

# Impact of the quality of life related to foot health in a sample of pregnant women

## A case control study

Daniel López-López, PhD, BSc, MsC, DP<sup>a,\*</sup>, Inés Rodríguez-Vila, DP<sup>a</sup>, Marta Elena Losa-Iglesias, RN, PhD, MsC, DP<sup>b</sup>, David Rodríguez-Sanz, PhD, MsC, PT, DP<sup>c</sup>, César Calvo-Lobo, PhD, Msc, PT<sup>d</sup>, Carlos Romero-Morales, PhD, MsC, PT<sup>c</sup>, Ricardo Becerro-de-Bengoa-Vallejo, RN, BSc, MLIS, DPM, PhD, DHL, FFPM, RCPS<sup>e</sup>

### Abstract

Pregnancy women coincide with numerous anatomical and physiological changes, which are believed to have a harmful effect on the quality of life related to foot health. The goal of this research was to identify and compare the impact foot health and overall health in a sample of pregnancy women and women without pregnancies with normalised reference values.

A sample of 159 participants of a mean age of  $30.13 \pm 6.28$  came to the area of midwifery center where self-reported data were registered, informants' with a 1 or various pregnancy was determined and the scores obtained were compared in the foot health status questionnaire (FHSQ). This has 13 questions that assess 4 health domains of the feet, namely pain, function, general health, and footwear.

The pregnant women group showed a worse quality of life related to health in general and to foot health specifically at the following domains, foot function, footwear, general foot, health, physical activity, social capacity, and vigor ( $P < 0.05$ ) and there were no differences at foot pain and general health ( $P > 0.05$ ).

Pregnant women present a negative impact on the quality of life related to foot health, which appears to be associated with the pregnancy period.

**Abbreviations:** BMI = body mass index, FHSQ = foot health status questionnaire, SD = standard deviation.

**Keywords:** foot deformities, foot diseases, pregnancy, quality of life, women's health, women's health services

## 1. Introduction

Pregnancy women coincide with numerous anatomical and physiological changes which include weight gain, alterations in posture and joint, hormonal variations, ligament laxity along with variations in musculotendinous strength that affect which

are a significant cause of functional limitations, disability, and risk of falls.<sup>[1-4]</sup>

These variations, occurring in general in the body of the pregnant woman, lead to many complains of discomfort, pain in low back, lower limbs, osteoarthritis,<sup>[5-8]</sup> and especial in the foot that increase range of movement at the first metatarsophalangeal joint, low arches height, growth volume in length and forefoot width, high plantar surface pressures, and difficulties putting shoes on.<sup>[6,9-12]</sup>

Also, the prevalence and severity of most of the pregnant symptoms related muscle and joint pain is virtually all woman and 25% have at least temporarily disabling symptoms,<sup>[13]</sup> in part, relate to foot changes that affect the activities of daily routine during this period of time.<sup>[14]</sup>

However, the comprehensive impact of pregnancy women related to foot health has not been explored.

Therefore, the goal of this research was to identify and compare the impact foot health and overall health in a sample of pregnancy women and women without pregnancies with normalized reference values in the light of the scores obtained with regard foot health-related quality of life. The authors hypothesized that a pregnant women present a negative impact on the quality of life related to foot health, compare with Nulliparous, which appears to be associated with the pregnancy period.

## 2. Methods

### 2.1. Design and sample

The research consisted of a descriptive observational case control study carried at the area of midwifery center Unit of the Galician

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<sup>a</sup> Research, Health and Podiatry Unit, Department of Health Sciences, Faculty of Nursing and Podiatry, Universidade da Coruña, <sup>b</sup> Faculty of Health Sciences, Universidad Rey Juan Carlos, <sup>c</sup> Physical Therapy & Health Sciences Research Group, European University of Madrid, Villaviciosa de Odón, Madrid, <sup>d</sup> Nursing and Physical Therapy Department, Institute of Biomedicine (IBIOMED), Faculty of Health Sciences, University of León, Ponferrada, León, <sup>e</sup> School of Nursing, Physiotherapy and Podiatry, Universidad Complutense de Madrid, Madrid, Spain.

\* Correspondence: Daniel López-López, Universidade da Coruña, Unidade de Investigación Saúde e Podoloxía, Facultade de Enfermaría e Podoloxía, Departamento de Ciencias da Saúde, Campus Universitario de Esteiro s/n, 15403 Ferrol (España) (e-mail: daniellopez@udc.es).

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Health System and the Clinic of Podiatric Medicine and Surgery that provides treatment of diseases and disorders of the foot at University of A Coruña (Ferrol, Spain) between January and September 2016. The selection of the investigation women's was conducted by a non-randomized and consecutive sampling method to 178 participants in the age range of 19 to 44 years, of which 159 gave consent and were enrolled into the study. The exclusion criteria were as the following: being under 18 years of age, smokers or alcoholic patients, women participating in vitro fertilization, multiple gestation or women with gestation before the twentieth week, immunocompromised subjects, previous trauma and a history of foot surgery, musculoskeletal problems, general discomfort neurological disorders, lack of autonomy/semi-autonomy in daily activities, the refusal to sign an informed consent form, and the inability to understand and carry out the instructions in the research.

## 2.2. Sample size

A minimal difference score of at least 21 was established as clinically relevant among the groups under study in the foot health status questionnaire (FHSQ). The standard deviation on that scale for people is approximately 29,<sup>[15-18]</sup> thus for a bilateral hypothesis, an alpha risk of 5% and a statistical power of 80%, at least 47 cases must be studied in each group (n=94).

## 2.3. Procedure

The volunteers were divided in 2 groups. A total of 159 women participated in the study. One hundred pregnant women and 59 healthy nulliparous women's as controls with normalized reference values.

All data were recorded and a detailed physical examination was performed by a single trained research to determine suitability. After confirmation of eligibility, an analysis of anthropometric data was performed for body weight, height weight, and body mass index (BMI) was calculated from weight in kilograms divided by the square of height in meters (kg/m<sup>2</sup>).<sup>[19]</sup>

Then, each subject completed the FHSQ.<sup>[20]</sup> This health-related quality of life self-reported instrument is specific to the foot which is recognized as a validated test.<sup>[21,22]</sup>

Foot-specific and general health-related quality of life was assessed by using the FHSQ (version 1.03),<sup>[20]</sup> that is divided into 3 sections. First section consists of 13 questions evaluates foot health in 4 domains: foot pain, foot function, footwear, and general foot health (Table 1). This section has demonstrated a high degree of content, criterion, and construct validity (Cronbach  $\alpha=0.89-0.95$ ) and high retest reliability (intraclass correlation coefficient=0.74-0.92),<sup>[21]</sup> and it has been shown to be the most appropriate measure of health-related quality of life for foot across pathologies such as skin, nail, neurological, orthopaedic, and musculoskeletal disorders, among other conditions.<sup>[21-27]</sup>

Every domain has a specific number of questions (Table 2). Four questions based on pain, 4 on function, 3 on footwear, and 2 on general foot health. The assessment of pain and function is based on physical phenomena, the evaluation of footwear uses practical aspects related to availability and the comfort of the shoes, while the perception of the foot's general health is based on the patients' self-assessment of the state of their feet.

Each question allows several answers and these are placed on a Likert-type ordinal scale (words or phrases corresponding to a numeric scale). The descriptors for these scales vary for each domain and the person completing the questionnaire has to choose only 1 response, whichever is thought to be the most appropriate. The questionnaire does not provide a global score, but rather generates an index for each domain. In order to obtain these indices, the responses may be easily obtained using software (The FHSQ, Version 1.03) which, after processing the data, gives a score ranging from 0 to 100. A 0 score represents the worst state of health for the foot and 100 is the best possible condition. Additionally, the computer program also provides graphical images of the outcomes.

Second section consists of 20 questions that reflect 4 general health-related domains (Table 3): general health, physical activity, social capacity, and vigor. The domains and questions in this section are largely adapted from the Medical Outcomes Study 36-Item Short-Form Health Survey,<sup>[28]</sup> which has been validated for use in the Australian population.<sup>[23]</sup> Specific questions of the FHSQ that assess Section 2 domains are shown in Table 4.

**Table 1**

**Basic domains of foot health assessed by the foot health status questionnaire. Section 1 domains.**

Domain	Item	Theoretical construct	Meaning of lowest score (0)	Meaning of highest score (100)
Foot pain	4	Type, severity and duration. Evaluation of foot pain in terms of type of pain, severity, and duration	Extreme pain in the feet and significant if acute in nature	Free from pain, no discomfort
Foot function	4	Evaluation of the feet in terms of impact on physical function	Severely limited for the performance of numerous physical activities due to their feet, such as walking, working, and moving about	Patients are able to carry out all physical activities desired, such as walking, working, and climbing stairs
General foot health	2	Self-perception of the feet (assessment of body image with respect to feet)	Perception of poor condition and status of the feet	Perception of excellent condition and status of the feet
Footwear	3	Lifestyle relating to footwear and feet	Great limitations to find suitable footwear	No problem obtaining suitable footwear. No limitations with respect to footwear

**Table 2**

**Thirteen questions of the foot health status questionnaire that assess 4 health domains of the feet: pain, function, general health, and footwear.**

1. What level of foot pain have you had during the past week?
2. How often have you had foot pain?
3. How often did your feet ache?
4. How often did you get sharp pains in your feet?
5. Have your feet caused you to have difficulties in your work or activities?
6. Were you limited in the kind of work you could do because of your feet?
7. How much does your foot health limit you walking?
8. How much does your foot health limit you climbing stairs?
9. How would you rate your overall foot health?
10. It is hard to find shoes that do not hurt my feet.
11. I have difficulty in finding shoes that fit my feet.
12. I am limited in the number of shoes I can wear.
13. In general, what condition would you say your feet are in?

In the last place, third section collects socioeconomic status, comorbidity, service utilization, and satisfaction information about their medical record. The FHSQ was performed at the last month of pregnancy.

**2.4. Ethics considerations**

This research was approved by the Research and Ethics Committee of the University of A Coruña (Spain), file number CE 17/2016. All voluntary informants gave their consent in written form before their inclusion in the study. Ethical standards for research on human beings based on the Declaration of Helsinki (World Medical Association) and the Convention of the Council of Europe on human rights and biomedicine, as well as those based on the Universal Declaration of the UNESCO on the Human Genome and Human Rights and other appropriate national or institutional organizations were preserved.

**2.5. Statistical analysis**

Demographic characteristics, including subject height, weight, age, and BMI, and independent variables were summarized as mean and standard deviation (SD), maximum, and minimum values and compared between the 2 groups.

All variables were examined for normality of distribution using the Kolmogorov–Smirnov test, and data were considered normally distributed if  $P > 0.05$ . Independent Student *t* tests were performed to find if differences are statistically significant when

showing a normal distribution. Measurements which were not normally distributed were tested using non-parametric Mann–Whitney *U* test.

The FHSQ, Version 1.03 was used for the obtention of quality of life scores related to foot health. In all of the analyses, statistical significance was established with a *P* value  $< 0.05$ . All the analyses were performed with commercially available software (SPSS 19.0, Chicago, IL).

**3. Results**

A total of 159 women with a mean of  $30.13 \pm 5.05$  years old ranged 19 and 44 years of age completed the research course. The sample analyzed included 100 (62.89%) pregnant women with an age of  $33.11 \pm 5.05$  (20–44) and 59 (37.19%) with an age of  $25 \pm 4.76$  (19–39) healthy nulliparous women’s as controls with normalized reference values. Table 5 shows the sociodemographic characteristics of the participants showing a significant difference at age, weight, and BMI ( $P < 0.05$ ) but there were no differences at height, ( $P > 0.05$ ).

Table 5 shows the sociodemographic characteristics of the participants.

The variables that did not show a normal distribution were age, weight, BMI, foot function, physical activity, and vigor ( $P < 0.05$ ) and showed a normal distribution height, foot pain, footwear, general foot health, general health, and social capacity ( $P > 0.05$ ).

In what regards the comparison of the scores obtained with the FHSQ, results appear on Table 6. These scores were higher for the group healthy nulliparous women’s, with normalized reference values, both in the first section of the questionnaire, which assesses the informants’ quality of life related specifically to foot health, and in the second section, which assesses the informants’ health in general.

The differences between the 2 groups were statistically significant ( $P < 0.05$ ).

**4. Discussion**

The goal of this research was to identify and compare the impact foot health and overall health in a sample of pregnancy women and women without pregnancies with normalized reference values in the light of the scores obtained with regard foot health-related quality of life.

Several studies have described a multifactorial etiology owing to the faulty foot adaptation occurring in pregnancy<sup>[29,30]</sup> and it is believed to be associated on the decrease in their quality of life

**Table 3**

**Definitions of the foot health questionnaire. Section 2 domains.**

Domain	Theoretical construct	Meaning of lowest score (0)	Meaning of highest score (100)
General health	Evaluation of subject’s self-reported health status	Poor perception of health status	Very good general health status
Physical activity	Evaluation of ability in terms of impact on physical function	Severely limited in performing a broad range of physical activities	Can perform all desired physical activities with no impairment or disability
Social capacity	Self-perceptions of ability to socially interact	Limited ability to interact without problems, socially isolated	Good ability to interact socially and experience no isolation
Vigor	Lifestyle issues to perceived energy and activity participation	Lacks energy to do things	No problems with energy levels

**Table 4****Questions of the foot health status questionnaire that assess section 2 domains.**

14. In general, how would you rate your health?
15. The following questions ask about activities you might do during a typical day. Does your health now limit you in these activities?
- Vigorous activities, such as running, lifting heavy objects, or (if you wanted to) your ability to participate in strenuous sports.
  - Moderate activities, such as cleaning the house, lifting a chair, playing golf, or swimming.
  - Lifting or carrying bags of shopping.
  - Climbing a steep hill.
  - Climbing one flight of stairs.
  - Getting up from a sitting position.
  - Walking more than a kilometer.
  - Walking 100 m.
  - Showering or dressing yourself.
16. To what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbors, or social groups?
17. These questions are about how you feel during the past month. For each question, please give the one answer that comes closest. How much of the time during the past 4 weeks:
- Did your feet get tired?
  - Did you have a lot of energy?
  - Did your feet feel worn out?
  - Did you feel full of life?
18. During the past 4 weeks, how much of the time has your emotional problems or physical health interfered with your social activities (like visiting with friends, relatives, etc.)?
19. How true or false is each of the following statements for you?
- I seem to get sick a little easier than other people.
  - I am as healthy as anybody I know.
  - I expect my health to get worse.
  - My health is excellent.

**Table 5****Socio-demographic and clinical characteristics of the sample population.**

	Total group mean $\pm$ SD range N = 159	Pregnant women mean $\pm$ SD range N = 100	Nulliparous women mean $\pm$ SD range N = 59	P
Age, yrs	30.13 $\pm$ 6.28 (19–44)	33.11 $\pm$ 5.05 (20–44)	25.08 $\pm$ 4.76 (19–39)	0.001**
Weight, kg	68.80 $\pm$ 14.15 (47–121)	73.35 $\pm$ 14.24 (50–121)	61.08 $\pm$ 10.15 (47–112)	0.001**
Height, cm	163.16 $\pm$ 6.20 (150–177)	163.55 $\pm$ 5.35 (152–175)	163.56 $\pm$ 5.36 (152–175)	0.504*
BMI, kg/m <sup>2</sup>	25.82 $\pm$ 4.95 (16.90 – 43.18)	22.81 $\pm$ 2.44 (16.90–40.16)	22.81 $\pm$ 3.44 (16.90 – 40.16)	0.001**

BMI = body mass index; SD = standard deviation. In all the analyses,  $P < 0.05$  (with a 95% confidence interval) was considered statistically significant.

\*  $P$  values are from Independent student  $t$  test\*.

\*\*  $P$  values are from non-parametric Mann–Whitney U test.

**Table 6****Foot health status questionnaire (FHSQ) mean scores for the case and control groups.**

	Total group mean $\pm$ SD range N = 159	Pregnant women mean $\pm$ SD range N = 100	Nulliparous women mean $\pm$ SD range N = 59	P
Foot pain	79.98 $\pm$ 20.24 (0–100)	82.05 $\pm$ 17.44 (25–100)	80.92 $\pm$ 18.50 (0–100)	0.766*
Foot function	81.00 $\pm$ 20.29 (6.25–100)	81.39 $\pm$ 17.85 (31.25–100)	89.04 $\pm$ 10.87 (56.25–100)	0.049**
Footwear	43.83 $\pm$ 29.69 (0–100)	51.08 $\pm$ 30.41 (0–100)	56.77 $\pm$ 31.50 (0–100)	0.011*
General foot health	56.20 $\pm$ 20.63 (25–100)	57.55 $\pm$ 18.53 (25–100)	65.72 $\pm$ 20.89 (25–100)	0.006**
General health	81.79 $\pm$ 19.81 (10–100)	83.64 $\pm$ 18.21 (10–100)	83.65 $\pm$ 18.21 (10–100)	0.351*
Physical activity	72.55 $\pm$ 25.95 (5.56–100)	89.72 $\pm$ 10.86 (56–100)	91.58 $\pm$ 20.54 (61.11–100)	0.001**
Social capacity	87.66 $\pm$ 13.79 (50–100)	82.61 $\pm$ 16.97 (37.50–100)	87.67 $\pm$ 13.79 (50–100)	0.004*
Vigor	73.42 $\pm$ 23.62 (25–100)	41.85 $\pm$ 24.54 (0–100)	73.42 $\pm$ 23.63 (25–100)	0.001**

FHSQ = foot health status questionnaire survey; SD = standard deviation. In all the analyses,  $P < 0.05$  (with a 95% confidence interval) was considered statistically significant.

\*  $P$  values are from Independent student  $t$  test.

\*\*  $P$  values are from non-parametric Mann–Whitney U test.

during pregnancy.<sup>[31]</sup> However, the impact of the quality of life related to foot health are pursued are still unclear.

This is the first research revealed that pregnant women present lower scores on the dimensions related to quality of life related to foot health, than healthy nulliparous women with normalized

reference values. In fact, the results of this research highlight the need for health care physicians to advise pregnant women about the changes that pregnancy will bring about to their feet largely<sup>[32]</sup> and would help to advise the pregnant women improving their quality of foot health during pregnancy.

These findings are congruent with the outcomes of a prospective non-experimental study conducted by Cassar and Formosa,<sup>[33]</sup> which reported negative impact on foot health pregnant women with less than 20 weeks pregnancy.

Furthermore, the current study has some limitations. We did not study the degree of foot care of the participants, and because we think is a cultural aspect of the different countries, a multicentre studies are needed to find out if a higher foot care could improve the foot health during pregnant and avoid the pain that pregnant women has described in our study.

In the second place, the age-related selection bias may deter applicability of outcomes on pregnant women. Future studies would benefit from larger sample sizes, investigation among different cultures, ethnicities and living locations. Additional research can evaluate foot health in the pregnancy period and an appropriate preventive treatment may significantly reduce the frequency of foot defects and their severity.

Appropriate preventive treatment may significantly reduce the frequency of foot defects and their severity.

## 5. Conclusions

The present research provides a comprehensive view of the pregnant women present a negative impact on the quality of life related to foot health, which appears to be associated with the pregnancy period. The physician has an improved understanding of the foot impact experienced by the pregnant patient and can select a proper care and controlling the feet health.

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