviewed the version for multiple sclerosis and found all items relevant to assess the impact of fatigue on QoL in polio survivors. Furthermore, the items were related more to the behavioural changes. In addition, from the findings of previous studies that used FIS in several disorders and from clinical experience, the FIS seemed to be appropriate for patients with PPS. We found that fatigue did not significantly impair mental health, but had a negative impact on several aspects of life, especially on physical and psychosocial functioning of the patients with PPS. Impact of fatigue on physical functioning seemed to be comparable with that previously reported on patients with multiple sclerosis (21), while impacts on cognitive and social activities were relatively to a lesser degree. These findings further support the previous studies suggesting that physical fatigue, more than mental fatigue represented the major problems in patients with PPS (14).

QoL was found to be impaired in our patients without PPS as well, as revealed by the significantly higher total scores of the NHP compared with the controls. However, analyses of the subdimension scores showed that only the score for the physical mobility dimension was significantly higher in the patients without PPS than in the controls. This finding may suggest that health problems concerned mainly physical mobility in the stable functioning polio survivors, and physical limitations are the major contributing factors to the impaired QoL. On the other hand, NHP showed significantly higher distress in physical mobility in our patients with PPS compared with the

Table I. *Demographic and clinical characteristics of the patients with post-polio syndrome (PPS), without PPS, and control groups*

	PPS group ($n = 26$)	Non-PPS group ($n = 10$)	Control group ($n = 30$)
Age (years), mean (SD)	39.9 (6.8)*	33.1 (8.1)	37.9 (7.8)
Gender (men/women)	8/18	7/3	11/19
MMT sum score (0–50), mean (SD)	28.1 (6.9)	25.9 (6.9)	

MMT = manual muscle testing.
*$p < 0.05$ between the PPS and the non-PPS group.

Table II. *Median scores of the Fatigue Severity Scale (FSS) Fatigue Impact Scale and Nottingham Health Profile and presence of significant fatigue (FSS >4) in the patient and control groups*

	PPS group ($n=26$)	Non-PPS group ($n=10$)	Control group ($n=30$)
Fatigue Severity Scale			
FSS score	5.2[a,b]	3.5	3.1
Presence of fatigue, *n* (%)	20 (76.9)[a,b]	3 (30)	7 (23.3)
Fatigue Impact Scale			
Physical (0–40)	20.5[a]	7.5	5.0
Cognitive (0–40)	6.5	4.0	3.0
Psychosocial (0–80)	16.0[a]	7.5	3.0
Total (0–160)	43.0[a]	19.5	9.5
Nottingham Health Profile			
Physical mobility	41.8[a,b]	27.4[c]	0.0
Pain	32.8[a,b]	4.5	0.0
Sleep	10.0	20.6	12.5
Energy	60.8[a,b]	0.0	0.0
Social isolation	0.0[b]	0.0	0.0
Emotional reaction	23.5[a,b]	4.8	0.0
Total score	188.8[a,b]	97.7[c]	14.3

[a] $p < 0.05$ between the PPS and the non-PPS group.
[b] $p < 0.05$ between the PPS and the control group.
[c] $p < 0.05$ between the non-PPS group and the control group.

patients without PPS, although no differences in manually tested strength of the leg muscles were found between them. Thus, further impairment of QoL in patients with PPS seems not to be attributed to the decreased muscle strength. This is in line with the previous study, which demonstrated that strength itself explained only 14% of the NHP-physical mobility score in patients with PPS (3). This, together with the higher incidence of significant fatigue found in our patients with PPS further supports our findings obtained by the FIS, indicating that fatigue may play an important role in impaired QoL in the patients with PPS.

There are strengths and weaknesses of this study to be considered. The strengths of this study include exclusion of the additional medical and psychiatric diseases that may be related to fatigue; thus only patients in whom fatigue was related to polio itself were included. Another strength was using FIS to assess fatigue. However, validation of the FIS in the patients with PPS should be studied. The limitations include: (*i*) small sample size due to rigid exclusion criteria. This prevented using multivariate analysis to investigate whether fatigue is independently associated with impaired QoL, regardless of the clinical course/disability status of patients with PPS. (*ii*) The study population included only the polio cases from Izmir city; thus it might not be representative of polio survivors. (*iii*) The control group consisted of the employees and caregivers, who may have a different perception of QoL than a random population sample.

In conclusion, the results of this study demonstrate that post-polio-related fatigue is frequently present and seems to be an important factor for further impairment of QoL in polio survivors. These findings highlight the importance of carefully screening all patients with PPS for the presence of fatigue and determination of its impacts on QoL, so that a variety of interventional strategies to reduce fatigue are implemented promptly.

ACKNOWLEDGEMENTS

Part of this material was presented at the 5th Mediterranean Congress of Physical Medicine and Rehabilitation, September 30–October 3, 2004, in Antalya, Turkey.

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