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Urinary incontinence symptoms during and after pregnancy in continent and incontinent primiparas

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Abstract *Objective:* Examine patterns of urinary incontinence during and after pregnancy, as recalled by incontinent and continent primiparas. *Study design:* Primiparous women reporting no pre-pregnancy incontinence, were recruited 6 to 9 months postpartum. Those reporting current continence and demonstrating a negative stress test were considered “Primiparous Continent” (PC, $n=64$). Those reporting current incontinence and demonstrating a positive stress test were considered “Primiparous Incontinent” (PI, $n=57$). Subjects self-administered a questionnaire recalling leakage during and after pregnancy. *Results:* Sixteen percent of PC women leaked during pregnancy. Of these, 70% experienced frequent leakage during pregnancy. Seventy-eight percent of PI women leaked both during and after pregnancy. Several patterns arose surrounding leakage frequency for PI women: 19% only leaked frequently during pregnancy, 4% only leaked frequently after pregnancy, and 51% leaked frequently both during and after pregnancy. *Conclusion:* Nearly five times as many primiparous incontinent women, compared with primiparous continent women, leaked during pregnancy.

Keywords Pregnancy · Urinary incontinence · Postpartum incontinence

Introduction

Many women report urinary incontinence during pregnancy or after childbirth. For some women, this incontinence resolves with postpartum healing, but for others it becomes long-lasting. This study was aimed to examine incontinent and continent primiparas’ recall of continence status during and after pregnancy. The study focuses on the presence and frequency of urinary incontinence to reveal patterns of leakage and distinguish time courses of urinary incontinence onset.

Materials and methods

This study is part of a parent project investigating vaginal delivery and stress urinary incontinence at the University of Michigan. Primiparous women who had one term vaginal delivery (spontaneous or operative) and reported no pre-pregnancy incontinence were recruited between 6 and 9 months postpartum for an IRB-approved study of postpartum stress incontinence. At screening, women were excluded if they had genital anomalies, had conditions such as diabetes that might pose increased risk of urinary tract infection, had prior urinary tract surgery, were currently pregnant, delivered by cesarean section, or reported symptoms of urinary incontinence before pregnancy. Those who were eligible gave informed consent. Each woman’s bladder was filled with 250 ml of normal saline to perform a standing cough stress test [1]. During the stress test, each woman held a paper towel at the perineum and was asked to cough hard three times. Women who leaked any amount of urine were considered to have a positive stress test, and those who did not leak were considered as having a negative stress test. Each woman was asked at the time of enrollment if she was currently experiencing any urine leakage and was also asked if she experienced any urinary incontinence before pregnancy. Primiparous women who reported no incontinence symptoms at enrollment and had a negative stress test at the time of testing, were assigned to the “Primiparous Continent”

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group (PC, $n=80$). Primiparous women who reported symptoms of incontinence at enrollment and who had a positive stress test were assigned to the “Primiparous Incontinent” group (PI, $n=80$). Women who reported no incontinence symptoms at enrollment, but had a positive stress test were not included in the study. Likewise, women who reported current incontinence symptoms at enrollment, but had a negative stress test were excluded. These sample sizes were based on a power calculation conducted for the parent study. Demographic information including age, race, height, weight, and birth weight were collected for each subject.

Each subject completed a 64-item, self-administered questionnaire concerning recall of continence from 35 weeks until delivery (during pregnancy) and at 6 months postpartum (after pregnancy). As part of the questionnaire, each subject answered two questions concerning the frequency of their incontinence at these two time points. The first question corresponded to “any leakage”: “Have you involuntarily lost or leaked any amount of urine?” The second question corresponded to “frequent leakage”: “Have you involuntarily lost or leaked any amount of urine at least a few times per week?” Each subject responded “Yes” or “No” for each of the time periods. Subjects reporting leakage at least a few times per week were considered as having “frequent” leakage, and those who leaked less than a few times per week were considered as having “infrequent” leakage. For this analysis, subjects

Table 1 Demographic comparisons of age, BMI, birth weight, and race

	PC ($n=64$)	PI ($n=57$)	p value
Mean age (years)	29.7	29.8	0.9146
Mean BMI	23.0	26.9	0.0001
Mean birth weight (grams)	3,392.6	3,560.4	0.0647
White (percent)	87.5	89.5	0.2860
African-American (percent)	9.4	3.5	
Other (percent)	3.1	7.0	

were excluded if their questionnaires were missing (PC, $n=9$; PI, $n=5$) or their questionnaire responses were inconsistent with their enrollment reports of current leakage and/or leakage before pregnancy (PC, $n=7$; PI, $n=17$). Subjects were included if some, but not all questions were answered. The PC group had a final sample size of $n=64$ and the PI group had a final sample size of $n=57$. The response rates for each time period and the response pattern for each subject were analyzed. Subgroups were developed based on response patterns.

Results

Table 1 shows that the PC and PI groups did not differ significantly in age, birth weight, and race. The PI group

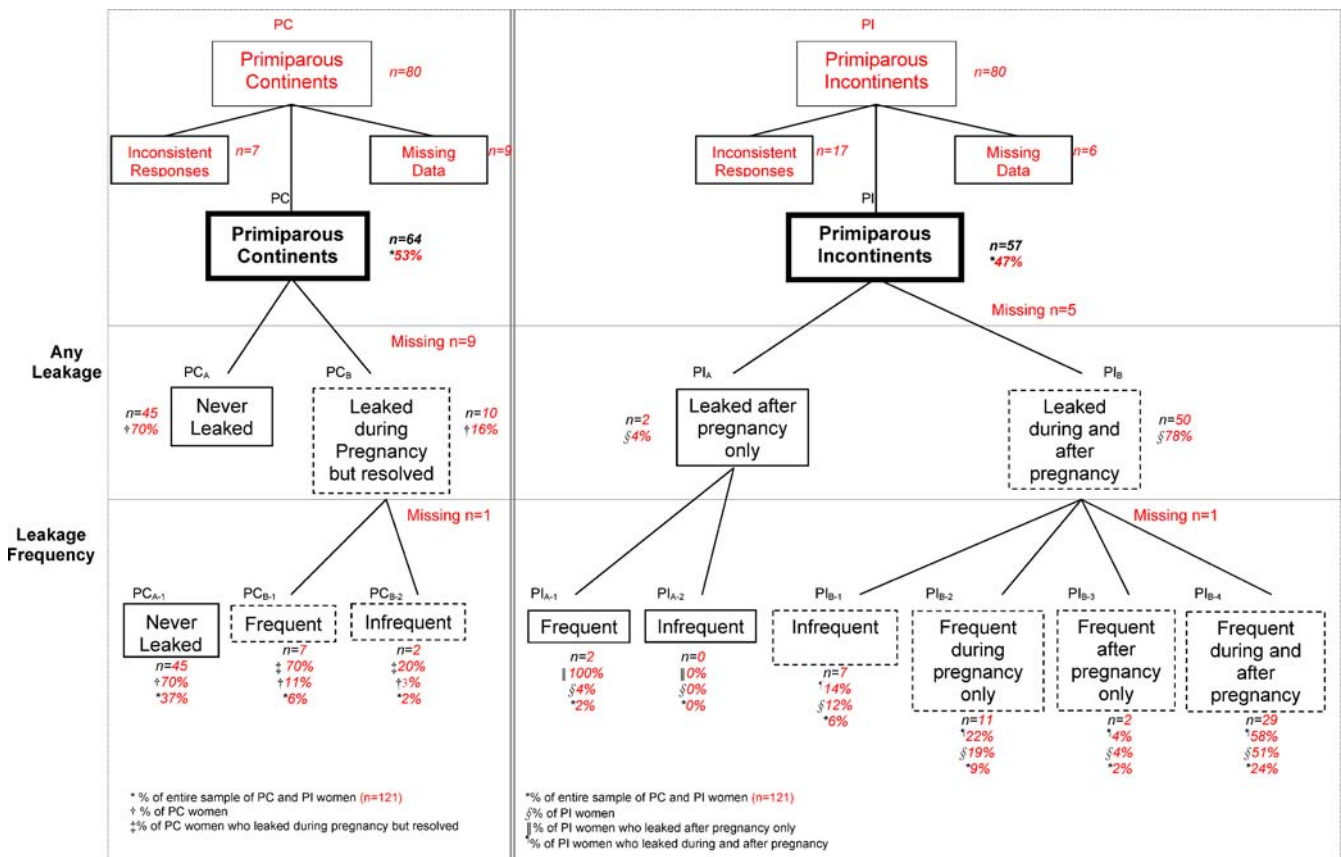


Fig. 1 The occurrence and frequency of leakage in primiparous continent and incontinent women at different time points

had significantly higher BMI than the PC group. Fig. 1 shows the breakdown of symptoms during and after pregnancy for the two groups, PC and PI. The amounts of leakage are listed in two tiers below these groups: the first tier shows results of the question that asked about any leakage (“any leakage”) and the second tier displays further breakdown based on information obtained from the question concerning frequent leakage (“leakage frequency”). Overall, 37% of the entire sample never leaked, 8% of the entire sample had leakage during pregnancy that resolved, and 47% of the entire sample had leakage that had not resolved at 6 months postpartum. The PI group had a significantly higher report of urine leakage during pregnancy than the PC group (PI=78%, PC=16%; $p<0001$).

In the PC group, 16% reported leakage during pregnancy (PC_B); of these, 70% leaked frequently (PC_{B-1}). When considering the entire sample of PC women, approximately one-tenth reported frequent leakage during pregnancy (PC_{B-1}). Among the PI women, 78% reported leakage during pregnancy (PI_B). Of these, 58% leaked frequently during pregnancy (PI_{B-2} + PI_{B-4}). Over one-half (58%) experienced frequent rates both during and after pregnancy (PI_{B-4}), an additional 4% experienced frequent rates only after pregnancy (PI_{B-3}), while the remaining women either experienced infrequent leakage (14%; PI_{B-1}), or only did so during pregnancy (22%; PI_{B-2}). Considering the entire PI group (including those who leaked during pregnancy and after pregnancy, as well as those who only leaked after delivery), 12% reported that the leakage was never frequent (PI_{A-2}+PI_{B-1}). However, the most common pattern of frequent leakage experience among the PI group was frequent leakage that occurred both during and after pregnancy (PI_{B-4}).

Overall, the majority (51%) of the entire sample of PC and PI women experienced some urine leakage at one or more of the two time points (PC_B+PI_A+PI_B); 42% of the entire sample experienced *frequent* urine leakage at one or more of the two time points (PC_{B-1}+PI_{A-1}+PI_{B-2}+PI_{B-3}+PI_{B-4}). For those women in whom leakage occurred during pregnancy (PC_B+PI_B; $n=60$), leakage resolved postpartum for some (PC_B; $n=10$). Of the women who reported “frequent” leakage during pregnancy (PC_{B-1}+PI_{B-2}+PI_{B-4}; $n=47$), 51% continued to leak frequently after delivery (PI_{B-4}; $n=29$).

Discussion

Primiparous incontinent women had a higher self-reported rate of urinary incontinence symptoms during pregnancy than primiparous continent women. Prevalence and incidence rates of urinary incontinence during and after pregnancy reveal that there are several patterns of incontinence onset surrounding pregnancy and delivery. This study aimed to look at the patterns by distinguishing time courses of urinary incontinence onset. Distinguishing time courses of urinary incontinence onset provides insight into the differences between transient incontinence due to the hormonal and mechanical effects of pregnancy and damage that occurs as a result of vaginal birth. Previous studies

have distinguished time courses of urinary incontinence onset before, during, and after pregnancy [2–5] as well as during and after pregnancy only [6–11]. However, most of these studies included women of varying parity [5–7, 9, 11], or assessed short-term postpartum incontinence at less than 6 months postpartum that might likely resolve [4, 6, 9, 11–13]. Prevalence estimates of incontinence studies within a population of women less than 6 months postpartum likely include some women whose symptoms will spontaneously resolve as part of the postpartum healing process, thus resulting in an overestimate of incontinence prevalence. The inclusion of only primiparous women in this study allowed for the effects of one vaginal delivery to be more distinguishable and eliminated the possible confounding and cumulative effects of multiple deliveries that may have occurred in other studies. In addition, determining the prevalence of urinary incontinence at least 6 months postpartum allows for any spontaneous recovery from transient incontinence during pregnancy and immediately after delivery to occur, thereby focusing on more long-term incontinence.

Prevalence rates for incontinence during pregnancy are reported in the literature ranging from 20 to 62% [2–4, 6, 7, 12, 13]. The finding that nearly half of the women in this study reported leakage during pregnancy is consistent with these rates. Onset of symptoms after delivery reported in this study (2%) is inconsistent with other incidence rates of urinary incontinence after childbirth ranging from 7 to 19% [2, 3, 14]. These findings are also inconsistent with the increased occurrence of stress incontinence observed in women who have delivered vaginally compared to others in the population [15] and do not support the hypothesis of vaginal delivery as the predominant risk factor for these women. The observations in this study show multiple patterns contributing to the onset of urinary incontinence symptoms during and after pregnancy. Vaginal birth alone cannot account for the high rate of new onset incontinence in pregnancy. The most common experience of continent women at 6 months postpartum was never experiencing leakage at all, yet one-sixth of these women experienced leakage in pregnancy.

Causes of gestational incontinence are unclear. Hormonal effects during pregnancy, including effects of the reproductive hormone relaxin [16], increased hormonal concentrations, and local tissue changes caused by hormones [3] may affect the continence mechanism during pregnancy. Variability in strength and thickness of pelvic floor muscle function in pregnant incontinent women may also influence the continence mechanism during pregnancy [17]. Pregnancy-related changes may also influence postpartum incontinence. These changes include substantial bladder neck mobility [10], diminished functional urethral length [18], damage to the urethra and its suspension [19], decreased maximum urethral closure pressures [10, 16, 18], and lower intra-vaginal and intra-anal pressures during pregnancy both at rest [18, 19] and during pelvic muscle contractions [10].

Postpartum incontinence may also be caused by changes in the pelvic floor. These changes include anterior vaginal

descent [20], anal sphincter damage [21], displacement of the urethro-vesical junction [22], greater bladder neck mobility [23], and increased pudendal nerve terminal motor latency [24, 25]. The occurrence of these changes may be the result of vaginal delivery alone, but may also be affected by other obstetric variables such as operative vaginal delivery [4, 14, 26, 27], episiotomy [2], long second stage of labor [2], and infant birth weight [2, 28]. Some studies, however, were not able to find significant obstetric relationships [13, 29, 30].

The cross-sectional design of this study limits the ability to determine cause and effect, thus predictive mechanistic hypotheses cannot be tested. Predictive testing would ideally require a longitudinal study design that follows women from the pre-pregnancy state to the 6-month postpartum state or longer. The study design also involved the use of recall with accompanying potential bias. If this bias had existed, those who were incontinent may have been more likely to recall occurrence of incontinence during pregnancy, resulting in an overestimate of pregnancy-related incontinence prevalence. Likewise, those who were continent may have been less likely to recall incontinence occurrence during the pregnancy, resulting in an underestimate of pregnancy-related incontinence prevalence. This study excluded women with inconsistent questionnaire responses and stress test results. Women in the PC group with inconsistent responses and positive stress tests may have had urine leakage during pregnancy, thereby resulting in an underestimate of urine leakage during pregnancy in the PC group. Likewise, women in the PI group with inconsistent responses and negative stress tests may not have had urine leakage during pregnancy, thereby resulting in an overestimate of urine leakage during pregnancy in the PI group.

Results from this study are thought-provoking and indicate the need for measuring incidence as well as prevalence. The results also indicate a need for examining frequency of leakage as well as any leakage, to test predictive and mechanistic hypotheses. Studies that build upon these insights and seek to explore the proposed hypotheses will contribute significantly to the advancement in the understanding, prevention, and treatment of urinary incontinence.

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