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ORIGINAL ARTICLE

Urinary incontinence related to perineal muscle strength in the first trimester of pregnancy: cross-sectional study

INCONTINÊNCIA URINÁRIA RELACIONADA À FORÇA MUSCULAR PERINEAL NO PRIMEIRO TRIMESTRE DA GESTAÇÃO: ESTUDO TRANSVERSAL

INCONTINENCIA URINARIA RELACIONADA CON LA FUERZA MUSCULAR PERINEAL EN EL PRIMER TRIMESTRE DEL EMBARAZO: ESTUDIO TRANSVERSAL

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ABSTRACT

Objective: To analyze pelvic floor muscle strength (PFMS), urinary continence and quality of life related to urinary incontinence (UI) of women in the first trimester of pregnancy. **Method:** Cross-sectional study with a sample of 500 women who started prenatal care in a complementary healthcare facility in Guarulhos, state of São Paulo, from 2012 and 2013. Pelvic floor muscle strength was evaluated through perineometry. The pregnant women who presented UI answered the International Consultation on Incontinence Questionnaire-Short Form (ICIQ-SF). **Results:** It was found that maternal age (OR=1.06; CI95% 1.02-1.11) and prior UI (OR=15.12; 95%CI 8.19-27.92) are the variables that, in tandem, best explain the occurrence of UI at the beginning of pregnancy. The mean score on the ICIQ-SF was 8.2 (SD=3.9), considered a moderate impact on quality of life. **Conclusion:** Older pregnant women with prior UI are more likely to have UI in the first trimester of pregnancy.

DESCRIPTORS

Pregnancy
Muscle strength
Perineum
Urinary incontinence
Midwifery

RESUMO

Objetivo: Analisar a força dos músculos do assoalho pélvico (FMAP), a continência urinária e a qualidade de vida associada à incontinência urinária (IU) em mulheres no primeiro trimestre da gestação. **Método:** Estudo transversal cuja amostra incluiu 500 gestantes que iniciaram o pré-natal em um serviço do setor de saúde suplementar, em Guarulhos, SP, em 2012-2013. A FMAP foi avaliada por meio da perineometria e as gestantes com IU responderam o *International Consultation on Incontinence Questionnaire-Short Form* (ICIQ-SF). **Resultados**: A idade materna (OR=1,06 IC95% 1,02-1,11) e IU prévia (OR=15,12; IC95% 8,19-27,92) são as variáveis que, em conjunto, melhor explicam a ocorrência de IU no início da gestação. A média do escore do ICQ-SF foi 8,2 (d.p.=3,9), considerado como de impacto moderado na qualidade de vida. **Conclusão**: As gestantes com mais idade e com IU prévia têm maior chance de apresentar IU no primeiro trimestre da gravidez.

DESCRITORES

Gravidez
Força muscular
Períneo
Incontinência urinária
Enfermagem obstétrica

RESUMEN

Objetivo: Analizar la fuerza de los músculos del suelo pélvico (FMSP), la continencia urinaria y la calidad de vida en mujeres en el primer trimestre del embarazo. **Método**: Estudio transversal cuyo muestra incluyó 500 mujeres que comenzaron la atención prenatal en un servicio del sector de salud complementaria en Guarulhos, SP, en 2012-2013. La FMSP fue evaluada por la perineometría y las mujeres embarazadas con incontinencia urinaria (IU) respondieron al *International Consultation on Incontinence Questionnaire-Short Form* (ICIQ-SF). **Resultados**: Muestran que edad materna (OR=1,06 IC95% 1,02-1,11) y IU previa (OR=15,12; IC95% 8,19-27,92) son las variables que, en conjunto, mejor explican la ocurrencia de IU al inicio del embarazo. La media del escore ICIQ-SF fue 8,2 (d.p.=3,9), considerado como de impacto moderado en la calidad de vida. **Conclusión**: Las embarazadas con más edad y con IU previa tienen chance mayor de presentar IU en el primer trimestre del embarazo.

DESCRIPTORES

Embarazo
Fuerza muscular
Perineo
Incontinencia urinaria
Enfermería obstétrica

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INTRODUCTION

Urinary incontinence (UI) is a symptom of the lower urinary tract defined as involuntary loss of any quantity of urine[1]. It impacts sexual, psychological and social health in women, affecting their quality of life[2-3].

Urinary incontinence during pregnancy and after birth has been widely studied, because during pregnancy at least 50% of women report loss of urine[4], with many studies showing a high variation in quantities[5].

Nerve and muscle trauma of the pelvic floor (PF) related to pregnancy and birth and weakness of the PF muscles are important predisposing factors for UI[6].

Studies show that pregnancy, more than birth, is associated with triggering UI, especially stress UI, which is defined as involuntary loss of urine caused by effort, exercise, sneezing or coughing[1]. During pregnancy, its incidence gradually increases, progressively decreasing over the first 12 months after birth[4].

A literature review, which included 22 cohort studies, showed that at least five etiological factors may be taken into consideration to explain the occurrence of stress UI: genetic factors, obesity, age, pregnancy and vaginal birth[7].

A multicentric transversal study conducted in the southern and southeastern areas of Brazil with 495 women after birth showed that 71% had UI in the last four weeks of pregnancy. Factors associated to UI were: four or more children (OR=4.93; CI95% 2.15-11.32), obesity (OR=4.22; CI95% 2.09-8.54), low education (OR=2.99; CI95% 1.74-5.12), previous vaginal birth (OR=2.59; CI95% 1.58-4.24) and black ethnicity (OR=2.32; CI95% 1.30-4.13)[2].

A prospective cohort study conducted with 618 primiparous Iranian women showed that UI before pregnancy, with at least one weekly occurrence, increased the risk for UI during pregnancy (RR=5.75) and prolonged the duration of UI for one year (RR=16.8), independently of the type of birth[8].

There is strong evidence in literature to support preventive actions for UI during pregnancy, in particular maintaining adequate nutritional status and performing perineal exercises to strengthen the PF muscles[5,9].

In relation to pelvic floor muscle strength (PFMS), the most common methods of evaluation in pregnant women are perineometry and digital vaginal palpation. Studies that use these instruments show conflicting results in regard to the preservation or decrease of PFMS during pregnancy and after birth[10-12]; however, decrease in PFMS has been pointed out as a predictor of UI[13-14].

A transversal study conducted in Belo Horizonte, in the state of Minas Gerais, with 192 primiparous women between five and seven months after birth found PFMS ≤ 35.5 cmH2O as the stronger predictor of postpartum UI. Through multivariate analysis using the CART (classification and regression tree) model, the combination of PFMS ≤ 35.5 with previous UI, newborn weight > 2,988 grams and UI during pregnancy composed a predictive model for postpartum UI[15].

Given the impact that UI has on quality of life, the International Consultation on Incontinence Questionnaire-Short Form (ICIQ-SF) has been used to measure this relationship. The ICIQ-SF was translated and revalidated for Portuguese[16] and consisted of four questions related to frequency and quantity of urinary loss, the interference of such loss in daily life and situations when UI can occur.

There are many studies concerning UI and PFMS during pregnancy, but there is little data concerning this relationship in the first trimester. Therefore, the objective of this study was to analyze PFMS, urinary continence and quality of life related to UI of women in the first trimester of pregnancy.

METHOD

A transversal study concerning PFMS and UI of women in the first trimester of pregnancy conducted in the Prenatal and Obstetrics Clinical Center (Centro Clínico de Obstetrícia e Pré-Natal) of SEISA Medical Care (SEISA Assistência Médica), a complementary healthcare facility located in the city of Guarulhos, state of São Paulo.

The population was composed of women who started prenatal care in the center. All of the pregnant women who received care between November 2012 and September 2013 and who met the following inclusion criteria were included in the sample: age ≥ 18 years; BMI < 35; completion of primary school; pregnancy only; gestational age < 13 weeks; no previous urogenital surgery or disease that may affect PFMS; no resistance to insertion of the perineometer probe into the vagina; not perform the Valsalva maneuver for PFMS measurement; no difficulty understanding or communicating in the Portuguese language. The final sample totaled 500 pregnant women.

The dependent variable in the study was UI in the prior four weeks and the independent variables were: maternal age (years); ethnicity (self-reported); educational level (complete primary or incomplete high school, complete high school or incomplete undergraduate, complete undergraduate); occupation (paid work, house work, student); marital status (lives with partner, does not have or does not live with partner); physical exercises before pregnancy (minimum frequency of two times per week); number of previous pregnancies, births and vaginal births; perineal trauma in previous birth (episiotomy or spontaneous laceration); high-weight newborn (in grams, immediately after birth); UI prior to current pregnancy; gestational age (weeks); nutritional status (low weight, adequate, overweight and obese, classified by body mass index, considering gestational age)[17]; PFMS (cmH2O); ICQ-SF score.

Data gathering was conducted immediately after the first prenatal consultation by the center's nurse-midwife or midwife. An interview was carried out using a form wi-

th sociodemographic information, clinical and obstetrics history and the status of the current pregnancy.

To evaluate PFMS, a Peritron™ electronic pressure perineometer (LABORIE, Toronto, Canada) was used. It registers muscle contractions of the PF in cmH2O through a sensor located in a silicon vaginal probe with a length of 8 cm and a diameter of 3 cm. The sensor is connected to a portable microprocessor that measures PFMS from 0.1 to 300 cm H2O.

For this measurement, the pregnant women were in the gynecological position and were instructed to contract the PF musculature. The probe was covered with a disposable condom, externally lubricated with water-based gel and introduced between 4 cm and 6 cm into the vagina. The perineometer was calibrated by the probe being inserted into the vagina and inflated to 100 cmH2O; after that, the scale was reset to zero, following the manufacturer's recommendations. The women were asked to contract the PF musculature as hard as they could, sustaining the contraction for 5 seconds. This contraction was repeated three times with an interval of 30 seconds between one. Three PFMS values were registered, but only the highest was considered for analysis.

The women who reported UI during the last four weeks in the interview answered the self-applied ICIQ-SF questionnaire. Values are attributed for questions related to frequency and quantity of urine loss and the interference of such loss in daily life, with a final score that varies from 0 to 21.

Data were entered into Microsoft Excel™ and analyzed using the statistical software Minitab™, version 16.1, and SPSS™, version 17.0.

In univariate analysis, the comparison among pregnant women with and without UI was conducted with a chi-square test (for the categorical variables), a t-test for independent samples (for the quantitative variables with normal distribution) and a Mann-Whitney test (when assumption of normality was not considered). All tests were conducted using the two-tailed method, with a significance level of 5% ($p \leq 0.05$).

In multivariate analysis, a logistic regression model was used to determine factors associated with UI, with all variables that presented a statistical significance of at least 20% ($p \leq 0.20$) in univariate analysis. The final model was obtained through the backward process, in which less significant variables were removed from the model, one by one, until only those with a 5% significance level remained.

A receiver operating characteristic (ROC) curve was constructed for the quantitative variables that presented statistical significance in univariate analysis (except the number of prior pregnancies, prior births and prior vaginal births) with the objective of verifying the best cut-off point to discriminate pregnant women with or without UI. The relation between PFMS and the ICIQ-SF score was analyzed with a Spearman's correlation.

The study was approved by the Research Ethics Committee of the School of Nursing of the University of São Paulo (CAAE: 05096412.7.0000.5392). The women's participation was voluntary, through reading and signing a Free and Informed Consent form.

RESULTS

Of a total of 1,266 women who began the prenatal care process at the center during the study period, 766 were not included because they did not meet the established criteria (n = 648) or because they refused to participate (n = 118). Therefore, the final total was 500 pregnant women.

The average gestational age was 8.5 weeks (SD = 1.9), 95 (19%) pregnant women presented UI, of whom 37 (38.9%) were primigravidas. The UI percentage among primigravidas was 7.4% and among women with one or more prior pregnancies, 11.6%. The average PFMS was 30.5 (SD = 17.3), with 27.2 (SD = 15.8) cmH2O and 31.1 (SD = 17.6) cmH20, among pregnant women with and without UI, respectively.

Tables 1 and 2 show the quantitative and categorical variables of the characteristics of pregnant women with or without UI.

Urinary incontinence was more frequent among pregnant women of higher age, with more prior pregnancies, births and vaginal births, with perineal trauma from prior births, overweight and obesity, previous UI and PFMS < 30 cmH2O, with statistically significant differences.

The variables ethnicity, occupation and marital status, although not significant at the 5% level, were relatively close to statistical significance. All remaining variables did not reach statistical significance.

Table 1 — Quantitative variables of the characteristics of pregnant women with and without UI — Guarulhos, state of São Paulo, **2012-2013**

Variable	With UI	Without UI	p-value
Maternal age (years)			
Average (SD)	29.4 (6.3)	25.5 (5.9)	0.007*
Median	30	27	
Min – max	18 – 46	18 – 45	
Previous pregnancies			
Average (SD)	1.0 (1.2)	0.7 (0.9)	0.006†
Median	1	0	
Min – max	0 – 5	0 – 7	

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Variable	With UI	Without UI	p-value
Previous births			
Average (SD)	0.9 (1.0)	0.5 (0.7)	<0.001*
Median	1	0	
Min – max	0 – 4	0 – 5	
Previous vaginal births			
Average (SD)	0.6 (0.9)	0.3 (0.6)	<0.001*
Median	0	0	
Min – max	0 – 4	0 – 4	
Newborn with highest weight (g)			
Average (SD)	3,145 (656)	3,128 (578)	0.867†
Median	3200	3200	
Min – max	1,100 – 4,900	500 – 5,370	

*Whitney-Mann test; †t-test for independent samples

Table 2 — Categorical variables of the characteristics of pregnant women with and without UI — Guarulhos, state of São Paulo, 2012-2013

Variable	With UI	Without UI	p-value*
	n (%)	n (%)	
Ethnicity			
Mixed, black, yellow	65 (68.4)	248 (61.4)	0.202
White	30 (31.6)	156 (38.6)	
Education level			
Complete primary or incomplete high school	12 (12.6)	41 (10.2)	0.764
Complete high school or incomplete undergraduate	66 (69.5)	285 (70.5)	
Complete graduate	17 (17.9)	78 (19.3)	
Occupation			
Paid work	79 (83.2)	310 (76.5)	0.163
House worker or student	16 (16.8)	95 (23.5)	
Marital status			
Lives with partner	87 (92.5)	344 (85.4)	0.064
Does not have or does not live with partner	7 (7.5)	59 (14.6)	
Physical exercise			
Yes	20 (21.1)	107 (26.5)	0.269
No	75 (78.9)	296 (73.5)	
Perineal trauma from previous birth			
Yes	35 (36.8)	84 (20.8)	0.001
No	60 (63.2)	320 (79.2)	
Gestational age (weeks)			
4 to 8	44 (46.3)	213 (52.6)	0.271
9 to 12	51 (53.7)	192 (47.4)	
Nutritional state			
Low weight	3 (3.2)	43 (10.7)	0.018
Adequate	39 (41.1)	187 (46.6)	
Overweight	35 (36.8)	128 (31.9)	
Obese	18 (18.9)	43 (10.7)	
Previous UI			
Yes	81 (85.3)	114 (28.2)	<0.001
No	14 (14.7)	290 (71.8)	
PFMS (cmH2O)			
< 30	62 (65.3)	215 (53.1)	0.032
≥ 30	33 (34.7)	190 (46.9)	

*Chi-square test.

During multivariate analysis of factors associated with UI, the following variables, which presented a p-value ≤ 20, were included in the logistic regression model: maternal age, previous vaginal births, ethnicity, occupation, marital status, nutritional state, prior UI and PFMS (Table 3).

The variables number of previous pregnancies, number of previous births and perineal trauma had a very high significance in univariate analysis (p = 0.006, p < 0.001 and p = 0.001, respectively), but were not included in the multivariate model, because they are highly correlated among themselves and with the variable previous vaginal births.

Table 3 — Initial model of logistic regression of variables associated with UI in the first trimester of pregnancy — Guarulhos, State of São Paulo, 2012 – 2013

Variable	OR	CI95%	p-value
Maternal age	1.04	0.99 – 1.09	0.118
Previous vaginal births	1.44	0.98 – 2.11	0.060
Ethnicity			
White	1		
Mixed/black/yellow	1.37	0.77 – 2.42	0.280
Occupation			
House worker or student	1		
Paid work	1.81	0.91 – 3.60	0.090
Marital status			
Does not have or does not live with partner	1		
Lives with partner	2.04	0.78 – 5.30	0.144
Nutritional state			
Adequate	1		
Low weight	0.30	0.08 – 1.13	0.075
Overweight	1.17	0.64 – 2.14	0.611
Obese	1.44	0.66 – 3.11	0.359
Previous UI			
No	1		
Yes	15.14	8.08 – 28.39	<0.001
PFMS (cmH2O)			
≥ 30	1		
< 30	1.50	0.87 – 2.58	0.150

Table 4 presents a final model of the multivariate analysis, indicating that the variables that, in tandem, best explain the occurrence of UI are maternal age (chance of UI increases 1.06 times as the pregnant women age) and previous UI (pregnant females who had had UI have a 15.12 times higher chance of presenting UI in the current pregnancy). The variable number of previous vaginal births presented a significance level very close to 5% and, if kept in the model, the results do not change significantly maternal age: OR = 1.05; CI95% 1.00 – 1.09; p = 0.033; previous UI: OR = 14.58; CI95% 7.87 – 26.98; p < 0,001; previous vaginal births: OR = 1.43; CI95% = 1.00 – 2.06; p = 0.052).

Table 4 — Final model of logistic regression of variables associated with UI in the first trimester of pregnancy — Guarulhos, State of São Paulo, 2012 – 2013

Variable	OR	IC 95%	p-value
Maternal age	1.06	1.02 – 1.11	0.006
Previous UI			
No	1		
Yes	15.12	8.19 – 27.92	<0.001

PFMS evaluation through a receiver operating characteristic (ROC) curve was significant for the effect of UI (p = 0.045), with an area under the curve of 0.556. The best cut-off point was 28.5 cmH2O, with a sensitivity of 64.2% and specificity of 49.4%.

In the multivariate model, to obtain factors associated with UI, PFMS was dichotomized in < 30 and ≥ 30 cmH2O. However, according to the results of the analysis through the ROC curve, the best cut-off point to evaluate UI is 28.5 cmH2O. Therefore, the multivariate model was reconstructed with the same parameters shown in Table 3, but using a new dichotomization for PFMS (< 28.5 and ≥ 28.5 cmH2O). Even with that, PFMS was still not significant, resulting in a final model similar to the one from Table 4.

Of the 95 pregnant women with UI, 90 were evaluated through the ICIQ-SF questionnaire. The scores obtained varied from 2 to 18 points, with an average of 8.2 points (SD = 3.9) and a median of 8 points. For the same pregnant women, PFMS varied from 1.6 to 69.1 cmH2O, with an average of 27.7 (SD = 15.7%) and a median of 25.9. The correlation between ICIQ-SF and PFMS was -0.115, not significant (p = 0.279).

DISCUSSION

Data from this study are part of the first stage of an ongoing cohort study with women during pregnancy and postpartum. Follow-up with these women is performed in the second and third trimesters of pregnancy and at 45, 90 and 180 days after birth.

The occurrence of UI in 19% of the pregnant women in this study is among the lowest reported in the literature, since reviews regarding UI epidemiology in pregnancy show percentages of up to 75%[4-5]. It should be noted that most of the data in these reviews comes from studies with women after the second trimester of pregnancy.

A cohort study with 1,128 nulliparous pregnant women without previous UI in the first trimester of pregnancy identified a prevalence of 8.3% of UI (CI95% 6.6 – 10.0)[18], close to the percentage of 7.4% among the primigravidas in this study.

According to multivariate analysis, higher maternal age (OR = 1.06; CI95% 1.02 – 1.11) and previous UI (OR = 1.06; CI95% 1.02 – 1.11) explain, in tandem, the occurrence of UI in the first trimester of pregnancy. This result is compatible with other studies that show that these same variables may be predictors of UI during pregnancy.

Maternal age was related to UI in a cross-sectional study[19] and in two literature reviews[9,20]. In the cross-sectional study[19], the chances of UI increased according to age (OR = 1.05 CI95% 1.01 – 1.09). In one of the reviews, a cut-off point of 35 years of age was shown in the referenced studies as a risk factor for UI[20]. In the other review, age was an independent factor for UI in more than 20 studies, with an evidence level of 2 (based on low quality random clinical trials and good quality cohort studies)[9].

Regarding history of UI, a cohort study with 618 pregnant Iranian women with light stress UI during pregnancy (up to one episode of urine loss per week) showed a relative UI risk of 5.75 among those with previous UI[8]. A cross-sectional study with 300 women in the second trimester of pregnancy showed that, among 46 (15.3%) pregnant women who had UI, 95.7% had previous UI history[21].

Regarding the remaining factors mentioned in the literature as associated with UI (ethnicity, education level, occupation, marital status, physical exercises, previous pregnancies and births, newborn weight, nutritional status, PFMS)[2,5,7,9,13-14,22-23], only a few had statistical significance in the univariate analysis. An explanation for the fact that in the multivariate analysis previous births, PFMS and nutritional status were not associated with UI among the pregnant women in this study may be related to low parity, early gestational age and the fact that only pregnant women with a BMI < 35 were included in the study.

There are no data in the literature regarding the relationship between PFMS and UI in the first trimester of pregnancy. However, studies that evaluated PFMS using the Peritron™ in women with UI between 20 and 34 weeks of pregnancy[13] and in the postpartum period[15] found the averages ≤ 30.05 cmH2O (SD = 11.05) and = 19.3 (SD = 13.1) cmH2O, respectively.

The results of the present study of women in the first trimester of pregnancy are close to the results obtained among those starting from the second half of pregnancy[13,21,24], considering that the proportion of pregnant women with PFMS < 30 cmH2O was higher among those with UI (average = 27.2, SD = 15.8), in comparison to continent women (average = 31.3; SD = 17.6).

Even though the PFMS cut-off point of 30 cmH2O established for analysis was higher than that obtained from the ROC curve, this value agreed with what was found in the literature[13,15] and may serve as parameter for new studies and clinical practice.

It is worth considering that, although the best cut-off point was 28.5 cmH2O according to the ROC curve, its sensitivity and specificity are insufficient to define this value.

Therefore, although it is not kept as predictor of UI in the final analysis model, pregnant women can be oriented to perform exercises to strengthen the PF, with or without biofeedback, to reach PFMS values higher than 30 cmH2O, as support for the prevention and treatment of UI[13,21,23].

Regarding the impact of UI in the life of the women, even when loss is minimal it may cause social embarrassment and sexual dysfunction, significantly interfering in their physical and mental health[25-26].

In this study, the average (8.2; SD = 3.9) and the median (8) of the ICIQ-SF score showed values that were compatible with moderate impact on the quality of life of pregnant women with UI, considering the classification into four categories of severity: light (1-5), moderate (6-12), heavy (13-18) and very heavy (19-21)[28].

A cross-sectional study with 298 incontinent women of various ethnicities and gestational ages between 26 and 30 weeks showed an ICIQ-SF score of 6.3 (SD = 3.5) [19]. Another prospective cohort study with 327 primiparous women had a score of 6.2 related to the last trimester of pregnancy[27]. These scores, although lower than in this study, are also compatible with moderate impact on quality of life. However, a cross-sectional study carried out in Brazil identified an ICIQ-SF score that was higher (12.11; SD = 4.04) among 352 women at the end of pregnancy[2]

CONCLUSION

Older pregnant women with previous UI history had a higher chance of presenting UI in the first trimester of pregnancy. PMFS < 28.5 cmH2O represented a cut-off point for UI, in spite of limited sensitivity and specificity, and UI had moderate impact on the quality of life of these women

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