

# THE IMPACT OF PREGNANCY ON FOOT HEALTH

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**Abstract.** Although pregnancy should be a joyous experience to all expectant mothers, it is also known to bring about a number of bodily changes which could impose lifestyle limitations throughout the nine months of pregnancy. In this study, the authors sought to evaluate the impact of pregnancy on foot health. A prospective non-experimental study was conducted. The authors interviewed 40 expectant Maltese mothers using the Bristol Foot Score (BFS). Results showed a significant difference ( $p < 0.001$ ) in foot health in the recruited subjects from Time 0 (15 weeks pregnancy) to Time 1 (37 weeks pregnancy), implying that pregnancy imposes a negative impact on foot health. This finding is of key importance and needs to be taken into consideration by all health stakeholders if better health care is to be offered to all expectant mothers. Both locally and internationally, antenatal care aims to monitor pregnant women’s general health and foetal development. However, very little attention is given to foot health. The authors highlight the importance of providing all expectant mothers with footcare education and podiatry services in the Antenatal Clinic.

**Keywords** pregnancy, quality of life, foot health, foot care advice, health education

## 1 Introduction

Pregnancy should be a period of joy for every expectant woman and it should be experienced with no health-related complications. However, it has been reported that many physiological and anatomical changes occur soon after fertilisation due to hormonal changes, as well as metabolic and mechanical factors arising from the enlarging uterus and other tissues (Artal, Lockwood & Barss, 2010). All of these are known to impose a negative impact on women’s health. Up to 75% of pregnant women have been reported to complain of back and foot pain problems (Goldberg, Besser & Selby-Silverstein, 2001; Karadag-Saygi, Unlu-Ozakan & Basqual, 2010). However, they are usually told that this pain is normal during pregnancy, and that they will have to learn how to live with it for the remaining term of their pregnancy (Karadag-Saygi et al., 2010). The most common foot problems occurring during pregnancy include edema, over-pronation, toe nail changes,

leg pain, varicose veins and pain in the arches and heels.

In the past, the aims of antenatal care were to detect, prevent and manage problems that could result in adverse effects on either the mother or the unborn child (World Health Organisation (WHO), 2005). Nowadays, the aims have been extended to promoting awareness of the sociological aspects involved in child-bearing, including the impact that the latter has on the family, as well as supporting the family’s psychological adjustment to child-bearing (National Health Service, (NHS) United Kingdom, 2008). Furthermore, women are today encouraged to keep more active during pregnancy by engaging in physical activity. It is being advised that pregnant women should engage in 30 minutes of daily activity such as walking, because physical activity has beneficial effects. It improves posture and circulation and reduces swelling, leg cramps, backache and varicose veins (Artal & O’Toole, 2003). However, the same authors report that if carried out inappropriately, physical training may result in increased incidence of foot and ankle complications.

Women’s satisfaction with the type of care received during pregnancy has been an area of interest to researchers (Abbaszadeh, Azam & Nahid, 2010). Thus, it is important for health care professionals to have a better understanding of the impact of pregnancy on women’s health, to be truly able to address patients’ health concerns (Russo, 2011). The Society of Chiropodists and Podiatrists, United Kingdom (2010) reported that more than half of the pregnant population has foot problems (Ponnapula & Boberg, 2010). The importance of the physician’s role in examining and assessing the foot need not to be emphasized. Despite this evidence, the literature reports that health care professionals are rarely performing foot examinations. When assessing all the possible negative factors which pregnancy can impose, better care and advice could be offered to all expectant mothers as from the early days of pregnancy. This would help to improve their quality of life during pregnancy (Ponnapula & Boberg, 2010).

In this study, the researchers sought to evaluate the impact of pregnancy on foot health. Expectant mothers need to care for their feet to be able to prevent foot pathologies, pain and discomfort. However, the literature reports that foot co-morbidities during pregnancy are often overlooked (Klein, n.d.). To date, no local prospective data exists on the prevalence of foot pathologies in Maltese expectant mothers. Such information could help predict which mothers are most at risk for foot complications and deterioration. These facts highlight the need for research that addresses such issues in this specific population, which is known to have a unique culture. It therefore differs from other populations which have been addressed so far in the research literature. Collecting and analysing key clinical information has been reported to be the stepping stone towards evidence-based improvements in health care. A fuller understanding of the factors that contribute to better foot health is important if improvements in health out-

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comes are to be achieved.

## 2 Methods

This study was approved by the University of Malta's Research Ethics Committee and was carried out in accordance with the principles of the Declaration of Helsinki. Participants were recruited from the Antenatal Clinic and Gynaecology Outpatients at Mater Dei Hospital, Malta, when they attended their first antenatal appointment (Time 0). Participants eligible for this study were Maltese 'healthy' pregnant women with less than 20 weeks pregnancy.

Participant recruitment took place over three months. During this time, all expectant women attending their first antenatal appointment who met the inclusion criteria were invited to participate in the study, verbally and in writing. All agreed to participate, leading to a sample size of 40. Authorisation was obtained from the Data Protection Office at Mater Dei Hospital to access the patients' records. Participants were reassured that confidentiality and anonymity would be maintained during the study. Participants all received the normal routine antenatal care offered during their clinical appointments.

The outcome variable measured, foot health, was assessed using the Bristol Foot Score (BFS) (Barnett, Campbell & Harvey, 2005). Permission from the authors to use and translate the questionnaire into the Maltese language was sought and granted. The BFS is a patient-based tool and its overall reliability using Cronbach's Alpha was found to be 0.9036. It consists of 15 questions related to mobility, footwear and general foot health, concern and pain. Scores are calculated by using the Likert scale. The maximum score on the BFS is 73 whilst the least score is 15. A higher score indicates that patients have more foot problems relating to mobility, footwear and general foot health, concern and pain (Barnett et al., 2005).

The contents of this questionnaire were read to the participants in one-to-one interviews in their language of preference (English or Maltese). All interviews were held at the Antenatal Outpatients Clinic at Mater Dei Hospital. When translating the BFS into the Maltese language, the "back translation" method was used. Back translation is the process used to translate a questionnaire into another language by an independent translator (Bernard, 2006). This method has been used extensively in translations of questionnaires across many countries in order to ensure reliability and validity of the original tool as is described in detail elsewhere (see Melvin et al., 2002; Bernard, 2006). Participants were interviewed twice during this study at Time 0 (mean 15 weeks pregnancy) and at Time 1, four months later (mean 37 weeks pregnancy).

## 3 Results

Data were analysed using the Predictive Analytics SoftWare (PASW) version 18. Normality of distribution was established using a Kolmogorov Smirnov test. This test revealed that the score distribution was not normal. Therefore, a non-parametric test was used to compare mean scores obtained through the Bristol Foot Score. The Wilcoxon Signed Rank Test was used to confirm or reject the null hypothesis, namely that pregnancy imposes no impact on foot health. This non-parametric test was used to compare scores recorded for the participant group at two different time points. When a  $p$ -value was found to be less than the 0.05 level of significance, it was deduced that the mean rating scores for each question of the Bristol Foot Score differed significantly, leading to rejection of the null hypothesis.

All participants chose to be interviewed in Maltese. The results of the BFS demonstrated a significant difference in mean scores ( $p < 0.001$ ) from Time 0 to Time 1, implying a deterioration in foot health and increased lifestyle limitations in the participants.

Furthermore, each of the 15 questions on the BFS was analysed

separately in order to identify which factors regarding mobility, footwear and general foot health, concern and pain were mostly affected during the course of pregnancy. Table 1 shows the results for each question of the Bristol Foot Score.

## 4 Discussion

The aim of this study was to determine the impact of pregnancy on the foot health of Maltese expectant women. Many studies have been conducted in which researchers sought to evaluate low back pain during pregnancy (Murray & Hassall, 2009) but only a few have evaluated the impact of pregnancy on leg, foot or hip pain and overall health. The current study reports a significant difference in foot health and lifestyle limitations in the study population from the first time the participants were interviewed using the BFS at approximately 15 weeks of pregnancy, up to four months after the first interview. This led to the conclusion that pregnancy does impose a negative impact on foot health. This finding is of key importance and needs to be taken into consideration by all health stakeholders, if better health care is to be offered to expectant mothers.

Antenatal care aims to monitor the pregnant woman's health and foetal development. In most hospitals, expectant mothers are assessed and monitored with regard to medical conditions. Issues pertaining to exercise and diet are discussed. Routine antenatal checks include weight and blood pressure monitoring, urine and blood glucose testing as well as monitoring of the unborn child and the mother's overall wellbeing (NHS, 2011; British Broadcasting Corporation (BBC), 2012; Bupa, United Kingdom, 2012). However, very little attention is given to foot health and foot care education. It has been reported that most of the time, pregnant women are told that back pain and foot problems are a normal occurrence during pregnancy and that they will have to learn to live with them for the rest of their pregnancy (Roniger, 2002).

The findings of this study stimulate discussion as to what is key in improving foot health status and quality of life in expectant mothers. Results demonstrated a significant difference in mobility, footwear and general foot health, concern and pain, implying poorer foot health and quality of life. Participants were not aware of the foot changes and pathologies that could arise during pregnancy. Moreover, they did not expect their foot health to change during pregnancy. Participants reported more difficulty in walking to the shops and standing up for long periods of time because of foot complications which developed towards the end of their pregnancy. Their feet became more painful by time, thus making them more conscious about them. Participants reported that towards the end of their pregnancy, mobility became more difficult. Also, more problems during sleep were reported at the second interview, mainly because of cramps in the legs and feet. Most of the pregnant women in later stages of pregnancy realised that they had to change the style of their footwear to more comfortable and wider ones. Furthermore, participants reported that their general health, including physical and emotional status had deteriorated throughout the course of their pregnancy. These findings indicate that the quality of life during pregnancy diminished due to changes in foot health which consequently affected the daily life of the participants.

These findings are congruent with the outcomes of a study conducted by Forger et al. (2005), which reported both physical changes and emotional disturbance during the course of pregnancy. Furthermore, Vullo, Richardson and Hurvitz (1996) reported that most of the foot pain started from the second and third trimester of pregnancy. In a study conducted by Ponnappala and Boberg (2010), more than 50% of pregnant women reported problems in the feet including unsteady gait, swelling of the foot, ankle and leg, as well as an increased foot width. The foot undergoes changes due to the increased weight and edema in the second and third pregnancy trimester. Body mass is said to increase by

approximately 12 kg (Coad & Dunstall, 2005) during pregnancy. Ankle edema of 2.4cm, a decreased gait propulsion force of 10% of body mass and an increase in the medio-lateral sway are additional changes seen during pregnancy. Thus, expectant women have to change their style of footwear.

Gaymer et al. (2009) reported that pregnant women have increased plantar pressures in their feet. Gait changes might increase foot pain during the later stages of pregnancy, accounting for the increase in lower limb pain and back pain in expectant women. Pregnant women have higher midfoot pressures, higher hindfoot pressures and lower forefoot pressures. Dynamic measurements show an increased maximal force in all areas. Pregnant women have a wider step width to maximise stability in the stance phase and to control mediolateral motion. Pregnancy influences foot biomechanics, leading to improper foot positions which induce pain. Gait disorders occurring during pregnancy can increase the risk of falls and musculoskeletal discomfort, thus affecting pregnant women's quality of life (Ponnapula & Boberg, 2010).

The results of this study highlight the need for health care professionals to advise pregnant women about the changes that pregnancy will bring about to their feet. Expectant mothers need

to learn how to deal with these changes, such as foot pain and swelling, and how to avoid other common foot pathologies. They need to be aware of these changes from the start of their pregnancy and not discover them during the course of gestation. Health stakeholders should consider the introduction of foot care and foot health education into the current health care system, especially in light of the fact that podiatric care is not currently offered in most antenatal clinics. Podiatrists need to identify expectant mothers' needs and equip them with the necessary foot care knowledge and skills to help them adapt to health behaviour changes required during pregnancy, in an effort to prevent foot-related complications. Effective education involves creating a situation where patients can actively participate in the management of their health. The true success of education will only be measured in behavioural and health-related outcomes. The authors recommend the provision of footcare education in antenatal clinics to all expectant mothers. Furthermore, availability of a podiatry service should also be considered for assessment of feet during the course of pregnancy and advice regarding appropriate foot-care and footwear. Improved care could result in improved foot outcomes and better quality of life during pregnancy.

**Table 1. Bristol Foot Score (BFS): means and standard deviations for the participants (N = 40) obtained at Time 0 (before) and Time 1 (after) (bold font indicates a significant change in the p-value over time).**

Wilcoxon Signed Rank Test Statistics				
		Mean	Std. Deviation	p-value
Do problems with your feet affect whether you go out of the house to visit family or friends?	After	1.21	0.528	<b>0.038</b>
	Before	1.03	0.162	
Do problems with your feet affect you when you walk to the shops?	After	1.45	0.724	<b>0.001</b>
	Before	1.05	0.226	
Do problems with your feet affect you when standing still?	After	2.53	1.059	<b>0.002</b>
	Before	2.03	0.788	
Do problems with your feet affect you when walking on bumpy or stony ground?	After	1.68	0.904	<b>0.004</b>
	Before	1.24	0.675	
Over the last two weeks how painful have your feet been?	After	2.53	1.289	<b>0.001</b>
	Before	1.68	1.068	
Over the last two weeks how often have you felt conscious of your feet?	After	2.66	1.529	<b>0.009</b>
	Before	2.00	1.356	
Over the last two weeks how often have you felt fed up about your feet?	After	2.03	1.174	<b>0.010</b>
	Before	1.42	0.722	
Over the last two weeks how often have you felt worried that your feet will get worse in the future?	After	2.16	1.701	0.421
	Before	1.97	1.515	
Over the last two weeks how often have you felt as if your feet are not a real part of you?	After	1.16	0.437	1.000
	Before	1.16	0.370	
Because of your feet have you had any problems sleeping in the last two weeks?	After	1.89	1.203	<b>0.044</b>
	Before	1.42	0.826	
In the last two weeks have you been able to put your everyday shoes on easily?	After	2.55	1.408	<b>&lt;0.001</b>
	Before	1.61	1.152	
Over the last two weeks how often have you been able to wear any shoes you like?	After	2.71	1.972	0.052
	Before	2.05	1.785	
If you could afford any shoes you wanted, how easily could you find shoes that fit comfortably?	After	2.79	0.991	<b>0.001</b>
	Before	2.18	0.955	
How would you rate your general foot health status?	After	3.13	0.906	0.301
	Before	2.97	0.677	
How would you rate your general health status?	After	3.08	0.673	<b>0.005</b>
	Before	2.79	0.622	

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