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STUDYİNG THE FOOT PRESSURE PATTERNS OF THE PRİMİGRAVİD WOMEN: AN OBSERVATİONAL LONGİTUDİNAL STUDY (COHORT STUDY)

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ABSTRACT

Background & aim: Pregnant women suffer various musculo-skeletal pain during pregnancy. The plantar surface of the feet may reflect normal and abnormal pressures apply from upper body to the ground or vice-versa. This might help prescribing shoe inserts to the pregnant women to modify abnormal changes on her feet. A review of the literature shows controversial issues remained in this area. The current study aimed to evaluate foot pressure patterns during first pregnancy.
Methods: The current observational longitudinal study recruited 30 primigravid women and 18 age-sex matched non-pregnant women as the control group. The pregnant women were studied three times at the 10th, 21st, and 32nd weeks of pregnancy; and the control group women were studied twice at the 10th and 32nd weeks of pregnancy. A Zebris pedobarograph tool (Zebris Company, Germany) was used and the pressures beneath the feet of all subjects were studied during bilateral standing position.
Results: The results showed a significant increased pressures and forces at the hind foot and decreased forefoot at all three trimesters when compared to the control group. In comparison between the right and left foot, the pressure and force were more at the right side than the left one, which, it be due to their right dominant leg.
Conclusion: Marked foot pressure changes occur during pregnancy and increased as the pregnancy period advances. The increased hindfoot pressure and force occurred in this study is highly likely to return the balance to the pregnant women during pregnancy.

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Introduction

The foot as the most distal part of the lower limb chain is in contact with the ground and resists against the forces pass through it[1]. Abnormal pressure distribution on the plantar surface of the foot may cause pain and act as a source of pain in people[2]. This can be more prominent, particularly during pregnancy where the center of pressure constantly changes due to increased weight of the mother[3]. This shows that understanding foot biomechanics helps clinicians to have a better evaluation of the normal or abnormal conditions[4]. Increased weight of the fetus and mother, altogether, cause marked physiological changes in virtually all parts of mother's body, particularly the trunk, pelvis and lower limbs[5-6]. Unfortunately, sometimes these vast biomechanical changes result in residual pain and deformities during pregnancy and even post delivery[7-10, 11].
Since most deleterious effects affect on the lower limb joints and spinal curves, the part of the foot suffer more pressures are very important factor[12]. Previous researchers have shown different findings regarding the part of the feet suffer more or less pressures during pregnancy. For instance, while Goldberg et al (2001) reported more pressure at the hind foot and less at the forefoot simultaneously with advances in pregnancy[8], Karadag-Saygi (2010) found more pressure at the forefoot in pregnant women in the third trimester when compared to the obese people[13]. They even found no significant difference between the

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pregnant and non-pregnant women[14]. Among studies on the plantar pressures in overweight people, very few of them are on pregnant women[15].This shows more needs for research in these subjects. It seems that a collaboration between physicians and engineers for designing suitable shoes, shoe inserts and corrective parts of the shoes (e.g. wedges) might help resolving pregnant woman's' problems via returning it to its correct biomechanics[13, 16-17]. Understanding the patterns of foot pressure in pregnant women is an appropriate way for assessment and diagnosis of foot problems and designing suitable foot orthosis in these subjects[18]. Studying prim gravid women would also exclude the confounding factors normally exist when studying multiparous women (such as releasing relax in hormone and hypermobility of the joints)[19-20]. The present cohort study aims to deliberately evaluate the foot pressure patterns in prim gravid women during pregnancy.

Methods:

Pilto Study:

Prior to start the main study and to find out if the data from the foot pressure system used in this study, is repeatable, a pilot study was conducted on six pregnant and six age-matched non-pregnant women. The test included three times static standing on the platform, two in one day and one in a week later. The excellent ICC (> 80%) found in this study and convinced the researchers that the tool was reliable enough to continue the test with more subjects.

Main Study

Subjects:

Thirty pregnant women (age: 25.4(0.7) years, height: 161(0.9) cm, BMI: 23.8(0.7) kg/m^2) at their 10th week of pregnancy were recuited based on the inclusion / exclusion criteria and were compared with 18 matched nulliparous subjects. The inclusion criteria were being pregnant for the first time (even no history of abortion), age 18-35 years old, not having BMI higher than 30, having the AOFAS score 100 (out of 100)[21], not being pregnant twins or more and having no history of fractures or any musculoskeltal deformities and problems at their lower limbs. The subjects were excluded if they refuse to continue the test in any reason, having pain higher than 5 (out of 10 in VAS)[22], being prohibited by their gynecologists, or finding problems related to their pregnancy safety during the test period. Table 1 shows the physical characteristics of the subjects. Eighteen age-sex and physical activity level matched nulliparous women were also recuited as the control group for comparison with the experimental group. The experimental group were tested three times at their first, second and thirs trimesters (i.e. end of weeks 10th, 21st and 32nd). All steps of the study were explained to the subjects and all of them and their guardians (mainly husbands) signed the consent form completed the demographic information form voluntarily. All authors hereby declare that all experiments have been examined and approved by the appropriate ethics committee and have therefore been performed in accordance with the ethical standards laid down by Shahid Beheshti Medical University's Ethical Committee.

The Amerian Orthopaedic Foot & Ankle Surgeons (AOFAS) questionnaire is commonly used in foot and ankle research studies. The questionnaire is valid and reliable (r=0.08, ICC=0.95) and aquiring the score of 100 (out of 100 maximum score) is necessary and shows the healthy foot[23].

Pedobarography

A platform type Zebris (FDM-SX) (Zebris Company, Germany) pedobarograph tool was used in this study. The platform includes many sensors converting foot pressures to the visible colorform graphs showing different loads with separate colors[16]. This 40*55*2.5 Cm platform consists of 1920 sesors directly measures the pressures applies on it through feet in static or dynamic standing. The data can be saved and transferred to the computer via USB ports. The system aquired data in 100 Hz frequency and is automatically calibratyed by entering the approriate button when offloaded. The sophisticated software of the tool divided the foot into two equal anterior / posterior parts. The validity and reliability of the pedobarograph systems has already been approved and reported by many researchers. Nakhaee et al (2007) reported an ICC=0.91; Gurney et al (2008) found it very good reliable (ICC>0.9) and Maluf et al (2001) reported r> 0.82 and Ahroni et al (1998) found a weak to good reliability for pedobarograph systems[24-27].

The Standing Test:

After calibrating the system, all subjects were asked to stand barefoot on the platform with their feet as wide as their shoulders. The subjects were asked to stay quiet and stare at a point on the front wall with equal force on their feet. In other words, when they felt that they apply equal pressure on each foot, the data were recorded for ten seconds[21]. Data acquisition was repeated for three times with five minutes rest between each test[16]. A mean of all three times acquired data was calculated for each subject.

All data were recorded in Microsoft Excel (2010) spreadsheet and were analysed by SPSS version 16. A one-way repeated measured ANOVA and Bonferoni post hoc was used for within groups data analysis and an independent t-test was used for between group data analysis. α was set at 0.05 for all data analysis.

Results

A reliability test showed that the ICC in static test was 0.88 in pregnant women and 0.89 in the control group, which were ranked as very good and convinced the researchers to continue the study in more subjects. The Kolmogrov-Smrinov test also showed that all parameters were normally distribution (p>0.05).

Table 1 shows the subjects' characteristics including age, height, weight and BMI. From out of 30 pregnant women in the experimental group, 21 (70%) subjects were right foot dominant and 9 (30%) were left foot dominant. In addition, from out of 18 non-pregnant women in the control group, 13 (72.2%) were right foot dominant and 5 (27.8%) were left foot dominant.

Table 1. Description of the subjects' characteristics.

Since a K-S test showed that all forces and pressures were normally distributed, the parametric data analyses were used in this study. It should be noted that all force data were divided on the weight of the subjects[28] and all pressures were presented as the percent of pressures to have data comparable among subjects.

By use of a paired t-test, non of the parameters were significantly changes in the control group ($p>0.05$). However, a One-way repeated measures ANOVA showed some differences among all trimesters.

Table 2. Foot pressure changes at the right and left foot in the control and pregnant groups

Table 2 showed a significant different pressures on the anterior and posterior of the feet, however, no significant different was shown between the left and right feet.

Table 3. Force changes at the right and left feet in pregnant and control groups.

As Table 3 shows, a significant different forces on the anterior and posterior of the feet ($p<0.05$), however, no significant different was shown between the left and right feet ($p>0.05$).

In brief, both the force and pressures showed significant increase at the posterior and decrease at the anterior of the feet.

Comparison of the force/pressure in pregnant and control groups:

As Tables 2&3 show, the anterior foot forces and pressures were lower in the pregnant than control group, which was significant at the third trimester ($p=0.049$). Inversely, the hindfoot forces and pressures were more at the pregnant women than control group, which was significant at the third trimester ($p=0.049$). The hindfoot forces and pressures of the right foot were more at the pregnant group when relative to the control group.

Comparison of plantar pressure and force in total right and left foot:

Table 4. Forces and pressures between the right and left foot at each trimesters.

In comparison of the forces and pressures between the right and left foot, no significant differences were found between the control group and non of the pregnant women trimesters ($p>0.05$). Table 4 shows specific values of the left and right foot forces and pressures in each trimesters.

In control group, there was no significant difference between the right and left feet in any trimesters, while pregnant women showed more force/pressure on their right feet when compared with the left one in all trimesters, which was significant in the second and third trimesters.

In the pregnant group, irrespective of significance, anterior pressure in the right foot was higher in the first trimester, but lower in the second and third trimesters compared to the left foot. In contrast, posterior pressure in the right foot was lower in the first trimester, but higher in the second and third compared to the left foot. However, total pressure in the right foot was always greater than in the left foot, with a significant difference in the second and third trimesters. With regard to force, irrespective of significance, anterior, posterior and total forces in the right foot were greater than in the left in all trimesters.

In the control group, no significant differences were observed between right and left foot in terms of total pressure and force ($P>0.05$).

Comparison of plantar pressure and force in anterior and posterior parts in each foot: Plantar pressures and forces were compared using paired t-test. In the control group and in the every trimester, posterior pressure and force were significantly greater than anterior ones in both feet ($P<0.05$).

Table 5.Comparison of plantar pressure and force in anterior and posterior parts in each foot in the control group.

Table 6.Comparison of plantar pressure and force in anterior and posterior parts in each foot in the each trimester.

Figure 1: (Percentage of pressure in anterior and posterior parts)

Vertical axis: Period (the first, second and third trimesters in pregnant group, and the first stage of measurement in control group), Horizontal axis: Percentage pressure

Discussion

In addition to the foot pathological conditions, pregnancy may also change the foot pressure patterns in terms of biomechanical, physiological and structural alterations[7]. This has already been shown to produce long lasting foot pressures[8] and pain at the pregnant women's feet[9]. The current study showed a significantly more pressure and force at the hind-foot of the pregnant women than forefoot in all trimesters. Anterior pressure and force in both feet were lower, and posterior pressure and force in both feet were higher in the pregnant group compared to the control group. A significant decrease was observed in pressure and force in anterior part and a significant increase in posterior part in the pregnant group with progress of pregnancy. These results concur with those obtained in studies by Niska et al. (1997), Goldberg et al. (2001) in pregnant women, and Tuna et al. (2004) in no pregnant pepole[8-9,29]. Anatomically, talus bears 50% of the body weight when standing on both feet. Of the load borne by talus, 50% is transferred to calcaneus by the posterior subtalar joint, and 50% is transferred to the forefoot through two routes[30]. According to literature, heel bears 2 to 3 times more weight than anterior foot[7]. Other studies, including Zhu et al. (1995), Rosenbaum et al. (1996), Wearing et al. (1999), and Bryant et al. (2000) have reported the

greatest pressure under the heel area, even when walking[31-35]. Heel pad is slightly stiff in normal loading condition, but with increasing load and entanglement of collagen fibers, the movement of adipose tissue is restricted, which increases stiffness of heel pad in the normal directions. Such structural differences of the heel compared to other parts of the foot make soft tissue thicker in this part[36]. Accordingly, in the both group the highest level of pressure was observed in the heel, which has the greatest resistance against pressure. Postural changes can also have other reasons. During pregnancy, biomechanical changes occur to compensate for the rise and change in distribution of weight, especially in the abdomen area and anterior movement of the center of gravity. Postural changes include increased lumbar lordosis, anterior pelvic tilt, and upper trunk posterior tilt[37-38]. Biomechanical changes in central parts of the body require readjustment of lower limb joints to absorb additional forces[7]. To compensate for these postural changes and create balance, gravity line moves posteriorly in pregnant women, as a result, weight shifts toward the heels, so that center of gravity of the body can move posteriorly[39]. As observed in the present study, posterior force was significantly greater than anterior force in all trimesters, and further increased with progress of pregnancy. In agreement with this result, Williams (2010) reported that center of gravity of the body tilts posteriorly onto lower extremities due to increased lumbar lordosis[40]. On the other hand, previous studies have shown that in Asian populations, anterior width of the foot is wider and height of longitudinal arch is shorter, while pronation of the foot is greater. These factors can lead to greater distribution of pressure onto a wider area due to wider width of the foot, resulting in lower anterior pressure than posterior in Asian populations[41]. Considering that the present study was conducted on an Iranian population, this difference appears reasonable. Moreover, greater foot pronation is highly likely in pregnant women. Taking into account the relationship between sex hormones and ligament laxity, previous studies have argued that estrogen and progesterone impact ligament laxity in women, and shorten the height of the longitudinal arch. Accordingly, weaker ligament structure in women causes collapse of longitudinal arch and increased contact in the mid-foot. Consequently, inward rotation and pronation are greater in women's feet[4]. Despite normalization of force in relation to body weight, the rise in the force in a particular part of the foot is maybe due to the effect of muscle guarding or ankle and high strategy. Thus, it is recommended that future studies conduct muscle electromyography in conjunction with examination of plantar changes during pregnancy.

However, the present study results disagree with those obtained by Ribeiro et al. (2011), who found no difference in parameters of plantar pressure in any trimester in their assessment of static posture in 6 women during the whole period of pregnancy. Their small sample size is worth noting, though. They also reported an increase in maximum force on posteromedial part of the foot during walking from the first trimester to the second[14]. Karadag-Saygi et al. (2010) studied changes in plantar pressure in 35 women with foot pain problems in the last trimester of pregnancy. Compared to overweight people, pregnant women experienced greater right foot anterior pressure in standing position in the third trimester. It should be noted that all participants in their study were overweight and had problems such as foot pain, and that participants were only studied in the third trimester[13]. Another reason for differences in results of these studies may be attributed to cultural differences or strategies utilized by participants; for instance anterior shifting of their weight due to problems such as pain in the heel.

The present study results also showed higher total right foot pressure and force than in the left in the pregnant group, with significant differences in some trimesters. Moreover, in the pregnant group, total right foot pressure and force were higher, and total left foot pressure and force were lower in all trimesters compared to control group. These results concur with those obtained by Niska et al. (1997), Karadag et al. (2010), and Marques (2005), who reported a greater increase in the right foot pressure in pregnant women in static and dynamic states[2, 9, 13]. The importance of this finding is that the right foot was the dominant foot in most participants in both pregnant and control groups. This can be attributed to the fact that before test, the participants were asked to focus on a point on the opposite wall, which prevented greater weight on one foot (dominant foot), and since the right foot was dominant in most participants from both groups, they tried to shift their weight onto the left foot, so as to balance distribution of weight. However, since data were recorded for 10 seconds, unlike the control group, probably because of pregnancy, the pregnant group was unable to equally spread their weight onto both feet or transfer appropriate weight onto the left foot. As a result, on average of three tests performed in 10 seconds, the right foot pressure and force were higher than those of the left foot. Furthermore, the dominance of the right foot in pregnant women causes much asymmetry in them. As the uterus grows, tendency toward right increases, which increases asymmetric load onto feet, causing greater right foot edema, and consequently greater compaction of pelvic veins on the right, reduced venous return on the same side, and a greater increase in the size of the right foot[28,42]. Given these reasons, the degree of symmetry between the two feet cam be used to determine changes in functional behavior of the feet[43].

The present study results also showed a significant increase in total right and left foot force during pregnancy. The reason for such a significant increase may be an increase in body mass, (up to 16 kg on average during pregnancy). But, distribution of pressure and force in different parts of the foot is undoubtedly indicative of the difference in the pattern of plantar pressure between pregnant and non-pregnant women and its relationship with specific changes during pregnancy. A significant relationship is observed between weight and plantar pressure in obese women[44]. In obese people, the highest pressure has been reported in the anterior part of the foot[21 ,45-46], which decrease with weight loss[47]. However, in the present and some previous studies, pressure and force have increased in the posterior part of the foot, which has been reported to persist for some time after delivery[8].

Conclusion

Major problems during pregnancy include musculoskeletal pain and injuries in feet, lower extremities and spinal cord[10, 48]. Considering this issue, the present study addressed the pattern of plantar pressure in 30 prim gravid women and 18 non-pregnant healthy women. The results obtained showed a significant increase in posterior foot pressure and force with progress of pregnancy, while anterior foot pressure and force significantly reduced. Moreover, pregnant women experienced greater plantar pressure and force in their right foot compared to the control group, while right foot was the dominant foot in most participants in both groups. Increased posterior foot pressure and force can be due to suitable anatomical and structural features of the heel pad, postural, biomechanical, and hormonal changes resulting from pregnancy, effort to balance, and posterior tendency of gravity, and finally, racial differences. Unfortunately, problems associated with feet are not adequately addressed in many pregnant women. Foot problems are often assumed secondary, and left in the hope that they will disappear after childbirth. Failure to address this issue can lead to greater damage and occasionally deformity of the feet, requiring further treatments. Such studies are essential for those running pregnancy and childbirth classes, as well as physicians and physiotherapists, in order to prevent and treat women's musculoskeletal problems during pregnancy and after delivery.

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Competing interests:

The authors declare that they have no competing interests.

Bullet Points:

The feet as the only body organ in touch with the ground, functions very crucially in pregnant women whose stability reduces day by day with advancement of their pregnancy. This, in turn, results their feet as a source of pain, pressures, callosity and probably wounds.

- In this study, increased posterior foot pressures occurred to compensate the increased lumbar curve changes and to achieve balance as pregnancy periods develops.
- Pregnant women and their families usually suppose their foot problems as temporary that is highly likely diminishes after the delivery. This may results in overlooking these problems and deformities that may need more cares.
- The results of this study may be helpful for physicians, physiotherapists and all health care managers to deliberately notice the hidden problems of pregnant women and treat them following the delivery.

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Table 1. Description of the subjects' characteristics.

Parameters	Pregnants (N=30)			Non-Pregnants (N=18)
	First Trimester	Second Trimester	Third Trimester	
Age (y)	25.4(0.7)	-	-	23.9(0.4)
Height (Cm)	161(0.9)	-	-	163.4(1.5)
Weight (Kg)	61.5(1.8)	63.8(1.9)	73.1(1.8)	61.3(2)
BMI (Kg/m^2)	23.8(0.7)	24.8(0.7)	28.3(0.7)	23(0.6)

Table 2. Foot pressure changes at the right and left foot in the control and pregnant groups

Parameters: %Pressures Mean (SD)	Control group (n=18)	Pregnants (n=30)			Within groups	Between groups		
		1st. trimester	2nd. trimester	3rd. trimester	P	groups	P	% changes
Total left foot	51(0.7)	49(0.5)	48.7(0.6)	48.7(0.6)	0.862	Cont vs. 1st.	0.021*	-2%
						Cont vs. 2nd.	0.018*	-2.3%
						Contvd. 3rd.	0.017*	-2.3%
Total right foot	49(0.7)	51(0.5)	51.3(0.6)	51.3(0.6)	0.862	Cont vs. 1st.	0.021*	+2%
						Cont vs. 2nd.	0.018*	+-2.3%
						Contvd. 3rd.	0.017*	+2.3%
Ant. Lt. Foot	43.7(2.2)	43.4(1.9)	42.9(2.3)	40.6(2.1)	0.008*	1st. vs. 3rd.	0.042*	-2.7%

Post. Lt. Foot	56.3(2.2)	56.6(1.9)	57.1(2.3)	59.4(2.1)	0.008*	1st. vs. 3rd.	0.042*	+2.7%
Ant. Rt. Foot	43.6(0.9)	43.4(1.8)	42.7(1.9)	40(1.5)	0.025*	1st. vs. 3rd.	0.007*	-3.4%
						1 2nd. vs. 3rd.	0.033*	-2.7%
						Contvd. 3rd.	0.049*	-3.5%
Post. Rt. Foot	56.4(0.9)	56.6(1.8)	57.3(1.9)	60(1.5)	0.025*	1st. vs. 3rd.	0.007*	+3.4%
						1 2nd. vs. 3rd.	0.033*	+2.7%
						Contvd. 3rd.	0.049*	+3.5%

*= significant, Lt.=Left, Rt.=Right, 1st.=First trimester, 2nd.=Second trimester, 3rd.=Third trimester

Table 3. Force changes at the right and left feet in pregnant and control groups.

Parameters: Force (N/Kg.) Mean (SD)	**Control group (n=18)**	**Pregnants (n=30)**			**Within groups**	**Between groups**		
		1st. trimester	2nd. trimester	3rd. trimester	P	groups	P	% changes
Total left foot	5.1(0.1)	4.8(0.04)	4.9(0.1)	5(0.06)	0.014*	Cont vs. 1st.	0.002*	-6.3%
						1st. vs. 3rd.	0.011*	+3.9%
Total right foot	4.9(0.01)	4.9(0.1)	5(0.1)	5.1(0.1)	0.020*	Cont vs. 3rd.	0.028*	+5.5%
						1st. vs. 3rd.	0.026*	+4.4%
Ant.Lt.Foot	2.2(0.1)	2.2(0.1)	2.1(0.1)	2(0.1)	0.015*	1st. vs. 3rd.	0.048*	-8%
Post. Lt. Foot	2.9(0.1)	2.6(0.1)	2.8(0.1)	3(0.1)	0.002*	1st. vs. 3rd.	0.002*	+13.6%
						2nd. vs. 3rd.	0.030*	+8.3%
Ant. Rt. Foot	2.2(0.1)	2.2(0.1)	2.1(0.1)	2.1(0.1)	0.08	1st. vs. 3rd.	0.07	-2.3%
						Contvd. 3rd.	0.08	-1.3%
Post.Rt.Foot	2.7(0.1)	2.8(0.01)	2.8(0.1)	3(0.1)	0.015*	1st. vs. 3rd.	0.010*	+9.8%
						2nd. vs. 3rd.	0.042*	+7.4%
						Contvd. 3rd.	0.036*	+11.8%

*= significant, Lt.=Left, Rt.=Right, 1st.=First trimester, 2nd.=Second trimester, 3rd.=Third trimester

Table 4. Forces and pressures between the right and left foot at each trimesters.

Parameters	Trimester	Total left foot	Total right foot	p
Pressures%	1st. trimester	49(0.5)	51(0.5)	0.066
	2nd. Trimester	48.7(0.6)	51.3(0.6)	0.046*
	3rd. trimester	48.7(0.6)	51.3(0.6)	0.04*
Force (N/Kg.)	1st. trimester	4.8(0.04)	4.9(0.1)	0.05*

*= significant .

Table 5. Comparison of plantar pressure and force in anterior and posterior parts in each foot in the control group.

Parameters	Side of foot	Part of foot	Mean (SD)	p
Pressures%	Left	Anterior	43.7(2.2)	0.010*
		Posterior	56.3(2.2)	
	Right	Anterior	43.6(0.9)	<0.001*
		Posterior	56.4(0.9)	
Force (N/Kg)	Left	Anterior	2.2(0.1)	0.005*
		Posterior	2.9(0.1)	
	Right	Anterior	2.2(0.1)	0.005*
		Posterior	2.7(0.1)	

*= Significant

Table 6. Comparison of plantar pressure and force in anterior and posterior parts in each foot in the each trimester.

Time	Side of foot	Part of foot	Pressures%		Force (N/Kg)	
			Mean (SD)	p	Mean (SD)	p
1st. Trimester	Left	Anterior	43.4(1.9)	0.002*	2.2(0.1)	0.011*
		Posterior	56.6(1.9)		2.6(0.1)	
	Right	Anterior	43.4(1.8)	0.001*	2.2(0.1)	0.002*
		Posterior	56.6(1.8)		2.8(0.1)	
2nd. Trimester	Left	Anterior	42.9(2.3)	0.004*	2.1(0.1)	0.008*
		Posterior	57.1(2.3)		2.8(0.1)	
	Right	Anterior	42.7(1.9)	0.001*	2.1(0.1)	0.001*
		Posterior	57.3(1.9)		2.8(0.1)	
3rd. Trimester	Left	Anterior	40.6(2.1)	<0.001*	2(0.1)	<0.001*
		Posterior	59.4(2.1)		3(0.1)	
	Right	Anterior	40(1.5)	<0.001*	2.1(0.1)	<0.001*
		Posterior	60(1.5)		3(0.1)	

*= Significant

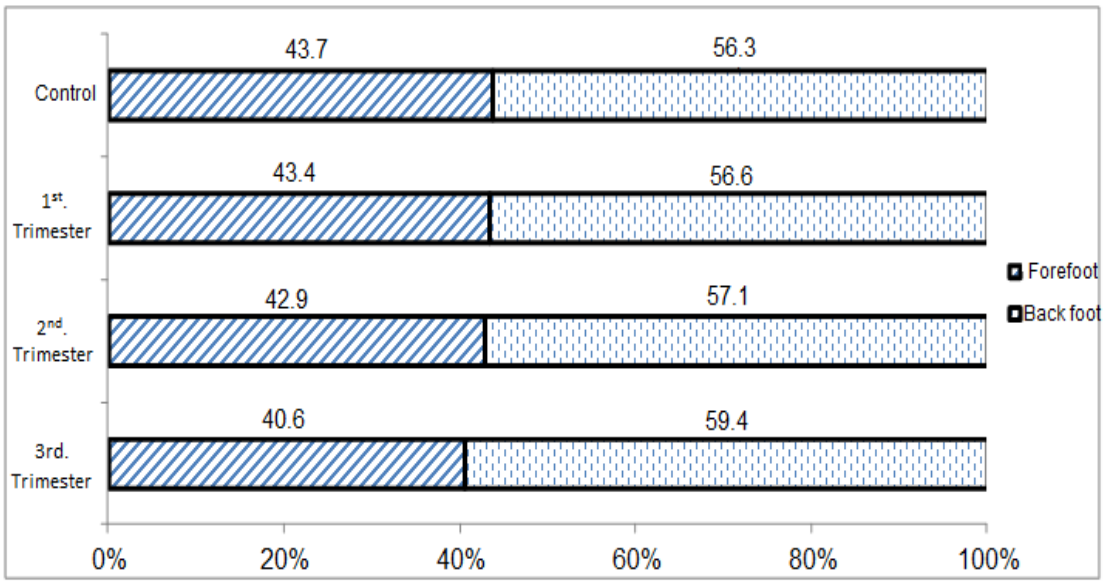

Figure 1. Percentage of pressure in anterior and posterior parts

Vertical axis: Period (the first, second and third trimesters in pregnant group, and the first stage of measurement in control group), Horizontal axis: Percentage pressure