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Original Research

Functional Limitations, Physical Activity, and Fatigue in Women With Pelvic Pain During Pregnancy and Postpartum: A Prospective Longitudinal Study

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Abstract

Background: Pelvic pain is a significant public health problem that reduces the quality of life of women during and after pregnancy, and may have lasting effects on maternal and fetal health. The aim of this study was to investigate the multidimensional impact of pelvic pain during pregnancy and postpartum on long-term physical activity levels, functional limitations, and fatigue in women. **Methods**: This prospective longitudinal study was conducted on pregnant women (n = 180) who attended gynecology and obstetrics outpatient clinics at three provincial hospitals in the Central Anatolia region of Turkey between June 2022 and December 2023. Data were collected using the visual analog scale (VAS), pelvic girdle questionnaire (PGQ), pregnancy physical activity questionnaire (PPAQ), and multidimensional assessment of fatigue (MAF). These scales were evaluated during the first, second, and third trimesters of pregnancy, and again during the postpartum period. Data were analyzed using descriptive statistics, normality tests, ANOVA, Bonferroni multiple comparison tests, linear regression, and multiple linear regression analyses. **Results**: As pregnancy progressed, VAS scores increased, PGQ scores increased significantly during the postpartum period, PPAQ scores gradually decreased, and MAF scores increased ($p < 0.05$). Correlations were found between VAS, PGQ, PPAQ, and MAF. Multiple regression analysis showed that decreased physical activity and increased fatigue were statistically associated with pelvic pain ($R^2 = 0.413$); however, the overall regression model was not statistically significant ($p > 0.05$). **Conclusions**: This study found that pelvic pain persists beyond pregnancy, significantly impairing the physical functioning and energy levels of affected women. The development of individualized and holistic rehabilitation programs during pregnancy may be effective in maintaining and improving the mother's quality of life postpartum.

Keywords: pregnancy; postpartum; pelvic pain; functional limitation; physical activity; fatigue

1. Introduction

Pregnancy is characterised by significant physiological, biomechanical, hormonal, and psychosocial changes in a woman's body [1]. The physiological and biomechanical changes experienced by mothers during pregnancy can lead to various disorders in the musculoskeletal system. This occurs not only during pregnancy, but also following birth and during later periods [2]. One of the common complaints of pregnant women is pelvic pain, usually in the area between the posterior iliac crest and the gluteal fold. This pain is most commonly felt in the sacroiliac joint and symphysis pubis areas [3]. Although the etiology of pelvic pain is still uncertain, it can be affected by factors such as biomechanical disorders, traumatic conditions, metabolic imbalances, genetic predisposition, and degenerative changes [4]. Studies conducted over the past 20 years have reported that pelvic pain is experienced in 7% to 65% of pregnancies [5–7]. However, when pain in the lumbo-pelvic region of pregnant and postpartum women is also included, the prevalence increases to 76% [4]. Pelvic pain can start in the first trimester of pregnancy, as well as in the second and third trimesters [8]. Although it has been reported that 78% of women recover spontaneously by the 6th week postpartum [9], approximately 33% continue to experience pelvic pain three months after delivery, indicating a risk for chronicity [4]. The high incidence of pelvic pain during pregnancy and the postpartum period warrants an in-depth investigation of the factors associated with this pain.

Pregnant women often report that daily activities such as walking, climbing stairs, getting in and out of cars, and turning in bed can be difficult [10]. Therefore, physical activity levels and functional limitations are basic elements in the clinical evaluation of pregnant women [11]. Fatigue during and after pregnancy is one of the most common problems encountered in the clinic [12]. Increased fatigue in pregnant women can be due to factors such as hormonal imbalance, sudden weight gain, increased energy needs, emotional changes, and sleep disorders. This can lead to a decrease in the physical and mental performance of pregnant women. If the fatigue is long-term and continues after birth, it can cause permanent health problems for both the mother and child [13,14]. Studies in the literature have addressed fatigue in pregnant women from different perspectives [12–14]. However, to our knowledge, there have been no long-term observational studies that examined the relationship between fatigue and pelvic pain during pregnancy and the postpartum period. Although the effects of pelvic pain on physical activity during pregnancy have been frequently examined [11,15–18], this relationship has not been investigated during all trimesters of pregnancy and during the postpartum period. Such a study is essential to gain a more comprehensive understanding of the impact of pelvic pain on maternal and fetal health, and to guide preventive strategies. This common problem is often overlooked in women's health. It needs to be studied long-term at the individual level, and based on objective assessment data. The aim of the current study was therefore to examine the long-term effects of pelvic pain during pregnancy and the postpartum period on physical activity levels, functional limitations, and fatigue. The following research questions were formulated to address these aims: 1. How do pelvic pain, functional limitations, physical activity, and fatigue levels change across the first, second, and third trimesters of pregnancy, as well as the postpartum period (fourth trimester)? 2. What are the predictive factors for pelvic pain throughout the pregnancy trimesters and postpartum period?

2. Materials and Methods

2.1 Research Design

This prospective longitudinal study was conducted using a quantitative research design, in line with the study objectives. It was designed in accordance with the guidelines for "Strengthening the Reporting of Observational Epidemiological Studies" (STROBE) [19].

Independent variables in this study were trimester (time), gestational week, number of previous pregnancies, body mass index (BMI), age, sleep patterns, occupation, education status, and other sociodemographic characteristics. Dependent variables were defined as functional limitation, pelvic girdle questionnaire (PGQ), pregnancy physical activity questionnaire (PPAQ), and multidimensional assessment of fatigue. In addition, pelvic pain, measured using the visual analog scale (VAS), was treated both as an independent and a dependent variable depending on the analytical context. Specifically, pelvic pain was considered a dependent variable when identifying its predictors, and as an independent variable when evaluating its effects on fatigue, functional limitation, and physical activity.

2.2 Place and Time of the Study

The study was conducted between June 2022 and December 2023 in the Gynecology and Obstetrics outpatient clinics of three hospitals located in a province in Central Anatolia, Turkey.

2.3 Research Sample

The study cohort consisted of pregnant women who attended the Gynecology and Obstetrics outpatient clinics of three different hospitals. The sample consisted of 180 volunteer pregnant women who did not have pelvic pain or had only mild pelvic pain (VAS $\leq$3) in the first trimester.

Inclusion criteria were as follows:

- Aged between 18–45 years;
- Participant in the study before the 12th week of pregnancy;
- Carrying a singleton pregnancy;
- VAS $\leq$3;
- Voluntary participation and gave written informed consent.

Exclusion criteria were as follows:

- Multiple pregnancy;
- Obstetric or systemic disease during pregnancy (preeclampsia, gestational diabetes, hypertension, etc.);
- Chronic musculoskeletal disease before pregnancy;
- Underwent previous pelvic surgery;
- Had a neuromuscular or neurological disease;
- Incomplete or irregular completion of the questionnaires;
- Wanting to withdraw from the study.

2.4 Sample Size and Power Analysis

The sample size for the study was calculated according to the ANOVA test in Repeated Measures. Preliminary power analysis, assuming a significance level of 5% (α = 0.05), 80% power (1–β = 0.80), and a medium effect size (Cohen's f = 0.25), showed that at least 178 participants were required. Taking into account possible losses during the follow-up period, 10% more pregnant women were included in the sample, and thus 197 pregnant women were included in the study. However, 17 were later excluded due to withdrawal from the study or lack of communication/follow-up, giving a final study cohort of 180 pregnant women. With this sample size, the power value as determined by the G*Power 3.1.9.8 program (Heinrich-Heine-Universität Düsseldorf, Düsseldorf, Germany) was 80.4%.

2.5 Data Collection Tools

The following five validated instruments were used to collect data:

- Introductory and Pregnancy Information Form;
- VAS;
- PGQ;
- PPAQ;
- Multidimensional assessment of fatigue scale (MAF).

2.5.1 Introductory and Pregnancy Information Form

This form was prepared based on relevant literature [12–18]. Participants were asked demographic questions including marital status, education level and occupation, as well as obstetric questions including previous delivery method, pelvic pain status in the current pregnancy, disease status in pregnancy, surgery history, disease history, medication use, presence of chronic disease, smoking, alcohol use, sleep disorder, exercise habits, age, height, weight, BMI, gestational week, number of previous pregnancies, and duration of pelvic pain.

2.5.2 VAS

The severity of pelvic pain was assessed with the VAS developed by Price *et al*. [20]. Values are recorded along a 10 cm vertical or horizontal line (0 = no pain, 10 = unbearable pain). The reliability of VAS in Turkish populations has been confirmed, with a Cronbach alpha value of 0.92 [21].

2.5.3 PGQ

PGQ was used to assess functional limitations and symptoms in pregnant women. It was developed by Stuge *et al*. [22] and adapted into Turkish by Yelvar *et al*. [23]. The PGQ consists of 25 questions, with each item scored from 0 (no problem) to 3 (very serious problem), giving a total score between 0 and 100. The test-retest reliability coefficient in the Turkish reliability study was 0.979 (95% confidence interval [CI]: 0.905–0.915).

2.5.4 PPAQ

The PPAQ was developed by Chasan-Taber *et al*. [24] and adapted into Turkish by Tosun *et al*. [25]. It contains a total of 35 questions around daily life, work, housework, exercise and transportation activities. Physical activities over the past week are evaluated in minutes. PPAQ, 0 metabolic equivalent task (MET)-h/week, maximum score: there is no specific upper limit for the PPAQ score, as it is calculated based on MET values and duration of activity using the formula MET × duration [24]. In the Turkish validity and reliability study, the test-retest reliability was found to be 0.981, while the validity was 0.70.

2.5.5 MAF Scale

The MAF scale developed by Belza [26] was used to comprehensively assess the fatigue level of pregnant women. Yildirim and Ergin [27] adapted the MAF scale to Turkish and conducted a validity-reliability study. MAF includes dimensions such as the intensity, frequency, discomfort level, and affected activities associated with fatigue. The total MAF score varies between 0–50 as follows: 0–10, mild fatigue; 11–30, moderate fatigue; 31–50, severe fatigue. A high score means more fatigue and more impairment in daily life. The Cronbach alpha value in the Turkish reliability study was 0.90.

2.6 Data Collection Process

Data collection lasted for approximately 18 months. Assessments were conducted at four time points: during the first, second, and third trimesters, and during the sixth week postpartum (fourth trimester). The VAS, PGQ, PPAQ, and MAF assessments were administered at each time point. First-trimester assessments were conducted face-to-face, while interim and final follow-ups were conducted by phone.

The entire process was carried out with the following timeline: problem determination and hypothesis generation (March–April 2022), literature review (April–May 2022), granting of ethical permission and initiation of the study (May 2022), data collection and analysis (June 2022–December 2023).

2.7 Statistical Analysis

Following the completion of data collection, analyses were performed using the Statistical Package for the Social Sciences version 25.0 (IBM Corp., Armonk, NY, USA). The dataset included sociodemographic and obstetric characteristics obtained from the introductory and pregnancy information form, along with VAS, PGQ, PPAQ, and MAF scores. Descriptive statistics were then calculated, including the mean, standard deviation (SD), and percentage. The normality of distribution for continuous variables was assessed using the Kolmogorov-Smirnov test. Data for variables showing normal distribution were presented as the mean ± SD. For variables that did not show a normal distribution, data were presented as the median (min–max). One-way ANOVA was used to evaluate differences between groups, and simple and multiple regression analyses were used to determine predictive factors. The statistical significance threshold was defined as $p < 0.05$.

3. Results

3.1 Sociodemographic and Pregnancy-Related Characteristics of Participants

Table 1 presents the sociodemographic and pregnancy-related characteristics of the 180 pregnant women included in the study. The majority were married, non-smokers, and did not consume alcohol. More than half were housewives, and most had no chronic or previous health conditions. Approximately one-third exercised regularly or occasionally. The mean age was 31.87 ± 7.30 years, and the average duration of pelvic pain was 4.50 weeks (range: 1–12).

3.2 Median VAS Scores in Different Trimesters

A statistically significant difference was found in the repeated measurements analysis conducted to examine changes in VAS values according to the trimester (χ^2 = 14.82; p = 0.001), with the eta squared value indicating a small size effect (η^2 = 0.031). The Bonferroni multiple comparison test revealed that VAS scores in the first trimester were significantly lower than those in the third and fourth trimesters (Table 2).

Table 1. Sociodemographic and pregnancy-related characteristics of pregnant women in the study (n = 180).

Characteristic	Category	n (%) or mean ± SD*
Marital status	Married	170 (94.4)
	Single	10 (5.6)
Educational status	Primary school	40 (22.2)
	Secondary school	41 (22.8)
	High school	40 (22.2)
	Bachelor's degree	50 (27.8)
	Master's degree	6 (3.3)
	Doctorate	3 (1.7)
Occupation	Housewife	100 (55.6)
	Freelance	20 (11.1)
	Other	20 (11.1)
	Teacher	15 (8.3)
	Engineer	10 (5.6)
	Nurse	10 (5.6)
	Doctor	5 (2.8)
Previous birth	Vaginal	50 (27.8)
	Cesarean	38 (21.1)
Number of previous pregnancies	0	92 (51.1)
	1	50 (27.8)
	≥2	38 (21.1)
Disease during pregnancy	None	180 (100.0)
Surgery history	None	180 (100.0)
Disease history	None	180 (100.0)
Drug use	Yes	79 (43.9)
	No	101 (56.1)
Chronic disease	None	180 (100.0)
Smoking	Yes	7 (3.9)
	No	173 (96.1)
Alcohol use	Yes	5 (2.8)
	No	175 (97.2)
Sleep disorder	Yes	105 (58.3)
	No	75 (41.7)
Exercise habit	Regular	60 (33.3)
	Occasional	66 (36.7)
	None	54 (30.0)
Age (years)		31.87 ± 7.30
Height (cm)		165.09 ± 8.35
Weight (kg)		82.91 ± 11.28
BMI (kg/m^2)		30.63 ± 5.09
Gestational weeks		7.93 ± 2.96
Duration of pelvic pain (weeks)		4.50 (min–max: 1.00–12.00)*

*Categorical variables are presented as n (%), and continuous variables as the mean ± SD. The median value is presented together with the range for minimum and maximum, since the data were not normally distributed. SD, standard deviation; BMI, body mass index; n, number of samples.

3.3 Mean PGQ Scores in Different Trimesters

A statistically significant difference was found in the repeated measurements analysis conducted to evaluate changes in PGQ values according to the trimester (F = 3.300; p = 0.022). The eta squared value indicated a small to medium size effect on the PGQ scores (η^2 = 0.045). The Bonferroni multiple comparison test revealed a significant difference between the first and fourth trimesters ($p < 0.05$), but none between the other trimesters (Table 3).

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Table 2. VAS scores according to trimester (n = 180).

Trimester	Median [IQR]	χ^2	*p*-value	η^2	Bonferroni comparison
First	1.55 [0.80–2.40]	14.82	0.001*	0.031	first < third*; first < fourth*
Second	1.80 [1.00–2.60]				
Third	2.30 [1.40–3.00]				
Fourth	2.60 [1.60–3.30]				

VAS, visual analog scale; χ^2, Chi-square test statistic; η^2, partial eta squared (effect size); IQR, interquartile range; * indicates statistical significance.

Table 3. PGQ values according to trimester.

Trimester	Mean ± SD	95% CI (Lower–Upper)	F	*p*-value	η^2	Bonferroni comparison
First	53.25 ± 25.60	49.50–57.00	3.300	0.022*	0.045	first < fourth*
Second	56.70 ± 26.10	52.85–60.55				
Third	59.90 ± 24.80	56.20–63.60				
Fourth	62.95 ± 26.00	59.10–66.77				

PGQ, pelvic girdle questionnaire; CI, confidence interval; F, ANOVA test statistic; * indicates statistical significance.

Table 4. PPAQ values according to trimester.

Trimester	Mean ± SD	95% CI (Lower–Upper)	F	*p*-value	η^2	Bonferroni comparison
First	797.79 ± 5.02	783.81–811.76	73.992	<0.001*	0.292	first > second*, first > third*, first > fourth*
Second	752.55 ± 95.17	738.54–766.54				second > third*, second > fourth*
Third	695.19 ± 102.36	680.13–710.24				third > fourth*
Fourth	650.44 ± 102.39	635.37–665.49				

PPAQ, pregnancy physical activity questionnaire. * indicates statistical significance.

Table 5. MAF values according to trimester.

Trimester	Mean ± SD	95% CI (Lower–Upper)	F	*p*-value	η^2	Bonferroni comparison
First	35.43 ± 12.40	33.62–37.24	3.582	0.014*	0.035	
Second	33.91 ± 13.37	31.96–35.87				second < fourth*
Third	36.37 ± 14.50	34.25–38.49				
Four	38.59 ± 14.71	36.44–40.74				

MAF, multidimensional assessment of fatigue scale; * indicates statistical significance.

3.4 Mean PPAQ Scores in Different Trimesters

A statistically significant difference was found in the repeated measurements analysis performed to examinechanges in PPAQ values according to the trimester (F = 73.992; $p < 0.001$). The eta squared value indicated a large effect size on the PPAQ scores ($\eta^2 = 0.292$). The Bonferroni multiple comparison test revealed the PPAQ scores in the first trimester were significantly higher than in the second, third and fourth trimesters. In addition, the second trimester scores were significantly higher than the third and fourth trimester scores, while the third trimester scores were significantly higher than the fourth trimester scores (Table 4).

3.5 Mean MAF Scores in Different Trimesters

The repeated measures ANOVA revealed a statistically significant difference in MAF score between trimesters (F = 3.582; $p = 0.014$). The eta squared value showed a small to moderate effect on the fatigue level ($\eta^2 = 0.035$). The Bonferroni multiple comparison test revealed a significant difference between the second and fourth trimesters (Table 5).

3.6 Simple Regression Analysis of Postpartum Data

Table 6 shows the results of a linear regression analysis of data obtained in the postpartum period (between 6–8 weeks after delivery), at which time the data on all variables available and complete. Simple linear regression analyses were performed for each variable, with VAS, PGQ, PPAQ and MAF treated as dependent variables. In each model, one variable was designated as the dependent variable and the others as independent variables. When PGQ was the dependent variable, MAF was a positive predictor ($\beta = 0.380$) and PPAQ was a negative predictor (β = –0.330). When MAF was the dependent variable, PGQ was positively affected and PPAQ was negatively affected. When PPAQ was the dependent variable, PGQ and MAF were both negatively correlated. When VAS was the dependent variable, only PGQ was found to be a significant positive predictor ($\beta = 0.340$).

Table 6. Simple linear regression analyses for the prediction of PGQ, MAF, PPAQ, and VAS scores using postpartum data.

Dependent variable	Independent variable	B	SE	β	95% CI (Lower–Upper)	p-value
PGQ	MAF	0.890	0.210	0.380	0.47 to 1.31	0.001*
PGQ	PPAQ	–0.041	0.012	–0.330	–0.065 to –0.017	0.001*
MAF	PGQ	0.310	0.080	0.360	0.15 to 0.47	0.001*
MAF	PPAQ	–0.026	0.009	–0.410	–0.044 to –0.008	0.005*
PPAQ	PGQ	–2.340	0.780	–0.280	–3.88 to –0.80	0.004*
PPAQ	MAF	–3.670	1.120	–0.410	–5.87 to –1.47	0.002*
VAS	PGQ	0.021	0.007	0.340	0.007 to 0.035	0.004*

B, unstandardized coefficient; SE, standard error; β, standardized coefficient; * indicates statistical significance.

Table 7. Multiple linear regression analysis for the prediction of VAS scores from PGQ, MAF, and PPAQ.

Predictor	B	SE	β	t	p-value
Constant	0.521	0.680	—	0.829	0.432
PGQ	0.032	0.014	0.384	2.308	0.053
MAF	0.042	0.020	0.302	2.094	0.071
PPAQ	–0.018	0.010	–0.295	–1.800	0.119

R^2 = 0.413; adjusted R^2 = 0.267, F(3,6) = 2.814, p = 0.119. t, t-value. —, not applicable (standardized coefficient is not calculated for the constant).

3.7 Multiple Linear Regression Analysis of the Effect of PGQ, PPAQ and MAF on the Prediction of VAS Scores

The theoretical basis for this regression model relies on the biopsychosocial model of pain, which suggests that musculoskeletal dysfunction (PGQ), behavioral components (PPAQ), and physiological states (MAF) collectively influence the perception of pain. Based on this framework, PGQ, reduced PPAQ, and increased MAF were hypothesized to predict increased VAS. Accordingly, multiple linear regression analysis was performed to examine the relationships between VAS, PGQ, PPAQ and MAF. As shown in Table 7, the regression model did not find a statistically significant result overall (F[3,6] = 2.814, p = 0.119), but it could explain 41.3% of the variance in VAS scores (R^2 = 0.413, adjusted R^2 = 0.267). None of the individual variables were found to be statistically significant at the 5% significance level. Although trends were observed in the unstandardized regression coefficients for PGQ (B = 0.032, p = 0.053) and MAF (B = 0.042, p = 0.071), and a negative trend for PPAQ (B = –0.018, p = 0.119).

4. Discussion

This study was designed to address two key research questions. The first was to examine changes in pelvic pain, physical activity, functional limitations and fatigue during all trimesters of pregnancy and the postpartum period. The results showed that pelvic pain and fatigue increased, physical activity decreased, and functional limitations increased, especially during the third trimester and postpartum period. The second aim was to investigate variables that predict pelvic pain. Although the result found with the regression model was not statistically significant ($p > 0.05$), the model nevertheless accounted for 41.3% of the variance in pelvic pain and showed that decreased physical activity and increased fatigue were clinically related to pain. These findings directly address the research objectives and underscore the importance of individualized rehabilitation strategies during the postpartum period.

Pelvic pain is common during pregnancy and is associated with the level of physical activity and fatigue. Although cross-sectional studies have demonstrated this relationship, changes in pain during pregnancy and its temporal relationship with physical activity and fatigue have yet to be studied over the long term. The current prospective longitudinal study investigated the long-term effects of pelvic pain on the physical activity level, functional limitations, and fatigue levels at different stages of pregnancy and during the postpartum period. Important and original results were obtained regarding the course, severity and clinical presentation of pelvic pain during pregnancy and postpartum.

Similar to previous studies [3,5,28], this study also observed a significant increase in the severity of pelvic pain during pregnancy progression. Pelvic pain is commonly experienced by pregnant women and continues into the postpartum period. Although biomechanical changes are the main reason for the increase in VAS values from the first trimester to postpartum, permanent changes in hormonal and biological mechanisms, as well as psychosocial processes, are also likely to play a role. This highlights the complex and dynamic structure of pelvic pain. Even though it is commonly thought that pelvic pain only occurs during pregnancy, the present study found that it continues after birth and intensifies, thus contradicting the notion that it only affects birth. Therefore, mothers should be regularly assessed and monitored for pelvic pain and precautions taken, especially in the postpartum period. Consistent with the literature, a notable finding of our study was the decline in physical activity level in pregnant women. The physical activity of pregnant women decreases as pregnancy progresses due to factors such as weight gain, growth of abdominal volume, and increased energy need [17,18]. However, one of the striking findings of the present study was the gradual decrease in the physical activity level of mothers during the postpartum period. This may be due to the stress experienced by the mother because of increased responsibilities [29], anxiety [30], insomnia [30], postoperative pain, and fatigue [31]. The lack of sufficient motivation by the mother to engage in physical activity may also be a contributing factor [32]. Hence, there is a need for individualized physical activity programs to encourage the participation of mothers. Multidimensional fatigue assessments adapted for pregnant women also showed a progressive and variable course during pregnancy and the postpartum period. Although fatigue symptoms tended to be mild in the first and second trimesters of pregnancy, a significant increase was observed in the third trimester and especially in the postpartum period. This can be explained by the responsibilities and associated psychological burden of the mother towards her baby, and is also consistent with previous studies emphasizing the long-term effects of fatigue on maternal health [12,14,31].

The pelvic girdle pain and functional limitations discussed in this study are directly related to pelvic pain. The physical and functional limitations experienced by pregnant women and the mechanical load they are under in the pelvic region may cause these conditions to affect each other. Moreover, increased fatigue is known to lead to increased severity of pelvic pain. This phenomenon may reduce the tolerance of pain perception in pregnant women who experience fatigue. Elevated levels of fatigue in pregnant women may activate central sensitivity mechanisms by affecting the pain processing and modulation system in the central nervous system [33]. Activation of this sensitivity causes the pain threshold of pregnant women to decrease and pelvic pain to increase [34]. In particular, long-term fatigue experienced during pregnancy may trigger hypersensitivity in dorsal horn neurons, leading to chronic pain [33–35].

Multiple regression analysis examining the relationship between physical activity, functional status, and fatigue with pelvic pain during pregnancy did not yield statistically significant results (p = 0.119). Although the explained variance in pelvic pain (R^2 = 0.413) suggests a potentially meaningful association, this finding should be interpreted with caution due to the lack of statistical significance. It is possible that the current study was underpowered to detect subtle effects. Previous studies, however, have demonstrated that higher physical activity levels during pregnancy are associated with lower levels of pain and fatigue [12,34,36], possibly due to enhanced pelvic stability and physical endurance. These findings highlight the need for further research with larger samples to better clarify these relationships.

4.1 Strengths of the Study

One of the strongest aspects of this study was its prospective longitudinal design, allowing long-term monitoring of pregnant women during different trimesters and the postpartum period. The participation of 180 pregnant women also strengthened the statistical power of the study. Furthermore, the pregnancy and postpartum periods were evaluated using several multidimensional assessment tools, with advanced statistical methods employed to increase the reliability and validity of the results. Together with previous literature reports, this study may contribute to the development of innovative strategies and clinical guidance for addressing decreased physical activity and increased fatigue in pregnant women, with the aim of reducing pelvic pain in the later stages of pregnancy.

4.2 Limitations of the Study

This study has several limitations. First, the pelvic pain condition of pregnant women was examined in relation to physical activity and fatigue. However, pelvic pain can be affected by many physical, hormonal, biomechanical and psychosocial conditions. The interaction of these different conditions with pain was not evaluated here. Although growth analysis may provide a more comprehensive understanding of changes over time, we used simple and repeated measures analyses due to the structure of the dataset and software limitations. This limitation is acknowledged in the present study and highlights the need for methodological improvements in future research. Second, the study cohort included only patients from three hospitals in the Central Anatolia Region of Turkey. This may limit the external validity of our results and restrict generalization of the findings to other populations with different socioeconomic, cultural or geographical characteristics. Pelvic pain, physical activity, and fatigue levels may show different patterns in pregnant women from low-income groups, adolescent pregnant women, or women with pre-existing musculoskeletal disorders. Therefore, it is recommended that more diverse and heterogeneous populations be included in future studies. Third, the physical activity level of pregnant women was assessed using the PPAQ. Accelerometers or wearable activity monitoring devices could instead be used in future studies. Finally, due to the long duration of the study and the high rate of sample loss, follow-up was continued into the postpartum period. In future studies, the follow-up of mothers could be extended even further into the first and second years after birth.

5. Conclusions

This prospective longitudinal study found that, pelvic pain not only occurs during pregnancy, but also persists with notable severity during the postpartum period. Such pain may impair maternal functionality and threaten the quality of life of both the mother and child. During this period, a gradual decrease in the level of physical activity by the mother and an accumulation of fatigue can increase her sensitivity to the perception of pain. The results of this study question the assumption that pelvic pain resolves after birth and therefore it should not be considered as a temporary discomfort specific to pregnancy. Rather, pelvic pain is a multidimensional clinical condition that continues after birth and can permanently affect the health of mothers. The severity of pain can be reduced by ensuring that mothers are encouraged to exercise and remain active in order to combat fatigue, especially during the postpartum period. Therefore, the implementation of holistic and individualized rehabilitation and support programs spanning the pre-pregnancy to postpartum periods may be a valuable strategy for promoting women's health. Programs could include pelvic floor muscle training, low-intensity aerobic activities, relaxation and breathing techniques, manual therapy and psychoeducation-based pain management. These activities should be assessed before, during and after pregnancy, and their applicability subsequently evaluated. This approach may contribute to the development of evidence-based, multidisciplinary, and clinically feasible approaches for managing pelvic pain.

Availability of Data and Materials

The data obtained and analyzed within the scope of this study are not publicly available due to participant confidentiality, ethical restrictions, or institutional policies. However, they can be obtained from the corresponding author upon reasonable request and with the necessary permissions.

Author Contributions

KG designed the research study, performed the research, analyzed the data, and wrote the manuscript. The author contributed to editorial changes in the manuscript. The author read and approved the final manuscript. The author has participated sufficiently in the work and agrees to be accountable for all aspects of the work.

Ethics Approval and Consent to Participate

Ethical approval was obtained for the study from the Yozgat Bozok University Clinical Research Ethics Committee with the decision number 2017-KAEK-189_2022.05.12_02. The necessary approval was obtained from the Yozgat Bozok University Health Application and Research Center for the study permit. The volunteers participating in the study were informed about the study. Data collection began after written and verbal consent was obtained from the volunteers. The study was conducted in accordance with the Declaration of Helsinki.

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Conflict of Interest

The author declares no conflict of interest.

Supplementary Material

Supplementary material associated with this article can be found, in the online version, at https://doi.org/10.31083/CEOG40056.

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