Pregnancy-related urinary and faecal incontinence: systematic and longitudinal collection of Patient-Reported Outcome measures in a large Italian population.

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Abstract

Objective To investigate urinary/faecal incontinence (UI/FI) prevalence during pregnancy and postpartum, and the main risk and protective factors, in a large Italian population. Design Prospective observational analysis of patient-reported outcome (PRO) measures. Population and setting All pregnant women agreed to participate to the systematic and longitudinal survey on the maternity pathway in Tuscany, Italy. Methods We employed data from four questionnaires completed by women from the beginning of pregnancy until six-months postpartum. Each questionnaire included two PRO measures – the Wexner scale for FI and the International Consultation on Incontinence Questionnaire for UI –, and several questions investigating the socio-demographic and clinical features of respondents. Main outcomes The UI/FI prevalence at each time-point and the related risk and protective factors. Results Among our 6,023 respondents, UI prevalence in the third trimester was 24.3% and almost halved six-months postpartum. Women reporting FI were 6.2% in the third trimester and 4.2% six-months postpartum. Higher UI occurrence and severity were found in highly-educated, aged > 30, and overweight/obese women. Caesarean-section was protective against postpartum UI, while spontaneous tear or episiotomy were risk factors. Protective effects were provided by performing pelvic-floor-muscle-training during pregnancy, mainly for specific risk groups. Furthermore, higher FI prevalence and severity emerged in overweight, aged > 40, highly-educated, non-Italian women and in those undergoing tear. Conclusion PRO measures systematically and longitudinally collected in a large Italian population highlighted the prevalence of pregnancy-related UI/FI and the risk and protective factors. Pelvic-floor-muscle-training may be recommended in women with peculiar socio-demographic and clinical features.

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ABSTRACT

Objective

To investigate urinary/faecal incontinence (UI/FI) prevalence during pregnancy and postpartum, and the main risk and protective factors, in a large Italian population.

Design

Prospective observational analysis of patient-reported outcome (PRO) measures.

Population and setting

All pregnant women agreed to participate to the systematic and longitudinal survey on the maternity pathway in Tuscany, Italy.

Methods

We employed data from four questionnaires completed by women from the beginning of pregnancy until six-months postpartum. Each questionnaire included two PRO measures – the Wexner scale for FI and the International Consultation on Incontinence Questionnaire for UI –, and several questions investigating the socio-demographic and clinical features of respondents.

Main outcomes

The UI/FI prevalence at each time-point and the related risk and protective factors.

Results

Among our 6,023 respondents, UI prevalence in the third trimester was 24.3% and almost halved six-months postpartum. Women reporting FI were 6.2% in the third trimester and 4.2% six-months postpartum. Higher UI occurrence and severity were found in highly-educated, aged > 30, and overweight/obese women. Caesarean-section was protective against postpartum UI, while spontaneous tear or episiotomy were risk factors. Protective effects were provided by performing pelvic-floor-muscle-training during pregnancy, mainly for specific risk groups. Furthermore, higher FI prevalence and severity emerged in overweight, aged > 40, highly-educated, non-Italian women and in those undergoing tear.

Conclusion

PRO measures systematically and longitudinally collected in a large Italian population highlighted the prevalence of pregnancy-related UI/FI and the risk and protective factors. Pelvic-floor-muscle-training may be recommended in women with peculiar socio-demographic and clinical features.

INTRODUCTION

Urinary and faecal incontinence (UI/FI) affect both young and elderly women, with different physiopathological mechanisms. Pregnancy is a well-known risk factor for incontinence (1). The estimated prevalence of UI is 35-67% during pregnancy and 15-45% postpartum (2). Stress UI is the most common type of pregnancy-related UI, because of the pressure exerted by the uterus on pelvic floor muscles and the progesterone-mediated ligamentous and muscle relaxation (3). Whenever the abdominal pressure rises, the bladder pressure overcomes the urethral closure pressure, leading to urine leakage (4). Despite its negative impact on the quality of life, patients often do not report UI symptoms (5). Moreover, pregnant and postpartum women may suffer from FI, defined as the spontaneous leakage of faecal material. Fewer studies investigating its epidemiology and the related risk factors have been published, although FI can affect about 4% of women at the twelfth week of pregnancy, and about 5.5% of women at three-months postpartum, with often underestimated psycho-physical and social consequences (6).

The ICHOM (*International Consortium for Health Outcomes Measurement*) chose pregnancy-related incontinence as a maternal-child domain to be evaluated through a standard set of patient-reported outcome (PRO) measures (7). PRO measures are self-compiled questionnaires through which patients evaluate their

perceived functional status, symptom intensity, and general health status (8). A recent review confirmed the usefulness of PRO measures in the evaluation of pelvic floor disorders (9). Indeed, PRO measures contribute to the decision-making process and symptom detection and monitoring. Furthermore, the systematic collection of PROs provides patient-tailored and real-world-evidence data (10), thus improving the doctor-patient communication and, eventually, the patient's outcome (11). Therefore, PROs may help to overcome that "silo-vision" of the performance results that consists of focusing just on the performance of a single unit, avoiding a patient-centred perspective. In other words, PRO measures may lead to the alignment of the healthcare targets with what is important to patients (12).

Several longitudinal studies facing such issues have been already published (13–16), but just a few studies carried out on a large cohort of patients through a systematic and longitudinal PRO collection are available, and even less regarding the Italian context. Moreover, the current literature outlines various risk and protective factors for pregnancy-related UI/FI (2,17), with pelvic-floor-muscle-training (PFMT) identified as the main preventive and/or rehabilitative intervention (18,19). Therefore, our study aims to

1. assess the prevalence and severity of UI/FI from the beginning of pregnancy until six-months postpartum;
2. identify the overall risk and protective factors;
3. investigate the impact of PFMT on pregnancy-related pelvic floor function.

METHODS

Study design, data source, and population

This is a prospective longitudinal study aiming to evaluate the impact of pregnancy and postpartum on pelvic floor function and continence. Data were obtained from the questionnaires systematically and longitudinally collected by the MeS (*Management and Health*) Laboratory of Sant'Anna School of Advanced Study of Pisa, Italy, and stored in the online platform of the same institution. This collection program was launched in 2019 by Sant'Anna School in collaboration with Tuscany Region and gradually integrated within the phone App*hAPPyMamma* , which is the digital version of the Maternity Services Dataset of Tuscany, Italy (20).

In this study, we employed data collected from all pregnant women that agreed to participate to the systematic and longitudinal survey on the maternity pathway in Tuscany through the administration of four online questionnaires at four time-point, specifically at the beginning of pregnancy (T0g), at the third trimester (T3g), and 3- and 6-months postpartum (T3p and T6p). Our cohort of respondents consisted of all those women who had answered all four questionnaires at the four time-points of the survey from the beginning of the PRO collection program (March 2019) to April 2021. The participation to this systematic and longitudinal survey was high: indeed, 1 out of 2 pregnant women (eligible population) completed the first questionnaire. The follow-up loss was quite low, with more than 1 out of 4 eligible women answering at 6-months postpartum. Each questionnaire included two translated PRO measures – the Wexner scale for FI and the ICIQ-SF (*International Consultation on Incontinence Questionnaire, short form*) for UI – to specifically investigate the pregnancy-related pelvic floor function. We also included in the surveys several questions regarding the socio-demographic and clinical characteristics of our respondents.

Patient-reported outcome measures

The ICIQ is one of the most used PRO measures to assess both the prevalence and the perceived impact on the daily life of UI (21). The validation of the Italian version allows for reliable and effective use for routine clinical practice and research (22). The evidence achieved by the collection of ICIQ results does not differ when the questionnaire is self-administrated or completed by the physician during an interview (23). Particularly, we employed the ICIQ-SF, a 3-items questionnaire that evaluates the frequency, the volume of leakage, and the overall impact of UI. Its total score ranges from 0 to 21, and greater values correspond to a higher severity (24).

Similarly, we used the Wexner scale, a PRO measure for FI developed by the Cleveland research group ranging from 0 to 20 which combines items about frequency and type of stool loss, pad use, and impact

on lifestyle (25). The higher is the Wexner score, the greater is the symptom intensity. Wexner scale is the most common patient-reported questionnaire used to evaluate the presence and the severity of FI perceived by patients (26). It ensures standardized and reproducible results for the clinical evaluation and management of FI, even though it does not consider the aspect of faecal urgency (27). The Italian version of this questionnaire has not been validated yet; however, the*International Consortium for Health Outcomes Measurement* (ICHOM) has included the Wexner scale – and the ICIQ as well – in the core set for the measurement of UI/FI during pregnancy and childbirth (28).

Data analysis

1) First aim

To assess the presence and the severity of UI/FI, we respectively computed the overall ICIQ-SF/Wexner score for each respondent of the cohort. Then, we created two dichotomous dependent variables ("Presence of UI" / "Presence of FI") for each time-point of the survey, assigning a value of 1 to those patients who had reported suffering from UI/FI and thus got an ICIQ-SF/Wexner score other than zero. Otherwise, the value of the variables was 0.

2) Second aim

To identify the incontinence-related risk and protective factors, we first performed bivariate analyses by running both $\chi 2$ $\tau\epsilon\sigma\tau\varsigma$ to compare UI/FI prevalence between groups and *t test* or*ANOVA* to estimate the between-group difference of the PRO measure scores, which represent the UI/FI symptom severity.

Then, we built panel regression models by employing those variables for which a statistical difference in UI/FI prevalence and/or symptom intensity emerged from bivariate analyses. We adopted panel models to identify the overall risk factors, socio-demographic characteristics, and clinical events associated with a higher risk of developing UI/FI over time and with a greater symptom intensity.

We performed a panel logistic regression model to estimate the between-group odds ratio (OR) for the prevalence of pregnancy-related UI/FI. We adjusted for the socio-demographic features of our respondents, and gradually added the peripartum clinical factors. Furthermore, we repeated the same analysis process to evaluate the between-group differences in the UI/FI symptom intensity, by running panel linear regression models for PRO measure scores. Again, we first adjusted just for sociodemographic features, and then also for clinical ones.

3) Third aim

To investigate the potential impact of PFMT as a preventive and/or rehabilitative intervention positively impacting pelvic floor function, we performed a sub-analysis by stratifying for the levels of the PFMT variable.

Finally, after defining the type of UI that each woman suffered from (specifically, stress UI, urgency UI, not defined UI, and mixed UI), we run a further sub-analysis by stratifying for the type of UI, to see how the impact of PFMT on the risk of developing more severe symptoms changed according to such feature.

Data management and statistical analysis were performed by using both SAS and Stata Software. Categorical variables were presented as percentages, while continuous variables as mean $\pm$ standard deviation. Statistical significance was set at a p-value < 0.05.

RESULTS

We obtained a cohort of 6,023 respondents who had answered all four questionnaires. We obtained ten categorical variables according to the respondent's features. All the socio-demographic, clinical, and pregnancy-related information is shown in Table 1.

Prevalence and severity of UI and FI

The overall prevalence of FI and UI and corresponding PRO measure mean scores ± standard deviations are shown in Figure 1. The prevalence of FI at the beginning of pregnancy was almost 4%, surprisingly with a mean Wexner score superior to the following ones. In the third trimester, the prevalence of FI achieved its peak (6.2%). However, it started to decrease after delivery, getting back to almost 4%; the corresponding mean scores declined as well. The prevalence of UI presented a five-fold increase from the beginning of pregnancy (4.9%) to the third trimester (24.3%), and the mean score rose up as well. After birth, the prevalence of UI decreased without getting back to the starting value, but the mean ICIQ-SF scores did not go down at the same time.

Risk factors

A) Bivariate analysis

Results of the bivariate analyses investigating the between-group difference in the prevalence and the PRO measure mean scores are omitted because the same variables for which a statistical difference emerged were further employed in the following analyses.

B) Panel regression models

Results of the panel models investigating the risk and protective factors for UI are shown in Table 2 (A/B). In every time-points following the first one (beginning of pregnancy), the risk of developing UI was higher. In addition, an age > 30 and a BMI > 25 were detected as risk factors. Multiparous and highly-educated women showed higher ORs for the prevalence of UI. No difference was found for nationality. We obtained the same results found for symptom intensity. Adjusting for peripartum clinical characteristics, multiparity lost its statistical significance. Foetal weight > 3.5 kg was a risk factor. Furthermore, we observed lower occurrence and severity in women undergoing C-section, while women suffering from spontaneous tear or receiving episiotomy were at greater risk. Moreover, a protective effect was demonstrated when PFMT was performed just during pregnancy, rather than just after pregnancy or both during and after it. Finally, the risk was higher for women who experienced UI during pregnancy.

The same risk factors emerged both for developing FI and its severity, which are shown in Table S1 (Supporting Information). Both the onset rate and the symptom intensity were higher at the end of pregnancy and 3 months postpartum, as compared to the beginning of pregnancy and 6 months postpartum. Age was a significant risk factor for women over 40 years. Interestingly, overweight – but not obese – women were at higher risk. Unlike multiparity, non-Italian citizenship was a risk factor. Finally, a high education level exposed to a greater risk than a medium education degree. Such results were confirmed by adjusting also for clinical features. In addition, we found no difference regarding the mode of delivery, as C-section was not protective. Moreover, women undergoing spontaneous tear had a higher risk, while episiotomy showed no significant OR. Finally, performing PFMT had no influence either on the prevalence or on the severity of FI.

Impact of PFMT

We identified the performance of PFMT as a potential preventive and/or rehabilitative intervention to reduce the risk of pregnancy-related UI. As a matter of fact, women performing PFMT during pregnancy showed a lower UI prevalence and severity as compared to those who performed PFMT just after delivery.

Strong evidence was found for UI, with panel regression models confirming such findings. On the contrary, no relationship emerged from statistical models for FI. However, we decided to run a sub-group analysis both for UI and FI, in accordance with the four levels of the variable describing the performance of PFMT.

Results of this sub-group analysis for UI are shown in Table 3A. We observed that performing PFMT postpartum was a significant protective factor in young women. Also, the effect of overweight on the risk of UI was nullified by performing PFMT postpartum, and obesity was not a risk factor in women performing PFMT during pregnancy or postpartum. Moreover, multiparous showed a lower risk when performing PFMT postpartum. Surprisingly, performing PFMT during pregnancy exposed to a greater risk of UI in women

receiving an operative delivery through vacuum/forceps. Finally, women performing PFMT during pregnancy and receiving episiotomy did not show a higher risk.

Some positive effects given by PFMT emerged from the sub-analysis also for FI, as shown in Table S2. Indeed, age was not a significant risk factor in women performing PFMT during pregnancy. Actually, performing PFMT during pregnancy was a protective factor in multiparous women. Surprisingly performing PFMT during pregnancy was a risk factor for FI in women receiving an operative delivery.

Finally, we determined the type of UI for each woman in the third trimester of pregnancy. Among those 1,463 women (24.3% of the total) suffering from UI at that time-point, we found that:

- 58.2% of them suffered from stress UI
- 6.7% of them suffered from urgency UI
- 12.9% of them suffered from not defined UI
- 22.2% of them suffered from mixed UI.

The results of the sub-analysis by stratifying for these types of UI are shown in Table 3B. We found that performing PFMT during pregnancy is a significant protective factor against more severe symptoms for women suffering from stress UI. A protective effect against urgency UI was given by performing PFMT during pregnancy or postpartum. Among women suffering from not defined UI, we found a higher risk in women performing PFMT just postpartum, but a lower risk in women performing PFMT both during and after pregnancy. Surprisingly, performing PFMT gave no protection against symptom intensity in women with mixed UI.

DISCUSSION

Main findings

We found that the prevalence of UI at the third trimester of pregnancy was 24.3%, declined to 15.9% and 12.6% at three- and six-months postpartum, respectively. Despite such a reduction in prevalence, the symptom intensity remained almost stable, as shown by ICIQ-SF mean scores. Our results showed a lower prevalence of UI than previous studies, where the prevalence of UI tended to 40% (2,29,30). However, the assessment of the prevalence of UI is a hard issue, with high variability in prevalence studies (31). Similarly, we observed lower rates of FI – 6.2% at the third trimester and 4.2% six-months postpartum – as compared to earlier studies (32,33).

We demonstrated that advanced age, overweight/obesity, high education level, high foetal weight, undergoing spontaneous tear, and receiving episiotomy were the main risk factors for UI. Our findings are aligned with previous studies (34,35). In accordance with the literature, a detrimental impact was provided by experiencing vaginal delivery as compared to C-S, while no difference emerged between natural and operative vaginal delivery (36,37). We also detected a protective role of performing PFMT during pregnancy or postpartum. For instance, during-pregnancy PFMT nullified the risk effect given by obesity and episiotomy and reduced the symptom intensity of stress UI, while postpartum PFMT was protective in young women. Such evidence was confirmed also by a previous randomized controlled trial and by a Cochrane's review (38,39). Particularly, Brennen *et al.* suggested that group-based PFMT sessions involving at least eight pregnant women were more cost-effective than the other intervention models (40).

Fewer but similar risk factors emerged for FI. Very advanced age (> 40), overweight (but not obesity), high education level, and undergoing spontaneous tear were the leading ones, without beneficial effects of receiving C-S. Such results were in accordance with the previous literature (41–43). Despite the not so strong evidence, some positive effect given by during-pregnancy PFMT was observed also for FI, mainly in older and multiparous women. However, we did not find a positive role of postpartum PFMT for FI, in contrast with previous evidence detected in a randomized controlled trial (44).

Strength and limitations

In this systematic and longitudinal PRO collection, we first confirmed the results of previous studies about the risk and protective factors for pregnancy-related UI/FI by using panel regression models. Besides, we focused on the potential role of PFMT as a potential preventive/rehabilitative intervention. Some divergence with the literature in the prevalence of UI/FI emerged, probably because of the bias given by patient-reported data. However, to our knowledge, this is the first study investigating the epidemiology of UI and FI in a large sample of the Italian population (6,023 patients) from a patient-tailored perspective. Moreover, since there is currently little available research regarding pregnancy-related FI within the Italian context, the novelty of our work is the simultaneous evaluation of UI/FI through web-based questionnaires administered at four time-points from the beginning of pregnancy until six-months postpartum. Furthermore, by employing two validated patient-reported measures we tried to integrate the systematic evaluation of patient's experience of care and the research activities. Together with the above-mentioned bias of patient-reported data, the main limitation of our study is the non-generalisability of our findings since the work was carried out in a single Italian Region.

Interpretation

Since medicine is progressively moving towards a patient-tailored care, the evaluation of the patient's perspective through the use of validated and standardized measures seems to be fundamental. In this study, we employed PRO measures to outline the groups of women at a higher risk of developing pregnancy-related UI/FI, focusing at the same time on the importance of prevention and rehabilitation strategies. DeLancey*et al.* suggested that these strategies, such as the performance of PFMT, should be based on a more individual-sharpened identification of UI/FI risk and not on universal recommendations for all patients (45). Indeed, we believe that the use of PRO measures could refine the detection of risk groups for which preventive/rehabilitative PFMT would be cost-effective in lowering not only the risk of pregnancy-related incontinence, but also the risk of long-term comorbidities as reported in the literature (46).

CONCLUSION

We systematically and longitudinally collected patient-reported outcome measures on a large cohort of Italian women to evaluate the epidemiology of pregnancy-related urinary and faecal incontinence. We found that up to a quarter of women can experience urinary incontinence during pregnancy, while the prevalence of faecal incontinence is lower (almost 6%). We also detected several groups of women who were at a higher risk of developing either urinary or faecal incontinence during the maternity pathway, and more severe symptoms. Finally, we demonstrated a potential beneficial role of pelvic-floor-muscle-training in preventing and/or treating such problems in specific groups of women with peculiar socio-demographic and clinical features.

DISCLOSURE OF INTERESTS

None declared.

CONTRIBUTION TO AUTHORSHIP

AF and MB participated in the design, methodology, implementation, conduct, monitoring, analysis, and writing of the study. MB coordinated the design and development of the systematic and longitudinal survey on the maternity pathway in Tuscany and the connected mobile and web App*hAPPyMamma* . ER participated in the interpretation of the study and writing of the Discussion paragraph. TS, PM, and MV revised the drafts of the article and approved the final version.

DETAILS OF ETHICS APPROVAL

Since the PRO collection was carried out within the systematic and longitudinal survey on the maternity pathway in Tuscany that is finalised to assess the women's experience of maternal and child healthcare, informed consent was not required, and ethics approval was not necessary.

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TABLES

Variables	**Value**	**N**	**%**
Educational level	High	3265	54.21
	Low	441	7.32
	Medium	2317	38.47
Parity	Multiparous	2301	38.20
	Primigravida	3722	61.80
Age class	16-30	1065	17.68

Variables	Value	N	%
	30-39	4296	71.33
	40+	662	10.99
Nationality	Italian	5686	94.40
	Not Italian	337	5.60
BMI	<18.5 (underweight)	430	7.14
	18.5-25 (normal)	4191	69.58
	25-30 (overweight)	1002	16.64
	>30 (obesity)	400	6.64
Pelvic floor muscle training	Never	3154	52.37
	Just before	1383	22.96
	Just after	628	10.43
	Both before and after	858	14.25
Caesarean section	Missing	120	
	No	4439	75.20
	Yes	1464	24.80
Mode of delivery	Missing	120	
	Caesarean section	1464	24.80
	Vacuum/forceps	394	6.67
	Spontaneous	4045	68.52
Tear	Missing	1658	
	Episiotomy	581	13.31
	Spontaneous tear	1613	36.95
	No tear	2171	49.74

Table 1. Socio-demographic, clinical, and pregnancy-related data. Most of our respondents was Italian, 30-39 years old, primigravida, normal-weight, with a high educational level, and had a spontaneous delivery with no caesarean-section and no tear. Half of our respondents did never perform pelvic floor muscle training (PFMT).

Table 2A. Risk factors for prevalence and severity of UI adjusted just for sociodemographic features

	Prevalence OR	Prevalence 95% CI	Prevalence p-value	Symptom severity Coefficient	Symptom sev 95% CI
Third trimester vs T0g	6.340	5.558 to 7.233	0.000	1.652	1.54 to 1.763
3 months postpartum vs T0g	3.722	3.247 to 4.267	0.000	0.981	0.87 to 1.093
6 months postpartum vs T0g	2.838	2.467 to 3.265	0.000	0.684	0.573 to 0.795
16-30 vs 30-39 years old	0.822	0.737 to 0.916	0.000	-0.148	-0.258 to -0.038
>40 vs 30-39 years old	1.122	1.001 to 1.258	0.048	0.173	0.045 to 0.301
Underweight vs normal weight	0.906	0.778 to 1.054	0.201	-0.089	-0.244 to 0.066
Overweight vs normal weight	1.253	1.137 to 1.38	0.000	0.288	0.18 to 0.396
Obesity vs normal weight	1.323	1.147 to 1.527	0.000	0.439	0.278 to 0.601
Multiparous vs primigravida	1.205	1.117 to 1.301	0.000	0.236	0.153 to 0.319
Non-Italian vs Italian citizenship	0.977	0.829 to 1.151	0.781	-0.087	-0.26 to 0.086
Low vs high education level	0.920	0.792 to 1.069	0.276	-0.026	-0.186 to 0.133
Medium vs high education level	0.882	0.814 to 0.956	0.002	-0.108	-0.193 to -0.023

Table 2B. Risk factors for prevalence and severity of UI adjusted also for clinical characteristics

	Prevalence OR	Prevalence 95% CI	Prevalence p-value	Symptom severity Coefficient	Sy 95
Third trimester vs T0g	10.710	9.206 to 12.46	0.000	1.672	1.5
3 months postpartum vs T0g	5.110	4.383 to 5.958	0.000	0.999	0.8
6 months postpartum vs T0g	3.545	3.031 to 4.145	0.000	0.692	0.5
16-30 vs 30-39 years old	0.809	0.712 to 0.919	0.001	-0.108	-0.
>40 vs 30-39 years old	1.219	1.062 to 1.399	0.005	0.212	0.0
Underweight vs normal weight	0.983	0.823 to 1.175	0.854	-0.003	-0.
Overweight vs normal weight	1.233	1.099 to 1.383	0.000	0.217	0.1
Obesity vs normal weight	1.362	1.147 to 1.616	0.000	0.369	0.2
Multiparous vs primigravida	0.972	0.883 to 1.07	0.560	0.020	-0.
Non-Italian vs Italian citizenship	1.097	0.902 to 1.335	0.355	0.014	-0.
Low vs high education level	0.945	0.789 to 1.132	0.539	0.001	-0.
Medium vs high education level	0.906	0.824 to 0.996	0.042	-0.064	-0.
Foetal weight over vs under 3,5 kg	1.159	1.052 to 1.276	0.003	0.164	0.0
C-section vs spontaneous delivery	0.582	0.511 to 0.662	0.000	-0.346	-0.
Operative vs spontaneous delivery	1.101	0.904 to 1.343	0.339	0.070	-0.
Spontaneous vs no tear	1.238	1.113 to 1.377	0.000	0.179	0.0
Episiotomy vs no tear	1.342	1.131 to 1.593	0.001	0.284	0.1
No PFMT vs during pregnancy	1.029	0.92 to 1.151	0.613	0.097	0.0
PFMT postpartum vs during pregnancy	1.387	1.186 to 1.621	0.000	0.402	0.2
PFMT during + after vs during pregnancy	1.235	1.07 to 1.426	0.004	0.252	0.1
UI during pregnancy vs not	14.871	13.572 to 16.296	0.000	3.065	2.9

Table 2. Risk factors for prevalence and severity of UI emerged from panel regression models.

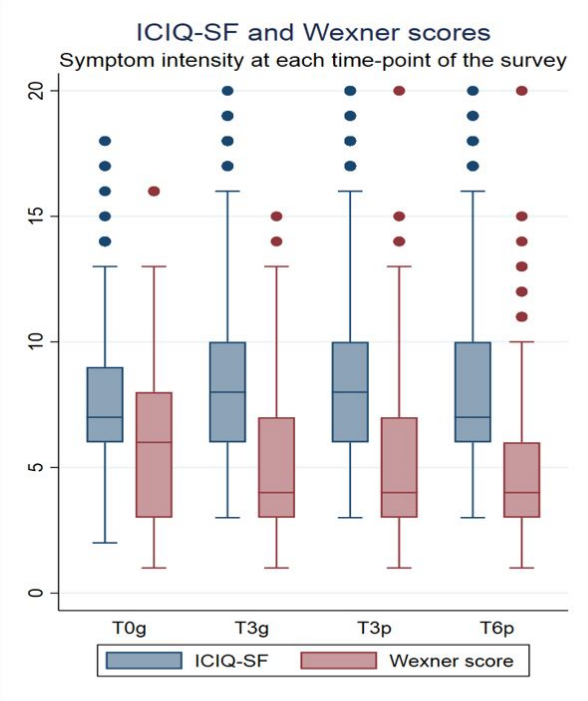
Table 3A. Prevalence of Urinary Incontinence by stratifying for the performance of PFMT

	No PFMT OR	No PFMT p	PFMT during pregnancy OR	PFMT during pregn p
Third trimester vs T0g	10.412	0.000	12.798	0.000
3 months postpartum vs T0g	4.010	0.000	5.113	0.000
6 months postpartum vs T0g	2.949	0.000	3.371	0.000
16-30 vs 30-39 years old	0.891	0.202	0.957	0.743
>40 vs 30-39 years old	1.131	0.214	1.494	0.008
Underweight vs normal weight	1.115	0.420	0.788	0.221
Overweight vs normal weight	1.268	0.005	1.293	0.039
Obesity vs normal weight	1.574	0.000	0.933	0.717
Multiparous vs primigravida	1.098	0.171	0.945	0.607
Non-Italian vs Italian citizenship	0.958	0.749	1.118	0.657
Low vs high education level	1.001	0.994	0.687	0.096
Medium vs high education level	0.934	0.331	0.807	0.038
Foetal weight over vs under 3.5 kg	1.098	0.188	1.025	0.821
C-section vs spontaneous delivery	0.610	0.000	0.512	0.000
Operative vs spontaneous delivery	1.046	0.779	1.525	0.043
Spontaneous vs no tear	1.164	0.058	1.302	0.023
Episiotomy vs no tear	1.280	0.059	1.003	0.987
UI during pregnancy vs not	17.403	0.000	14.451	0.000

Table 3B. UI symptom severity according to the type of Urinary Incontinence

	Stress Coeff.	**Stress p-value**	**Urgency Coeff.**	**Urgency p-value**	**Not defined Coeff.**	**Not defin p-value**
Third trimester vs T0g	7.085	0.000	6.924	0.000	7.769	0.000
3 months postpartum vs T0g	1.638	0.000	2.283	0.000	1.607	0.000
6 months postpartum vs T0g	1.090	0.000	1.772	0.001	0.566	0.138
16-30 vs 30-39 years old	-0.459	0.010	-0.228	0.682	-0.759	0.045
>40 vs 30-39 years old	0.649	0.000	1.435	0.029	-0.793	0.159
Underweight vs normal weight	-0.267	0.243	1.056	0.288	0.292	0.643
Overweight vs normal weight	0.359	0.024	1.124	0.059	0.817	0.023
Obesity vs normal weight	0.668	0.009	0.097	0.901	1.739	0.002
Multiparous vs primigravida	0.009	0.942	0.016	0.973	0.193	0.546
Non-Italian vs Italian citizenship	-0.031	0.914	-0.758	0.322	0.421	0.585
Low vs high education level	-0.157	0.544	0.605	0.430	0.092	0.850
Medium vs high education level	-0.066	0.600	0.118	0.800	-0.295	0.373
Foetal weight over vs under 3.5 kg	0.345	0.010	-0.263	0.589	0.821	0.010
C-section vs spontaneous delivery	-0.895	0.000	0.624	0.387	-1.072	0.005
Operative vs spontaneous delivery	0.232	0.458	0.366	0.732	-0.151	0.810
Spontaneous vs no tear	0.110	0.456	0.396	0.420	-0.041	0.907
Episiotomy vs no tear	0.330	0.218	-0.524	0.434	0.796	0.151
No PFMT vs during pregnancy	0.383	0.009	1.169	0.055	-0.348	0.311
PFMT postpartum vs during pregnancy	0.444	0.038	1.130	0.127	2.978	0.000
PFMT during + after vs during pregnancy	0.755	0.000	1.850	0.012	-1.102	0.018

Table 3. Sub-analyses for UI by stratifying for the performance of PFMT (A) and for the type of UI (B).



	T0g	T3g	T3p	T6p
Urinary incontinence				
Prevalence, n (%)	292 (4.85)	1463 (24.29)	957 (15.89)	759 (12.60)
ICIQ-SF mean score ± SD	7.66 ± 2.82	8.35 ± 3.20	8.54 ± 3.39	8.43 ± 3.34
Faecal incontinence				
Prevalence, n (%)	239 (3.97)	372 (6.18)	323 (5.36)	253 (4.20)
Wexner mean score ± SD	5.77 ± 3.03	5.01 ± 2.87	5.18 ± 2.98	4.55 ± 2.90