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Functional Status of Patients With Primary Biliary Cirrhosis

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Abstract

OBJECTIVES—Although autoimmune diseases can have a significant impact on the quality of life, there has been a relative paucity of data with respect to the functional status of patients with primary biliary cirrhosis (PBC).

METHODS—We conducted a case-control study of 182 patients (“cases”) with PBC as well as 225 age- and sex-matched friend control subjects using a standardized instrument obtained from the National Health and Nutrition Examination Survey.

RESULTS—In all, 126 of 182 cases (69%) and 141 of 225 friend controls (62.6%) responded to this survey, a response rate comparable to or better than in similar previous studies of such instruments. Patients with PBC had a significantly reduced functional status score compared to their controls ($p < 0.001$). Interestingly, a lower level of education and the presence of arthritis and hypertension were significantly associated with these lower levels of functional capabilities. These data were subjected to multivariate analysis and confirmed. Age was not associated with impaired functional status in either the patients or controls.

CONCLUSIONS—Studies of this nature have potential implications for the well-being and management of patients with PBC, and focus on issues that can be addressed to help maintain functional status in this chronic disease.

INTRODUCTION

Autoimmune diseases have a significant impact on overall quality of life, resulting in significant disability and chronic morbidity (1). Although a number of studies have examined the nature of disability associated with rheumatoid arthritis (2) and systemic lupus erythematosus (SLE) (3), functional status has been evaluated for patients with primary biliary cirrhosis (PBC) in a small number of studies of patients with various liver diseases (4, 5). Interest in the epidemiology of primary biliary cirrhosis is attracting significant attention because of increased recognition of the disease and the development of good statistical models (6–9). As chronic fatigue and pruritis are classic symptoms of PBC, the potential for impaired functional status is considerable.

The present epidemiological case-control study was therefore undertaken to examine the association of PBC with lifestyle and the medical risk factors that may play a role in its

occurrence (7). Our major objectives in conducting these analyses were to characterize and to compare the levels of functional ability and physical activity among PBC cases and healthy controls.

MATERIALS AND METHODS

Study Population and Data Collection

We have previously reported the design of our case-control study in which 199 PBC patients were identified from an Internet support group for individuals with PBC (7). Control subjects were friends of the patients ("cases"), matched on 10-yr age group and sex. The details of patient and control selection, the criteria for disease verification, and the description of the survey instrument have been previously described in detail (7), and will only be summarized briefly. Our questionnaire was developed using a series of standardized questions drawn from the third National Health and Nutrition Examination Survey (10). The survey instrument included questions about demographics (age, education, sex, race/ethnicity), general medical history (including childhood illnesses, chronic diseases, infections, and medications), functional status, reproductive history (including gynecological surgery and procedures, age at menarche and menopause, prior use of oral contraceptives, pregnancy history, and history of infertility), and lifestyle factors (such as physical activity, smoking, and alcohol use). These questions have been tested for reliability and validity in a number of studies (11).

Of the 199 cases who participated in our initial survey, current address information was available only for 182 of these cases. For the study reported herein, these 182 cases were mailed a second, focused questionnaire (described below), in which they were asked to provide the names and addresses of three friends who were willing to participate in the survey who were the same sex as the case and within 10 yr of the age of the case. Of the 182 cases, 126 (66%) responded, identifying 225 friends. These friends identified by the cases were sent the same packet of information that was originally sent to the cases. The questions on the focused questionnaire concerned information on reproductive history, smoking, and alcohol use. The packets mailed to cases and controls contained a cover letter from the principal investigator as well as postage-prepaid envelopes for sending back completed questionnaires. A second request packet was sent approximately 1 month later to those who did not respond to the first mailing. Upon return of questionnaires, attempts were made to verify the diagnosis of PBC in the cases by contacting their physicians. Of the 100 cases for whom physician information was available, only two were found not to be cases and were excluded from the study.

Specification of Variables

All survey information was coded, double key entered, and read into a SAS (SAS, Cary, NC) database. Range and logic checks were performed on all of the data. SAS version 8.0 software was used for all analyses (12). Our ability to examine differences by male sex was limited because only 15 (5.6%) of the survey respondents were male. Consequently, we limited these analyses to the 119 female cases and 134 female controls who responded to the survey.

Independent Variables

We examined the effects of the following independent variables on functional status and physical activity in cases and controls, separately: education, gravidity, smoking, age, history of arthritis or hypertension, and number of comorbid conditions. Most of these were dichotomous (coded yes/no) variables, including smoking and history of arthritis or hypertension. Education was coded 0 for respondents with less than a college degree and 1

for those with at least a college degree. A continuous variable that added up the number of various comorbid conditions was also created. The conditions included in this variable were heart disease, stroke, asthma, chronic bronchitis, emphysema, hay fever, goiter, other thyroid disease, gout, skin cancer, lupus, autoimmune thyroid disease, multiple sclerosis, Raynaud's syndrome, Sjögren's syndrome scleroderma, polymyositis, diabetes, and liver disease other than biliary cirrhosis. Gravidity was a created variable derived from adding up the number of live births, miscarriages, stillbirths, and tubal pregnancies. Although the variables age, comorbidity, and gravidity ultimately were analyzed continuously in the multivariate models, they were divided into categories for the initial bivariate analyses: <50 yr *versus* ≥50 yr for age, and any *versus* none for comorbidity and gravidity.

Dependent Variables

Questions about the level of functional status were obtained from the Health Assessment Questionnaire (13). These questions have also been used and validated extensively in the National Health and Nutrition Examination Survey. The questions ask about level of difficulty in performing specific activities of daily living. They consisted of descriptions of a series of activities scored on a four-point scale: "no difficulty," "some difficulty," "much difficulty," or "unable to do," in addition to a "don't know/don't do" option. These 12 questions were scored and summed to obtain an overall score for functional status. The scale for scoring the individual items was 0–3, with scores assigned in one-point increments. An answer of "no difficulty" was assigned 0 points and "unable to do" was assigned three points. The answer "don't know/don't do" was excluded from the functional status score calculation. A missing value for a scale was given if more than half of the items were missing; if fewer items were missing, the missing values were replaced by the respondent's mean score on the remaining items. The scores for individual items were added up to obtain an overall score for functional status, with higher scores indicating lower levels of functional status. The range of scores possible for functional status was 0–36. Functional status was analyzed as a continuous outcome.

The physical activity questions asked about specific types of activities performed in the past month: whether they were performed (yes/no), and, if yes, how many times in the past day/wk/month. Responses to frequency of activity were converted into number of times/wk for all activities. Total physical activity scores were calculated for each respondent by multiplying the frequency of each activity by the intensity in metabolic equivalents (METs), using the values in the Compendium of Physical Activity by Ainsworth *et al.* (14). The products of all activities were summed and divided by the total number of possible activities to compute a mean score in METs/wk. Participants reporting fewer than three METs of activity/wk were categorized as "irregularly active"; those reporting three to six METs/wk were "moderately active"; and those reporting more than six METs/wk were "vigorously active." Although the frequencies of participants in each of these categories were reported, physical activity scores were analyzed continuously in the bivariate analyses.

Data Analysis

Descriptive statistics were generated for all variables. Frequencies and percentages were generated for nominal variables, and medians and 95% CI were generated for continuous variables because most had skewed distributions. The Wilcoxon rank sum test was used to assess differences in medians. The distributions of continuous variables were used to determine the best categories, if appropriate. For the dichotomous variables, χ^2 statistics were used to compare cases and controls to assess the significance of differences in proportions of cases and controls for the conditions of interest, and OR and 95% CI were generated to summarize associations of independent variables with dichotomous outcomes and to compare dichotomous outcomes in cases and controls.

The multivariate analytical approach was multiple linear regression. The primary outcome variable was functional status score, a continuous variable. As mentioned previously, functional status scores were not normally distributed; as a result, a natural logarithmic transformation of the scores was used for the outcome variable. Separate models for cases and controls were generated because the effects of several covariates on functional status were modified by case/control status in the univariate analyses. The best subsets approach to modeling was used to select the variables to include in the final linear regression model. In this approach, a criterion of $p < 0.15$ in the bivariate analyses was used to determine whether a variable should be included in the best subsets. The best subsets approach assigns R^2 values to each of the models that includes different combinations of variables. The amount of improvement in R^2 with the addition of each new variable was examined to determine the best model.

RESULTS

Demographic Characteristics

Of the 225 friends named by the PBC cases, 141 responded to the survey, for a response rate of 62.6%; 134 of these were female. The mean age of the respondents was 53 yr for cases ($n = 119$) and 54 yr for controls ($n = 134$) (Table 1). Approximately 98% of the sample identified themselves as white. More than one third of cases and controls reported that they had finished some college or vocational school, and an additional third of both cases and controls had a bachelor's or graduate degree. All of the respondents reported having health insurance; the most common types in both groups were private insurance or a health maintenance organization and Medicare/Medicaid. The health insurance categories were not mutually exclusive; respondents could indicate multiple sources of insurance. Cases were more likely than controls to have ever smoked or to have had a personal or family history of autoimmune disease.

Functional Status

Overall, cases had considerably lower functional status than controls for most of the specific activities comprising the functional status scales (Table 2). Approximately 28.8% of cases had difficulty with walking one quarter of a mile on the level, compared with 12.8% of controls. More cases than controls had difficulty walking up 10 steps without resting. A significantly larger proportion of cases than controls had difficulty with stooping, crouching, or kneeling. Cases were also more than twice as likely as controls to have difficulty with lifting more than 10 pounds, doing household chores, and standing from an armless straight chair. More cases than controls also reported difficulty with preparing their own meals, managing money, and walking from one room to another on the same level, although the numbers so affected were small. No significant differences were observed in the proportions of cases and controls who reported difficulty eating and dressing. The median overall functional status score among cases was significantly higher than the median score among controls, representing significantly poorer overall functional status among cases.

Study participants with no college degree had more impaired functional status than those with a college degree or more education (Table 3), for both cases and controls. Arthritis was strongly associated with scores indicating more impaired functioning among cases and controls, as was hypertension. A history of smoking, and older age were significantly associated with impaired functional status among cases but not among controls. Having comorbid conditions was significantly associated with lower functional status among cases, but only marginally associated among controls.

Work and Disability

Overall, cases were much more limited in the type of work that they could do because of a health problem (Table 4). More cases than controls reported that they were limited in the kind or amount of work or activities that they could do because of a health problem. The proportion of cases reporting a permanent change to an easier job because of health problems was three times higher than the proportion of controls. Significantly more cases than controls were retired because of a disability.

Physical Activity

No significant differences in overall amount of physical activity were observed between cases and controls (Table 5). The largest proportions of both cases and controls were irregularly active, with only 4% of cases and 17.2% of controls reporting a regularly vigorous level of activity. The type of physical activities reported by cases and controls did vary somewhat. Fewer cases than controls reported jogging, but more than twice as many cases as controls reported swimming. Weight lifting was reported by half as many cases as controls. More controls than cases reported walking, although this difference was not statistically significant. No significant differences were observed between cases and controls in aerobics, dancing, or gardening.

Cases had higher overall median physical activity scores than controls, but this difference was not statistically significant (Table 6). We found no significant association between median physical activity score and smoking, gravidity, arthritis, hypertension, comorbidity, or age among cases or controls. Controls with college degrees were more active than controls with less education than a college degree.

Results of Multivariate Analyses

Separate multiple linear regression models were run for factors associated with functional status in cases and controls, because the results of the univariate analyses indicated that different factors were associated with functional status in the two groups. No multivariate models were run for physical activity scores because no significant difference was found in the unadjusted scores between cases and controls. In addition, none of the independent variables were significantly associated with physical activity score. The model for functional status among cases indicated that impaired functional status was associated with having less than a college education, arthritis, more comorbid conditions, and older age (Table 7). Among controls, the model was similar: age was not associated, but hypertension was significantly associated with functional status, and arthritis was more strongly associated with functional status among controls than among cases.

DISCUSSION

To our knowledge, this is the first study to characterize functional status and associated factors among a large sample of PBC cases and controls. We found that cases had significantly more disability than controls. Our results are consistent with another recent study in which researchers found that health-related quality of life was much lower among patients with chronic liver disease than among healthy people (5). The variables that were found to affect functional status in both groups in our study—namely, education, hypertension, comorbidity, age, and arthritis—are consistent with the findings of previous studies of functional status in various other diseased and nondiseased populations (3, 5, 15–19). The previously mentioned study by Younossi *et al.* also found that older patients had lower physical functioning scores (5).

Arthritis was the variable that was most strongly associated with functional status among both cases and controls in the multivariate analyses. This finding supports the well known relationship between disability and arthritis. Guralnik and Kaplan (15) reported that persons with arthritis were almost three times more likely to have low function than those without arthritis (OR = 2.8, 95% CI = 1.3, 6.0). Harris *et al.* found that individuals who never had arthritic complaints were almost twice as likely to have continued physical function (OR = 1.9, 95% CI = 1.2, 2.7) (20). In this study, more than half of all cases and one third of controls reported any difficulty stooping, crouching, or kneeling, a strong indicator of arthritis.

The significant association between impaired functional status and lower levels of education among cases and controls in our analysis is consistent with observations in other studies of functional status in patients with other morbid conditions. In a study of rheumatoid arthritis patients, Pincus and Callahan found that lower levels of formal education were associated with higher morbidity and mortality (18). They observed significant losses in functional capacity among patients as formal education level decreased. The relationship was not confounded by age, sex, duration of disease, or smoking history. Partridge *et al.* found that having a high school education or less was a risk factor for early work disability among patients with systemic lupus erythematosus (OR = 3.9, $p = 0.0004$) (3). In two other prospective studies of aging, however, education was not an independent predictor of disability (15, 21). Education is likely a proxy for many other variables, including socioeconomic status, access to health care, and decision making related to preventive health care. Patients with higher levels of education may receive better medical care and information that prevents them from experiencing a sharp decline in physical function. Further study of the components of the education variable are needed. In our study, detailed information about income was not available. In addition, the health insurance variable, which may have provided some information about quality of care or level of income, was not useful because nearly all respondents had private insurance, which limited our ability to examine differences in this variable.

We found that hypertension was significantly associated with lower levels of functional status among controls, but not among cases, when controlled for other important predictors. This question ("Has a doctor ever told you that you had hypertension?") may also be an indicator of access to health care. Detection bias is possible in our sample because the cases probably see their physicians more often than controls because they are chronically ill. The findings indicated, however, that hypertension was significantly associated with functional status among controls. Hypertension may be overshadowed by all of the other comorbid conditions present among the cases, as cases had much more comorbid illness than controls in our study.

We did not have information on several variables that may have been relevant to functional status level in this population. Although we had limited information on occupational history, we did not have the statistical power to examine the association of specific occupations with functional status. Approximately one third of cases reported that they had retired because of a disability. In addition, this population is relatively highly educated; thus, most of the working participants had sedentary jobs. We had no information on social support, body mass index, or marital status, which have been found to be strongly associated with disability or decreased functional status (20, 22, 23).

Our findings may not be generalizable to men, as we did not have the ability to study them because of the small sample size. Most likely, the lack of men in the PBC support group is due to the fact that the disease occurs predominantly in women. Research has shown, however, that men with chronic diseases are much less likely to join support groups (24).

Several limitations must be considered, however, when interpreting the data. The study population overall was relatively high functioning, with few individuals having severely impaired functional status. Given that this sample was recruited from an Internet support group consisting of relatively highly educated individuals, this finding is not surprising. In addition, the data are largely self-reported, although the disease status of the cases was confirmed. The possibility of recall bias thus exists. Furthermore, the use of friend controls, who are likely to be more similar to cases than other types of controls, may have decreased our ability to find factors that affected disability that were unique to the cases (25–27). Finally, selection bias is also a possibility, as many of the individuals who did not respond may have been healthier or sicker than the respondents (28).

In conclusion, the results of this study have potential implications for PBC and points to measures that can be taken to maintain functional status in this population. Among the factors that were found to affect functional status in this population were arthritis and comorbid conditions such as cardiovascular disease. These are conditions for which preventive measures are available, and early behavioral interventions can potentially reduce decrements in functional status associated with these conditions (29–32).

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Table 1

Demographic and Lifestyle Characteristics of Female PBC Cases and Controls

Characteristic	Cases (%) (n = 119)	Controls (%) (n = 134)
Mean age (yr)	52.9 yr (SD = 8.1)	54.3 yr (SD = 9.4)
Range: 29–77		
Ethnicity		
White	115 (98.3)	131 (97.8)
Other	2 (1.7)	3 (2.2)
Education (highest level completed)		
Less than high school	6 (5.0)	2 (1.5)
High school graduate	19 (16.0)	33 (24.4)
Some college/vocational school	51 (42.9)	49 (36.3)
College graduate	26 (21.9)	32 (23.7)
Graduate degree	17 (14.2)	18 (14.1)
Health insurance (not mutually exclusive)		
Private/HMO	112 (94.1)	117 (87.4)
Medicare/Medicaid	20 (16.8)	20 (14.8)
Veteran's Administration	1 (0.9)	0 (0.0)
Other	3 (2.6)	12 (8.9)
Smoking		
Ever smoked ($p = 0.009$)	77 (64.7)	65 (48.5)
History of autoimmune disease		
Associated autoimmune diseases ($p < 0.001$)	40 (33.6)	9 (6.7)
Family history of autoimmune disease ($p = 0.001$)	36 (30.2)	18 (13.4)

Table 2

Unadjusted Functional Status for Specific Activities Among Female PBC Cases and Controls

Activity	Cases (n = 119) (%)	Controls (n = 134) (%)	OR (Any vs No Difficulty)	95% CI	p
Difficulty walking on the level for a mile					
No difficulty	84 (71.2)	116 (87.2)	2.8	1.4–5.3	0.002
Some difficulty	23 (19.5)	13 (9.8)			
Much difficulty	5 (4.2)	3 (2.3)			
Unable to do	6 (5.1)	1 (0.7)			
Difficulty walking up 10 steps without resting					
No difficulty	89 (76.7)	120 (89.6)	2.6	1.3–5.2	0.006
Some difficulty	22 (19.0)	12 (8.9)			
Much difficulty	2 (1.7)	2 (1.5)			
Unable to do	3 (2.6)	0 (0.0)			
Difficulty stooping, crouching or kneeling					
No difficulty	49 (41.5)	80 (60.2)	2.1	1.3–3.5	0.003
Some difficulty	48 (40.7)	42 (31.6)			
Much difficulty	17 (14.4)	10 (7.5)			
Unable to do	4 (3.4)	1 (0.7)			
Difficulty lifting >10 lb.					
No difficulty	79 (67.0)	112 (84.2)	2.6	1.4–4.8	0.001
Some difficulty	29 (24.6)	13 (9.8)			
Much difficulty	6 (5.1)	5 (3.8)			
Unable to do	4 (3.3)	3 (2.2)			
Difficulty doing household chores					
No difficulty	72 (61.0)	109 (81.3)	2.8	1.6–4.9	0.0003
Some difficulty	39 (33.1)	22 (16.4)			
Much difficulty	6 (5.1)	2 (1.5)			
Unable to do	1 (0.8)	1 (0.8)			
Difficulty preparing own meals					
No difficulty	100 (85.5)	133 (99.3)			
Some difficulty	13 (11.1)	0 (0.0)			

Activity	Cases (n = 119) (%)	Controls (n = 134) (%)	OR (Any vs No Difficulty)	95% CI	p
Much difficulty	3 (2.6)	1 (0.7)			
Unable to do	1 (0.8)	0 (0.0)			
Difficulty managing money					
No difficulty	104 (88.1)	131 (97.8)			
Some difficulty	12 (10.2)	2 (1.5)			
Much difficulty	2 (1.7)	1 (0.7)			
Unable to do	0 (0.0)	0 (0.0)			
Difficulty walking from one room to another on the same level					
No difficulty	111 (94.1)	131 (97.8)			
Some difficulty	6 (5.1)	2 (1.5)			
Much difficulty	0 (0.0)	1 (0.7)			
Unable to do	1 (0.8)	0 (0.0)			
Difficulty standing up from an armless straight chair					
No difficulty	87 (74.4)	118 (88.1)	2.5	1.3–5.0	0.005
Some difficulty	24 (20.5)	13 (9.7)			
Much difficulty	4 (3.4)	2 (1.5)			
Unable to do	2 (1.7)	1 (0.7)			
Difficulty getting in and out of bed					
No difficulty	90 (76.3)	122 (91.0)	3.2	1.5–6.6	0.001
Some difficulty	26 (22.0)	11 (8.2)			
Much difficulty	2 (1.7)	1 (0.8)			
Unable to do	0 (0.0)	0 (0.0)			
Difficulty eating					
No difficulty	112 (94.9)	130 (97.0)	1.7	0.5–6.3	0.39
Some difficulty	6 (5.1)	4 (3.0)			
Much difficulty	0 (0.0)	0 (0.0)			
Unable to do	0 (0.0)	0 (0.0)			
Difficulty dressing					
No difficulty	108 (91.5)	128 (95.5)	2.0	0.7–5.6	0.19
Some difficulty	9 (7.6)	5 (3.7)			
Much difficulty	1 (0.9)	1 (0.8)			

Activity	Cases (n = 119) (%)	Controls (n = 134) (%)	OR (Any vs No Difficulty)	95% CI	p
Unable to do	0 (0.0)	0 (0.0)			
Overall functional status scores					
Median	2.0	0.0			<0.001
95% CI	(1.0–3.0)	(0.0–1.0)			
Range	0–23	0–24			

Table 3
Demographic and Health Factors Associated With Median Functional Status Scores in Female PBC Cases and Controls

Variable	Cases				Controls			
	n	Median	95% CI	p	n	Median	95% CI	p
Education								
No college degree	76	3.0	2.0–4.0	<0.001	84	1.0	0.0–1.0	0.05
College or more	43	1.0	0.0–1.0		50	0.0	0.0–1.0	
Gravidity								
No pregnancies	19	0.0	0.0–4.0	0.25	33	1.0	0.0–2.0	0.13
Any pregnancies	100	2.0	1.0–3.0		101	0.0	0.0–1.0	
Ever smoked								
No	42	1.0	0.0–3.0	0.05	69	0.0	0.0–1.0	0.57
Yes	77	2.0	1.0–3.0		65	1.0	0.0–1.0	
Arthritis								
No	78	1.0	0.0–2.0	0.008	91	0.0	0.0–1.0	0.001
Yes	39	3.0	1.0–5.0		42	1.0	1.0–2.0	
Hypertension								
No	89	1.0	1.0–2.2	0.03	100	0.0	0.0–1.0	0.01
Yes	30	3.0	1.0–6.0		32	1.5	0.0–2.0	
Comorbidity								
No	67	1.0	1.0–3.0	0.01	110	0.0	0.0–1.0	0.09
Yes	52	2.6	1.0–5.0		24	1.0	0.0–2.0	
Age (yr)								
< 50	40	1.0	0.0–2.2	0.04	43	0.0	0.0–1.0	0.19
≥ 50	79	2.0	1.0–3.0		91	1.0	0.0–1.0	
Overall functional status scores								
Cases								
2.0								
1.0–3.0								
0–23								
Median								

Variable	Cases				Controls			
	n	Median	95% CI	p	n	Median	95% CI	p
95% CI								
Range								
Controls								
0.0								
0.0–1.0								
0–24								

* Wilcoxon rank sum test was used to assess differences in medians.

Table 4

Work and Limitations of Activities in Female PBC Cases and Controls

Variable	Cases (n = 119) n (%)	Controls (n = 134) n (%)	OR	95% CI	p
Limited in the kind/amount of work can do because of health problem	61 (51.3)	17 (13.0)	7.1	3.8–13.2	<0.0001
Limited in the kind/amount of chores can do because of health problem	60 (50.9)	19 (14.3)	6.2	3.4–11.4	<0.0001
Limited in the kind/amount of activities can do because of health problem	67 (56.3)	28 (21.1)	4.8	2.8–8.4	<0.0001
Changed jobs or cut down on housework because of health problem	70 (59.3)	23 (17.2)	7.0	3.9–12.6	<0.0001
Permanently changed to an easier job because of health problem	14 (21.2)	3 (7.0)	3.6	1.0–13.3	0.04
Retired because of disability	29 (42.0)	5 (11.9)	5.4	1.9–15.3	0.0008

Table 5

Comparison of Physical Activity in Past Month in Female PBC Cases and Controls

Activity	Cases (n = 119) n (%)	Controls (n = 134) n (%)	p Value
Walking	71 (59.7)	93 (69.4)	0.11
Jogging	11 (9.2)	27 (20.2)	0.02
Bicycling	24 (20.2)	30 (22.4)	0.67
Swimming	36 (30.1)	11 (8.2)	<0.0001
Aerobics	11 (9.2)	13 (9.7)	0.90
Dancing	17 (14.3)	22 (16.4)	0.63
Calisthenics/exercises	30 (25.2)	46 (34.3)	0.11
Gardening	67 (56.3)	69 (51.5)	0.44
Weight lifting	14 (11.8)	29 (21.6)	0.04
Activity level			
Irregular	48 (40.4)	68 (50.8)	0.25
Moderate	46 (38.6)	43 (32.0)	
Vigorous	25 (4.0)	23 (17.2)	

Table 6
Demographic and Health Factors Related to Median Activity Scores in Female PBC Cases and Controls

Variable	Cases				Controls			
	n	Median	95% CI	p	n	Median	95% CI	p
Education								
No college degree	76	2.5	1.8–3.2	0.75	84	1.4	0.9–2.1	0.006
College degree	43	2.9	2.2–4.2		50	3.9	1.7–5.1	
Gravidity								
No pregnancies	19	4.3	1.9–6.9	0.31	33	1.3	0.8–2.9	0.34
Any pregnancies	100	2.6	1.9–2.9		101	2.1	1.3–3.4	
Ever smoked								
No	42	2.7	1.6–3.8	0.32	69	1.9	1.2–2.6	0.90
Yes	77	2.6	1.9–4.0		65	2.1	1.1–3.4	
Arthritis								
No	78	2.8	2.2–4.1	0.54	91	1.8	1.7–2.6	0.64
Yes	39	2.4	0.9–3.7		42	2.0	1.2–3.7	
Hypertension								
No	89	2.4	1.8–3.2	0.73	100	2.2	1.5–3.2	0.20
Yes	30	2.8	2.2–5.1		32	1.3	0.6–2.3	
Comorbidity								
No	52	2.8	2.3–4.2	0.18	110	2.0	1.3–2.9	0.38
Yes	67	1.8	1.4–3.2		24	1.5	0.4–3.7	
Age (yr)								
< 50	40	3.0	1.9–4.1	0.38	43	1.8	1.3–3.0	0.90
≥ 50	79	2.5	1.8–3.4		91	1.9	1.1–3.4	
Overall activity scores								
Cases								
2.7								
2.2–3.2								
0–23								
Median								

Variable	Cases				Controls			
	n	Median	95% CI	p	n	Median	95% CI	p
95% CI								
Range								
p = 0.18								
Controls								
1.9								
1.3–2.6								
0–24								
p = 0.18								

* Wilcoxon rank sum test was used to assess differences in medians.

Table 7

Multiple Linear Regression Models for Characteristics Associated With Functional Status Among Female PBC Cases and Controls

Cases (n = 119)			
Variable	β	95% CI	<i>p</i>
Education (less than college degree is referent category)	−0.3994	−0.5657 to −0.1697	0.002
Arthritis	0.4624	0.3676–1.063	0.031
Comorbid conditions	0.0124	0.0156–0.2586	0.025
Age	0.0197	−0.0002 to 0.0400	0.053
Controls (n = 134)			
Variable	β	95% CI	<i>p</i>
Arthritis	0.5688	0.2028–1.0462	0.001
Hypertension	0.3412	0.0004–0.7981	0.049
Comorbid conditions	0.1044	−0.0045 to 0.2252	0.060
Education (less than college degree is referent category)	−0.1881	−0.3713 to 0.0486	0.110