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CLINICAL ARTICLE

Obstetrics

Influence of COVID-19 pandemic on self-reported urinary incontinence during pregnancy and postpartum: A prospective study

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Abstract

Objective: To explore how the COVID-19 pandemic influenced self-reported occurrence and severity of pregnancy-related urinary incontinence (UI) in the maternity pathways of Tuscany, Italy.

Methods: In this prospective pre-post cohort study, we selected a pre-pandemic ($n = 1018$) and a post-pandemic ($n = 3911$) cohorts of women that completed, from the first trimester until 3 months postpartum, three surveys including validated patient-reported outcome measures for UI. Data were obtained from systematic surveys on the maternity pathways of Tuscany from March 2019 to June 2021. We performed panel regression models to explore how UI risk differed between COVID-19 groups.

Results: UI occurred less frequently and less severely in post-pandemic patients—especially stress/mixed UI in women never performing pelvic floor muscle training (PFMT)—whereas no difference emerged in women performing during-pregnancy PFMT. During COVID-19, obese women had higher risk of UI, whereas women undergoing operative delivery had lower risk. The post-pandemic group reported more severe UI symptoms at the third trimester, but less severe UI postpartum in women suffering from UI during pregnancy.

Conclusions: During the COVID-19 pandemic, women reported fewer UI symptoms because they might have lacked chances to identify UI symptoms as a result of pandemic-related sedentarism and inactivity. The risk in women performing during-pregnancy PFMT was not increased, but just six of 26 health districts organized remote PFMT sessions, thus revealing limited resilience to the pandemic in Tuscany.

KEYWORDS
COVID-19 pandemic, Italy, patient-reported outcome, postpartum, pregnancy, urinary incontinence

1 | INTRODUCTION

The COVID-19 pandemic has disruptively changed healthcare routine practice and affected the delivery of elective care. Italy has been one of the countries most affected by COVID-19 in Europe. The clinical and economic burden for the Italian National Health System during the pandemic was overwhelming and led to the suspension of several elective medical activities. Hospitals and frontline

healthcare professionals had to face and manage unexpected pressures to sustain ordinary activities in extraordinary conditions.[1] On the other hand, patients often felt abandoned and neglected: the lack of family support and the difficulty of communicating with doctors produced negative consequences for their social and emotional functionality. In addition, the suspension of preventive and rehabilitation medical services and the requirement to stay at home during the lockdown may have resulted in reduced quality of life and worsening symptoms.

Collection of patient-reported data became even more crucial after the start of the COVID-19 outbreak in March 2020.[2] Patient-reported data may be useful for exploring the psycho-physical impact of COVID-19 on patients and healthcare avoidance during the pandemic, with its consequences.[3] Indeed, previous studies have shown serious concerns among patients about the COVID-19 emergency, with negative impact on emotional function.[4,5] Also, post-pandemic patients report a reduced quality of life after the infection.[6] However, how the transient reduction in health services provision during the COVID-19 lockdown has affected the self-reported quality of life, experience, and symptom perception—regardless of having COVID-19—remains controversial. For instance, Ciurea et al.[7] observed no disease worsening in inflammatory rheumatic diseases during the COVID-19 pandemic, and Gilmore et al.[8] even found an improvement in patient-reported experiences despite the pandemic.

Few studies have explored postpartum recovery after the COVID-19 pandemic, and no consensus has been reached on which patient-reported outcome measure is better to evaluate postpartum recovery.[9] Indeed, during-pregnancy care and prevention services may have been suspended because of the pandemic, with negative impact on postpartum recovery. For instance, Ferreira et al.[10] stressed the need to continue urogynecologic physiotherapy services during the pandemic, in line with WHO recommendations.

In a previous study, we have shown the importance of during-pregnancy pelvic floor muscle training (PFMT) for reducing the risk of pregnancy-related urinary incontinence (UI) occurrence and symptom worsening, especially in specific groups of women.[11] The present study aims to assess the impact of the COVID-19 pandemic on patient-reported prevalence and severity of pregnancy-related urinary incontinence by using validated patient-reported outcome measures, exploring at the same time how risk and protective factors for pregnancy-related UI have been influenced by the lockdown and the suspension of health services.

2 | MATERIALS AND METHODS

This is a prospective pre-post cohort study evaluating the impact of the COVID-19 pandemic on the occurrence and symptom severity of pregnancy-related UI reported by patients. As an observational study, it has been reported in accordance with the STROBE guidelines. The study was carried out in Tuscany, a central Italian Region divided into 26 health districts, responsible for the healthcare services provided to 3.7 million inhabitants, and receiving around 6% of the national healthcare fund.

As explained in our previous paper,[11] our data source was the population of pregnant women who agreed to participate in the systematic and longitudinal survey on the maternity pathway of Tuscany. This systematic survey was launched by the Sant'Anna School of Advanced Study of Pisa in collaboration with the Tuscany Region, and integrated within the mobile and web App *hAPPy-Mamma* (comprising the digital Pregnancy Booklet of Tuscany).[12] It involves all pregnant women of Tuscany that receive the Pregnancy Booklet (eligible population). Women are invited to join the survey, and—if they agree—they are recruited through online invitation at different time-points during and after pregnancy.

This study includes all women that answered all three surveys at the beginning of pregnancy (T0), at the third trimester (T1), and 3 months postpartum (T2) from March 2019 (when the collection program was started) to June 2021. Participation in the survey was high; more than 50% of women filled in the first questionnaire. Each survey comprised several questions on women's sociodemographic and clinical features as well as the Italian version of the International Consultation on Incontinence Questionnaire—Short Form (ICIQ-SF). The ICIQ-SF is a three-item validated patient-reported outcome measure evaluating frequency and volume of urine leakage and the overall UI impact. It provides a 0-to-21 score with greater values corresponding to higher symptom intensity.[13,14]

Particularly, we obtained two independent study cohorts composed of women who experienced pregnancy just before or after the COVID-19 outbreak, regardless of having COVID-19: (1) the pre-pandemic group, including all women that gave birth before March 10, 2020 ($n = 1018$), and (2) the post-pandemic group, including all women that answered the first survey after March 10, 2020 ($n = 3911$).

As previously explained,[11,15] this patient-reported outcome collection did not require informed consent and ethics approval according to the 2011 Italian guidelines of the Italian Data Protection Authority on processing personal data to perform customer satisfaction surveys in the healthcare sector. Indeed, it was conducted within a systematic survey monitoring women's experiences, outcomes, and satisfaction across the maternity care pathways of Tuscany.

We computed the ICIQ-SF score for each respondent at each time-point and created the dichotomous variable "Presence of UI" considering the disease as present for ICIQ-SF scores different from zero.[16] We performed bivariate analyses to detect pre-post differences in UI occurrence and symptom severity. Then, we ran panel regression models including as covariates all those women's attributes and features that were used in our previous work[11] as well as the dichotomous variable for pre-/post-pandemic groups. We performed panel logistic regressions for the dichotomous variable "Presence of UI", and panel linear regressions for the ICIQ-SF scores.

Furthermore, we stratified our models for the type of UI and the performance of PFMT. Particularly, we obtained information on the type of UI from the answers on when the urine leakage occurred,

thus detecting four groups: (1) stress UI, (2) urgency UI, (3) not defined, (4) mixed UI. On the other hand, we used the answer provided by women on when they performed PFMT to identify the following groups: (1) PFMT never performed, (2) PFMT during pregnancy, (3) PFMT postpartum, (4) PFMT during pregnancy and postpartum. Please, note that PFMT courses are territorial health services that are directly organized by the public counseling centers afferent to the 26 Tuscan health districts.

Finally, we created interaction variables between the dichotomous variable for COVID-19 groups and the various women's attributes included in our models to investigate the effect of the pandemic on each risk factor for UI severity and occurrence separately.

We performed data management using SAS software (SAS Institute), while statistical analyses on Stata Software (StataCorp). Statistical significance was set at a *P* value less than 0.05.

3 | RESULTS

There were 1018 women in the pre-pandemic group and 3911 women in the post-pandemic group. The sociodemographic and clinical characteristics of our respondents are shown in Table 1. The study cohorts were independent, and each woman spent her entire pregnancy in one of two study periods. The two groups were homogeneous in terms of educational level, parity, nationality, and mode of delivery. Most women were highly educated, primigravidae, and Italian; around 25% of them underwent cesarean section. In contrast, we observed lower rates of pregnant women over 40 years of age during the COVID-19 pandemic. Also, neonates more frequently had a birth weight above 3.5 kg. Furthermore, the number of women who never performed PFMT was higher in the post-pandemic group, and women had higher chances of experiencing spontaneous tears during the pandemic. Indeed, the prevalence of UI at the third trimester was significantly higher in the post-pandemic group.

Bivariate analyses (Figure 1) revealed no statistical pre-post difference in the ICIQ-SF scores. Therefore, there was no difference in the perceived UI symptom intensity despite the pandemic. However, the prevalence of UI—which did not differ between groups at the beginning of pregnancy (T0)—was significantly higher in the post-pandemic group at the end of pregnancy (T1) but significantly lower 3 months postpartum (T2) (Table 1).

Contrary to bivariate analyses, panel regression models (Table 2) showed a lower self-reported risk of developing pregnancy-related UI (odds ratio [OR] 0.83, 95% confidence interval [CI] 0.71–0.97) and more severe symptoms (Coeff. −0.17, 95% CI −0.28 to −0.06) during the COVID-19 pandemic than before.

The other risk and protective factors that emerged from regression models were very similar to those we previously reported.[11] Particularly, the risk was higher at T1 and T2 than at T0. Also, it was higher in women older than 40 years and in obese women. Highly educated women were more likely to report UI symptoms than poorly educated ones. UI occurred less frequently and with less severe symptoms in women undergoing cesarean section, but more frequently and with more severe symptoms in women experiencing spontaneous tears. Women undergoing episiotomy reported less intense symptoms than women with no tears. Performing PFMT during pregnancy was protective rather than just postpartum. Finally, women experiencing during-pregnancy UI were at higher risk.

Stratifying for the type of UI (Table 3), we observed that the post-pandemic group was less likely to experience stress and mixed UI, and with less severe symptoms than the pre-pandemic group, but not from urgency UI. We also found that during-pregnancy PFMT was protective against stress and mixed UI but was a risk factor for urgency UI. Furthermore, stratifying for the performance of PFMT (Table S1), the reduced risk of UI occurrence and severity during the COVID-19 pandemic—detected in previous analyses—remained significant only among women who had never performed PFMT, who accounted for about half of the study population.

We finally ran interaction models (Table 4). We found that, at the end of pregnancy, women reported more severe symptoms (Coeff. 0.28, $P = 0.040$) and more frequent UI occurrence (OR 1.50, $P = 0.087$) during the COVID-19 pandemic than before. Moreover, obese women were at higher risk of more severe UI symptoms during the pandemic than before. Women undergoing operative delivery with vacuum or forceps were at lower risk of more intense UI symptoms during the COVID-19 pandemic. Finally, women experiencing UI during pregnancy and belonging to the post-pandemic group were less likely to report more severe UI symptoms postpartum.

4 | DISCUSSION

In this study, we used self-reported survey data systematically collected at three time-points during and after pregnancy from 4929 women divided into a pre-pandemic group ($n = 1018$) and a post-pandemic group ($n = 3911$). Surveys also included a specific patient-reported outcome measure (ICIQ-SF) for evaluating UI occurrence and severity.

First, we confirmed the results of our previous study[11] on the main risk factors for developing pregnancy-related UI and more severe symptoms, such as advanced age, obesity, spontaneous tears or episiotomy, and experiencing a natural delivery rather than receiving a cesarean section.[17,18] Women with higher education more frequently reported UI symptoms, probably thanks to their greater awareness of their condition. Furthermore, despite having no specific information on the PFMT regimen, we confirmed the protective effect of performing PFMT during pregnancy rather than just postpartum.[19–21] Indeed, women might have performed PFMT postpartum as rehabilitative procedures for relevant delivery-related injuries on the pelvic floor. Women might never have performed PFMT because they did not suffer from any UI symptom and so had no need.

Second, women belonging to the post-pandemic group were less likely to report UI symptoms and a more intense symptomatology compared with the pre-pandemic group. Stratified analyses showed

TABLE 1 Sociodemographic and clinical characteristics of women in pre- and post-groups[a]

Variables	Value	Pre-pandemic group (n = 1018)		Post-pandemic group (n = 3911)		P value[b]
Educational level	High	526	(51.7)	2097	(53.6)	0.198
	Low	98	(9.6)	312	(8.0)	
	Medium	394	(38.7)	1502	(38.4)	
Parity	Multiparous	392	(38.5)	1531	(39.1)	0.710
	Primigravida	626	(61.5)	2380	(60.9)	
Age class, year	16–30	181	(17.8)	755	(19.3)	0.024
	30–39	709	(69.6)	2775	(71.0)	
	40+	128	(12.6)	381	(9.7)	
Nationality	Italian	960	(94.3)	3666	(93.7)	0.502
	Non-Italian	58	(5.7)	245	(6.3)	
BMI	<18.5 (underweight)	76	(7.5)	272	(7.0)	
	18.5–25 (normal weight)	700	(68.8)	2712	(69.3)	
	25–30 (overweight)	169	(16.6)	652	(16.7)	
	>30 (obesity)	73	(7.2)	275	(7.0)	
PFMT	Never	493	(48.4)	2141	(54.7)	<0.001
	Just before	255	(25.0)	769	(19.7)	
	Just after	73	(7.2)	469	(12.0)	
	Both before and after	197	(19.4)	532	(13.6)	
Cesarean section	Missing	72		48		0.180
	No	701	(74.1)	2943	(76.2)	
	Yes	245	(25.9)	920	(23.8)	
Mode of delivery	Missing	72		48		0.330
	Cesarean section	245	(25.9)	920	(23.8)	
	Vacuum/forceps	54	(5.7)	249	(6.4)	
	Spontaneous	647	(68.4)	2694	(69.7)	
Tears	Missing	79		61		<0.001
	Not applicable (CS)	245		920		
	Episiotomy	100	(14.4)	330	(11.5)	
	Spontaneous tear	215	(31.0)	1115	(38.7)	
	No tear	379	(54.6)	1437	(49.9)	
Fetal weight, g	Missing	26		73		<0.001
	<3000	405	(40.8)	1138	(29.7)	
	3000–3500	338	(34.1)	1592	(41.5)	
	>3500	249	(25.1)	1108	(28.9)	
UI at the first trimester	Yes	49	(4.8)	157	(4.0)	0.256
	No	969	(95.2)	3754	(96.0)	
UI at the third trimester	Yes	206	(20.2)	916	(23.4)	0.031
	No	812	(79.8)	2995	(76.6)	
UI 3 months postpartum	Yes	178	(17.5)	579	(14.8)	0.035
	No	840	(82.5)	3332	(85.2)	

Abbreviations: BMI, body mass index (calculated as weight in kilograms divided by the square of height in meters); CS, cesarean section; PFMT, pelvic floor muscle training; UI, urinary incontinence.

[a]Values are presented as number (percentage).

[b]χ^2 test was performed to detect the between-group difference.

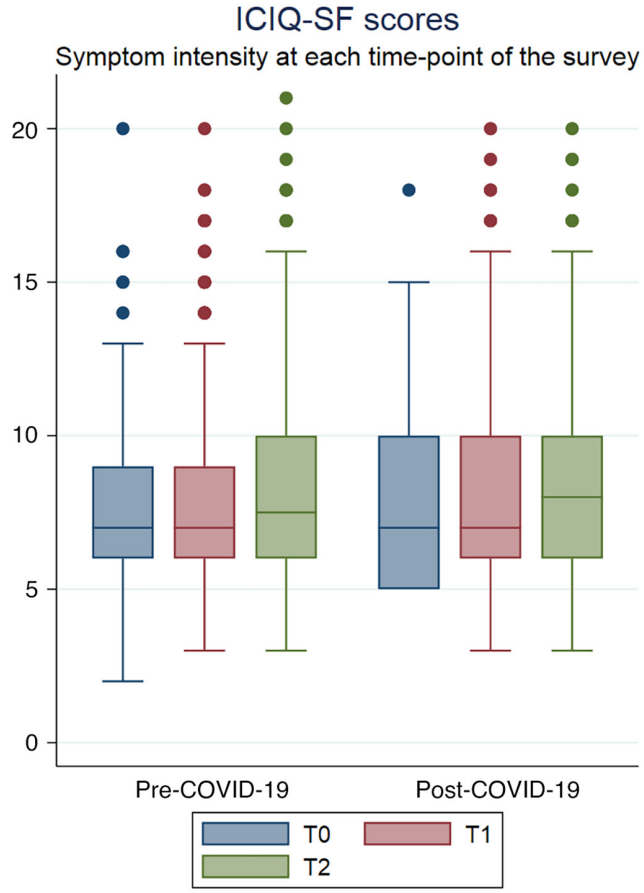

FIGURE 1 Boxplots of the International Consultation on Incontinence Questionnaire—Short Form (ICIQ-SF) scores for urinary incontinence at the different time-points and for the two groups. We performed Student's *t test* and Mann–Whitney *U test* to detect the between-group differences in urinary incontinence symptom intensity, but no statistically significant difference emerged ($P > 0.05$).

that the "protective" effect of the COVID-19 pandemic was significant only in women who suffered from stress or mixed UI and women who had never performed PFMT. Interaction analyses revealed that the "protection" given by the COVID-19 pandemic was also present in women undergoing operative delivery. In contrast, obese women had a higher risk during the pandemic. During the COVID-19 pandemic, women reported more severe symptoms at the third trimester, but less severe symptoms postpartum if they had suffered from UI during pregnancy.

The "protective" effect against UI of the COVID-19 pandemic was predominant in women who had never performed PFMT. This evidence could be explained by the fact that this group of women could not attend PFMT courses because the service was discontinued, or that they may have never needed to perform such exercises because of the absence of symptoms. Although the lockdown period in Italy ended at the end of May 2020, the state of emergency lasted until July 2021, with discontinuation of non-essential health services, rules for social distancing, closure of recreational activities, travel bans between regions, curfews, and remote classes for children. This, together with the general state of fear of infection, may have contributed to sedentarism and inactivity, preventing pregnant women from perceiving UI symptoms because they did not have the opportunity to make intense physical efforts that might result in urine leakage. On the other hand, sedentarism may have been detrimental to obese women who were unable to engage in physical activity during the pandemic.

On the other hand, UI risk was not increased in women performing PFMT during pregnancy despite the pandemic. Also, women suffering from UI during pregnancy reported less intense symptoms afterwards. These findings may depend on a beneficial emotional component related to changes in women's expectations of the care services they received during the lockdown and the global emergency,[8] which made pregnant women more empathetic and more appreciative of the efforts of health professionals despite limited access to services. Furthermore, the percentage of women who performed PFMT during pregnancy was lower during the pandemic (20%) than before the pandemic (25%). So, we directly contacted the midwifery coordinators of each health district to obtain information on PFMT delivery during the pandemic and found that only six out of 26 health districts had organized PFMT sessions remotely, while other districts had discontinued them. This evidence implies that women probably continued to perform PFMT on their own or privately, revealing only partial resilience to the pandemic by the Regional Health System of Tuscany.

The major limitation of this article is that it attempts to describe a phenomenon—the effect of the pandemic on self-reported UI—and suggests potential explanations, but it cannot establish with certainty what factors led to a reduction in UI risk during the COVID-19 pandemic. Further qualitative research is needed to understand more deeply how the regional health system managed to face the COVID-19 pandemic. The use of telephysiotherapy and the organization of remote PFMT courses partially allowed continuity of care during the pandemic, as already suggested,[22] so avoiding the dramatic reduction in access to and use of health services observed in other settings.[23]

Another limitation is related to the non-generalizability of our results. The work was carried out in the Italian Region of Tuscany, and the reduced risk of UI during the pandemic is limited to this context. Despite this, our findings remain relevant because the Italian National Health System follows a decentralized model, whereby each region is an autonomous administrative, legislative, fiscal, and political entity that can implement initiatives independently within its territory. So, it would be interesting to understand how COVID-19 has impacted the risk of pregnancy-related UI in other regions and how and whether other regions have organized themselves to cope with the emergency.

Finally, there are several limitations related to the data quality and availability. For instance, we might have not considered other well-known pregnancy- and delivery-related risk factors, as this information was not collected in our surveys. Furthermore, there is an underlying bias related to the self-reported nature of our data. Women, especially those with low educational level, may not be

TABLE 2 Risk factors for prevalence and severity of urinary incontinence

	Prevalence			Symptom severity		
	OR	95% CI	*P*	Coeff.	95% CI	*P*
After COVID-19 outbreak vs. before	0.83	0.71–0.97	0.022	−0.17	−0.28 to −0.06	0.003
Third trimester vs. T0	14.62	12.12–17.4	0.000	1.49	1.38–1.6	0.000
3 months postpartum vs. T0	6.43	5.34–7.74	0.000	0.98	0.88–1.09	0.000
16–30 vs. 30–39 years old	0.89	0.74–1.06	0.181	−0.03	−0.15 to 0.09	0.621
>40 vs. 30–39 years old	1.25	1.02–1.52	0.031	0.27	0.13–0.41	0.000
Underweight vs. normal weight	0.95	0.74–1.22	0.687	−0.06	−0.23 to 0.11	0.506
Overweight vs. normal weight	1.05	0.89–1.24	0.564	0.06	−0.06 to 0.18	0.317
Obesity vs. normal weight	1.38	1.1–1.75	0.006	0.46	0.28–0.63	0.000
Multiparous vs. primigravida	1.08	0.94–1.23	0.268	0.08	−0.02 to 0.17	0.117
Non-Italian vs. Italian citizenship	1.02	0.78–1.34	0.879	0.07	−0.12 to 0.26	0.473
Low vs. high education level	0.76	0.59–0.98	0.035	−0.16	−0.33 to 0.01	0.063
Medium vs. high education level	0.96	0.84–1.1	0.535	−0.01	−0.1 to 0.08	0.826
Fetal weight over vs. under 3,5 kg	1.11	0.97–1.27	0.144	0.08	−0.02 to 0.18	0.101
CS vs. spontaneous delivery	0.61	0.51–0.73	0.000	−0.20	−0.32 to −0.08	0.001
Operative vs. spontaneous delivery	1.16	0.88–1.54	0.296	0.07	−0.13 to 0.27	0.476
Spontaneous vs. no tear	1.22	1.06–1.42	0.008	0.22	0.12–0.33	0.000
Episiotomy vs. no tear	1.19	0.93–1.53	0.175	0.25	0.07–0.422	0.006
PFMT during vs. after pregnancy	0.61	0.48–0.76	0.000	−0.46	−0.62 to −0.3	0.000
PFMT during + after vs. after pregnancy	0.76	0.6–0.95	0.018	−0.33	−0.5 to −0.16	0.000
No PFMT vs. after pregnancy	0.74	0.61–0.89	0.002	−0.37	−0.52 to −0.23	0.000
UI during pregnancy vs. not	31.26	27.33–35.74	0.000	3.57	3.47–3.68	0.000
Constant	0.01	0.01–0.01	0.000	−0.16	−0.35 to 0.04	0.116

Abbreviations: CI, confidence interval; Coeff., coefficient; CS, cesarean section; OR, odds ratio; PFMT, pelvic floor muscle training; UI, urinary incontinence.

Panel regression models were adjusted for the sociodemographic and clinical features of women.

TABLE 3 Stratified analyses for symptom severity according to the type of urinary incontinence

	Stress		Urgency		Not defined		Mixed	
	Coeff.	*P*	Coeff.	*P*	Coeff.	*P*	Coeff.	*P*
After COVID-19 outbreak vs. before	−0.67	0.004	−0.77	0.268	−0.23	0.703	−0.91	0.020
PFMT during vs. after pregnancy	−1.07	0.000	2.32	0.029	0.50	0.476	−0.92	0.099
PFMT during + after vs. after pregnancy	−0.79	0.007	1.40	0.14	−0.52	0.517	−1.30	0.021
No PFMT vs. after pregnancy	−0.76	0.003	2.52	0.008	−0.03	0.965	−0.85	0.087

Abbreviation: Coeff., coefficient; PFMT, pelvic floor muscle training; UI, urinary incontinence.

Panel regression models were adjusted for the sociodemographic and clinical features of women (not shown).

totally aware of their clinical condition, may underestimate their symptoms, or may have difficulties in interpreting and answering questionnaires correctly. Indeed, we found a higher risk of reporting UI symptoms in highly educated women.

Nevertheless, this study has the strength of using a large amount of data, collected over three time-points, from a large cohort (n = 4929), employing a standardized questionnaire already validated for the Italian context. The use of patient-reported outcome

TABLE 4 Interaction analyses between women's attributes and the variable for the post-pandemic group

	Prevalence		Symptom severity	
	OR	*P*	Coeff.	*P*
(After COVID-19 outbreak vs. before)				
Third trimester vs. T0	1.50	0.087	0.28	0.040
3 months postpartum vs. T0	0.81	0.361	−0.17	0,209
16–30 vs. 30–39 years old	1.06	0.801	−0.05	0.760
>40 vs. 30–39 years old	1.22	0.426	0.20	0.260
Underweight vs. normal weight	0.77	0.381	−0.10	0.625
Overweight vs. normal weight	0.90	0.645	−0.02	0.869
Obesity vs. normal weight	1.56	0.173	0.71	0.001
Multiparous vs. primigravida	0.85	0.360	−0.13	0.288
Non-Italian vs. Italian citizenship	0.71	0.335	−0.13	0.585
Low vs. high education level	0.82	0.523	−0.20	0.339
Medium vs. high education level	1.17	0.394	0.04	0.723
Fetal weight over vs. under 3.5 kg	1.01	0.936	0.01	0.935
Cesarean section vs. spontaneous delivery	0.86	0.561	−0.22	0.143
Operative vs. spontaneous delivery	0.54	0.087	−0.58	0.028
Spontaneous vs. no tear	1.15	0.488	0.05	0.728
Episiotomy vs. no tear	1.09	0.787	0.02	0.915
PFMT during vs. after pregnancy	1,00	0.989	0.14	0.543
PFMT during + after vs. after pregnancy	1.07	0.826	0.06	0.804
No PFMT vs. after pregnancy	0.94	0.817	0.08	0.723
UI during pregnancy vs. not	0.95	0.787	−0.55	0.000
Constant	0.01	0.000	−0.21	0.366

Abbreviations: Coeff., coefficient; CS, cesarean section; OR, odds ratio; PFMT, pelvic floor muscle training; UI, urinary incontinence.

measures is continuously increasing in various clinical and research settings, including pelvic floor disorder care pathways.[24] Patient-reported outcome measures provide patient-centered real-world data, so have the power to highlight what patients need,[25] enabling health systems to align supply.[26]

In conclusion, we employed patient-reported data systematically collected from the maternity pathways of Tuscany to explore how the COVID-19 pandemic has affected the pelvic floor function of pregnant women and the main risk factors for developing pregnancy-related UI. We found that women reported lower risks of UI occurrence and severity during the pandemic. As this "protective" effect was observed mainly for stress/mixed UI and among women never performing PFMT—whose number was significantly higher during the pandemic—we hypothesize that the lockdown-related sedentarism and inactivity prevented women from noticing their symptomatology, especially if provoked by physical efforts. Moreover, despite the pandemic the risk was not increased in women who performed during-pregnancy PFMT but just six of 26 health districts organized PFMT courses, so our findings imply that women might have continued to perform such exercises on their own or privately, revealing limited resilience to the pandemic by the maternity pathways of Tuscany.

AUTHOR CONTRIBUTIONS

Amerigo Ferrari and Manila Bonciani were responsible for study design, methodology, statistical analyses, and manuscript writing. Manila Bonciani developed the systematic longitudinal survey on the maternity pathway in Tuscany and the connected web App *hAPPyMamma*. Ilaria Corazza and Paolo Mannella participated in result interpretation and manuscript writing. Tommaso Simoncini supervised the work, revised and edited the drafts of the manuscript, and approved the final version.

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CONFLICT OF INTEREST

The authors have no conflicts of interest to declare.

DATA AVAILABILITY STATEMENT

The data sets used in this study cannot be shared for privacy reasons unless reasonably requested by the publisher for review purposes. Instead, the statistical procedures that support our results can be made available upon request.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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